UNITED STATES PATENT AND TRADEMARK OFFICE

CERTIFICATE OF CORRECTION

PATENT NO.	: 8,594,122 B2
APPLICATION NO.	: 11/627181
DATED	: November 26, 2013
INVENTOR(S)	: Wentink

It is certified that error appears in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

On the Title Page:

The first or sole Notice should read --

Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 1372 days.

Signed and Sealed this
Twenty-first Day of April, 2015

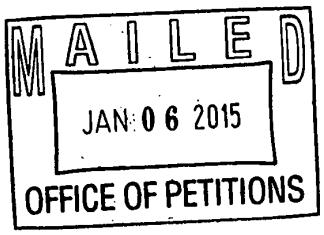
Michelle K. Lee

Michelle K. Lee
Director of the United States Patent and Trademark Office

UBIQUITI 1002

UNITED STATES PATENT AND TRADEMARK OFFICE

Commissioner for Patents
United States Patent and Trademark Office
P.O. Box 1450
Alexandria, VA 22313-1450
www.uspto.gov



FOLEY & LARDNER LLP
3000 K STREET N.W.
SUITE 600
WASHINGTON DC 20007-5109

In re Patent No. 8,594,122	: DECISION ON REQUEST
Wentink	: FOR
Issue Date: November 26, 2013	: RECONSIDERATION OF
Application No. 11/627,181	: PATENT TERM ADJUSTMENT
Filed: January 25, 2007	: and
Atty Docket No. 088245-2616	: NOTICE OF INTENT TO ISSUE
	: CERTIFICATE OF CORRECTION

This is a decision on the petition filed on January 24, 2014, which is being treated as a petition under 37 CFR 1.705(d) requesting that the patent term adjustment indicated on the above-identified patent be corrected to indicate that the term of the above-identified patent is extended or adjusted one thousand, three hundred and seventy-two (1,372) days.

The petition to correct the patent term adjustment indicated on the above-identified patent to indicate that the term of the above-identified patent is extended or adjusted by one thousand, three hundred and seventy-two (1,372) days is **GRANTED**.

The Office acknowledges receipt of $200.00 for the fee set forth in 37 CFR 1.18(e). No additional fees are required.

The Office will *sua sponte* issue a certificate of correction. Pursuant to 37 CFR 1.322, the Office will not issue a certificate of correction without first providing assignee or patentee an opportunity to be heard. Accordingly, patentee is given **one (1) month or thirty (30) days**, whichever is longer, from the mail date of this decision to respond. No extensions of time will be granted under § 1.136.

The application is being forwarded to the Certificates of Correction Branch for issuance of a certificate of correction. The Office will issue a certificate of correction indicating that the term of the above-identified patent is extended or adjusted by one thousand, three hundred and seventy-two (1,372) days.

Telephone inquiries specific to this matter should be directed to the undersigned, at (571) 272-3222.

/Kenya A. McLaughlin/

Kenya A. McLaughlin
Attorney Advisor
Office of Petitions

Enclosure: Copy of DRAFT Certificate of Correction

DRAFT COPY

UNITED STATES PATENT AND TRADEMARK OFFICE

CERTIFICATE OF CORRECTION

PATENT : 8,594,122 B2

DATED : Nov. 26, 2013

INVENTOR(S) : Wentink

It is certified that error appears in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

On the cover page,

[*] Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 USC 154(b) by (1248) days

Delete the phrase "1248" days" and insert – by 1372 days--

UNITED STATES PATENT AND TRADEMARK OFFICE

CERTIFICATE OF CORRECTION

PATENT NO. : 8,594,122 B2
APPLICATION NO. : 11/627181
DATED : November 26, 2013
INVENTOR(S) : Wentink

It is certified that error appears in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

In the Specifications

In Column 2, Line 47, delete "FIG. 1" and insert -- FIG. 1. --, therefor.

In Column 2, Line 60, delete "NoACK" and insert -- No ACK --, therefor.

In Column 5, Lines 22-23, delete "an CTS" and insert -- a CTS --, therefor.

In Column 5, Line 29, delete "TXA" and insert -- TxA --, therefor.

In the Claims

In Column 9, Lines 36-37, in Claim 24, delete "an high" and insert -- a high --, therefor.

Signed and Sealed this
Sixth Day of May, 2014

Michelle K. Lee

Michelle K. Lee
Deputy Director of the United States Patent and Trademark Office

PTO/SB/44 (09-07)
Approved for use through 08/31/2013. OMB 0651-0033
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.
(Also Form PTO-1050)

UNITED STATES PATENT AND TRADEMARK OFFICE
CERTIFICATE OF CORRECTION

PATENT NO. : 8,594,122 B2

APPLICATION NO. : 11/627,181

ISSUE DATE : November 26, 2013

INVENTOR(S) : Wentink

It is certified that an error appears or errors appear in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

In Column 2, Line 47, delete “FIG. 1” and insert - - FIG. 1. - -, therefor.

In Column 2, Line 60, delete “NoACK” and insert - - No ACK - -, therefor.

In Column 5, Lines 22-23, delete “an CTS” and insert - - a CTS - -, therefor.

In Column 5, Line 29, delete “TXA” and insert - - TxA - -, therefor.

In Column 9, Lines 36-37, in Claim 24, delete “an high” and insert - - a high - -, therefor.

MAILING ADDRESS OF SENDER (Please do not use customer number below):

Maschoff Brennan
1389 Center Drive, Suite 300
Park City, Utah 84098, United States

This collection of information is required by 37 CFR 1.322, 1.323, and 1.324. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 1.0 hour to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Attention Certificate of Corrections Branch, Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

Privacy Act Statement

The **Privacy Act of 1974 (P.L. 93-579)** requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether disclosure of these records is required by the Freedom of Information Act.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (*i.e.*, GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

IN THE UNITED STATES PATENT & TRADEMARK OFFICE

PATENT NO.: 8,594,122

USPTO CONFIRMATION CODE: 1464

APPLICATION NO.: 11/627,181

FILED: January 25, 2007

EXAMINER: Abdullah Riyami

GROUP ART UNIT: 2474

FOR: TRANSMIT ANNOUNCEMENT INDICATION

37 CFR 1.322 & 37 CFR 1.323 REQUEST FOR CERTIFICATE OF CORRECTION FOR USPTO AND/OR APPLICANT MISTAKE

Commissioner for Patents
Office of Patent Publication
ATTN: Certificate of Correction Branch
P.O. Box 1450
Alexandria, VA 22313-1450

Dear Sir:

A certificate of correction under 35 USC 254 is respectfully requested in the above-identified patent.

It is believed that all errors identified herein were the fault of both the applicant and USPTO and, accordingly, please charge **$100.00** to the credit card utilized for this certificate of correction filing. In the event that a further fee is required, please charge the amount to the same credit card.

The exact locations where the errors appear in the patent and patent application are as follows:

In Column 2, Line 47, delete "FIG. 1" and insert - - FIG. 1. - -, therefor.
(ORIGINALLY FILED SPECIFICATION DATED JANUARY 25, 2007, PAGE 4, PARAGRAPH [0013], LINE 2)

In Column 2, Line 60, delete "NoACK" and insert - - No ACK - -, therefor.
(ORIGINALLY FILED SPECIFICATION DATED JANUARY 25, 2007, PAGE 5, PARAGRAPH [0017], LINE 2)

In Column 5, Lines 22-23, delete "an CTS" and insert - - a CTS - -, therefor.
(ORIGINALLY FILED SPECIFICATION DATED JANUARY 25, 2007, PAGE 10, PARAGRAPH [0031], LINE 4)

In Column 5, Line 29, delete "TXA" and insert - - TxA - -, therefor.
(ORIGINALLY FILED SPECIFICATION DATED JANUARY 25, 2007, PAGE 10, PARAGRAPH [0031], LINE 9)

In Column 9, Lines 36-37, in Claim 24, delete "an high" and insert - - a high - -, therefor.
(NOTICE OF ALLOWANCE AND FEES DUE (PTOL-85) DATED JULY 24, 2013, PAGE 6, CLAIM 26, LINE 1)

The requested corrections are attached on Form PTO/SB/44.

Dated this 27th day of February, 2014.

Respectfully Submitted,

/R. Burns Israelsen/ Reg. # 42,685
R. BURNS ISRAELSEN
Acting in Representative Capacity
(37 CFR 1.34)
Registration No. 42,685
Telephone No. (435) 252-1360

Electronic Patent Application Fee Transmittal	
Application Number:	11627181
Filing Date:	25-Jan-2007
Title of Invention:	TRANSMIT ANNOUNCEMENT INDICATION
First Named Inventor/Applicant Name:	Menzo Wentink
Filer:	Robert Burns Israelsen/Jeffrey Woodward
Attorney Docket Number:	088245-2616
Filed as Large Entity	

Utility under 35 USC 111(a) Filing Fees

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
Certificate of Correction	1811	1	100	100
Extension-of-Time:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Miscellaneous:				
			Total in USD ($)	**100**

Electronic Acknowledgement Receipt	
EFS ID:	18317948
Application Number:	11627181
International Application Number:	
Confirmation Number:	1464
Title of Invention:	TRANSMIT ANNOUNCEMENT INDICATION
First Named Inventor/Applicant Name:	Menzo Wentink
Customer Number:	23524
Filer:	Robert Burns Israelsen/Jeffrey Woodward
Filer Authorized By:	Robert Burns Israelsen
Attorney Docket Number:	088245-2616
Receipt Date:	27-FEB-2014
Filing Date:	25-JAN-2007
Time Stamp:	11:26:25
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	Credit Card
Payment was successfully received in RAM	$100
RAM confirmation Number	10780
Deposit Account	
Authorized User	

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)

1	Request for Certificate of Correction	1052USAP154382_2014-02-27_CoC.pdf	252262 5985517446c1ad1d4d03eb0214d466e9d1ebaed5	no	2
Warnings:					
Information:					
2	Request for Certificate of Correction	1052USAP154382_2014-02-27_Request_Letter.pdf	189397 8047399c1b50329062d7f180adb822cbfe38547c	no	2
Warnings:					
Information:					
3	Fee Worksheet (SB06)	fee-info.pdf	30002 f10ba1d238743250bb4d83c1faf249cb0613a9f4	no	2
Warnings:					
Information:					
		Total Files Size (in bytes):	471661		

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111
If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371
If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office
If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

First Inventor Name:	Menzo Wentink
Title:	TRANSMIT ANNOUNCEMENT INDICATION
Appl. No.:	11/627,181
Filing Date:	1/25/2007
Patent No.:	8594122
Grant Date:	11/26/2013
Examiner:	Abdulla A. Riyami
Art Unit:	2474
Confirmation Number:	1464

REQUEST FOR RECONSIDERATION OF PATENT TERM ADJUSTMENT FOR ISSUED PATENT UNDER *EXELIXIS*

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Commissioner:

The Patent Office determined that the patent was entitled to 1248 days of PTA. Patentee believes that this PTA determination was made in accordance with 37 CFR § 1.703(b)(1). Under that interpretation of the PTA statute, PTA does not accrue under § 154(b)(1)(B) for the time period "beginning on the date on which a request for continued examination ... was filed and ending on the date the patent was issued." Thus, for the captioned patent, PTA was not awarded under § 154(b)(1)(B) for the time period beginning on 7/25/2013 and ending on 11/26/2013.

On November 1, 2012, the United States District Court for the Eastern District of Virginia issued a decision finding that the Patent Office's interpretation of the PTA statute is incorrect. Exelixis v. Kappos, No. 1:12cv96 (E. D. Va. Nov. 1, 2012). The court determined that, under the correct interpretation of the PTA statute, "RCE's have no impact on PTA if filed after the three year deadline has passed, such that, [t]he proper measure of B delay ... is from ...

three years after the application filing date ... to ... the date the patent issued." 2012 U.S. Dist. LEXIS 157762 at *26 (emphasis added).

In the present case, the RCE was filed more than three years after the application's filing date. Thus, the Patent Office's PTA determination that did not award PTA for the time period after the RCE was filed from the time the Notice of Allowance was issued until the patent grant date is contrary to law under the court's *Exelixis* decision.

Patentee has recalculated PTA for the captioned patent under the court's interpretation of the PTA statute, and has determined that the patent is entitled to 1372 days PTA.

The attached sheet details the relevant dates and time periods for PTA under 37 CFR § 1.702 and § 1.703 and the relevant dates and time periods for deductions under 37 CFR § 1.704. The correct PTA is determined as follows:

Total of non-overlapping PTO delay under §154(b)(1)(A), (B) & (C):	1949 days
Total Applicant delay under §154(b)(2)(C):	577 days
Final PTA Determination:	1372 days

The patent is not subject to a terminal disclaimer.

Patentee therefore requests that the patent be accorded 1372 days PTA.

The requisite fee is submitted herewith.

Fees in the amount of $200.00 set forth in 37 C.F.R. § 1.18(e) to cover the fee for this request are being paid by credit card via EFS-Web.

The Commissioner is hereby authorized to charge any additional fees which may be required regarding this application under 37 C.F.R. § 1.705, or credit any overpayment, to Deposit Account No. 19-0741. Should no proper payment be enclosed herewith, as by the credit card payment instructions in EFS-Web being incorrect or absent, resulting in a rejected or incorrect credit card transaction, the Commissioner is authorized to charge the unpaid amount to Deposit Account No. 19-0741.

However, because this PTA error is due to a Patent Office error in interpreting and applying the PTA statute, a refund of the fee is respectfully requested.

Respectfully submitted,

Date January 24, 2014

By */Paul S. Hunter/*

FOLEY & LARDNER LLP
Customer Number: 23524
Telephone: (608) 258-4292
Facsimile: (608) 258-4258

Paul S. Hunter
Attorney for Applicant
Registration No. 44,787

Patent Term Adjustment Calculation System

Add a new event to this case

Docket Number: 088245-2616
Application Number: 11/627181
Patent Number: 8594122

	Event Description	Event Date	Days from Filing	PTO Days	Applicant Days
Edit Delete	Priority Date	01/25/2006	-365		
CLOSE WINDOW Edit Delete	ALL CASES SELECT CASE Application Filing Date	01/25/2007	0		
	14 month From Application date	03/25/2008	425		
	Three Years From Filing	01/25/2010	1,096		
	3 Year Period Starts	01/25/2010	1,096		
Edit Delete	IDS Rcv'd at PTO - No Statement under 1.704(d)	07/21/2010	1,273		
Edit Delete	Advisory Action	01/21/2011	1,457		
Edit Delete	Non-Final Office Action	05/23/2011	1,579	(1154)	
Edit Delete	Non-Final Office Action Rsp. Rcv'd at PTO	08/23/2011	1,671		
Edit Delete	IDS Rcv'd at PTO - No Statement under 1.704(d)	10/27/2011	1,736		65
Edit Delete	Final Office Action	11/07/2011	1,747		
Edit Delete	Final Office Action Response Received at PTO	12/21/2011	1,791		
	3 Year Period Paused	01/30/2012	1,831	(735) 1406	
Edit Delete	Request For Continued Examination (including amendment)	01/31/2012	1,832		
	Request For Continued Examination + 4 months	05/31/2012	1,953		512
Edit Delete	IDS Rcv'd at PTO - No Statement under 1.704(d)	06/26/2013	2,344		
Edit Delete	Notice of Allowance	07/24/2013	2,372	419	
	3 Year Period Resumed	07/25/2013	2,373		
Edit Delete	Issue Fee Paid	10/23/2013	2,463		
Edit Delete	Patent Grant Date	11/26/2013	2,497	124	
			Totals:	1,949	577
			PTA:		

1372

Created and maintained by

FOLEY

FOLEY & LARDNER LLP

Version: 3.02.16 LOGIN: Linda Anderson IP: 10.24.4.13 Foley & Lardner LLP

Electronic Patent Application Fee Transmittal	
Application Number:	11627181
Filing Date:	25-Jan-2007
Title of Invention:	TRANSMIT ANNOUNCEMENT INDICATION
First Named Inventor/Applicant Name:	Menzo Wentink
Filer:	Paul S. Hunter/Linda Anderson
Attorney Docket Number:	088245-2616
Filed as Large Entity	

Utility under 35 USC 111(a) Filing Fees

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Application for patent term adjustment	1455	1	200	200
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Miscellaneous:				
			Total in USD ($)	**200**

Electronic Acknowledgement Receipt	
EFS ID:	18012122
Application Number:	11627181
International Application Number:	
Confirmation Number:	1464
Title of Invention:	TRANSMIT ANNOUNCEMENT INDICATION
First Named Inventor/Applicant Name:	Menzo Wentink
Customer Number:	23524
Filer:	Paul S. Hunter/Linda Anderson
Filer Authorized By:	Paul S. Hunter
Attorney Docket Number:	088245-2616
Receipt Date:	24-JAN-2014
Filing Date:	25-JAN-2007
Time Stamp:	11:13:46
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	Credit Card
Payment was successfully received in RAM	$200
RAM confirmation Number	9125
Deposit Account	
Authorized User	

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)

1	Patent Term Adjustment Petition	RequestforReconofPTA.pdf	142344 fd21b19dd2d2f4a2c77b66337c26c3c6138a86ba	no	4
Warnings:					
Information:					
2	Fee Worksheet (SB06)	fee-info.pdf	30166 50daaa91d2f86a74ec2fae9c6c889b82f618d8af	no	2
Warnings:					
Information:					
		Total Files Size (in bytes):	172510		

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111
If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371
If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office
If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	ISSUE DATE	PATENT NO.	ATTORNEY DOCKET NO.	CONFIRMATION NO.
11/627,181	11/26/2013	8594122	088245-2616	1464

23524 7590 11/06/2013

FOLEY & LARDNER LLP
3000 K STREET N.W.
SUITE 600
WASHINGTON, DC 20007-5109

ISSUE NOTIFICATION

The projected patent number and issue date are specified above.

Determination of Patent Term Adjustment under 35 U.S.C. 154 (b)
(application filed on or after May 29, 2000)

The Patent Term Adjustment is 1248 day(s). Any patent to issue from the above-identified application will include an indication of the adjustment on the front page.

If a Continued Prosecution Application (CPA) was filed in the above-identified application, the filing date that determines Patent Term Adjustment is the filing date of the most recent CPA.

Applicant will be able to obtain more detailed information by accessing the Patent Application Information Retrieval (PAIR) WEB site (http://pair.uspto.gov).

Any questions regarding the Patent Term Extension or Adjustment determination should be directed to the Office of Patent Legal Administration at (571)-272-7702. Questions relating to issue and publication fee payments should be directed to the Application Assistance Unit (AAU) of the Office of Data Management (ODM) at (571)-272-4200.

APPLICANT(s) (Please see PAIR WEB site http://pair.uspto.gov for additional applicants):

Menzo Wentink, Utrecht, NETHERLANDS;

The United States represents the largest, most dynamic marketplace in the world and is an unparalleled location for business investment, innovation, and commercialization of new technologies. The USA offers tremendous resources and advantages for those who invest and manufacture goods here. Through SelectUSA, our nation works to encourage and facilitate business investment. To learn more about why the USA is the best country in the world to develop technology, manufacture products, and grow your business, visit SelectUSA.gov.

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

First Inventor Name:	Menzo Wentink
Title:	TRANSMIT ANNOUNCEMENT INDICATION
Appl. No.:	11/627,181
Filing Date:	1/25/2007
Examiner:	Abdulla A. Riyami
Art Unit:	2474
Confirmation Number:	1464

ISSUE FEE TRANSMITTAL

Mail Stop Issue Fee
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450
Commissioner:

Enclosed herewith please find Issue Fee Transmittal Form PTOL-85(B).

Fees in the amount of $2,080.00 for payment of the Issue Fee and the Publication Fee are being paid by credit card via EFS-Web.

The Commissioner is hereby authorized to charge any additional fees which may be required regarding this application under 37 C.F.R. §§ 1.16-1.17, or credit any overpayment, to Deposit Account No. 19-0741. Should no proper payment be enclosed herewith, as by the credit card payment instructions in EFS-Web being incorrect or absent, resulting in a rejected or incorrect credit card transaction, the Commissioner is authorized to charge the unpaid amount to Deposit Account No. 19-0741.

Respectfully submitted,

Date October 23, 2013

By _____

FOLEY & LARDNER LLP
Customer Number: 23524
Telephone: (608) 258-4292
Facsimile: (608) 258-4258

Paul S. Hunter
Attorney for Applicant
Registration No. 44,787

PART B - FEE(S) TRANSMITTAL

Complete and send this form, together with applicable fee(s), to: Mail **Mail Stop ISSUE FEE**
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450
or Fax (571)-273-2885

INSTRUCTIONS: This form should be used for transmitting the ISSUE FEE and PUBLICATION FEE (if required). Blocks 1 through 5 should be completed where appropriate. All further correspondence including the Patent, advance orders and notification of maintenance fees will be mailed to the current correspondence address as indicated unless corrected below or directed otherwise in Block 1, by (a) specifying a new correspondence address; and/or (b) indicating a separate "FEE ADDRESS" for maintenance fee notifications.

CURRENT CORRESPONDENCE ADDRESS (Note: Use Block 1 for any change of address)

23524 7590 07/24/2013
FOLEY & LARDNER LLP
3000 K STREET N.W.
SUITE 600
WASHINGTON, DC 20007-5109

Note: A certificate of mailing can only be used for domestic mailings of the Fee(s) Transmittal. This certificate cannot be used for any other accompanying papers. Each additional paper, such as an assignment or formal drawing, must have its own certificate of mailing or transmission.

Certificate of Mailing or Transmission
I hereby certify that this Fee(s) Transmittal is being deposited with the United States Postal Service with sufficient postage for first class mail in an envelope addressed to the Mail Stop ISSUE FEE address above, or being facsimile transmitted to the USPTO (571) 273-2885, on the date indicated below.

(Depositor's name)
(Signature)
(Date)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
11/627,181	01/25/2007	Menzo Wentink	088245-2616	1464

TITLE OF INVENTION: TRANSMIT ANNOUNCEMENT INDICATION

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	UNDISCOUNTED	$1780	$300	$0	$2080	10/24/2013

EXAMINER	ART UNIT	CLASS-SUBCLASS
RIYAMI, ABDULLAH A	2474	370-445000

1. Change of correspondence address or indication of "Fee Address" (37 CFR 1.363).
☐ Change of correspondence address (or Change of Correspondence Address form PTO/SB/122) attached.
☐ "Fee Address" indication (or "Fee Address" Indication form PTO/SB/47; Rev 03-02 or more recent) attached. **Use of a Customer Number is required.**

2. For printing on the patent front page, list
(1) the names of up to 3 registered patent attorneys or agents OR, alternatively,
(2) the name of a single firm (having as a member a registered attorney or agent) and the names of up to 2 registered patent attorneys or agents. If no name is listed, no name will be printed.
1 _____
2 _____
3 _____

3. ASSIGNEE NAME AND RESIDENCE DATA TO BE PRINTED ON THE PATENT (print or type)

PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. If an assignee is identified below, the document has been filed for recordation as set forth in 37 CFR 3.11. Completion of this form is NOT a substitute for filing an assignment.

(A) NAME OF ASSIGNEE: Intellectual Ventures I LLC
(B) RESIDENCE: (CITY and STATE OR COUNTRY): Wilmington, Delaware

Please check the appropriate assignee category or categories (will not be printed on the patent): ☐ Individual ☒ Corporation or other private group entity ☐ Government

4a. The following fee(s) are submitted:
☒ Issue Fee
☒ Publication Fee (No small entity discount permitted)
☐ Advance Order - # of Copies _____

4b. Payment of Fee(s): **(Please first reapply any previously paid issue fee shown above)**
☐ A check is enclosed.
☒ Payment by credit card. Form PTO-2038 is attached. XXXXXXXXXXXXXXX EFS Web
☒ The Director is hereby authorized to charge the required fee(s), any deficiency, or credit any overpayment, to Deposit Account Number 19-0741 (enclose an extra copy of this form). XXXXXXXXXXXXXXXXXXXXXXXX

5. **Change in Entity Status** (from status indicated above)

☐ Applicant certifying micro entity status. See 37 CFR 1.29	NOTE: Absent a valid certification of Micro Entity Status (see form PTO/SB/15A and 15B), issue fee payment in the micro entity amount will not be accepted at the risk of application abandonment.
☐ Applicant asserting small entity status. See 37 CFR 1.27	NOTE: If the application was previously under micro entity status, checking this box will be taken to be a notification of loss of entitlement to micro entity status.
☐ Applicant changing to regular undiscounted fee status.	NOTE: Checking this box will be taken to be a notification of loss of entitlement to small or micro entity status, as applicable.

NOTE: The Issue Fee and Publication Fee (if required) will not be accepted from anyone other than the applicant; a registered attorney or agent; or the assignee or other party in interest as shown by the records of the United States Patent and Trademark Office.

Authorized Signature _____ Date October 23, 2013

Typed or printed name Paul S. Hunter Registration No. 44,787

This collection of information is required by 37 CFR 1.311. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, Virginia 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, Virginia 22313-1450.

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant:	Menzo Wentink
Title:	TRANSMIT ANNOUNCEMENT INDICATION
Appl. No.:	11/627,181
Filing Date:	01/25/2007
Examiner:	Abdulla A. Riyami
Art Unit:	2474
Confirmation Number:	1464

COMMENTS ON STATEMENT OF REASONS FOR ALLOWANCE

Mail Stop ISSUE FEE
Commissioner for Patents
PO Box 1450
Alexandria, Virginia 22313-1450

These Comments on Statement of Reasons for Allowance under 37 C.F.R. § 1.104 are intended to be responsive to the Notice of Allowance dated July 24, 2013. On pages 9-10 of the Notice of Allowability under "Examiner's Statement of Reasons for Allowance," the Examiner provided a statement of reasons for allowance.

While Applicant agrees that the allowed claims recite a combination of subject matter that is patentable over the cited references, Applicant does not necessarily agree with or acquiesce in the statement of reasons for allowance given by the Examiner. Moreover, the Applicant notes that the recited subject matter as well as various other subject matter and/or combinations of subject matter may be patentable for other reasons than those given by the Examiner. Applicant expressly reserves the right to set forth additional and/or alternative reasons for patentability and/or allowance with the present Application or in any other future proceeding.

Respectfully submitted,

By: _____

Paul S. Hunter
Attorney for Applicant
Registration No. 44,787

Date: October 23, 2013

FOLEY & LARDNER LLP
Customer Number: 23524
Telephone: (608) 258-4292
Facsimile: (608) 258-4258

Electronic Patent Application Fee Transmittal	
Application Number:	11627181
Filing Date:	25-Jan-2007
Title of Invention:	TRANSMIT ANNOUNCEMENT INDICATION
First Named Inventor/Applicant Name:	Menzo Wentink
Filer:	Paul S. Hunter/Linda Anderson
Attorney Docket Number:	088245-2616
Filed as Large Entity	

Utility under 35 USC 111(a) Filing Fees

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
Utility Appl Issue Fee	1501	1	1780	1780
Publ. Fee- Early, Voluntary, or Normal	1504	1	300	300

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Extension-of-Time:				
Miscellaneous:				
			Total in USD ($)	**2080**

Electronic Acknowledgement Receipt	
EFS ID:	17201971
Application Number:	11627181
International Application Number:	
Confirmation Number:	1464
Title of Invention:	TRANSMIT ANNOUNCEMENT INDICATION
First Named Inventor/Applicant Name:	Menzo Wentink
Customer Number:	23524
Filer:	Paul S. Hunter/Linda Anderson
Filer Authorized By:	Paul S. Hunter
Attorney Docket Number:	088245-2616
Receipt Date:	23-OCT-2013
Filing Date:	25-JAN-2007
Time Stamp:	10:51:05
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	Credit Card
Payment was successfully received in RAM	$2080
RAM confirmation Number	11258
Deposit Account	
Authorized User	

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)

1		Issuefeeandcomments.pdf	198857 3abcedf50a29e20fac586e76d3a88291a30a5373	yes	6
	Multipart Description/PDF files in .zip description				
	Document Description		**Start**	**End**	
	Issue Fee Payment (PTO-85B)		1	4	
	Post Allowance Communication - Incoming		5	6	
Warnings:					
Information:					
2	Fee Worksheet (SB06)	fee-info.pdf	31839 d91e5491b5682c116553bd1379750e5aaf097bbe	no	2
Warnings:					
Information:					
		Total Files Size (in bytes):	230696		

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

<u>New Applications Under 35 U.S.C. 111</u>
If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

<u>National Stage of an International Application under 35 U.S.C. 371</u>
If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

<u>New International Application Filed with the USPTO as a Receiving Office</u>
If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

NOTICE OF ALLOWANCE AND FEE(S) DUE

23524 7590 07/24/2013

FOLEY & LARDNER LLP
3000 K STREET N.W.
SUITE 600
WASHINGTON, DC 20007-5109

EXAMINER
RIYAMI, ABDULLAH A

ART UNIT	PAPER NUMBER
2474	

DATE MAILED: 07/24/2013

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
11/627,181	01/25/2007	Menzo Wentink	088245-2616	1464

TITLE OF INVENTION: TRANSMIT ANNOUNCEMENT INDICATION

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	UNDISCOUNTED	$1780	$300	$0	$2080	10/24/2013

THE APPLICATION IDENTIFIED ABOVE HAS BEEN EXAMINED AND IS ALLOWED FOR ISSUANCE AS A PATENT. PROSECUTION ON THE MERITS IS CLOSED. THIS NOTICE OF ALLOWANCE IS NOT A GRANT OF PATENT RIGHTS. THIS APPLICATION IS SUBJECT TO WITHDRAWAL FROM ISSUE AT THE INITIATIVE OF THE OFFICE OR UPON PETITION BY THE APPLICANT. SEE 37 CFR 1.313 AND MPEP 1308.

THE ISSUE FEE AND PUBLICATION FEE (IF REQUIRED) MUST BE PAID WITHIN THREE MONTHS FROM THE MAILING DATE OF THIS NOTICE OR THIS APPLICATION SHALL BE REGARDED AS ABANDONED. THIS STATUTORY PERIOD CANNOT BE EXTENDED. SEE 35 U.S.C. 151. THE ISSUE FEE DUE INDICATED ABOVE DOES NOT REFLECT A CREDIT FOR ANY PREVIOUSLY PAID ISSUE FEE IN THIS APPLICATION. IF AN ISSUE FEE HAS PREVIOUSLY BEEN PAID IN THIS APPLICATION (AS SHOWN ABOVE), THE RETURN OF PART B OF THIS FORM WILL BE CONSIDERED A REQUEST TO REAPPLY THE PREVIOUSLY PAID ISSUE FEE TOWARD THE ISSUE FEE NOW DUE.

HOW TO REPLY TO THIS NOTICE:

I. Review the ENTITY STATUS shown above. If the ENTITY STATUS is shown as SMALL or MICRO, verify whether entitlement to that entity status still applies.

If the ENTITY STATUS is the same as shown above, pay the TOTAL FEE(S) DUE shown above.

If the ENTITY STATUS is changed from that shown above, on PART B - FEE(S) TRANSMITTAL, complete section number 5 titled "Change in Entity Status (from status indicated above)".

For purposes of this notice, small entity fees are 1/2 the amount of undiscounted fees, and micro entity fees are 1/2 the amount of small entity fees.

II. PART B - FEE(S) TRANSMITTAL, or its equivalent, must be completed and returned to the United States Patent and Trademark Office (USPTO) with your ISSUE FEE and PUBLICATION FEE (if required). If you are charging the fee(s) to your deposit account, section "4b" of Part B - Fee(s) Transmittal should be completed and an extra copy of the form should be submitted. If an equivalent of Part B is filed, a request to reapply a previously paid issue fee must be clearly made, and delays in processing may occur due to the difficulty in recognizing the paper as an equivalent of Part B.

III. All communications regarding this application must give the application number. Please direct all communications prior to issuance to Mail Stop ISSUE FEE unless advised to the contrary.

IMPORTANT REMINDER: Utility patents issuing on applications filed on or after Dec. 12, 1980 may require payment of maintenance fees. It is patentee's responsibility to ensure timely payment of maintenance fees when due.

PART B - FEE(S) TRANSMITTAL

Complete and send this form, together with applicable fee(s), to: Mail **Mail Stop ISSUE FEE**
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450
or Fax (571)-273-2885

INSTRUCTIONS: This form should be used for transmitting the ISSUE FEE and PUBLICATION FEE (if required). Blocks 1 through 5 should be completed where appropriate. All further correspondence including the Patent, advance orders and notification of maintenance fees will be mailed to the current correspondence address as indicated unless corrected below or directed otherwise in Block 1, by (a) specifying a new correspondence address; and/or (b) indicating a separate "FEE ADDRESS" for maintenance fee notifications.

CURRENT CORRESPONDENCE ADDRESS (Note: Use Block 1 for any change of address)

23524 7590 07/24/2013
FOLEY & LARDNER LLP
3000 K STREET N.W.
SUITE 600
WASHINGTON, DC 20007-5109

Note: A certificate of mailing can only be used for domestic mailings of the Fee(s) Transmittal. This certificate cannot be used for any other accompanying papers. Each additional paper, such as an assignment or formal drawing, must have its own certificate of mailing or transmission.

Certificate of Mailing or Transmission

I hereby certify that this Fee(s) Transmittal is being deposited with the United States Postal Service with sufficient postage for first class mail in an envelope addressed to the Mail Stop ISSUE FEE address above, or being facsimile transmitted to the USPTO (571) 273-2885, on the date indicated below.

(Depositor's name)
(Signature)
(Date)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
11/627,181	01/25/2007	Menzo Wentink	088245-2616	1464

TITLE OF INVENTION: TRANSMIT ANNOUNCEMENT INDICATION

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	UNDISCOUNTED	$1780	$300	$0	$2080	10/24/2013

EXAMINER	ART UNIT	CLASS-SUBCLASS
RIYAMI, ABDULLAH A	2474	370-445000

1. Change of correspondence address or indication of "Fee Address" (37 CFR 1.363).

❑ Change of correspondence address (or Change of Correspondence Address form PTO/SB/122) attached.

❑ "Fee Address" indication (or "Fee Address" Indication form PTO/SB/47; Rev 03-02 or more recent) attached. **Use of a Customer Number is required.**

2. For printing on the patent front page, list

(1) the names of up to 3 registered patent attorneys or agents OR, alternatively,

(2) the name of a single firm (having as a member a registered attorney or agent) and the names of up to 2 registered patent attorneys or agents. If no name is listed, no name will be printed.

1 _____
2 _____
3 _____

3. ASSIGNEE NAME AND RESIDENCE DATA TO BE PRINTED ON THE PATENT (print or type)

PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. If an assignee is identified below, the document has been filed for recordation as set forth in 37 CFR 3.11. Completion of this form is NOT a substitute for filing an assignment.

(A) NAME OF ASSIGNEE (B) RESIDENCE: (CITY and STATE OR COUNTRY)

Please check the appropriate assignee category or categories (will not be printed on the patent) : ❑ Individual ❑ Corporation or other private group entity ❑ Government

4a. The following fee(s) are submitted:

❑ Issue Fee

❑ Publication Fee (No small entity discount permitted)

❑ Advance Order - # of Copies _____

4b. Payment of Fee(s): **(Please first reapply any previously paid issue fee shown above)**

❑ A check is enclosed.

❑ Payment by credit card. Form PTO-2038 is attached.

❑ The Director is hereby authorized to charge the required fee(s), any deficiency, or credit any overpayment, to Deposit Account Number _____ (enclose an extra copy of this form).

5. **Change in Entity Status** (from status indicated above)

❑ Applicant certifying micro entity status. See 37 CFR 1.29

NOTE: Absent a valid certification of Micro Entity Status (see form PTO/SB/15A and 15B), issue fee payment in the micro entity amount will not be accepted at the risk of application abandonment.

❑ Applicant asserting small entity status. See 37 CFR 1.27

NOTE: If the application was previously under micro entity status, checking this box will be taken to be a notification of loss of entitlement to micro entity status.

❑ Applicant changing to regular undiscounted fee status.

NOTE: Checking this box will be taken to be a notification of loss of entitlement to small or micro entity status, as applicable.

NOTE: The Issue Fee and Publication Fee (if required) will not be accepted from anyone other than the applicant; a registered attorney or agent; or the assignee or other party in interest as shown by the records of the United States Patent and Trademark Office.

Authorized Signature _____ Date _____

Typed or printed name _____ Registration No. _____

This collection of information is required by 37 CFR 1.311. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, Virginia 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, Virginia 22313-1450.

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
11/627,181	01/25/2007	Menzo Wentink	088245-2616	1464

23524 7590 07/24/2013

FOLEY & LARDNER LLP
3000 K STREET N.W.
SUITE 600
WASHINGTON, DC 20007-5109

EXAMINER	
RIYAMI, ABDULLAH A	
ART UNIT	**PAPER NUMBER**
2474	

DATE MAILED: 07/24/2013

Determination of Patent Term Adjustment under 35 U.S.C. 154 (b)
(application filed on or after May 29, 2000)

The Patent Term Adjustment to date is 996 day(s). If the issue fee is paid on the date that is three months after the mailing date of this notice and the patent issues on the Tuesday before the date that is 28 weeks (six and a half months) after the mailing date of this notice, the Patent Term Adjustment will be 996 day(s).

If a Continued Prosecution Application (CPA) was filed in the above-identified application, the filing date that determines Patent Term Adjustment is the filing date of the most recent CPA.

Applicant will be able to obtain more detailed information by accessing the Patent Application Information Retrieval (PAIR) WEB site (http://pair.uspto.gov).

Any questions regarding the Patent Term Extension or Adjustment determination should be directed to the Office of Patent Legal Administration at (571)-272-7702. Questions relating to issue and publication fee payments should be directed to the Customer Service Center of the Office of Patent Publication at 1-(888)-786-0101 or (571)-272-4200.

Privacy Act Statement

The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether disclosure of these records is required by the Freedom of Information Act.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

Notice of Allowability	Application No. 11/627,181	Applicant(s) WENTINK, MENZO	
	Examiner ABDULLAH RIYAMI	Art Unit 2474	AIA (First Inventor to File) Status No

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to *01/31/2012*.
   ☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on_____.
2. ☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.
3. ☒ The allowed claim(s) is/are *1, 4-29, and 32-46 (respectfully renumbered 1-42)*. As a result of the allowed claim(s), you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see http://www.uspto.gov/patents/init_events/pph/index.jsp or send an inquiry to PPHfeedback@uspto.gov .
4. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

   Certified copies:

   a) ☐ All b) ☐ Some *c) ☐ None of the:
   1. ☐ Certified copies of the priority documents have been received.
   2. ☐ Certified copies of the priority documents have been received in Application No. _____ .
   3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

   * Certified copies not received: _____.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.
THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

5. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
   ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____.

   Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).
6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

1. ☒ Notice of References Cited (PTO-892)
2. ☒ Information Disclosure Statements (PTO/SB/08), Paper No./Mail Date _____
3. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material
4. ☒ Interview Summary (PTO-413), Paper No./Mail Date *July 19, 2013* .
5. ☒ Examiner's Amendment/Comment
6. ☒ Examiner's Statement of Reasons for Allowance
7. ☐ Other _____.

/Abdullah Riyami/
Primary Examiner, Art Unit 2474

Examiner-Initiated Interview Summary	**Application No.** 11/627,181	**Applicant(s)** WENTINK, MENZO	
	Examiner ABDULLAH RIYAMI	**Art Unit** 2474	

All participants (applicant, applicant's representative, PTO personnel):

(1) *ABDULLAH RIYAMI*. (3)_____.

(2) *Troy Smith (Reg No. 62349)*. (4)_____.

Date of Interview: *19 July 2013*.

Type: ☒ Telephonic ☐ Video Conference
☐ Personal [copy given to: ☐ applicant ☐ applicant's representative]

Exhibit shown or demonstration conducted: ☐ Yes ☒ No.
If Yes, brief description: _____.

Issues Discussed ☐101 ☐112 ☐102 ☐103 ☒Others
(For each of the checked box(es) above, please describe below the issue and detailed description of the discussion)

Claim(s) discussed: *1-3, 13, 18, 29-31, 38, and 42*.

Identification of prior art discussed: _____.

Substance of Interview
(For each issue discussed, provide a detailed description and indicate if agreement was reached. Some topics may include: identification or clarification of a reference or a portion thereof, claim interpretation, proposed amendments, arguments of any applied references etc...)

Discussed cancelation of claims 2-3 and 30-31, and discussed including subject matter in claim 2 in all independent claims. Attorney authorized and agreed to the changes.

Applicant recordation instructions: It is not necessary for applicant to provide a separate record of the substance of interview.

Examiner recordation instructions: Examiners must summarize the substance of any interview of record. A complete and proper recordation of the substance of an interview should include the items listed in MPEP 713.04 for complete and proper recordation including the identification of the general thrust of each argument or issue discussed, a general indication of any other pertinent matters discussed regarding patentability and the general results or outcome of the interview, to include an indication as to whether or not agreement was reached on the issues raised.

☐ Attachment

/Abdullah Riyami/ Primary Examiner, Art Unit 2474	

Continued Examination Under 37 CFR 1.114

A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 01/31/2012 has been entered.

EXAMINER'S AMENDMENT

1. An examiner's amendment to the record appears below. Should the changes and/or additions be unacceptable to applicant, an amendment may be filed as provided by 37 CFR 1.312. To ensure consideration of such an amendment, it MUST be submitted no later than the payment of the issue fee.

Authorization for this examiner's amendment was given in a telephone interview with Attorney Troy Smith (Reg No. 62349) on July 19, 2013. Discussed cancelation of claims 2-3 and 30-31, and discussed including subject matter of claim 2 in all independent claims. Attorney authorized and agreed to the changes.

As per currently amended claims, please insert the following.

1. (Currently Amended) A method comprising:
transmitting a first communication frame from a first station to a second station;

wherein the first communication frame comprises an address of the second station and a transmit announcement indication indicating that a second communication frame intended for the second station will follow the first communication frame and that the second communication frame will not include the address of the second station, and wherein the second communication frame follows after a short inter frame space (SIFS) after the first communication frame with the transmit announcement indication.

2. (Canceled)

3. (Canceled)

4. (Original) The method of claim 1, wherein the transmit announcement indication comprises a zero-length frame.

5. (Previously Presented) The method of claim 1, wherein transmitting the first communication frame comprises providing the transmit announcement indication with a request to send (RTS) frame.

6. (Original) The method of claim 5, further comprising receiving, by the first station, a clear to send (CTS) frame from the second station after the first station has transmitted the transmit announcement indication with the RTS frame.

7. (Previously Presented) The method of claim 6, further comprising transmitting the second communication frame from the first station to the second station, wherein the second communication frame does not include the address of the second station.

8. (Previously Presented) The method of claim 1, wherein transmitting the first communication frame comprises providing the transmit announcement indication in a quality of service null (QoS-null) frame.

9. (Original) The method of claim 8, further comprising receiving, by the first station, an acknowledgement (ACK) frame from the second station after the first station has transmitted the transmit announcement indication with the QoS-null frame.

10. (Original) The method of claim 9, further comprising transmitting the second communication frame associated with the transmit announcement indication.

11. (Original) The method of claim 1, wherein providing the transmit announcement indication comprises providing the transmit announcement indication with a clear to send (CTS) frame.

12. (Original) The method of claim 11, further comprising transmitting the second communication frame associated with the transmit announcement indication.

13. (Currently Amended) A non-transitory computer-readable medium having instructions stored thereon that, if executed by a computing device, cause the computing device to perform operations comprising:

transmitting a first communication frame from a first station to a second station;

wherein the first communication frame comprises an address of the second station and a transmit announcement indication indicating that a second communication frame intended for the second station will follow the first communication frame and that the second communication frame will not include the address of the second station, and wherein the second communication frame follows after a short inter frame space (SIFS) after the first communication frame with the transmit announcement indication.

14. (Previously Presented) The computer-readable medium of claim 13, wherein the transmit announcement indication comprises a zero-length frame.

15. (Previously Presented) The computer-readable medium of claim 13, wherein transmitting the first communication frame comprises providing the transmit announcement indication with a request to send (RTS) frame.

16. (Previously Presented) The computer-readable medium of claim 15, wherein the operations further comprise receiving a clear to send (CTS) frame from the second station after the first station has transmitted the transmit announcement indication with the RTS frame.

17. (Previously Presented) The computer-readable medium of claim 16, wherein the operations further comprise transmitting the second communication frame associated with the transmit announcement indication.

18. (Currently Amended) A system comprising:

a transmitter configured to:

transmit a first communication frame from a first station to a second station;

wherein the first communication frame comprises an address of the second station and a transmit announcement indication indicating that a second communication frame intended for the second station will follow the first communication frame and that the second communication frame will not include the address of the second station, and wherein the second communication frame follows after a short inter frame space (SIFS) after the first communication frame with the transmit announcement indication.

19. (Original) The system of claim 18, wherein the transmit announcement indication comprises a zero-length frame.

20. (Original) The system of claim 18, wherein the transmitter is further configured to provide the transmit announcement indication with a request to send (RTS) frame.

21. (Original) The system of claim 20, further comprising a receiver configured to receive, by the first station, a clear to send (CTS) frame from the second station after the first station has transmitted the transmit announcement indication with the RTS frame.

22. (Currently Amended) The system of claim 21, wherein the transmitter is further configured to transmit ~~frame~~ the second communication frame associated with the transmit announcement indication.

23. (Original) The system of claim 18, wherein the first station comprises one of a wireless radio, desktop computer, portable computer, laptop computer, multi-media players,

personal digital assistant (PDA), printer, fax machine, scanner, hub, switch, router, set-top box, and television with communication capability.

24. (Previously Presented) The method of claim 1, wherein the second communication frame comprises a physical layer (PHY) header without a media access control (MAC) portion.

25. (Previously Presented) The method of claim 1, wherein the transmit announcement indication comprises a bit inside a MAC header field.

26. (Previously Presented) The method of claim 25, wherein the bit comprises an high throughput-control field.

27. (Previously Presented) The method of claim 1, wherein the transmit announcement indication is located within one of a data frame, a management frame, or a control frame.

28. (Previously Presented) The method of claim 1, wherein the transmit announcement indication precedes a zero-length frame.

29. (Currently Amended) A method comprising:

receiving a first communication frame from a first station at a second station, wherein the first communication frame includes an address of the second station and a transmit announcement indication that indicates that a second communication frame intended for the second station will follow the first communication frame and that the second communication frame will not include the address of the second station; and

receiving, at the second station, the second communication frame after a short inter frame space (SIFS) that follows the first communication frame.

30. (Canceled)

31. (Canceled)

32. (Previously Presented) The method of claim 29, wherein the transmit announcement indication comprises a zero-length frame.

33. (Previously Presented) The method of claim 29, wherein receiving the first communication frame comprises receiving the transmit announcement indication with a request to send (RTS) frame.

34. (Previously Presented) The method of claim 33, further comprising transmitting a clear to send (CTS) frame from the second station to the first station in response to receiving the RTS frame.

35. (Previously Presented) The method of claim 29, wherein receiving the first communication frame comprises receiving the transmit announcement indication in a quality of service null (QoS-null) frame.

36. (Previously Presented) The method of claim 35, further comprising receiving an acknowledgement (ACK) frame at the second station from the first station.

37. (Previously Presented) The method of claim 29, wherein receiving the first communication frame comprises receiving the transmit announcement indication with a clear to send (CTS) frame.

38. (Currently Amended) A non-transitory computer-readable medium having instructions stored thereon that, if executed by a computing device, cause the computing device to perform operations comprising:

receiving a first communication frame from a first station, wherein the first communication frame includes an address of ~~the~~ a second station and a transmit announcement indication that indicates that a second communication frame will follow the first communication frame and that the second communication frame will not include the address of the second station; and

receiving, at the second station, the second communication frame after a short inter frame space (SIFS) that follows the first communication frame.

39. (Previously Presented) The computer-readable medium of claim 38, wherein the transmit announcement indication comprises a zero-length frame.

40. (Previously Presented) The computer-readable medium of claim 38, wherein the receiving the first communication frame comprises receiving the transmit announcement indication with a request to send (RTS) frame.

41. (Previously Presented) The computer-readable medium of claim 40, wherein the operations further comprise transmitting a clear to send (CTS) frame to the first station in response to the RTS frame.

42. (Currently Amended) A system comprising:

a receiver configured to:

receive a first communication frame from a first station at a second station, wherein the first communication frame includes an address of the second station and a transmit announcement indication that indicates that a second communication frame intended for the second station will follow the first communication frame and that the second communication frame will not include the address of the second station; and

receive the second communication frame after a short inter frame space (SIFS) that follows the first communication frame.

43. (Previously Presented) The system of claim 42, wherein the transmit announcement indication comprises a zero-length frame.

44. (Previously Presented) The system of claim 43, wherein the receiver is further configured to receive the transmit announcement indication with a request to send (RTS) frame.

45. (Previously Presented) The system of claim 44, further comprising a transmitter configured to transmit a clear to send (CTS) frame from the second station to the first station in response to the RTS frame.

46. (Previously Presented) The system of claim 42, wherein the second station comprises one of a wireless radio, desktop computer, portable computer, laptop computer, multi-media players, personal digital assistant (PDA), printer, fax machine, scanner, hub, switch, router, set-top box, and television with communication capability.

Allowable Subject Matter

2. Claims 1, 4-29, and 32-46 are allowed.

3. The following is an examiner's statement of reasons for allowance:

An updated search has been performed, and no prior art has been found that alone, or in any reasonable combination would read on the claims as amended.

Applicants remarks filed on 01/31/2012 have been fully considered, and these remarks, in combination with the amendment filed herein have overcome the submitted prior art.

The prior art of record fails to teach or fairly suggest "wherein the first communication frame includes an address of the second station and a transmit announcement indication that indicates that a second communication frame intended for the second station will follow the first communication frame and that the second communication frame will not include the address of the second station; and receive the second communication frame after a short inter frame space (SIFS) that follows the first communication frame", as substantially described in independent claims 1, 13, 18, 29,

38, and 42. These limitations, in combination with the remaining limitations of claims 1, 13, 18, 29, 38, and 42 are not taught nor suggested by the prior art of record.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

Any inquiry concerning this communication or earlier communications from the examiner should be directed to ABDULLAH RIYAMI whose telephone number is (571)270-3119. The examiner can normally be reached on Monday through Thursday 9am-5pm EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Michael Thier can be reached on (571) 272-2832. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Abdullah Riyami/
Primary Examiner, Art Unit 2474

Notice of References Cited	Application/Control No. 11/627,181	Applicant(s)/Patent Under Reexamination WENTINK, MENZO	
	Examiner ABDULLAH RIYAMI	Art Unit 2474	Page 1 of 1

U.S. PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	Classification
*	A	US-6,349,210 B1	02-2002	Li, Chris Cho-Pin	455/450
*	B	US-2005/0114749 A1	05-2005	Yonge et al.	714/752
*	C	US-2005/0249244 A1	11-2005	McNamara et al.	370/474
*	D	US-2005/0243781 A1	11-2005	Vesuna et al.	370/338
*	E	US-2005/0265393 A1	12-2005	Fischer et al.	370/474
*	F	US-2006/0116076 A1	06-2006	Li et al.	455/041.2
*	G	US-2006/0187964 A1	08-2006	Li et al.	370/474
*	H	US-2007/0025388 A1	02-2007	Abhishek et al.	370/447
*	I	US-2007/0115882 A1	05-2007	Wentink, Menzo	370/329
*	J	US-2007/0280192 A1	12-2007	Yagyu et al.	370/349
*	K	US-2008/0298306 A1	12-2008	Larsson, Peter	370/328
*	L	US-2010/0142493 A1	06-2010	SAKODA et al.	370/336
	M	US-			

FOREIGN PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Country	Name	Classification
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	O					
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NON-PATENT DOCUMENTS

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*A copy of this reference is not being furnished with this Office action. (See MPEP § 707.05(a).)
Dates in MM-YYYY format are publication dates. Classifications may be US or foreign.

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	11627181	WENTINK, MENZO
	Examiner	Art Unit
	ABDULLAH RIYAMI	2474

CPC- SEARCHED		
Symbol	Date	Examiner

CPC COMBINATION SETS - SEARCHED		
Symbol	Date	Examiner

US CLASSIFICATION SEARCHED			
Class	Subclass	Date	Examiner
370	328,336,338,310,310.2,350,431,443,444,433,448,445,465,474,447	5/18/2011	AR
455	41.2,69,91,296	5/18/2011	AR
370	328,336,338,310,310.2,350,431,443,444,433,448,445,465,474,447	11/2/2011	AR
455	41.2,69,91,296	11/2/2011	AR
370	328,336,338,310,310.2,350,431,443,444,433,448,445,465,474,447	7/19/2013	AR
455	41.2,69,91,296	7/19/2013	AR

SEARCH NOTES		
Search Notes	Date	Examiner
Conducted East search (limited text search in class/subclass listed above)	5/18/2011	AR
Read IEEE documents related to subjec tmatter	5/18/2011	AR
Conducted updated East search (limited text search in class/subclass listed above)	11/2/2011	AR
Conducted updated East search (limited text search in class/subclass listed above)	7/19/2013	AR
Consulted with Primary Examiner Habte Mered regarding allowable subject matter	7/19/2013	AR

/ABDULLAH RIYAMI/ Examiner.Art Unit 2474	

INTERFERENCE SEARCH			
US Class/ CPC Symbol	**US Subclass / CPC Group**	**Date**	**Examiner**
	See Interference search in East search history	7/19/2013	AR

/ABDULLAH RIYAMI/ Examiner.Art Unit 2474	

PTO/SB/08 (09-06)
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Substitute for form 1449/PTO				Complete if Known	
INFORMATION DISCLOSURE STATEMENT BY APPLICANT				**Application Number**	11/627,181
Date Submitted: June 29, 2012				**Filing Date**	1/25/2007
				First Named Inventor	Menzo Wentink
(use as many sheets as necessary)				Art Unit	2474
				Examiner Name	Abdullah A. Riyami
Sheet	1	of	1	Attorney Docket Number	088245-2616

U.S. PATENT DOCUMENTS

Examiner Initials*	Cite No.[1]	Document Number Number-Kind Code[2] (*if known*)	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear

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		WO-2005/041467	05-06-2005	SONY CORP		

NON PATENT LITERATURE DOCUMENTS

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		Anonymous Ed - Anonymous: "Information technology-Telecommunications and information exchange between systems - Local and metropolitan area networks - Specific requirements - Part 11: Wireless LAN Media Access Control (MAC) and Physical Layer (PHY) Specifications," IEEE Standard, January 1, 2003, 528 pages	
		Extended Search Report issued on EP Application 07717414.2, dated 6/21/12.	
		Office Action on Chinese Application 200780003618.1, dated 5/3/2012, English translation not available.	

Examiner Signature	/Abdullah Riyami/	Date Considered	07/19/2013

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4835-6957-3648.1

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT (**Not for submission under 37 CFR 1.99**)		
	Application Number	11627181
	Filing Date	2007-01-25
	First Named Inventor	Menzo Wentink
	Art Unit	2614
	Examiner Name	
	Attorney Docket Number	050337-1570

U.S.PATENTS						Remove
Examiner Initial*	Cite No	Patent Number	Kind Code[1]	Issue Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
	1	6842460		2005-01-11	Olkkonen et al.	
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Examiner Initial*	Cite No	Publication Number	Kind Code[1]	Publication Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
	1	20050124294		2005-06-09	Wentink	
	2	20050243849		2005-11-03	Wentink	
	3	20030231608		2003-12-18	Wentink	
	4	20050059347		2005-03-17	Haartsen	
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Receipt date: 01/18/2008	Application Number	11627181	11627181 - GAU: 2474
INFORMATION DISCLOSURE STATEMENT BY APPLICANT (**Not for submission under 37 CFR 1.99)**	Filing Date	2007-01-25	
	First Named Inventor	Menzo Wentink	
	Art Unit	2614	
	Examiner Name		
	Attorney Docket Number	050337-1570	

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/A.R./	1	International Search Report and Written Opinion 11/01/2007	☐

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EXAMINER SIGNATURE

Examiner Signature	/Abdullah Riyami/	Date Considered	07/23/2013

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT

Date Submitted: April 26, 2012

(use as many sheets as necessary)

Sheet 1 of 1

Complete if Known	
Application Number	11/627,181
Filing Date	1/25/2007
First Named Inventor	Menzo Wentink
Art Unit	2474
Examiner Name	Abdulla A. Riyami
Attorney Docket Number	088245-2616

U.S. PATENT DOCUMENTS

Examiner Initials*	Cite No.[1]	Document Number / Number-Kind Code[2] (*if known*)	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
		2005/0025131	02-03-2005	KO ET AL.	
		2005/0050219	03-03-2005	CHOI ET AL.	

FOREIGN PATENT DOCUMENTS

Examiner Initials*	Cite No.[1]	Foreign Patent Document Country Code[3]-Number[4]-Kind Code[5] (*if known*)	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Documents	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear	T[6]
		WO-03/096627 (English abstract only)	11-20-2003	SHARP KABUSHIKI KAISHA		
		WO-2005/112488	11-24-2005	INTER-DIGITAL TECHNOLOGY CORPORATION		
		KR-200513872 (English equivalent US2005/0025131 also cited)	02-05-2005	KO ET AL.		
		KR-200523940 (English equivalent US2005/0050219 also cited)	03-10-2005	SAMSUNG ELECTRONICS CO., LTD.		

NON PATENT LITERATURE DOCUMENTS

Examiner Initials*	Cite No.[1]	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.) date, page(s), volume-issue number(s), publisher, city and/or country where published.	T[6]
		Office Action on Japanese Application 2008-552579, mailed March 13, 2012 (English translation not available)	

Examiner Signature	/Abdullah Riyami/	Date Considered	07/19/2013

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant. 1 Applicant's unique citation designation number (optional). 2 See Kinds Codes of USPTO Patent Documents at www.uspto.gov or MPEP 901.04. 3 Enter Office that issued the document, by the two-letter code (WIPO Standard ST.3). 4 For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. 5 Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. 6 Applicant is to place a check mark here if English language Translation is attached. This collection of information is required by 37 CFR 1.97 and 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 2 hours to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 (1-800-786-9199) and select option 2.

4836-3204-8399.1

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /A.R./

EAST Search History

EAST Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
L1	3	"20040243846"	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	ADJ	ON	2013/07/19 18:18
S1	29	transmi$9 near1 announc$10 near1 indicat$7	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2011/05/09 10:23
S2	54628	transmi$9 near1 indicat$7	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2011/05/09 10:43
S3	275	S2 same rts	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2011/05/09 10:44
S4	202	S3 and cts	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2011/05/09 10:44
S5	1371	(short$2 inter$frame$2 or short$2 inter$frame$3 or short inter frame$3)	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2011/05/09 10:45
S6	37	S3 and S5	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2011/05/09 10:46
S7	10434	(zero$length$2 or zero length$2 or zerolength$2 or zlf or null$data or null data)	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2011/05/09 11:26
S8	29	S7 same rts	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2011/05/09 11:26
S9	3	S7 same (without near1 mac)	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2011/05/09 12:04
S10	38541	370/328,336,338,310,310.2,350,431,443,444,433,448,445,465,474,447.ccls.	US-PGPUB;	ADJ	ON	2011/05/18

		or 455/41.2,69,91,296.ccls.	USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB			18:39
S11	54777	transmi$9 near1 indicat$7	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2011/05/18 18:40
S12	1382	(short$2 inter$frame$2 or short$2 inter$frame$3 or short inter frame$3)	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2011/05/18 18:40
S13	280	S11 and S12	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2011/05/18 18:40
S14	132	S10 and S13	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2011/05/18 18:40
S15	23774	(without or "not includ$5") near2 address$4	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2011/11/01 11:37
S16	57679	transmi$9 near1 indicat$7	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2011/11/01 11:37
S17	600	S15 and S16	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2011/11/01 11:37
S18	24941	(without or "not includ$5") near2 (address$4 or mac)	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2011/11/01 11:42
S19	11	S18 same S16	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2011/11/01 11:42
S20	24941	(without or "not includ$5"or "no need") near2 (address$4 or mac)	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2011/11/01 11:47
S21	26109	(without or "not includ$5" or "no need") near2 (address$4 or mac)	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2011/11/01 11:47

S22	12	S21 same S16	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2011/11/01 11:48
S23	755	S21 and S16	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2011/11/01 11:48
S24	26109	(without or "not includ$5" or "no need") near2 (address$4 or mac)	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2011/11/01 18:10
S25	35	S24 same rts	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2011/11/01 18:10
S26	683	S24 same subsequent	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2011/11/01 18:10
S27	92	S26 same (frame or packet)	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2011/11/01 18:11
S28	26109	(without or "not includ$5" or "no need") near2 (address$4 or mac)	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2011/11/01 21:10
S29	683	S28 same subsequent	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2011/11/01 21:10
S30	0	S29 same (anounc$10)	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2011/11/01 21:10
S31	0	S29 same (announc$10)	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2011/11/01 21:11
S33	42	qos-null	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2011/11/01 21:12
S34	5	S33 and S28	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT;	ADJ	ON	2011/11/01 21:12

			IBM_TDB			
S35	41524	370/328,336,338,310,310.2,350,431,443,444,433,448,445,465,474,447.ccls. or 455/41.2,69,91,296.ccls.	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2011/11/01 22:20
S36	26109	(without or "not includ$5" or "no need") near2 (address$4 or mac)	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2011/11/01 22:20
S37	820	S36 and S35	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2011/11/01 22:20
S38	104	S37 and rts	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2011/11/01 22:21
S39	41715	(without or "not includ$5" or "no need") near2 (address$4 or mac or destination)	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2013/07/16 13:10
S40	16887649	"4"	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2013/07/16 13:10
S41	75399	(without or "not includ$5" or "no need") near4 (address$4 or mac or destination)	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2013/07/16 13:11
S42	0	S41 asame rts	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2013/07/16 13:11
S43	72	S41 same rts	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2013/07/16 13:11
S44	2328	(transmi$9 near1 announc$10)	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2013/07/16 13:41
S45	3	S41 same S44	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2013/07/16 13:41
S46	106	S41 and S44	US-PGPUB; USPAT; FPRS; EPO; JPO;	ADJ	ON	2013/07/16 13:42

			DERWENT; IBM_TDB			
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S48	20221	(without or "not includ$5" or "no need") near4 (destination)	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2013/07/16 14:46
S49	12384	(without or "not includ$5" or "no need") near2 (destination)	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2013/07/16 14:46
S50	3602784	S49 same packet or frame	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2013/07/16 14:47
S51	2612	S49 same (packet or frame)	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2013/07/16 14:47
S52	1011	S51 same address$4	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2013/07/16 14:48
S53	10	S52 and sifs	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2013/07/16 14:49
S54	1118	rts same broadcast	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2013/07/16 15:25
S55	26	S54 and S49	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2013/07/16 15:25

EAST Search History (Interference)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
S56	0	(address and transmit announc$6 and frame and station and second and sifs).clm.	US-PGPUB; USPAT; UPAD	ADJ	ON	2013/07/19 14:30
S57	0	(address and transmit announc$6 and frame and station and second).clm.	US-PGPUB; USPAT; UPAD	ADJ	ON	2013/07/19 14:30
S58	2	(address and transmit announc$6 and frame and second).clm.	US-PGPUB; USPAT; UPAD	ADJ	ON	2013/07/19 14:31
S59	0	(address and transmit announcement and frame and second).clm.	US-PGPUB; USPAT; UPAD	ADJ	ON	2013/07/19 14:31
S60	0	(address and transmit anouncement and frame and	US-PGPUB;	ADJ	ON	2013/07/19

		second).clm.	USPAT; UPAD		14:31

7/19/2013 6:19:48 PM
C:\Users\ariyami\Documents\EAST\Workspaces\11627181.wsp

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	11627181	WENTINK, MENZO
	Examiner	**Art Unit**
	ABDULLAH RIYAMI	2474

CPC		
Symbol	**Type**	**Version**

CPC Combination Sets				
Symbol	**Type**	**Set**	**Ranking**	**Version**

NONE (Assistant Examiner) (Date)		**Total Claims Allowed:** 42	
/ABDULLAH RIYAMI/ Primary Examiner.Art Unit 2474 (Primary Examiner)	07/19/2013 (Date)	O.G. Print Claim(s) 1	O.G. Print Figure 8

U.S. Patent and Trademark Office Part of Paper No. 20130719

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	11627181	WENTINK, MENZO
	Examiner	Art Unit
	ABDULLAH RIYAMI	2474

US ORIGINAL CLASSIFICATION		INTERNATIONAL CLASSIFICATION										
CLASS	SUBCLASS	CLAIMED					NON-CLAIMED					
370	447	H	0	4	L	12 / 413 (2006.01.01)						
CROSS REFERENCE(S)												
CLASS	SUBCLASS (ONE SUBCLASS PER BLOCK)											
370	445											

NONE (Assistant Examiner)	(Date)	Total Claims Allowed: 42	
/ABDULLAH RIYAMI/ Primary Examiner.Art Unit 2474 (Primary Examiner)	07/19/2013 (Date)	O.G. Print Claim(s) 1	O.G. Print Figure 8

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
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	Examiner	Art Unit
	ABDULLAH RIYAMI	2474

☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47

Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original
1	1	15	17	29	33										
	2	16	18	30	34										
	3	17	19	31	35										
2	4	18	20	32	36										
3	5	19	21	33	37										
4	6	20	22	34	38										
5	7	21	23	35	39										
6	8	22	24	36	40										
7	9	23	25	37	41										
8	10	24	26	38	42										
9	11	25	27	39	43										
10	12	26	28	40	44										
11	13	27	29	41	45										
12	14		30	42	46										
13	15		31												
14	16	28	32												

NONE (Assistant Examiner)	(Date)	Total Claims Allowed: 42	
/ABDULLAH RIYAMI/ Primary Examiner.Art Unit 2474 (Primary Examiner)	07/19/2013 (Date)	O.G. Print Claim(s) 1	O.G. Print Figure 8

U.S. Patent and Trademark Office Part of Paper No. 20130719

Index of Claims	Application/Control No.	Applicant(s)/Patent Under Reexamination
	11627181	WENTINK, MENZO
	Examiner	Art Unit
	ABDULLAH RIYAMI	2474

✓	Rejected	-	Cancelled	N	Non-Elected	A	Appeal
=	Allowed	÷	Restricted	I	Interference	O	Objected

☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47

CLAIM		DATE								
Final	Original	05/18/2011	11/03/2011	07/19/2013						
1	1	✓	✓	=						
	2	✓	✓	-						
	3	✓	✓	-						
2	4	✓	✓	=						
3	5	✓	✓	=						
4	6	✓	✓	=						
5	7	✓	✓	=						
6	8	✓	✓	=						
7	9	✓	✓	=						
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9	11	✓	✓	=						
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	31	✓	✓	-						
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29	33	✓	✓	=						
30	34	✓	✓	=						
31	35	✓	✓	=						
32	36	✓	✓	=						

Index of Claims	Application/Control No.	Applicant(s)/Patent Under Reexamination
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	Examiner	**Art Unit**
	ABDULLAH RIYAMI	2474

✓	Rejected	-	Cancelled	N	Non-Elected	A	Appeal
=	Allowed	÷	Restricted	I	Interference	O	Objected

☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47

CLAIM		DATE								
Final	Original	05/18/2011	11/03/2011	07/19/2013						
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34	38	✓	✓	=						
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36	40	✓	✓	=						
37	41	✓	✓	=						
38	42	✓	✓	=						
39	43	✓	✓	=						
40	44	✓	✓	=						
41	45	✓	✓	=						
42	46	✓	✓	=						

PTO/SB/08 (09-06)
Approved for use through 03/31/2007. OMB 0651-0031
U.S. Patent and Trademark Office: U.S. DEPARTMENT OF COMMERCE

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Substitute for form 1449/PTO

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

Date Submitted: June 26, 2013

(use as many sheets as necessary)

Sheet 1 of 1

Complete if Known	
Application Number	11/627,181
Filing Date	1/25/2007
First Named Inventor	Menzo Wentink
Art Unit	2474
Examiner Name	Abdulla A. Riyami
Attorney Docket Number	088245-2616

U.S. PATENT DOCUMENTS

Examiner Initials*	Cite No.[1]	Document Number / Number-Kind Code[2] (*if known*)	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear

FOREIGN PATENT DOCUMENTS

Examiner Initials*	Cite No.[1]	Foreign Patent Document Country Code[3] Number[4] Kind Code[5] (*if known*)	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Documents	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear	T[6]
		WO-01/31881	05-03-2001	NOKIA INC.		

NON PATENT LITERATURE DOCUMENTS

Examiner Initials*	Cite No.[1]	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.) date, page(s), volume-issue number(s), publisher, city and/or country where published.	T[6]
		Examination Report on EP Application 07717414.2, mailed 6/10/2013.	

Examiner Signature	/Abdullah Riyami/	Date Considered	07/19/2013

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP . if possible. and . The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by . This collection is estimated to take 2 hours to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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4850-1159-6052.1

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /A.R./

PTO/SB/06 (09-11)
Approved for use through 1/31/2014. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
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PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875	Application or Docket Number 11/627,181	Filing Date 01/25/2007	☐ To be Mailed

ENTITY: ☒ LARGE ☐ SMALL ☐ MICRO

APPLICATION AS FILED – PART I

	(Column 1)	(Column 2)		
FOR	NUMBER FILED	NUMBER EXTRA	RATE ($)	FEE ($)
☐ BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A	N/A	
☐ SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A	N/A	
☐ EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A	
TOTAL CLAIMS (37 CFR 1.16(i))	minus 20 =	*	X $ =	
INDEPENDENT CLAIMS (37 CFR 1.16(h))	minus 3 =	*	X $ =	
☐ APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is $310 ($155 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).			
☐ MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))				
* If the difference in column 1 is less than zero, enter "0" in column 2.			TOTAL	

APPLICATION AS AMENDED – PART II

		(Column 1)		(Column 2)	(Column 3)		
	07/23/2013	CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA	RATE ($)	ADDITIONAL FEE ($)
AMENDMENT	Total (37 CFR 1.16(i))	* 42	Minus	** 46	= 0	X $80 =	0
	Independent (37 CFR 1.16(h))	* 6	Minus	***6	= 0	X $420 =	0
	☐ Application Size Fee (37 CFR 1.16(s))						
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))						
						TOTAL ADD'L FEE	0

		(Column 1)		(Column 2)	(Column 3)		
		CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA	RATE ($)	ADDITIONAL FEE ($)
AMENDMENT	Total (37 CFR 1.16(i))	*	Minus	**	=	X $ =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=	X $ =	
	☐ Application Size Fee (37 CFR 1.16(s))						
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))						
						TOTAL ADD'L FEE	

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.
** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".
*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".
The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1.

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Substitute for form 1449/PTO				Complete if Known	
INFORMATION DISCLOSURE STATEMENT BY APPLICANT				**Application Number**	11/627,181
Date Submitted: June 26, 2013				**Filing Date**	1/25/2007
				First Named Inventor	Menzo Wentink
(use as many sheets as necessary)				Art Unit	2474
				Examiner Name	Abdulla A. Riyami
Sheet	1	of	1	Attorney Docket Number	088245-2616

U.S. PATENT DOCUMENTS

Examiner Initials*	Cite No.[1]	Document Number Number-Kind Code[2] (*if known*)	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear

FOREIGN PATENT DOCUMENTS

Examiner Initials*	Cite No.[1]	Foreign Patent Document Country Code[3]-Number[4]-Kind Code[5] (*if known*)	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Documents	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear	T[6]
		WO-01/31881	05-03-2001	NOKIA INC.		

NON PATENT LITERATURE DOCUMENTS

Examiner Initials*	Cite No.[1]	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.) date, page(s), volume-issue number(s), publisher, city and/or country where published.	T[6]
		Examination Report on EP Application 07717414.2, mailed 6/10/2013.	

Examiner Signature		Date Considered	

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4850-1159-6052.1

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
3 May 2001 (03.05.2001)

PCT

(10) International Publication Number
WO 01/31881 A1

(51) International Patent Classification[7]: H04L 29/06

(21) International Application Number: PCT/IB00/01531

(22) International Filing Date: 24 October 2000 (24.10.2000)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
09/429,626 29 October 1999 (29.10.1999) US

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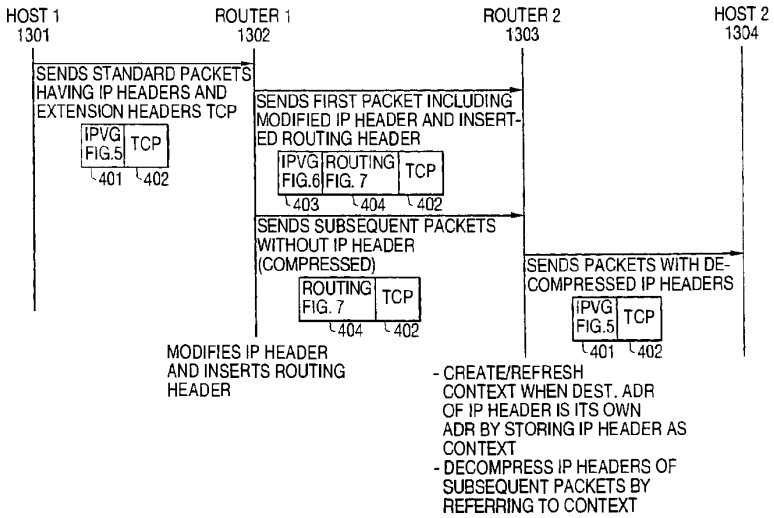
(81) Designated States (national): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CR, CU, CZ, DE, DK, DM, DZ, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, UZ, VN, YU, ZA, ZW.

(84) Designated States (regional): ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).

Published:
— With international search report.

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(54) Title: METHOD AND APPARATUS FOR IP PACKET HEADER COMPRESSION



(57) Abstract: A method and apparatus for initiating compression of IP headers of a stream of packets to be sent from a source apparatus (1301) to a destination apparatus (1304). IP header compression is initiated by changing the destination address of the IP header of a full header packet to identify the address of a node, such as a router (1303), which serves as an interface to the destination apparatus (1304), and passing the context identifier (CID) and generation fields in a routing header which immediately follows or is inserted to immediately follow the IP header.

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METHOD AND APPARATUS FOR IP PACKET HEADER COMPRESSION

BACKGROUND OF THE INVENTION

The present invention relates to a method and apparatus for initiating compression of headers of a stream of packets and refreshing a context related to the packets, wherein the context corresponds to the un-compressed form of the headers of the stream of packets.

In packet switched networks, packets are transmitted between nodes connected to the network to effect communication between the nodes. Information in the packets may include messages and commands such as a request for service, connection management controls, or data. Large transmissions are divided into packets instead of being transmitted as one long string.

The Internet is, for example, a packet switched network. Internet Protocol (IP) is an Internetwork protocol that defines how to format various information into packets and transmit those packets using the Internet. IP provides a near universal delivery system that can operate on almost any underlying network.

Currently IP is defined according to IPv4 with the "v4" indicating version 4 of the Internet Protocol. IPv4 serves what could be called the computer market. The focus of IPv4 is to connect computers together to permit communications over various networks where the computers range from Personal Computers (PC's) to Supercomputers. Most of the computers are attached to Local Area Networks (LAN's) and the vast majority are not mobile. The next generation Internet Protocol is referred to as IPv6 where the "v6" indicates version 6 of the Internet Protocol. IPv6 is intended to be compatible with IPv4 while addressing the needs of high performance networks (e.g., ATM) and low bandwidth networks (e.g., wireless). IPv6 also provides a platform for new Internet functionality that may be required in the future (e.g., telephony, television, video on demand, equipment control).

A common characteristic of IPv4 and IPv6 is the use of an IP header of a particular format for each of the packets for identifying the source, destination and other information related to the packet. The routing header identifies one or more intermediate nodes to be "visited" by the packet on the way to the destination. Since the format of IP headers and routing headers for IPv4 and IPv6 are similar, Fig. 1 illustrates the format of an IP header for IPv6 and Figs. 2 and 3 illustrate the format of routing headers for IPv6.

The IP header 100 illustrated in Fig. 1 includes a Version field 101 which stores information indicating the IP version number to which the packet corresponds, a Traffic Class field 102 which stores information indicating the desired delivery priority of the packet relative

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to other packets, a Flow Label field 103 which stores information indicating that the packet requires special handling such as a non-default quality of service, a Payload Length field 104 which stores information indicating the length of the rest of the packet following the IP header, a Next Header field 105 which stores information identifying the type of header immediately following the IP header, a Hop Limit field 106 which stores a value indicating the maximum number of hops permitted for the packet, wherein the value is decremented by one by each node that forwards the packet and the packet is discarded if the value is decremented to zero, a Source Address field 107 which stores the address of the initial sender (source apparatus) of the packet, and a Destination Address field 108 which stores the address of the intended recipient (destination apparatus) of the packet.

The routing header 200 illustrated in Fig. 2 includes a Next Header field 201 which stores information identifying the type of header immediately following the Routing header, a Header Extension Length field 202 which stores information indicating the length of the routing header, a Routing Type field 203 which stores information indicating the variant of the routing header, a Segments Left field 204 which stores a value indicating the number of route segments remaining still to be visited by the packet before the destination is reached, and a Type-Specific Data field 205 which stores information including addresses of the nodes to be visited by the packet.

The routing header 300 illustrated in Fig. 3 is a routing header where the Routing Type field 203 has a value of "0", thereby identifying it as a Type 0 routing header. The Type 0 routing header 300 illustrated in Fig. 3 includes all of the fields shown in the routing header 200 illustrated in Fig. 2 with the exception of a Reserved field 301 which is initialized by the source and can be used in any manner by the intermediate nodes, and Address fields 302-1 to 302-n which include a sequence of addresses of nodes to which the packet is to be routed including the address of the destination. For the type 0 routing header 300, the bits of the Reserved field 301 are all set to "0". Thus, in order to implement an IP header compression scheme, a routing header of its own is needed.

Much of the header information stays the same over the lifetime of a packet stream. For Non-Transmission Control Protocol (TCP) packet streams, almost all fields of the headers are constant. For TCP packet streams, many fields of the headers are constant and others change with small and predictable values.

To initiate compression of the headers of a packet stream, a packet having a full header (Full Header Packet) carrying Context Identifier (CID) and generation fields are transmitted over the link between first and second nodes as part of the Length fields of the IP header. The compressor (first node) and decompressor (second node) store most fields of

this full header as the context which is referred to by the CID. The context includes each of the fields of the header whose values are constant and thus need not be sent over the link at all, or change little between consecutive headers so that it uses fewer bits to send the difference from the previous value compared to sending the absolute value. Thus, after the full header packet is transmitted, subsequent packets are transmitted without headers or with compressed headers having the CID and information of the headers that is unpredictable.

Any change in fields that are expected to be constant in a packet stream will cause the compressor to send a full header packet again to update the context at the decompressor, thereby refreshing the context. As long as the context is the same at the compressor and decompressor, headers can be decompressed to be exactly as they were before compression. However, if a full header packet or compressed header packet is lost during transmission, then the context of the decompressor may become obsolete as it has not been updated properly. Compressed headers will then be decompressed improperly.

Compressing IP headers in the manner described above conserves the bandwidth of slow or medium speed links. The need for compression of IP headers is even greater for IPv6 systems due to the length of the IP headers and the desire to address the needs of high performance systems. The auto- configuration feature of IPv6 makes it attractive for mobile applications. Link speeds in systems implementing mobile applications are often relatively low, however the number of the such systems can be large, thereby making it highly desirable to use header compression.

The above described method of performing IP header compression is disclosed in "IP Header Compression", by M. Degermark, et al, Internet Draft, Networking Group IETF, February 1999 (Reference 1). The method disclosed in Reference 1 is based on the IPv4 header compression method disclosed in "Compressing TCP/IP Header for Low Speed Serial Length RFC 1144", Networking Group IETF, February 1990 (Reference 2).

However, the method disclosed by Reference 1, which is based on Reference 2, suffers from various disadvantages. Namely, when initiating IP header compression, the CID and generation which are included in the Length fields of the IP header must be passed to the IP layer by the underlying network layer. The length of the CID and generation fields varies depending on the transported protocol. Thus, the disclosed method requires that a node, such as a router, thoroughly examine and process the nested headers of each and every packet to detect when header compression is to be initiated. Such a procedure requires significant overhead, thereby reducing the efficiency of the network. Further, the disclosed method preempts the use of padding in layer 2 packets.

SUMMARY OF THE INVENTION

The present invention overcomes the above by initiating compression of IP headers of a stream of packets to be sent from a source apparatus to a destination apparatus by changing the destination address of the IP header of a full header packet to identify the address of a node, such as a router or a host, which serves as an interface to the destination apparatus, and passing the context identifier (CID) and generation fields in a routing header which immediately follows or is inserted to immediately follow the IP header.

The present invention provides a method and apparatus for initiating compression of IP headers of a stream of packets to be sent from a source apparatus to a destination apparatus in a packet switched network. The source and destination apparatuses can, for example, be a host and a router respectively or a first host and a second host, respectively. For the description proposed, the source and destination apparatuses will be assumed to be first and second hosts respectively. The source apparatus is connected to the packet switched network by a first router and the destination apparatus is connected to the packet switched network by a second router.

The present invention provides that at the first router the IP header of a full header packet of the stream of packets is modified so that the destination address field of the IP header contains a second router address indicating a location of the second router. Further, at the first router, a routing header is inserted in the full header packet of the stream of packets after the IP header. The inserted routing header includes the CID identifying the context and a destination address indicating a location of the destination apparatus. If a routing header already exists in the full header packet then the routing header is modified to include the CID identifying the context and a destination address indicating a location of the destination apparatus.

The full header packet including the modified IP header and the inserted or modified routing header is transmitted from the first router to the second router. Header compression of the IP headers of packets of the stream of packets subsequent to the full header packet is initiated upon receipt by the second router of the full header packet including the modified IP header and the inserted or modified routing header.

Specifically, compression is initiated by the second router examining and processing the full header packet upon detecting that the destination address in the IP header is its own address. A context is created corresponding to the IP header by storing information of the IP header in corresponding relation to the CID in the second router. The context including information of the IP header is also stored in corresponding relation to the CID in the first router. If the CID has been previously stored in the second router, then information of the IP

header is updated to new values indicated by the IP header of the full header packet, thereby refreshing the context.

After the initiation of compression of IP headers, the IP headers of packets subsequent to the full header packet of the stream of packets are compressed by transmitting the subsequent packets without their IP headers. In practice however, the subsequent packets are sent with compressed IP headers each having the CID and information of the IP header that is unpredictable. Decompression of the IP headers of the packets subsequent to the full header packet of the stream of packets is accomplished in the second router by referring to the stored context using the CID.

In the present invention, header compression is initiated without the second router having to thoroughly examine and process the nested headers of each packet of a stream of packets to detect the beginning of header compression. The second router need only examine and process a packet which identifies the second router as its destination.
In the present invention, the modified IP header of the full header packet transmitted from the first router to the second router contains information in the destination address field indicating the second router is its destination.

BRIEF DESCRIPTION OF THE DRAWINGS

The present invention will be more apparent from the following detailed description, when taken in conjunction with the accompanying drawings, in which:

Fig. 1 is a schematic diagram illustrating the format of an IP header according to IPv6;

Fig. 2 is a schematic diagram illustrating the format of a routing header according to IPv6;

Fig. 3 is a schematic diagram illustrating the format of a Type 0 routing header according to IPv6;

Fig. 4 is a schematic diagram illustrating the sequence of processings performed by the first and second hosts and the first and second routers when the packets sent by the first host do not include routing headers;

Fig. 5 is a schematic diagram illustrating the format of an IP header according to IPv6 of a packet sent from the first host;

Fig. 6 is a schematic diagram illustrating the format of a modified IP header included in the full header packet sent from the first router;

Fig. 7 is a schematic diagram illustrating the format of a routing header inserted in the full header packet sent from the first router;

Fig. 8 is a schematic diagram illustrating the sequence of processings performed by the first and second hosts and the first, second and third routers when the packets sent by the first host include routing headers;

Fig. 9 is a schematic diagram illustrating the format of an IP header according to IPv6 of a packet sent from the first host;

Fig. 10 is a schematic diagram illustrating the format of a routing header according to IPv6 included in the packet sent by the first host;

Fig. 11 is a schematic diagram illustrating the format of a modified IP header included in a full header packet sent from the first router;

Fig. 12 is a schematic diagram illustrating the format of a modified routing header included in the full header packet sent from the first router;

Fig. 13 is a schematic diagram illustrating the present invention when applied to a packet switched network having first and second routers, and first and second hosts; and

Fig. 14 is a schematic diagram illustrating the present invention when applied to a packet switched network having first, second and third routers and first and second hosts.

DETAILED DESCRIPTION OF THE INVENTION

The features of the present invention will be described according to the elements of the present invention illustrated in Figs. 4-14.

The present invention provides a method and apparatus for initiating compression of IP headers of a stream of packets to be sent from a source apparatus to a destination apparatus by changing the destination address of the IP header to identify the address of a node, such as a router or a host, which serves as an interface to the destination apparatus and passing the Context Identifier (CID) and Generation fields in a routing header which immediately follows or is inserted to immediately follow the IP header of the full header packet of the stream of packets. Once the CID and Generation has been passed according to the present invention a context is established that allows for the compression of IP headers of packets of the stream of packets subsequent to a full header packet.

Compression of the IP headers of the packets of the stream of packets subsequent to the full header packet is accomplished by transmitting the packets without their IP headers. In practice however, the subsequent packets are sent with compressed IP headers each having the CID and information of the IP header that is unpredictable.

Decompression of the IP headers of the packets of the stream of packets subsequent to the full header packet is accomplished by referring to the context using the CID and restoring the IP headers to the packets. The source and destination apparatuses can, for

example, be a host and a router, respectively or a first and a second host, respectively. In the following description, the source and destination will be assumed to be first and second hosts respectively. However, the present invention is not limited to such an embodiment.

The present invention can be applied to apparatus such as that illustrated in Fig. 13. The present invention is intended to operate in a packet switched network 1300 which may conform to IPv4 or IPv6. As illustrated in Fig. 13 a first host 1301 is connected to the packet switched network 1300 by a first router 1302. The first router 1302 serves as an interface between the first host 1301 and the packet switched network 1300. Transmission can be conducted from the first router 1302 to any one of a number of routers included in the packet switched network 1300 such as a second router 1303. The second router 1303 connects the second host 1304 to the packet switched network 1300. Thus, the second router 1303 interfaces the second host 1304 to the packet switched network 1300.

Transmission can be conducted from the first host 1301 to the second host 1304 via the first router 1302 and the second router 1303. For a stream of packets formatted according to the IPv4 or IPv6 and transmitted between the first host 1301 and the second host 1304, a considerable amount of redundant information in the headers of the packets must be processed and sent. In order to lessen the overhead for transmitting a stream of packets from the first router 1302 to the second router 1303, compression of the IP headers of the packets is conducted. In the present invention, initiating IP header compression is performed in a unique manner to further lessen the amount of processing required by the routers, particularly the second router (decompressor) 1303. A description of the procedures of the present invention for initiating IP header compression in the apparatus illustrated in Fig. 13 is provided below relative to Fig. 4.

According to Fig. 4, the first host 1301 sends a standard stream of packets each having an IP header 401, the details of which are illustrated in Fig. 5, and a Transmission Control Protocol (TCP) header 402. The IP header illustrated in Fig. 5 has the same format as the IP header illustrated in Fig. 1 with the exception that some of the fields included in the IP header are defined. For example, the Version field 101 stores a value of "0110" indicating an IPv6 header, the Next Header field 105 stores information indicating that the next header is a TCP header, the Source Address field 107 stores an address of the first host 1301 and the Destination Address field 108 stores an address of the second host 1304. It should be noted that the present invention can operate with any type of payload protocol besides TCP, such as User Data Protocol (UDP), Routing Table Protocol (RTP) or Internet Control Message Protocol (ICMP).

The first router 1302 receives the stream of packets and modifies the IP header of a

full header packet in the manner illustrated in Fig. 6 and inserts a routing header such as that illustrated in Fig. 7. The first router 1302 then sends the full header packet including the modified IP header 403 illustrated in Fig. 6 and the routing header 404 illustrated in Fig. 7 to the second router 1303.

The modified IP header 403 illustrated in Fig. 6 has the same format and essentially the same information stored in the fields thereof as the IP header 401 illustrated in Fig. 5. However, in the IP header 401 the address of the second host 1304 is stored in the Destination Address field 108, whereas in IP header 403 the address of the second router 1303 is stored in the Destination Address field 108. Storing the address of the second router 1303 in the Destination Address field 103 of the IP header 403 causes the second router 1303 to examine and process the full header packet in a manner so as to initialize IP header compression. All other packets having an address other than the second router 1303 in the Destination Address field 108 of the IP header are ignored and need not be examined and processed by the second router 1303.

Fig. 7 illustrates the routing header 404 which is inserted in the full header packet to be transmitted from the first router 1302 to the second router 1303. The routing header 404 essentially has the same format as the routing header 200 illustrated in Fig. 2 with the exception that values are stored in each of the fields. The Next Header field 201 has stored therein information indicating that the next header is a TCP header, the Header Extension Length field 202 has stored therein the value "2" indicating that the length of the routing header is 2 octets, the Routing Type 203 field has stored therein information indicating its type is COMPR., the Segments Left field 204 has stored therein a value indicating that one segment is left to be visited by the packet and the Type-Specific data field 205 has stored therein the address of the second host 1304.

Further, the routing header 404 provides various additional fields indicative of the context related to the compression of the IP header. Specifically, the routing header 404 includes a CID field 701 which stores a context identifier CID1 which identifies or is the label of IP header that forms the context. The context is an uncompressed version of the header of the full header packet last sent by the first router 1302 (compressor) and received by the second router 1303 (decompressor) over a link connecting the compressor and the decompressor. The context includes information from the fields of the IP header that do not change or can be inferred (e.g., the size of the link-level packet), and a Generation field 702 which has stored therein information associated with the CID and related to the context for non-TCP packet streams. The context, namely the IP header of the full header packet, is stored in the first router 1302 and the second router 1303 in corresponding relation to the CID,

and the Generation, if the packet is a non-TCP packet.

The second router 1302 sends the full header packet including the modified IP header 403 and the inserted routing header 404 to the second router 1303. The second router 1303 upon receipt of the full header packet including the modified IP header 403 and the inserted routing header 404 creates a context related to the packet stream to which the full header packet belongs or refreshes a previously stored context corresponding to the packet stream to which the full header packet belongs. The second router 1303 creates a context by storing information of the IP header 403 for later use in corresponding relation to CID1 stored in the CID field 701 of the routing header 404. The second router 1303 refreshes the context by updating values and information of the previously stored IP header with the values and information provided by the IP header 403 of the full header packet.

After conducting the above described processes, IP header compression has been initiated. Accordingly, the first router 1302 now sends all subsequent packets of the packet stream to the second router 1303 without the IP header. In practice however, the subsequent packets are sent with compressed IP headers which contain the CID and information corresponding to fields that are unpredictable. Accordingly, from this point forward IP header compression is being conducted so as to transmit a reduced amount of data from the first router 1302, which serves as the compressor, to the second router 1303, which serves a the decompressor. The second router 1303 decompresses the IP headers of the subsequent packets by referring to the previously stored context by use of the CID transmitted with the subsequent packets. Thus, the second router 1303 restores the subsequent packets to their original format including the IP header and sends the restored packets to the second host 1304.

The present invention can also be applied to apparatus such as that illustrated in Fig. 14. The apparatus illustrated in Fig. 14 is similar to that illustrated in Fig. 13 with the exception of, for example, a switch 1401 which forwards the stream of packets transmitted from the first router 1302 to the second router 1303. A description of the procedures of the present invention for initiating IP header compression in the apparatus illustrated in Fig. 14 is provided relative to Fig. 8.

According to Fig. 8, the first host 1301 sends a standard stream of packets each having an IP header 801, the details of which are illustrated in Fig. 9, and extension headers including a routing header 802, the details of which are illustrated in Fig. 10, and a TCP header 402. The IP header 801 illustrated in Fig. 9 has the same format as the IP header 100 illustrated in Fig. 1 with the exception that some of the fields included in the IP header 801 are defined. For example, the Version field 101 stores a value of "0110" indicating an IPv6

header, the Next Header field 105 stores information indicating that the Next Header is a routing header, the Source Address field 107 stores an address of the first host 1301 and the Destination Address field 108 stores an address of the second host 1304.

The routing header 802 illustrated in Fig. 10 essentially has the same format as the routing header 300 illustrated in Fig. 3 with the exception that some of the fields included in the routing header are defined. Particularly, the Next Header field 201 stores information indicating that the Next Header is a TCP header, the Header Extension Length field 202 stores a value of "2" indicating that the header length is 2 octets, the Routing Type field 203 stores a value of "0" indicating that the routing header is a Type 0 routing header, the Segments Left field 204 stores a value of "1" indicating that one segment is left to be visited by the packet, and the Address field 302 stores an address of the switch 1401.

The first router 1302 receives the stream of packets and modifies the IP header of the full header packet in the manner illustrated in Fig. 11 and modifies the routing header in the manner illustrated in Fig. 12. The first router 1302 then sends the full header packet including the modified IP header 803, the modified routing header 804 and the TCP header 402 to the second router 1303 via the switch 1401. It should be noted that the present invention can operate with any type of payload protocol besides TCP, such as User Data Protocol (UDP), Routing Table Protocol (RTP) or Internet Control Message Protocol (ICMP).

The modified IP header 803 illustrated in Fig. 11 has the same format and essentially the same information stored in the fields thereof as the IP header 801 illustrated in Fig. 9. However, in the IP header 801 the address of the second host 1304 is stored in the Destination Address field 108, whereas in the IP header 803 the address of the second router 1303 is stored in the Destination Address field 108. Storing the address of the second router 1303 in the Destination Address field 108 of the IP header 803 causes the switch 1401 to not examine and process the full header packet since the address of the switch 1401 is not contained in the Destination Address field 108 of the IP header 803. Essentially, the switch 1401 passes the full header packet on toward its destination. Storing the address of the second router 1303 in the Destination Address field 108 of the IP header 803 causes the second router 1303, upon receipt of the full header packet, to examine and process the full header packet in a manner so as to initiate IP header decompression. All other packets having an address other than the second router 1303 in the Destination Address field 108 of the IP header 803 need not be examined and processed by the second router 1303.

Fig. 12 illustrates the modified routing header 804 to be transmitted in the full header packet, along with the modified IP header 803, from the first router 1302 to the second router 1303. The routing header 804 essentially has the same format as the routing header 300

illustrated in Fig. 3 with the exception that some of the fields included in the routing header 804 are defined. Particularly, the Next Header field 201 stores information indicating that the Next Header is a TCP header, the Header Extension Link field 202 stores a value of "4" indicating that the header length is 4 octets, the Routing Type field 203 stores a value of "COMPR", the Segments Left field 204 stores a value of "2" indicating that 2 segments are left to be visited by the packet, the first Address field 302-1 stores an address of the second host 1304 and the second address field 302-2 stores an address of the switch 1401.

Further, the routing header 804 provides various additional fields indicative of the context related to the compression of the IP header. Specifically, the routing header 804 includes a CID field 1101 which stores a context identifier CID2 and Generation field 1102 which stores information related to the context if the packet is a non-TCP packet.

The second router 1302 sends the full header packet including the modified IP header 803 and the modified routing header 804 to the second router 1303 via the third router 1304. The switch 1401 passes the full header packet on toward its destination since the Destination Address field 108 of the IP header 803 stores the address of the second router 1303. The second router 1303 upon receipt of the full header packet including the modified IP header 803 and the modified routing header 804 creates a context related to the packet stream to which the full header packet belongs or refreshes a previously stored context corresponding to the packet stream to which the full header packet belongs. The second router 1303 creates a context by storing information of the IP header 803 in corresponding relation to the CID stored in the CID field 1101 of the routing header 804. The second router 1303 refreshes the context by updating values and information of the previously stored IP header with values and information provided by the IP header 803 of the full header packet.

Similar to that described with respect to the present invention illustrated in Fig. 4, after conducting the above described procedures, IP header compression is initiated. Accordingly, the first router 1302 now sends all subsequent packets of the packet stream to the second router 1303 via the switch 1401 without the IP header. Alternatively, the subsequent packets of the packet stream could be sent with what could be termed as a compressed or shortened IP header which contains the CID and information corresponding to fields that are unpredictable or that change in small increments. Accordingly, from this point forward, IP header compression is being conducted so as to transmit a reduced amount of data from the first router 1302, which serves as the compressor, to the second router 1303, which serves as the decompressor. The second router 1303 decompresses the IP headers of the subsequent packets by referring to the previously stored context by use of CID2 and the Generation when the packets are non-TCP packets. Thus, the second router 1303 restores the subsequent

packets to their original format including the IP header and sends the restored packets to the second host 1304.

Therefore, according to the above, the present invention provides a method and apparatus for initiating compression of IP headers of a stream of packets to be sent from a source apparatus to a destination apparatus by changing the destination address of the IP header of a full header packet to identify the address of a node such as router, which serves as an interface to the destination apparatus, or a host and passing the Context Identifier (CID) in generation fields in a routing header which immediately follows or is inserted to immediately follow the IP header.

By the above described operations, in the present invention, compression of the IP headers of the packets of the stream of packets are initiated. Compression of the IP headers of the packets of the stream of packets subsequent to the full header packet is accomplished by transmitting the packets without their IP headers or transmitting the subsequent packets with compressed headers each having the CID information and information of the IP header that is unpredictable. Decompression of the IP headers of the subsequent packets is accomplished by referring to the context using the CID and restoring the IP headers to the subsequent packets.

The present invention as described above, lessens the overhead for not only transmitting a stream of packets from a first node to a second node due to the compression of the IP headers but also lessens the processing required by the apparatus which perform the compression and decompression. Particularly, the present invention lessens the amount of processing required by the decompressor being that the decompressor need only perform a full inspection of the packets which identify the decompressor in its destination address. Thus, the present invention provides unique advantages over that of conventional apparatuses.

While the present invention has been described in detail and pictorially in the accompanying drawings it is not limited to such details since many changes and modifications recognizable to those of ordinary skill in the art may be made to the invention without departing from the spirit and the scope thereof.

CLAIMS:

1. A method of initiating compression of an Internet Protocol (IP) header of each packet of a stream of packets to be sent from a source apparatus to a destination apparatus in a packet switched network, said source apparatus being connected to said packet switched network by a first node and said destination apparatus being connected to said packet switched network by a second node, said method comprising the steps of:

modifying, at said first node, the IP header of a full header packet of the stream of packets so that a destination address field of the IP header contains a second node address indicating a location of the second node;

inserting, at the first node, a routing header in the full header packet of the stream of packets, said routing header having context identification (CID) information identifying information of the IP header and a destination address indicating a location of the destination apparatus;

transmitting, from the first node to the second node, said full header packet including the modified IP header and the inserted routing header; and

initiating header compression of IP headers of packets of the stream of packets subsequent to the full header packet, when the second node receives said full header packet including the modified IP header and the inserted routing header.

2. A method according to claim 1, wherein each of said first and second nodes is a router.

3. A method according to claim 1, further comprising the step of:

compressing IP header of each of the subsequent packets when IP header compression has been initiated.

4. A method according claim 3, wherein said compressing step comprises the step of:

transmitting the subsequent packets including the CID information without an IP header.

5. A method according to claim 3, wherein said compressing step comprises the step of:

transmitting each of the subsequent packets including the CID information with a compressed IP header which includes unpredictable IP header information.

6. A method according claim 1, wherein said initiating step comprises the step of:

storing information of the IP header of the full header packet as a context in corresponding relation to the CID information.

7. A method according to claim 6, further comprising the step of:
compressing the IP headers of each of the subsequent packets when IP header compression has been initiated.

8. A method according to claim 7, wherein said compressing step comprises the step of:
transmitting each of the subsequent packets including the CID information without an IP header.

9. A method according to claim 7, wherein said compressing step comprises the step of:
transmitting each of the subsequent packets including the CID information with a compressed IP header which includes unpredictable IP header information.

10. A method according to claim 8, further comprising the step of:
decompressing each of the subsequent packets by using the CID information included in the subsequent packet to refer to the stored context.

11. A method according to claim 9, further comprising the step of:
decompressing each of the subsequent packets by using the CID information included in the subsequent packet to refer to the stored context.

12. A method of initiating compression of an Internet Protocol (IP) header of each packet of a stream of packets to be sent from a source apparatus to a destination apparatus in a packet switched network, said source apparatus being connected to said packet switched network by a first node and said destination apparatus being connected to said packet switched network by a second node, said method comprising the steps of:
modifying, at said first node, the IP header of a full header packet of the stream of packets so that a destination address field of the IP header contains a second node address indicating a location of the second node;
modifying, at the first node, a routing header in the full header packet of the stream of packets to include context identification (CID) information identifying information of the IP header and a destination address indicating a location of the destination apparatus;
transmitting, from the first node to the second node, said full header packet including the modified IP header and the modified routing header; and

initiating header compression of IP headers of packets of the stream of packets subsequent to the full header packet, when the second node receives said full header packet including the modified IP header and the modified routing header.

13. A method according to claim 12, wherein each of said first and second nodes in a router.

14. A method according to claim 12, further comprising the step of:
compressing IP header of each of the subsequent packets when IP header compression has been initiated.

15. A method according claim 14, wherein said compressing step comprises the step of:
transmitting the subsequent packets including the CID information without an IP header.

16. A method according to claim 14, wherein said compressing step comprises the step of:
transmitting each of the subsequent packets including the CID information with a compressed IP header which includes unpredictable IP header information.

17. A method according claim 12, wherein said initiating step comprises the step of:
storing information of the IP header of the full header packet as a context in corresponding relation to the CID information.

18. A method according to claim 17, further comprising the step of:
compressing the IP headers of each of the subsequent packets when IP header compression has been initiated.

19. A method according to claim 18, wherein said compressing step comprises the step of:
transmitting each of the subsequent packets including the CID information without an IP header.

20. A method according to claim 18, wherein said compressing step comprises the step of:
transmitting each of the subsequent packets including the CID information with a compressed IP header which includes unpredictable IP header information.

21. A method according to claim 19, further comprising the step of:

decompressing each of the subsequent packets by using the CID information included in the subsequent packet to refer to the stored context.

22. A method according to claim 20, further comprising the step of:

decompressing each of the subsequent packets by using the CID information included in the subsequent packet to refer to the stored context.

23. A router for use in a packet switched network for initiating compression of an Internet Protocol (IP) header of each packet of a stream of packets to be sent from a source apparatus to a destination apparatus in the packet switched network, said source apparatus being connected to said packet switched network by said router and said destination apparatus being connected to said packet switched network by another router, said router comprising:

first apparatus which modifies the IP header of a full header packet of the stream of packets so that a destination address field of the IP header contains an address indicating a location of said another router;

second apparatus which inserts a routing header in the full header packet of the stream of packets, said routing header having Context Identification (CID) information identifying information of the IP header in a destination address indicating a location of said destination apparatus;

third apparatus which transmits to said another router said full header packet including the modified IP header and the inserted routing header to initiate header compression of the IP header of each packet of the stream of packets subsequent to the full header packet upon receipt in said another router of said full header packet including the modified IP header and the inserted routing header.

24. A router according to claim 23, further comprising:

fourth apparatus which compresses the IP header of each of the subsequent packets when IP header compression has been initiated.

25. A router according to claim 24, wherein said fourth apparatus comprises:

fifth apparatus which transmits the subsequent packets including the CID information without an IP header.

26. A router according to claim 24, wherein said fourth apparatus comprises:

sixth apparatus which transmits each of the subsequent packets including the CID information with a compressed header which includes unpredictable IP header

information.

27. A router according to claim 23, wherein said third apparatus comprises:

seventh apparatus which stores information of the IP header of the full header packet as a context in corresponding relation to the CID information.

28. A router according to claim 27, further comprising eighth apparatus which compresses the IP headers of each of the subsequent packets when the IP header compression has been initiated.

29. A router according to claim 23, further comprising:

ninth apparatus which stores information of the IP header of said full header packet in corresponding relation to the CID information in response to receipt of said full header packet including the modified IP header and the inserted router header from said another router.

30. A router according to claim 29, further comprising:

tenth apparatus which decompresses packets subsequent to the full header packet according to the stored CID information.

FIG. 1

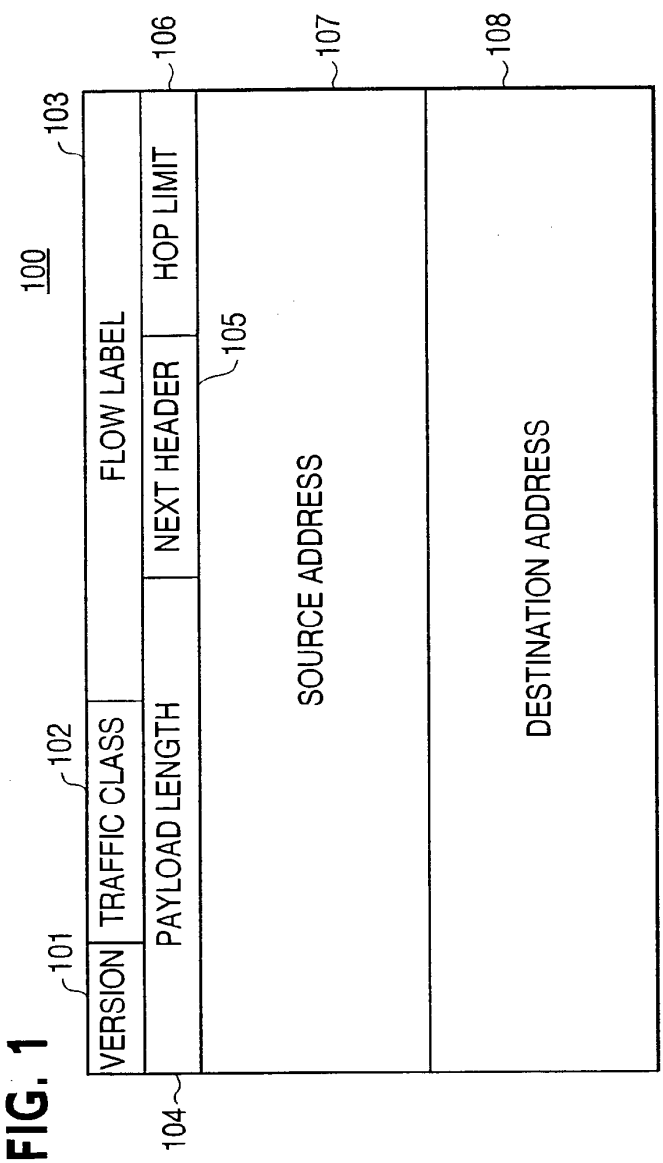

100
101
VERSION
102
TRAFFIC CLASS
103
FLOW LABEL
104
PAYLOAD LENGTH
106
NEXT HEADER
HOP LIMIT
105
107
SOURCE ADDRESS
108
DESTINATION ADDRESS

FIG. 2

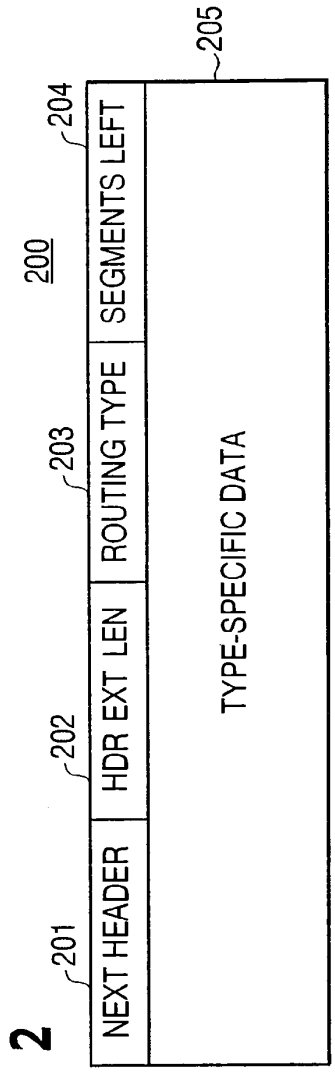

200
201
NEXT HEADER
202
HDR EXT LEN
203
ROUTING TYPE
204
SEGMENTS LEFT
205
TYPE-SPECIFIC DATA

FIG. 3

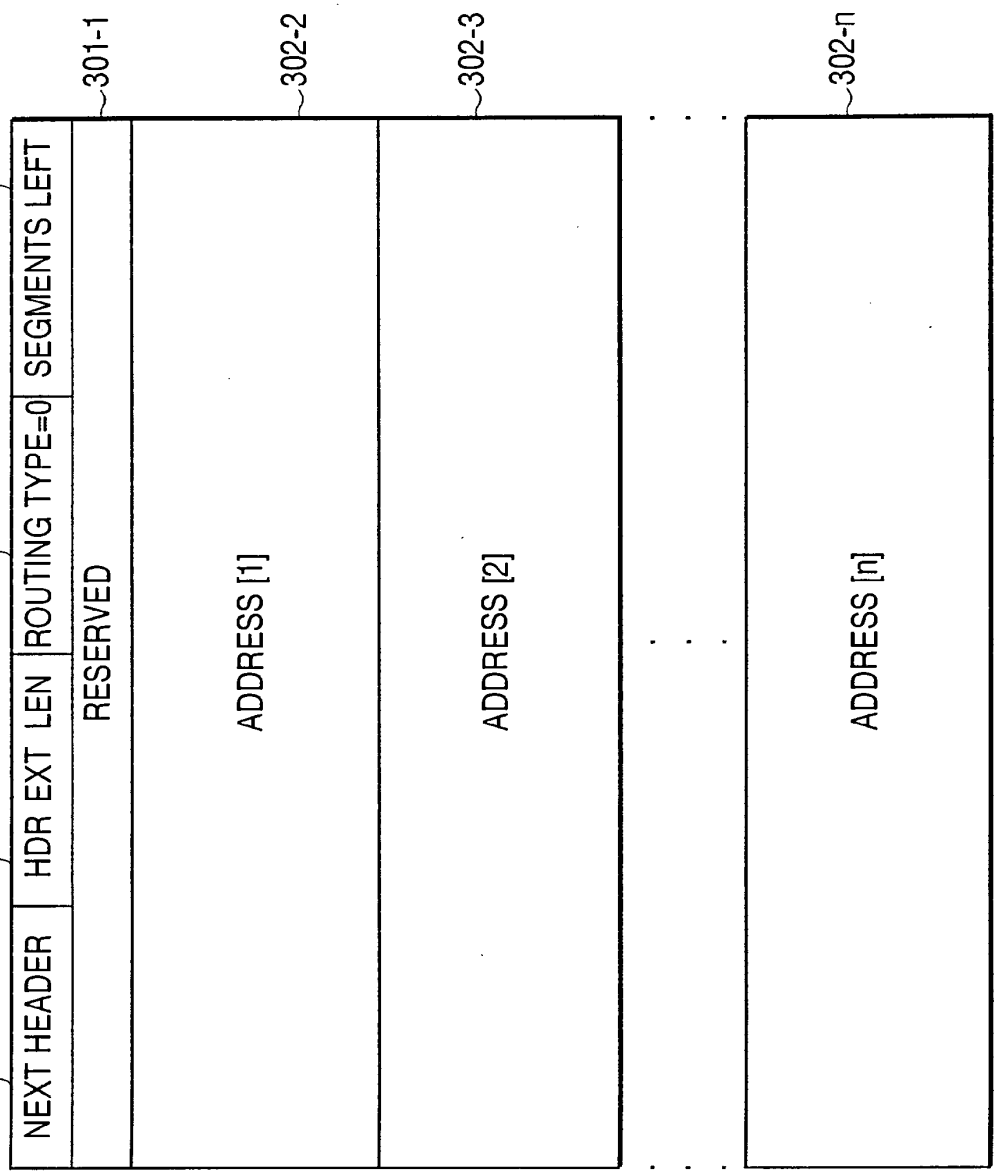

300
NEXT HEADER
HDR EXT LEN
ROUTING TYPE=0
SEGMENTS LEFT
RESERVED
ADDRESS [1]
ADDRESS [2]
ADDRESS [n]
201
202
203
204
301-1
302-2
302-3
302-n

FIG. 4

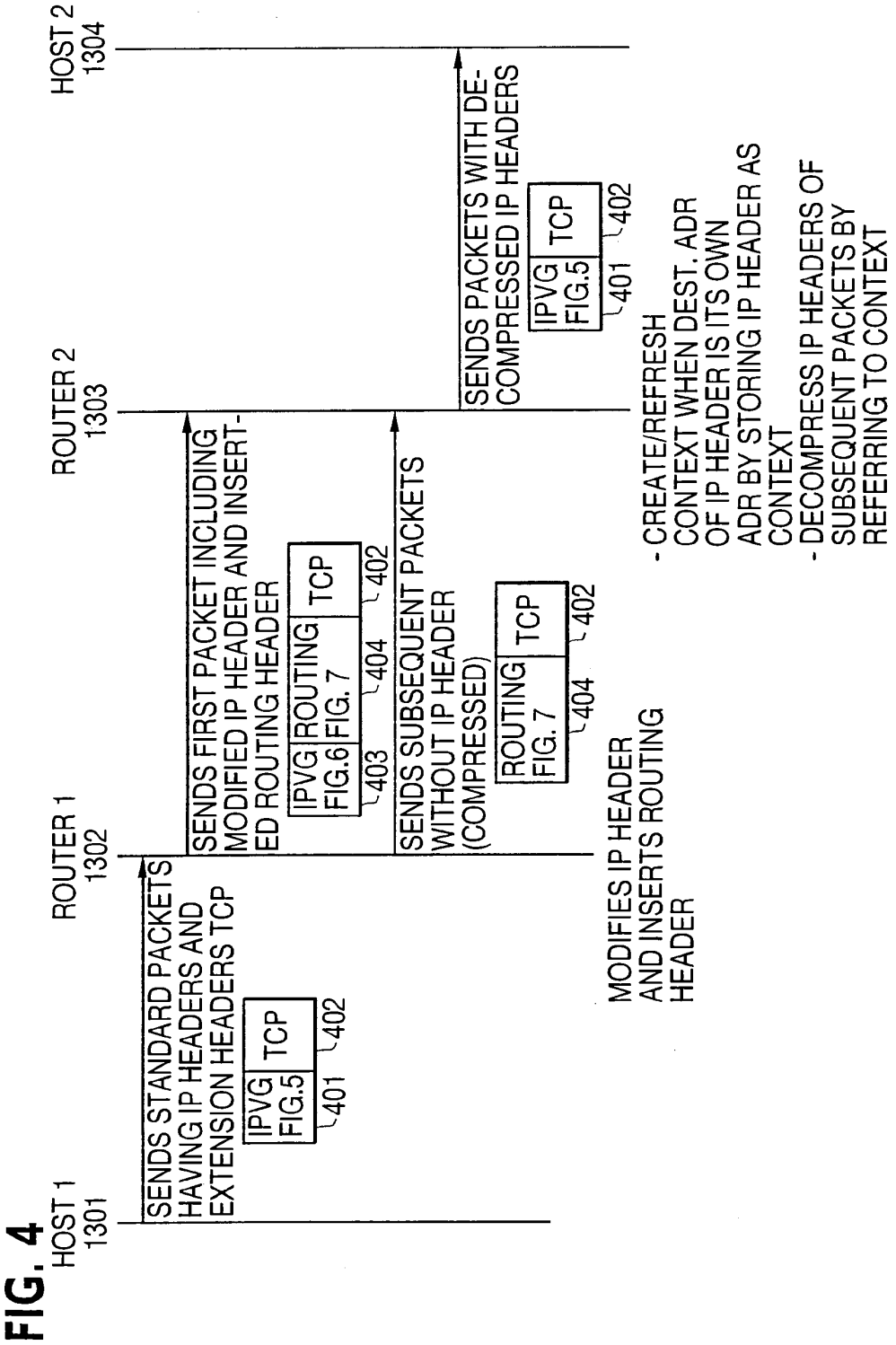

HOST 1
1301
ROUTER 1
1302
ROUTER 2
1303
HOST 2
1304
SENDS STANDARD PACKETS HAVING IP HEADERS AND EXTENSION HEADERS TCP
IPVG FIG.5
TCP
401
402
SENDS FIRST PACKET INCLUDING MODIFIED IP HEADER AND INSERTED ROUTING HEADER
IPVG FIG.6
ROUTING FIG. 7
TCP
403
404
402
SENDS SUBSEQUENT PACKETS WITHOUT IP HEADER (COMPRESSED)
ROUTING FIG. 7
TCP
404
402
SENDS PACKETS WITH DECOMPRESSED IP HEADERS
IPVG FIG.5
TCP
401
402
MODIFIES IP HEADER AND INSERTS ROUTING HEADER
- CREATE/REFRESH CONTEXT WHEN DEST. ADR OF IP HEADER IS ITS OWN ADR BY STORING IP HEADER AS CONTEXT
- DECOMPRESS IP HEADERS OF SUBSEQUENT PACKETS BY REFERRING TO CONTEXT

FIG. 5

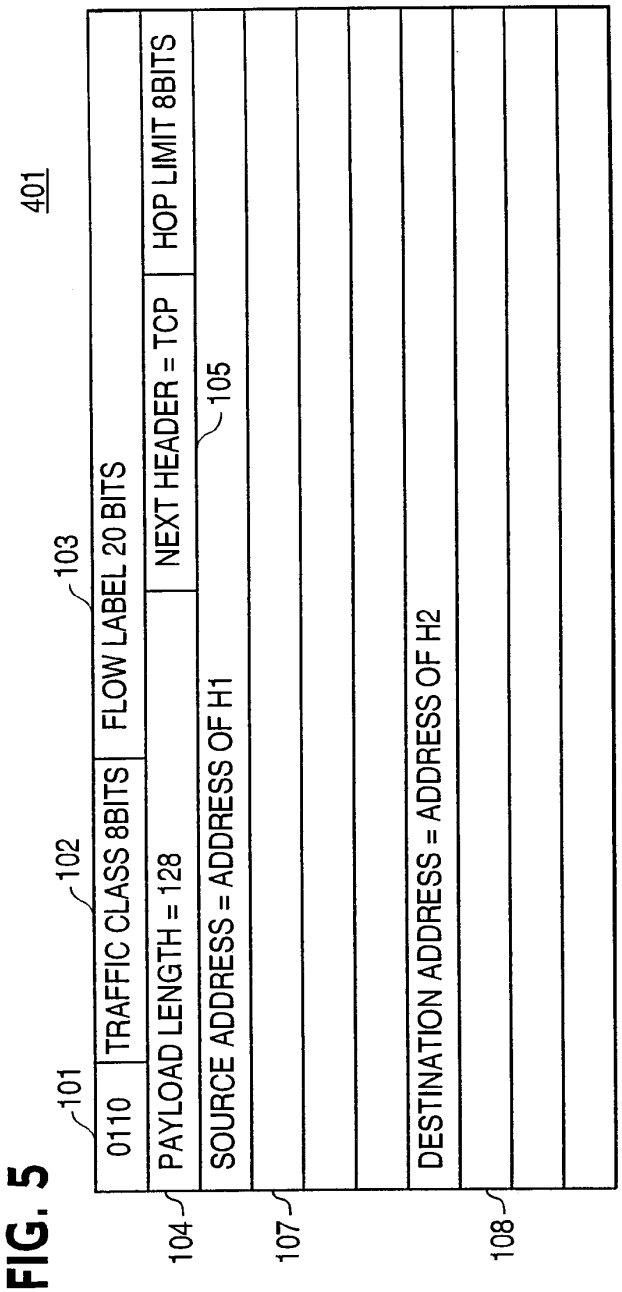

401
101
102
103
0110
TRAFFIC CLASS 8BITS
FLOW LABEL 20 BITS
PAYLOAD LENGTH = 128
NEXT HEADER = TCP
HOP LIMIT 8BITS
105
SOURCE ADDRESS = ADDRESS OF H1
DESTINATION ADDRESS = ADDRESS OF H2
104
107
108

FIG. 6

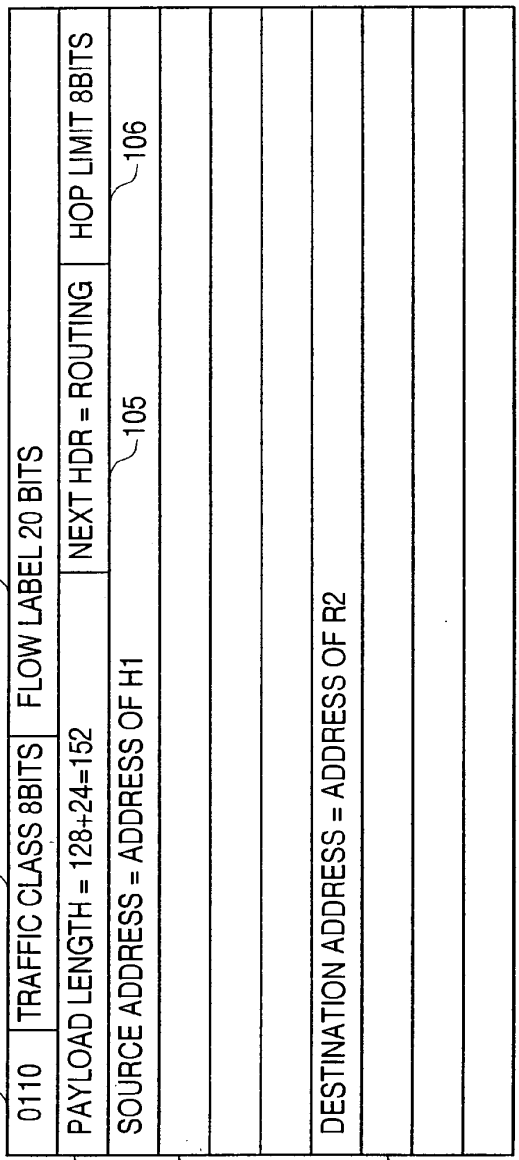

403
101
102
103
0110
TRAFFIC CLASS 8BITS
FLOW LABEL 20 BITS
104
PAYLOAD LENGTH = 128+24=152
NEXT HDR = ROUTING
HOP LIMIT 8BITS
105
106
SOURCE ADDRESS = ADDRESS OF H1
107
DESTINATION ADDRESS = ADDRESS OF R2
108

FIG. 7

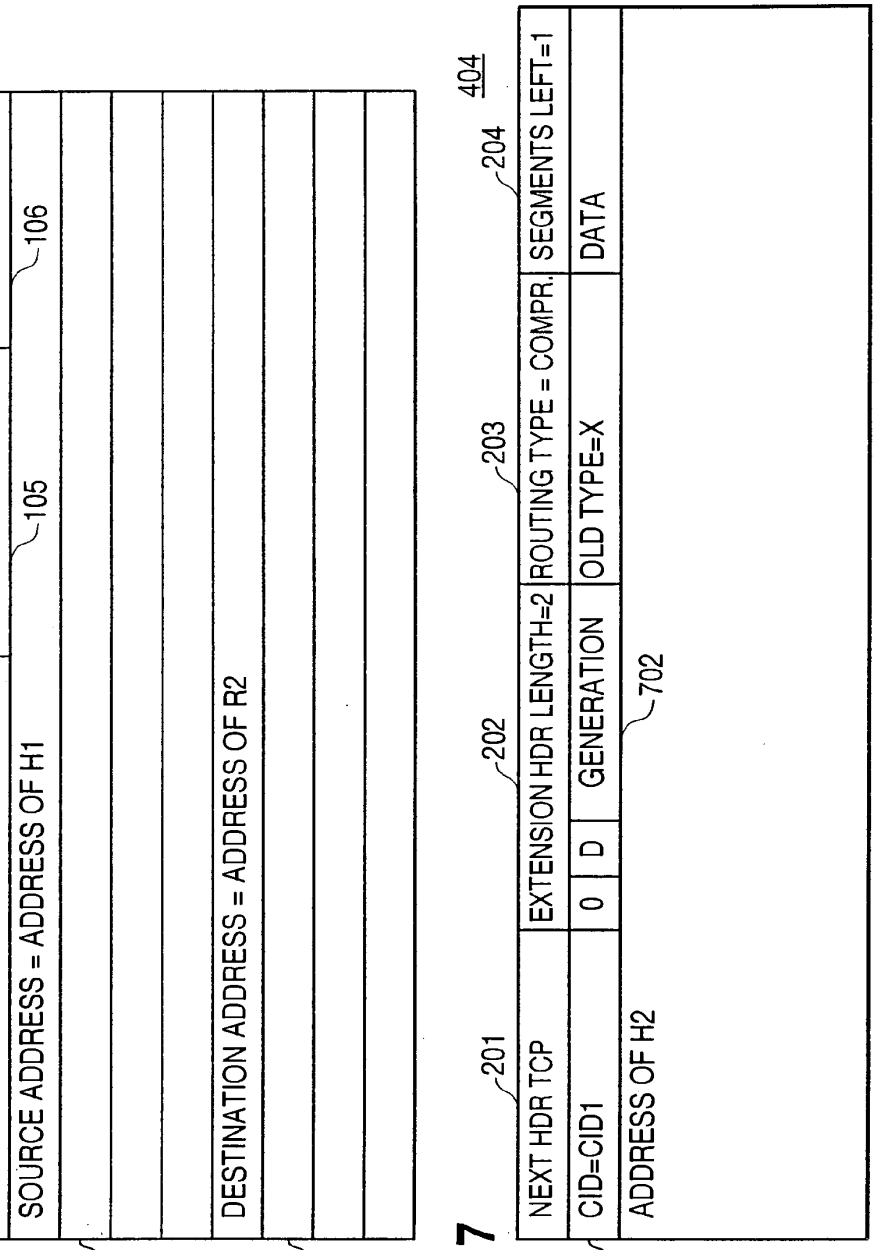

404
201
202
203
204
NEXT HDR TCP
EXTENSION HDR LENGTH=2
ROUTING TYPE = COMPR.
SEGMENTS LEFT=1
CID=CID1
0
D
GENERATION
OLD TYPE=X
DATA
704
ADDRESS OF H2
702

FIG. 8

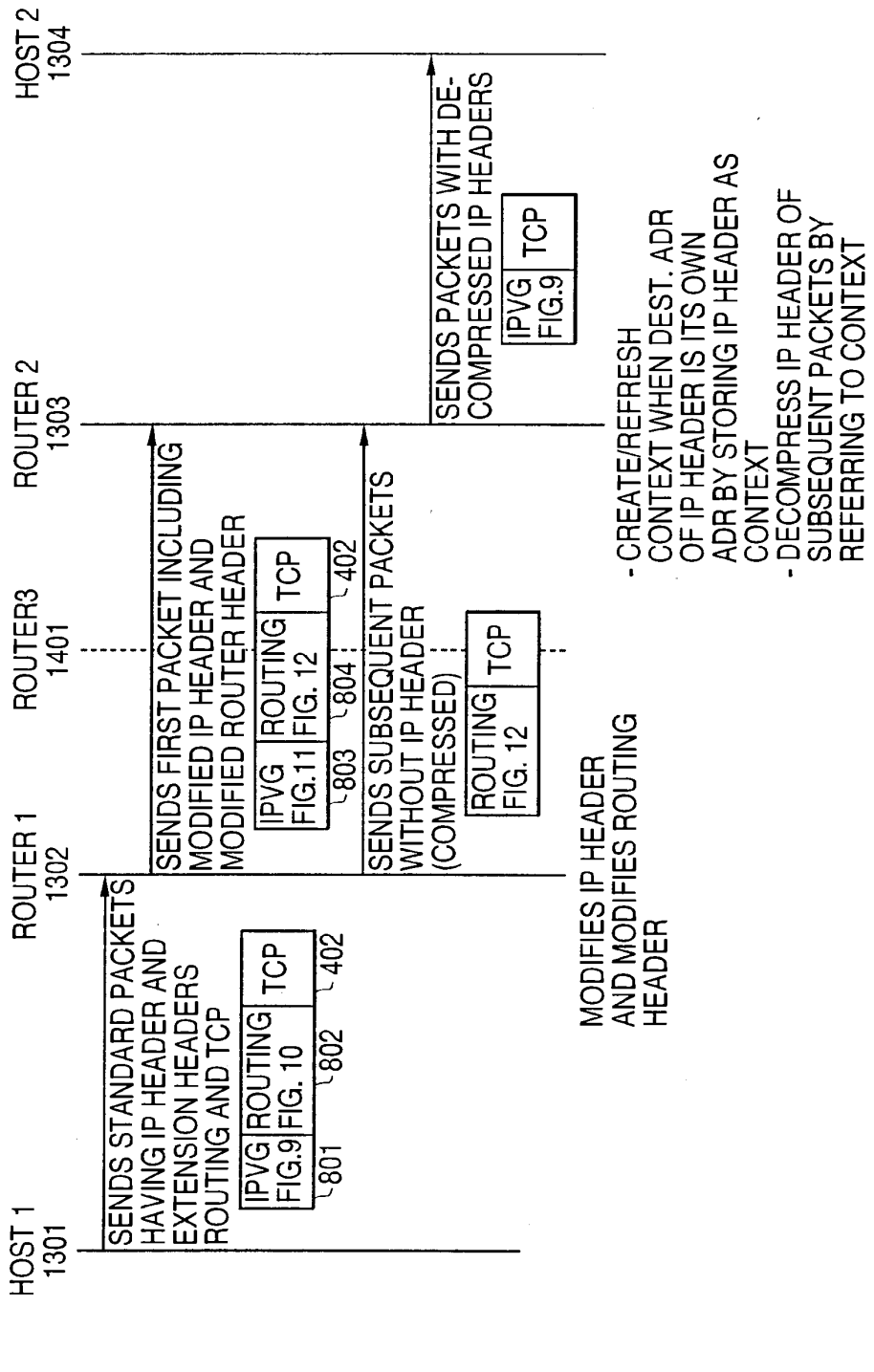

HOST 1
1301
ROUTER 1
1302
ROUTER3
1401
ROUTER 2
1303
HOST 2
1304
SENDS STANDARD PACKETS HAVING IP HEADER AND EXTENSION HEADERS ROUTING AND TCP
IPVG FIG.9
ROUTING FIG. 10
TCP
801
802
402
SENDS FIRST PACKET INCLUDING MODIFIED IP HEADER AND MODIFIED ROUTER HEADER
IPVG FIG.11
ROUTING FIG. 12
TCP
803
804
402
SENDS SUBSEQUENT PACKETS WITHOUT IP HEADER (COMPRESSED)
ROUTING FIG. 12
TCP
MODIFIES IP HEADER AND MODIFIES ROUTING HEADER
SENDS PACKETS WITH DE-COMPRESSED IP HEADERS
IPVG FIG.9
TCP
- CREATE/REFRESH CONTEXT WHEN DEST. ADR OF IP HEADER IS ITS OWN ADR BY STORING IP HEADER AS CONTEXT
- DECOMPRESS IP HEADER OF SUBSEQUENT PACKETS BY REFERRING TO CONTEXT

FIG. 9

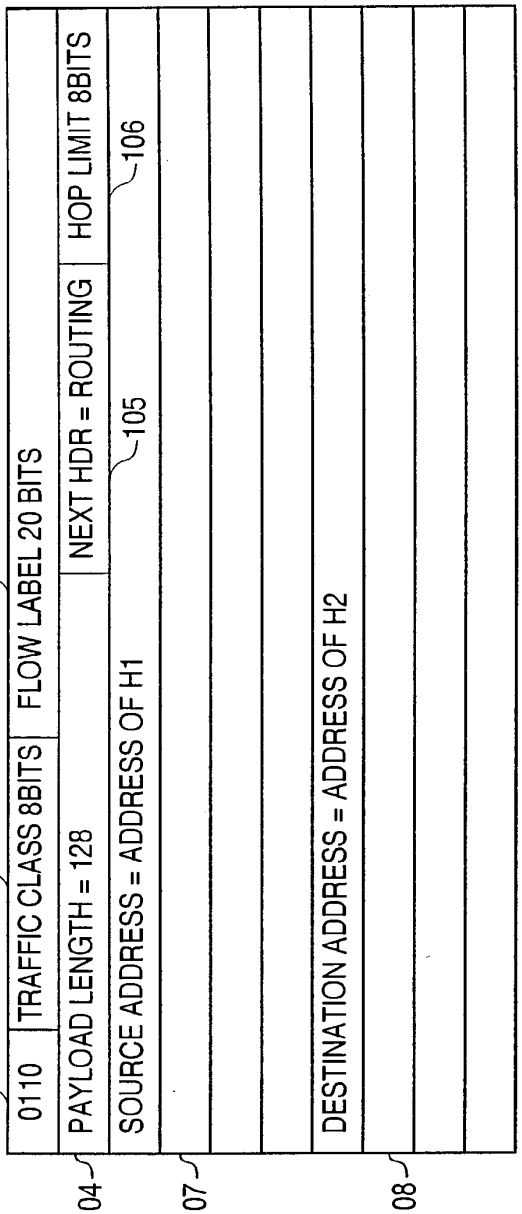

801
101
102
103
0110
TRAFFIC CLASS 8BITS
FLOW LABEL 20 BITS
104
PAYLOAD LENGTH = 128
NEXT HDR = ROUTING
HOP LIMIT 8BITS
105
106
107
SOURCE ADDRESS = ADDRESS OF H1
DESTINATION ADDRESS = ADDRESS OF H2
108

FIG. 10

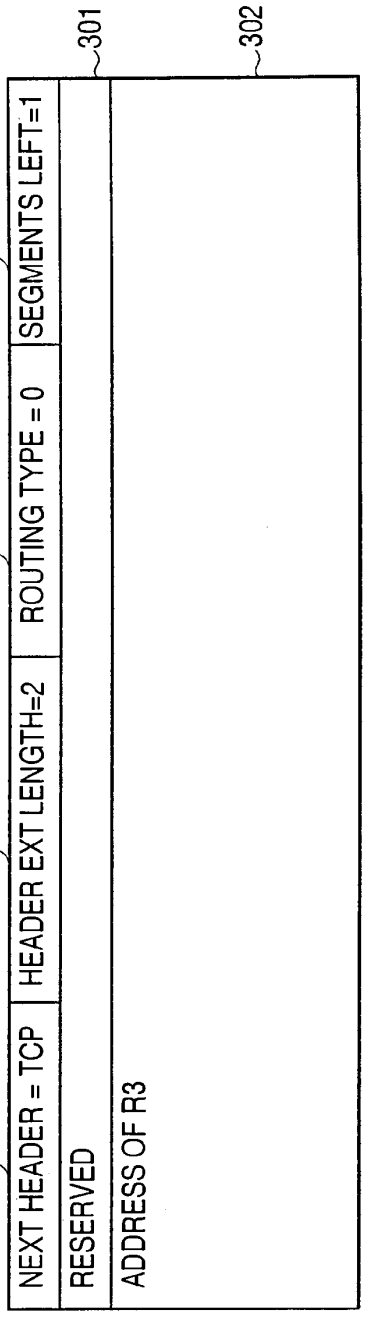

802
201
202
203
204
NEXT HEADER = TCP
HEADER EXT LENGTH=2
ROUTING TYPE = 0
SEGMENTS LEFT=1
301
RESERVED
302
ADDRESS OF R3

FIG. 11

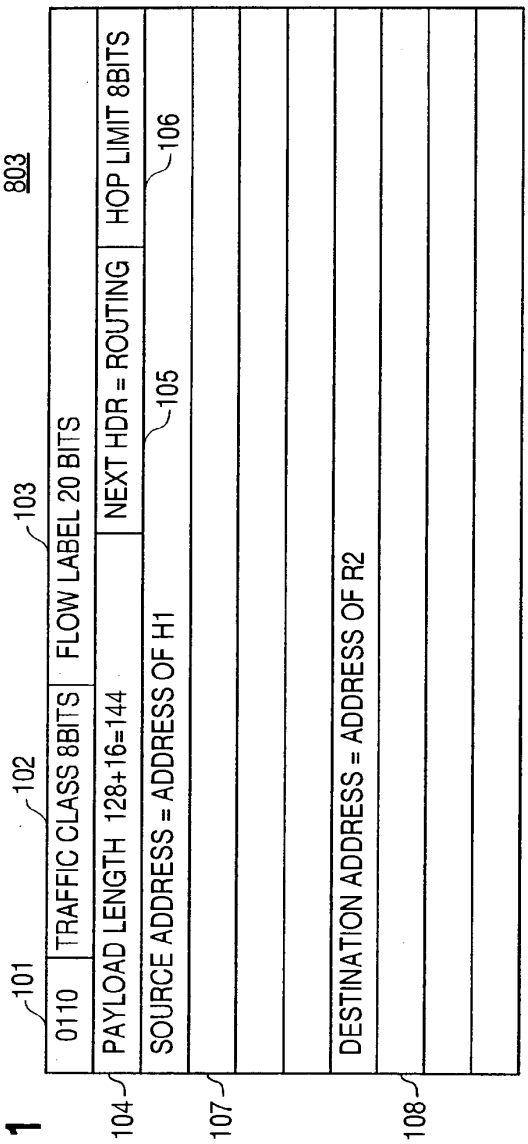
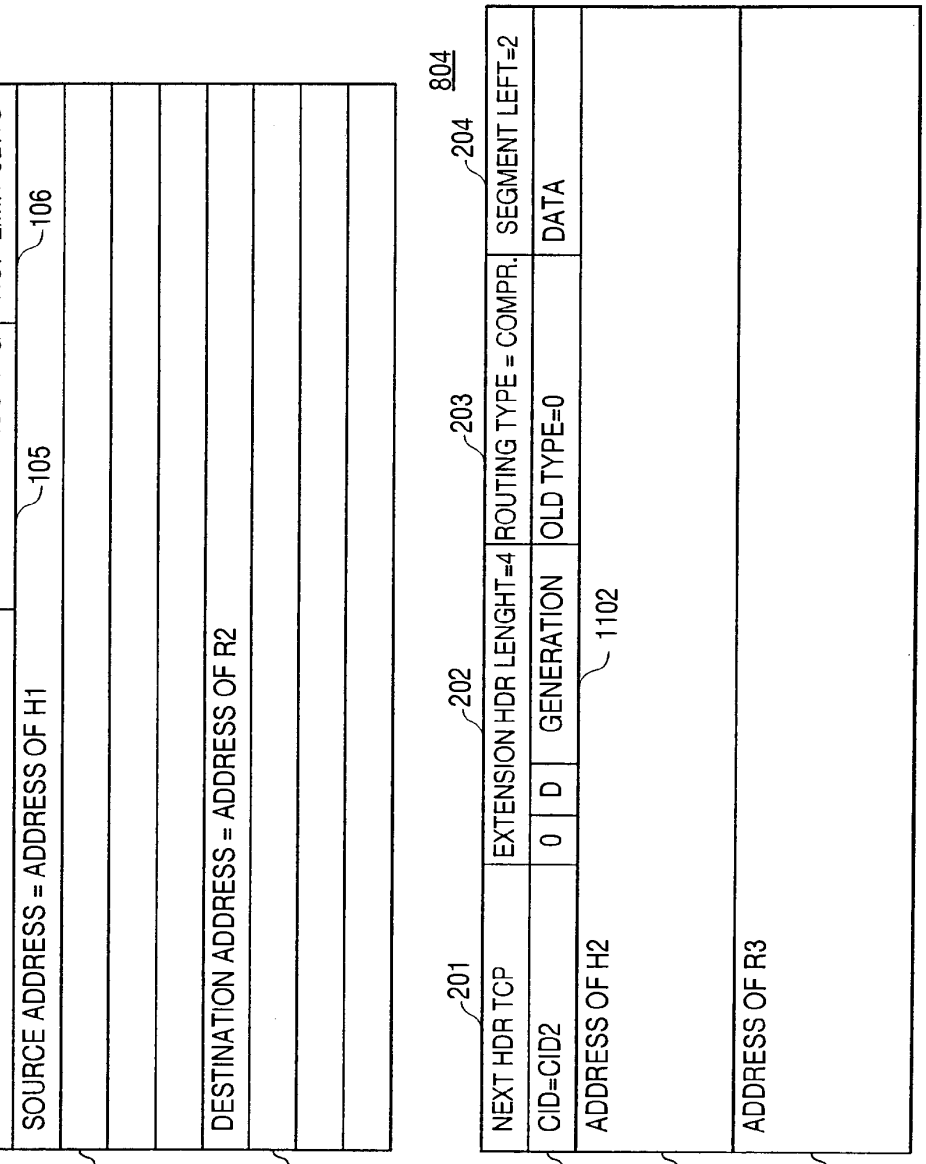

803
101
102
103
0110
TRAFFIC CLASS 8BITS
FLOW LABEL 20 BITS
PAYLOAD LENGTH 128+16=144
NEXT HDR = ROUTING
HOP LIMIT 8BITS
SOURCE ADDRESS = ADDRESS OF H1
105
106
DESTINATION ADDRESS = ADDRESS OF R2
104
107
108

FIG. 12


804
201
202
203
204
NEXT HDR TCP
EXTENSION HDR LENGHT=4
ROUTING TYPE = COMPR.
SEGMENT LEFT=2
CID=CID2
0
D
GENERATION
OLD TYPE=0
DATA
1102
ADDRESS OF H2
ADDRESS OF R3
1101
302-1
302-2

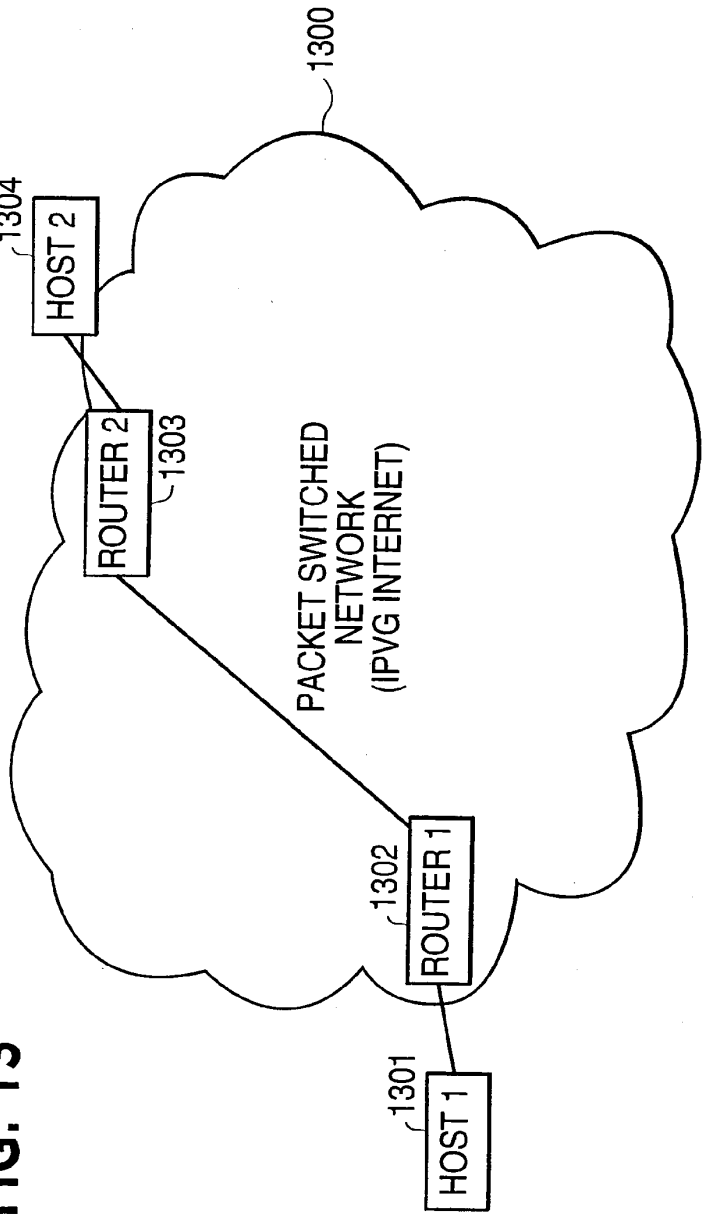

1300
1304
HOST 2
ROUTER 2
1303
PACKET SWITCHED
NETWORK
(IPVG INTERNET)
1302
ROUTER 1
1301
HOST 1

FIG. 13

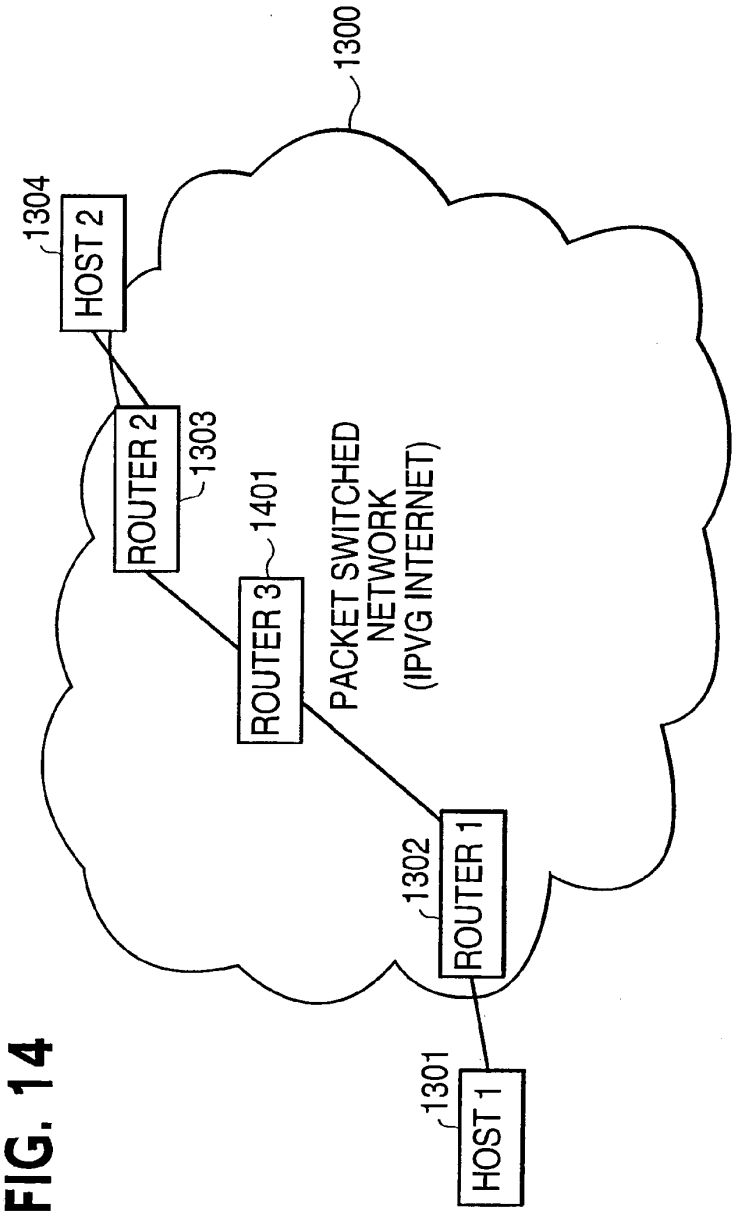

1300
1304
HOST 2
ROUTER 2
1303
1401
ROUTER 3
PACKET SWITCHED
NETWORK
(IPVG INTERNET)
1302
ROUTER 1
1301
HOST 1

FIG. 14

INTERNATIONAL SEARCH REPORT

Interr nal Application No
PCT/IB 00/01531

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 H04L29/06

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 H04L

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)
EPO-Internal, WPI Data, PAJ, INSPEC, COMPENDEX, IBM-TDB

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	M DEGERMARK: "RFC2507 : IP Header Compression" INTRENET ENGINEERING TASK FORCE (IETF) , 1 March 1999 (1999-03-01), pages 1-47, XP002157130 page 3, line 1 -page 8, line 22 page 24, paragraph 7.1 -page 27, line 12 ---	1-30
A	DEGERMARK M ET AL: "LOW-LOSS TCP/IP HEADER COMPRESSION FOR WIRELESS NETWORKS" WIRELESS NETWORKS,US,ACM, vol. 3, no. 5, 1 October 1997 (1997-10-01), pages 375-387, XP000728935 ISSN: 1022-0038 page 376, right-hand column, paragraph 2 -page 378, left-hand column, line 22 -----	1-30

☐ Further documents are listed in the continuation of box C.

☐ Patent family members are listed in annex.

° Special categories of cited documents :

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"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
12 January 2001	25/01/2001

Name and mailing address of the ISA	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3016	Karavassilis, N

2

Form PCT/ISA/210 (second sheet) (July 1992)

Electronic Acknowledgement Receipt	
EFS ID:	16155391
Application Number:	11627181
International Application Number:	
Confirmation Number:	1464
Title of Invention:	Transmit Announcement Indication
First Named Inventor/Applicant Name:	Menzo Wentink
Customer Number:	23524
Filer:	Nicholas M. Lagerwall/Linda Anderson
Filer Authorized By:	Nicholas M. Lagerwall
Attorney Docket Number:	088245-2616
Receipt Date:	26-JUN-2013
Filing Date:	25-JAN-2007
Time Stamp:	11:57:59
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1		SuppIDS.pdf	356447 5fca3f9f9dc47b2b1acca0cbcbe6e3554d96527e	yes	10

	Multipart Description/PDF files in .zip description		
	Document Description	**Start**	**End**
	Transmittal Letter	1	3
	Information Disclosure Statement (IDS) Form (SB08)	4	4
	Non Patent Literature	5	10
Warnings:			
Information:			

2	Foreign Reference	WO0131881.pdf	2063703 3e7ece5880a2a7c6920f949591867c05206099d7	no	29
Warnings:					
Information:					
		Total Files Size (in bytes):	2420150		

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New Applications Under 35 U.S.C. 111
If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371
If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office
If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant:	Menzo Wentink
Title:	TRANSMIT ANNOUNCEMENT INDICATION
Appl. No.:	11/627,181
Filing Date:	1/25/2007
Examiner:	Abdulla A. Riyami
Art Unit:	2474
Confirmation Number:	1464

SUPPLEMENTAL INFORMATION DISCLOSURE STATEMENT UNDER 37 CFR §1.56

Mail Stop Amendment
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Commissioner:

Applicant submits herewith documents for the Examiner's consideration in accordance with 37 CFR §§1.56, 1.97 and 1.98.

Applicant respectfully requests that each listed document be considered by the Examiner and be made of record in the present application and that an initialed copy of Form PTO/SB/08 be returned in accordance with MPEP §609.

The submission of any document herewith is not an admission that such document constitutes prior art against the claims of the present application or that such document is considered material to patentability as defined in 37 CFR §1.56(b). Applicant does not waive

any rights to take any action which would be appropriate to antedate or otherwise remove as a competent reference any document submitted herewith.

CONCISE EXPLANATION OF RELEVANCE

The listed documents were cited during the prosecution of a related European Patent Application 07717414.2. A copy of the Examination Report is also cited.

TIMING OF THE DISCLOSURE

The listed documents are being submitted in compliance with 37 CFR §1.97(b), before the mailing of a first Office action after the filing of a RCE.

STATEMENT UNDER 37 CFR §1.704(d)

The undersigned hereby states in accordance with 37 CFR §1.704(d) that each item of information contained in the information disclosure statement was first cited in any communication from a patent office in a counterpart foreign or international application or from the Office, and that this communication was not received by any individual designated in 37 CFR §1.56(c) more than thirty days prior to the filing of the information disclosure statement.

Although Applicant believes that no fee is required, the Commissioner is hereby authorized to charge any additional fees which may be due to Deposit Account No. 19-0741.

Respectfully submitted,

Date June 26, 2013

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Electronic Acknowledgement Receipt

EFS ID:	13143748
Application Number:	11627181
International Application Number:	
Confirmation Number:	1464
Title of Invention:	Transmit Announcement Indication
First Named Inventor/Applicant Name:	Menzo Wentink
Customer Number:	23524
Filer:	Paul S. Hunter/Linda Anderson
Filer Authorized By:	Paul S. Hunter
Attorney Docket Number:	088245-2616
Receipt Date:	29-JUN-2012
Filing Date:	25-JAN-2007
Time Stamp:	16:00:57
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Non Patent Literature	IEEENPLpt4b.pdf	18892799 cafcc9539dfcaa2e5fa06f3132e988cf6b710ab6	no	50

Warnings:	
Information:	

2	Non Patent Literature	IEEENPLpt4c.pdf	9137297 fed0afdbd5c3421c0a75a41a448f91a743421cf4	no	28
Warnings:					
Information:					
3	Non Patent Literature	IEEENPLpt4a2.pdf	14156076 529b1560b2997ce63a58f80e9dfcbcb8820cd1c0	no	40
Warnings:					
Information:					
4	Non Patent Literature	IEEENPLpt4a3.pdf	12072354 2d66c2da113b3b2ef2415d9e726b3cf52fedb6bd	no	35
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If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

<u>National Stage of an International Application under 35 U.S.C. 371</u>
If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

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PTO/SB/08 (09-06)
Approved for use through 03/31/2007. OMB 0651-0031
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Substitute for form 1449/PTO				***Complete if Known***	
INFORMATION DISCLOSURE STATEMENT BY APPLICANT				**Application Number**	11/627,181
				Filing Date	1/25/2007
Date Submitted: June 29, 2012				**First Named Inventor**	Menzo Wentink
				Art Unit	2474
(use as many sheets as necessary)				Examiner Name	Abdullah A. Riyami
Sheet	1	of	1	Attorney Docket Number	088245-2616

U.S. PATENT DOCUMENTS

Examiner Initials*	Cite No.[1]	Document Number Number-Kind Code[2] (*if known*)	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear

FOREIGN PATENT DOCUMENTS

Examiner Initials*	Cite No.[1]	Foreign Patent Document Country Code[3]-Number[4]-Kind Code[5] (*if known*)	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Documents	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear	T[6]
		WO-2005/041467	05-06-2005	SONY CORP		

NON PATENT LITERATURE DOCUMENTS

Examiner Initials*	Cite No.[1]	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.) date, page(s), volume-issue number(s), publisher, city and/or country where published.	T[6]
		Anonymous Ed - Anonymous: "Information technology-Telecommunications and information exchange between systems - Local and metropolitan area networks - Specific requirements - Part 11: Wireless LAN Media Access Control (MAC) and Physical Layer (PHY) Specifications," IEEE Standard, January 1, 2003, 528 pages	
		Extended Search Report issued on EP Application 07717414.2, dated 6/21/12.	
		Office Action on Chinese Application 200780003618.1, dated 5/3/2012, English translation not available.	

Examiner Signature		Date Considered	

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If you need assistance in completing the form, call 1-800-PTO-9199 (1-800-786-9199) and select option 2.

4835-6957-3648.1

Electronic Acknowledgement Receipt	
EFS ID:	13142071
Application Number:	11627181
International Application Number:	
Confirmation Number:	1464
Title of Invention:	Transmit Announcement Indication
First Named Inventor/Applicant Name:	Menzo Wentink
Customer Number:	23524
Filer:	Paul S. Hunter/Linda Anderson
Filer Authorized By:	Paul S. Hunter
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Time Stamp:	16:05:08
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Foreign Reference	WO041467.pdf	6168765 b5bc9b2e38e4dfa459c94b5a3fe4ed59ab334687	no	176
Warnings:					
Information:					

2		FORNPLS.pdf	595721 74db875186b9b262dda651b1012dbac45ff8651b	yes	12

	Multipart Description/PDF files in .zip description		
	Document Description	**Start**	**End**
	Non Patent Literature	1	8
	Non Patent Literature	9	12

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3		SuppIDS.pdf	142908 e71f651d6f08aa06e6aeee62a367570c2fb12b66	yes	3

	Multipart Description/PDF files in .zip description		
	Document Description	**Start**	**End**
	Transmittal Letter	1	2
	Information Disclosure Statement (IDS) Form (SB08)	3	3

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Information:

Total Files Size (in bytes):	6907394

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New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

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New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
6 May 2005 (06.05.2005)

PCT

(10) International Publication Number
WO 2005/041467 A2

(51) International Patent Classification[7]: H04L 1/00, H04Q 7/38, H04L 12/56, H04Q 7/22, H04L 12/28, 12/413

(21) International Application Number: PCT/JP2004/015962

(22) International Filing Date: 21 October 2004 (21.10.2004)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:

2003-364231	24 October 2003 (24.10.2003)	JP
2004-203627	9 July 2004 (09.07.2004)	JP
10/916,596	12 August 2004 (12.08.2004)	US
2004-300675	14 October 2004 (14.10.2004)	JP

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(81) Designated States *(unless otherwise indicated, for every kind of national protection available)*: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NA, NI, NO, NZ, OM, PG, PH,

[Continued on next page]

(54) Title: WIRELESS COMMUNICATION SYSTEM, WIRELESS COMMUNICATION DEVICE AND WIRELESS COMMUNICATION METHOD, AND COMPUTER PROGRAM

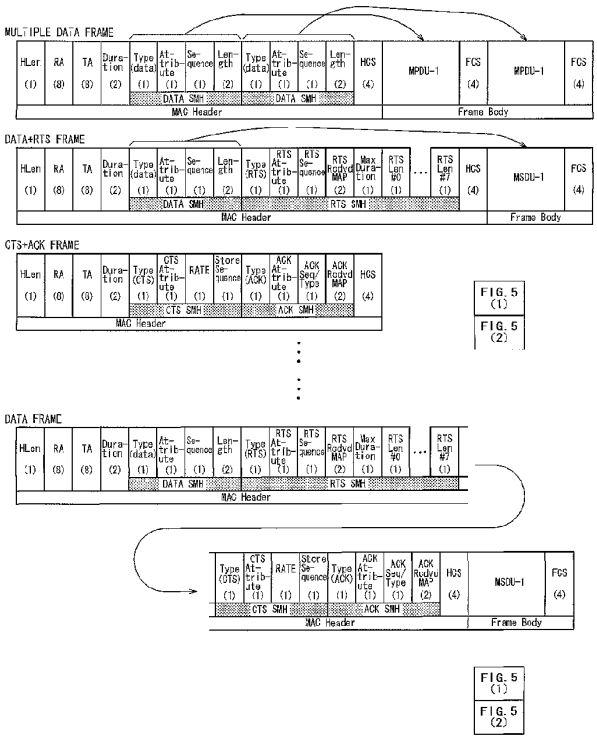


FIG. 5 (1)
FIG. 5 (2)

(57) Abstract: Access control based on CSMA is favorably carried out with the RTS/CTS method used together. If the RTS/CTS procedure is used together, CTS information is transmitted in response to the reception of RTS information, and data is transmitted in response to the reception of CTS. The CTS transmitting station measures the quality of RTS receive signal, and thereby determines a transmission rate at which it can receive and notifies a station as the destination of CTS. The station as the destination of CTS transmits data in response to CTS information. As the transmission rate for this data, the transmission rate indicated in the RATE field in CTS is applied.

WO 2005/041467 A2

WO 2005/041467 A2

PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW.

(84) Designated States *(unless otherwise indicated, for every kind of regional protection available)*: ARIPO (BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PL, PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:

— *without international search report and to be republished upon receipt of that report*

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

DESCRIPTION

WIRELESS COMMUNICATION SYSTEM, WIRELESS COMMUNICATION DEVICE AND WIRELESS COMMUNICATION METHOD, AND COMPUTER PROGRAM

Technical Field

The present invention relates to a wireless communication system wherein a plurality of wireless stations communicate with one another as in wireless LAN (Local Area Network) or PAN (Personal Area Network), a wireless communication device and a wireless communication method, and a computer program. More particularly, it relates to a wireless communication system, a wireless communication device and a wireless communication method, and a computer program wherein random access is made based on carrier detection by CSMA/CA (Carrier Sense Multiple Access with Collision Avoidance).

Further more particularly, the present invention relates to a wireless communication system, a wireless communication device and a wireless communication method, and a computer program wherein access control is carried out based on CSMA using the RTS/CTS method to maintain communication quality. Further more particularly, it relates to a wireless communication system, a wireless communication device and a wireless communication method, and a computer program wherein a plurality of classes of frames, such as RTS, CTS, DATA, and ACK, are multiplexed and thereby flexible transmitting and receiving procedures are provided and overheads are reduced.

Background Art

The wireless network has received widespread attention as a communication system which relieves users of cable wiring between wire communication devices. With the wireless network, the majority of cables can be omitted in working spaces, such as offices; therefore, communication terminals, such as personal computers (PCs), can be relatively easily relocated. As wireless LAN systems become faster and inexpensive, recently the demand for the wireless network has been significantly increased. In particular, these days, the introduction of personal area network (PAN) has been considered to build a small-scale wireless network among a plurality of pieces of electronic equipment existing in people's surroundings to carry out information communication. For example, different wireless communication systems and wireless communication devices are defined using frequency bands, such as 2.4-GHz band and 5-GHz band, for which licenses from competent authorities are unnecessary.

Typical standards related to wireless network include IEEE (The Institute of Electrical and Electronics Engineers) 802.11 (Refer to Non-Patent Document 1, for example.), HiperLAN/2 (Refer to Non-Patent Document 2 or Non-Patent Document 3, for example.), IEEE802.15.3, and Bluetooth communication. With respect to the IEEE802.11 standard, various wireless transmission methods, such as the IEEE802.11a standard and the IEEE802.11b standard, are present depending on differences in wireless communication method and frequency

band used.

To build a local area network using radio engineering, the following method is generally used: one device, designated as "access point" or "coordinator," that functions as control station is provided in the area. Then the network is formed under the centralized control of the control station.

In wireless networks provided with an access point, an access control method based on bandwidth reservation is in wide use. In this method, when information is transmitted from some communication device, a band required for the information transmission is reserved at the access point. Thus, transmission channels are utilized so that collision with information transmission by other communication devices will be prevented. That is, by providing an access point, synchronous wireless communication, wherein the communication devices within the wireless network synchronize them with one another, is carried out.

However, a problem arises if asynchronous communication is carried out between a transmitting communication device and a receiving communication devices in a wireless communication system provided with an access point: wireless communication must be carried out through the access point without exception, and thus the efficiency of transmission channel utilization is reduced by half.

To cope with this, "ad-hoc communication" in which terminals asynchronously communicate directly with each other has been devised as another method for building a wireless

network. In particular, in small-scale wireless networks consisting of a relatively small number of clients located nearby, the ad-hoc communication is believed to be appropriate. In the ad-hoc communication, any terminals can carry out wireless communication directly, or randomly, with each other without use of any specific access point.

In ad-hoc wireless communication systems, a central control station does not exist; therefore, it is suitable for constituting, for example, a home network comprising household electric appliances. The ad-hoc network has the following features, for example: even if one unit becomes faulty or is turned off, routing is automatically changed, and thus the network is less prone to fail; packets are caused to hop a plurality of times between mobile stations, and thereby data can be transmitted a relatively long way with a high data rate maintained. Various cases of ad-hoc system development have been known. (Refer to Non-Patent Document 5, for example.)

For example, the IEEE802.11 wireless LAN systems are provided with ad-hoc mode in which the system autonomously and decentralizedly operates in a peer to peer manner without providing a control station.

With respect to wireless LAN networks in the ad-hoc environment, it is generally known that a problem of hidden terminal occurs. Hidden terminal is a communication station which can be heard by one communication station as the counterpart of communication but cannot be heard by the other when communication is carried out between the specific

communication stations. Hidden terminals cannot carry out negotiation between them, and thus transmit operation can collide.

As one of methodologies for solving such a problem of hidden terminal, CSMA/CA according to the RTS/CTS procedure is known.

The CSMA/CA (Carrier Sense Multiple Access with Collision Avoidance) is a connecting method wherein multiple access is made based on carrier detection. In wireless communication, it is difficult for a communication device to receive signals by which the device itself transmits information. Therefore, the communication device confirms that there is no information transmission from other communication devices by the CSMA/CA (Collision Avoidance) system, not by the CSMA/CD (Collision Detection) system. Then, the communication device starts its own information transmission, and thereby collision is avoided. The CSMA system is an access method suitable for asynchronous data communication, such as file transfer and electronic mail.

In the RTS/CTS method, the communication station as the origin of data transmission transmits a request to send packet RTS (Request To Send). In response to the reception of a response packet CTS (Clear To Send) from the communication station as the destination of data transmission, the transmitting communication station starts data transmission. When hidden terminals receive either or both of RTS and CTS, they set their own transmission stop period. The transmission stop period is equivalent to a period during which data

transmission is expected to be performed based on the RTS/CTS procedure. Thus, collision can be avoided. Hidden terminals for the transmitter station receive CTS and set a transmission stop period to avoid collision with data packets. Hidden terminals for the receiver station receive RTS and stop a transmission period to avoid collision with ACK.

Here, the wireless network will be described with IEEE802.11a, an expansion standard to IEEE802.11, taken as an example.

FIG. 15 illustrates the frame format specified by IEEE802.11a. In the figure, a preamble which indicates the presence of packet is added to the head of each packet. For the preamble, known symbol patterns are defined in the standard. Based on these known patterns, receivers can judge whether a receive signal corresponds to a preamble or not.

Following the preamble, SIGNAL field is defined. In the SIGNAL field, information required for decoding the information portion of the packet concerned is placed. The information required for decoding packets is designated as PLCP header (Physical Layer Convergence Protocol header). The PLCP header includes: RATE field which indicates the transmission rate of an information portion (This includes Service field as part of PLCP header; however, it is hereafter simply and generically referred to as "information portion" for the purpose of simplifying the explanation.); LENGTH field which indicates the length of information portion; parity bit; Tail bit of encoder; and the like. Receivers decode the subsequent information

portions based on the result of decoding the RATE and LENGTH fields in the PLCP header.

The SIGNAL portion where the PLCP header is placed is subjected to encoding resistant to noise, and is transmitted at 6Mbps. In case of normal packets, the information portion is transmitted in a transmission rate mode in which the highest bit rate is provided to the extend that the occurrence of errors is minimized according to the SNR or the like of the receiver.

IEEE802.11a defines eight classes of transmission rate modes: 6, 9, 12, 18, 24, 36, and 54Mbps, and any of them is selected. If a transmitter/receiver is positioned nearby, a high-bit rate transmission rate mode is selected. A communication station positioned far away cannot decode this information sometimes.

The information portion is transferred as PSDU (Physical Layer Service Data Unit) to the data link layer as the higher level layer. FIG. 16 illustrates the constitution of the PSDU frame field. IEEE802.11 defines several frame types. Here, description will be given only to four types of frames, RTS, CTS, ACK, and DATA, required for describing the present invention.

For each frame, Frame Control field and Duration field are defined in common. The Frame Control field holds information indicating the type and use of the frame concerned, and more specifically, it describes the information listed in Table 1. The Duration field holds information on the use of NAV (Network Allocation Vector) (to be described later), and

describes the time that elapses before the transaction of the packet concerned is completed.

Table 1

Field Name	Length [Bit]	Description
Protocol Version	2	Version information
Type/Subtype	6	Identifier indicating the frame type
ToDS, FromDS	2	Identifier determining what each ADDR indicates
More Fragment	1	Flag indicating the last fragment
Retry	1	Flag indicating whether this is retransmission or not
Power Management	1	Flag indicating power management mode
More Data	1	Flag indicating whether more data has been accumulated or not
WEP	1	Flag indicating the utilization of WEP
Other	1	

In addition to the foregoing, the Data frame contains: four address fields Addr1 to Addr4 for identifying the communication stations as the origin of transmission and the destination and others; sequence field (SEQ); Frame Body which is the primary information to be provided to the upper level layer; and FCS (Frame Check Sequence) which is a checksum.

In addition to the foregoing, the RTS frame contains: Receiver Address (RA) which indicates the destination; Transmitter Address (TA) which indicates the origin of transmission; and FCS which is a checksum.

In addition to the foregoing, the CTS frame and ACK frame contain RA which indicates the destination and FCS which is a checksum.

Here description will be given to the method for coping with access contention defined in IEEE802.11.

IEEE802.11 defines four types of inter frame spaces (IFS): SIFS (Short IFS), PIFS (PCF IFS), DIFS (DCF IFS), and EIFS (extended IFS) in ascending order.

IEEE802.11 adopts CSMA as a basic media access procedure (described above). Before a transmitter transmits something, the state of the medium is monitored and further a backoff timer is actuated for a random time. The transmitter is provided with transmission right only when there is no a transmit signal during this period, and the transmitter can transmit packets on the medium.

When a normal packet is transmitted according to the CSMA procedure, the DCF (Distributed Coordination Function) operate as follows: after the transmission of a packet of some kind is completed, the state of the medium is monitored only for a DIFS. If there is no transmit signal during this period, random backoff is carried out. If there is no transmit signal during this period, either, then transmission right is provided.

When a packet, such as ACK, whose degree of urgency is exceptionally high is transmitted, it is permitted to transmit the packet after a short inter frame space SIFS. Thus, packets whose degree of urgency is high can be transmitted before packets transmitted according to the normal CSMA procedure.

To sum up, the reason why different types of inter frame spaces IFS are defined is as follows: packets competing for transmission right are given priorities according to whether their IFS is SIFS, PIFS, or DIFS, that is, according to the length of inter frame space.

Next, description will be given to the RTS/CTS procedure in IEEE802.11, referring to FIG. 17 to FIG. 19. With respect to wireless LAN networks in the ad-hoc environment, it is

generally known that a problem of hidden terminal occurs. CSMA/CA according to the RTS/CTS procedure is known as one of methodologies for alleviating most of this problem (described above). IEEE802.11 also adopts this methodology.

FIG. 17 schematically illustrates an example of the operation of the RTS/CTS procedure. This figure shows an example in which information (Data) of some kind is transmitted from STA0 to STA1.

Prior to the actual transmission of information, STA0 transmits an RTS (Request To Send) packet to STA1 as the destination of information according to the CSMA procedure. In response to the reception of the RTS packet, STA1 transmits a CTS (Clear To Send) packet to STA0, feeding back that STA1 has successfully received the RTS.

If the transmitting STA0 successfully receives the CTS packet, the medium is considered to be clear, and the transmission of information (Data) packets is immediately started. When STA1 has successfully received the information (Data) packets, STA1 returns an ACK packet. Thus, the transmission and reception transaction equivalent to one packet is completed.

FIG. 18 illustrates action which can take place in surrounding stations when the RTS/CTS procedure is carried out between a transmitter station and a receiver station. In this figure, the following communication environment is assumed: four communication stations, STA2, STA0, STA1, and STA3, exist, and communication stations adjoining to each other in the figure

are located within the range of radio waves. Here, it is assumed that STA0 desires to transmit information to STA1.

The transmitting STA0 confirms that the medium is clear for a certain period (from time T0 to time T1) according to the CSMA procedure. Then, STA0 starts the transmission of an RTS packet to STA1 at time T1. In the Type/Subtype field of the Frame Control field of the RTS packet, information which indicates the packet concerned is RTS is described; in the Duration field, the time that lapses before the transmission and reception transaction for the packet concerned is completed (i.e. the time until time T8) is described ; in the RA field, the address of the destination communication station (STA1) is described; and in the TA field, the address of the transmitter station (STA0) itself is described.

Here, attention should be paid to the following point: for STA0 to describe in the Duration field the time that lapses before the transaction according to the RTS/CTS procedure is completed, the time when the transaction is completed must be determined when RTS is transmitted. More specific description will be given. The transmitting STA0 must determine all the transmission rate mode, including CTS packet, Data packet, and ACK packet to be subsequently transmitted and received in the transaction in question, when it transmits RTS. The transmission rate mode determined here relates to the entire transaction, and it is not permitted to set an individual transmission rate mode with respect to each packet transmission within a transaction.

FIG. 19 illustrates the procedure according to which the transmitting STA0 determines a transmission rate mode with respect to the entire transaction concerned when it transmits RTS. When RTS is transmitted, it must be determined where the time at which the transaction is completed is (T8 in FIG. 4). Therefore, the transmission rate mode is determined only due to information held by the transmitter station when it transmits RTS (based on the amount of data communicated in the entire transaction, the transmission rate, and the like). The transmission rate of each of the CTS, DATA, and ACK frames thereafter transmitted and received is basically in accordance with the rate applied in the RTS. That is, it is not permitted to set an individual transmission rate mode with respect to each packet transmission within a transaction.

Here, description will be given, referring to FIG. 18 again. The RTS packet is received also by STA2 which is positioned in the vicinity of STA0. When STA2 receives the RTS signal, STA2 discovers the preamble and thus starts receive operation. Further, STA2 decodes PSDU based on the information obtained by decoding the PLCP header. Then, STA2 recognizes from the Frame Control field in the PSDU that the packet in question is RTS packet, and knows that STA0 desires to transmit information of some kind. Further, STA2 recognizes from the RA field that STA2 itself is not the destination communication station. Then, STA2 does not monitor the medium and recognizes that the medium is occupied until the transaction in question is completed, and stops its own transmission so as not to hinder

STA0's desire to send. To refer to this operation, it is said that a surrounding station "sets NAV (Network Allocation Vector)." The NAV is effective during the period indicated in the Duration field, and STA2 is kept in transmission prohibited state until time T8.

The RTS packet is received also by STA1 which is the intended destination. STA1 decodes the PSDU according to the same procedure as described above, and thereby recognizes that STA0 desires to transmit packets to STA1 itself. Then, STA1 waits for a SIFS (described above) and returns a CTS packet at time T3.

At this time, the transmission rate mode of the CTS packet must be identical with that of RTS. Further, in the Frame Control field of the PSDU, it is described that the packet concerned is CTS packet; in the Duration field, the time that elapses between the transaction concerned is completed (i.e. time until time T8) is described; and in the RA field, the address of the destination communication station (STA1) is described.

The CTS packet is received also by STA3 which is positioned in the vicinity of STA1 as the destination of transmission. STA1 decodes the PSDU according to the same procedure as described above, and recognizes that "some nearby communication station is expected to receive packets until time T8." STA3 sets an NAV and refrains from its own transmission until the transaction concerned is completed so as not to hinder STA1's desire to receive. The NAV is effective during the period indicated in the Duration field, and STA3 is also kept in

transmission prohibited state until time T8.

The CTS packet is received also by STA0 as the destination. STA0 decodes the PSDU according to the same procedure as described above, and recognizes that STA1 has got ready to receive. Then, STA0 waits for a SIFS, and starts the transmission of Data packet at time T5.

If the transmission of the Data packet is completed at time T6 and STA1 decodes them without any error, STA1 waits for a SIFS and returns ACK at time T7. When STA0 receives it, the transmission and reception transaction equivalent to one packet is completed at time T8.

At time T8, STA2 and STA3 which are nearby communication stations put down the NAV, and return to ordinary transmitting and receiving state.

In summary, in the above-mentioned RTS/CTS procedure, the following surrounding stations are prohibited from carrying out transmission: a "surrounding station for STA0 as the transmitter station," or STA2, which could receive RTS, and a "surrounding station for STA1 as the receiver station," or STA3, which could receive CTS. Thus, information transmission from STA0 to STA1 and a return of ACK are carried out without being hindered by a sudden transmit signal from surrounding stations. Therefore, the communication quality is maintained.

FIG. 20 illustrates an example of an operation sequence followed when the above-mentioned packet transmission and reception transaction based on the RTS/CTS procedure in IEEE802.11 is implemented with traffic through TCP/IP

(Transmission Control Protocol/Internet Protocol). The TCP/IP is a typical communication protocol for transmission control and path control.

Even if communication is of one way in terms of application, ACK is returned by the TCP layer typically every two segments, and it is brought into the form of asymmetrical two-way communication in the MAC layer. The ACK of the TCP layer is small in amount of data, and thus RTS/CTS is not used together. However, RTS/CTS is used together with respect to data traffic. The figure illustrates such an example.

In the example illustrated in FIG. 20, packets equivalent to 24 times in total are transmitted and received in the MAC layer to transmit five segments, Data0 to Data4. That is, while the operation in the TCP layer is relatively simple, complicated operation is performed in the MAC layer.

As described up to this point, problems of access contention and bandwidth assurance can be solved by implementing the transmitting and receiving procedures based on CSMA in combination with the RTS/CTS method in accordance with IEEE802.11. Meanwhile, several problems described below are left unsolved.

(1) Imperfection of Transmission Rate

When data is transmitted and received according to the RTS/CTS procedure, the transmission rate of data packets must be determined before an RTS packet is transmitted.

This is because, for a transmitter station to describe in the Duration field the time that lapses before a transaction

based on the RTS/CTS procedure is completed, the time at which the transaction is completed must be determined when it transmits an RTS. This means that all the transmission rate mode, including CTS packet, Data packet, and ACK packet subsequently transmitted and received in that transaction must be determined when RTS is transmitted. The transmission rate mode determined when RTS is transmitted relates to the entire transaction; it is not permitted to set an individual transmission rate mode with respect to each packet transmission within a transaction. Therefore, the transmission rate is imperfect.

Further, transmitter stations cannot grasp the state of reception in receiver stations in real time. Therefore, determining the transmission rate of the entire transaction when RTS is transmitted results in a lower probability that data packets are transmitted at the optimal transmission rate corresponding to the state of reception in the receiver station.

An example will be taken. Patent Document 1 discloses a method for packet transfer communication. The method is such that, when the receiving end receives an RTS packet, it measures the environment and state of communication at that point of time; then, the receiving end adds the result of the measurement to the CTS packet and returns it to the transmitting end; thereby the transmitting end optimizes the communication rate and the like. However, this case is also nothing but another case where the transmitting end determines the transmission rate of the entire transaction before it transmits an RTS packet.

Therefore, the imperfection of transmission rate is not eliminated.

The RTS transmitter station is required to: determine the transmission rate of the entire transaction including CTS packet, Data packet, and ACK packet transmitted and received as the outcome of RTS transmission; determine a value to be written as the transaction finish time, that is, Duration based on a value obtained by dividing the amount of transmitted data by the transmission rate; and describe the determined value in RTS. Patent Document 1 describes that the CTS transmitter station determines a transmission rate through the reception of RTS; however it does not refer to how to obtain the value in the Duration field described in RTS by the RTS transmitter station prior thereto.

If the CTS transmitting station sets a high transmission rate, the transaction is completed ahead of the Duration determined when RTS is transmitted. As a result, the surrounding stations which heard the RTS still keep a NAV set and refrain from their own transmission after the transaction is completed, and this is a waste of bandwidth. If the CTS transmitting station sets a low transmission rate, the transaction is not completed even after the Duration determined when RTS is transmitted has passed. Nevertheless, surrounding stations which heard RTS put down the NAV and start transmit operation, and this induces collision.

(2) Difficulty of Data Unit Multiplexing with RTS/CTS Used Together

In the conventionally known RTS/CTS procedure, the data transmitting end determines a data rate before it transmits an RTS. It does not give consideration to the following: the data receiving end determines a data rate and further transmits a plurality of data units as one data packet. To enhance the efficiency of the MAC layer (Refer to FIG. 20.), it is preferably that the receiving end should be capable of determining a data rate and transmitting a plurality of data units as one data packet. However, the conventional RTS/CTS format cannot implement this.

(3) Concomitant Use of Delay Acknowledgement and RTS/CTS Procedure

The IEEE802.11 standard is premised on the immediate ACK wherein an acknowledgement (ACK) is returned as soon as data is received. To reduce the overhead of ACK packets, delay ACK can be used.

However, some problems arise. For example, if delay ACK is used together with the RTS/CTS procedure, there is a possibility that an RTS is transmitted for the purpose of retransmission before an ACK cannot be returned to the transmitting end. Thus, with the existing format, the concomitant use of delay acknowledgement and the RTS/CTS procedure has its limit in the enhancement of efficiency.

(4) Methodology For Selective Acknowledgement

It is known that carrying out selective acknowledgement enhances the efficiency of the MAC layer. The IEEE802.11 standard does not give consideration to selective

acknowledgement itself. The selective acknowledgement referred to here is a retransmission control method. In this method, ACK or NACK information is fed back to the transmitting end with respect to an arbitrary packet which was or was not successfully received. Thereby, retransmission is carried out only with respect to packets which the receiving end could not receive.

Implementation of selective acknowledgement requires massive memory and its processing places a significant burden; therefore, it has not be actually applied so much. However, necessity for selective acknowledgement will be more and more increased in the future. With this being the situation, the following case is expected: communication stations in the initial stage do not have selective acknowledgement implemented but communication stations developed later have selective acknowledgement implemented. In this case, it is unfavorable that both cannot communicate with each other, and a format wherein downward compatibility is maintained is desired.

Further, up to now consideration has not given to concomitant use of selective acknowledgement, a technique for the receiving end to determine a data rate, and the RTS/CTS procedure. Therefore, this cannot be implemented by the existing format.

(5) Influence of Overhead Produced in MAC Layer

The IEEE802.11 standards independently defines RTS frame, CTS frame, ACK frame, and the like. (Refer to FIG. 16.) For this reason, if individual information is to be transmitted,

they must be respectively transmitted by separate frames. However, each time a frame is transmitted, overheads, such as preamble, are produced. In particular, if the transmission rate is high, the amount of overheads becomes too large to neglect.

Needless to add, increase in overheads in the MAC layer is undesirable because it contributes in such a direction as to limit the bandwidth which can be provided for the upper level layers, such as TCP/IP.

[Patent Document 1] Japanese Unexamined Patent Publication No. 2000-151639

[Non-Patent Document 1] International Standard ISO/IEC 8802-11: 1999(E) ANSI/IEEE Std 802.11, 1999 Edition, Part11: Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) Specifications

[Non-Patent Document 2] ETSI Standard ETSI TS 101 761-1 V1.3.1 Broadband Radio Access Networks (BRAN); HIPERLAN Type 2; Data Link Control (DLC) Layer; Part1: Basic Data Transport Functions

[Non-Patent Document 3] ETSI TS 101 761-2 V1.3.1 Broadband Radio Access Networks (BRAN); HIPERLAN Type 2; Data Link Control (DLC) Layer; Part2: Radio Link Control (RLC) sublayer

[Non-Patent Document 4] C. K. Tho, "Ad Hoc Mobile Wireless Network" (Prentice Hall PTR)

Disclosure of Invention

An object of the present invention is to provide an excellent wireless communication system, wireless communication device and wireless communication method, and computer program wherein the RTS/CTS method is used together and yet access control based on CSMA can be favorably carried out.

Another object of the present invention to provide an excellent wireless communication system, wireless communication device and wireless communication method, and computer program wherein a plurality of types of frames, such as RTS, CTS, DATA, and ACK, are multiplexed and thereby flexile transmitting and receiving procedures can be provided and overheads can be reduced.

The present invention has been made with the above problems taken into account. A first aspect of the present invention is a wireless communication system wherein random access is carried out using together the RTS/CTS method in which a communication station as the origin of data transmission transmits a request to send packet RTS, and starts data transmission in response to the reception of a response packet CTS from a communication station as the destination of data transmission.

The RTS receiving communication station measures the quality of a receive signal, determines a data rate based on the result of the measurement, describes the data rate in CTS, and transmits the CTS.

The CTS receiving communication station carries out data transmission as the outcome of the reception of the CTS information based on the data rate described in the CTS.

The "system" described here refers to what is obtained by logically aggregating a plurality of devices (or functional modules which implement specific functions). It does not matter whether the devices or functional modules are placed in a single enclosure or not.

The RTS transmitting communication station describes in RTS the time that lapses before the reception of a packet, including CTS information, transmitted as the outcome of the reception of RTS information is completed, as medium reservation time information Duration. The CTS transmitting communication station describes in CTS the time that lapses before the reception of a data packet transmitted as the outcome of the reception of CTS information is completed, as medium reservation time information Duration. Other communication stations that receive RTS or CTS set a NAV (Network Allocation Vector), and keep it in effect for the medium reservation time information Duration and bring themselves in transmission prohibited state.

In a wireless communication system according to the first aspect of the present invention, a transmission rate can be selected based on the quality of receive signal. Therefore, the imperfection of transmission rate can be wiped off.

Here, the following constitution may be adopted: the RTS sending communication station describes in RTS factor

information referred to by the RTS receiving communication station when it determines a data rate. The RTS receiving communication station determines a data rate with consideration given to the factor information described in the RTS, in addition to the result of measurement of the quality of receive signal.

As the factor information described here, information related to whether a high data rate should be aggressively determined or a low data rate should be passively determined is described. Further, the following constitution may be adopted: the RTS transmitting communication station measures the transmission error rate for the RTS receiving communication station. Then, based on the result of the measurement, factor information (Rate Strategy) is determined. Or, factor information may be determined based on the difference in transmission power between RTS packet and data packet, the causal relationship between data rate and transmission power, or the like.

In these cases, a data rate is determined according to the quality of RTS receive signal at the receiving end. A transmission rate is determined with consideration additionally given to information, such as error rate monitored by the transmitting end. Therefore, the correspondence between reception quality and error rate arising from fluctuation in channel state or fluctuation in the amount of interference can be corrected in two steps.

Further, the following constitution may be adopted: the

RTS transmitting communication station describes in RTS information related to one or more data units the station tries to transmit. The RTS receiving communication station determines medium reservation time information Duration in which the reception of all the data packets is completed. The medium reservation time information Duration is determined based on the information related to the data units, described in the RTS and the determined data rate. Then, the station describes it in CTS. In this case the data transmitting communication station which receives the CTS carries out data transmission as the outcome of the reception of CTS information. The data transmission is carried out based on the data rate described in the CTS so that the data transmission will be completed in a time specified by the medium reservation time information.

Examples of the information related to data units, referred to here, include: the data length of each data unit for which transmission is tried; the sum of data lengths of one or more data units for which transmission is tried; the length of time required for transmitting one or more data units for which transmission is tried; information on the number of data units for which transmission is tried (in this case, however, data units are of fixed length); and the like.

In these cases, the RTS/CTS procedure can be used together and further data units can be effectively multiplexed. Further, the RTS/CTS procedure and delay ACK can be implemented. As a result, the amount of overheads produced in the MAC layer can

be reduced.

In this case, when the RTS receiving communication station determines medium reservation time information after the reception of RTS, the station takes into account the time at which the station itself completes data reception. Or, when the RTS receiving communication station determines medium reservation time information after the reception of RTS, it gives consideration so that the period information described in the RTS is not exceeded.

For example, the following constitution may be adopted: the RTS transmitting communication station assigns sequence numbers to transmit data units, and describes in RTS the first sequence number of data the station tries to transmit. Thereby, the station notifies of information related to the data units it tries to transmit. Meanwhile, the RTS receiving communication station refers to the first sequence number of data unit, described in the RTS, and extracts and excludes data units the station has already received from data units for which transmission is tried. Then, the station determines medium reservation time information.

Further, if selective acknowledgement is applied, the following constitution may be adopted: the RTS transmitting communication station describes reception acknowledgement information in RTS. The reception acknowledgement information includes the first sequence number of data units for which data transmission is tried and bit map information obtained by mapping the reception confirmation information on the

subsequent data units into bits corresponding to the relative positions to the first sequence number. Further, the station generates information related to the data units with only data units for which reception confirmation has not been obtained taken as objects to be transmitted. Meanwhile, the RTS receiving communication station refers to the bit map information described in the RTS. The station extracts data units the station has already received from data units for which transmission is tried, and excludes them from the objects to be transmitted. Then, the station determines medium reservation time information.

Further, the following constitution may be adopted: if data units the RTS receiving communication station has already received are included in data units as objects to be transmitted, described in RTS, the station describes ACK information in CTS. In this case, the CTS receiving communication station excludes data units the RTS receiving communication station has already received from objects to be transmitted based on the ACK information added to the CTS. Then, the station carries out data transmission based on the data rate described in the CTS.

Further, the following constitution may be adopted: the RTS receiving communication station stores one or more pieces of data length information of data units taken as objects to be transmitted, of data for which transmission is tried as the outcome of the RTS. Then, the station describes in CTS the sequence number of the last data unit stored. In this case, the CTS receiving communication station stores the sequence

number of the last data unit described in the CTS. When an RTS is transmitted next time, the station generates information related to data units for which transmission is tried in such form that the data unit indicated by the sequence number of the last data unit is not included in objects to be transmitted.

A second aspect of the present invention is a wireless communication system wherein a plurality of data units are transmitted and received. Sequence numbers are assigned to transmit data units to identify the data units. At the same time, if selective acknowledgement is applied, the following is caused to take place:

The receiving communication station describes the following in reception acknowledgement information ACK: the sequence numbers of data units completely received in the order of sequence number and the bit map information represented by mapping the state of reception of data of the subsequent sequence numbers into relative bit positions from the sequence numbers. The station transmits the reception acknowledgement information ACK.

The transmitting and receiving communication stations add information indicating a causal data flow to transmit data and acknowledgement.

In a wireless communication system according to the second aspect of the present invention, information required for selective acknowledgement is managed on a data flow-by-data flow basis. Such information includes the sequence numbers of completely received data units, bit map information wherein

the state of reception of the subsequent data units are described, and the like. Thus, a plurality of service classes can be handled by different sequence numbers. Therefore, communication can be maintained regardless of whether selective acknowledgement is implemented or not.

Some receiver stations do not support selective acknowledgement. Such receiver stations transmit the bit map information with zero set for all the bits of the bit map field. Thus, the receiver stations can ensure communication with transmitter stations which support the selective acknowledgement function.

Further, some transmitter stations do not support selective acknowledgement. Such transmitter stations disregards the bit map information transmitted from the receiving end, and transmits the bit map information to be transmitted with zero set for all the bits of the bit map field. Thus, the transmitter stations can ensure communication with receiver stations which support the selective acknowledgement function.

Further, with respect to at least one data flow, the ARQ system wherein sequence numbers are not assigned is adopted. When Link session is established, data is transmitted and received through the data flow, and thereby the sequence numbers of the transmitter station and the receiver station are synchronized with each other.

A third aspect of the present invention is a wireless communication system wherein random access is carried out using

the RTS/CTS method together. The RTS/CTS method is such that: the communication station as the origin of data transmission transmits a request to send packet RTS. In response to the reception of a response packet CTS from the communication station as the destination of data transmission, the communication station as the origin of data transmission starts data transmission.

The transmission and reception of packets wherein any two or more of request to send RTS, confirmative advice CTS, data, and acknowledgement ACK are multiplexed are permitted.

The amount of overheads produced in the MAC layer can be significantly reduced by including pieces of information, such as RTS, CTS, DATA, and ACK, having different purposes in one packet.

In this case, the communication station which receives a packet containing RTS information transmits a packet containing CTS information according to the contents of the RTS. The communication station which receives a packet containing CTS information transmits a packet containing data according to the contents of the CTS.

Here, the following constitution may be adopted: the RTS transmitting communication station can specify whether the receiving communication station may add RTS information to CTS or not. In this case, in RTS, first information which indicates whether RTS information may be added to CTS transmitted as the outcome of the RTS or not is described. Then, the RTS receiving communication station judges whether it may add RTS information

to CTS based on the first information in the RTS. If there is data the station desires to transmit to the RTS transmitting communication station, it adds RTS information for the purpose of transmitting the data to CTS, and transmits the CTS.

In this case, the RTS transmitting communication station determines the first information, for example, based on information elements contained in the packets received in the past from the station to which the RTS is directed. The information element described here refers to More bit which indicates the presence of subsequent transmit data in the packet, and the like. Alternatively, it may be judged from other means than information elements that subsequent transmit data is present in the station to which the RTS is directed to determine the first information. Examples include the following case: a station receives an RTS from a station to which RTS is directed. However, the receiving station itself received a packet from another surrounding station and thus has set a NAV. Therefore, the station cannot return a CTS, and the data transmission sequence is stopped. There are also cases where it can be judged based on any other communication history that subsequent transmit data is present in the station to which RTS is directed.

Further, the following constitution may be adopted: the RTS receiving communication station recognizes from the information in the RTS that the RTS transmitting communication station is trying to transmit data the receiving communication station itself has already received. In this case, the RTS receiving communication station adds ACK information to CTS to

notify of the state of data reception.

Further, the following constitution may be adopted: in the data transmitting and receiving procedure, the data transmitting communication station specifies whether the data receiving communication station should return an ACK. The ACK includes immediate ACK and delay ACK. In this case, the following constitution may be adopted: the data receiving communication station receives data requesting ACK, from the data transmitting communication station. If the data receiving communication station judges that it has not transmitted an ACK of the data, it adds ACK information when it transmits a packet of some kind to the data transmitting communication station. In some cases, ACK information may be added at the transmitter station's request. At this time, if the transmitter station judges that it has not received ACK information related to previously transmitted data, it sends a request to add ACK information. However, with respect to packets in which RTS information is solely transmitted, ACK information need not be added by way of exception.

Further, data requesting an ACK may be transmitted as a packet directed to two or more communication stations.

Further, the following constitution may be adopted: the RTS transmitting communication station requests the RTS receiving communication station to return an ACK of data which has been transmitted so far. In this case, the RTS transmitting communication station multiplexes an ACK request for requesting a return of ACK into an RTS for starting the next data

transmission transaction, and transmits it.

Even if the RTS transmitting communication station requests an ACK, the ACK is not returned sometimes. Possible causes include that transmit data was not properly received, that data was property received but the reception of ACK failed, and the like. In these cases, the RTS transmitting communication station must verify whether to retransmit data. In these cases, the RTS transmitting communication station may multiplex an ACK request requesting a return of ACK into an RTS for starting data retransmission transaction, and transmit it.

The communication station which received an RTS with an ACK request multiplexed returns an ACK which indicates whether it has properly completed the reception of data transmitted from the RTS transmitting communication station. If the station has failed to receive data transmitted from the RTS transmitting communication station, it may multiplex an ACK indicating that it failed to properly receive the data. Then, it may return a CTS requesting to retransmit the data.

A fourth aspect of the present invention is a wireless communication system wherein the data transmitting communication station acquires transmission right on the medium and carries out data communication between it and the data receiving communication station.

After data transmission from the data transmitting communication station is stopped, the presence or absence of subsequent data at the data transmitting communication station is detected. If the subsequent data is present, it is made

easier for the data transmitting communication station to acquire transmission right for transmitting the subsequent data.

The state in which, though the subsequent data is present at the data transmitting communication station, data transmission is stopped corresponds to the following cases, for example: cases where an RTS from the data transmitting communication station reaches the data receiving communication station and the data receiving communication station returns a CTS, but the data transmitting communication station does not start data transmission; and cases where transmit data does not reach the data receiving communication station.

The data receiving communication station can detect the presence/absence of the subsequent data at the data transmitting communication station based on the communication history of transactions based on RTS/CTS. Or, the data transmitting communication station can include in a packet a specific information element indicating the presence/absence of the subsequent data and transmit the packet. In this case, the data receiving communication station checks the information element, and can thereby detect the presence/absence of the subsequent data at the data transmitting communication station.

According to CSMA, it is confirmed only for a predetermined period that the medium is clear, and then the operation waits only for an arbitrary backoff time before transmission right is acquired. In the communication environment wherein medium access control is carried out based

on CSMA, the data receiving communication station tries to acquire transmission right on the medium, and transmits a signal onto the medium for eliminating other communication stations' transmission right. Thereby, it can be made easier for the data transmitting communication station to acquire transmission right for transmitting the subsequent data.

In medium access control with the RTS/CTS method used together, the communication station as the origin of data transmission transmits a request to send packet RTS. In response to the reception of a response packet CTS from the communication station as the destination of data transmission, it starts data transmission. In case this medium access control is carried out, the data receiving communication station transmits a dummy RTS onto the medium for eliminating other communication stations' transmission right. Thereby, it can be made easier for the data transmitting communication station to transmit an RTS for transmitting the subsequent data. For example, when the data transmitting communication station receives a dummy RTS, it can transmit an RTS with a shorter frame space for transmitting the subsequent data.

A fifth aspect of the present invention is a computer program written in a computer-readable format for performing on a computer system processing for controlling communicating operation in the communication environment wherein random access is carried out with the RTS/CTS method used together. In the RTS/CTS method, the communication station as the origin of data transmission transmits a request to send packet RTS;

in response to the reception of a response packet CTS from the communication station as the destination of data transmission, it starts data transmission. The program comprises:

a communication quality measuring step in which, when an RTS is received, the quality of receive signal is measured;

a data rate determining step in which a data rate is determined based on the measured quality of receive signal;

a CTS transmitting step in which the data rate is described in CTS as the outcome of the received RTS, and the CTS is transmitted; and

a data transmitting step in which, when CTS information is received, data transmission as the outcome of the CTS information is carried out based on the data rate described in the CTS.

A sixth aspect of the present invention is a computer program written in a computer-readable format for carrying out on a computer system control of communicating operation for transmitting and receiving a plurality of data units. Sequence numbers are assigned to transmit data units to identify the data units. If selective acknowledgement is applied, the following steps are provided:

a step in which, in response to data reception, the sequence numbers of completely received data units in the order of sequence number, and bit map information represented by mapping the state of reception of data of the subsequent sequence numbers into relative bit positions from the sequence numbers, are described in reception acknowledgement

information ACK and are transmitted; and

a step in which information indicating a causal data flow is added, and transmit data and an acknowledgement are transmitted.

A seventh aspect of the present invention is a computer program written in a computer-readable format for performing on a computer system processing for controlling communicating operation in the communication environment wherein random access is carried out with the RTS/CTS method used together. In the RTS/CTS method, the communication station as the origin of data transmission transmits a request to send packet RTS; in response to the reception of a response packet CTS from the communication station as the destination of data transmission, it starts data transmission. The program comprises:

an information generating step in which varied information, including request to send RTS, confirmative advice CTS, data, and acknowledgement ACK, is generated; and

a packet transfer communication step in which a packet wherein any two or more pieces of information of request to send RTS, confirmative advice CTS, data, and acknowledgement ACK are multiplexed is transmitted and received.

An eighth aspect of the present invention is a computer program written in a computer-readable format for performing on a computer system processing for controlling the communicating operation in the following communication environment: in the communication environment, the communication station acquires transmission right on the

medium before it carries out data communication. The program comprises:

a step in which the presence/absence of transmit data from other communication stations is detected; and

a medium access control step in which, in response to the detection of the presence of transmit data from other communication stations, a signal for eliminating the other communication stations' transmission right is transmitted onto the medium so as to make easier for the relevant communication station to acquire transmission right for transmitting data.

The computer programs according to the fifth to eighth aspects of the present invention are computer programs written in a computer-readable format for performing predetermined processing on a computer system by definition. In other words, when installed on a computer system, the computer programs according to the fifth to eighth aspects of the present invention deliver synergistic action on the computer system and operate as wireless communication devices. When a plurality of such wireless communication devices are started to build a wireless network, the same action and effect as with the wireless communication systems according to the first to fourth aspects of the present invention can be obtained.

According to the present invention, an excellent wireless communication system, wireless communication device and wireless communication method, and computer program wherein the RTS/CTS method is used together and further access control can be favorably carried out based on CSMA can be provided.

Further, according to the present invention, an excellent wireless communication system, wireless communication device and wireless communication method, and computer program wherein a plurality of types of frames, such as RTS, CTS, DATA, and ACK, are multiplexed, and thereby flexible transmitting and receiving procedures can be provided and overheads can be reduced can be provided.

According to the present invention, a transmission rate can be selected based on the quality of receive signals. Therefore, the imperfection of transmission rate can be eliminated. In addition, when a transmission rate is determined, information, such as the error rate monitored by the transmitting end, is also taken into account. Therefore, the correspondence between reception quality and error rate arising from fluctuation in channel state or fluctuation in the amount of interference can be corrected in two steps.

Further, according to the present invention, data units can be effectively multiplexed while the RTS/CTS procedure is used together. Further, the RTS/CTS procedure and delay ACK can be implemented. As a result, the amount of overheads produced in the MAC layer can be reduced.

Further, according to the present invention, communication can be maintained regardless of whether selective acknowledgement is implemented or not.

Further, according to the present invention, the amount of overheads produced in the MAC layer can be significantly reduced by including pieces of information, such as RTS, CTS,

DATA, and ACK, having different purposes in one packet.

Other objects, features, and advantages of the present invention will be apparent from the embodiments of the present invention described later and the more detailed description taken in connection with the accompanying drawings.

Brief Description of Drawings

FIG. 1 is a drawing illustrating an example of the disposition of communication devices constituting a wireless communication system in an embodiment of the present invention.

FIG. 2 is a drawing schematically illustrating the functional constitution of a wireless communication device which operates as a communication station in a wireless network in an embodiment of the present invention.

FIG. 3 is a drawing illustrating an example of a frame format used in a wireless communication system according to the present invention.

FIG. 4 is a drawing illustrating an example of the constitution of PSDU.

FIG. 5 is a drawing illustrating several examples of PSDUs which can be defined.

FIG. 6 is a drawing explaining the process for determining a transmission rate in a wireless communication system according to the present invention.

FIG. 7 is a drawing illustrating an example of the operation sequence of the RTS/CTS procedure according to the present invention.

FIG. 8 is a drawing illustrating an example of the application of transmitting and receiving procedures according to the present invention.

FIG. 9 is a drawing illustrating another example of the application of transmitting and receiving procedures according to the present invention.

FIG. 10 is a drawing illustrating a further example of the application of transmitting and receiving procedures according to the present invention.

FIG. 11 is a drawing illustrating the acknowledgement procedure related to data other than data flow 0 assumed in the present invention.

FIG. 12 is a drawing illustrating a concrete example of the interaction of individual fields which occurs when selective acknowledgement is carried out with RTS/CTS used together.

FIG. 13 is a drawing illustrating an example of data transmitting and receiving procedures taken when delay ACK and the RTS/CTS procedure are applied.

FIG. 14 is a drawing illustrating an example of the sequence in which traffic is transmitted and received through TCP/IP in accordance with the MAC procedure according to the present invention.

FIG. 15 is a drawing illustrating the frame format according to IEEE802.11a.

FIG. 16 is a drawing illustrating the constitution of frame fields in PSDU.

FIG. 17 is a drawing schematically illustrating an example of the operation of the RTS/CTS procedure.

FIG. 18 is a drawing explaining the action which can occur at surrounding stations when the RTS/CTS procedure is carried out between the transmitter station and the receiver station.

FIG. 19 is a drawing explaining the procedure for determining the transmission rate mode of the entire transaction when STA0 as the origin of transmission transmits an RTS.

FIG. 20 is a drawing illustrating an example of the operation sequence in which packet transmission and reception transaction based on the RTS/CTS procedure according to IEEE802.11 is implemented with traffic through TCP/IP.

FIG. 21 is a drawing explaining an example of the application of transmitting and receiving procedures according to the present invention.

FIG. 22 is a drawing explaining another example of the application of transmitting and receiving procedures according to the present invention.

FIG. 23 is a drawing explaining a further example of transmitting and receiving procedures according to the present invention.

FIG. 24 is a drawing explaining the mechanism for controlling the judgment of whether "information indicating that an RTS may be multiplexed into a CTS" should be set or not.

FIG. 25 is another drawing explaining the mechanism for controlling the judgment of whether "information indicating

that an RTS may be multiplexed into a CTS" should be set or not.

FIG. 26 is a further drawing explaining the mechanism for controlling the judgment of whether "information indicating that an RTS may be multiplexed into a CTS" should be set or not.

Best Mode for Carrying Out the Invention

Referring to the drawings, the embodiments of the present invention will be described in detail below.

A. System Configuration

The propagation path for communication the present invention assumes is wireless, and a network is built among a plurality of communication stations. The communication the present invention assumes is store and forward traffic, in which information is transferred on a packet-by-packet basis. With respect to each communication station, the following description assumes single-channel station; however, the present invention can be expanded to cases where a transmission medium comprising a plurality of frequency channels, that is, multiple channels is used.

In a wireless network according to the present invention, each communication station can directly (randomly) transmit information in accordance with an access procedure based on CSMA (Carrier Sense Multiple Access). Thus, the communication stations can build an autonomous and decentralized wireless network.

The autonomous and decentralized wireless communication system does not have the relation of control station and

controlled station. In such a wireless communication system, for example, each communication station sends beacon information. The station thereby informs other communication station located nearby (i.e. within the range of communication) of the presence of itself, and informs them of the constitution of the network. A communication station which newly emerges in some communication station's range of communication receives a beacon signal, and thereby detects that it has entered the range of communication. Further, the station decodes the information described in the beacon, and can thereby recognize the network and participate in the network.

In the wireless network according to the present invention, communication stations exchange beacon signals, and modestly and temporally synchronize with each other. Thus, transmission control is carried out wherein channel resources are effectively utilized by transmission (MAC) frames having the time division multiple access structure. Therefore, each communication station can implement an access method based on temporal synchronization, such as reserving a bandwidth and setting a preferential period of use.

The processing at each communication station, described below, is basically carried out at every communication station that participates in the network. In some cases, however, the processing described below is not necessarily performed by all the communication stations constituting the network.

FIG. 1 illustrates an example of the disposition of communication devices which constitute the wireless

communication system in an embodiment of the present invention. This wireless communication system does not have the relation of control station and controlled station. In this communication system, each communication device autonomously and decentralizedly operates, and an ad-hoc network is formed. The figure shows how the communication device #0 to the communication device #6 are distributed in the same space.

In the figure, each communication device's range of communication is indicated by broken line. Each communication device can communicate with other communication devices located within its range, and the range of communication is defined as a range in which a signal transmitted by each station interferes with other communication devices. More specific description will be given. The communication device #0 is located in a range in which it can communicate with the communication devices #1 and #4 located nearby; the communication device #1 is located in a range in which it can communicate with the communication devices #0, #2, and #4 located nearby; the communication device #2 is located in a range in which it can communicate with the communication devices #1, #3, and #6 located nearby; the communication device #3 is located in a range in which it can communicate with the communication device #2 located nearby; the communication device #4 is located in a range in which it can communicate with the communication devices #0, #1, and #5 located nearby; the communication device #5 is located in a range in which it can communicate with the communication device #4 located nearby; and the communication device #6 is located

in a range in which it can communicate with the communication device #2 located nearby.

When communication is carried out between certain communication devices, a "hidden terminal" exists. Hidden terminal is defined as a communication device which can be heard by either of the communication devices communicating with each other but cannot by the other.

The scope of the present invention is not limited to the above ad-hoc environment. It can be widely applied to other modes of communication wherein each communication station can directly and asynchronously transmit information in accordance with the access procedure based on CSMA with the RTS/CTS procedure used together.

FIG. 2 schematically illustrates the functional constitution of a wireless communication device which operates as a communication station in a wireless network in an embodiment of the present invention. The wireless communication device in the figure can carry out access control based on CSMA using the RTS/CTS procedure together and form a network in the autonomous and decentralized communication environment in which a control station is not provided.

As illustrated in the figure, the wireless communication device 100 comprises an interface 101, a data buffer 102, a central control unit 103, a beacon generating unit 104, a radio transmitter unit 106, a timing control unit 107, an antenna 109, a radio receiver unit 110, a beacon analyzing unit 112, and an information storing unit 113.

The interface 101 exchanges varied information between it and external equipment (e.g. personal computer (not shown)) connected to this wireless communication device 100.

The data buffer 102 is used to temporarily store data transmitted from connected equipment through the interface 101 or data received through a wireless transmission channel before the data is sent out through the interface 101.

The central control unit 103 manages a series of information transmission and reception processing in the wireless communication device 100 and controls accesses to the transmission channel in a centralized manner. In the central control unit 103, for example, access control is carried out based on CSMA with the RTS/CTS procedure used together. In this embodiment, transmitting and receiving procedures wherein a plurality of types of frames, such as RTS, CTS, DATA, and ACK, are multiplexed are implemented. These procedures will be described in detail below.

The beacon generating unit 104 generates beacon signals periodically exchanged between the wireless communication device 100 and nearby wireless communication devices.

The radio transmitter unit 106 includes: a modulator which modulates transmit signals by a predetermined modulation method; a D-A converter which converts digital transmit signals into analog signals; an up converter which up converts analog transmit signals by frequency conversion; a power amplifier (PA) which amplifies the power of up converted transmit signals; and the like. (None of these items is shown in the figure.).

The radio transmitter unit 106 wirelessly transmits data temporarily stored in the data buffer 102 and beacon signals at a predetermined transmission rate.

The radio receiver unit 110 comprises: a low noise amplifier (LNA) which voltage amplifies signals received from other stations through the antenna 109; a down converter which down converts voltage amplified receive signals by frequency conversion; an automatic gain controller (AGC); an A-D converter which converts analog receive signals into digital signals; a synchronization circuit for obtaining synchronism, a channel estimation circuit, and a demodulator which carries out demodulation by a predetermined demodulation method; and the like. (None of these items is shown in the figure.) The radio receiver unit 110 receives signals, such as information and beacons, transmitted from other wireless communication devices during predetermined periods.

As radio transmission and reception methods for the radio transmitter unit 106 and the radio receiver unit 110, for example, various transmission methods which are applicable to wireless LANs and suitable for relatively short distance communication can be applied. Specifically, the UWB (Ultra Wide Band) method, OFDM (Orthogonal Frequency Division Multiplexing) method, CDMA (Code Division Multiple Access) method, and the like can be adopted.

The antenna 109 wirelessly transmits signals directed to other wireless communication devices on a predetermined frequency channel. Or, the antenna 109 gathers signals sent

from other wireless communication devices. In this embodiment, the wireless communication device 100 is provided with a single antenna and is incapable of carrying out transmission and reception in parallel.

The timing control unit 107 controls timing with which radio signals are transmitted and received. For example, it controls the following timing: transmission timing and reception timing for various packets of RTS, CTS, DATA, ACK, and the like and packets in which these are multiplexed; timing with which the wireless communication device 100 transmits beacons; timing with which beacons are received from other stations; and the like.

The beacon analyzing unit 112 analyzes beacon signals which could be received from neighbor stations, and analyzes the presence of nearby wireless communication devices and the like. For example, such information as reception timing for beacons of neighbor stations and nearby beacon reception timing, is stored as nearby device information in the information storing unit 113.

The information storing unit 113 stores the following: execution procedure instructions (programs wherein the collision avoidance procedure and the like are described) for a series of access control operation and the like, performed in the central control unit 103; nearby device information obtained from the result of analyses of received beacons; and the like.

B. Frame Format (Packet Format)

FIG. 3 illustrates an example of the constitution of frame format used in a wireless communication system according to the present invention. However, in this figure, the preamble, PLCP header, and the like illustrated in FIG. 15 are omitted, and only the portion represented as PSDU (PHY Service Data Unit) is selected and shown.

As illustrated in the figure, the PSDU comprises MAC header portion and MSDU (MAC Service Data Unit: one data unit passed from the upper level layer) portion. In this embodiment, a plurality of MSDUs can be placed in one PSDU. The MAC header portion comprises common MAC header portion, sub MAC header portion, and HCS (Header Check Sequence) portion. As sub MAC header, a plurality of sub MAC headers can be placed.

FIG. 4 illustrates an example of the constitution of PSDU in this embodiment. These frame examples correspond to conventional RTS frame, CTS frame, ACK frame, and data frame, respectively. (Refer to FIG. 16.)

The header length (HLen), destination address (RA), transmission origin address (TA), and Duration defined in each frame in common correspond to the common MAC header portion. Table 2 indicates the fields in the common MAC header portion in detail.

Table 2

Field Name	Length [Bit]	Description
H LENGTH	1	MAC header length. Up to 255 bytes. Refer to this value to determine to what extent the CRC computation for HCS should be carried out.
RA	8	The destination address of the relevant packet. If this is not matched with the relevant packet's ID or broadcast ID, decoding is immediately stopped.
TA	8	The transmission origin address of the relevant packet.
Duration	2	Field indicating for what period of time in [μsec] reception is expected to last after the completion of transmission of the relevant PHY burst. This is used for the receiver station to indicate a period for which it can transmit and for surrounding other stations to set a NAV.

The sub MAC header portion is defined in different formats depending on the purpose of each frame. For example, in a packet corresponding to RTS frame, RTS SMH (Sub MAC Header) is placed as sub MAC header; in a packet corresponding to CTS frame, CTS SMH is placed as sub MAC header; in a packet corresponding to ACK frame, ACK SMH is placed as sub MAC header; and in a packet corresponding to data frame, DATA SMH is placed as sub MAC header.

With respect to the RTS, CTS, and ACK frames, PSDU is constituted only of the MAC header portion, and the MSDU does not exist. To the data frame, data specified by the DATA SMH is added as frame body.

FIG. 5 illustrates several examples of PSDUs which can be defined in the present invention. In the uppermost tier in FIG. 5, a packet in which two MSDUs are multiplexed is shown. In the second tier, a packet in which one MSDU and RTS information are multiplexed is shown. In the third tier, a packet in which CTS information and ACK information are multiplexed is shown.

In the lowermost tier, a packet in which one MSDU, RTS information, CTS information, and ACK information are multiplexed is shown.

If an RTS is to be transmitted, an RTS SMH is added as SMH; if a CTS is to be transmitted, a CTS SMH is added as SMH; if an ACK is transmitted, an ACK SMH is added as SMH; and if data units are to be transmitted, DATA SMHs are added by a number equivalent to the number of data units to be transmitted. Thus, pieces of information, such as RTS, CTS, DATA, and ACK, having different purposes can be multiplexed into one packet.

Next, the details of the components of each SMH will be described referring to Table 3 to Table 6. The leading field of each SMH is Type field, in which an identifier indicating what information is contained in the relevant SMH is described. The length of SMH differs depending on the type of SMH. Since the SMH has an intrinsic length with respect to each Type, however, the receiving end can learn the length of the relevant SMH by referring to the Type field.

Fields in DATA SMH:

Table 3 illustrates the details of the fields in DATA SMH used when general-purpose data, other than RTS, CTS, and ACK, is transmitted. As illustrated below, the DATA SMH comprises Attribute, Sequence, and Length fields.

Table 3

Field Name	Length [Bit]	Description
Type	1	Identifier indicating that this is an SMH for general-purpose data transmission.
Attribute	1	Identifier indicating the attribute of the data specified by the SMH. [2] Data Flow [2] ACK Type [1] More Bit [3] Fragment
Sequence	1	The sequence number of the data specified by the SMH. Rotation of 0 to 255 is repeated.
Length	2	Indicates the length in byte of the data specified by the SMH.

In the Attribute field, the identifier indicating the attribute of the data specified by the relevant DATA SMH is described.

In the Data Flow portion, the data flow of the relevant data is placed. Here, it is assumed that data flows having a plurality of attributes on a link-by-link basis can be defined. Data flows having different attributes are used to define different ARQ (Automatic Repeat reQuest) methods on a data flow-by-data flow basis, to handle traffic different in priority from data flow to data flow, and to attain the like intended purposes.

In the ACK Type portion, information which indicates what ACK the receiver that received the data should be requested to return is placed. Specifically, three types of information, immediate ACK (Im-ACK) request, delay ACK (Del-ACK) request, and ACK not required, are notified. If the immediate ACK request is specified, the receiving end returns a packet containing ACK information immediately after it receives data.

If the delay ACK request is specified, preparations for returning ACK are made but the transmission of ACK information is not carried out until a packet of some kind is transmitted to the origin of transmission of data. (When a packet of some kind other than RTS is transmitted to the origin of transmission of data, an ACK SMH is added to the packet and it is transmitted.) If ACK not required is notified, an ACK is not returned.

In the More Bit portion, information indicating whether, after the relevant packet is transmitted, more data to be transmitted has been accumulated or not is placed. The receiver stores the address of the packet transmitting station at which the More Bit portion has been most recently set, and, in some cases, polls that station. The polling procedure is not related directly to the subject matter of the present invention, and thus further description will not be given.

If the relevant data is fragmented, the Fragment portion is used to indicate borders in the data.

In the Sequence field, the sequence number assigned to the relevant data is placed. It is assumed that sequence numbers 0, 1, 2, 3, ... are assigned to data units in ascending order as is performed in ordinary data communication. The sequence numbers of 0 to 255 are repeatedly used by rotation.

In the Length field, the length of the relevant data is placed.

Fields in ACK SMH:

Table 4 illustrates the components of ACK SMH fields used

when ACK information is transmitted. As described below, the ACK SMH comprises ACK Attribute, ACK Sequence/Type, and Received MAP fields.

Table 4

Field Name	Length [Bit]	Description
Type	1	Identifier indicating that this is an ACK SMH.
ACK Attribute	1	Identifier indicating the attribute of ACK. [2] Data Flow [6] Reserved
ACK Sequence/Type	1	Transcribes DATA Type of the object of ACK if DATA Flow is 0. Describes sequence number in the other cases.
Received MAP	2	Used when Data Flow is not 0. ACK/NACK information for Selective ACK.

In the ACK Attribute field, the identifier indicating the attribute of ACK is described. The Data Flow portion indicates in which data flow the data as the object of ACK information is transmitted. Here it is assumed that, if data flow 0 is selected, immediate ACK (Im-ACK) is used, and if any other data flow is selected, selective ACK (Sel-ACK) is used.

The ACK Sequence/Type field is a field for indicating up to which sequence number of the relevant data flow has been sequentially received if the data flow is not 0. For example, the value of 6 is placed, that indicates data of up to sequence number 6 has been all successfully received. If 0 is selected for data flow, immediate ACK is used, and the data type of that data is transcribed to indicate which data the ACK is for.

The Received MAP field is a field for indicating whether any data that has been received after the data indicated by the ACK Sequence exists or not. Relative to the sequence number indicated by the ACK Sequence, the subsequent sequence numbers

are brought into correspondence by bit map, and bits corresponding to data (sequence number) which has been received are marked. The MSB corresponds to the number next to the sequence number indicated by the ACK Sequence. As an example, it is assumed that: the Received MAP field is constituted of eight bits; the sequence number in the ACK Sequence field is 23; and the Received MAP is 00100000. This means the following: data of up to #23 has been all received; (the Received MAP represents the success or failure in receiving the eight pieces of data of #24 and the following numbers by bit map); the reception of data of #24 and #25 failed; data of #26 has been received; and the subsequent data has not been received.

The method of transmission and reception wherein data units received at intervals are held at the receiving end is designated as selective acknowledgement (Selective ACK). If the receiver supports selective acknowledgement, a Received MAP is generated in accordance with the above-mentioned rule. If the receiver does not support selective acknowledgement, data which could not sequentially received is discarded, and zero is placed in all the bits of the Received MAP field.

Fields in RTS SMH:

Table 5 illustrates the components of RTS SMH fields used when RTS information is transmitted. As described below, the RTS SMH comprises RTS Attribute, RTS Sequence, RTS Received MAP, Max Duration, and Length (or Number Of Data Unit) fields.

Table 5

Field Name	Length [Bit]	Description
Type	1	Identifier indicating that this is a (Directed) RTS SMH.
RTS Attribute	1	Identifier indicating the attribute of RTS. [2] Data Flow [2] Rate Strategy [1] Rate Set [1] RTS/CTS Mux [1] ACK Request [1] Reserved
RTS Sequence	1	The sequence number of the leading MSDU to be transmitted.
RTS Received MAP	2	With respect to MSDUs subsequent to RTS Sequence, the bit corresponding to data recognized to have been transmitted is marked with "1."
Max Duration	1	The maximum data transmission time which can be allowed by the transmitting end.
Length	1 × N	Information related to data unit to be transmitted (value indicating the data length information).
(Number of Data Unit)	1	(For example, if the data units are of fixed length) the number of data units to be transmitted.
(Directed Address)	8	(Only in case of Directed RTS) the MAC address of the node as the object of RTS.

In the RTS Attribute field, the identifier indicating the attribute of the RTS information is described.

In the Data Flow portion, the data flow of data for which transmission is about to be tried is placed.

In the Rate Strategy portion, auxiliary information is placed which is referred to when the transmission rate of data is determined. This auxiliary information is used to bias criteria for determining: whether to aggressively select a high rate for transmission rate; whether to slightly aggressively select a slightly high rate; whether to slightly passively select a slightly low rate; or whether to passively select a

low rate. The usage of the Rate Strategy portion will be described in detail later.

In the Rate Set portion, indication is placed which indicates whether to fix the transmission rate at the value applied in RTS for transmission or not. If transmission is carried out with the transmission rate fixed, the entry in the Rate Strategy portion is disregarded.

In the RTS/CTS Mux portion, information is placed which indicates whether to permit adding RTS information to a CTS packet transmitted in response to the relevant RTS or not. If the addition of RTS is permitted, the station which receives the relevant RTS and returns a CTS operates as follows: if the station holds data directed to the station as the origin of transmission of the RTS, it is permitted to add RTS information to the CTS and transmit it. Thus, two-way communication is carried out by one transaction.

In the ACK Request portion, information is placed which indicates whether to request to add ACK information to a CTS packet transmitted in response to the relevant RTS or not. If the addition of ACK information is requested, the station which receives the RTS and returns a CTS operates as follow: the station adds the ACK information of data which it has received from the station of the origin of transmission of the RTS to the CTS and transmits it.

The RTS Sequence field is a field in which the sequence number of the leading data of pieces of data for which the station as the origin of transmission tries to transmit is described.

The station as the destination of RTS refers to this field. Thereby, the station can learn whether the station as the origin of transmission is trying to transmit data which is a duplicate of the data already received or not.

The RTS Received MAP field produces an effect when selective acknowledgement is used together. Relative to the sequence number indicated in the RTS Sequence field, pieces of data of the subsequent sequence numbers are brought into correspondence by bit map. Then, the bits corresponding to data (sequence numbers) the reception of which the receiver station recognizes to have been completed are marked. The MSB corresponds to the sequence number indicated by RTS Sequence. As an example, it is assumed that: the RTS Received MAP field is constituted of eight bits; the sequence number in the RTS Sequence field is 23; and the Received MAP is 00100000. This means the following: pieces of data of #23, #24, and #25 are skipped, and for pieces of data of #26 and the following numbers, transmission is continuously tried. The station as the destination of RTS refers to this field, and can thereby learn whether the station as the origin of transmission is trying to transmit data which is a duplicate of the data already received.

The Max Duration field is used for the transmitting end to set the maximum period of data transmission in the present data transmission transaction. As an example, it is assumed that, with respect to the present transaction, data transmission is to be completed within 200 microseconds on the grounds of the transmitter station. In this case, a value

indicating 200 microseconds (or a value obtained by subtracting the time required for the RTS/CTS procedure from 200 microseconds) is placed in this field. The station as the destination of RTS has right to determine a period of data reception. At this time, the station determines a period of data reception so that the period indicated in the Max Duration field will not be exceeded.

In the Length field, the length of data for which transmission is tried is described. In case of a first example of constitution, a plurality of pieces of Length information (e.g. number of bits and number of bytes) are defined if it is permitted to transmit one or more data units in one packet. Here, it is assumed that, for example, N pieces of Length information are defined. (N is typically a fixed value but may be a non-fixed value.) Data units the reception of which the receiving end recognizes to have been completed are excluded from data for which transmission is tried. As an example, it is assumed that: the sequence number in the RTS Sequence field is 23; and the Received MAP is 00100000. In this case, the length of data unit of #23 is placed in Length0, and the length of data unit of #24 is placed in Length1. In Length2, the length of data unit of #26, not that of data unit of #25 which has been already received, is placed.

As a second example of constitution, the sum of the lengths of a plurality of data units for which transmission is tried can be described as Length information. In this case, in the RTS Sequence field, the sequence number of the leading data of

a plurality of data units is described.

As a third example of constitution, the length of data for which transmission is tried can be expressed in time and described in the Length field. In this case, in the Length field, a plurality of lengths of time for which the channel is occupied when data or a plurality of data groups for which transmission is tried are transmitted are described with respect to cases where they are transmitted at several data rates. Here, it is assumed that, for example, N pieces of Length information are defined. (On the assumption that transmission is carried out at N different data rates, the length of time required for data transmission is described.)

As a fourth example of constitution, the Number Of Data Unit field can be defined in place of the Length field if the length of a data unit mainly transmitted is a fixed value. In this case, in the field, the number of data units for which transmission is tried is described.

In the RTS SMH, the Directed Address field can be defined in addition to the foregoing. This is used in the following case: broadcast or multicast is set in the destination (RA) field of the common MAC header but RTS information is to be transmitted to some specific station. In the Directed Address field, the address of the destination of RTS information is described.

Fields in CTS SMH:

Table 6 illustrates the components of CTS SMH fields used

when CTS information is transmitted. As described below, the CTS SMH comprises CTS Attribute, RATE, and Stored Sequence fields.

Table 6

Field Name	Length [Bit]	Description
Type	1	Identifier indicating that this is a CTS SMH.
CTS Attribute	1	Identifier indicating the attribute of CTS. [2] Data Flow [6] Reserved
RATE	1	Specifies the data rate class of transmit data.
Stored Sequence	1	Notifies that the Length information of up to the relevant Sequence number has been stored.

In the CTS Attribute field, the identifier indicating the attribute of the relevant CTS information is described.

In the Data Flow portion, the data flow of data for which transmission is about to be tried is placed.

In the RATE field, a value which indicates the transmission rate of data transmitted in response to the transmission of CTS is placed.

In the Stored Sequence field, the Sequence number is placed which indicates up to what Sequence number the data receiving end (CTS transmitting end) has held data length information. If the relevant communication station is not provided with a function of holding data length information, the number immediately preceding the Sequence number indicated in the RTS Sequence field is placed. Or, a value is placed which represents NULL indicating that the relevant communication station is not provided with a function of holding data length information.

In the example described above, CMH and SMH independently

exist in PSDU and a plurality of different types of SMHs are independently added for convenience of explanation. An aspect of the objects of the present invention is attained as long as the format contains the similar components of information; therefore, the present invention is not limited to the above-mentioned format.

An example will be taken. Information elements equivalent to the MAC header are preferably disposed at the head of a packet in a lump, as described above. However, they can be disposed behind or between data units constituting a packet sometimes. In particular, the DATA SMH is disposed immediately before the data unit to which the relevant SMH corresponds in some examples of utilization.

In the examples described above, the RA, TA, and Duration fields are disposed in CMH. However, these fields are disposed in the PLCP portions in some examples of utilization. Duration field contains the media reservation time information. But, Duration field is not necessary to be structured as a field which records length information in unit of [usec], in some examples of utiliazation, it can also be composed of the information which can make instruction of keeping in transmission prohibited state in the duration of what the other communication stations except destinations hope, or composed of information groups. In order to explain conveniently, examples conluding Duration field will be used to explain.

C. Transmission Rate Determination Process

Referring to FIG. 6, description will be given to a process for determining a transmission rate in a wireless communication system according to the present invention.

In the present invention, access control based on CSMA is carried out with the RTS/CTS procedure used together. In such a case, CTS information is transmitted in response to the reception of RTS information, and data is transmitted in response to the reception of CTS. The CTS transmitting station measures the quality of RTS receive signal, and thereby determines a transmission rate at which reception can be implemented and notifies the station as the destination of CTS of it. The station as the destination of CTS transmits data in response to the CTS information. At this time, the station applies the transmission rate indicated in the RATE field in the CTS as the transmission rate of this data. The process for determining the transmission rate is as follows:

Step 1: the quality, such as reception SINR, is measured based on RTS receive signal.
Step 2: the quality or transmission rate class measured according to the value indicated in the Rate Strategy field in RTS is biased, and a transmission rate is determined. In case of IEEE802.11a, for example, it is determined from among eight different transmission rate modes prescribed: 6, 9, 12, 18, 24, 36, and 54Mbps.

When the measured quality is biased, the measured

reception SINR value is biased at the level of ± several dB in accordance with the value indicated by Rate Strategy. Based on the biased reception SINR value, a transmission rate class at which reception can be implemented is determined by lookup table or the like.

When the transmission rate class is biased, a transmission rate class at which reception can be implemented is extracted by lookup table or the like based on the measured reception SINR value. The extracted transmission rate class is shifted in accordance with the value indicated by Rate Strategy.

This shift processing may be applied, for example, only when a high-rate class is selected or only when a low-rate class is selected depending on the characteristics of the physical layer.

The data transmitting station (RTS transmitting station) which received CTS holds the transmission rate class, specified in the RATE field, as a default transmission rate class directed to the station as the origin of CTS transmission. Thus, the station can refer to it when the station transmits an RTS or data next time. When the station transmits an RTS, it refers to this default transmission rate class, and applies this transmission rate class or the next lower transmission rate class (higher by one level in tolerance to noise). When data is transmitted without using RTS/CTS together, the default transmission rate class is applied in place of the transmission rate class notified by CTS.

When the RTS transmitting station transmits data units, it counts the following with respect to each destination: the number of times when a data unit is transmitted for the first time, and the number of times when a data unit is retransmitted. By referring to these values, the transmission error rate can be extracted with respect to each destination. Based on the destination-by-destination transmission error rates, the Rate Strategy of RTS information can be determined. More specific description will be given. The lower threshold value and the upper threshold value of transmission error rate are defined in advance. If the transmission error rate exceeds the upper threshold value, the value for Rate Strategy is decremented in the passive direction and held. If the transmission error rate falls below the lower threshold value, the value for Rate Strategy is incremented in the aggressive direction and held. When an RTS is transmitted, this held Rate Strategy is transcribed into the Rate Strategy field in RTS. If the held value for Rate Strategy is changed, it is important to reset the count values for obtaining the transmission error rate.

According to the above-mentioned procedure, the transmission rate is determined from the receive signal quality of RTS. Thus, control can be carried out by dual loop wherein the applied transmission rate is biased in accordance with the error rate (bit error rate (BER) or packet error rate (PER)) monitored by the transmitting end.

In addition, as a technique different from the foregoing, the following constitution is possible: the transmission error

rate is measured by the receiving end, not by the data (RTS) transmitting end. In this case, the above-mentioned monitoring of error rate is carried out at the receiving end, and similarly dual loop control is carried out wherein the applied transmission rate is biased in accordance with the error rate. If the RTS/CTS procedure is not used together in the technique, however, certain risk is involved. This is because, in an environment where errors frequently occur, the receiving end cannot even recognize that packets are transmitted. Where RTS/CTS is used together, the error rate is computed with the packets received after CTS is transmitted taken as the population parameter.

The quintessence of Rate Strategy is to provide a methodology for communicating auxiliary information for selecting and determining a rate on the grounds of the transmitting end. Where the receiving end measures the transmission error rate, mentioned above, or in the like cases, the transmitting end may set the value of Rate Strategy due to other factors than error rate. For example, the transmitting end may set the value of Rate Strategy due to the difference in transmission power between RTS packet and data packet. Or, it may set the value of Rate Strategy due to the causal relationship between transmission rate and transmission power. (Refer to Japanese Patent Application No. 2003-6973 specification, already assigned to the present applicant, for example.)

D. Basic CSMA Procedure

In a wireless communication system according to the present invention, access control based on CSMA is carried out with the RTS/CTS procedure used together. FIG. 7 illustrates an example of the operation sequence of the RTS/CTS procedure in the present invention. In this figure, the following communication environment is assumed: four communication stations, STA2, STA0, STA1, and STA3, exist, and communication station adjoining to each other in the figure are located within the range of radio waves. Here, it is assumed that STA0 desires to transmit information to STA1.

STA0 confirms that the medium is clear for a certain period (from time T0 to time T1) according to, for example, the ordinary CSMA procedure. Then, STA0 starts the transmission of a packet containing RTS information to STA1 at time T1.

In the Duration field in the packet containing the RTS information, the time that lapses before the reception of a packet containing CTS information, transmitted as the outcome of the reception of the RTS information, is completed, is described. (That is, the time from T2 to T4 is described.) At this time, as the length of time described in the Duration field, the time that lapses before time T4 may be given some margin and the time until time T5 or so may be described. Or, the time until time slightly before time T4 may be described.

STA0 holds a list of information on the length of data unit it tries to transmit to STA1. This list is designated as "transmit data unit candidate list."

In case the RTS SMH adopts the first example of constitution mentioned above, in the Length field in the RTS SMH, the lengths (e.g. number of bits and number of bytes) of data units in the transmit data unit candidate list are described as data length information by N pieces. And, in case the number N of the Length fields is smaller than the number of data units desiring to send, as the second example introduced in next paragraphs, the sum of the lengths of several data units is described as Length field.

In case the RTS SMH adopts the second example of constitution, in the Length field in the RTS SMH, the sum of the lengths of one or more data units in the transmit data unit candidate list is described as data length information.

In case the RTS SMH adopts the third example of constitution, in the Length field in the RTS SMH, the length of time required for transmitting the data units in the transmit data unit candidate list is described as data length information. The length of time fluctuates depending on the data rate at which transmission is carried out. Therefore, if transmission is carried out at several data rates, a plurality of lengths of time are described sometimes.

In case the RTS SMH adopts the fourth example of constitution, in the Number Of Data Unit field (defined in place of the Length field) in RTS SMH, the number of data units in the transmit data unit candidate list is described as data length information.

This packet containing RTS information is received also

by STA2 which is positioned in the vicinity of STA0. STA2 checks the destination of the common MAC header based on the transmission rate information in the PSDU portion obtained from the RATE field in the PLCP header. If STA2 cannot confirm that the packet is directed to itself, it recognizes time T2 from the RATE field and the LENGTH field in the PLCP header. Further, STA2 refers to the Duration field in the common MAC header, and thus recognizes time T4. Then, STA2 sets an NAV and brings itself in transmission prohibited state until time T4.

This packet containing RTS information is received also by STA1 which is the intended destination. STA1 checks the destination of the common MAC header based on the transmission rate information in the PSDU portion obtained from the RATE field in the PLCP header, and recognizes that the packet is directed to itself. Further, when STA1 successfully decodes the sub MAC header, it recognizes that there is a request from STA0 to send data packets, directed to itself. Then, STA1 determines a transmission rate based on information obtained from the received packet containing RTS information.

Further, STA1 refers to the Length field (or the Number Of Data Unit field) in RTS SMH, and thereby obtains the data length information on the data to be received.

In case the RTS SMH adopts the above-mentioned first example of constitution, STA1 obtains a list of information on the lengths of data units to be received. This list is designated as "receive data unit candidate list." STA1 refers to this list in sequence. Thereby, it counts the number of data

units which can be received if reception is carried out at the determined transmission rate and a reception period to the extent that the period indicated in the Max Duration field in RTS SMH is not exceeded. (This reception period is the time period until time T6 when the transmission of data packets is completed.)

In case the RTS SMH adopts the second example of constitution, STA1 obtains the total length of one or more data units received. STA1 counts the reception period to the extent that the period indicated in the Max Duration field in RTS SMH is not exceeded. At this time, consideration is given to whether data unit groups of the indicated length can be received if reception is carried out at the determined transmission rate.

In case the RTS SMH adopts the third example of constitution, STA1 obtains time length candidates of data packets received. STA1 extracts one reception period (time length) corresponding to the determined transmission rate from the Length field.

In case the RTS SMH adopts the fourth example of constitution, STA1 obtains information on the number of data units received from the Number Of Data Unit field. Where the length of data units is uniquely fixed, this information is equivalent to the "receive data unit candidate list." STA1 refers to the length and number of data units. Thereby, it counts the number of data units which can be received if reception is carried out at the determined transmission rate and the reception period to the extent that the period indicated

in the Max Duration field in RTS SMH is not exceeded.

If STA1 desires to limit the reception period on the grounds of itself at this time, it sets this reception period as the threshold value of reception period, together with the period indicated by Max Duration, sometimes. Further, STA1 transmits a packet containing CTS information. Thus, it transcribes the value obtained by the reception period computed here into the Duration field in that packet, and transcribes the transmission rate class determined as mentioned above into the RATE field.

The packet itself containing CTS information is transmitted at a transmission rate most superior in noise tolerance in many cases. Thus, the possibility that a packet containing CTS information cannot be decoded is reduced as much as possible.

If STA1 fails to decode a packet containing RTS information, a packet containing CTS information is not returned by due time T4. Therefore, STA0 retries to transmit the packet containing RTS information in accordance with the random backoff procedure. At this time, STA2 puts down the NAV at time T4, and transitions into normal state in which it can transmit. Thus, damage resulting from that the packet containing CTS information is not returned is minimized.

If STA1 succeeds in decoding the packet containing RTS information, a packet containing CTS information is returned to STA0 at time T4 as scheduled in accordance with the above-mentioned procedure.

This packet containing CTS information is received also by STA3 which is positioned in the vicinity of STA1. STA3 decodes the Duration field and the like in the packet containing CTS information, and refers to the RA address. If STA3 cannot confirm that the packet is directed to itself as the result, it sets an NAV and stops transmission over the time indicated in the Duration field or the like. As a result, STA3 is kept in transmission prohibited state until time T6 which is the time indicated in the Duration field.

This packet containing CTS information is received also by STA0 which is the intended destination. STA0 decodes the PSDU, and thereby recognizes the following: STA1 is ready to receive and it desires to receive at the transmission rate indicated in the RATE field during the period indicated by Duration. STA0 calls data units which can be transmitted at the specified transmission rate during the specified period, beginning with the first one in the transmit data unit candidate list in sequence. Then, it generates a transmit data packet, and transmits it.

The data packet transmission is completed at time T6, and STA3 which is a neighbor station of STA1 refrains from transmission until T6. Therefore, the reception by STA1 is not hindered.

E. Applications of CSMA Procedure

FIG. 8 to FIG. 10 and FIG. 21 to FIG. 23 illustrate a number of examples of the applications of transmitting and receiving

procedures according to the present invention. Here, examples of the applications of the communication method according to the present invention will be described in detail based on the CSMA procedure described referring to FIG. 7.

E-1. First Example of Application

FIG. 8 illustrates the first example of application of transmitting and receiving procedures in a wireless communication system according to the present invention. The figure illustrates an example in which two data units are transmitted from STA0 to STA1. In this example, the number of data units which can be transmitted in one packet is limited to one, and delay ACK (Del-ACK) or immediate ACK (Im-ACK) is specified as the case may be.

STA0 starts the procedure for transmitting data units at time T0, and starts backoff count in accordance with the CSMA procedure for acquiring transmission right. The backoff count is completed at T1, and it is confirmed that the medium is clear during this period. Therefore, STA0 transmits a packet containing RTS information.

After STA1 receives the RTS directed to itself, it returns a packet containing CTS information at time T2 based on the information described in the RTS SMH.

After STA0 receives the CTS directed to itself, it transmits a data packet at time T3. At this time, STA0 describes in the ACK Type portion of the data packet information indicating it desires that ACK should be returned by delay ACK

(Del-ACK). At the same time, STA0 describes in the More Bit portion information indicating that more data unit is stored. This data packet is received by STA1 without error.

To further transmit the stored data unit directed to STA1, STA0 waits for a random time, and then transmits a packet containing RTS information at time T5. At this point of time, STA0 has not received the ACK of the data unit it previously transmitted. Therefore, STA0 generates a transmit data unit candidate list so that the previously transmitted data unit is included, and constitutes an RTS SMH based on the list.

After STA1 receives it, its returns a packet containing CTS information at time T6 based on the information described in the RTS SMH. At this time, STA1 refers to the RTS Sequence and RTS Received MAP in the RTS SMH, and thereby recognizes that STA0 has not recognized the reception confirmation of the previously received data unit. Then, STA1 decides to include ACK information in the packet containing CTS information. Or, STA1 determines to include ACK information because of it's holding untransmitted ACK directed to STA0. Further, STA1 deletes the already received packet from the receive data unit candidate list to update the list, and then generates CTS information.

As a result, STA1 returns a packet (i.e. CTS with ACK multiplexed) containing the CTS information and the ACK information at time T6. For ACK information, the ACK information corresponding to the data flow specified by the received RTS information is described.

After receiving the packet containing the CTS information and ACK information, STA0 operates as follows: based on the ACK information, STA0 deletes the data unit already received by STA1 from the transmit data unit candidate list it holds; STA0 generates a new transmit data unit candidate list, and determines a transmit data unit based on the new list. STA0 transmits the thus generated data packet at T7. At this time, it describes in the ACK Type portion of the data packet information indicating it desires that ACK should be returned by immediate ACK. At the same time, it describes in the More Bit portion information indicating that a data unit to be transmitted is not present any more.

When STA1 receives the data packet, it recognizes that it is desired to immediately transmit an ACK, from the ACK Type portion in the DATA SMH. Then, STA1 returns an immediate ACK (Im-ACK) packet corresponding to the relevant data flow at time T8.

In this example of application, the Duration field in each packet is set so that it indicates the time period until the time indicated by arcuate arrow in FIG. 8.

E-2. Second Example of Application

FIG. 21 illustrates the second example of application of transmitting and receiving procedures in a wireless communication system according to the present invention. The figure illustrates an example in which two data units are transmitted from STA0 to STA1. This example is on the

assumption that the number of data units which can be transmitted in one packet is limited to one and immediate ACK (Im-ACK) is constantly applied.

STA0 starts the procedure for transmitting data units at time T0, and starts backoff count in accordance with the CSMA procedure for acquiring transmission right. The backoff count is completed at T1, and it is confirmed that the medium is clear during this period. Therefore, STA0 transmits a packet containing RTS information.

After STA1 receives the RTS directed to itself, it returns a packet containing CTS information at time T2 based on the information described in the RTS SMH.

After STA0 receives the CTS directed to itself at time T2, it transmits a data packet at time T3. At this time, STA0 describes in the ACK Type portion of the data packet information indicating it desires that ACK should be returned by immediate ACK (Im-ACK).

However, STA1 detects an error when it receives the data packet and cannot accurately extract the data. Though STA1 should return an ACK, therefore, it does not transmit an ACK at time T4. (The ACK in the figure is not transmitted.)

Since STA0 cannot receive ACK at due time, it judges that some error has occurred in the previous data. Thus, to retransmit the still stored data unit directed to STA1, STA0 waits for a random time, and then transmits a packet containing the RTS information at time T5. As mentioned above, STA0 has not received the ACK of the data it previously transmitted. At

this time, therefore, STA0 describes in the ACK Request portion in the RTS SMH that it requests that ACK information should be added. (That is, STA0 transmits an RTS with an ACK request multiplexed.)

After receiving this, STA1 returns a packet containing CTS information at time T6 based on the information described in the RTS SMH. At this time, STA1 refers to the ACK Request portion in the RTS SMH, and thereby recognizes that STA0 is requesting that ACK information should be transmitted. Then, STA1 decides to include ACK information in the packet containing CTS information. Further, STA1 deletes the already received packet from the receive data unit candidate list to update the list, and then generates CTS information.

As a result, STA1 returns a packet (i.e. CTS with ACK multiplexed) containing the CTS information and the ACK information at time T6. For ACK information, the ACK information corresponding to the data flow specified by the received RTS information is described.

After receiving the packet containing the CTS information and the ACK information, STA0 operates as follows: based on the ACK information, STA0 deletes the data unit already received by STA1 from the transmit data unit candidate list it holds; STA0 generates a new transmit data unit candidate list, and determines a transmit data unit based on the new list. (In this example, STA0 retransmits the data unit it transmitted at time T3.) STA0 transmits the thus generated data packet at time T7. At this time, it describes in the ACK Type portion of the data

packet information indicating it desires that ACK should be returned by immediate ACK.

When STA1 receives the data packet, it recognizes that it is desired to immediately transmit an ACK, from the ACK Type portion in the DATA SMH. Then, STA1 returns an immediate ACK (Im-ACK) packet corresponding to the relevant data flow at time T8.

In this example of application, the Duration field in each packet is set so that it indicates the time period until the time indicated by arcuate arrow in FIG. 8.

E-3. Third Example of Application

FIG. 22 illustrates the third example of application of transmitting and receiving procedures in a wireless communication system according to the present invention. The figure illustrates an example in which one data unit is transmitted from STA0 to STA1. This example is on the assumption that the number of data units which can be transmitted in one packet is limited to one and immediate ACK (Im-ACK) is constantly applied.

STA0 starts the procedure for transmitting data units at time T0, and starts backoff count in accordance with the CSMA procedure for acquiring transmission right. The backoff count is completed at T1, and it is confirmed that the medium is clear during this period. Therefore, STA0 transmits a packet containing RTS information.

After STA1 receives the RTS directed to itself, it returns

a packet containing CTS information at time T2 based on the information described in the RTS SMH.

After STA0 receives the CTS directed to itself at time T2, it transmits a data packet at time T3. At this time, STA0 describes in the ACK Type portion of the data packet information indicating it desires that ACK should be returned by immediate ACK (Im-ACK). At the same time, STA0 describes in the More Bit portion information indicating that a transmit data unit is not stored any more. This data packet is received by STA1 without error.

STA1 returns the ACK of the received data. However, STA0 detects an error when it receives the ACK and cannot accurately extract the data. Since STA0 cannot receive ACK at due time, it judges that some error has occurred in the previous data. Thus, to retransmit the still stored data unit directed to STA1, STA0 waits for a random time, and then transmits a packet containing RTS information for data retransmission at T5. As mentioned above, STA0 has not received the ACK of the data it previously transmitted. At this time, therefore, STA0 describes in the ACK Request portion in the RTS SMH that it requests that ACK information should be added. That is, STA0 transmits an RTS with an ACK request multiplexed.

After receiving this, STA1 returns a packet containing CTS information at time T6 based on the information described in the RTS SMH. At this time, STA1 refers to the ACK Request portion in the RTS SMH, and thereby recognizes that STA0 is requesting that ACK information should be transmitted. Then,

STA1 decides to include ACK information in the packet containing CTS information. Further, STA1 recognizes that, as the result of the already received packet being deleted from the receive data unit candidate list, all the data STA0 desires to transmit has been already received. Thus, STA1 returns only an ACK, and does not return CTS information.

As a result, STA1 returns a packet containing only ACK information at time T6. For ACK information, the ACK information corresponding to the data flow specified by the received RTS information is described.

After receiving the packet containing the ACK information, STA0 judges that all the transmit data unit directed to STA1 it has held has been already transmitted, and terminates the transaction.

In this example of application, the Duration field in each packet is set so that it indicates the time period until the time indicated by arcuate arrow in FIG. 8.

E-4. Fourth Example of Application

FIG. 23 illustrates the fourth example of application of transmitting and receiving procedures in a wireless communication system according to the present invention. The figure illustrates an example in which two data units are transmitted from STA0 to STA1. This example is on the assumption that the number of data units which can be transmitted in one packet is limited to one and it is permitted to continuously transmit a plurality of data packets.

STA0 starts the procedure for transmitting data units at time T0, and starts backoff count in accordance with the CSMA procedure for acquiring transmission right. The backoff count is completed at T1, and it is confirmed that the medium is clear during this period. Therefore, STA0 transmits a packet containing RTS information.

After STA1 receives the RTS directed to itself, it returns a packet containing CTS information at time T2 based on the information described in the RTS SMH.

After STA0 receives the CTS directed to itself, it transmits a data packet at time T3. At this time, STA0 describes in the ACK Type portion of the data packet information indicating it desires that ACK should be returned by delay ACK (Del-ACK). At the same time, STA0 describes in the More Bit portion information indicating that more transmit data unit is stored. This data packet is received by STA1 without error.

Further, STA0 judges whether STA0 can complete transmission within the period indicated in the Duration field in the CTS, transmitted by STA1 at time T2, if STA0 continuously transmits data packets, starting at time T4. In the example illustrated in the figure, STA0 judges that, if it transmits the next data packet, it can complete data transmission within the period indicated in the Duration field in the CTS. Then, STA0 further transmits a stored data unit directed to STA1 at time T4. At this time, STA0 describes in the ACK Type portion of the data packet information indicating it desires that ACK should be returned by immediate ACK (Im-ACK). At the same time,

STA0 describes in the More Bit portion information indicating a transmit data unit is not stored any more. This data packet is received by STA1 without error.

When STA1 receives the data packet, it recognizes that it is desired to immediately transmit an ACK, from the ACK Type portion in the DATA SMH. Then, STA1 returns an immediate ACK (Im-ACK) packet corresponding to the relevant data flow at time T5.

In this example of application, the Duration field in each packet is set so that it indicates the time period until the time indicated by arcuate arrow in FIG. 8.

E-5. Fifth Example of Application

FIG. 9 illustrates the fifth example of application of transmitting and receiving procedures in a wireless communication system according to the present invention. The figure also illustrates an example in which two data units are transmitted from STA0 to STA1. In this example, the number of data units which can be transmitted in one packet is limited to one. With respect to both the data units, immediate ACK is specified, and the transmitter station is permitted to continuously transmit packets.

STA0 starts the procedure for transmitting data units at time T0, and starts backoff count in accordance with the CSMA procedure for acquiring transmission right. The backoff count is completed at T1, and it is confirmed that the medium is clear during this period. Therefore, STA0 transmits a packet

containing RTS information.

After STA1 receives the RTS directed to itself, it returns a packet containing CTS information at time T2 based on the information described in the RTS SMH.

After STA0 receives the CTS directed to itself, it transmits a data packet at time T3. At this time, STA0 describes in the ACK Type portion of the data packet information indicating it desires that ACK should be returned by immediate ACK. At the same time, STA0 describes in the More Bit portion information that more transmit data unit is stored. Further, STA0 adds RTS information for transmitting another data unit. That is, STA0 transmits a data packet with the RTS multiplexed. This data packet is received by STA1 without error.

STA1 recognizes that the data packet contains RTS information, and then tries to transmit a packet containing CTS information. At this time, STA1 refers to RTS Sequence and RTS Received MAP, and thereby recognizes that STA0 has not recognized the acknowledgement of the data unit previously received. Then, STA1 decides to include ACK information in the packet containing CTS information. Further, STA1 generates a receive data unit candidate list based on the information described in the RTS SMH. At this time, STA1 deletes the already received packet from the receive data unit candidate list to update the list, and then generates CTS information. Further, as ACK information, STA1 describes the ACK information corresponding to the data flow specified by the received RTS information. Thus, STA1 returns a packet containing ACK

information and CTS information (i.e. a CTS packet with an ACK multiplexed) at time T4.

After STA0 receives the packet containing ACK information and CTS information, it tries to transmit a data unit based on the CTS information. Based on the ACK information, STA0 deletes the data unit already received by STA1 from the transmit data unit candidate list it holds. Then, STA0 generates a new transmit data unit candidate list, and determines a transmit data unit based on this new list. At this time, STA0 describes in the ACK Type portion of the data packet information indicating it desires that ACK should be returned by immediate ACK. At the same time, STA0 describes in the More Bit portion information indicating that a data unit to be transmitted is not present any more. STA0 transmits the thus generated data packet at time T5.

When STA1 receives the data packet with ACK information multiplexed, it recognizes that it is desired to immediately transmit an ACK, and returns a corresponding ACK information packet at time T6.

In this example of application, the Duration field in each packet is set so that it indicates the time period until the time indicated by arcuate arrow in FIG. 9. As the Duration value of the packet transmitted at time T6, zero indicating NULL is placed.

E-6. Sixth Example of Application

FIG. 10 illustrates the sixth example of application of

transmitting and receiving procedures in a wireless communication system according to the present invention. This figure illustrates an example of two-way communication wherein two data units are transmitted from STA0 to STA1 and simultaneously two data units are transmitted from STA1 to STA0. In this example, the number of data units which can be transmitted in one packet is limited to one, and it is permitted to multiplex RTS into CTS.

STA0 starts the procedure for transmitting data units at time T0, and starts backoff count in accordance with the CSMA procedure for acquiring transmission right. The backoff count is completed at T1, and it is confirmed that the medium is clear during this period. Therefore, STA0 transmits a packet containing RTS information. In the RTS/CTS Mux portion in the RTS SMH, information is set which indicates that RTS may be multiplexed into CTS.

After STA1 receives the RTS information, it returns a packet containing CTS information at time T2 based on the information described in the RTS SMH. At this time, STA1 recognizes from the RTS/CTS Mux portion in the RTS SMH that RTS may be multiplexed into CTS, and it holds data units directed to STA0. Therefore, STA1 generates RTS information for transmitting these data units to STA0. As a result, a packet containing CTS information and RTS information (i.e. a CTS packet with an RTS multiplexed) is transmitted.

After STA0 receives the packet containing CTS information and RTS information, it tries to transmit a data unit at time

T3 based on the CTS information. At this time, STA0 describes in the ACK Type portion of the data packet information indicating it desires that ACK should be returned by immediate ACK. At the same time, STA0 describes in the More Bit portion information indicating that more transmit data unit is stored. Further, STA0 adds RTS information for transmitting another data unit. Since RTS information is also contained in the receive packet, STA0 generates CTS information in response thereto, and adds the CTS information.

As a result, a packet in which data, the RTS information, and the CTS information are multiplexed is transmitted from STA0 at time T3. (That is, a data packet in which CTS in response to RTS from STA1 and RTS for transmitting the subsequent data unit are multiplexed is transmitted.) This data packet is received by STA1 without error.

STA1 receives the packet with the data, RTS information, and CTS information multiplexed, and recognizes that this packet contains RTS information. Then, STA1 tries to transmit a packet containing CTS information. At this time, STA1 refers to RTS Sequence and RTS Received MAP, and thereby recognizes that STA0 has not recognized the acknowledgement of the data unit previously received. Thus, STA1 decides to include ACK information in the packet containing CTS information. Further, STA1 generates a receive data unit candidate list based on the information described in the RTS SMH. At this time, STA1 deletes the already received packet from the receive data unit candidate list to update the list, and then generates CTS

information. Further, as ACK information, STA1 describes the ACK information corresponding to the data flow specified by the received RTS information. Further, STA1 recognizes that the packet contains CTS information, and transmits a data unit as well based on the CTS information. STA1 describes in the ACK Type portion in the DATA SMH information indicating it desires that ACK should be returned by immediate ACK. At the same time, STA1 describes in the More Bit portion information indicating that more transmit data unit is stored. Further, STA1 adds RTS information for transmitting another data unit.

Thus, STA1 returns a packet containing ACK information, CTS information, a data unit, and RTS information at time T4. That is, STA1 multiplexes and transmits the following: a data packet in response to the reception of CTS from STA0; a CTS in response to an RTS from STA0; an RTS for transmitting the subsequent data unit; and an ACK corresponding to the reception of a data unit from STA0.

STA0 receives the packet containing ACK information, CTS information, a data unit, and RTS information, and tries to transmit a data unit based on the CTS information. Based on the ACK information in the received packet, STA0 deletes the data unit already received by STA1 from the transmit data unit candidate list it holds. Then, STA0 generates a new transmit data unit candidate list, and determines a transmit data unit based on this new list. At this time, STA0 describes in the ACK Type portion of the data packet information indicating it desires that ACK should be returned by immediate ACK. At the

same time, STA0 describes in the More Bit portion information indicating that a data unit to be transmitted is not present any more. Further, since STA0 extracted the new data unit from the received packet without error, it decides to return ACK information. Further, since the received packet contains RTS information as well, STA0 generates CTS information corresponding thereto, and also decides to transmit the CTS information. The generating procedure for CTS information is the same as described above; therefore, its description will be omitted here.

Thus, STA0 returns the packet containing a data unit, ACK information, and CTS information at time T5. That is, STA0 multiplexes and transmits the following: a data unit in response to a CTS from STA1; a CTS in response to an RTS from STA1; and an ACK corresponding to a data unit received form STA1.

When STA1 receives the packet containing a data unit, ACK information, and CTS information, it extracts the data unit, and decides to transmit ACK information corresponding thereto. Further, when STA1 recognizes that the packet contains CTS information and ACK information, it updates the transmit data unit candidate list based on the ACK information. Then, STA1 decides to transmit a data unit as well based on the CTS information. Thus, STA1 returns a packet containing ACK information and a data unit (i.e. a data packet with the ACK of the data unit received from STA0 multiplexed) at time T6.

After STA0 receives the packet containing ACK information and a data unit, it refers to the ACK Type portion in the DATA

SMH, and thereby recognizes that it is desired to immediately transmit an ACK. Then, STA0 returns a corresponding ACK information packet at time T7.

In the above example, the Duration field in each packet is set so that it indicates the time period until the time indicated by arcuate arrow in FIG. 10. Since the data length is determined beforehand when CTS information is generated, each Duration value can be set.

Whether RTS information or ACK information is multiplexed in a returned packet is unknown; therefore, Duration cannot be exactly specified sometimes. In preparation for such a case, a slightly larger value allowing a margin is set for the Duration value sometimes.

Further, there are cases where a Duration value is set on the assumption that RTS information or ACK information is not multiplexed and an actual packet is transmitted over a period slightly longer than the Duration value. Since the length of this information is not so large, however, great loss will not result. As the Duration value of the packet transmitted at time T8, zero indicating NULL is placed.

In the above-mentioned embodiments E-1 to E-6, it is judged whether to set "information indicating RTS may be multiplexed into CTS" in the RTS/CTS Mux portion in the RTS SMH. This judgment can also be made based on the history of communication between RTS transmitting station and station as its destination, or the packets received from the station as the destination of the relevant RTS in the past. Referring to

the relevant drawings, description will be given below to some examples in which control is carried out in accordance with whether the station as the destination of RTS holds data it desires to transmit to the RTS transmitting station or not.

In the example illustrated in FIG. 24, STA1 transmits RTS (P0), STA0 returns CTS (P1), STA1 transmits DATA (P2), and STA0 returns ACK (P3).

Here, it is assumed that, in the More Bit portion in the DATA SMH of the packet P2 containing DATA, it is described that STA1 still holds data directed to STA0.

STA0 holds the information in the More Bit portion of data most recently received from STA1, and can thereby recognize that STA1 holds data STA1 desires to transmit to STA0.

If STA0 recognizes that STA1 holds data directed to STA0 when STA0 transmits an RTS to STA1, it sets in the RTS/CTS Mux portion in the RTS SMH "information indicating that RTS may be multiplexed into CTS."

FIG. 24 illustrates a case where this RTS is transmitted as P4. In response thereto, STA1 returns a packet containing CTS and RTS SMH related to its own data transmission, that is, a packet (P5) wherein a CTS is multiplexed into an RTS. Then, STA0 transmits a packet containing data in response to the received CTS SMH and a CTS SMH corresponding to the received RTS SMH, that is, a packet (P6) wherein data and CTS are multiplexed. Subsequently, STA1 transmits a packet containing ACK SMH corresponding to the received data and data corresponding to the received CTS SMH, that is, a packet (P7)

wherein data and ACK are multiplexed. Further, STA0 transmits a packet (P8) containing ACK SMH corresponding to the received data.

In the example illustrated in FIG. 25, as in the example illustrated in FIG. 24, STA1 transmits RTS (P0), STA0 returns CTS (P1), STA1 transmits DATA (P2), and STA0 returns ACK (P3).

Here, it is assumed that, in the More Bit portion in the DATA SMH of the packet P2 containing DATA, it is described that STA1 still holds data directed to STA0.

STA0 holds the information in the More Bit portion of data most recently received from STA1, and can thereby recognize that STA1 holds data STA1 desires to transmit to STA0.

In this case, the following can occur even if data directed to STA1 is not present in STA0: because STA1 holds data STA1 desires to transmit to STA0, STA0 transmits an RTS wherein "information indicating that RTS may be multiplexed into CTS" is set in the RTS/CTS Mux portion in the RTS SMH. At this time, STA0 writes in the other fields in the RTS SMH information indicating that STA0 has no data to transmit.

This RTS is a dummy RTS which is different from the RTS proper which requests data transmission of the destination of data transmission. Other surrounding stations than STA1 receive this dummy RTS, and thereby set an NAV and refrain from transmission only for the Duration described in the RTS. Since the other surrounding stations refrain from transmission, it is easier for STA1 to transmit RTS for transmitting the subsequent data unit. That is, STA0 transmits a dummy RTS, and

can thereby make it easier for STA1 to acquire RTS transmission right. As a result, STA0 can efficiently receive the subsequent data unit from STA1.

FIG. 25 illustrates a case where this dummy RTS is transmitted as P4. In response thereto, STA1 performs the operation of transmitting the subsequent data unit in accordance with the ordinary RTS/CTS procedure. Specifically, STA1 returns a packet (P5) containing RTS SMH related to its own data transmission, and STA0 transmits a packet (P6) containing CTS SMH corresponding to the received RTS SMH. STA1 transmits a packet (P7) containing data corresponding to the received CTS SMH, and STA0 transmits a packet (P8) containing ACK SMH corresponding to the received data.

In the example illustrated in FIG. 26, STA1 transmits RTS (P0) to STA0, and STA0 can receive it without error. However, a problem arises. During this period of time, STA0 interpreted the Duration field in a packet transmitted from another station (hidden terminal (not shown) for STA1), and thereby has set an NAV. Therefore, STA0 cannot return a CTS. STA0 receives the RTS packet (P0), and thereby recognizes that STA1 holds data STA1 desires to transmit STA0.

In the example illustrated in FIG. 25, STA1 sets More bit, and thereby STA0 recognizes that STA1 has the subsequent data unit. The example illustrated in FIG. 26 is different in that: STA0 receives an RTS from STA1 and thereby recognizes that STA1 has the subsequent data unit. In the latter, STA0 sets an NAV and thus cannot return a CTS. Therefore, though STA1 has the

subsequent data unit, its data transmission operation is stopped.

In this case, the following can occur even if data directed to STA1 is not present in STA0: because STA1 holds data STA1 desires to transmit to STA0, STA0 transmits an RTS wherein "information indicating that RTS may be multiplexed into CTS" is set in the RTS/CTS Mux portion in the RTS SMH. At this time, STA0 writes in the other fields in the RTS SMH information indicating that STA0 has no data to transmit. (If data directed to STA1 is present in STA0, the same operation takes place though this is not shown in the figure. That is, STA0 transmits an RTS wherein "information indicating that RTS may be multiplexed into CTS" is set in the RTS/CTS Mux portion in the RTS SMH.)

This RTS is a dummy RTS which is different from the RTS proper. When other surrounding stations than STA1 receive this dummy RTS, they set an NAV and refrain from transmission. Since the other surrounding station refrain from transmission, it is easier for STA1 to transmit RTS for transmitting the subsequent data unit. That is, STA0 transmits a dummy RTS, and can thereby make it easier for STA1 to acquire RTS transmission right. As a result, STA0 can efficiently receive the subsequent data unit from STA1 (same as above).

FIG. 26 illustrates a case where this RTS is transmitted as P4. In response thereto, STA1 performs the operation of transmitting the subsequent data unit in accordance with the ordinary RTS/CTS procedure. Specifically, STA1 returns a packet (P5) containing RTS SMH related to its own data

transmission, and STA0 transmits a packet (P6) containing CTS SMH corresponding to the received RTS SMH. STA1 transmits a packet (P7) containing data corresponding to the received CTS SMH, and STA0 transmits a packet (P8) containing ACK SMH corresponding to the received data.

As an example of utilization different from the foregoing, "information indicating that RTS may be multiplexed into CTS" may be always set in the RTS/CTS Mux portion in the RTS SMH.

F. Procedure for Acknowledgement of Sequence Number

FIG. 11 illustrates the acknowledgement procedure related to data other than data flow 0 assumed in the present invention. The figure shows a concrete example of the interaction of individual fields which occurs when selective acknowledgement is carried out. The example is on the assumption that the Received MAP field is constituted of four bits for the purpose of simplifying the explanation; however, the present invention is not limited to this constitution.

The data transmitting end transmits data units of sequence numbers "0," "1," "2," and "3" from the transmit data unit candidate list. It is assumed that the data unit #2 is received with an error therein.

In the ACK Sequence field in the acknowledgement ACK returned by the data receiving end, "1," which indicates that the data units of up to #1 could be completely received, is placed. With the data unit #2 which is the data unit subsequent to #1 taken as the basis (as MSB), "0100" is placed in the Received

MAP field. "0100" indicates the following: the reception of the data unit #2 failed (0); that of the data unit #3 succeeded (1); that of the data unit #4 failed (0); and that of the data unit #5 also failed (0).

When the data transmitting end receives this, it recognizes that the data units of up to #1 were received and the data unit #3 was also received. In the next data transmission, the data transmitting end deletes them from the transmit data unit candidate list, and transmits the data units of sequence numbers "2," "4," "5," and "6." It is assumed that the data units #4 and #5 are received with an error therein.

In the ACK Sequence field in the acknowledgement ACK returned by the data receiving end, "3," which indicates that the data units of up to #3 could be completely received, is placed. With the data unit #4 which is the data unit subsequent to #3 taken as the basis (as MSB), "0010" is placed in the Received MAP field. "0010" indicates the following: the reception of the data unit #4 failed (0); that of the data unit #5 also failed (0); that of the data unit #6 succeeded (1); and that of the data unit #7 failed (0).

Thus, the ACK Sequence field and the Received MAP are used together, and thereby ARQ (Automatic Repeat reQuest) is carried out. If the data transmitting end does not support selective acknowledgement, the following procedure is taken: when it receives an ACK and updates the transmit data unit candidate list, it disregards Received MAP. If the data receiving end does not support selective acknowledgement, the following

procedure is taken: it does not try to decode the data unit with an error therein and the subsequent pieces of data for linkage with the ACK Sequence field, and places zero in all the bits of the Received MAP field. Thus, even if communication is carried out between a communication station which supports selective acknowledgement and a communication station which does not, the communication can be maintained without failure.

G. Procedure for Acknowledgement of Sequence Number with RTS/CTS Procedure Used Together

FIG. 12 illustrates another concrete example of the interaction of individual fields which occurs when selective acknowledgement is carried out with RTS/CTS used together. Here, to give description with attention focused only on the portions related to the sequence number and the Received MAP, other fields will not be mentioned. However, in reality, procedures using other fields, which are described elsewhere, are also carried out. The example is on the assumption that the Received MAP field is constituted of four bits for the purpose of simplifying the explanation; however, the present invention is not limited to this constitution. With respect to RTS SMH, this example is on the assumption that the first or fourth example of constitution is adopted.

The data transmitting end transmits an RTS which indicates that the data units of sequence numbers "3," "4," "5," "6," …, are entered in the transmit data unit candidate list. At this time, in the RTS Sequence field in the RTS SMH, "3" is

placed which indicates the leading data unit, and in the RTS Received MAP field, "0000" is placed which indicates that all the data units #4 to #7 are transmit candidates.

Since all the data units indicated by the RTS have not received yet, the data receiving end does not return an ACK but returns a CTS and waits for incoming data units.

It is assumed that the data units #4 and #5 are received with an error therein. Further, it is assumed that delay ACK is specified for these data. Because of delay ACK, the receiving end does not immediately return an ACK.

To further transmit data, the data transmitting end transmits an RTS again which indicates that the data units #3, #4, #5, #6, ... are entered in the transmit data unit candidate list. Similarly with the foregoing, in the RTS Sequence field in the RTS SMH, "3" is placed which indicates the leading data unit, and in the RTS Received MAP, "0000" is placed which indicates that all the data units #4 to #7 are transmit candidates.

Since some of the data units indicated by the RTS have been already received, the data receiving end adds ACK information when it returns a CTS. At this time, "3" is placed in the ACK SEQUENCE field in the ACK SMH, indicating that the data units of up to #3 could be completely received. With the data unit #4 which is the data unit subsequent to "3" taken as the basis (as MSB), "0010" is placed in the Received MAP field. "0010" indicates the following: the reception of the data unit #4 failed (0); that of the data unit #5 also failed (0); that

of the data unit #6 succeeded (1); and that of the data unit #7 is failed (0).

When the data transmitting end receives this, it recognizes that the data units of up to #3 were received and the data unit #6 was also received. In the next data transmission, the data transmitting end deletes them from the transmit data unit candidate list, and further transmits the data units of sequence numbers "4," "5," "7," and "8" based on the CTS information.

Thus, the RTS Sequence field and the RTS Received MAP field are used, and further multiplexing of the CTS SMH and the ACK SMH is used together. Thereby, data can be transmitted and received without failure.

If the data transmitting end does not support selective acknowledgement, the following procedure can be taken: the transmitting end always places zero in all the bits of the RTS Received MAP field, and, when it receives an ACK and updates the transmit data unit candidate list, it disregards the Received MAP. If the data receiving end does not support selective acknowledgement, it can disregard the RTS Received MAP. Thus, even if communication is carried out between a communication station which supports selective acknowledgement and a communication station which does not, the communication can be maintained without failure.

H. Utilization of CTS Stored Sequence and Uses of Fields with RTS/CTS Procedure Used Together

FIG. 13 illustrates an example of data transmitting and receiving procedures wherein delay ACK and the RTS/CTS procedure are applied. This section gives description with attention focused on the handling of each sequence number and the use of the Stored Sequence field in the CTS SMH.

The example is on the assumption that the RTS Received MAP and Received MAP fields are both constituted of four bits for the purpose of simplifying the explanation; however, the subject matter of the present invention is not limited to this constitution. Further, it is assumed that the number of the Length fields in the RTS SMH is four, but the subject matter of the present invention is not limited to this. Some value is indicated in the Duration field; however, no notice will be taken of the correctness of the value by Duration here. With respect to RTS SMH, this example is also on the assumption that the first or fourth example of constitution is adopted.

Prior to data transmission, the data transmitting end transmits RTS(1). It indicates that the data units of sequence numbers "3," "4," "5," and "6" are entered in the transmit data unit candidate list at this time. (That is, "3" is placed in the RTS Sequence field, and "0000" is placed in the RTS Received MAP field. Further, the data transmitting end notifies that it desires that this data transmission should be completed in 255-unit time on the grounds of the data transmitting end. (That is, "255" is placed in the Max Duration field.) Further, the data transmitting end notifies that the lengths of the data units it is about to transmit are 200, 20, 100, and 80 unit bytes,

respectively. (That is, "200" is placed in Length0; "20" is placed in Length1; "100" is placed in Length2; and "80" is placed in Length3.) The time that lapses before the transmission of a CTS transmitted in response to this RTS is completed is set to 40-unit time, and "40" is written in the Duration field.

After receiving this, the data receiving end returns CTS(1). At this time, it determines rate class 1 as the transmission rate for data reception in accordance with the above-mentioned procedure, and notifies of this. (That is, "1" is placed in RATE). Further, the data receiving end determines that it receives the data units #3, #4, #5, and #6 in accordance with the above-mentioned procedure, and notifies that the time period required for completing the reception of them is 240-unit time. (That is, "240" is placed in Duration.) Further, the data receiving end holds the lengths of the data units of up to #6 which it determined to receive in this transaction. Then, it notifies that it has held information on the lengths of the data units of up to #6. (That is, "6" is placed in Stored Sequence.)

After receiving this, the data transmitting end transmits Data(1). At this time, it recognizes that it can transmit the data units #3, #4, #5, and #6 at the specified transmission rate class 1, in accordance with the above-mentioned procedure. Then, it transmits these information at transmission rate class 1. Since delay ACK is specified, "0" is placed in the Duration field. Further, the data transmitting end holds sequence number 6 reported by the Stored Sequence in the CTS so that it

can refer to the number when it transmits an RTS next time.

It is assumed that the data receiving end can extract only the data units of sequence numbers "3" and "6." However, the data transmitting end cannot confirm whether data reception succeeded or not, at this point of time.

To further transmit data units, the data transmitting end transmits RTS(2). At this time, the data units of sequence numbers "3," "4," "5," "6," ... are entered in the transmit data unit candidate list. When CTS(1) was received before, it was reported by Stored Sequence that "the lengths of the data units of up to sequence number 6 are held." Therefore, information is described which is related to the data units of higher sequence numbers than 6 in the transmit data unit candidate list. More specifically, the data transmitting end notifies that the data units of sequence numbers "7" and "8" are entered and also notifies of their lengths. (That is, "7" is placed in the RTS Sequence field; "0000" is placed in RTS Received MAP; "160" is placed in Length0; "120" is placed in Length1; "0" is placed in Length2; and "0" is placed in Length3.) That Length2 and Length3 are 0 notifies that transmit data candidates are only two data units with lengths of 160 and 120. Further, the data transmitting end notifies that it desires that this data transmission should be completed in 255-unit time on the grounds of the data transmitting end. (That is, "255" is placed in the Max Duration field.) Further, the time that lapses before the transmission of a CTS transmitted in response to this RTS is completed is set to 40-unit time, and "40" is written in the

Duration field.

After receiving this, the data receiving end returns CTS(2). At this time, it notifies that it determined rate class 2 as the transmission rate for data reception, in accordance with the above-mentioned procedure. (That is, "2" is placed in RATE in CTS SMH.) Further, the data receiving end determines that it receives the data units of sequence numbers "4," "5," and "7" in accordance with the above-mentioned procedure, and notifies that the time period required for completing the reception of them is 200-unit time. (That is, "200" is placed in Duration.) Further, the data receiving end holds the lengths of the data units of up to #7 which it determined to receive in this transaction. Then, it notifies that it has held information on the lengths of the data units of up to #7. (That is, "7" is placed in Stored Sequence in CTS SMH.) Further, the data receiving end determines to return ACK information as well, in accordance with the above-mentioned procedure, and notifies that it could completely receive the data units of up to #3 and could receive the data unit #6. (That is, "3" is placed in ACK Sequence in ACK SMH, and "0010" is placed in Received MAP.)

After receiving this, the data transmitting end transmits Data(2). Since ACK information is included, at this time, it updates the transmit data unit candidate list in accordance with the above-mentioned procedure. Thereafter, the data transmitting end recognizes that it can transmit the data units #4, #5, and #7 at the specified transmission rate class 2, and transmits them. Further, since delay ACK is specified, "0" is

placed in the Duration field. Further, the data transmitting end holds sequence number "7" reported by the Stored Sequence in the CTS so that it can refer to the number when it transmits an RTS next time.

To further transmit data units, the data transmitting end transmits RTS(3). At this time, it describes information related to the data units of higher sequence numbers than 7, which is the Stored Sequence held when CTS(2) was received, in the transmit data unit candidate list. More specifically, the data transmitting end notifies that the data unit of sequence number "8" is entered and also notifies of its length. (That is, "8" is placed in RTS Sequence; "0000" is placed in RTS Received MAP; "120" is placed in Length0; "0" is placed in Length1; "0" is placed in Length2; and "0" is placed in Length3.) Further, the data transmitting end notifies that it desires that this data transmission should be completed in 255-unit time on the grounds of the data transmitting end. (That is, "255" is placed in Max Duration.) Further, the time that lapses before the transmission of a CTS transmitted in response to this RTS is set to 40-unit time, and "40" is written in Duration.

Thus, the transmitter and the receiver set the fields in the respective packet headers, and refer to each other's headers and thereby determine the details of processing as the outcome of receive packets. As a result, even if delay ACK is used together, Length information is prevented from being uselessly specified in RTS, and thus the efficiency is enhanced.

I. Transmitting and Receiving Procedures for Traffic through TCP

FIG. 14 illustrates an example of the sequence in which traffic is transmitted and received through TCP/IP in accordance with the MAC procedure according to the present invention. Even if communication is of one way in terms of application, ACK is returned by the TCP layer typically every two segments, and it is brought into the form of asymmetrical two-way communication in the MAC layer. The figure illustrates an example in which delay ACK is applied; multiplexing of such packets as RTS, CTS, DATA, and ACK is permitted; and these are used together.

In conventional transmitting and receiving procedures through TCP, packets equivalent to 24 times in total are transmitted and received in the MAC layer to transmit five segments Data0 to Data4, as illustrated in FIG. 20. Thus, the processing is complicated and redundant.

In the transmitting and receiving procedures according to the present invention, packets equivalent to 15 times in total are transmitted and received in the MAC layer to transmit seven segments Data0 to Data6, as illustrated in FIG. 14.

As is obvious from the foregoing as well, it will be understood that, in the transmitting and receiving procedures according to the present invention, the process in the MAC layer is simplified, and its overheads can be significantly reduced.

Up to this point, the present invention has been described in details referring to the specific embodiments. However, it

is obvious that those skilled in the art can make modifications to or substitutions for the embodiments without departing from the scope of the present invention.

In this specification, description has been given to the embodiments made by applying the present invention to a system wherein the RTS/CTS procedure and the access method based on CSMA are used together in a wireless network in accordance with the IEEE802.11 standard. However, the subject matter of the present invention is not limited to this. For example, the present invention can be similarly applied to the following systems: a system wherein the RTS/CTS procedure is used together with a random access method other than CSMA; and a random access system in accordance with other requirements than in IEEE802.11.

In short, this specification discloses the present invention in the form of exemplification, and the contents of this specification should not be interpreted in a restrictive manner. The scope of the present invention, therefore, is to be determined solely by the following claims.

CLAIMS

1. A wireless communication system in which random access is made concomitantly using the RTS/CTS method wherein a communication station as the origin of data transmission transmits a request to send packet RTS (Request To Send) and starts data transmission in response to the reception of a response packet CTS (Clear To Send) from a communication station as the destination of data transmission,

wherein the RTS receiving communication station measures the quality of receive signal, determines a data rate based on the result of the measurement, describes the data rate in a CTS, and transmits the CTS, and

wherein the CTS receiving communication station carries out data transmission as the outcome of the reception of the CTS information based on the data rate described in the CTS.

2. The wireless communication system according to Claim 1,

wherein the RTS transmitting communication station describes in RTS the time that lapses before the reception of a packet containing the CTS information, transmitted as the outcome of the reception of RTS information, as medium reservation time information,

wherein the CTS transmitting communication station describes in CTS the time that lapses before the reception of a data packet, transmitted as the outcome of the reception of CTS information, as medium reservation time information, and

wherein other communication stations which receive RTS or CTS set a NAV (Network Allocation Vector), and keep it effective and other communication stations themselves in transmission prohibited state over the duration of the medium reservation time information.

3. The wireless communication system according to Claim 1,

wherein the RTS transmitting communication station describes in RTS factor information which is referred to by the RTS receiving communication station when it determines a data rate, and

wherein the RTS receiving communication station takes into account the factor information described in the RTS in addition to the result of the measurement of receive signal quality when it determines a data rate.

4. The wireless communication system according to Claim 3,

wherein as said factor information, information related to whether to aggressively determine a high data rate or passively determine a low data rate is described, and

wherein the RTS transmitting communication station determines factor information based on at least one of the transmission error rate for the RTS receiving communication station, the difference in transmission power between RTS packet and data packet, and the causal relationship between data rate and transmission power.

5. The wireless communication system according to Claim 1,

wherein the RTS transmitting communication station describes in RTS information related to one or more data units it tries to transmit, and

wherein the RTS receiving communication station determines the medium reservation time information in the duration of which the reception of all the data packets is completed based on the information related to the data units described in the RTS and the determined data rate, and describes the determined medium reservation time information in CTS.

6. The wireless communication system according to Claim 5,

wherein the CTS receiving communication station carries out data transmission as the outcome of the reception of CTS information based on the data rate described in the CTS so that the transmission is completed within the time specified by the medium reservation time information.

7. The wireless communication system according to Claim 5,

wherein the information related to data units is the data length of each data unit for which transmission is tried.

8. The wireless communication system according to Claim 5,

wherein the information related to data units is the sum of the data lengths of one or more data units for which transmission is tried.

9. The wireless communication system according to Claim 5,

wherein the information related to data units is the time length required for transmitting one or more data units for which transmission is tried.

10. The wireless communication system according to Claim 5,

wherein the information related to data units is information on the number of data units for which transmission is tried.

11. The wireless communication system according to Claim 5,

wherein, when the RTS receiving communication station determines medium reservation time information after the reception of RTS, the station takes into account the time at which the station itself completes data reception.

12. The wireless communication system according to Claim 5,

wherein the RTS transmitting communication station describes in RTS information on the period until the time until which the station itself can transmit, and

wherein the RTS receiving communication station gives consideration so that said information on the period described in the RTS is not exceeded when it determines medium reservation time information after the reception of RTS.

13. The wireless communication system according to Claim 5,

wherein the RTS transmitting communication station

assigns sequence numbers to transmit data units, describes in RTS the first sequence number of data it tries to transmit, and notifies of information related to the data units it tries to transmit, and

wherein the RTS receiving communication station refers to the first sequence number of data units described in the RTS, extracts data units already received from data units for which transmission is tried, excludes them from objects to be received, and then determines medium reservation time information.

14. The wireless communication system according to Claim 13,

wherein, if selective acknowledgement is applied, the RTS transmitting communication station describes in RTS reception acknowledgement information containing the first sequence number of data units for which data transmission is tried and bit map information obtained by mapping the reception confirmation information on the subsequent data units into bits corresponding to the relative positions to the first sequence number, and further generates information related to said data units with only data units for which reception confirmation has not been obtained taken as objects to be transmitted, and

wherein, if selective acknowledgement is applied, the RTS receiving communication station refers to said bit map information described in the RTS, extracts data units it has already received from data units for which transmission is tried, excludes them from the objects to be received, and then determines medium reservation time information.

15. The wireless communication system according to Claim 5, wherein, if a data unit already received is included in the data units to be transmitted described in the RTS, the RTS receiving communication station describes ACK information in CTS.

16. The wireless communication system according to Claim 5, wherein the CTS receiving communication station excludes the data units already received by the RTS receiving communication station from the objects to be transmitted based on the ACK information added to the CTS, and carries out data transmission based on the data rate described in the CTS.

17. The wireless communication system according to Claim 13, wherein the RTS receiving communication station stores one or more pieces of data length information of data units to be received, of data for which transmission is tried as the outcome of the RTS, and describes in CTS the sequence number of the last data unit stored.

18. The wireless communication system according to Claim 17, wherein the CTS receiving communication station stores the sequence number of said last data unit described in the CTS, and generates information related to data units for which transmission is tried in such form that the data unit indicated by the sequence number of said last data unit is not included

in objects to be transmitted when an RTS is transmitted next time.

19. A wireless communication system for transmitting and receiving a plurality of data units in which sequence numbers are assigned to transmit data units to identify the data units,

wherein, if selective acknowledgement is applied, the receiving communication station describes in reception acknowledgement information ACK the sequence numbers of completely received data units in the order of sequence number, and bit map information represented by mapping the state of reception of data of the subsequent sequence numbers into relative bit positions from the sequence numbers, and transmits the information,

wherein, if selective acknowledgement is applied, the receiving and transmitting communication stations add information indicating a causal data flow to transmit data and acknowledgement.

20. The wireless communication system according to Claim 19,

wherein the receiver station which does not support selective acknowledgement transmits said bit map information with zero set for all the bits of the bit map field.

21. The wireless communication system according to Claim 19,

wherein, with respect to at least one data flow, the ARQ system in which sequence numbers are not assigned is adopted,

and, when Link session is established, data is transmitted and received through the data flow, and thereby the sequence numbers of the transmitter station and the receiver station are synchronized with each other.

22. A wireless communication system in which random access is made concomitantly using the RTS/CTS method wherein a communication station as the origin of data transmission transmits a request to send packet RTS and starts data transmission in response to the reception of a response packet CTS from a communication station as the destination of data transmission,

wherein it is permitted to transmit and receive packets in which any two or more of request to send RTS, confirmative advice CTS, data, and acknowledgement ACK are multiplexed.

23. The wireless communication system according to Claim 22,

wherein the communication station sets the time by which the other station's transmission of a packet as the outcome of the transmission of a packet is completed, and describe it as medium reservation time information of the transmit packet.

24. The wireless communication system according to Claim 22,

wherein the communication station which receives a packet containing RTS information transmits a packet containing CTS information in accordance with the contents of the RTS, and

wherein the communication station which receives a packet

containing CTS information transmits a packet containing data in accordance with the contents of the CTS.

25. The wireless communication system according to Claim 22, wherein in the RTS, first information is described which indicates whether RTS information may be added to a CTS transmitted as the outcome of the RTS or not.

26. The wireless communication system according to Claim 25, wherein the RTS receiving communication station judges whether it may add RTS information to a packet returned or not, based on the first information in the RTS, and, if data of desiring to transmit to the RTS transmitting communication station is present, transmits a CTS to which RTS information is added for the purpose of transmitting the data or a packet containing RTS information for the purpose of transmitting the data.

27. The wireless communication system according to Claim 25, wherein the RTS receiving communication station, when a packet containing RTS information is received, and if data of desring to transmit to the RTS transmitting communication station is present, transmits a CTS to which RTS information is added for the purpose of transmitting the data or a packet containing RTS information for the purpose of transmitting the data.

28. The wireless communication system according to Claim 25, wherein the RTS transmitting communication station determines first information based on information elements contained in the packets received from the station as the destination of the RTS in the past.

29. The wireless communication system according to Claim 22, wherein, if the RTS receiving communication station recognizes from the information in the RTS that the RTS transmitting communication station is trying to transmit data already received by the RTS receiving communication station, adds ACK information to the CTS.

30. The wireless communication system according to Claim 22, wherein, if the data receiving communication station receives data which requests an ACK from the data transmitting communication station and judges that it has not transmitted the ACK of the data, the data receiving communication station adds ACK information when it transmits a packet of some kind to the data transmitting communication station.

31. The wireless communication system according to Claim 30, wherein the data receiving communication station does not add ACK information to a packet in which RTS information is solely transmitted.

32. The wireless communication system according to Claim 30,

wherein the communication station transmits data which requests an ACK in a packet directed to two or more communication stations.

33. The wireless communication system according to Claim 22,

wherein the RTS transmitting communication station transmits to the RTS receiving communication station an RTS in which an ACK request for requesting a return of the ACK of data it has transmitted so far is multiplexed.

34. The wireless communication system according to Claim 22,

wherein, if the RTS transmitting communication station failed to receive the ACK of data it has transmitted so far, it transmits to the RTS receiving communication station an RTS in which an ACK request for requesting a return of an ACK is multiplexed.

35. The wireless communication system according to Claim 33 or 34,

wherein the communication station which receives the RTS with an ACK request multiplexed returns an ACK which indicates whether the reception of data transmitted from said RTS transmitting communication station has been completed or not, or, if it has failed to receive data transmitted from said RTS transmitting communication station, multiplexes a CTS which requests to retransmit the data and an ACK of the ACK request and returns them.

36. A wireless communication device which makes random access concomitantly using the RTS/CTS method wherein a communication station as the origin of data transmission transmits a request to send packet RTS and starts data transmission in response to the reception of a response packet CTS from a communication station as the destination of data transmission, the wireless communication device comprising:

a communication quality measuring means which measures the quality of receive signal when an RTS is received;

a data rate determining means which determines a data rate based on the measured quality of receive signal; and

a CTS transmitting means which describes the data rate in CTS as the outcome of the received RTS and transmits the CTS.

37. The wireless communication device according to Claim 36, further comprising:

an RTS transmitting means which transmits an RTS when the device requests data transmission; and

a data transmitting means which, based on the data rate described in the CTS when it receives CTS information, carries out data transmission as the outcome of the CTS information.

38. The wireless communication device according to Claim 37,

wherein said RTS transmitting means describes in RTS the time that lapses before the reception of a packet containing CTS information, transmitted as the outcome of the reception

of RTS information, as medium reservation time information , and transmits the RTS, and

wherein said CTS transmitting means describes in CTS the time that lapses before the reception of a data packet, transmitted as the outcome of the reception of CTS information, as medium reservation time information , and

wherein a transmission stopping means is further provided which, when the wireless communication device receives an RTS or a CTS not directed to itself, sets an NAV and keeps it effective and the wireless communication device itself in transmission prohibited state over the duration of medium reservation time information.

39. The wireless communication device according to Claim 37,

wherein said RTS transmitting means describes in RTS factor information which is referred to by the RTS receiving communication station when it determines a data rate, and

wherein said data rate determining means takes into account the factor information described in the RTS in addition to the result of the measurement of receive signal quality when it determines a data rate.

40. The wireless communication device according to Claim 39,

wherein said factor information is information related to whether to aggressively determine a high data rate or passively determine a low data rate, and

wherein said RTS transmitting means determines factor

information based on at least one of the transmission error rate for the RTS receiving communication station, the difference in transmission power between RTS packet and data packet, and the causal relationship between data rate and transmission power.

41. The wireless communication device according to Claim 37,

wherein said RTS transmitting means describes in RTS information related to one or more data units it tries to transmit, and

wherein said CTS transmitting means determines the medium reservation time information in the duration of which the reception of all the data packets is completed based on information related to the data units described in RTS and the determined data rate.

42. The wireless communication device according to Claim 41,

wherein said data transmitting means carries out data transmission as the outcome of the reception of CTS information based on the data rate described in the CTS so that the transmission is completed within the time specified by the medium reservation time information.

43. The wireless communication device according to Claim 41,

wherein the information related to data units is the data length of each data unit for which transmission is tried.

44. The wireless communication device according to Claim 41,

wherein the information related to data units is the sum of the data lengths of one or more data units for which transmission is tried.

45. The wireless communication device according to Claim 41,

wherein the information related to data units is the time length required for transmitting one or more data units for which transmission is tried.

46. The wireless communication device according to Claim 41,

wherein the information related to data units is information on the number of data units for which transmission is tried.

47. The wireless communication device according to Claim 41,

wherein, when said CTS transmitting means determines medium reservation time information after the reception of RTS, the transmitting means takes into account the time at which the communication device itself completes data reception.

48. The wireless communication device according to Claim 41,

wherein said RTS transmitting means describes in RTS information on the period until the time until which the communication device itself can transmit, and

wherein said CTS transmitting means gives consideration so that said information on the period described in the RTS is not exceeded when it determines medium reservation time

information after the reception of RTS.

49. The wireless communication device according to Claim 41,

wherein said data transmitting means assigns sequence numbers to transmit data units,

wherein said RTS transmitting means describes in RTS the first sequence number of data for which transmission is tried, and notifies of information related to data units for which transmission is tried, and

wherein said CTS transmitting means refers to the first sequence number of data units described in the RTS, extracts data units already received from data units for which transmission is tried, excludes them from objects to be received, and then determines medium reservation time information.

50. The wireless communication device according to Claim 49,

wherein, if selective acknowledgement is applied, said RTS transmitting means describes in RTS reception acknowledgement information containing the first sequence number of data units for which data transmission is tried and bit map information obtained by mapping the reception confirmation information on the subsequent data units into bits corresponding to the relative positions to the first sequence number, and further generates information related to said data units with only data units for which reception confirmation has not been obtained taken as objects to be transmitted, and

wherein, if selective acknowledgement is applied, said

CTS transmitting means refers to said bit map information described in the RTS, extracts data units already received from data units for which transmission is tried, excludes them from the objects to be received, and then determines medium reservation time information.

51. The wireless communication device according to Claim 41, wherein, if a data unit already received is included in the data units to be transmitted described in the RTS, said CTS transmitting means describes ACK information in CTS.

52. The wireless communication device according to Claim 41, wherein said data transmitting means excludes the data units already received by the RTS receiving communication station from the objects to be transmitted based on the ACK information added to the CTS, and carries out data transmission based on the data rate described in the CTS.

53. The wireless communication device according to Claim 49, wherein said CTS transmitting means stores one or more pieces of data length information of data units to be received, of data for which transmission is tried as the outcome of the RTS, and describes in CTS the sequence number of the last data unit stored.

54. The wireless communication device according to Claim 53, wherein said RTS transmitting means stores the sequence

number of said last data unit described in the CTS, and generates information related to data units for which transmission is tried in such form that the data unit indicated by the sequence number of said last data unit is not included in objects to be transmitted when an RTS is transmitted next time.

55. A wireless communication device for transmitting and receiving a plurality of data units in which sequence numbers are assigned to transmit data units to identify the data units, comprising:

an ACK information transmitting means which, if selective acknowledgement is applied, describes in a reception acknowledgement information ACK the sequence numbers of completely received data units in the order of sequence number, and bit map information represented by mapping the state of reception of data of the subsequent sequence numbers into relative bit positions from the sequence numbers in response to data reception, and transmits the information, and

a packet transmitting means which, if selective acknowledgement is applied, adds information indicating a causal data flow when it transmits transmit data and an acknowledgement in response to data reception/transmission.

56. The wireless communication device according to Claim 55,

wherein, if said ACK information transmitting means does not support selective acknowledgement, it transmits said bit map information with zero set for all the bits of the bit map

field.

57. The wireless communication device according to Claim 55, wherein, with respect to at least one data flow, the ARQ system in which sequence numbers are not assigned is adopted, and, when Link session is established, data is transmitted and received through the data flow, and thereby the communication device synchronizes its sequence numbers with those of the station on the other end.

58. A wireless communication device which makes random access concomitantly using the RTS/CTS method wherein a communication station as the origin of data transmission transmits a request to send packet RTS and starts data transmission in response to the reception of a response packet CTS from a communication station as the destination of data transmission, the wireless communication device comprising:

an information generating means which generates information of request to send RTS, confirmative advice CTS, data, and acknowledgement ACK; and

a packet transfer communication means which transmits and receives packets in which any two or more of request to send RTS, confirmative advice CTS, data, and acknowledgement ACK are multiplexed.

59. The wireless communication device according to Claim 58, further comprising:

a means which sets the time by which the other station's transmission of a packet as the outcome of the transmission of a packet is completed, and describes the set time information as the reservation time information of the transmit packet.

60. The wireless communication device according to Claim 58, further comprising:

a means which, in response to the reception of a packet containing RTS information, transmits a packet containing CTS information in accordance with the contents of the RTS; and

a means which, in response to the reception of a packet containing CTS information, transmits a packet containing data in accordance with the contents of the CTS.

61. The wireless communication device according to Claim 58,

wherein, when generating RTS information, said information generating means describes first information which indicates whether RTS information may be added to CTS transmitted as the outcome of the RTS.

62.The wireless communication device according to Claim 61,

wherein, when transmitting a return packet, said packet transmitting means judges whether RTS information may be added to CTS based on the first information in the causal RTS, and, if data it desires to transmit to the RTS transmitting communication station is present, transmits a CTS to which RTS information is added for the purpose of transmitting the data

or a packet containing RTS information for the purpose of transmitting the data.

63. The wireless communication device according to Claim 62,

wherein said packet transmitting means, when transmitting a return packet in response to the packet containg RTS information, if data of desiring to transmit to the RTS transmitting communication station is present, transmits a CTS to which RTS information is added for the purpose of transmitting the data or a packet containing RTS information for the purpose of transmitting the data.

64. The wireless communication device according to Claim 61,

wherein said information generating means determines first information based on information elements contained in the packets received from the station as the destination of the RTS in the past.

65. The wireless communication device according to Claim 58,

wherein, if said packet transfer communication means recognizes from the information in the RTS that the causal RTS transmitting communication station is trying to transmit data already received by the communication device itself when transmitting a CTS, the packet transfer communication means adds ACK information to the CTS.

66. The wireless communication device according to Claim 58,

wherein, if said packet transfer communication means receives data which requests an ACK from the data transmitting communication station in response to the reception of a data packet and judges that it has not transmitted the ACK of the data, the packet transfer communication means adds ACK information when it transmits a packet of some kind to the data transmitting communication station.

67. The wireless communication device according to Claim 66,

wherein said packet transfer communication means does not add ACK information to a packet in which RTS information is solely transmitted.

68. The wireless communication device according to Claim 66,

wherein said packet transfer communication means transmits data which requests an ACK in a packet directed to two or more communication stations.

69. The wireless communication device according to Claim 58,

wherein, when transmitting an RTS, said packet transfer communication means multiplexes an ACK request for requesting a return of the ACK of data it has transmitted so far.

70. The wireless communication device according to Claim 58,

wherein, if said packet transfer communication means failed to receive the ACK of data it has transmitted so far, it multiplexes an ACK request for requesting a return of the

ACK of data it has transmitted so far when transmitting an RTS.

71. The wireless communication device according to Claim 69 or 70,

wherein, in response to the reception of an RTS with an ACK request multiplexed, said information generating means generates an ACK which indicates whether the reception of data transmitted from the RTS transmitting communication station has been completed or not, and

wherein said packet transfer communication means returns an ACK which indicates whether the reception of data transmitted from the RTS transmitting communication station has been completed or not, or, if it has failed to receive data transmitted from said RTS transmitting communication station, multiplexes a CTS which requests to retransmit the data and an ACK of the ACK request and returns them.

72. A wireless communication method for making random access concomitantly using the RTS/CTS method wherein a communication station as the origin of data transmission transmits a request to send packet RTS and starts data transmission in response to the reception of a response packet CTS from a communication station as the destination of data transmission, the method comprising:

a communication quality measuring step in which the quality of receive signal is measured when an RTS is received;

a data rate determining step in which a data rate is

determined based on the measured quality of receive signal;

a CTS transmitting step in which the data rate is described in an CTS as the outcome of the received RTS and transmitted; and

a data transmitting step in which, when CTS information is received, data transmission as the outcome of the CTS information is carried out based on the data rate described in the CTS.

73. A wireless communication method for transmitting and receiving a plurality of data units, comprising the steps of:

assigning sequence numbers to transmit data units to identify the data units, and, if selective acknowledgement is applied, describing in reception acknowledgement information ACK the sequence numbers of completely received data units in the order of sequence number and bit map information represented by mapping the state of reception of data of the subsequent sequence numbers into relative bit positions from the sequence numbers in response to data reception, and transmitting the information; and

adding information indicating a causal data flow when transmitting transmit data and an acknowledgement in response to data transmission/reception.

74. A wireless communication method for making random access concomitantly using the RTS/CTS method wherein a communication station as the origin of data transmission transmits a request

to send packet RTS and starts data transmission in response to the reception of a response packet CTS from a communication station as the destination of data transmission, the method comprising:

an information generating step in which information of request to send RTS, confirmative advice CTS, data, and acknowledgement ACK is generated; and

a packet transfer communication step in which a packet in which any two or more pieces of information of request to send RTS, confirmative advice CTS, data, and acknowledgement ACK are multiplexed is transmitted and received.

75. A computer program described in a computer-readable format for carrying out on a computer system the processing for controlling communicating operation in a communication environment in which random access is made concomitantly using the RTS/CTS method wherein a communication station as the origin of data transmission transmits a request to send packet RTS and starts data transmission in response to the reception of a response packet CTS from a communication station as the destination of data transmission, the computer program comprising:

a communication quality measuring step in which the quality of receive signal is measured when an RTS is received;

a data rate determining step in which a data rate is determined based on the measured quality of receive signal;

a CTS transmitting step in which the data rate is described

in a CTS as the outcome of the received RTS and transmitted; and

a data transmitting step in which, when CTS information is received, data transmission as the outcome of the CTS information is carried out based on the data rate described in the CTS.

76. A computer program described in a computer-readable format for carrying out on a computer system the control of communicating operation for transmitting and receiving a plurality of data units, the computer program comprising the steps of:

assigning sequence numbers to transmit data units to identify the data units, and, if selective acknowledgement is applied, describing in reception acknowledgement information ACK the sequence numbers of completely received data units in the order of sequence number and bit map information represented by mapping the state of reception of data of the subsequent sequence numbers into relative bit positions from the sequence numbers in response to data reception, and transmitting the information; and

adding information indicating a causal data flow when transmitting transmit data and an acknowledgement in response to data transmission/reception.

77. A computer program described in a computer-readable format for carrying out on a computer system the processing for

controlling communicating operation in a communication environment in which random access is made concomitantly using the RTS/CTS method wherein a communication station as the origin of data transmission transmits a request to send packet RTS and starts data transmission in response to the reception of a response packet CTS from a communication station as the destination of data transmission, the computer program comprising:

an information generating step in which information of request to send RTS, confirmative advice CTS, data, and acknowledgement ACK is generated; and

a packet transfer communication step in which a packet in which any two or more pieces of information of request to send RTS, confirmative advice CTS, data, and acknowledgement ACK are multiplexed is transmitted and received.

78. A wireless communication system in which random access is made concomitantly using the RTS/CTS method wherein a communication station as the origin of data transmission transmits a request to send packet RTS and starts data transmission in response to the reception of a response packet CTS from a communication station as the destination of data transmission,

wherein the RTS transmitting communication station transmits an RTS in which information related to one or more data units for which transmission is tried is described.

79. The wireless communication system according to Claim 78, wherein the information related to data units is the data length of each data unit for which transmission is tried.

80. The wireless communication system according to Claim 78, wherein the information related to data units is the sum of the data lengths of one or more data units for which transmission is tried.

81. The wireless communication system according to Claim 78, wherein the information related to data units is the time length required for transmitting one or more data units for which transmission is tried.

82. The wireless communication system according to Claim 78, wherein the information related to data units is information on the number of data units for which transmission is tried.

83. The wireless communication system according to Claim 78, wherein, when the RTS receiving communication station determines medium reservation time information after the reception of RTS, the station takes into account the time at which the station itself completes data reception.

84. The wireless communication system according to Claim 78, wherein the RTS transmitting communication station

describes in RTS information on the period until the time until which the communication station itself can transmit, and

wherein the RTS receiving communication station gives consideration so that said information on the period described in the RTS is not exceeded when it determines medium reservation time information after the reception of RTS.

85. The wireless communication system according to Claim 78,

wherein the RTS transmitting communication station describes in RTS the time that lapses before the reception of a packet containing CTS information, transmitted as the outcome of the reception of RTS information, as medium reservation time information , and

wherein other communication stations which receive RTS set a NAV, and keep it effective and communication stations themselves in transmission prohibited state over the duration of medium reservation time information.

86. The wireless communication system according to Claim 78,

wherein the RTS receiving communication station measures the quality of receive signal and determines a data rate based on the result of measurement.

87. The wireless communication system according to Claim 78,

wherein the CTS transmitting communication station describes in CTS a data rate at which it desires to receive, and transmits the CTS.

88. The wireless communication system according to Claim 87, wherein the CTS receiving communication station carries out data transmission as the outcome of the reception of CTS information based on the data rate described in the CTS.

89. The wireless communication system according to Claim 78, wherein the CTS transmitting communication station describes in CTS the time that lapses before the reception of a data packet, transmitted as the outcome of the reception of CTS information, as medium reservation time information , and wherein other communication stations which receive CTS set a NAV, and keep it effective and themselves in transmission prohibited state over the duration of medium reservation time information.

90. The wireless communication system according to Claim 89, wherein the CTS transmitting communication station determines medium reservation time information which corresponds to the time period during which the reception of a data unit, transmitted from the RTS transmitting end, is completed based on the information related to each data unit described in the received RTS.

91. The wireless communication system according to Claim 89, wherein, if it is described in RTS that a plurality of data units are transmitted from the RTS transmitting

communication station, the CTS transmitting communication station determines medium reservation time information which corresponds to the time period during which the reception of all the data units is completed.

92. The wireless communication system according to Claim 89, wherein the CTS receiving communication station carries out data transmission as the outcome of the reception of CTS information based on the data rate described in the CTS so that the transmission is completed within the time specified by the medium reservation time information.

93. The wireless communication system according to Claim 78, wherein the RTS transmitting communication station assigns sequence numbers to transmit data units, describes in RTS the first sequence number of data it tries to transmit, and notifies of information related to the data units it tries to transmit.

94. The wireless communication system according to Claim 93, wherein the RTS receiving communication station refers to the first sequence number of data units described in RTS, extracts data units already received from data units for which transmission is tried, excludes them from objects to be received, and then determines medium reservation time information.

95. The wireless communication system according to Claim 93,

wherein, if selective acknowledgement is applied, the RTS transmitting communication station describes in RTS reception acknowledgement information containing the first sequence number of data units for which data transmission is tried and bit map information obtained by mapping the reception confirmation information on the subsequent data units into bits corresponding to the relative positions to the first sequence number, and further generates information related to said data units with only data units for which reception confirmation has not been obtained taken as objects to be transmitted, and

wherein, if selective acknowledgement is applied, the RTS receiving communication station refers to said bit map information described in the RTS, extracts data units it has already received from data units for which transmission is tried, and then determines medium reservation time information.

96. The wireless communication system according to Claim 93,

wherein the RTS receiving communication station stores one or more pieces of data length information of data units to be received, of data for which transmission is tried as the outcome of the RTS, and describes in CTS the sequence number of the last data unit stored.

97. The wireless communication system according to Claim 96,

wherein the CTS receiving communication station stores the sequence number of said last data unit described in the CTS, and generates information related to data units for which

transmission is tried in such form that the data unit indicated by the sequence number of said last data unit is not included in objects to be transmitted when an RTS is transmitted next time.

98. The wireless communication system according to Claim 78, wherein, if a data unit already received is included in the data units to be transmitted described in the RTS, the RTS receiving communication station describes ACK information in CTS.

99. The wireless communication system according to Claim 78, wherein the CTS receiving communication station excludes the data units already received by the RTS receiving communication station from the objects to be transmitted based on the ACK information added to the CTS, and carries out data transmission based on the data rate described in the CTS.

100. A wireless communication device which makes random access concomitantly using the RTS/CTS method wherein a communication station as the origin of data transmission transmits a request to send packet RTS and starts data transmission in response to the reception of a response packet CTS from a communication station as the destination of data transmission, the wireless communication device comprising:

an RTS transmitting means which transmits an RTS when data transmission is requested;

a data transmitting means which, when CTS information is received, carries out data transmission as the outcome of the CTS information; and

a CTS transmitting means which, when an RTS is received, transmits a CTS as the outcome of the RTS,

wherein said RTS transmitting means transmits an RTS in which information related to one or more data units for which transmission is tried is described.

101. The wireless communication device according to Claim 100,

wherein the information related to data units is the data length of each data unit for which transmission is tried.

102. The wireless communication device according to Claim 100,

wherein the information related to data units is the sum of the data lengths of one or more data units for which transmission is tried.

103. The wireless communication device according to Claim 100,

wherein the information related to data units is the time length required for transmitting one or more data units for which transmission is tried.

104. The wireless communication device according to Claim 100,

wherein the information related to data units is information on the number of data units for which transmission is tried.

105. The wireless communication device according to Claim 100,

wherein said CTS transmitting means describes in CTS medium reservation time information which is determined after the reception of RTS with consideration given to the time at which the communication device itself completes data reception.

106. The wireless communication device according to Claim 100,

wherein said RTS transmitting means describes in RTS information on the period until the time until which the communication device itself can transmit, and

wherein said CTS transmitting means describes in CTS medium reservation time information determined with consideration given so that said information on the period described in the received RTS is not exceeded.

107. The wireless communication device according to Claim 100,

wherein said RTS transmitting means describes in RTS the time that lapses before the reception of a packet containing CTS information, transmitted as the outcome of the reception of RTS information, as medium reservation time information.

108. The wireless communication device according to Claim 100, further comprising:

a communication quality measuring means which measures the quality of receive signal when an RTS is received; and

a data rate determining means which determines a data rate

based on the measured quality of receive signal.

109. The wireless communication device according to Claim 100, wherein said CTS transmitting means describes in CTS a data rate at which it desires to receive, and transmits the CTS.

110. The wireless communication device according to Claim 109, wherein said data transmitting means carries out data transmission as the outcome of the reception of CTS information based on the data rate described in the CTS.

111. The wireless communication device according to Claim 100, wherein said CTS transmitting means describes in CTS the time that lapses before the reception of a data packet, transmitted as the outcome of the reception of CTS information, as medium reservation time information .

112. The wireless communication device according to Claim 111, wherein said CTS transmitting means determines medium reservation time information which corresponds to the time period during which the reception of a data unit, transmitted from the RTS transmitting end, is completed based on the information related to each data unit described in the received RTS.

113. The wireless communication device according to Claim 106, wherein, if an RTS in which it is described that a

plurality of data units are transmitted is received, said CTS transmitting means determines medium reservation time information which corresponds to the time period during which the reception of all the data units is completed.

114. The wireless communication device according to Claim 111, wherein said data transmitting means carries out data transmission as the outcome of the reception of CTS information based on the data rate described in the received CTS so that the transmission is completed within the time specified by the medium reservation time information.

115. The wireless communication device according to Claim 100, wherein said RTS transmitting means assigns sequence numbers to transmit data units, describes in RTS the first sequence number of data it tries to transmit, and notifies of information related to the data units it tries to transmit.

116. The wireless communication device according to Claim 115, wherein said CTS transmitting means describes in CTS medium reservation time information determined after referring to the first sequence number of data units described in RTS, extracting data units already received from data units for which transmission is tried, and excluding them from objects to be received.

117. The wireless communication device according to Claim 115,

wherein, if selective acknowledgement is applied, said RTS transmitting means describes in RTS reception acknowledgement information containing the first sequence number of data units for which data transmission is tried and bit map information obtained by mapping the reception confirmation information on the subsequent data units into bits corresponding to the relative positions to the first sequence number, and further generates information related to said data units with only data units for which reception confirmation has not been obtained taken as objects to be transmitted, and

wherein, if selective acknowledgement is applied, said CTS transmitting means describes in CTS medium reservation time information determined after referring to said bit map information described in the received RTS, and extracting data units it has already received from data units for which transmission is tried.

118. The wireless communication device according to Claim 115,

wherein said CTS transmitting means stores one or more pieces of data length information of data units to be received, of data for which transmission is tried as the outcome of the received RTS, and describes in CTS the sequence number of the last data unit stored.

119. The wireless communication device according to Claim 118,

wherein said data transmitting means stores the sequence number of said last data unit described in CTS, and generates

information related to data units for which transmission is tried in such form that the data unit indicated by the sequence number of said last data unit is not included in objects to be transmitted when an RTS is transmitted next time.

120. The wireless communication device according to Claim 100, wherein, if a data unit already received is included in the data units to be transmitted described in the RTS, said CTS transmitting means describes ACK information in CTS.

121. The wireless communication device according to Claim 100, wherein said data transmitting means excludes the data units already received by the RTS receiving communication station from the objects to be transmitted based on the ACK information added to the CTS, and carries out data transmission based on the data rate described in the CTS.

122. A wireless communication method for making random access concomitantly using the RTS/CTS method wherein a communication station as the origin of data transmission transmits a request to send packet RTS and starts data transmission in response to the reception of a response packet CTS from a communication station as the destination of data transmission, the method comprising:

an RTS transmitting step in which, when data transmission is requested, an RTS in which information related to one or more data units for which transmission is tried is described is

transmitted;

a CTS transmitting step in which, when an RTS is received, a CTS in which medium reservation time information determined based on the information related to each data unit described in the RTS and the data rate is transmitted; and

a data transmitting step in which, when CTS information is received, data transmission as the outcome of the reception of the CTS information is carried out so that the transmission is completed within the time specified by the medium reservation time information.

123. A computer program described in a computer-readable format for carrying out on a computer system the processing for controlling communicating operation in a communication environment in which random access is made concomitantly using the RTS/CTS method wherein a communication station as the origin of data transmission transmits a request to send packet RTS and starts data transmission in response to the reception of a response packet CTS from a communication station as the destination of data transmission, the computer program comprising:

an RTS transmitting step in which, when data transmission is requested, an RTS in which information related to one or more data units for which transmission is tried is described is transmitted;

a CTS transmitting step in which, when an RTS is received, a CTS in which medium reservation time information determined

based on the information related to each data unit described in the RTS and the data rate is described is transmitted; and

a data transmitting step in which, when CTS information is received, data transmission as the outcome of the reception of CTS information is carried out so that the transmission is completed within the time specified by the medium reservation time information.

124. A wireless communication system in which a data transmitting communication station acquires transmission right on a medium and then carries out data communication with a data receiving communication station,

wherein, after data transmission from the data transmitting communication station is stopped, it is detected whether the subsequent data is present in the data transmitting communication station or not, and, if the subsequent data is present, it is made easier for the data transmitting communication station to acquire transmission right for transmitting the subsequent data.

125. The wireless communication system according to Claim 124, in which medium access control wherein each communication station confirms that said medium is clear only for a predetermined time, waits for an arbitrary backoff time, and then acquires transmission right is carried out by each communication station,

wherein, when the data receiving communication station

detects the presence of the subsequent data in the data transmitting communication station, the data receiving communication station tries to acquire transmission right on said medium, and transmits a signal onto said medium for eliminating other communication stations' transmission right and thereby makes it easier for the data transmitting communication station to acquire transmission right for transmitting the subsequent data.

126. The wireless communication system according to Claim 124, in which medium access control is carried out by each communication station concomitantly using the RTS/CTS method wherein a communication station as the origin of data transmission transmits a request to send packet RTS and starts data transmission in response to the reception of a response packet CTS from a communication station as the destination of data transmission,

wherein, when the data receiving communication station detects the presence of the subsequent data in the data transmitting communication station, the data receiving communication station transmits a dummy RTS or an RTS onto said medium for eliminating other communication stations' transmission right, and thereby makes it easier for the data transmitting communication station to transmit an RTS for transmitting the subsequent data.

127. The wireless communication system according to Claim 124,

wherein the presence or absence of the subsequent data in the data transmitting communication station is detected based on the history of communication between the data transmitting communication station and the data receiving communication station in the past.

128. The wireless communication system according to Claim 124,

wherein the presence or absence of the subsequent data in the data transmitting communication station is detected based on that an RTS from the data transmitting communication station reaches the data receiving communication station and the data receiving communication station can not return a CTS, or that after the data receiving communication station returns a CTS,

transmit data does not reach the data receiving communication station.

129. The wireless communication system according to Claim 124,

wherein the presence or absence of the subsequent data in the data transmitting communication station is detected based on specific information elements indicating the presence or absence of the subsequent data, contained in the data transmitted from the data transmitting communication station.

130. A wireless communication device which operates in a communication environment in which each communication station acquires transmission right on the medium before carrying out

data communication, comprising:

a communicating means which transmits and receives data on said medium;

a data processing means which processes transmit/receive data; and

a medium access controlling means which controls access operation on said medium,

wherein, after data transmission from the data transmitting communication station is stopped, said data processing means detects the presence or absence of the subsequent data in the data transmitting communication station, and

wherein, if the subsequent data is present, said medium access controlling means makes it easier for the data transmitting communication station to acquire transmission right for transmitting the subsequent data.

131. The wireless communication device according to Claim 130,

wherein said medium access controlling means carries out medium access control wherein it confirms that said medium only for a predetermined time, waits for an arbitrary backoff time, and then acquires transmission right, and, if it detects the presence of the subsequent data in the data transmitting communication station, tries to acquire transmission right on said medium, transmits a signal to said medium for eliminating other communication stations' transmission right, and thereby makes it easier for the data transmitting communication station

to acquire transmission right for transmitting the subsequent data.

132. The wireless communication device according to Claim 130, wherein said medium access controlling means carries out medium access control concomitantly using the RTS/CTS method wherein a communication station as the origin of data transmission transmits a request to send packet RTS and starts data transmission in response to the reception of a response packet CTS from a communication station as the destination of data transmission, and, if it detects the presence of the subsequent data in the data transmitting communication station, transmits a dummy RTS or an RTS onto said medium for eliminating other communication stations' transmission right, and thereby makes it easier for the data transmitting communication station to acquire transmission right for transmitting the subsequent data.

133. The wireless communication device according to Claim 130, wherein said data processing means detects the presence or absence of the subsequent data in the data transmitting communication station based on the history of communication with the data transmitting communication station in the past.

134. The wireless communication device according to Claim 130, wherein said data processing means detects the presence or absence of the subsequent data in the data transmitting

communication station based on that it can not return a CTS in response to an RTS from the data transmitting communication station, or that it returns a CTS in response to an RTS from the data transmitting communication station thereafter the transmission of transmit data from the data transmitting communication station is stopped.

135. The wireless communication device according to Claim 130,

wherein said data processing means detects the presence or absence of the subsequent data in the data transmitting communication station based on specific information elements indicating the presence or absence of the subsequent data, contained in the data transmitted from the data transmitting communication station.

136. A wireless communication method in a communication environment in which each communication station acquires transmission right on the medium before carrying out data communication, comprising:

a step in which the presence or absence of transmit data from other communication stations is detected; and

a medium access control step in which, in response to detection of the presence of transmit data from another communication station, a signal is transmitted onto said medium for eliminating other communication stations' transmission right so as to make it easier for the communication station to acquire transmission right for transmitting data.

137. A computer program described in a computer-readable format for carrying out on a computer system the processing for controlling communicating operation in a communication environment in which each communication station acquires transmission right on the medium before carrying out data communication, the computer program comprising:

a step in which the presence or absence of transmit data from other communication stations is detected; and

a medium access control step in which, in response to detection of the presence of transmit data from another communication station, a signal is transmitted onto said medium for eliminating other communication stations' transmission right so as to make it easier for the communication station to acquire transmission right for transmitting data.

FIG. 1

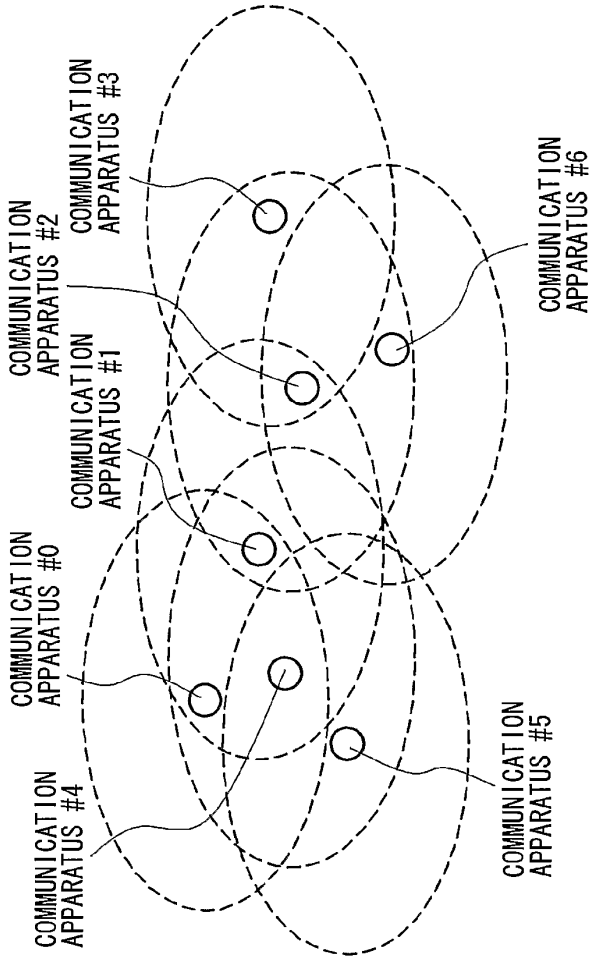

COMMUNICATION APPARATUS #3
COMMUNICATION APPARATUS #2
COMMUNICATION APPARATUS #6
COMMUNICATION APPARATUS #1
COMMUNICATION APPARATUS #0
COMMUNICATION APPARATUS #4
COMMUNICATION APPARATUS #5

FIG. 2

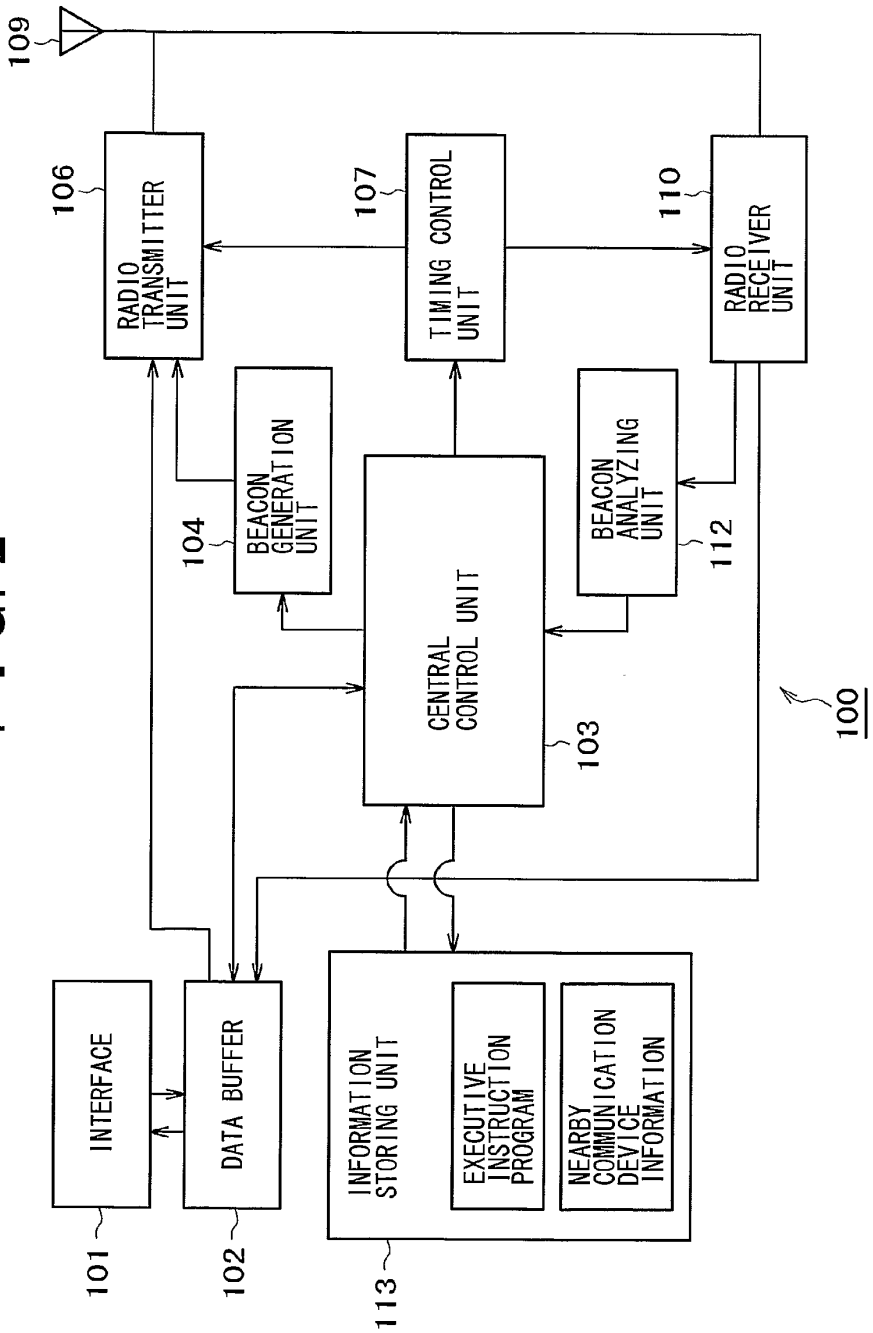

109
106
RADIO TRANSMITTER UNIT
107
TIMING CONTROL UNIT
110
RADIO RECEIVER UNIT
104
BEACON GENERATION UNIT
112
BEACON ANALYZING UNIT
CENTRAL CONTROL UNIT
103
100
INTERFACE
DATA BUFFER
INFORMATION STORING UNIT
EXECUTIVE INSTRUCTION PROGRAM
NEARBY COMMUNICATION DEVICE INFORMATION
101
102
113

FIG. 3

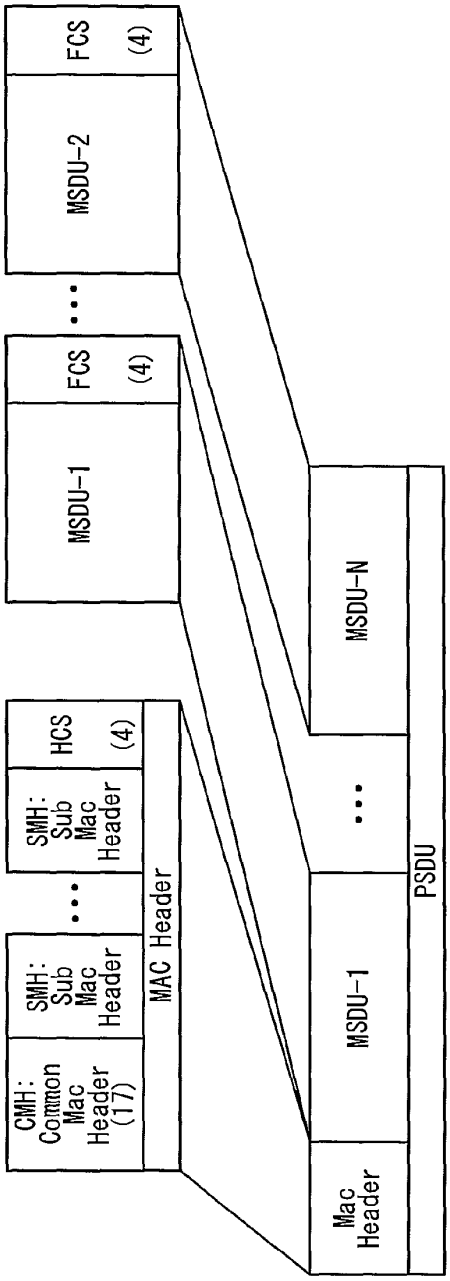

CMH: Common Mac Header (17)
SMH: Sub Mac Header
...
SMH: Sub Mac Header
HCS (4)
MAC Header
MSDU-1
FCS (4)
...
MSDU-2
FCS (4)
Mac Header
MSDU-1
...
MSDU-N
PSDU

FIG. 4

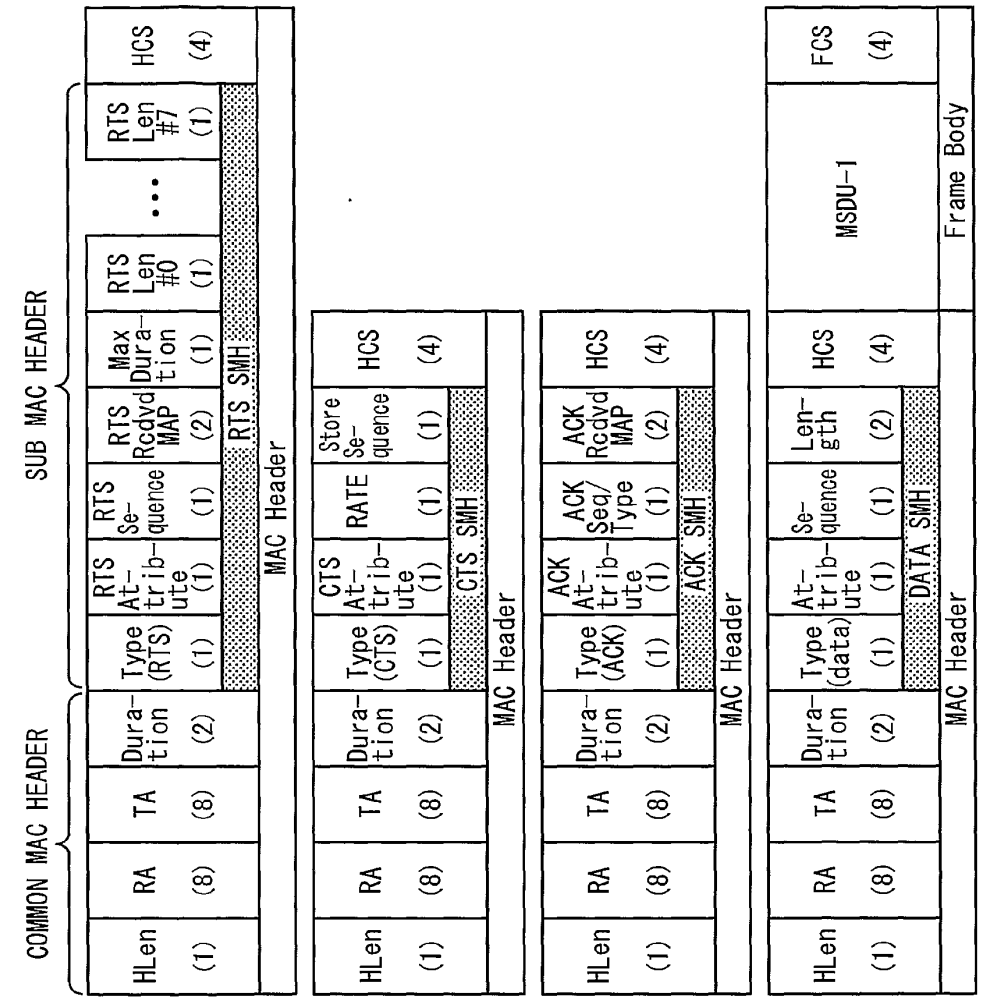

COMMON MAC HEADER
SUB MAC HEADER
HLen (1)
RA (8)
TA (8)
Dura-tion (2)
Type (RTS) (1)
RTS At-trib-ute (1)
RTS Se-quence (1)
RTS Rcdvd MAP (2)
Max Dura-tion (1)
RTS Len #0 (1)
...
RTS Len #7 (1)
HCS (4)
RTS SMH
MAC Header
RTS FRAME
Type (CTS) (1)
CTS At-trib-ute (1)
RATE (1)
Store Se-quence (1)
CTS SMH
CTS FRAME
Type (ACK) (1)
ACK At-trib-ute (1)
ACK Seq/ Type (1)
ACK Rcdvd MAP (2)
ACK SMH
ACK FRAME
Type (data) (1)
At-trib-ute (1)
Se-quence (1)
Len-gth (2)
DATA SMH
MSDU-1
FCS (4)
Frame Body
DATA FRAME

FIG. 5 (1)

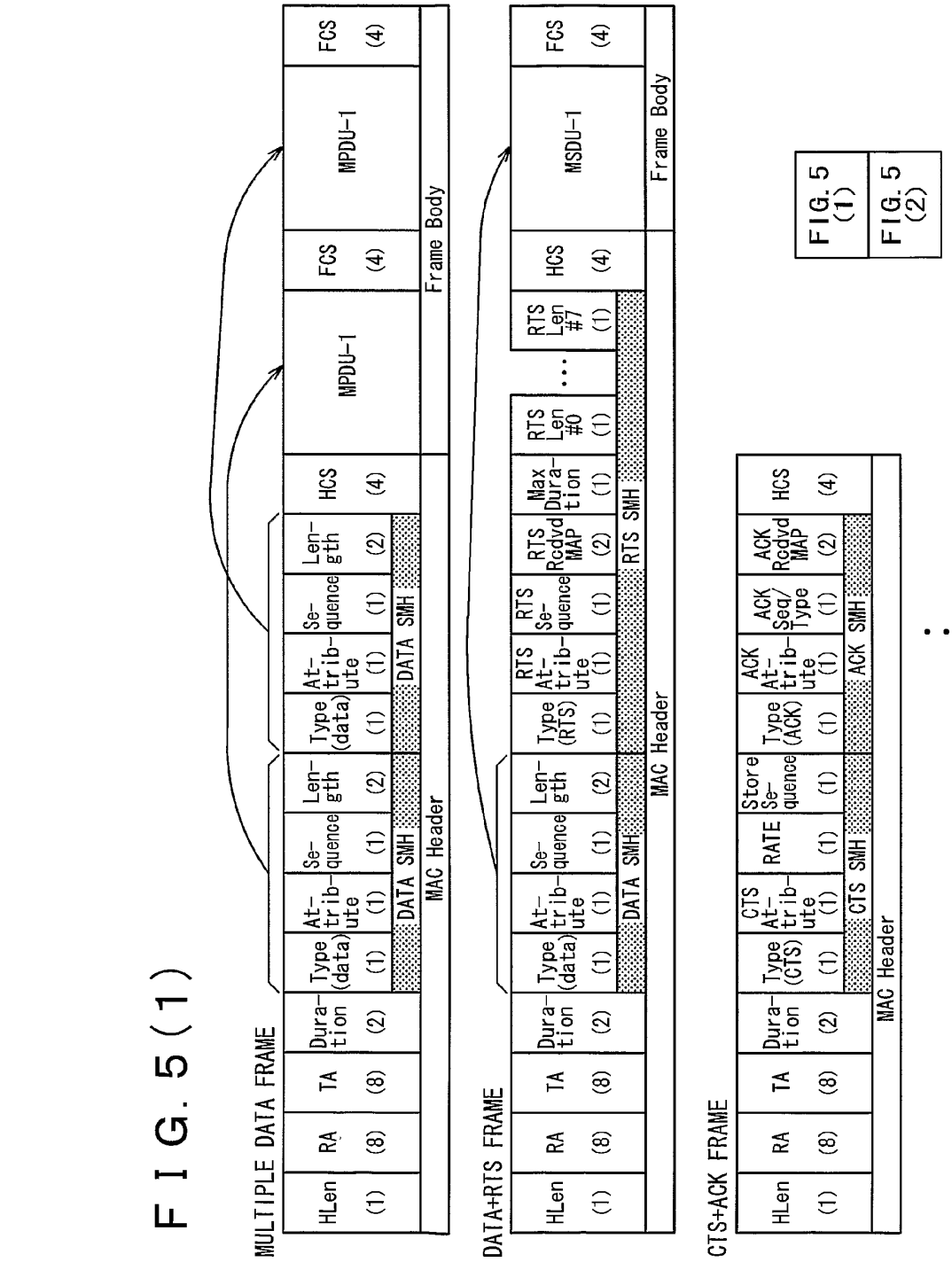


FIG. 5 (1)
FIG. 5 (2)

FIG. 5 (2)

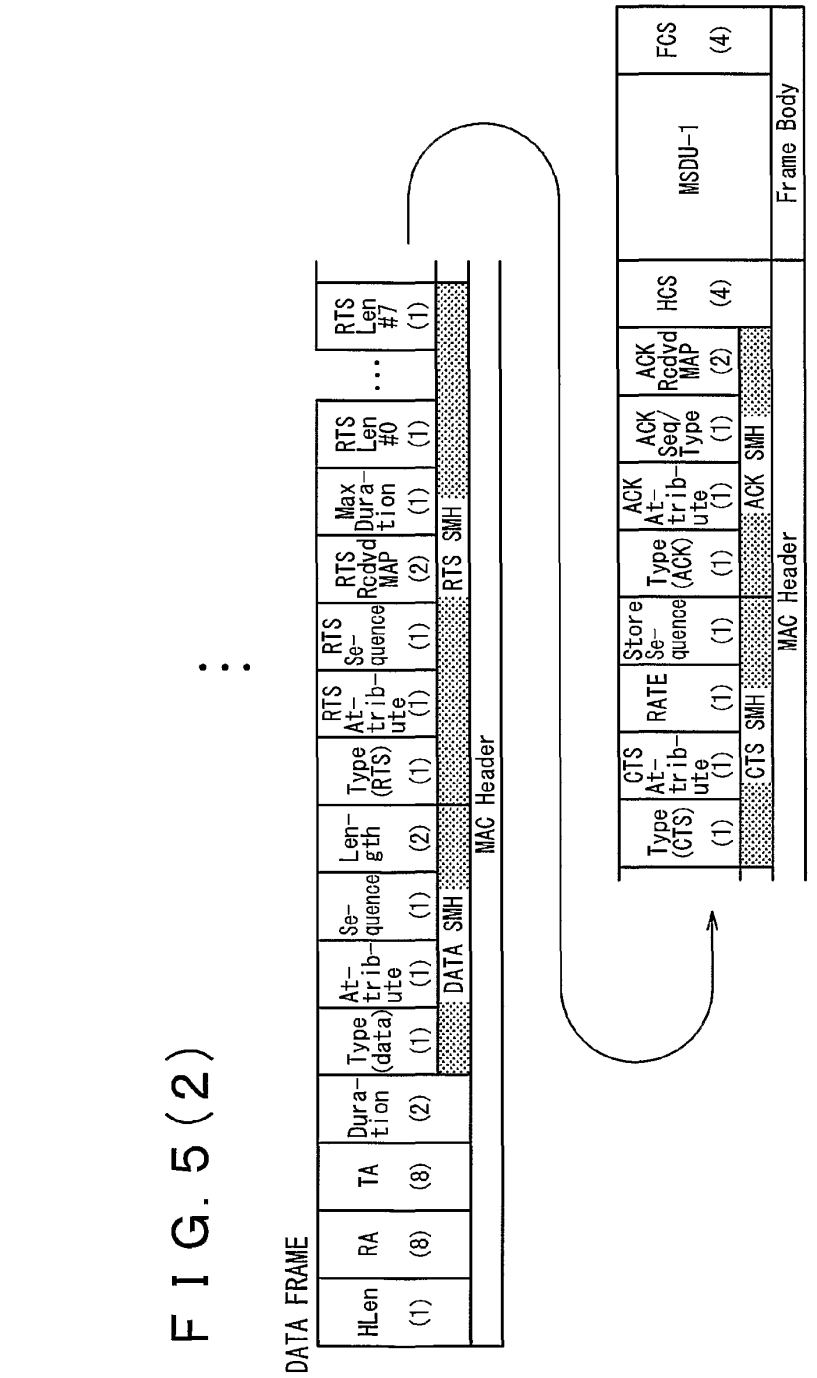


FIG. 5 (1)
FIG. 5 (2)

FIG. 6

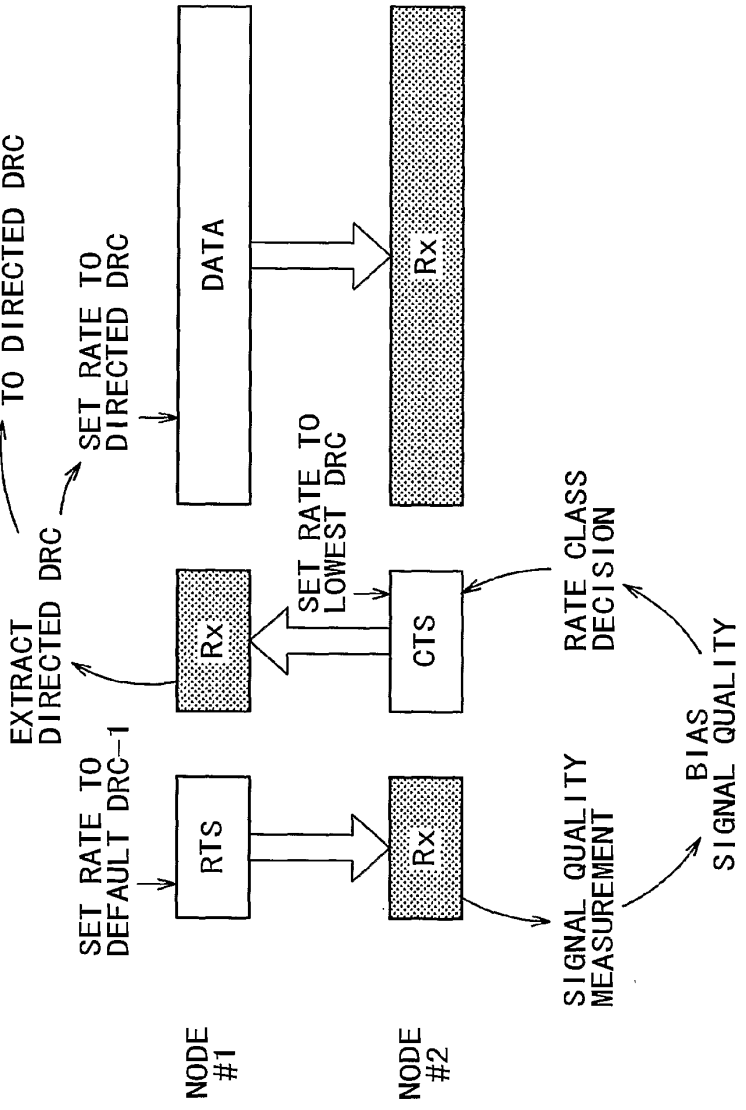

SET DEFAULT DRC TO DIRECTED DRC
SET RATE TO DIRECTED DRC
DATA
Rx
SET RATE TO LOWEST DRC
EXTRACT DIRECTED DRC
Rx
CTS
RATE CLASS DECISION
SET RATE TO DEFAULT DRC-1
RTS
Rx
SIGNAL QUALITY MEASUREMENT
BIAS SIGNAL QUALITY
NODE #1
NODE #2

FIG. 7

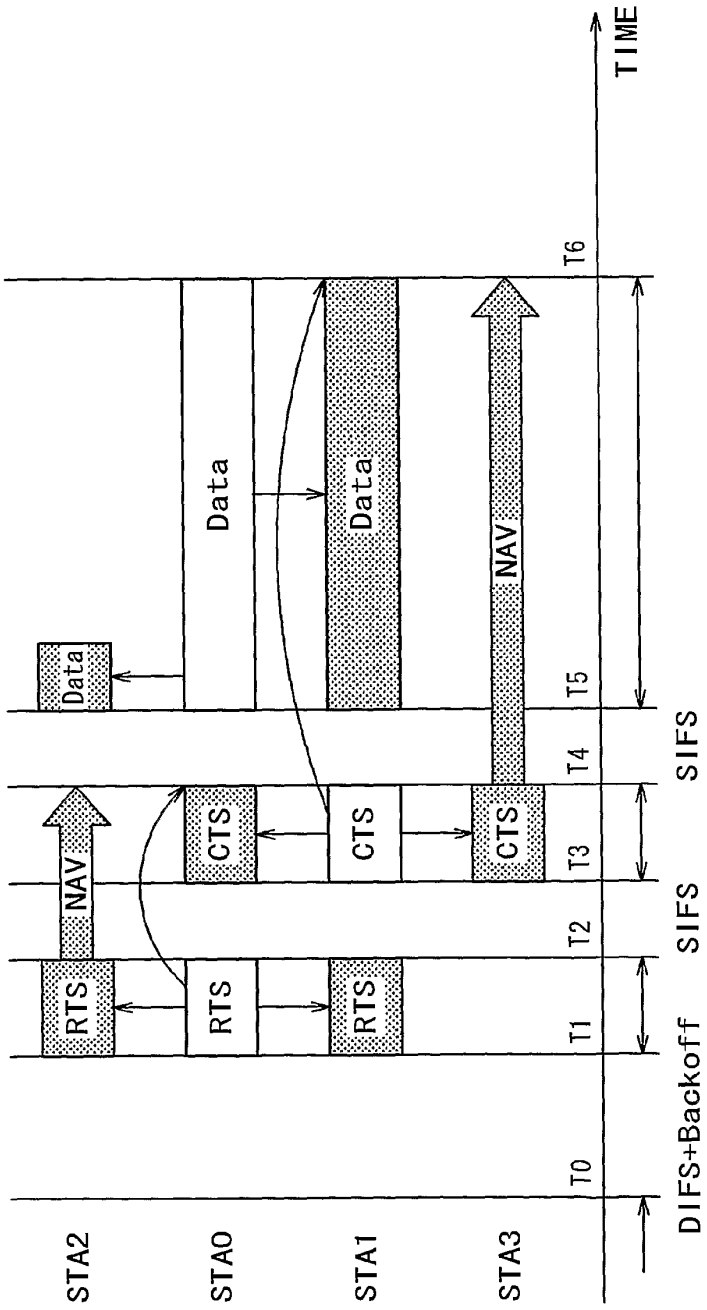

TIME
T6
T5
T4
T3
T2
T1
T0
Data
Data
NAV
Data
CTS
CTS
CTS
NAV
RTS
RTS
RTS
SIFS
SIFS
DIFS+Backoff
STA2
STA0
STA1
STA3

FIG. 8

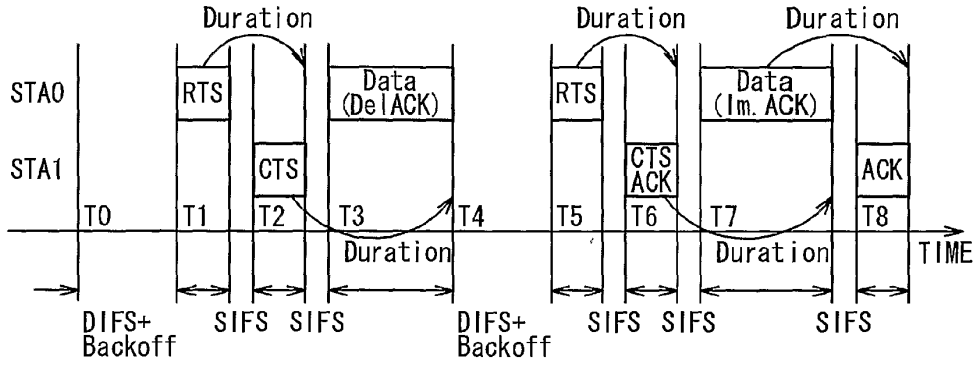

Duration
Duration
Duration
STA0
RTS
Data
(DelACK)
RTS
Data
(Im. ACK)
STA1
CTS
CTS
ACK
ACK
T0
T1
T2
T3
T4
T5
T6
T7
T8
Duration
Duration
TIME
DIFS+
Backoff
SIFS
SIFS
DIFS+
Backoff
SIFS
SIFS
SIFS

FIG. 9

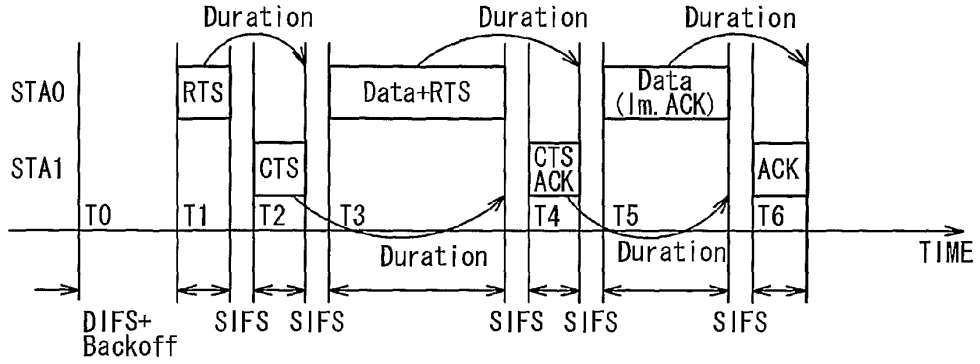

Duration
Duration
Duration
STA0
RTS
Data+RTS
Data
(Im. ACK)
STA1
CTS
CTS
ACK
ACK
T0
T1
T2
T3
T4
T5
T6
Duration
Duration
TIME
DIFS+
Backoff
SIFS
SIFS
SIFS
SIFS
SIFS

FIG. 10

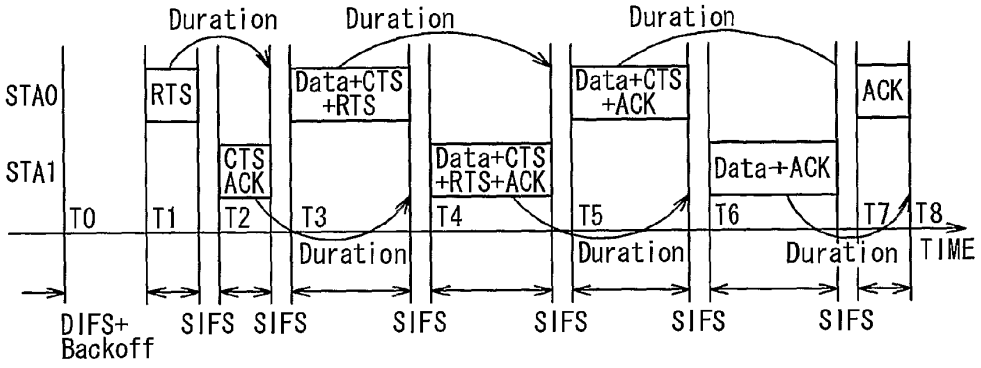

Duration
Duration
Duration
STA0
STA1
RTS
CTS
ACK
Data+CTS
+RTS
Data+CTS
+RTS+ACK
Data+CTS
+ACK
Data+ACK
ACK
T0
T1
T2
T3
T4
T5
T6
T7
T8
TIME
Duration
Duration
Duration
DIFS+
Backoff
SIFS
SIFS
SIFS
SIFS
SIFS
SIFS
SIFS

FIG. 11

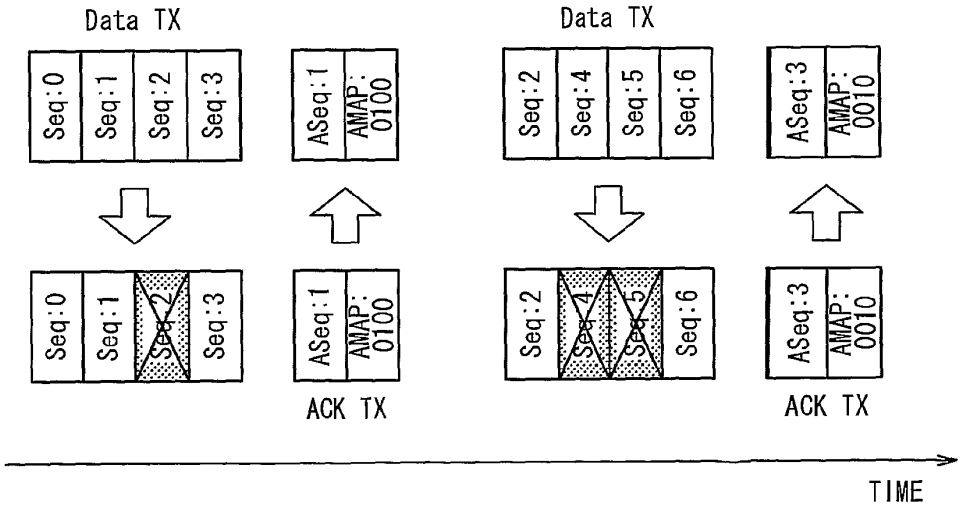

Data TX
Data TX
Seq:0
Seq:1
Seq:2
Seq:3
ASeq:1
AMAP:
0100
Seq:2
Seq:4
Seq:5
Seq:6
ASeq:3
AMAP:
0010
Seq:0
Seq:1
Seq:3
Seq:2
Seq:4
Seq:5
Seq:6
ACK TX
ACK TX
TIME

FIG. 12

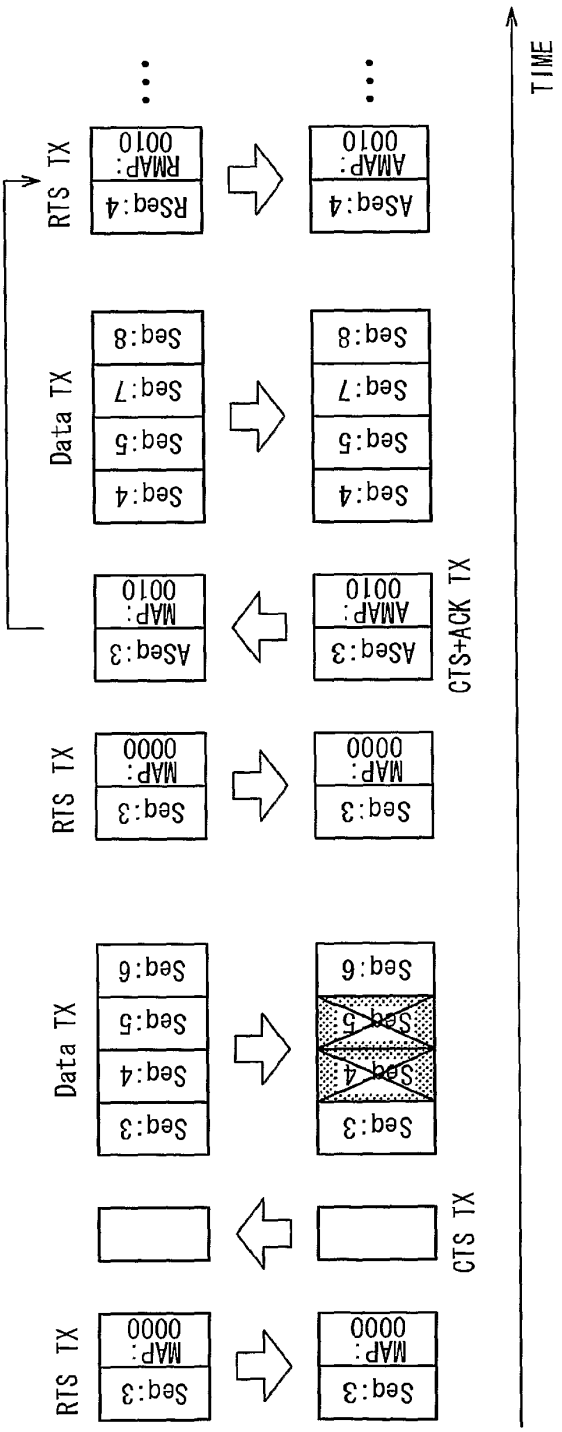

TIME
RTS TX
RSeq:4
RMAP: 0010
ASeq:4
AMAP: 0010
Data TX
Seq:8
Seq:7
Seq:5
Seq:4
CTS+ACK TX
ASeq:3
MAP: 0010
RTS TX
Seq:3
MAP: 0000
Data TX
Seq:6
Seq:5
Seq:4
Seq:3
CTS TX
RTS TX

FIG. 13

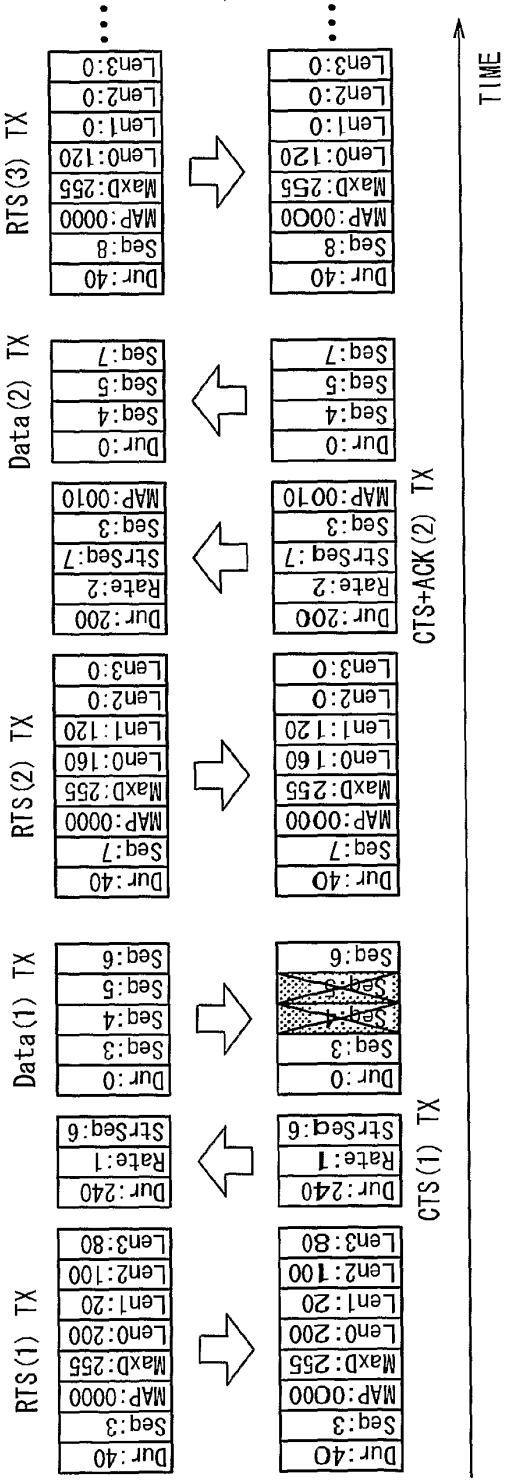

TIME
RTS(1) TX
Dur:40
Seq:3
MAP:0000
MaxD:255
Len0:200
Len1:20
Len2:100
Len3:80
Dur:240
Rate:1
StrSeq:6
CTS(1) TX
Dur:0
Seq:3
Seq:4
Seq:5
Seq:6
Data(1) TX
Dur:40
Seq:7
MAP:0000
MaxD:255
Len0:160
Len1:120
Len2:0
Len3:0
RTS(2) TX
Dur:200
Rate:2
StrSeq:7
Seq:3
MAP:0010
CTS+ACK(2) TX
Dur:0
Seq:4
Seq:5
Seq:7
Data(2) TX
Dur:40
Seq:8
MAP:0000
MaxD:255
Len0:120
Len1:0
Len2:0
Len3:0
RTS(3) TX

FIG. 14

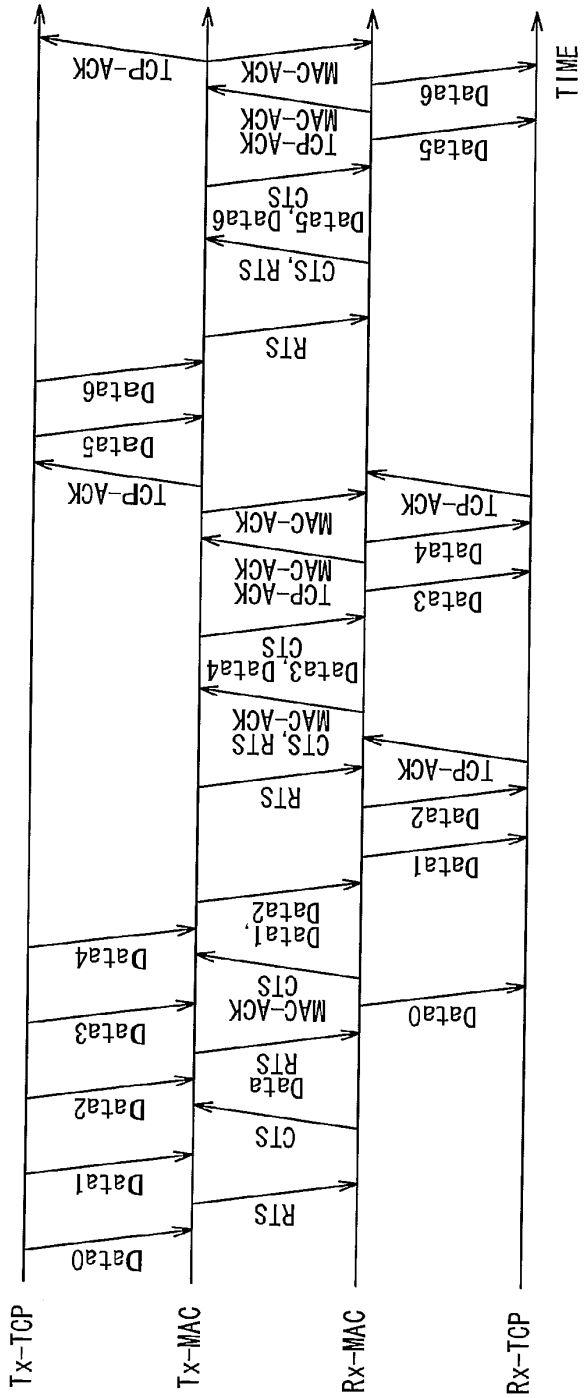

Tx-TCP
Tx-MAC
Rx-MAC
Rx-TCP
TIME
Data0
RTS
CTS
Data1
Data2
Data3
Data4
Data RTS
MAC-ACK CTS
Data1, Data2
CTS, RTS MAC-ACK
RTS
Data1
Data2
TCP-ACK
Data3
Data4
TCP-ACK MAC-ACK
Data3, Data4 CTS
MAC-ACK
TCP-ACK
Data5
Data6
RTS
CTS, RTS
Data5, Data6 CTS
TCP-ACK MAC-ACK
Data5
Data6
MAC-ACK
TCP-ACK

FIG. 15

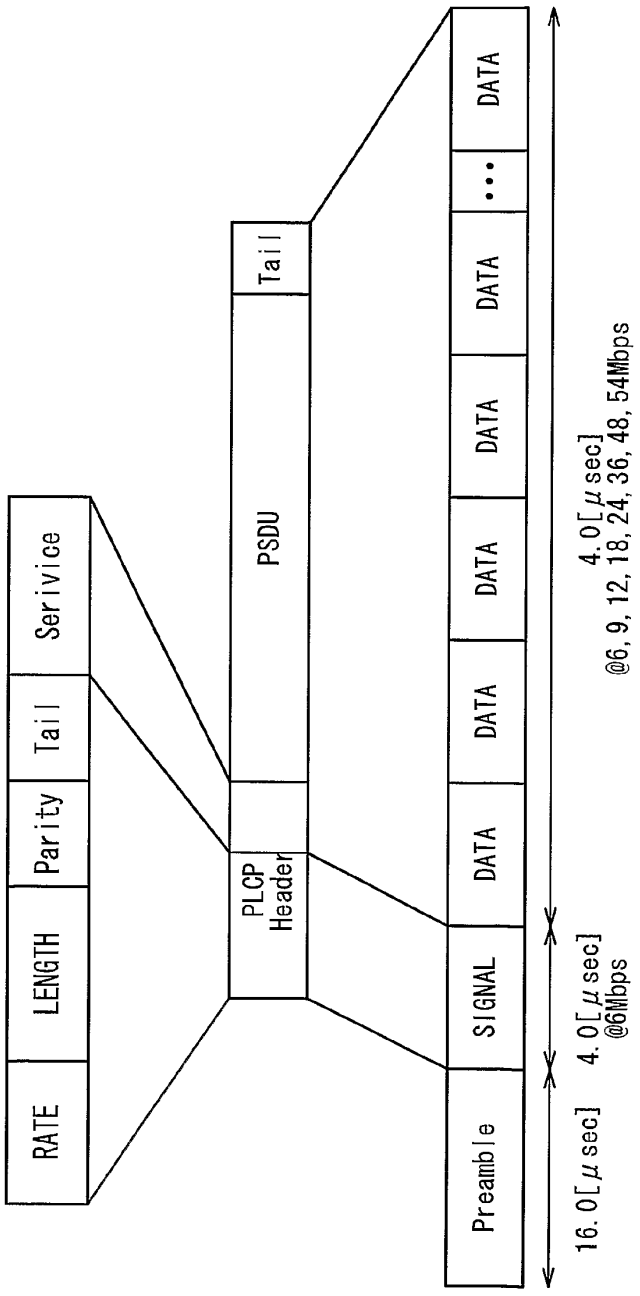

RATE
LENGTH
Parity
Tail
Serivice
PSDU
Tail
PLCP Header
Preamble
SIGNAL
DATA
DATA
DATA
DATA
DATA
DATA
...
DATA
16.0[μsec]
4.0[μsec] @6Mbps
4.0[μsec] @6, 9, 12, 18, 24, 36, 48, 54Mbps

FIG. 16

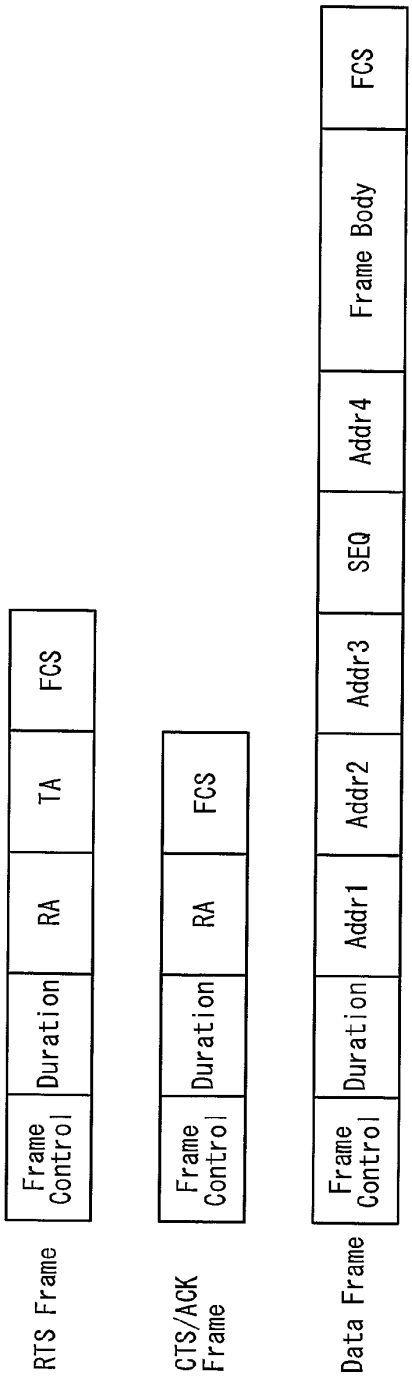

Frame Control
Duration
RA
TA
FCS
RTS Frame
Frame Control
Duration
RA
FCS
CTS/ACK Frame
Frame Control
Duration
Addr1
Addr2
Addr3
SEQ
Addr4
Frame Body
FCS
Data Frame

FIG. 17

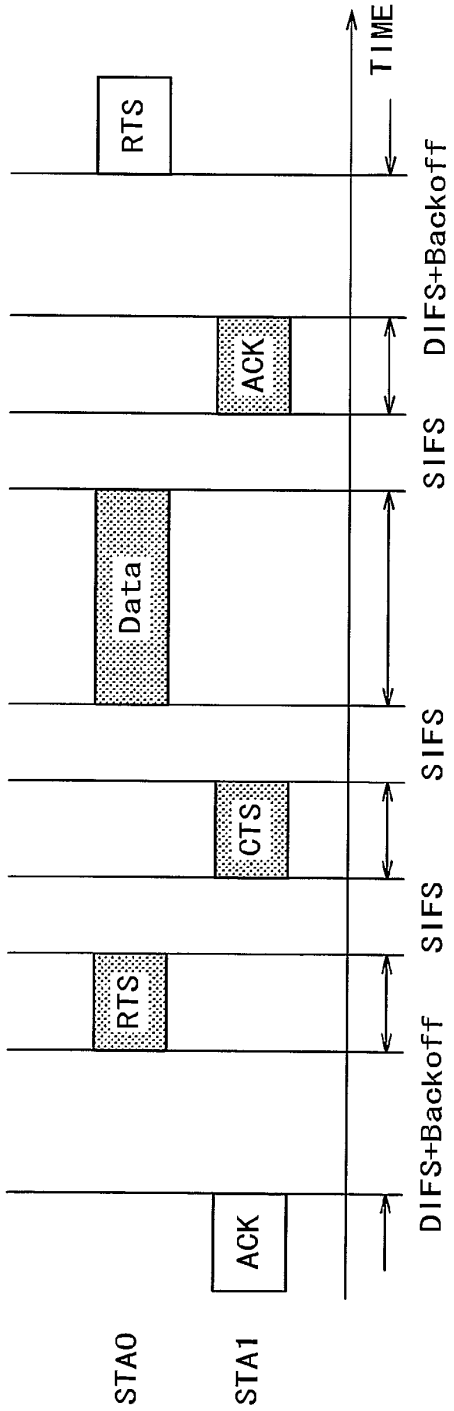

TIME
RTS
ACK
DIFS+Backoff
SIFS
Data
SIFS
CTS
SIFS
RTS
DIFS+Backoff
ACK
STA0
STA1

FIG. 18

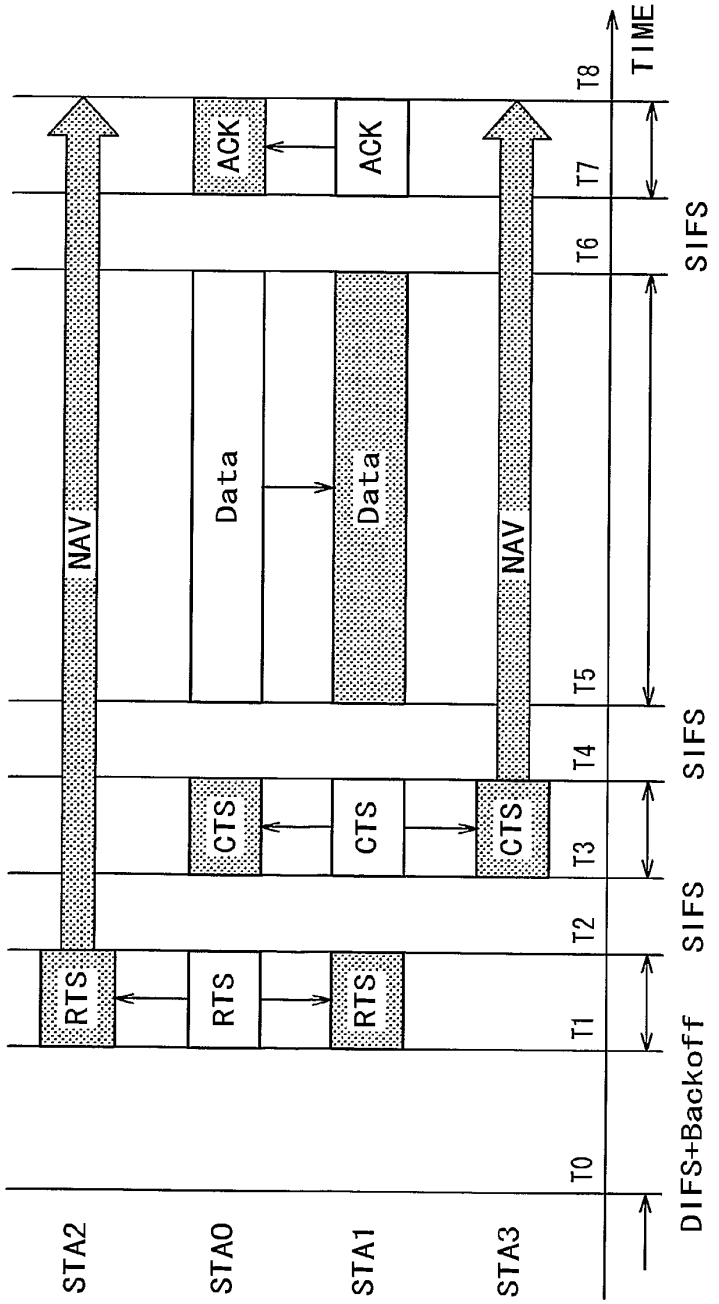

TIME
T8
T7
T6
T5
T4
T3
T2
T1
T0
SIFS
SIFS
SIFS
DIFS+Backoff
ACK
ACK
Data
Data
NAV
NAV
CTS
CTS
CTS
RTS
RTS
RTS
STA2
STA0
STA1
STA3

FIG. 19

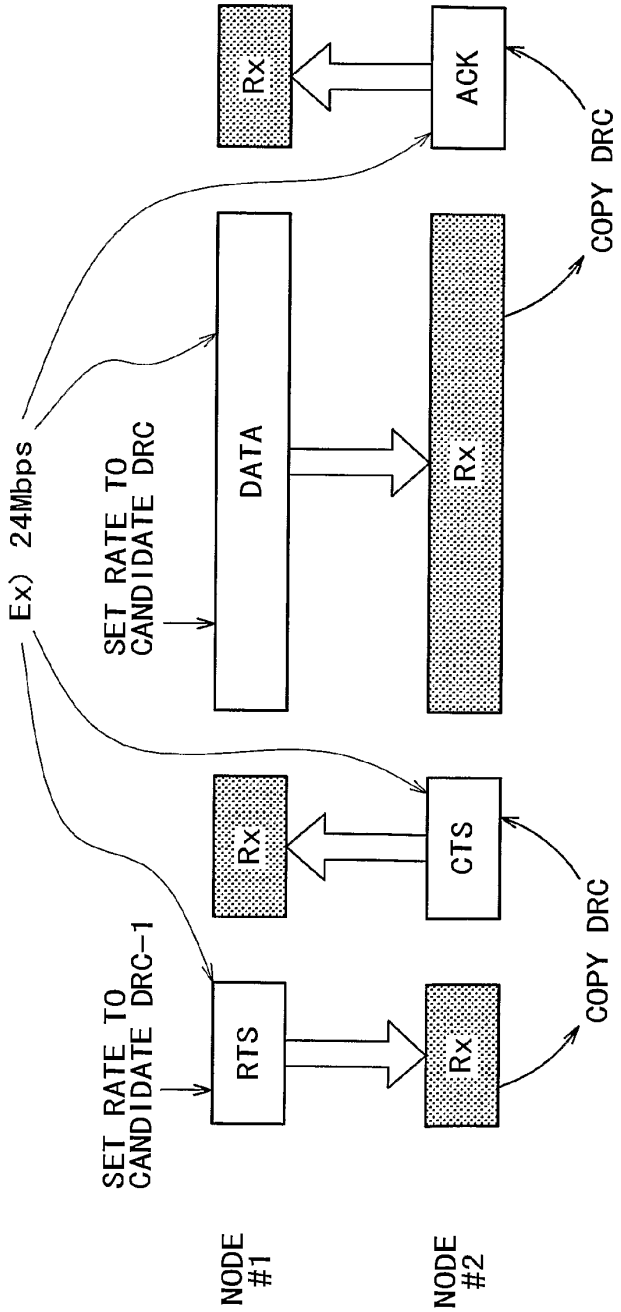

NODE #1
NODE #2
SET RATE TO CANDIDATE DRC-1
RTS
Rx
COPY DRC
CTS
Rx
COPY DRC
Ex) 24Mbps
SET RATE TO CANDIDATE DRC
DATA
Rx
ACK
Rx

FIG. 20

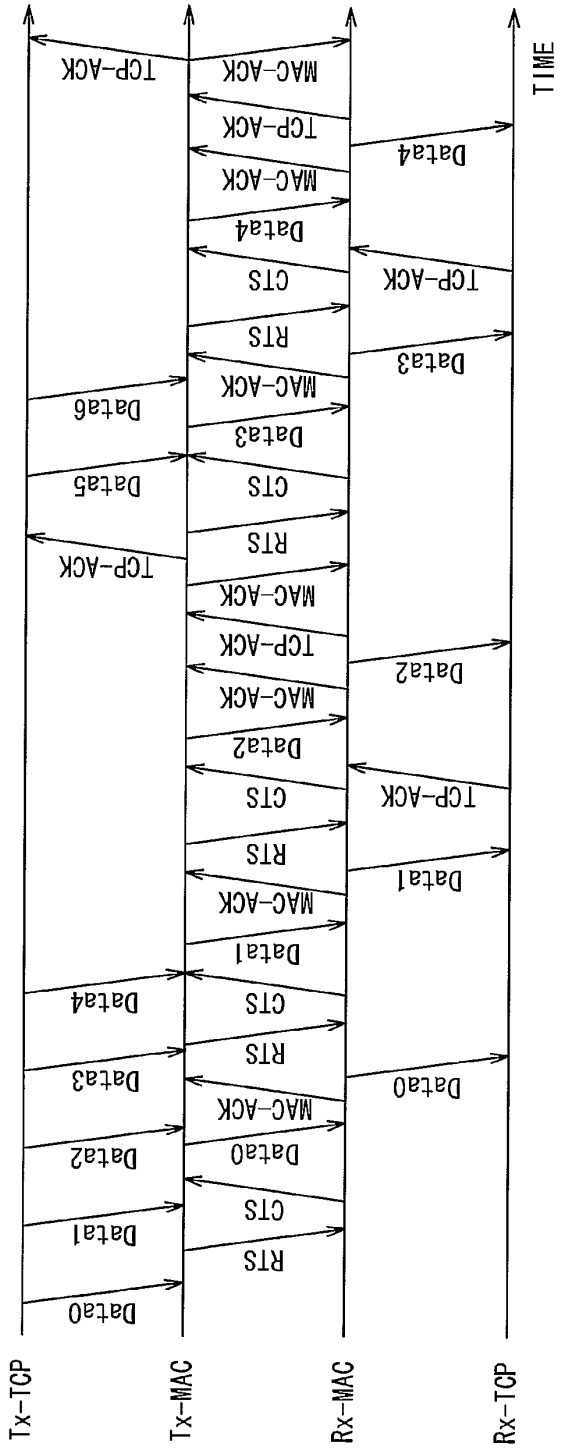

Tx-TCP
Tx-MAC
Rx-MAC
Rx-TCP
TIME
Data0
RTS
CTS
Data1
Data2
Data3
Data4
MAC-ACK
TCP-ACK
Data5
Data6

FIG. 21

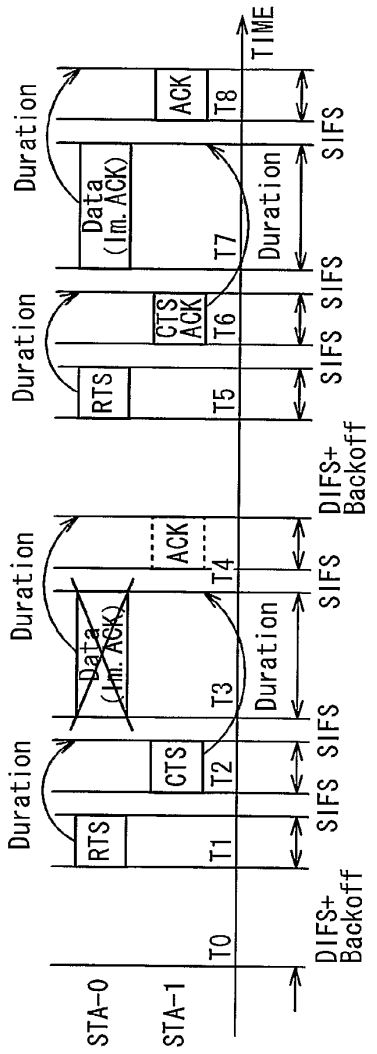

TIME
STA-0
STA-1
T0
DIFS+ Backoff
RTS
T1
SIFS
CTS
T2
SIFS
Data (Im. ACK)
T3
Duration
SIFS
ACK
T4
DIFS+ Backoff
RTS
T5
SIFS
CTS ACK
T6
SIFS
Data (Im. ACK)
T7
Duration
SIFS
ACK
T8
Duration

FIG. 22

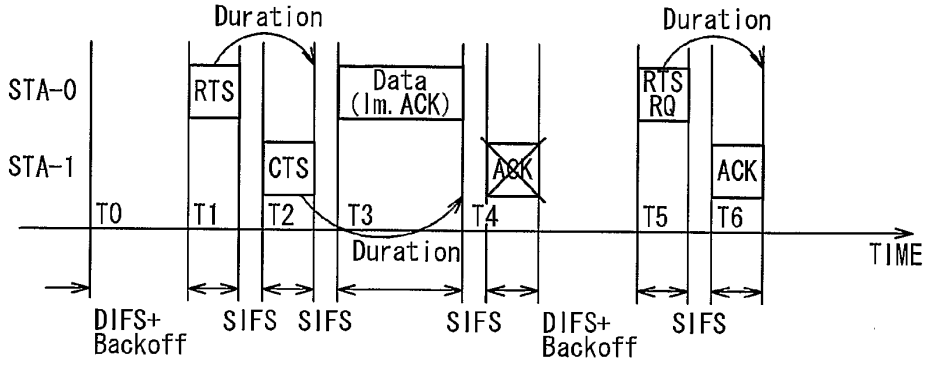

Duration
Duration
STA-0
STA-1
RTS
CTS
Data
(Im. ACK)
ACK
RTS
RQ
ACK
T0
T1
T2
T3
T4
T5
T6
Duration
TIME
DIFS+
Backoff
SIFS
SIFS
SIFS
DIFS+
Backoff
SIFS

FIG. 23

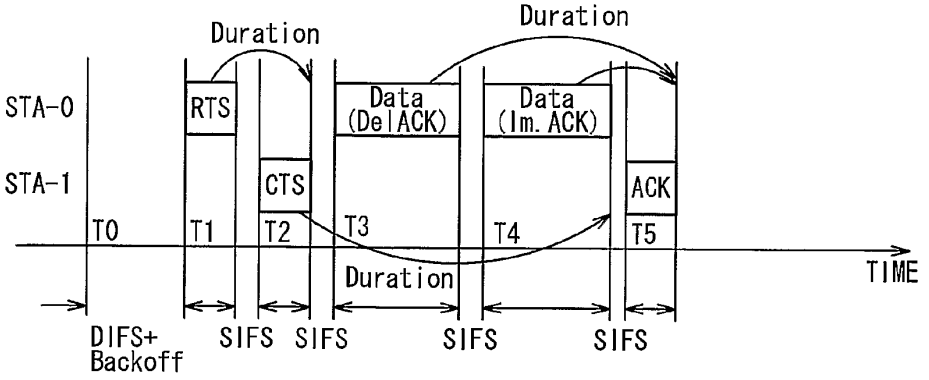

Duration
Duration
STA-0
STA-1
RTS
CTS
Data
(DelACK)
Data
(Im. ACK)
ACK
T0
T1
T2
T3
T4
T5
Duration
TIME
DIFS+
Backoff
SIFS
SIFS
SIFS
SIFS

FIG. 24

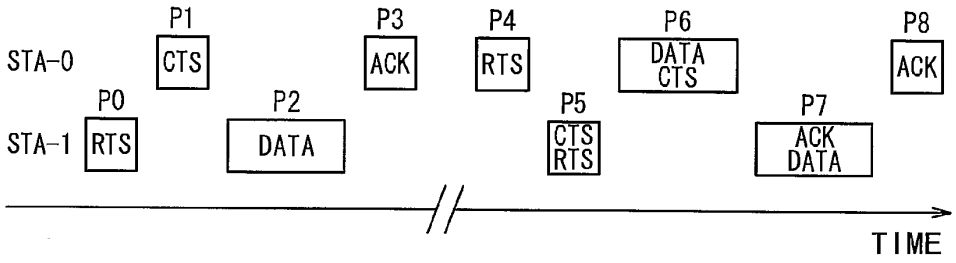


FIG. 25

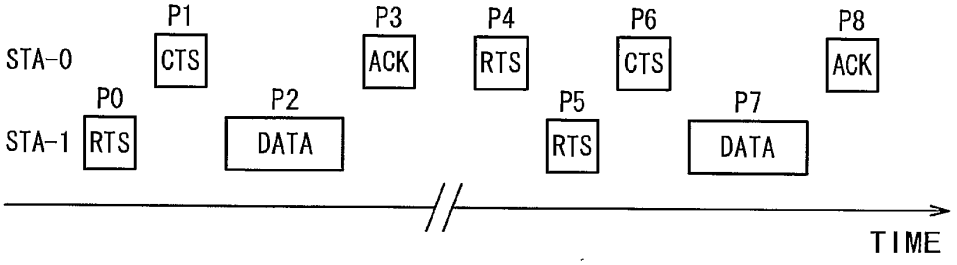
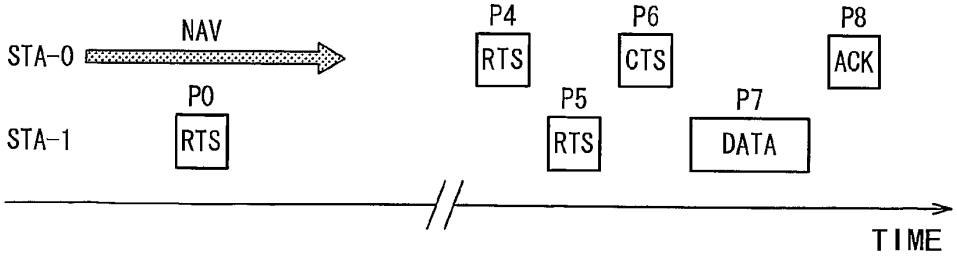


FIG. 26



IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant: Menzo Wentink

Title: TRANSMIT ANNOUNCEMENT INDICATION

Appl. No.: 11/627,181

Filing Date: 1/25/2007

Examiner: Abdullah A. Riyami

Art Unit: 2474

Confirmation Number: 1464

SUPPLEMENTAL INFORMATION DISCLOSURE STATEMENT UNDER 37 CFR §1.56

Mail Stop Amendment
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Commissioner:

Applicant submits herewith documents for the Examiner's consideration in accordance with 37 CFR §§1.56, 1.97 and 1.98.

Applicant respectfully requests that each listed document be considered by the Examiner and be made of record in the present application and that an initialed copy of Form PTO/SB/08 be returned in accordance with MPEP §609.

The submission of any document herewith is not an admission that such document constitutes prior art against the claims of the present application or that such document is considered material to patentability as defined in 37 CFR §1.56(b). Applicant does not waive

any rights to take any action which would be appropriate to antedate or otherwise remove as a competent reference any document submitted herewith.

CONCISE EXPLANATION OF RELEVANCE

Foreign Language Documents

An English translation of the foreign-language document is being provide if readily available. However, the absence of such translation does not relieve the PTO from its duty to consider the submitted foreign language document (37 CFR §1.98 and MPEP §609).

The attached references were cited during the prosecution of a corresponding European and Chinese applications. Copies of the Communications are attached and sets forth the portion of the document considered relevant by the examiner.

TIMING OF THE DISCLOSURE

The listed documents are being submitted in compliance with 37 CFR §1.97(b), before the mailing of a first Office action after the filing of a RCE.

Although Applicant believes that no fee is required, the Commissioner is hereby authorized to charge any additional fees which may be due to Deposit Account No. 19-0741.

Respectfully submitted,

Date June 29, 2012

By _____

FOLEY & LARDNER LLP
Customer Number: 23524
Telephone: (608) 258-4292
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Paul S. Hunter
Attorney for Applicant
Registration No. 44,787

Electronic Acknowledgement Receipt

EFS ID:	13142247
Application Number:	11627181
International Application Number:	
Confirmation Number:	1464
Title of Invention:	Transmit Announcement Indication
First Named Inventor/Applicant Name:	Menzo Wentink
Customer Number:	23524
Filer:	Paul S. Hunter/Linda Anderson
Filer Authorized By:	Paul S. Hunter
Attorney Docket Number:	088245-2616
Receipt Date:	29-JUN-2012
Filing Date:	25-JAN-2007
Time Stamp:	16:06:56
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Non Patent Literature	IEEENPLpt1a.pdf	22811880 2530b99a8b282fe0cfb5514a9246262579c6dcd0	no	50

Warnings:	
Information:	

Total Files Size (in bytes):	22811880

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New Applications Under 35 U.S.C. 111
If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371
If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office
If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

Electronic Acknowledgement Receipt

EFS ID:	13142334
Application Number:	11627181
International Application Number:	
Confirmation Number:	1464
Title of Invention:	Transmit Announcement Indication
First Named Inventor/Applicant Name:	Menzo Wentink
Customer Number:	23524
Filer:	Paul S. Hunter/Linda Anderson
Filer Authorized By:	Paul S. Hunter
Attorney Docket Number:	088245-2616
Receipt Date:	29-JUN-2012
Filing Date:	25-JAN-2007
Time Stamp:	16:08:48
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Non Patent Literature	IEEENPLpt1b.pdf	25757753 41e4d6150f9ba9fd3af1974d4623e1711491efef	no	50

Warnings:	
Information:	

Total Files Size (in bytes):	25757753

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New Applications Under 35 U.S.C. 111
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New International Application Filed with the USPTO as a Receiving Office
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Electronic Acknowledgement Receipt	
EFS ID:	13142953
Application Number:	11627181
International Application Number:	
Confirmation Number:	1464
Title of Invention:	Transmit Announcement Indication
First Named Inventor/Applicant Name:	Menzo Wentink
Customer Number:	23524
Filer:	Paul S. Hunter/Linda Anderson
Filer Authorized By:	Paul S. Hunter
Attorney Docket Number:	088245-2616
Receipt Date:	29-JUN-2012
Filing Date:	25-JAN-2007
Time Stamp:	16:10:16
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Non Patent Literature	IEEENPLpt2a.pdf	2634847 fc3026c2aed8dabcbb4d2747f5020f9ef37285e0	no	40
Warnings:					
Information:					

2	Non Patent Literature	IEEENPLpt2b.pdf	1667447 099c31b0fedccd7b752a6bb4e77d27d8ef685e97	no	26
Warnings:					
Information:					
3	Non Patent Literature	IEEENPLpt2c.pdf	2240286 656bfa86265eb581ebc58d5da08798f6c9ba2261	no	38
Warnings:					
Information:					
4	Non Patent Literature	IEEENPLpt2d.pdf	2624222 bd62a65378ea8ea7d5cfd2026549353cdc7173ab	no	46
Warnings:					
Information:					
5	Non Patent Literature	IEEENPLpt3a.pdf	23737795 3e82ed0100d3eb88dbe5cde24b3adbe8d95a4365	no	50
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Information:					
6	Non Patent Literature	IEEENPLpt3b.pdf	18016394 8595f8fb5731279cd954e8b1a4f5ca3627fd8f07	no	50
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7	Non Patent Literature	IEEENPLpt3c.pdf	8798673 8f5f9082df9494de35e0d3743fac91c789103a0c	no	25
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Information:					
		Total Files Size (in bytes):	59719664		

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PTO/SB/08 (09-06)
Approved for use through 03/31/2007. OMB 0651-0031
U.S. Patent and Trademark Office: U.S. DEPARTMENT OF COMMERCE
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Substitute for form 1449/PTO				Complete if Known	
INFORMATION DISCLOSURE STATEMENT BY APPLICANT				**Application Number**	11/627,181
Date Submitted: April 26, 2012				**Filing Date**	1/25/2007
				First Named Inventor	Menzo Wentink
(use as many sheets as necessary)				Art Unit	2474
				Examiner Name	Abdulla A. Riyami
Sheet	1	of	1	Attorney Docket Number	088245-2616

U.S. PATENT DOCUMENTS					
Examiner Initials*	Cite No.[1]	Document Number Number-Kind Code[2] (*if known*)	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
		2005/0025131	02-03-2005	KO ET AL.	
		2005/0050219	03-03-2005	CHOI ET AL.	

FOREIGN PATENT DOCUMENTS						
Examiner Initials*	Cite No.[1]	Foreign Patent Document Country Code[3]-Number[4]-Kind Code[5] (*if known*)	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Documents	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear	T[6]
		WO-03/096627 (English abstract only)	11-20-2003	SHARP KABUSHIKI KAISHA		
		WO-2005/112488	11-24-2005	INTER-DIGITAL TECHNOLOGY CORPORATION		
		KR-200513872 (English equivalent US2005/0025131 also cited)	02-05-2005	KO ET AL.		
		KR-200523940 (English equivalent US2005/0050219 also cited)	03-10-2005	SAMSUNG ELECTRONICS CO., LTD.		

NON PATENT LITERATURE DOCUMENTS			
Examiner Initials*	Cite No.[1]	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.) date, page(s), volume-issue number(s), publisher, city and/or country where published.	T[6]
		Office Action on Japanese Application 2008-552579, mailed March 13, 2012 (English translation not available)	

Examiner Signature		Date Considered	

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant. 1 Applicant's unique citation designation number (optional). 2 See Kinds Codes of USPTO Patent Documents at www.uspto.gov or MPEP 901.04. 3 Enter Office that issued the document, by the two-letter code (WIPO Standard ST.3). 4 For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. 5 Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. 6 Applicant is to place a check mark here if English language Translation is attached. This collection of information is required by 37 CFR 1.97 and 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 2 hours to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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4836-3204-8399.1

Electronic Acknowledgement Receipt

EFS ID:	12634438
Application Number:	11627181
International Application Number:	
Confirmation Number:	1464
Title of Invention:	Transmit Announcement Indication
First Named Inventor/Applicant Name:	Menzo Wentink
Customer Number:	23524
Filer:	Christopher L. Kalafut/Linda Anderson
Filer Authorized By:	Christopher L. Kalafut
Attorney Docket Number:	088245-2616
Receipt Date:	26-APR-2012
Filing Date:	25-JAN-2007
Time Stamp:	12:39:58
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Foreign Reference	wo03096627.pdf	4749473 19347aa0e849f91ead465b12f5305b8a5eed5bc2	no	141
Warnings:					
Information:					

2	Foreign Reference	WO2005112488.pdf	1509346 507cbf31b850e9f0a9a024c37bfbd45581ae938c	no	33
Warnings:					
Information:					
3	Foreign Reference	KR20050013872.pdf	781448 381bef26d9b2a12bb5d33b29ea632ba759ead902	no	14
Warnings:					
Information:					
4	Foreign Reference	KR20050023940.pdf	912188 8b7868efe1624c5fb2bc5fd99b41f53ba584e4c6	no	16
Warnings:					
Information:					
5	Non Patent Literature	JPoa.pdf	135284 f2c928c2e14474c195aa52a62983c64abef8b8eb	no	3
Warnings:					
Information:					
6		suppids.pdf	135510 5a33fdf5ff7c41bffee777a148d71e85c4350820	yes	3

	Multipart Description/PDF files in .zip description		
	Document Description	**Start**	**End**
	Transmittal Letter	1	2
	Information Disclosure Statement (IDS) Form (SB08)	3	3

Warnings:	
Information:	
Total Files Size (in bytes):	8223249

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New Applications Under 35 U.S.C. 111
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(12)特許協力条約に基づいて公開された国際出願

(19) 世界知的所有権機関
国際事務局

(43) 国際公開日
2003 年11 月20 日 (20.11.2003)

PCT

(10) 国際公開番号
WO 03/096627 A1

(51) 国際特許分類[7]: H04L 12/28

(21) 国際出願番号: PCT/JP03/02276

(22) 国際出願日: 2003 年2 月27 日 (27.02.2003)

(25) 国際出願の言語: 日本語

(26) 国際公開の言語: 日本語

(30) 優先権データ:
特願2002-133303 2002 年5 月8 日 (08.05.2002) JP
特願2002-198003 2002 年7 月5 日 (05.07.2002) JP

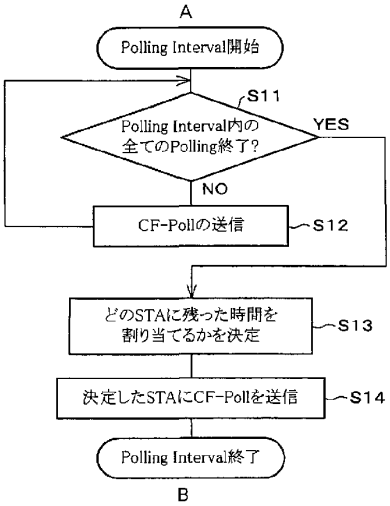
(71) 出願人 (米国を除く全ての指定国について): シャープ株式会社 (SHARP KABUSHIKI KAISHA) [JP/JP]; 〒545-8522 大阪府 大阪市 阿倍野区長池町２２-２２ Osaka (JP).

(72) 発明者; および
(75) 発明者/出願人 (米国についてのみ): 藤井 秀和 (FUJII,Hidekazu) [JP/JP]; 〒632-0004 奈良県 天理市 櫟本町２６１３-１-８３８ Nara (JP). 大谷 昌弘 (OHTANI,Yoshihiro) [JP/JP]; 〒619-0232 京都府 相楽郡 精華町桜が丘３-１-２-３０１ Kyoto (JP). 東 人司 (AZUMA,Hitoshi) [JP/JP]; 〒632-0052 奈良県 天理市 柳本町１３６６-２６ Nara (JP). 西川 徹 (NISHIKAWA,Akira) [JP/JP]; 〒632-0004 奈良県 天理市 櫟本町２６１３-１-５６８ Nara (JP).

/続葉有/

(54) Title: COMMUNICATION MANAGEMENT METHOD, CONTROL STATION, COMMUNICATION STATION, COMMUNICATION MANAGEMENT PROGRAM, AND RECORDING MEDIUM CONTAINING THE COMMUNICATION MANAGEMENT PROGRAM

(54) 発明の名称: 通信管理方法、制御局、通信局、通信管理プログラム、および通信管理プログラムを記録した記録媒体



A...Polling Interval START
S11...ALL Pollings COMPLETE IN Polling Interval?
S12...CF-Poll TRANSMISSION
S13...DECIDE TO WHICH STA REMAINING TIME IS ASSIGNED
S14...TRANSMIT CF-Poll TO THE DECIDED STA
B...Polling Interval END

(57) Abstract: In a communication management system, according to a transmission right request from a communication station, a predetermined period is defined and a transmission right is assigned. When at least a part of the communication station terminates its transmission right period assigned or terminates transmission within the transmission right period, a transmission right is again assigned. Thus, when a control station and a plurality of communication stations are present, it is possible to eliminate waste of a communication band and effectively use the communication band. Moreover, it is possible to perform control so that a communication station of an adverse communication condition will not affect another communication station.

(57) 要約: 本発明の通信管理システムは、通信局からの送信権要求に基づいて所定の期間を規定して、送信権を割り当て、通信局の少なくとも一部が自己に割り当てられた送信権期間を終了するか、あるいは送信権期間内に送信を終了した時点で、再度送信権を割り当てるものとなっている。これにより、制御局と複数の通信局とが存在する場合に、通信帯域の無駄を確実に無くし、通信帯域の有効利用を図ることができる。また、通信状況の悪い通信局の影響を他の通信局が受けないような制御することができる。

WO 03/096627 A1

(74) 代理人: 原 謙三 , 外(HARA,Kenzo et al.); 〒530-0041 大阪府 大阪市 北区天神橋２丁目北２番６号 大和南森町ビル 原謙三国際特許事務所 Osaka (JP).

(81) 指定国 (国内): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, OM, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW.

(84) 指定国 (広域): ARIPO 特許 (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW), ユーラシア特許 (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), ヨーロッパ特許 (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PT, SE, SI, SK, TR), OAPI 特許 (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

添付公開書類:
— 国際調査報告書

２文字コード及び他の略語については、定期発行される各*PCT*ガゼットの巻頭に掲載されている「コードと略語のガイダンスノート」を参照。

明　細　書

通信管理方法、制御局、通信局、通信管理プログラム、および通信管理プログラムを記録した記録媒体

技術分野

本発明は、制御局と複数の通信局とが存在する場合に、通信帯域を有効に使用し、通信状況の良い送信局が悪影響を受けることを回避できる通信管理方法、及びこの通信管理方法を実現する制御局、通信局、ならびに通信管理プログラムに関するものである。

背景技術

現在の８０２．１１のＴＧｅ（Ｔａｓｋ　Ｇｒｏｕｐ　Ｅ）において策定しているＩＥＥＥ　Ｓｔｄ　８０２．１１ｅ／Ｄ３．０、Ｍａｙ　２００２によれば、図３８に示すように、制御局はＣＦ－Ｐｏｌｌを送信することによって送信局に送信権を付与し、送信局は付与された期間（ＴＸＯＰ）にデータ（パケット）を受信局に向かって送信することが可能となる。

送信局は、データ（ＤＡＴＡ）を送信する前にＴＳｐｅｃ（詳細は後述する）により事前に送信すべきデータの概要を制御局に通知する。これに対して、制御局は、この通知内容からスケジューリング可能か否か（受け入れるか否か）を判断する。

各送信局（ＳＴＡ）は、現在のバッファ状況などを含む通信状況を制御局のスケジューラにＱｏＳ　Ｎｕｌｌを介して必要に応じて報告を行

う。ＱｏＳ　Ｎｕｌｌを介して報告される情報には、送信局でたまっているバッファ状況または送信権を付与して欲しい期間の情報が含まれている。

一方、制御局のスケジューラは、前記ＴＳｐｅｃおよびＱｏＳ　Ｎｕｌｌによる報告に基づいて、次に付与すべき時間をどのように調整すべきかを判断し、スケジューリングを更新していく。

なお、送信権が付与された送信局は、付与された期間（ＴＸＯＰ）において送信すべきデータが存在しなくなった場合には、付与された前記期間（ＴＸＯＰ）を早い目に終了する。

ところで、たとえば８０２．１１ａで審議されている物理層では、５４Ｍｂｐｓ、４８Ｍｂｐｓ、３６Ｍｂｐｓ、２４Ｍｂｐｓ、１２Ｍｂｐｓ、９Ｍｂｐｓ、及び６Ｍｂｐｓという複数種類の送信 PHY Rate が定義されている。送信 PHY Rate を変更することによって、通信可能な距離と通信時間とが大きく変化する。図３９に示すように、たとえば、５４Ｍｂｐｓで通信可能な送信距離と６Ｍｂｐｓで通信可能な送信距離とでは、数倍も差がある。

一般に、データを伝送する場合、伝送距離を長くすると、伝送のエラーレート（ Error Rate ）が上昇するので、物理レート（送信 PHY Rate ）を小さくする必要がある。その結果、同じアプリケーションレートのデータを伝送するためにはＴＸＯＰを大きく（長く）設定することが必要となる。しかしながら、この場合、多数の送信局をサポートすることができないことになり、無線ネットワークに接続できない送信局がでてくることになる。

一方、多くの送信局（ストリーム）をサポートしようとすると、一つ

の送信局（ストリーム）に対してＴＸＯＰを小さく（短く）する必要がある。しかしながら、この場合、伝送距離を長くすることができない。

ところで、たとえば８０２．１１ａによれば、送信 PHY Rate は、送信局（Ｓｅｎｄｅｒ）のアプリケーション層レベルで自動的に切り替わり得る。

従来では、一般に文書ファイルのやりとりやＷＥＢページの閲覧等のデータ通信が想定されており、通信に要する時間に関わらず確実にデータの通信が成功することのみが求められていた。したがって、たとえば他のユーザの通信状態によってデータの実効スループットが動的に変動したとしても問題にならなかった。

しかしながら、テレビ映像などリアルタイム性が要求されるデータの通信においては、一定時間内に送信局アプリケーションが要求するデータを確実に配信できなければ意味をなさないという特性がある。

しかし、上述のように１つの通信局が占有する通信時間は通信距離により大きく変わるため、複数の通信局が存在する場合には、同時に通信させたい台数や各局の通信距離などを、ユーザの要求を反映させた値に設定できることが望ましい。

なお、前記ＴＳｐｅｃには、パラメータとして、Ｔｒａｆｆｉｃ Ｔｙｐｅ、ＦＥＣ（Ｆｏｒｗａｒｄ Ｅｒｒｏｒ Ｃｏｌｌｅｃｔｉｏｎ）、Ａｃｋ Ｐｏｌｉｃｙ、Ｎｏｍｉｎａｌ ＭＳＤＵ ｓｉｚｅ、および、Ｍｅａｎ Ｄａｔａ Ｒａｔｅなどの情報が含まれている。Ｔｒａｆｆｉｃ Ｔｙｐｅは、Ｐｅｒｉｏｄｉｃなデータであるか、またはｎｏｎ－ｐｅｒｉｏｄｉｃなデータであるかを表すものである。ＦＥＣは、ＦＥＣの有無を示すものである。Ａｃｋ Ｐｏｌｉｃｙは、すぐに

パケットに対して送信確認を受信局に求める８０２．１１　Ｎｏｒｍａｌ　Ａｃｋを使用するのか、もしくは、パケットに対して送信確認を必要としないｎｏ－Ａｃｋを使用するのか、もしくは、後で複数のパケットに対しての送信確認を受信局に求めるＢｕｒｓｔ　Ａｃｋを使用するのかを示すものである。Ｎｏｍｉｎａｌ　ＭＳＤＵ　ｓｉｚｅは、ＭＳＤＵ（データ）の長さを表すものである。Ｍｅａｎ　Ｄａｔａ　Ｒａｔｅは、平均のデータレートを表すものである。

ところが、前記従来技術は次のような問題点を有している。

すなわち、現在の８０２．１１のＴＧｅ（Ｔａｓｋ　Ｇｒｏｕｐ　Ｅ）において策定しているＩＥＥＥ　Ｓｔｄ　８０２．１１ｅ／Ｄ３．０、Ｍａｙ　２００２によれば、制御局は送信局が使用する物理レート及び伝送するデータの種類が分からないため、送信局ごとの最適な長さのＴＸＯＰを予測することはできず、スケジューリングを行う具体的な方法については示されていない。

また、図３８に示すように、制御局と複数の送信局が存在する場合、ＱｏＳ　Ｎｕｌｌを介して報告された通信状況をそのままスケジューリングに反映していくと、通信状況の良い他の送信局は、通信状況の悪い送信局（ＴＸＯＰが長くなっていく送信局）の影響を受けてしまうことになる。

また、上述のように、伝送距離を長くすることと、多数の送信局をサポートすることとは、相反する事項である。したがって、前記従来技術によれば、距離を優先してＴＸＯＰを送信局に付与していくか、複数の送信局をサポートすることを優先してＴＸＯＰを送信局に付与していくかについての指針がない。また、例えば、制御局が距離優先で制御され

ており、１台目の送信局における送信ストリームをサポートして大きくＴＸＯＰを設定している場合に、ユーザは、ＴＸＯＰが不足していて２台目、３台目の送信局の送信ストリームをサポートできない、すなわち、ネットワークに接続できないということが分からないことになる。

また、上述のように、テレビ映像などリアルタイム性が要求されるデータの通信を行うためには、送信局アプリケーションが想定するスループットを達成するために必要な最小 PHY Rate が確保される必要がある。

ところで、８０２．１１ｅにおいて新設されたパラメータ Minimum Tx Rate 値は、通信状態に応じて前記最小 PHY Rate 以上の値へと変更することができるが、どの値に変更するかという指針が与えられていない。これは、たとえば次のような不具合を招来する。

たとえば、近距離でもよいので３つの映像を同時に見たい場合に、家族３人のそれぞれが自分用の携帯ＴＶ受像機を持っていて、いつでもＴＶを見ることができる状態であってほしいと３人ともが希望している場合（ただし、自分の部屋でさえ見ることができれば良い。）に、誰かがＴＶ受像機を持ったまま（オンしたまま）遠くへ行ってしまい（このとき、他の２台のＴＶ受像機はオフしている。）、アプリケーション層が自動的に（勝手に）送信 PHY Rate を３６Ｍｂｐｓから１２Ｍｂｐｓまで低下させてしまうと、後からＴＶ受像機をオンした２人はＴＶを見ることができないことになる。

このような場合、なぜ、自分のＴＶ受像機が映らないのか（理由は、送信 PHY Rate が３６Ｍｂｐｓの場合には３人のＴＶ受像機が映っていたが、１２Ｍｂｐｓに低下すると、約３倍の時間が必要となり２人の

ＴＶ受像機は映らないことにある。）２人には理解できない。

また、広い通信範囲を確保して一つの映像を見たい場合、送信 PHY Rate を低くし通信範囲を確保したいにもかかわらず、アプリケーション層において送信 PHY Rate が自動的に高くなるように切り替えられてしまうと、その分、自分の通信範囲が狭くなってしまう。

このように、前記従来技術では、アプリケーション層において送信 PHY Rate が自動的に切り替えられてしまうため、送信局あるいはユーザが想定する最小送信レートが確保されず、その意図が反映された通信を行うことができない。

本発明は、前記従来の問題点に鑑みなされたものであり、その目的は、最適な通信管理方法を提供することにある。

発明の開示

上記の課題を解決するために、本発明に係る通信管理方法は、複数の通信局と、前記通信局の送信権を制御する制御局から構成される通信システムにおいて前記制御局が行う通信管理方法であって、少なくとも１つの前記通信局からの送信権要求に基づいて、該通信局に対して、所定の期間内で送信権付与期間を割り当てるとともに、前記所定の期間が予め特定の長さに限定されている方法である。

複数の通信局が存在する場合、データの送信ができるのは、その時点で送信権を有する通信局のみであり、制御局は、通信局からの送信権要求で通知されてきた情報に基づいて、送信権を割り当てる時間を調節している。この際、一般的な方法として、制御局による通信局への送信権の割り当ての制御が予め定められた特定の期間に限定されていない場合

、制御局においては、複数存在する通信局に対して送信権を割り当てる順番及び割り当てる時間などを管理する情報量が無限に多くなってしまう。

そこで、前記通信管理システムによれば、制御局によって、予め特定の長さに限定されている所定の期間で各通信局に送信権を割り当てるように制御される。このように制御局が予め定められた特定の期間で送信権を割り当てる時間情報を制御することによって、制御局は、複数存在する通信局に対して送信権を割り当てる際の順番及び割り当てる時間などの情報を、特定の期間の間分だけ管理すればよいことになり、管理する情報量を確実に減少させることが可能となる。

また、本発明に係る通信管理方法は、上記の方法において、前記所定の期間が連続的に設定されるとともに、前記所定の期間の連続が、周期性を有するように設定される方法としてもよい。

この場合、所定の期間の並びはある連続した範囲内で周期性を備えているため、制御局においては、複数存在する通信局に対して送信権を割り当てる際の順番及び割り当てる時間などの情報を、不連続な並びである場合に比べて、管理する情報量を確実に減少させることが可能となる。

また、本発明に係る通信管理方法は、複数の通信局と前記通信局の送信権を制御する制御局から構成される通信システムにおいて前記制御局が行う通信管理方法であって、少なくとも１つの前記通信局からの送信権要求に基づいて、該通信局に対して、所定の期間内で送信権付与期間を割り当てるとともに、前記所定の期間内で送信権を割り当てた通信局の全てが送信権付与期間を終了するか、あるいは送信権付与期間内に送

信を終了した時点で、少なくとも１つの前記通信局に対して、前記所定の期間内において再度送信権を割り当てる方法である。

前記制御局は前記所定の期間内に前記通信局に送信権の割り当てを行っていくが、前記通信局の少なくとも一部が自己に割り当てられた送信権期間を終了するか、あるいは送信権期間内に送信を終了することにより、前記所定の期間内に空いた期間が存在する場合がある。この場合、前記通信局の少なくとも一部に再度送信権を割り当てることにより、通信帯域の無駄を確実に無くし、通信帯域の有効利用を図ることが可能となる。

また、本発明に係る通信管理方法は、上記の方法において、前記通信局からのバッファ状況または送信権を割り当てて欲しい時間の情報を考慮するか、前記通信局に送信権を割り当ててきた実績値を考慮するか、前記通信局毎に優先度を設定しておき、前記優先度を考慮するか、またはこれらのうち２つ以上組み合わせることによって、前記所定の期間内において再度送信権を割り当てる方法としてもよい。

この場合、通信帯域の無駄を確実に無くし、通信帯域の有効利用を図ることができると共に、通信環境が悪く、及び／又は、優先度が高い通信局に送信権が再度割り当てるので、送信権が割り当てられた通信局においては迅速なエラー復帰が実現できる。

また、本発明に係る通信管理方法は、複数の通信局と前記通信局の送信権を制御する制御局から構成される通信システムにおいて前記制御局が行う通信管理方法であって、少なくとも１つの前記通信局からの送信権要求に基づいて、該通信局に対して、所定の期間内で送信権付与期間を割り当てるとともに、前記所定の期間内で割り当てる送信権付与期間

を、それ以前の各通信局の通信状況および／または各通信局の性質に基づいて設定する方法である。

前記制御局は前記所定の期間内に前記通信局に送信権の割り当てを行っていくが、前記通信局の少なくとも一部が自己に割り当てられた送信権期間を終了するか、あるいは送信権期間内に送信を終了することにより、前記所定の期間内に空いた期間が存在する場合がある。この場合、前記通信局の少なくとも一部の送信権の割り当て期間を再調整することにより、通信帯域の無駄を確実に無くし、通信帯域の有効利用を図ることが可能となる。また、再調整することにより、各通信局の通信状況に応じた送信権の割り当てが可能となる。

また、本発明に係る通信管理方法は、上記の方法において、前記通信局からのバッファ状況または送信権を割り当てて欲しい時間の情報を考慮するか、前記通信局に送信権を割り当ててきた実績値を考慮するか、前記通信局毎に優先度を設定しておき、前記優先度を考慮するか、またはこれらのうち２つ以上組み合わせることによって前記送信権の割り当て期間を設定する方法としてもよい。

この場合、各通信局の通信状況に応じた送信権の割り当てができると共に、通信環境が悪く、及び／又は、優先度が高い通信局に送信権を割り当てる時間を増やすことができるので、割り当てられた通信局においては迅速なエラー復帰が実現できる。

また、本発明に係る通信管理方法は、複数の通信局と前記通信局の送信権を制御する制御局から構成される通信システムにおいて前記制御局が行う通信管理方法であって、少なくとも１つの前記通信局からの送信権要求に基づいて、該通信局に対して、所定の期間内で送信権付与期間

を割り当てるとともに、前記送信権を与える期間には上限値および／または下限値がある方法である。

前記制御局は前記通信局からの送信権要求に基づいて送信権の割り当てを行っていくが、複数の通信局が存在する場合、前記通信局からの送信権要求をそのまま送信権の割り当てに反映した場合、通信状況が悪い通信局は、通信状況が悪くない通信局に影響を及ぼす可能性がある。

そこで、前記の方法によれば、通信局に送信権を与える期間には上限値および／または下限値が設定されているため、通信状況の悪い送信局の影響を他の送信局が受けないように上限値を設定することにより制御することができる。また下限値により、最低限の送信権が割り当てられる時間が保証されることになるので、システムとして安定してデータを送信することができる。その結果、システムの信頼性が著しく向上する。

また、本発明に係る通信管理方法は、上記の方法において、前記通信局毎に送信権付与期間に関する基準値を予め設定しておき、前記送信権付与期間を設定した結果、前記所定の期間内に送信権の割り当てができない場合に、前記基準値から最も離れている通信局に対する送信権付与期間を優先的に削減することによって、前記所定の期間内に送信権の割り当てができるように制御する方法としてもよい。

通信状況が悪い通信局が存在し、各通信局に割り当てる期間の再調整の結果、前記期間内に収まらない場合があるが、この場合、そのまま通信状況が悪い送信局に送信権を割り当てると、通信状況が正常な他の送信局に悪影響を及ぼすことになる。

そこで、このような場合、前記通信管理システムによれば、通信局毎

に割り与える期間の再調整を行った結果と予め設定しておいた基準値からの差を求め、前記差の最も大きい通信局に割り当てる期間を優先的に削減していく。これにより、前記差の大きい通信局ほど所望の送信を行うことはできなくなるが、他の通信局は悪影響を受けることなく、継続して送信を行うことができる。

また、本発明に係る通信管理方法は、複数の通信局と前記通信局の送信権を制御する制御局から構成される通信システムにおいて前記制御局が行う通信管理方法であって、少なくとも１つの前記通信局からの送信権要求に基づいて、該通信局に対して、所定の期間内で送信権付与期間を割り当てるとともに、動作モードとして、距離優先モードまたは台数優先モードの切り替えを行う方法としてもよい。

一般に、伝送距離を長くすることと、多数の送信局（ストリーム）をサポートすることとは、相反する事項である。したがって、従来は、ユーザの意図を認識して、距離を優先して送信局に送信権を付与していくか、複数の送信局（ストリーム）をサポートすることを優先して送信局に送信権を与えていくかの指針がなかった。

そこで、前記通信管理システムによれば、前記制御局で距離優先モードあるいは台数優先モードの切り替えができる。これによって、ユーザの意図通りのモード設定を行うことができる。

また、本発明に係る通信管理方法は、上記の方法において、送信局が通知する送信レートの最低値を示す最小送信レートを受け入れるか否かを判断する閾値を設定する方法としてもよい。

送信レートが送信局アプリケーション層レベルで自動的に切り替わり、送信局アプリケーションの想定する最小 PHY Rateが確保されないと

いう不具合は生じる。そこで、前記通信管理システムによれば、制御局において、送信局の送信レートの最低値を示す最小送信レートを受け入れるか否かを判断する閾値が設定可能となっている。

これにより、たとえ送信レート が送信局アプリケーション層レベルで自動的に切り替わるということが生じても、前記閾値をユーザの希望する使用状況に合ったものに変更すれば、前記不具合を確実に解消できる。

また、本発明に係る通信管理方法は、上記の方法において、距離優先モードまたは台数優先モードに応じて前記閾値を設定する方法としてもよい。

たとえば、近距離でもよいので複数の映像を複数のＴＶ受像機で同時に見たい場合、１台のＴＶ受像機がオンし他のＴＶ受像機がオフしていた状態で、アプリケーション層が自動的に（勝手に）送信レートを低下させてしまうと、後からオンされるＴＶ受像機は映らなくなってしまう。また、広い通信範囲を確保して一つの映像を見たい場合、アプリケーション層が自動的に（勝手に）送信レートを高くなるように切り替えてしまうと、その分、自分の通信範囲が狭くなってしまう。

そこで、上記のように、前記制御局が、距離優先モードまたは台数優先モードに応じて前記閾値を設定すれば、前記閾値をユーザの希望する使用状況に合ったものに変更することによって、複数の映像を複数のＴＶ受像機で同時に見ることが可能となる（台数優先モードに対応）と共に、品質を劣化させることなく、広い通信範囲を確保して一つの映像を見ることも可能となる（距離優先モードに対応）。

また、本発明に係る通信管理方法は、上記の方法において、送信局ま

たは受信局からモード切り替え要求を受信する方法としてもよい。これにより、前記制御局における動作モードを、前記送信局または受信局からも変更することができる。

また、本発明に係る通信管理方法は、上記の方法において、動作モードを切り替えた場合、送信局または受信局にその旨を通知する方法としてもよい。これにより、前記送信局または前記受信局において、前記制御局の動作モードの切り替えを認識できる。

また、本発明に係る通信管理方法は、上記の方法において、動作モードを切り替えない場合、その旨を前記制御局が備える表示手段に表示する方法としてもよい。これにより、ユーザは前記制御局において、前記制御局の動作モードの切り替えが行われなかったことを認識できる。

また、本発明に係る通信管理方法は、上記の方法において、動作モードを切り替えない場合、その理由を前記制御局が備える表示手段に表示する方法としてもよい。これにより、ユーザは前記制御局において、前記制御局の動作モードの切り替えが行われなかった理由を知ることができ、必要な措置を講じることが可能となる。

また、本発明に係る通信管理方法は、上記の方法において、動作モードを切り替えない場合、送信局および／または受信局にその旨を通知する方法としてもよい。

これにより、動作モード切り替えを要求した送信局または受信局は、切り替え要求が認められなかったことを認識できる。

また、本発明に係る通信管理方法は、上記の方法において、動作モードを切り替えない場合、送信局および／または受信局にその理由を通知する方法としてもよい。

これにより、動作モード切り替えを要求した送信局または受信局は、切り替え要求が認められなかった理由を知ることができ、ユーザは必要な措置を講じ得る。

また、本発明に係る通信管理方法は、上記の方法において、前記制御局が備える表示手段に現在の動作モードを表示すると共に、送信局または受信局が要求してきた動作モードを表示する方法としてもよい。

この場合、一見して、制御局の動作モードを認識することができる。

また、本発明に係る制御局は、複数の通信局と前記通信局の送信権を制御する制御局から構成される通信システムが備える制御局であって、

前記複数の通信局からの送信権要求を受信する受信部と、前記複数の通信局の少なくとも一部に対して送信権を付与する情報を送信する送信部と、上記本発明に係る通信管理方法を実行するスケジューリング部とを備えている構成である。

これにより、本発明を実現する制御局を提供することができる。

また、本発明に係る通信管理方法は、複数の通信局と前記通信局の送信権を制御する上記本発明に係る制御局から構成される通信システムにおいて前記通信局が行う通信管理方法であって、前記制御局が距離優先モードまたは台数優先モードで制御しているのかを前記通信局が備える表示手段に表示する方法である。

この場合、制御局が距離優先モードで制御しているのか、あるいは台数優先で制御しているのかが通信局側で表示される。これによって、ユーザは、現在、距離優先モードで制御されているのか、あるいは台数優先モードで制御されているのかを表示により知ること、及び／又は、確認することができるので、必要に応じた処置を早めに講ずることができ

る。

また、本発明に係る通信管理方法は、複数の通信局と前記通信局の送信権を制御する上記本発明に係る制御局から構成される通信システムにおいて前記通信局が行う通信管理方法であって、前記通信システムにおける通信ネットワークに接続できない送信局が存在する場合に、その理由を前記通信局が備える表示手段に表示する方法である。

この場合、例えば２台目以降の送信局（ストリーム）が送信権を付与してもらえないとき、「回線事情により送信局（ストリーム）をサポートできない」旨が通信局側で表示される。これによって、ユーザは、現在のモードが適切であるかどうかを判断することができ、現在の制御モードが不適切なものであれば適切なものに変更することができる。

また、本発明に係る通信管理方法は、複数の通信局と前記通信局の送信権を制御する上記本発明に係る制御局から構成される通信システムにおいて前記通信局が行う通信管理方法であって、送信を行う場合に、前記制御局に対して、動作モードを距離優先モードまたは台数優先モードに切り替えることを要求する方法である。

これにより、送信局においても制御局の動作モードを切り替えることができる。

また、本発明に係る通信管理方法は、上記の方法において、送信を行う場合に、前記制御局の現在の動作モードを前記通信局が備える表示手段に表示すると共に、前記制御局に切り替え要求した動作モードを前記表示手段に表示する方法としてもよい。

これにより、ユーザは前記送信局において、前記制御局に対して現在要求中の動作モードを確認することができる。

また、本発明に係る通信管理方法は、上記の方法において、前記制御局から、動作モードが切り替えられた旨を受信した際に、その通知された内容を前記通信局が備える表示手段に表示する方法としてもよい。

これにより、前記送信局において、前記制御局の動作モードの切り替えを認識できる。

また、本発明に係る通信管理方法は、上記の方法において、前記制御局から、自局から送信したモード切り替え要求が拒否された旨を受信した際に、その旨を前記通信局が備える表示手段に表示する方法としてもよい。

これにより、動作モード切り替えを要求した送信局は、切り替え要求が認められなかったことを認識できる。

また、本発明に係る通信管理方法は、上記の方法において、前記制御局から、自局から送信したモード切り替え要求が拒否された旨を受信した際に、その理由を前記通信局が備える表示手段に表示する方法としてもよい。

これにより、ユーザは必要な措置を講じることができる。

また、本発明に係る通信管理方法は、上記の方法において、複数の通信局と前記通信局の送信権を制御する上記本発明に係る制御局から構成される通信システムにおいて前記通信局が行う通信管理方法であって、送信局からデータを受信する場合に、前記制御局に対して、動作モードを距離優先モードまたは台数優先モードに切り替えることを、前記送信局を介して要求する方法である。

この場合、制御局、送信局、または受信局のいずれからも制御局の動作モードを変更することが可能となる。

また、本発明に係る通信管理方法は、上記の方法において、受信を行う場合に、前記制御局の現在の動作モードを前記通信局が備える表示手段に表示すると共に、前記制御局に切り替え要求した動作モードを前記表示手段に表示する方法としてもよい。

この場合、一見して、制御局の動作モードを認識することができる。

また、本発明に係る通信管理方法は、上記の方法において、前記制御局から、動作モードが切り替えられた旨を送信局を介して受信した際に、その通知された内容を前記通信局が備える表示手段に表示する方法としてもよい。

この場合、受信局において制御局の動作モードが変更されたことを知ることができる。

また、本発明に係る通信管理方法は、上記の方法において、前記制御局から、自局から送信したモード切り替え要求が拒否された旨を受信した際に、その旨を前記通信局が備える表示手段に表示する方法としてもよい。

これにより、動作モード切り替えを要求した受信局は、切り替え要求が認められなかったことを認識できる。

また、本発明に係る通信管理方法は、上記の方法において、前記制御局から、自局から送信したモード切り替え要求が拒否された旨を受信した際に、その理由を前記通信局が備える表示手段に表示する方法としてもよい。

これにより、ユーザは必要な措置を講じることが可能となる。

また、本発明に係る通信管理方法は、複数の通信局と前記通信局の送信権を制御する上記本発明に係る制御局から構成される通信システムに

おいて前記通信局が行う通信管理方法であって、送信を行う際の動作モードとして、高速送信モードおよび低速送信モードに切替可能である方法である。

また、本発明に係る通信管理方法は、上記の方法において、送信レートの最低値を示す最小送信レートが設定されている方法としてもよい。

前述のように、送信レートが送信局アプリケーション層レベルで自動的に切り替わり送信局アプリケーションの想定する最小 PHY Rate が確保されないという不具合は生じ得る。そこで、前記通信管理システムにおいて、前記送信局は、送信レートの最低値を示す最小送信レートを設定可能であることが好ましい。

これにより、たとえ送信レートが送信局アプリケーション層レベルで自動的に切り替わり得るということが生じても、送信局において前記最小送信レートをユーザの希望する使用状況に合ったものに変更すれば、前記不具合は確実に解消できる。

また、本発明に係る通信管理方法は、上記の方法において、高速送信モードまたは低速送信モードに応じて前記最小送信レートが設定される方法としてもよい。

たとえば、近距離でもよいので複数の映像を複数のＴＶ受像機で同時に見たい場合、１台のＴＶ受像機がオンし他のＴＶ受像機がオフしていた状態で、アプリケーション層が自動的に（勝手に）送信レートを低下させてしまうと、後からオンされるＴＶ受像機は映らなくなってしまう。また、広い通信範囲を確保して一つの映像を見たい場合、アプリケーション層が自動的に（勝手に）送信レートを高くなるように切り替えてしまうと、その分、自分の通信範囲が狭くなってしまう。

そこで、上記の方法のように、前記送信局は、高速送信モードまたは低速送信モードに応じて前記最小送信レートを設定するようにすれば、前記閾値をユーザの希望する使用状況に合ったものに変更することによって、複数の映像を複数のＴＶ受像機で同時に見ることが可能となると共に、品質を劣化させることなく、広い通信範囲を確保して一つの映像を見ることも可能となる。

また、本発明に係る通信管理方法は、上記の方法において、動作モードを切り替えた場合、前記制御局と、送信先となる受信局とに、その旨をそれぞれ通知する方法としてもよい。

これにより、前記制御局または前記受信局において、前記通信局の動作モードの切り替えを認識できる。

また、本発明に係る通信管理方法は、上記の方法において、現在の動作モードを前記通信局が備える表示手段に表示する方法としてもよい。

この場合、一見して、送信局の動作モードを認識することができる。

また、本発明に係る通信管理方法は、上記の方法において、前記制御局から、動作モードが切り替えられた旨を受信した際に、その通知された内容を前記通信局が備える表示手段に表示する方法としてもよい。

これにより、通信局において、制御局が動作モードを切り替えたことを認識することが可能となる。

また、本発明に係る通信管理方法は、上記本発明に係る通信管理方法を行う送信局としての通信局から受信を行う受信局としての通信局が行う通信管理方法であって、前記送信局の現在の動作モードを前記受信局としての通信局が備える表示手段に表示する方法である。

この場合、前記受信局において、一見して、送信局の動作モードを認

識することができる。

また、本発明に係る通信管理方法は、上記の方法において、前記制御局から、動作モードが切り替えられた旨を受信した際に、その通知された内容を前記受信局としての通信局が備える表示手段に表示する方法としてもよい。

これにより、前記受信局において、前記送信局の動作モードの切り替えを認識できる。

また、本発明に係る通信管理方法は、上記の方法において、前記送信局の動作モードを高速送信モードまたは低速送信モードに切り替えることを要求する方法としてもよい。

この場合、前記受信局からも前記送信局の動作モードを変更することができる。

また、本発明に係る通信局は、複数の通信局と前記通信局の送信権を制御する制御局から構成される通信システムが備える通信局であって、前記通信局および／または前記制御局に対して情報の送信および／または受信を行う送受信部と、上記本発明に係る通信管理方法を実行するスケジューリング部とを備えている構成である。

これにより、本発明を実現する通信局を提供することができる。

また、本発明に係る通信管理方法は、上記本発明に係る通信管理方法を行う送信局としての通信局の送信権を制御する制御局が行う通信管理方法であって、前記送信局の動作モードを前記制御局が備える表示手段に表示する方法である。

これにより、前記制御局において、前記送信局の動作モードの切り替えを認識できる。

また、本発明に係る制御局は、複数の通信局と前記通信局の送信権を制御する制御局から構成される通信システムが備える制御局であって、前記複数の通信局からの送信権要求を受信する受信部と、前記複数の通信局の少なくとも一部に対して送信権を付与する情報を送信する送信部と、上記本発明に係る通信管理方法を実行するスケジューリング部とを備えている構成である。

これにより、本発明を実現する制御局を提供することができる。

また、本発明に係る通信管理プログラムは、上記本発明に係る通信管理方法をコンピュータに実行させるものである。

また、本発明に係る通信管理プログラムを記録した記録媒体は、上記通信管理プログラムを記録している構成である。

上記プログラムをコンピュータシステムにロードすることによって、上記通信管理方法をユーザに提供することが可能となる。

本発明のさらに他の目的、特徴、および優れた点は、以下に示す記載によって十分わかるであろう。また、本発明の利益は、添付図面を参照した次の説明で明白になるであろう。

図面の簡単な説明

図１は、本発明の通信管理システムにおいて通信帯域の有効利用を図ることについての処理手順を示すフローチャートである。

図２（ａ）および図２（ｂ）は、本発明の通信管理システムにおいて周期的な間隔を説明する説明図である。

図３（ａ）および図３（ｂ）は、本発明の通信管理システムにおいて他の周期的な間隔を説明する説明図である。

図４は、本発明の通信管理システムにおいてデータ送信を説明する説明図である。

図５は、本発明の他の通信管理システムにおいて通信帯域の有効利用を図ることについて示す説明図である。

図６は、本発明の通信管理システムにおいて通信帯域の有効利用を図る他の例について示す説明図である。

図７は、図６の通信管理システムの処理手順を示すフローチャートである。

図８は、本発明の通信管理システムにおいて、ＴＸＯＰの下限値、基準値、及び上限値を説明する説明図である。

図９は、前記通信管理システムの手順を説明する説明図である。

図１０は、Ａｃｋ　Ｐｏｌｉｃｙ毎のＴＸＯＰの具体例を示す説明図である。

図１１は、図９の通信管理システムの処理手順を示すフローチャートである。

図１２は、送信局の台数と物理レートとの関係を示す説明図である。

図１３は、前記通信管理システムで使用される制御局の構成例を示すブロック図である。

図１４は、前記制御局内のスケジューリング部の構成例を示すブロック図である。

図１５は、前記通信管理システムで使用される送信局の構成例を示すブロック図である。

図１６は、前記通信管理システムで使用される受信局の構成例を示すブロック図である。

図１７は、制御局のモードの変更に係るパターン例を示す説明図である。

図１８は、ユーザが制御局／送信局を台数優先モードに設定する処理手順例を示す説明図である。

図１９は、制御局の動作モード変更に係る制御局の処理手順例を示すフローチャートである。

図２０は、制御局の動作モード変更に係る受信局の処理手順例を示すフローチャートである。

図２１は、ユーザが、受信局を介して制御局の動作モードを台数優先モードに指定し、制御局／送信局に対してモード変更要求信号を送信する場合の処理手順例を示す説明図である。

図２２は、ユーザが、制御局／受信局を台数優先モードに設定する場合の処理手順例を示す説明図である。

図２３は、制御局の動作モード変更に係る送信局の処理手順例を示すフローチャートである。

図２４は、ユーザが、送信局を介して制御局の動作モードを台数優先モードに指定し、制御局／受信局に対してモード変更要求信号を送信する場合の処理手順例を示す説明図である。

図２５は、ユーザが、制御局において、前記制御局を台数優先モードにする場合の処理手順例を示す説明図である。

図２６は、ユーザが、送信局を介して制御局の動作モードを台数優先モードに指定し、制御局に対してモード変更要求信号を送信する場合の処理手順例を示す説明図である。

図２７は、ユーザが、受信局を介して制御局の動作モードを台数優先

モードに指定し、送信局に対してモード変更要求信号を送信し、それを受信した送信局は制御局に対してモード変更要求信号を送信する場合の処理手順例を示す説明図である。

図２８は、送信局のモードの変更に係るパターン例を示す説明図である。

図２９は、ユーザが制御局／送信局を高速送信モードにする場合の処理手順例を示す説明図である。

図３０は、送信局の動作モード変更に係る送信局の処理手順例を示すフローチャートである。

図３１は、送信局の動作モード変更に係る受信局の処理手順例を示すフローチャートである。

図３２は、ユーザが送信局を高速送信モードにする場合の処理手順例を示す説明図である。

図３３は、ユーザが送信局を高速送信モードにする場合の他の処理手順を示す説明図である。

図３４は、送信局の動作モード変更に係る制御局の処理手順例を示すフローチャートである。

図３５は、ユーザが受信局を介して制御局／送信局を高速送信モードに指定し、制御局／送信局へ動作モードの変更要求信号を送信する場合の処理手順例を示す説明図である。

図３６は、ユーザが制御局／受信局を介して送信局の動作モードを高速送信モードに指定し、送信局へ動作モードの変更要求信号を送信する場合の処理手順例を示す説明図である。

図３７は、ユーザが受信局を介して送信局の動作モードを高速送信モ

ードに指定し、送信局へ動作モードの変更要求信号を送信する場合の処理手順例を示す説明図である。

図３８は、従来の通信管理システムにおける信号の流れを説明する説明図である。

図３９は、送信 PHY Rate と送信距離及び送信 PHY Rate と送信時間の関係を説明する説明図である。

発明を実施するための最良の形態

本発明の実施の一形態について図面に基づいて説明すれば、以下のとおりである。

本実施の形態に係る通信管理システムによれば、所定の期間をある特定の値に限定し、ある連続した範囲内で周期性を備え、ＣＦ－ＰＯＬＬを各通信局に送信（スケジューリング）することによりＴＸＯＰの情報を管理する量を減らすことができる。

（ポーリングインターバル）

ここで、前記通信管理システムの周期性（ポーリングインターバル）の説明を図２～図４を参照しながら以下に説明する。

一般に無線などの媒体を用いた通信の場合は、制御局は、他の通信局と時間の同期を取るためにＢｅａｃｏｎと呼ばれるパケットを一定間隔（Ｂｅａｃｏｎ　Ｉｎｔｅｒｖａｌ）で送信する。

本発明においては、通信管理システムにおいて周期性を有している場合として、次の４つの場合を想定している。なお、１ＴＵは１０２４μｓに対応するものとする。

①図２（ａ）のようにポーリングインターバルを１０ＴＵとし、ビー

コンインターバルを１００ＴＵとした場合に、Ｂｅａｃｏｎを送信し始めたところからポーリングインターバルが開始し、その後一定周期の間隔でポーリングインターバルに区切られている。

②図２(ｂ)のようにポーリングインターバルを１０ＴＵとし、ビーコンインターバルを１００ＴＵとした場合に、Ｂｅａｃｏｎを送信し終わったところからポーリングインターバルが開始し、その後１０ＴＵの一定周期の間隔でポーリングインターバルに区切られている。

③図３(ａ)のようにポーリングインターバルを８ＴＵとし、ビーコンインターバルを１００ＴＵとした場合に、Ｂｅａｃｏｎを送信し始めたところからポーリングインターバルが開始し、その後８ＴＵの一定周期の間隔でポーリングインターバルに区切られて、ビーコンインターバルの最後には空白の時間（空き時間）が存在する。

④図３(ｂ)のようにポーリングインターバルを８ＴＵと１０ＴＵとし、ビーコンインターバルを１００ＴＵとした場合に、Ｂｅａｃｏｎを送信し始めたところからポーリングインターバルが開始し、その後８ＴＵのポーリングインターバルと１０ＴＵのポーリングインターバルが交互に現れる。

（通信局の動作）

次にＴＸＯＰを割り当てされた通信局の動作について図４を参照しながら詳細に説明する。なお、図４は、通信局が複数個（送信局（ＳＴＡ）１～３）存在し、送信局１～３の順に送信権が付与される場合について例示している。

図４に示すように、制御局からＣＦ－Ｐｏｌｌを受けて送信権が割り当てられた送信局１は、付与された期間（ＴＸＯＰ１：送信局１が占有

している時間）にデータ（パケット（Packet））を受信局に向かって送信する。データの送信後、ＱｏＳ　Ｎｕｌｌを介して制御局にバッファ状況などを含む通信状況が送信局から報告される。

次に、制御局からＣＦ－Ｐｏｌｌを受けて送信権が付与された送信局２は、付与された期間（ＴＸＯＰ２：送信局２が占有している時間）にデータ（パケット（Packet））を受信局に向かって送信する。データの送信後、ＱｏＳ　Ｎｕｌｌを介して制御局にバッファ状況などを含む通信状況が送信局から報告される。

そして、送信権を割り当てする間隔（ポーリングインターバル）内の最後に、制御局からＣＦ－Ｐｏｌｌを受けて送信権が付与された送信局３は、付与された期間（ＴＸＯＰ３：送信局３が占有している時間）にデータ（パケット（Packet））を受信局に向かって送信する。データの送信後、ＱｏＳ　Ｎｕｌｌを介して制御局にバッファ状況などを含む通信状況が送信局から報告される。

図４から明らかなように、ポーリングインターバル内で、送信局３によるデータの送信後、送信局３から制御局のスケジューラにＱｏＳ　Ｎｕｌｌを介して通信状況が報告されると、次に送信局１に送信権が付与されるまでの期間は空き状態になる。すなわち、どの送信局にも送信権が付与されない状態になる。

勿論、ポーリングインターバルの全期間を使用するように、各送信局に付与されるＴＸＯＰが決定されていても、通信状況により、前記のように空きが生じる場合がある。また、図４ではポーリングインターバルの最後部に空きが生じているが、送信局１によるデータ送信後または送信局２によるデータ送信後に空きが生じる場合もある。

ここで、前記のようにポーリングインターバルに空きが生じた場合に、通信帯域を有効に利用するためにはどのようにＴＸＯＰを割り当てればよいかについて説明する。

本実施の形態によれば、前記空いた期間内にＴＸＯＰを再度割り当てる（付与する）ようにしている。

空いた前記期間内にＴＸＯＰを送信局に再度割り当てる方法として、①ＱｏＳ　Ｎｕｌｌを介して報告してきた情報を基にＴＸＯＰを割り当てていく方法、②付与したＴＸＯＰのうち実際に使用した時間の情報を基に割り当てる方法、③優先度の情報がある場合、優先度の情報を基に割り当てる方法、又は④これらの方法①～③のうち２つ以上組み合わせて割り当てる方法が好ましい。

（ＴＸＯＰ割り当ての具体例）

ここで、通信帯域の有効利用について図５を参照しながら具体例を挙げて説明する。なお、図５中、中段は本発明の通信管理システムを説明するものであり、同上段には参考のために従来方法を併せて描いた。

本具体例によれば、図５に示すように、各ポーリングインターバル（１０ｍｓ）の最後部の空いた期間（図５の例では、１ｍｓの時間が空いている。）を利用し、この期間内にＴＸＯＰが以下のようにして再割り当てされる（図５中、中段の第１ポーリングインターバル～第４ポーリングインターバルを参照）。

なお、図５は、送信局が複数個（ＳＴＡ１～３）存在する場合を説明するものであるが、本発明はこれに限定されるものではなく、４個以上の送信局が存在する場合についても適用可能である。また、図５では空いた期間を１つの送信局に再度付与しているが、複数の送信局に再度付

与しても良い。また、図５ではポーリングインターバルの最後部に空いた期間が生じているが、ＳＴＡ１またはＳＴＡ２がデータの送信を終了した時点で空きが生じる場合も適用可能である。

すなわち、図５に示すように、第１ポーリングインターバルにおいて送信局１～３に対して初期設定されているＴＸＯＰの基本値（割り当てる予定の値）がそれぞれ４ｍｓ、３ｍｓ、及び２ｍｓであると共に、実際に割り当てられた（割り当てられた）ＴＸＯＰの長さがそれぞれ４ｍｓ、３ｍｓ、及び２ｍｓであるとする。また、送信局１～３によって実際に使用されたＴＸＯＰの長さが、それぞれ２ｍｓ、３ｍｓ、及び２ｍｓであったとし、更に、送信局１～３からＱｏＳ　Ｎｕｌｌ（図示しない）を介して要求されたＴＸＯＰの長さが、それぞれ０ｍｓ、１ｍｓ、及び１ｍｓであったとする。

この場合、第１ポーリングインターバルにおいて、送信局３、送信局２、送信局１の順（危ない順）に通信状況が悪いと判断され、最も通信状況の悪い送信局３にＴＸＯＰが空き期間に再度割り当てられる。

なお、送信局２及び３は、何れも要求値が１ｍｓで同じであるが、基本値を考慮して通信状況の悪さが判断される。すなわち、送信局２の基本値は３ｍｓである一方、送信局３の基本値は２ｍｓである。したがって、基本値に対する要求値の割合は送信局３の方が大きいので、送信局３の方が送信局２よりも通信状況が悪いと判断される。

第２ポーリングインターバルは、送信局１～３によって実際に使用されたＴＸＯＰの長さが、それぞれ４ｍｓ、３ｍｓ、及び２ｍｓであり、送信局１～３からＱｏＳ　Ｎｕｌｌ（図示しない）を介して要求されたＴＸＯＰの長さが、それぞれ１ｍｓ、２ｍｓ、及び０ｍｓであった点に

おいて、前記の第１ポーリングインターバルの場合と異なっている。この場合、送信局２、送信局１、送信局３の順（危ない順）に通信状況が悪いと判断され、最も通信状況の悪い送信局２にＴＸＯＰが空き期間に再度割り当てられる。

第３ポーリングインターバルは、送信局１～３からＱｏＳ　Ｎｕｌｌ（図示しない）を介して要求されたＴＸＯＰの長さが、それぞれ３ｍｓ、０ｍｓ、及び１ｍｓであった点において、前記の第２ポーリングインターバルの場合と異なっている。この場合、送信局１、送信局３、送信局２の順に通信状況が悪いと判断され、最も通信状況の悪い送信局１にＴＸＯＰが空き期間に再度割り当てられる。

第４ポーリングインターバルは、送信局１～３によって実際に使用されたＴＸＯＰの長さが、それぞれ４ｍｓ、２ｍｓ、及び２ｍｓであり、送信局１～３からＱｏＳ　Ｎｕｌｌ（図示しない）を介して要求されたＴＸＯＰの長さが、それぞれ０ｍｓ、０ｍｓ、及び２ｍｓであった点において、前記の第３ポーリングインターバルの場合と異なっている。この場合、送信局３、送信局２、送信局１の順に通信状況が悪いと判断され、最も通信状況の悪い送信局３にＴＸＯＰが空き期間に再度割り当てられる。

本実施の形態によれば、以上のように、通信帯域の無駄を確実になくし、通信帯域の有効利用を確実に図ることが可能となる。

（ＴＸＯＰ付与処理のフローチャート）

ここで、図１を参照しながら、図５の処理手順を以下に説明する。

まず、ポーリングインターバルが開始されると、ポーリングインターバル内の全てのポーリングが終了したか否かが判断される（Ｓ１１）。

全て終了していない場合、ＣＦ－Ｐｏｌｌの送信が行われ（Ｓ１２）、前記Ｓ１１に戻る。

一方、前記Ｓ１１において、全てのポーリングが終了したと判断された場合、どの送信局（ＳＴＡ）に空いた（残った）時間を割り当てるかが決定される（Ｓ１３）。それから、決定した送信局にＣＦ－Ｐｏｌｌを送信し（Ｓ１４）、ポーリングインターバルが終了する。

（ＴＸＯＰ割り当て方法の他の例）

ここで、通信帯域を有効に利用し、各通信局の通信状況に応じた送信権の割り当てるためにはどのようにＴＸＯＰを割り当てればよいかについて他の例を挙げて説明する。

この例においては、ポーリングインターバル内で報告されたＱｏＳ Ｎｕｌｌに基づいて、次のポーリングインターバルでスケジューリングに反映することについて説明する。

本実施の形態によれば、第２ポーリングインターバル以降、各ポーリングインターバル内で空いた期間が生じないようにＴＸＯＰを割り当てる（付与する）ようにしている。

次のポーリングインターバルでスケジューリングに反映する方法として、①ＱｏＳ　Ｎｕｌｌを介して報告してきた情報を基にＴＸＯＰを割り当てていく方法、②付与したＴＸＯＰのうち実際に使用した時間の情報を基に割り当てる方法、③優先度の情報がある場合、優先度の情報を基に割り当てる方法、又は④これらの方法①～③のうち２つ以上組み合わせて割り当てる方法が好ましい。

（ＴＸＯＰ割り当ての具体例）

ここで、通信帯域の有効利用について図６を参照しながら具体例を挙

げて説明する。なお、図６中、中段は本発明の通信管理システムを説明するものであり、同上段には参考のために従来方法を併せて描いた。

本具体例によれば、図６に示すように、第１ポーリングインターバル（１０ｍｓ）内で報告されたＱｏＳ　Ｎｕｌｌを次の第２ポーリングインターバルでのスケジューリングに反映し、以降も同様に、送信局の各ＴＸＯＰの長さを調節するようにしている。

なお、図６は、送信局が複数個（ＳＴＡ１～３）存在する場合を説明するものであるが、本発明はこれに限定されるものではなく、４台以上の送信局が存在する場合にも適用可能である。また、図６では１つの送信局のみの送信権を再調整しているが、複数の送信局の送信権を再調整しても良い。また、図６においては送信権を割り当てる時間を増やす場合のみを示しているが、減らす場合も適用可能である。さらに、図６ではポーリングインターバルの最後部において再調整を行っているが、ＳＴＡ１またはＳＴＡ２がデータの送信を終了した時点で再調整を行ってもよい。

すなわち、図６に示すように、第１ポーリングインターバルにおいて送信局１～３に対して初期設定されているＴＸＯＰの基本値がそれぞれ４ｍｓ、３ｍｓ、及び２ｍｓであると共に、実際に割り当てられた（付与された）ＴＸＯＰの長さがそれぞれ４ｍｓ、３ｍｓ、及び２ｍｓであるとする。また、送信局１～３によって実際に使用されたＴＸＯＰの長さが、それぞれ２ｍｓ、３ｍｓ、及び２ｍｓであったとし、更に、送信局１～３からＱｏＳ　Ｎｕｌｌ（図示しない）を介して要求されたＴＸＯＰの長さが、それぞれ０ｍｓ、１ｍｓ、及び１ｍｓであったとする。

この場合、第１ポーリングインターバルにおいて、送信局３、送信局

２、送信局１の順(危ない順)に通信状況が悪いと判断され、このことが、次の第２ポーリングインターバルにおいて、第１ポーリングインターバル内で最も通信状況の悪かった送信局３のＴＸＯＰの調節に反映される。

なお、送信局２及び３は、何れも要求値が１ｍｓで同じであるが、基本値を考慮して通信状況の悪さが判断される。すなわち、送信局２の基本値は３ｍｓである一方、送信局３の基本値は２ｍｓである。したがって、基本値に対する要求値の割合は送信局３の方が大きいので、送信局３の方が送信局２よりも通信状況が悪いと判断される。

第２ポーリングインターバルにおいては、送信局３に実際に割り当てられたＴＸＯＰの長さが２ｍｓから３ｍｓに増加された。そして、送信局１～３によって実際に使用されたＴＸＯＰの長さが、それぞれ４ｍｓ、３ｍｓ、及び３ｍｓであった。その結果、送信局１～３からＱｏＳ Ｎｕｌｌ（図示しない）を介して要求されたＴＸＯＰの長さは、それぞれ１ｍｓ、２ｍｓ、及び０ｍｓであった。この場合、送信局２、送信局１、送信局３の順に通信状況が悪いと判断され、このことが、次の第３ポーリングインターバルにおいて、第２ポーリングインターバル内で最も通信状況の悪かった送信局２のＴＸＯＰの調節に反映される。

第３ポーリングインターバルにおいては、送信局２に実際に割り当てられたＴＸＯＰの長さが３ｍｓから４ｍｓに増加されると共に、送信局３に実際に割り当てられたＴＸＯＰの長さが３ｍｓから２ｍｓに減少された。そして、送信局１～３によって実際に使用されたＴＸＯＰの長さが、それぞれ４ｍｓ、４ｍｓ、及び２ｍｓであった。その結果、送信局１～３からＱｏＳ Ｎｕｌｌ（図示しない）を介して要求されたＴＸＯ

Ｐの長さは、それぞれ３ｍｓ、０ｍｓ、及び１ｍｓであった。この場合、送信局１、送信局３、送信局２の順に通信状況が悪いと判断され、このことが、次の第４ポーリングインターバルにおいて、第３ポーリングインターバル内で最も通信状況の悪かった送信局１のＴＸＯＰの調節に反映される。

第４ポーリングインターバルにおいては、送信局１に実際に割り当てられたＴＸＯＰの長さが４ｍｓから５ｍｓに増加されると共に、送信局２に実際に割り当てられたＴＸＯＰの長さが４ｍｓから３ｍｓに減少された。そして、送信局１～３によって実際に使用されたＴＸＯＰの長さが、それぞれ５ｍｓ、２ｍｓ、及び２ｍｓであった。その結果、送信局１～３からＱｏＳ　Ｎｕｌｌ（図示しない）を介して要求されたＴＸＯＰの長さは、それぞれ０ｍｓ、０ｍｓ、及び２ｍｓであった。この場合、送信局３、送信局２、送信局１の順に通信状況が悪いと判断され、このことが、次のポーリングインターバル（図示しない）において、第４ポーリングインターバル内で最も通信状況の悪かった送信局３のＴＸＯＰの調節に反映される。

本実施の形態によれば、以上のように、通信帯域の無駄を確実になくし、通信帯域の有効利用が可能となると共に各通信局の通信状況に応じた送信権の割り当てることが可能となる。

（ＴＸＯＰ付与処理のフローチャート）

ここで、図７を参照しながら、前記処理手順を以下に説明する。

まず、ポーリングインターバルが開始されると、ポーリングインターバル内の全てのポーリングが終了したか否かが判断される（Ｓ２１）。全て終了していない場合、ＣＦ－Ｐｏｌｌの送信が行われ（Ｓ２２）、

前記Ｓ２１に戻る。

一方、前記Ｓ２１において、全てのポーリングが終了したと判断された場合、どの送信局（ＳＴＡ）の時間（ＴＸＯＰ）を次のポーリングインターバルで増やすかが決定される（Ｓ２３）。そして、割り当てるＴＸＯＰの調整を行い（Ｓ２４）ポーリングインターバルが終了する。

以上のように、本実施の形態に係る他の通信管理方法によれば、制御局と複数の通信局が存在する場合に、送信権を割り当てる期間は各通信局において設定されている上限値かつまたは下限値を超えないように制御される。その結果、通信状況が悪い通信局が通信状況が悪くない通信局に影響を及ぼすのを防ぐことができると共に、ポーリングインターバルを超えるようなスケジューリングが行われることを未然に且つ確実に回避することができる。

（通信管理システムの具体例）

ここで、前記通信管理システムの具体例について、図８及び図９を参照しながら以下に説明する。

まず、ストリームの定義が行われ、送信局（Ａ～Ｃ）から制御局に対してストリームを流す前に、ネゴーシエーションが行われる。つまり、送信局（Ａ～Ｃ）から或るデータを或るジッタ範囲で送信したい旨などを制御局に対してストリームを流す前に通知し、両者間でネゴーシエーションが行われる。制御局は、物理レートの変動を考慮に入れて、前記データの内容及びジッタ範囲等に基づいて送信局に付与するＴＸＯＰの下限値及び上限値を決定する（図８参照）。

つまり、ストリームの定義の際には、物理レートは送信局次第であって不明であり、制御局は特定することができない。そこで、制御局とし

ては、例えば、考えられる物理レートの範囲における中程のレート（ＴＸＯＰの基準値に対応する）に設定し、この物理レートよりも大きくても小さくても対応できるように前記の下限値及び上限値を決定すればよい。なお、制御局は、通常、このように決定した下限値未満のＴＸＯＰ、及び上限値より大きいＴＸＯＰを送信局に対して付与することはない。

送信局Ａは、図９に示す第１ポーリングインターバルにおいて、制御局（図示しない）からＣＦ－Ｐｏｌｌ（図示しない）を受けて送信権が付与されると、付与された期間（ＴＸＯＰ：送信局Ａが占有している時間）にデータ（パケット）を受信局（図示しない）に向かって送信する。データの送信後、ＱｏＳ　Ｎｕｌｌを介して制御局のスケジューラに通信状況が送信局Ａから報告される。説明の便宜上、この報告結果が良いものであったと仮定する。

次に、前記制御局からＣＦ－Ｐｏｌｌを受けて送信権が付与された送信局Ｂは、付与された期間（ＴＸＯＰ：送信局Ｂが占有している時間）にデータ（パケット）を受信局に向かって送信する。データの送信後、ＱｏＳ　Ｎｕｌｌを介して制御局のスケジューラに通信状況が送信局Ｂから報告される。説明の便宜上、この報告結果が良いものであったと仮定する。

そして、第１ポーリングインターバル内の最後の期間で、制御局からＣＦ－Ｐｏｌｌを受けて送信権が付与された送信局Ｃは、付与された期間（ＴＸＯＰ：送信局Ｃが占有している時間）にデータ（パケット）を受信局に向かって送信する。データの送信後、ＱｏＳ　Ｎｕｌｌを介して制御局のスケジューラにバッファ状況などを含む通信状況が送信局Ｃ

から報告される。説明の便宜上、この報告結果が悪いものであったと仮定する。この場合、送信局Ｃは、前記スケジューラに対して長いＴＸＯＰを要求することになる。

そして、スケジューリングが更新されて第２ポーリングインターバルに入る。この第２ポーリングインターバルにおいては、前記の第１ポーリングインターバルの前記報告結果に基づいて、スケジューリングが更新される。

すなわち、前記の第１ポーリングインターバルにおける報告結果が良いものであったので、図９に示す第２ポーリングインターバルにおいて同じ長さ以下のＴＸＯＰが送信局Ａに対して付与される。そして、送信局Ａによるデータ送信後、ＱｏＳ　Ｎｕｌｌを介して制御局のスケジューラに通信状況が送信局Ａから報告されるが、このとき、この報告結果が良いものであったと仮定する。

次に、前記の第１ポーリングインターバルにおける報告結果が良いものであったので、第２ポーリングインターバルにおいて同じ長さ以下のＴＸＯＰが付与される。そして、送信権が付与された送信局Ｂによるデータ送信後、ＱｏＳ　Ｎｕｌｌを介して制御局のスケジューラに通信状況が送信局Ｂから報告されるが、このとき、この報告結果が悪いものであったと仮定する。この場合、送信局Ｂは、前記スケジューラに対して長いＴＸＯＰを要求することになる。

そして、前記の第１ポーリングインターバルにおける報告結果が悪いものであったので、前記要求に応じて第２ポーリングインターバルにおいて、前（第１ポーリングインターバル）よりも長いＴＸＯＰが送信局Ｃに対して付与される。そして、送信権が付与された送信局Ｃによるデ

ータ送信後、ＱｏＳ　Ｎｕｌｌを介して制御局のスケジューラに通信状況が送信局Ｃから報告されるが、このとき、この報告結果が悪いものであったと仮定する。この場合、送信局Ｃは、前記スケジューラに対して第２ポーリングインターバルの場合よりも長いＴＸＯＰを要求することになる。

そして、スケジューリングが更新されて第３ポーリングインターバルに入る。この第３ポーリングインターバルにおいては、前記の第２ポーリングインターバルの前記報告結果に基づいて、スケジューリングが更新される。

すなわち、前記の第２ポーリングインターバルにおける報告結果が良いものであったので、図９に示す第３ポーリングインターバルにおいて同じ長さ以下のＴＸＯＰが送信局Ａに対して付与される。そして、送信局Ａによるデータ送信後、ＱｏＳ　Ｎｕｌｌを介して制御局のスケジューラに通信状況が送信局Ａから報告される。

次に、前記の第２ポーリングインターバルにおける報告結果は悪いものであったので、前記要求に応じて第３ポーリングインターバルにおいて、前（第２ポーリングインターバル）よりも長いＴＸＯＰが送信局Ｂに付与される。そして、送信権が付与された送信局Ｂによるデータ送信後、ＱｏＳ　Ｎｕｌｌを介して制御局のスケジューラに通信状況が送信局Ｂから報告される。

そして、前記の第２ポーリングインターバルにおける報告結果も悪いものであったので、前記要求に応じて第３ポーリングインターバルにおいて、前（第２ポーリングインターバル）よりも長いＴＸＯＰが送信局Ｃに付与される。

しかしながら、送信局Ｃが第２ポーリングインターバルにおいて要求したＴＸＯＰの長さは、各送信局Ａ～ＣのＴＸＯＰの合計長さが第３ポーリングインターバルを超えさせるものとなる。したがって、要求どおりのＴＸＯＰを送信局Ｃに与えてしまうと、図８で決定したＴＸＯＰの上限値を未だ超えていない送信局Ａ・Ｂ（通信状況の悪くない他の送信局）に悪影響を及ぼすことになる。

そこで、本実施の形態によれば、ポーリングインターバル内にＴＸＯＰの合計が収まらない場合（図９の場合、第３ポーリングインターバルが前記当する。）、送信局Ａ～Ｃのうち、各ＴＸＯＰの基準値から最も離れた値（長さ）をＱｏＳ　Ｎｕｌｌを介して報告してきた送信局に付与する時間を調節するようにスケジューリングが制御される。すなわち、図９の場合、送信局Ｃの通信状況が非常に悪いと判断され、送信局ＣのＴＸＯＰを削減するように制御される。

つまり、本実施の形態によれば、前記送信局Ｃが第２ポーリングインターバルにおいて要求してきたＴＸＯＰの長さと送信局ＣのＴＸＯＰの基準値との差が、他の送信局が要求してきたＴＸＯＰの各長さとこれら他の送信局のＴＸＯＰの各基準値との差より大きい場合、制御局は、送信局Ｃの通信状況が非常に悪いと判断し、送信局Ｃには要求したＴＸＯＰを第３ポーリングインターバルにおいて割り当てないことにしている。

これにより、送信局Ｃは、所望の送信を行うことができなくなるが、送信局Ａ・Ｂに悪影響を与えることは未然に回避される。

（ＴＸＯＰの計算方法）

ここで、前記ＴＸＯＰの計算方法について説明する。ＴＸＯＰの基準

値は次のようにして求める。

Ｍを平均データレート（Mean Data Rate）とし、Ｓを公称ＭＳＤＵサイズ（Nominal MSDU size）とし、ＰをＡｃｋポリシー（Ack Policy）とし、ＲPHYをデータを送信するＰＨＹレート（物理レート）とし、ｄheaderをＭＡＣヘッダーなどの付属長とし、ＴSIFSをＳＩＦＳ１６usとし、ＴPIをポーリングインターバルとし、ＴnullをＱｏＳ　Ｎｕｌｌを送信する時間とし、ＴpollをＣＦ－Ｐｏｌｌを送信する時間とし、ＴAckを８０２．１１Ｎｏｒｍａｌ　Ａｃｋを送信する時間とし、ＴBARをＢｕｒｓｔ　Ａｃｋ要求を送信する時間とし、ＴBAをＢｕｒｓｔ　Ａｃｋを送信する時間とする。

なお、Ｔnull～ＴBAについては、フレーム長とレートが決まっているので、事前に計算できる。

まず、ポーリングインターバルＴPI内で送信しなければならない平均データ量ＤをＤ＝Ｍ×ＴPIにより計算する。それから、平均データ量Ｄを何個（Ｎ個）のＭＳＤＵ（データ）に分割するかをＮ＝〔Ｄ／Ｓ〕により計算する。ここで、〔〕は繰り上げ処理を意味するものとする。そして、１パケットの送信時間ＴPacketをＴPacket＝（ｄheader＋Ｓ）÷ＲPHYにより計算する。

次に、ＡｃｋポリシーからＡｃｋの方法を考慮してＴＸＯＰの基準値を計算する。すなわち、８０２．１１　Ｎｏｒｍａｌ　Ａｃｋの場合、ＴＸＯＰの基準値＝Ｔpoll＋ＴSIFS＋ＴAck＋（ＴSIFS＋ＴPacket＋ＴSIFS＋ＴAck）×Ｎ＋ＴSIFS＋Ｔnull＋ＴSIFS＋ＴAck＋ＴSIFSにより求める。Ｎｏ　Ａｃｋの場合、ＴＸＯＰの基準値＝Ｔpoll＋（ＴSIFS＋ＴPacket）×Ｎ＋ＴSIFS＋Ｔnull＋ＴSIFSにより求める。また、Ｂｕｒｓ

ｔ　Ａｃｋの場合、ＴＸＯＰの基準値＝Ｔpoll＋ＴSIFS＋ＴAck＋（ＴSIFS＋ＴPacket）×Ｎ＋ＴSIFS＋ＴBAR＋ＴSIFS＋ＴBA＋ＴSIFS＋Ｔnull＋ＴSIFS＋ＴAck＋ＴSIFSにより求める。

制御局は、許可する物理レートのうち、最小値、及び最大値を設定し、ＴＸＯＰの下限値、及び上限値の各々を計算してもよいし、基準値の数％としてＴＸＯＰの下限値、及び上限値の各々を計算してもよい。

図１０は、Ａｃｋポリシー毎のＴＸＯＰの具体例を示す説明図である。図中、１～５は、パケットを表す。

（ＴＸＯＰ設定処理のフローチャート）

ここで、図１１を参照しながら、前記スケジューリングにおいて行われるＴＸＯＰの付与について以下に説明する。

まず、送信局ごとのＱｏＳ　Ｎｕｌｌを受信し、送信局ごとに要求されるＴＸＯＰを計算する（Ｓ３１）。ただし、ＴＸＯＰの計算結果が上限値または下限値を超える場合には上限値または下限値とする。このようにして計算されたＴＸＯＰの合計がポーリングインターバルを超えているか否かが判断される（Ｓ３２）。Ｓ３２において、ＴＸＯＰの合計がポーリングインターバルを超えていると判断された場合、Ｓ３３に移行し、ＴＸＯＰの基準値から一番離れているＴＸＯＰを要求している送信局を探してＨビットを立てた後、Ｓ３４に移行する。このＨビットは、送信局ごとに対応させて設けられている。

前記Ｓ３４において、Ｈビットを立てた送信局のＴＸＯＰを調節することによって、全送信局のＴＸＯＰの合計がポーリングインターバル内に収まるか否かが判断される。ＴＸＯＰの合計がポーリングインターバル内に収まると判断された場合、Ｓ３５に移行し、Ｈビットを立てた送

信局のＴＸＯＰの調整が行われた後、ＴＸＯＰの設定が更新される（Ｓ３６）。

これに対して、前記Ｓ３４において、ＴＸＯＰの合計がポーリングインターバル内に収まらないと判断された場合、Ｓ３７に移行し、Ｈビットを立てた送信局のＴＸＯＰを下限値に設定する。その結果、Ｈビットを立てた送信局は、要求したＴＸＯＰが付与されなくなるので、所望のデータ送信が行えなくなる。ただし、下限値分のデータ送信は保証されている。

（モード設定）

ところで、前述のように、伝送距離を長くすることと、多数の送信局をサポートすることとは、相反する事項である。したがって、前記従来技術によれば、ユーザの意図を認識して、距離を優先してＴＸＯＰを送信局に付与していくか、複数の送信局をサポートすることを優先してＴＸＯＰを送信局に付与していくかの指針がなかった。また、例えば制御局が距離優先で制御されており、１台目の送信局（ストリーム）をサポートして大きくＴＸＯＰを設定している場合に、ユーザは、ＴＸＯＰが不足していて２台目、３台目の送信局（ストリーム）をサポートできない（ネットワークに接続できない）ということが分からなかった。

そこで、本実施の形態によれば、制御局を距離優先モードにするのか、あるいは台数優先モードにするのかをユーザが指定するようになっている。これにより、ユーザの意図通りのモード設定が行える。

また、本実施の形態においては、距離優先モードで制御されているのか、あるいは台数優先モードで制御されているのかが通信局の表示部（図１５の表示部１４及び図１６の表示部１９を参照）で表示されるよう

になっている。これにより、ユーザは端末側で、現在、距離優先モードで制御されているのか、あるいは台数優先モードで制御されているのかを知ることができ、必要に応じた措置（たとえば、スケジューリングを中断したり、所望の制御モードに設定したりする等の措置）を早期に講ずることができる。

たとえば、具体的には、距離優先で制御されている際、２台目以降の送信局（ストリーム）が無線ネットワークに入ることができない場合、「回線事情により２台目以降の送信局（ストリーム）がネットワーク内に入ることができない」旨を通信局のモニタ（前記の表示部）等に表示を行うようになっている。これにより、距離優先で制御しようとしている（距離優先モード）のか、あるいは台数優先で制御しようとしている（台数優先モード）のかについて、ユーザは表示により知ることができる。これに基づいて、現在の制御モードが不適切なものであれば、適切なものに変更する等の措置を講ずることが可能となる。

（モード設定の具体例）

ここで、図１２を参照しながら、前記モード設定の具体例について以下に説明する。図１２においては、送信局としてＳＤ－ＴＶ（６Ｍｂｐｓ）を最大３台使用し、物理レート（送信 PHY レート）がＩＥＥＥ８０２．１１ａで使用できる６Ｍｂｐｓ～５４Ｍｂｐｓの範囲の場合を示しているが、本発明は、これに限定されるものではなく、台数と物理レートの他の組み合わせにも適用できる。

図１２に示すように、送信局が１台の場合、１２Ｍｂｐｓの物理レートで十分に伝送可能となる。つまり、遠距離まで送信が可能となる。送信局が２台になると、１２Ｍｂｐｓの物理レートで伝送することはでき

ず、この場合、物理レートとしては最低でも２４Ｍｂｐｓ必要となる。送信局が３台になると、２４Ｍｂｐｓの物理レートで伝送することはできず、この場合、物理レートとしては最低でも３６Ｍｂｐｓ必要となる。つまり、サポートできる送信局の台数が増えるほど送信可能距離は短くなる一方、送信距離が長くなるほどサポート可能な送信局の台数が減少する。この関係を考慮して適切なモード設定を行えば良い。

（物理レートの変動に対する対応の具体例）

ここで、送信 PHY Rate が送信局アプリケーション層レベルで自動的に切り替わり得るという事態に対応可能な具体例について以下に詳細に説明する。

この例によれば、制御局（中央制御局：ＨＣ）において、送信局（Ｓｅｎｄｅｒ）の送信 PHY Rate の最低値を示す最小送信レート（ Minimum Tx Rate ）を受け入れる（認める）かどうかを判断する閾値が設定可能であり、これにより、前記閾値をユーザの希望する使用状況に合ったものに設定することができる。前記制御局は、前記閾値よりも低い最小送信レートを有する送信局のストリーム要求を受け入れない（認めない）。

なお、前記制御局は、前記最小送信レートを受け入れた（認めた）後は、この最小送信レートで通信できるＴＸＯＰを付与することを送信局に対して保証する。

また、制御局は、前記の閾値を高く設定すると前述の台数優先モードになり、前記の閾値を低く設定すると前述の距離優先モードになる。前記最小送信レートは、前記制御局において予めテーブルとして設けられており、具体例を図１２に示す。

前記の閾値を設定する具体例としては、図１７に示すように少なくとも①～⑦のパターンが考えられる。①～⑦のパターンには、更に、制御局のモードを表示すること、制御局のモードの変更（切替）の通知を表示すること、及び／又は制御局の動作モードの拒否通知及び／又は理由を表示すること（ただし、動作モード切替の要求が拒否された場合のみ）等を組み合わせてもよい。なお、以下の説明において、引用される図面中のステップにおける①～⑦は、図１７の前記パターン①～⑦に対応している。

ここで、図１８～図２０を参照しながら、制御局において前記の閾値を設定する具体例（制御局の動作モードを台数優先モード又は距離優先モードに設定する具体例）を説明する。

（台数優先モードの設定処理例①）

図１８は、ユーザが制御局／送信局（ＨＣ／Ｓｅｎｄｅｒ）を台数優先モードに設定する例を示す。なお、前記の制御局／送信局は、制御局と送信局の両方の機能を備えたものである。また、説明の便宜上、台数優先モードに対応する閾値を３６Ｍｂｐｓとする。

まず、ユーザは、ステップ①－０１において、制御局の動作モードとして台数優先モードを選択する（図１９のステップＨＣ－１０１に対応）。これは、たとえば、ユーザが台数優先モード用の入力手段（押しボタン等）を介して台数優先モードを選択することによって行なわれる。

このような選択が行なわれると、制御局において、前記テーブル（図１２参照）を参照して、最小送信レートの閾値がたとえば３６Ｍｂｐｓに設定される（図１９のステップＨＣ－１０４に対応）。この設定により、制御局は、３６Ｍｂｐｓ以上の最小送信レートを有する送信局のス

トリーム要求のみを受け付ける（ステップ①－０２）。

それから、ステップ①－０３において、制御局の動作モードが台数優先モードに変更された（切り替わった）ことが制御局／送信局において表示される（図１９のステップＨＣ－１０５に対応）。そして、ステップ①－０４において、制御局／送信局は、動作モードが台数優先モードに変更されたことを受信局（Ｒｅｃｅｉｖｅｒ）に通知する（図１９のステップＨＣ－１０６に対応）。

前記受信局は、ステップ①－０５において前記制御局／送信局から台数優先モードに変更された旨の通知を受信すると（図２０のステップＲｅｃｅｉｖｅｒ－１０４に対応）、ステップ①－０６において制御局の動作モードが台数優先モードに変更された旨を表示し（図２０のステップＲｅｃｅｉｖｅｒ－１０５に対応）、ステップ①－０７において制御局が台数優先モードにあることを表示する（図２０のステップＲｅｃｅｉｖｅｒ－１０６に対応）。

なお、前記ステップ①－０３～前記ステップ①－０７は、オプションのステップであり、これらの表示を一見するだけで、制御局の動作モードを認識することができる。また、前記ステップ①－０１・①－０２においては、台数優先モードの場合について説明しているが、距離優先モードの場合には、前記テーブルを参照して、最小送信レートが、たとえば１２Ｍｂｐｓ以上の最小送信レートを有する送信局のストリーム要求のみ受け付けるとする。

（台数優先モードの設定処理例②）

ここで、図１９～図２１を参照しながら、制御局の動作モードを台数優先モードに設定する他の具体例を説明する。

図２１は、ユーザが、受信局（Ｒｅｃｅｉｖｅｒ）を介して（受信局において）制御局の動作モードを台数優先モードに指定し、制御局／送信局に対してモード変更要求信号を送信する例を示す。なお、前記の制御局／送信局は、制御局と送信局の両方の機能を備えたものである。また、説明の便宜上、台数優先モードに対応する閾値を３６Ｍｂｐｓとする。

まず、ユーザは、ステップ②－０１において、受信局を介して、制御局の動作モードを台数優先モードに変更する（切り替える）ことを要求する（図２０のステップＲｅｃｅｉｖｅｒ－１０１に対応）。これは、たとえば、ユーザが台数優先モード用の入力手段（押しボタン等）を介して台数優先モードを選択することによって行なわれる。

これに伴って、ステップ②－０２において、受信局は、制御局の動作モードを台数優先モードに切り替えることを制御局に対して要求したことを表示する（図２０のステップＲｅｃｅｉｖｅｒ－１０２に対応）。そして、ステップ②－０３において、受信局から制御局／送信局に対して、動作モードの変更要求信号が送信される（図２０のステップＲｅｃｅｉｖｅｒ－１０３に対応）。

制御局／送信局は、ステップ②－０４において、前記の変更要求信号を受信すると（図１９のステップＨＣ－１０１に対応）、ステップ②－０５において動作モードを台数優先モードに変更する変更要求を受信局から受領したことを表示する（図１９のステップＨＣ－１０２に対応）。

制御局／送信局は、ステップ②－０６・②－０７において、要求のあった動作モードへの変更が受け入れ可能かどうか（認め得るかどうか）

を判断し、可能であれば、前記テーブルを参照して、判断基準となる最小送信レートの閾値を変更し、３６Ｍｂｐｓに設定する（図１９のステップＨＣ－１０３・１０４に対応）。この場合、この設定により、制御局はこれ以降、３６Ｍｂｐｓ以上の最小送信レートを有する送信局のストリーム要求のみを受け付ける（図１９のステップＨＣ－１０９に対応）。

それから、ステップ②－０８において、制御局の動作モードが台数優先モードに変更された（切り替わった）ことが制御局／送信局において表示される（図１９のステップＨＣ－１０５に対応）。そして、ステップ②－０９において、制御局／送信局は、動作モードが台数優先モードに変更されたことを受信局（Ｒｅｃｅｉｖｅｒ）に通知する（図１９のステップＨＣ－１０６に対応）。

前記受信局は、ステップ②－１０において前記制御局／送信局から台数優先モードに変更された旨の通知を受信すると（図２０のステップＲｅｃｅｉｖｅｒ－１０４に対応）、ステップ②－１１において制御局の動作モードが台数優先モードに変更された旨を表示し（図２０のステップＲｅｃｅｉｖｅｒ－１０５に対応）、ステップ②－１２において制御局が、現在、台数優先モードにあることを表示する（図２０のステップＲｅｃｅｉｖｅｒ－１０６に対応）。

なお、前記ステップ②－０２、前記ステップ②－０５、及び前記ステップ②－０８～前記ステップ②－１２は、オプションのステップであり、これらの表示を一見するだけで、制御局の動作モードを認識することができる。また、前記説明においては、台数優先モードの場合について説明しているが、距離優先モードの場合には、前記テーブルを参照して

、最小送信レートが、たとえば１２Ｍｂｐｓ以上の最小送信レートを有する送信局のストリーム要求のみ受け付けるとする。

（台数優先モードの設定処理例③）

ここで、図１９、図２２、及び図２３を参照しながら、制御局の動作モードを台数優先モードに設定する更に他の具体例を説明する。

図２２は、ユーザが制御局／受信局（ＨＣ／Ｒｅｃｅｉｖｅｒ）を台数優先モードに設定する例を示す。なお、前記の制御局／受信局は、制御局と受信局の両方の機能を備えたものである。また、説明の便宜上、台数優先モードに対応する閾値を３６Ｍｂｐｓとする。

まず、ユーザは、ステップ③－０１において、制御局の動作モードとして台数優先モードを選択する（図１９のステップＨＣ－１０１に対応）。これは、たとえば、ユーザが台数優先モード用の入力手段（押しボタン等）を介して台数優先モードを選択することによって行なわれる。

このような選択が行なわれると、制御局／受信局において、前記テーブルを参照して、最小送信レートの閾値がたとえば３６Ｍｂｐｓに設定される（図１９のステップＨＣ－１０４に対応）。この設定により、制御局／受信局は、３６Ｍｂｐｓ以上の最小送信レートを有する送信局のストリーム要求のみを受け付ける（ステップ③－０２）。

それから、ステップ③－０３において、制御局の動作モードが台数優先モードに変更された（切り替わった）ことが制御局／受信局において表示される（図１９のステップＨＣ－１０５に対応）。そして、ステップ③－０４において、制御局／受信局は、動作モードが台数優先モードに変更されたことを送信局（Ｓｅｎｄｅｒ）に通知する。

前記送信局は、ステップ③－０５において前記制御局／受信局から台

数優先モードに変更された旨の通知を受信すると（図２３のステップＳｅｎｄｅｒ－１０４に対応）、ステップ③－０６において制御局の動作モードが台数優先モードに変更された旨を表示し（図２３のステップＳｅｎｄｅｒ－１０５に対応）、ステップ③－０７において制御局が台数優先モードにあることを表示する（図２３のＳｅｎｄｅｒ－１０６に対応）。

なお、前記ステップ③－０３～前記ステップ③－０７は、オプションのステップであり、これらの表示を一見するだけで、制御局の動作モードを認識することができる。また、前記説明においては、台数優先モードの場合について説明しているが、距離優先モードの場合には、前記テーブルを参照して、最小送信レートが、たとえば１２Ｍｂｐｓ以上の最小送信レートを有する送信局のストリーム要求のみ受け付けるとする。

（台数優先モードの設定処理例④）

ここで、図１９、図２３、及び図２４を参照しながら、制御局の動作モードを台数優先モードに設定する更に他の具体例を説明する。

図２４は、ユーザが、送信局を介して制御局の動作モードを台数優先モードに指定し、制御局／受信局に対してモード変更要求信号を送信する例を示す。なお、前記の制御局／受信局は、制御局と受信局の両方の機能を備えたものである。また、説明の便宜上、台数優先モードに対応する閾値を３６Ｍｂｐｓとする。

まず、ユーザは、ステップ④－０１において、送信局を介して（送信局において）、制御局の動作モードを台数優先モードに切り替えることを要求する（図２３のステップＳｅｎｄｅｒ－１０１に対応）。これは、たとえば、ユーザが台数優先モード用の入力手段（押しボタン等）を

介して台数優先モードを選択することによって行なわれる。

これに伴って、ステップ④－０２において、送信局は、制御局の動作モードを台数優先モードに切り替えることを制御局に要求したことを表示する（図２３のステップＳｅｎｄｅｒ－１０２に対応）。そして、ステップ④－０３において、送信局から制御局／受信局に対して、動作モードの変更要求信号が送信される（図２３のステップＳｅｎｄｅｒ－１０３に対応）。

制御局／受信局は、ステップ④－０４において、前記の変更要求信号を受信すると（図１９のステップＨＣ－１０１に対応）、ステップ④－０５において動作モードを台数優先モードに変更する変更要求を送信局から受領したことを表示する（図１９のステップＨＣ－１０２に対応）。

制御局／受信局は、ステップ④－０６・④－０７において、要求のあった動作モードへの変更が受け入れ可能かどうか（認め得るかどうか）を判断し、可能であれば、前記テーブルを参照して、判断基準となる最小送信レートの閾値を変更し、３６Ｍｂｐｓに設定する（図１９のステップＨＣ－１０３・１０４に対応）。この場合、この設定により、制御局は、これ以降３６Ｍｂｐｓ以上の最小送信レートを有する送信局のストリーム要求のみを受け付ける（図１９のステップＨＣ－１０９に対応）。

それから、ステップ④－０８において、制御局の動作モードが台数優先モードに変更された（切り替わった）ことが制御局／受信局において表示される（図１９のステップＨＣ－１０５に対応）。そして、ステップ④－０９において、制御局／送信局は、動作モードが台数優先モード

に変更されたことを送信局（Ｓｅｎｄｅｒ）に通知する（図１９のステップＨＣ－１０６に対応）。

前記送信局は、ステップ④－１０において前記制御局／受信局から台数優先モードに変更された旨の通知を受信すると（図２３のステップＳｅｎｄｅｒ－１０４に対応）、ステップ④－１１において制御局の動作モードが台数優先モードに変更された旨を表示し（図２３のステップＳｅｎｄｅｒ－１０５に対応）、ステップ④－１２において制御局が、現在、台数優先モードにあることを表示する（図２３のＳｅｎｄｅｒ－１０６に対応）。

なお、前記ステップ④－０２、前記ステップ④－０５、及び前記ステップ④－０８～前記ステップ④－１２は、オプションのステップであり、これらの表示を一見するだけで、制御局の動作モードを認識することができる。また、前記説明においては、台数優先モードの場合について説明しているが、距離優先モードの場合には、前記テーブルを参照して、最小送信レートが、たとえば１２Ｍｂｐｓ以上の最小送信レートを有する送信局のストリーム要求のみ受け付けるとする。

（台数優先モードの設定処理例⑤）

ここで、図１９、図２０、図２３、及び図２５を参照しながら、制御局の動作モードを台数優先モードに設定する更に他の具体例を説明する。図２５は、ユーザが、制御局において、前記制御局を台数優先モードにする例を示す。なお、説明の便宜上、台数優先モードに対応する閾値を３６Ｍｂｐｓとする。

まず、ユーザは、ステップ⑤－０１において、制御局の動作モードとして台数優先モードを選択する（図１９のステップＨＣ－１０１に対応

）。これは、たとえば、ユーザが台数優先モード用の入力手段（押しボタン等）を介して台数優先モードを選択することによって行なわれる。

このような選択が行なわれると、制御局において、前記テーブルを参照して、最小送信レートの閾値がたとえば３６Ｍｂｐｓに設定される（図１９のステップＨＣ－１０４に対応）。この設定により、制御局は、３６Ｍｂｐｓ以上の最小送信レートを有する送信局のストリーム要求のみを受け付ける（ステップ⑤－０２）。

それから、ステップ⑤－０３において、制御局の動作モードが台数優先モードに変更された（切り替わった）ことが制御局において表示される（図１９のステップＨＣ－１０５に対応）。そして、ステップ⑤－０４において、制御局は、動作モードが台数優先モードに変更されたことを送信局（Ｓｅｎｄｅｒ）に通知する（図１９のステップＨＣ－１０６に対応）。

ステップ⑤－０５において前記変更の通知を送信局が制御局から受信すると（図２３のステップＳｅｎｄｅｒ－１０４に対応）、送信局は、ステップ⑤－０６において動作モードが台数優先モードに変更された旨の通知を制御局から受領したことを表示し（図２３のステップＳｅｎｄｅｒ－１０５に対応）、変更後の制御局の動作モード（台数優先モード）を表示する（図２３のステップＳｅｎｄｅｒ－１０６に対応）。

一方、ステップ⑤－０５において前記変更の通知を送信局が制御局から受信すると（図２３のステップＳｅｎｄｅｒ－１０４に対応）、送信局は、制御局の動作モードが台数優先モードに変更された旨の通知を受信局に送信する。受信局は、ステップ⑤－０８においてこの通知を受信すると（図２０のステップＲｅｃｅｉｖｅｒ－１０４に対応）、ステッ

プ⑤－０９において制御局の動作モードが台数優先モードに変更された旨を表示し（図２０のステップＲｅｃｅｉｖｅｒ－１０５に対応）、ステップ⑤－１０において変更後の制御局の動作モード（台数優先モード）を表示する（図２０のステップＲｅｃｅｉｖｅｒ－１０６に対応）。

なお、前記ステップ⑤－０３～ステップ⑤－１０は、オプションのステップであり、これらの表示を一見するだけで、制御局の動作モードを認識することができる。また、前記説明においては、台数優先モードの場合について説明しているが、距離優先モードの場合には、前記テーブルを参照して、最小送信レートが、たとえば１２Ｍｂｐｓ以上の最小送信レートを有する送信局のストリーム要求のみ受け付けるとする。

（台数優先モードの設定処理例⑥）

ここで、図１９、図２０、図２３及び図２６を参照しながら、制御局の動作モードを台数優先モードに設定する更に他の具体例を説明する。

図２６は、ユーザが、送信局から制御局を台数優先モードに指定し、制御局に対してモード変更要求信号を送信する例を示す。なお、説明の便宜上、台数優先モードに対応する閾値を３６Ｍｂｐｓとする。

まず、ユーザは、ステップ⑥－０１において、送信局を介して（送信局において）、制御局の動作モードを台数優先モードに切り替えることを要求する（図２３のステップＳｅｎｄｅｒ－１０１に対応）。これは、たとえば、ユーザが台数優先モード用の入力手段（押しボタン等）を介して台数優先モードを選択することによって行なわれる。

これに伴って、ステップ⑥－０２において、送信局は、台数優先モードに切り替わることを制御局に要求したことを表示する（図２３のステップＳｅｎｄｅｒ－１０２に対応）。そして、ステップ⑥－０３におい

て、送信局から制御局に対して、動作モードの変更要求信号が送信される（図２３のステップＳｅｎｄｅｒ－１０３に対応）。

制御局は、ステップ⑥－０４において、前記の変更要求信号を受信すると（図１９のステップＨＣ－１０１に対応）、ステップ⑥－０５において動作モードを台数優先モードに変更する変更要求を送信局から受領したことを表示する（図１９のステップＨＣ－１０２に対応）。

制御局は、ステップ⑥－０６・⑥－０７において、要求のあった動作モードへの変更が受け入れ可能かどうか（認め得るかどうか）を判断し、可能であれば、前記テーブルを参照して、判断基準となる最小送信レートの閾値を変更し、３６Ｍｂｐｓに設定する（図１９のステップＨＣ－１０３・１０４に対応）。この場合、この設定により、制御局は、これ以降３６Ｍｂｐｓ以上の最小送信レートを有する送信局のストリーム要求のみを受け付ける（図１９のステップＨＣ－１０９に対応）。

それから、ステップ⑥－０８において、制御局の動作モードが台数優先モードに変更された（切り替わった）ことが制御局において表示される（図１９のＨＣ－１０５に対応）。そして、ステップ⑥－０９において、制御局は、動作モードが台数優先モードに変更されたことを送信局（Ｓｅｎｄｅｒ）に通知する（図１９のステップＨＣ－１０６に対応）。

前記送信局は、ステップ⑥－１０において前記制御局から台数優先モードに変更された旨の通知を受信すると（図２３のステップＳｅｎｄｅｒ－１０４に対応）、ステップ⑥－１１において前記受信内容（制御局の動作モードが台数優先モードに変更された旨の通知）を表示し（図２３のステップＳｅｎｄｅｒ－１０５に対応）、ステップ⑥－１２におい

て制御局が台数優先モードにあることを表示する（図２３のステップＳｅｎｄｅｒ－１０６に対応）。

一方、ステップ⑥－１０において前記変更の通知を送信局が制御局から受信すると（図２３のステップＳｅｎｄｅｒ－１０４に対応）、送信局は、動作モードが台数優先モードに変更された旨の通知を受信局に送信する。受信局は、ステップ⑥－１３においてこの通知を受信すると（図２０のステップＲｅｃｅｉｖｅｒ－１０４に対応）、ステップ⑥－１４において制御局の動作モードが台数優先モードに変更された旨を表示し（図２０のステップＲｅｃｅｉｖｅｒ－１０５に対応）、ステップ⑥－１５において変更後の制御局の動作モード（台数優先モード）を表示する（図２０のステップＲｅｃｅｉｖｅｒ－１０６に対応）。

なお、前記ステップ⑥－０２、⑥－０５、及びステップ⑥－０８～ステップ⑥－１５は、オプションのステップであり、これらの表示を一見するだけで、制御局の動作モードを認識することができる。また、前記説明においては、台数優先モードの場合について説明しているが、距離優先モードの場合には、前記テーブルを参照して、最小送信レートが、たとえば１２Ｍｂｐｓ以上の最小送信レートを有する送信局のストリーム要求のみ受け付けるとする。

（台数優先モードの設定処理例⑦）

ここで、図１９、図２０、図２３及び図２７を参照しながら、制御局の動作モードを台数優先モードに設定する更に他の具体例を説明する。

図２７は、ユーザが、受信局（Ｒｅｃｅｉｖｅｒ）から制御局の動作モードを台数優先モードに指定し、送信局に対してモード変更要求信号を送信し、それを受信した送信局は制御局に対してモード変更要求信号

を送信する例を示す。なお、説明の便宜上、台数優先モードに対応する閾値を３６Ｍｂｐｓとする。

まず、ユーザは、ステップ⑦－０１において、受信局を介して（受信局において）、制御局の動作モードを台数優先モードに切り替えることを要求する（図２０のステップＲｅｃｅｉｖｅｒ－１０１に対応）。これは、たとえば、ユーザが台数優先モード用の入力手段（押しボタン等）を介して台数優先モードを選択することによって行なわれる。

これに伴って、ステップ⑦－０２において、受信局は、制御局が台数優先モードに切り替わることを制御局に要求したことを表示する（図２０のステップＲｅｃｅｉｖｅｒ－１０２に対応）。そして、ステップ⑦－０３において、受信局から送信局に対して、動作モードの変更要求信号が送信される（図２０のステップＲｅｃｅｉｖｅｒ－１０３に対応）。

送信局は、⑦－０４において、前記の変更要求信号を受信すると（図２３のステップＳｅｎｄｅｒ－１０１に対応）、ステップ⑦－０５において動作モードを台数優先モードに変更する変更要求を受信局から受領したことを表示する（図２３のステップＳｅｎｄｅｒ－１０２に対応）。送信局は、ステップ⑦－０６において、受信局から動作モードの変更要求を受領した旨を制御局に送信する（図２３のステップＳｅｎｄｅｒ－１０３に対応）。

制御局は、ステップ⑦－０７において、送信局から前記変更要求を受信すると（図１９のステップＨＣ－１０１に対応）、ステップ⑦－０８において受信局から動作モードの変更要求を受領したことを表示する（図１９のステップＨＣ－１０２に対応）。

制御局は、ステップ⑦－０９・⑦－１０において、要求のあった動作モードへの変更が受け入れ可能かどうか（認め得るかどうか）を判断し、可能であれば、前記テーブルを参照して、判断基準となる最小送信レートの閾値を変更し、３６Ｍｂｐｓに設定する（図１９のステップＨＣ－１０３・１０４に対応）。この場合、この設定により、制御局は、これ以降３６Ｍｂｐｓ以上の最小送信レートを有する送信局のストリーム要求のみを受け付ける（図１９のステップＨＣ－１０９に対応）。

それから、ステップ⑦－１１において、制御局の動作モードが台数優先モードに変更された（切り替わった）ことが制御局において表示される（図１９のステップＨＣ－１０５に対応）。そして、ステップ⑦－１２において、制御局は、動作モードが台数優先モードに変更されたことを送信局（Ｓｅｎｄｅｒ）に通知する（図１９のステップＨＣ－１０６に対応）。

前記送信局は、ステップ⑦－１３において前記制御局から台数優先モードに変更された旨の通知を受信すると（図２３のステップＳｅｎｄｅｒ－１０４に対応）、ステップ⑦－１４において前記受信内容（制御局の動作モードが台数優先モードに変更された旨の通知）を表示し（図２３のステップＳｅｎｄｅｒ－１０５に対応）、ステップ⑦－１５において制御局が、現在、台数優先モードにあることを表示する（図２３のステップＳｅｎｄｅｒ－１０６に対応）。

一方、ステップ⑦－１３において前記変更の通知を送信局が制御局から受信すると（図２３のステップＳｅｎｄｅｒ－１０４に対応）、送信局は、動作モードが台数優先モードに変更された旨の通知を受信局に送信する。受信局は、ステップ⑦－１６においてこの通知を受信すると（

図２０のステップＲｅｃｅｉｖｅｒ－１０４に対応）、ステップ⑦－１７において制御局の動作モードが台数優先モードに変更された旨を表示し（図２０のステップＲｅｃｅｉｖｅｒ－１０５に対応）、ステップ⑦－１８において変更後の制御局の動作モード（台数優先モード）を表示する（図２０のステップＲｅｃｅｉｖｅｒ－１０６に対応）。

なお、前記ステップ⑦－０２、⑦－０５、⑦－０８、及び前記ステップ⑦－１１～前記ステップ⑦－１８は、オプションのステップであり、これらの表示を一見するだけで、制御局の動作モードを認識することができる。また、前記説明においては、台数優先モードの場合について説明しているが、距離優先モードの場合には、前記テーブルを参照して、最小送信レートが、たとえば１２Ｍｂｐｓ以上の最小送信レートを有する送信局のストリーム要求のみ受け付けるとする。

（台数優先モードの設定処理におけるフローチャート）

以上、図１７における前記①～⑦のパターンの処理を制御局、送信局、及び受信局ごとにまとめると、図１９、図２０、及び図２３に示すようなフローチャートになる。

図１９に示すように、ステップＨＣ－１０３において、制御局が動作モード（最小送信レートの閾値）の変更を受け入れることができない場合、ステップＨＣ－１０７が実行され、変更要求してきた送信局または受信局に対して、制御局の動作モードの変更ができない旨及び／又は理由の変更拒否信号を送信する。これにより、ユーザは必要な措置を講じることが可能となる。

なお、制御局の動作モードの変更要求がない場合には、ステップＨＣ－１０８が実行され、送信局からストリームの新規追加の要求、又は今

までのストリームの変更要求の有無が判断される。前記要求があると判断されると、最小送信レートが設定済みの閾値以上か否かが判断される（ステップＨＣ－１０９）。

最小送信レートが閾値以上の場合にストリームの新規追加要求又はストリームの変更要求を受け入れると判断される一方、閾値未満の場合に前記要求を受け入れないと判断される（ステップＨＣ－１１０）。前記要求が受け入れられると、前記当するストリームに対して、前記最小送信レートで通信できるＴＸＯＰの付与を保証する（ステップＨＣ－１１１）。一方、前記要求が受け入れられないと判断されると、前記要求は拒絶される（ステップＨＣ－１１２）。

図２３に示すように、制御局に対する動作モードの変更要求が受け入れられた場合、前述のように、送信局は制御局から変更通知信号を受信し（ステップＳｅｎｄｅｒ－１０４）、前述のステップＳｅｎｄｅｒ－１０５・１０６が実行された後、前記変更通知信号を受信局に送信する（ステップＳｅｎｄｅｒ－１０７）。

これに対して、制御局に対する動作モードの変更要求が受け入れられなかった場合、送信局は、制御局から変更拒否信号を受信し（ステップＳｅｎｄｅｒ－１０８）、制御局に対する動作モードの変更要求が受け入れられなかった旨の通知（制御局からの通知）及び／又は理由を表示する（ステップＳｅｎｄｅｒ－１０９）。これにより、ユーザは必要な措置を講じることが可能となる。

なお、制御局の動作モードの変更要求がない場合には、ステップＳｅｎｄｅｒ－１１０が実行される。ストリームの新規追加要求がある場合には、その旨の信号（新規追加要求信号）が送信局から制御局に対して

送信される（ステップＳｅｎｄｅｒ－１１１）。ストリームの新規追加要求が制御局によって受け入れられると、制御局とのネゴーシエーションの結果決定した最小送信レート以上の通信速度でストリームの送信が送信局から制御局に対して行なわれる（ステップＳｅｎｄｅｒ－１１３）。

これに対して、ストリームの新規追加要求が制御局によって受け入れられなかった場合、最小送信レートの増加（最小送信レートを高くすること）が可能か否かが判断され（ステップＳｅｎｄｅｒ－１１４）、可能な場合には最小送信レートを増加させた（ステップＳｅｎｄｅｒ－１１５）後、前記ステップＳｅｎｄｅｒ－１１２へ移行し、前記処理が繰り返される。

また、図２０に示すように、制御局に対する動作モードの変更要求が受け入れられた場合、前述のように、受信局は送信局から変更通知信号を受信し（ステップＲｅｃｅｉｖｅｒ－１０４）、前述のステップＲｅｃｅｉｖｅｒ－１０５・１０６が実行される。

これに対して、制御局に対する動作モードの変更要求が受け入れられなかった場合、受信局は、送信局から変更拒否信号を受信し（ステップＲｅｃｅｉｖｅｒ－１０７）、制御局に対する動作モードの変更要求が受け入れられなかった旨の通知（制御局からの通知）及び／又は理由を表示する（ステップＲｅｃｅｉｖｅｒ－１０８）。これにより、ユーザは必要な措置を講じることが可能となる。

（モード選択処理）

以上のように、ユーザ又は動作モードの変更要求によって、希望したときに、制御局、送信局、又は受信局において、最小送信レートを受け

入れるかどうかの閾値を、押しボタン等の入力手段または信号の送受信を介して、ユーザの希望する使用状況に合ったものに設定される。この場合、最小送信レートの閾値を高く設定すれば制御局の動作モードは台数優先モードになり、低く設定すれば距離優先モードになる。

制御局（ＨＣ）の動作モードを変更する前記①、③、及び⑤の各パターンを用いれば、たとえば、ＳＤＴＶを３台使用したいユーザは、制御局に対して指示し、制御局が前記テーブルを参照して最小送信レートの閾値を３６Ｍｂｐｓに設定する（あるいは台数優先モード用の押しボタン等により指示する）ことによって、制御局の動作モードを台数優先モードに変更できる。

また、前記④及び⑥の各パターンを用いれば、たとえば、ＳＤＴＶを３台使用したいユーザは、送信局を介して動作モードの変更を要求できる（あるいは台数優先モード用の押しボタン等を介して動作モードの変更を要求できる）。この変更要求を受けた制御局は、最小送信レートの閾値の変更が可能であるか否かを判断し、可能であれば、前記テーブルを参照して最小送信レートの閾値を３６Ｍｂｐｓに変更し、送信局に変更許可信号を送信する。なお、動作モード（最小送信レートの閾値）の変更が不可能であれば、モード変更拒否信号を送信局に送信する。このようにして、送信局を介して、制御局の動作モードを台数優先モードに変更できる。

一方、１台のＳＤＴＶを高品質で使用したいユーザは、距離優先モード用の押しボタン等を介して制御局において最小送信レートの閾値を１２Ｍｂｐｓに変更することによって、台数優先モードの場合と同様に、可能であれば、動作モードを距離優先モードに変更することができる。

また、②及び⑦のパターンのように、受信局からも（⑦のパターンの場合は送信局を経由して）制御局の動作モードの変更を行なうこともできる。

このように非常に操作性に優れた通信管理システムを提供できる。

（物理レートの変動に対する対応の他の具体例）

ここで、送信 PHY Rate が送信局アプリケーション層レベルで自動的に切り替わり得るという事態に対応可能な他の具体例について以下に詳細に説明する。

この例によれば、送信局（Ｓｅｎｄｅｒ）において、前記送信局の送信 PHY Rate の最低値を示す最小送信レート（ Minimum Tx Rate ）が設定可能であり、これにより、前記最小送信レートをユーザの希望する使用状況に合ったものに設定できる。

また、送信局は、高速で送信を行いたいときは、前記最小送信レートを高く設定することで対応できる。これを、高速送信モードと呼ぶこととする。逆に、送信局は、低速で送信を行いたいときは、前記最小送信レートを低く設定することで対応できる。これを、低速送信モードと呼ぶこととする。

前記の具体例としては、図２８に示すように少なくとも(8)～(13)のパターンが考えられる。(8)～(13)のパターンには、更に、送信局のモードを表示すること、及び送信局のモードの変更（切替）の通知を表示すること等を組み合わせてもよい。なお、以下の説明において、引用される図面中のステップにおける(8)～(13)は、図２８の前記パターン(8)～(13)に対応している。

ここで、図２９～図３１を参照しながら、送信局の送信 PHY Rate

の最低値を示す最小送信レートがユーザの希望する使用状況に合ったものに設定する具体例（送信局の動作モードを高速送信モード又は低速送信モードに設定する具体例）を説明する。

（高速送信モードの設定処理例①）

図２９は、ユーザが制御局／送信局（ＨＣ／Ｓｅｎｄｅｒ）を高速送信モードにする例を示す。なお、前記の制御局／送信局は、制御局と送信局の両方の機能を備えたものである。また、説明の便宜上、高速送信モードに対応する最小送信レートを３６Ｍｂｐｓとする。

まず、ユーザは、ステップ(8)－０１において、送信局の動作モードとして高速送信モードを選択する（図３０のステップＳｅｎｄｅｒ－２０１に対応）。これは、たとえば、ユーザが高速送信モード用の入力手段（押しボタン等）を介して高速送信モードを選択することによって行なわれる。

このような選択が行なわれると、制御局／送信局は、高速送信モードへの変更要求を表示し（図３０のステップＳｅｎｄｅｒ－２０２参照）、ステップ(8)－０２において、最小送信レートを３６Ｍｂｐｓに設定する（図３０のステップＳｅｎｄｅｒ－２０３に対応）。それから、ステップ(8)－０３において、制御局／送信局は、変更後の動作モード（高速送信モード）を表示する（図３０のステップＳｅｎｄｅｒ－２０４に対応）。そして、ステップ(8)－０４において、制御局／送信局は、動作モードが高速送信モードに変更されたことを受信局（Ｒｅｃｅｉｖｅｒ）に通知する（図３０のステップＳｅｎｄｅｒ－２０５に対応）。

前記受信局は、ステップ(8)－０５において前記制御局／送信局から高速送信モードに変更された旨の通知を受信すると（図３１のステップ

Ｒｅｃｅｉｖｅｒ－２０４に対応）、ステップ(8)－０６において送信局の動作モードが高速送信モードに変更された旨を表示し（図３１のステップＲｅｃｅｉｖｅｒ－２０５に対応）、ステップ(8)－０７において送信局が高速送信モードにあることを表示する（図３１のステップＲｅｃｅｉｖｅｒ－２０６に対応）。

なお、前記ステップ(8)－０３～前記ステップ(8)－０７は、オプションのステップであり、これらの表示を一見するだけで、送信局（制御局／送信局）の動作モードを認識することができる。また、前記ステップ(8)－０１・(8)－０２においては、高速送信モードの場合について説明しているが、低速送信モードの場合には、最小送信レートは、たとえば１２Ｍｂｐｓとする。

（高速送信モードの設定処理例②）

ここで、図３０～図３２を参照しながら、送信局の送信 PHY Rate の最低値を示す最小送信レートがユーザの希望する使用状況に合ったものに設定する他の具体例を説明する。

図３２は、ユーザが送信局（Ｓｅｎｄｅｒ）を高速送信モードにする例を示す。なお、制御局／受信局（ＨＣ／Ｒｅｃｅｉｖｅｒ）は、制御局と受信局の両方の機能を備えたものである。また、説明の便宜上、高速送信モードに対応する最小送信レートを３６Ｍｂｐｓとする。

まず、ユーザは、ステップ(9)－０１において、送信局の動作モードとして高速送信モードを選択する（図３０のステップＳｅｎｄｅｒ－２０１に対応）。これは、たとえば、ユーザが高速送信モード用の入力手段（押しボタン等）を介して高速送信モードを選択することによって行なわれる。

このような選択が行なわれると、送信局は、高速送信モードへの変更要求を表示し（図３０のステップＳｅｎｄｅｒ－２０２参照）、ステップ(9)－０２において、最小送信レートを３６Ｍｂｐｓに設定する（図３０のステップＳｅｎｄｅｒ－２０３に対応）。

それから、ステップ(9)－０３において、送信局は、変更後の動作モード（高速送信モード）を表示する（図３０のステップＳｅｎｄｅｒ－２０４に対応）。そして、ステップ(9)－０４において、送信局は、動作モードが高速送信モードに変更されたことを制御局／受信局に通知する（図３０のステップＳｅｎｄｅｒ－２０５に対応）。

前記制御局／受信局は、ステップ(9)－０５において前記送信局から高速送信モードに変更された旨の通知を受信すると（図３１のステップＲｅｃｅｉｖｅｒ－２０４に対応）、ステップ(9)－０６において送信局の動作モードが高速送信モードに変更された旨を表示し（図３１のステップＲｅｃｅｉｖｅｒ－２０５に対応）、ステップ(9)－０７において送信局が高速送信モードにあることを表示する（図３１のステップＲｅｃｅｉｖｅｒ－２０６に対応）。

なお、前記ステップ(9)－０３～前記ステップ(9)－０７は、オプションのステップであり、これらの表示を一見するだけで、送信局の動作モードを認識することができる。また、前記説明においては、高速送信モードの場合について説明しているが、低速送信モードの場合には、最小送信レートは、たとえば１２Ｍｂｐｓとする。

（高速送信モードの設定処理例③）

ここで、図３０、図３１、図３３、及び図３４を参照しながら、送信局の送信 PHY Rate の最低値を示す最小送信レートがユーザの希望す

る使用状況に合ったものに設定する更に他の具体例を説明する。

図３３は、ユーザが送信局（Ｓｅｎｄｅｒ）を高速送信モードにする他の例を示す。なお、説明の便宜上、高速送信モードに対応する最小送信レートを３６Ｍｂｐｓとする。

まず、ユーザは、ステップ(10)－０１において、送信局の動作モードとして高速送信モードを選択する（図３０のステップＳｅｎｄｅｒ－２０１に対応）。これは、たとえば、ユーザが高速送信モード用の入力手段（押しボタン等）を介して高速送信モードを選択することによって行なわれる。

このような選択が行なわれると、送信局は、高速送信モードへの変更要求を表示し（図３０のステップＳｅｎｄｅｒ－２０２参照）、ステップ(10)－０２において、最小送信レートを３６Ｍｂｐｓに設定する（図３０のステップＳｅｎｄｅｒ－２０３に対応）。

それから、ステップ(10)－０３において、送信局は、変更後の動作モード（高速送信モード）を表示する（図３０のステップＳｅｎｄｅｒ－２０４に対応）。そして、ステップ(10)－０４において、送信局は、動作モードが高速送信モードに変更されたことを制御局と受信局とにそれぞれ通知する（図３０のステップＳｅｎｄｅｒ－２０５に対応）。

前記制御局は、ステップ(10)－０５において前記送信局の動作モードが高速送信モードに変更された旨の通知を前記送信局から受信すると（図３４のステップＨＣ－２０１に対応）、ステップ(10)－０６において送信局の動作モードが高速送信モードに変更された旨を表示し（図３４のステップＨＣ－２０２に対応）、ステップ(10)－０７において送信局が高速送信モードにあることを表示する（図３４のステップＨＣ－２０

３に対応）。

一方、前記受信局は、ステップ(10)－０８において前記送信局の動作モードが高速送信モードに変更された旨の通知を前記送信局から受信すると（図３１のステップＲｅｃｅｉｖｅｒ－２０４に対応）、ステップ(10)－０９において送信局の動作モードが高速送信モードに変更された旨を表示し（図３１のステップＲｅｃｅｉｖｅｒ－２０５に対応）、ステップ(10)－１０において送信局が高速送信モードにあることを表示する（図３１のステップＲｅｃｅｉｖｅｒ－２０６に対応）。

なお、前記ステップ(10)－０３～前記ステップ(9)－１０は、オプションのステップであり、これらの表示を一見するだけで、送信局の動作モードを認識することができる。また、前記説明においては、高速送信モードの場合について説明しているが、低速送信モードの場合には、最小送信レートは、たとえば１２Ｍｂｐｓとする。

（高速送信モードの設定処理例④）

ここで、図３０、図３１、及び図３５を参照しながら、送信局の送信 PHY Rate の最低値を示す最小送信レートがユーザの希望する使用状況に合ったものに設定する他の具体例を説明する。

図３５は、ユーザが受信局（Ｒｅｃｅｉｖｅｒ）を介して（受信局において）制御局／送信局（ＨＣ／Ｓｅｎｄｅｒ）を高速送信モードにし、制御局／送信局へ動作モードの変更要求信号を送信する例を示す。なお、制御局／送信局は、制御局と送信局の両方の機能を備えたものである。また、説明の便宜上、高速送信モードに対応する最小送信レートを３６Ｍｂｐｓとする。

まず、ユーザは、ステップ(11)－０１において、受信局を介して（受

信局において）、送信局の動作モードを高速送信モードに切り替えることを要求する（図３１のステップＲｅｃｅｉｖｅｒ－２０１に対応）。これは、たとえば、ユーザが高速送信モード用の入力手段（押しボタン等）を介して高速送信モードを選択することによって行なわれる。

これに伴って、ステップ(11)－０２において、受信局は、送信局の動作モードを高速送信モードに切り替えることを制御局／送信局に要求したことを表示する（図３１のステップＲｅｃｅｉｖｅｒ－２０２に対応）。そして、ステップ(11)－０３において、受信局から制御局／送信局に対して、送信局の動作モードの変更要求信号が送信される（図３１のステップＲｅｃｅｉｖｅｒ－２０３に対応）。

制御局／送信局は、ステップ(11)－０４において、前記の変更要求信号を受信すると（図３０のＳｅｎｄｅｒ－２０１に対応）、ステップ(11)－０５において動作モードを高速送信モードに変更する変更要求を受信局から受領したことを表示する（図３０のステップＳｅｎｄｅｒ－２０２に対応）。制御局／送信局は、ステップ(11)－０６及びステップ(11)－０７において、最小送信レートを３６Ｍｂｐｓに設定する（図３０のステップＳｅｎｄｅｒ－２０３に対応）。

それから、ステップ(11)－０８において、制御局／送信局は、変更後の動作モード（高速送信モード）を表示する（図３０のステップＳｅｎｄｅｒ－２０４に対応）。そして、ステップ(11)－０９において、制御局／送信局は、送信局の動作モードが高速送信モードに変更されたことを受信局に通知する（図３０のステップＳｅｎｄｅｒ－２０５に対応）。

前記受信局は、ステップ(11)－１０において前記送信局の動作モード

が高速送信モードに変更された旨の通知を前記制御局／送信局から受信すると（図３１のステップＲｅｃｅｉｖｅｒ－２０４に対応）、ステップ(11)－１１において送信局の動作モードが高速送信モードに変更された旨を表示し（図３１のステップＲｅｃｅｉｖｅｒ－２０５に対応）、ステップ(11)－１２において制御局／送信局が高速送信モードにあることを表示する（図３１のステップＲｅｃｅｉｖｅｒ－２０６に対応）。

なお、前記ステップ(11)－０２、(11)－０５、及び前記ステップ(11)－０８～前記ステップ(11)－１２は、オプションのステップであり、これらの表示を一見するだけで、送信局の動作モードを認識することができる。また、前記説明においては、高速送信モードの場合について説明しているが、低速送信モードの場合には、最小送信レートは、たとえば１２Ｍｂｐｓとする。

（高速送信モードの設定処理例⑤）

ここで、図３０、図３１、及び図３６を参照しながら、送信局の送信 PHY Rate の最低値を示す最小送信レートがユーザの希望する使用状況に合ったものに設定する他の具体例を説明する。

図３６は、ユーザが制御局／受信局（ＨＣ／Ｒｅｃｅｉｖｅｒ）において送信局（Ｓｅｎｄｅｒ）の動作モードを高速送信モードにし、送信局へ動作モードの変更要求信号を送信する例を示す。なお、制御局／受信局は、制御局と受信局の両方の機能を備えたものである。また、説明の便宜上、高速送信モードに対応する最小送信レートを３６Ｍｂｐｓとする。

まず、ユーザは、ステップ(12)－０１において、送信局の動作モードを高速送信モードに切り替えることを制御局／受信局において要求する

（図３１のステップＲｅｃｅｉｖｅｒ－２０１に対応）。これは、たとえば、ユーザが高速送信モード用の入力手段（押しボタン等）を介して高速送信モードを選択することによって行なわれる。これに伴って、ステップ(12)－０２において、制御局／受信局は、高速送信モードに切り替わることを送信局に要求したことを表示する（図３１のステップＲｅｃｅｉｖｅｒ－２０２に対応）。

これに伴って、ステップ(12)－０３において、制御局／受信局から送信局に対して、送信局の動作モードの変更要求信号が送信される（図３１のステップＲｅｃｅｉｖｅｒ－２０３に対応）。

送信局は、ステップ(12)－０４において、前記の変更要求信号を受信すると（図３０のステップＳｅｎｄｅｒ－２０１に対応）、ステップ(12)－０５において動作モードを高速送信モードに変更する変更要求を制御局／受信局から受領したことを表示する（図３０のステップＳｅｎｄｅｒ－２０２に対応）。

送信局は、ステップ(12)－０６及びステップ(12)－０７において、最小送信レートを３６Ｍｂｐｓに設定する（図３０のステップＳｅｎｄｅｒ－２０３に対応）。それから、ステップ(12)－０８において、送信局は、変更後の動作モード（高速送信モード）を表示する（図３０のステップＳｅｎｄｅｒ－２０４に対応）。そして、ステップ(12)－０９において、送信局は、動作モードが高速送信モードに変更されたことを制御局／受信局に通知する（図３０のステップＳｅｎｄｅｒ－２０５に対応）。

前記制御局／受信局は、ステップ(12)－１０において前記送信局から高速送信モードに変更された旨の通知を受信すると（図３１のステップ

Ｒｅｃｅｉｖｅｒ－２０４に対応）、ステップ(12)－１１において送信局の動作モードが高速送信モードに変更された旨を表示し（図３１のステップＲｅｃｅｉｖｅｒ－２０５に対応）、ステップ(12)－１２において送信局が高速送信モードにあることを表示する（図３１のステップＲｅｃｅｉｖｅｒ－２０６に対応）。

なお、前記ステップ(12)－０２、(12)－０５、及び前記ステップ(12)－０８～前記ステップ(12)－１２は、オプションのステップであり、これらの表示を一見するだけで、送信局の動作モードを認識することができる。また、前記説明においては、高速送信モードの場合について説明しているが、低速送信モードの場合には、最小送信レートは、たとえば１２Ｍｂｐｓとする。

（高速送信モードの設定処理例⑥）

ここで、図３０、図３１、図３４、及び図３７を参照しながら、送信局の送信 PHY Rate の最低値を示す最小送信レートがユーザの希望する使用状況に合ったものに設定する他の具体例を説明する。

図３７は、ユーザが受信局（Ｒｅｃｅｉｖｅｒ）を介して（受信局において）送信局（Ｓｅｎｄｅｒ）の動作モードを高速送信モードにし、送信局へ動作モードの変更要求信号を送信する例を示す。なお、説明の便宜上、高速送信モードに対応する最小送信レートを３６Ｍｂｐｓとする。

まず、ユーザは、ステップ(13)－０１において、受信局を介して（受信局において）、送信局の動作モードを高速送信モードに切り替えることを要求する（図３１のステップＲｅｃｅｉｖｅｒ－２０１に対応）。これは、たとえば、ユーザが高速送信モード用の入力手段（押しボタン

等）を介して高速送信モードを選択することによって行なわれる。

これに伴って、ステップ(13)－０２において、受信局は、送信局の動作モードを高速送信モードに切り替えることを送信局に要求したことを表示する（図３１のステップＲｅｃｅｉｖｅｒ－２０２に対応）。これに伴って、ステップ(13)－０３において、受信局から送信局に対して、送信局の動作モードの変更要求信号が送信される（図３１のステップＲｅｃｅｉｖｅｒ－２０３に対応）。

送信局は、ステップ(13)－０４において、前記の変更要求信号を受信すると（図３０のステップＳｅｎｄｅｒ－２０１に対応）、ステップ(13)－０５において動作モードを高速送信モードに変更する変更要求を受信局から受領したことを表示する（図３０のステップＳｅｎｄｅｒ－２０２に対応）。送信局は、ステップ(13)－０６及びステップ(13)－０７において、最小送信レートを３６Ｍｂｐｓに設定する（図３０のステップＳｅｎｄｅｒ－２０３に対応）。

それから、ステップ(13)－０８において、送信局は、変更後の動作モード（高速送信モード）を表示する（図３０のステップＳｅｎｄｅｒ－２０４に対応）。そして、ステップ(13)－０９において、送信局は、動作モードが高速送信モードに変更されたことを制御局と受信局とにそれぞれ通知する（図３０のステップＳｅｎｄｅｒ－２０５に対応）。

前記制御局は、ステップ(13)－１０において前記送信局から高速送信モードに変更された旨の通知を受信すると（図３４のステップＨＣ－２０１に対応）、ステップ(13)－１１において送信局の動作モードが高速送信モードに変更された旨を表示し（図３４のステップＨＣ－２０２に対応）、ステップ(13)－１２において送信局が高速送信モードにあるこ

とを表示する（図３４のステップＨＣ－２０３に対応）。

一方、前記受信局は、ステップ(13)－１３において前記送信局から高速送信モードに変更された旨の通知を受信すると（図３１のステップＲｅｃｅｉｖｅｒ－２０４に対応）、ステップ(13)－１４において送信局の動作モードが高速送信モードに変更された旨を表示し（図３１のステップＲｅｃｅｉｖｅｒ－２０５に対応）、ステップ(13)－１５において送信局が高速送信モードにあることを表示する（図３１のステップＲｅｃｅｉｖｅｒ－２０６に対応）。

なお、前記ステップ(13)－０２、(13)－０５、及び前記ステップ(13)－０８～前記ステップ(13)－１５は、オプションのステップであり、これらの表示を一見するだけで、送信局の動作モードを認識することができる。また、前記説明においては、高速送信モードの場合について説明しているが、低速送信モードの場合には、最小送信レートは、たとえば１２Ｍｂｐｓとする。

（高速送信モードの設定処理におけるフローチャート）

以上、図２８における前記(8)～(13)のパターンの処理を制御局、送信局、及び受信局ごとにまとめると、図３４、図３０、及び図３１に示すようなフローチャートになる。

図３４に示すように、ステップＨＣ－２０１において、送信局の動作モードの変更通知信号を受信しなかった場合、ステップＨＣ－２０４が実行され、送信局からストリームの新規追加、又は今までのストリームの変更要求の有無が判断される。変更要求があると判断されると、この要求を受け入れるか否かが判断された（ステップＨＣ－２０５）後、ステップＨＣ－２０６（受け入れ）又はステップＨＣ－２０７（拒否）が

実行される。

図３０に示すように、送信局の動作モード（高速送信モード又は低速送信モード）の変更要求がない場合、ストリーム送信要求の有無が判断される（ステップＳｅｎｄｅｒ－２０６）。ストリーム送信要求がある場合、ストリームの新規追加要求信号を制御局に対して送信する（ステップＳｅｎｄｅｒ－２０７）。

ストリームの新規追加要求が制御局によって受け入れられる（ステップＳｅｎｄｅｒ－２０８）と、制御局とのネゴーシエーションの結果決定した最小送信レート以上の通信速度でストリームの送信が送信局から受信局に対して行なわれる（ステップＳｅｎｄｅｒ－２０９）。これに対して、ストリームの新規追加要求が制御局によって受け入れられなかった場合、最小送信レートの増加（最小送信レートを高くすること）が可能か否かが判断され（ステップＳｅｎｄｅｒ－２１０）、可能な場合には最小送信レートを増加させた（ステップＳｅｎｄｅｒ－２１１）後、前記ステップＳｅｎｄｅｒ－２０８へ移行し、前記処理が繰り返される。

以上のように、ユーザ又は動作モードの変更要求によって、希望したときに、送信局又は受信局において、最小送信レートを押しボタン等の入力手段を介して選択することによって、送信局の送信 PHY Rate の最低値を示す最小送信レートをユーザの希望する使用状況に合ったものに設定できる。

たとえば、もともと３６Ｍｂｐｓ以上で送信しようと思っているユーザは、送信局又は受信局に対して、送信局の最小送信レートを３６Ｍｂｐｓに設定する（または、高速送信モード用の押しボタンを介して選択

する）。同様に、１２Ｍｂｐｓ以上で送信しようと思っているユーザは、送信局又は受信局に対して、送信局の最小送信レートを１２Ｍｂｐｓに設定する。これにより、ユーザが、希望したときに、希望する使用状況に合った最小送信レートを有するように送信局を設定できる。

（動作モード変更処理のまとめ）

以上の制御局の動作モード変更（台数優先モード・距離優先モード）と、送信局の動作モード（高速送信モード・低速送信モード）とをまとめると次のようになる。

制御局において、台数優先モード又は距離優先モードを設定する場合、(1)台数優先モードになった制御局は、通信速度（最小送信レート）が設定済みの閾値（前記説明では、たとえば３６Ｍｂｐｓ）未満の送信局を受け入れず、(2)制御局は一度受け入れると、その送信局がたとえ前記閾値以上(たとえば、４８Ｍｂｐｓや５４Ｍｂｐｓ)の通信速度で通信しようとも、送信局には前記閾値（３６Ｍｂｐｓ）で通信できるＴＸＯＰの付与を保証し、(3)距離優先モードに変更した制御局は、通信速度（最小送信レート）が設定済みの閾値（前記説明では、たとえば１２Ｍｂｐｓ）未満の送信局を受け入れず、(4)制御局は一度受け入れると、その送信局がたとえ前記閾値以上(たとえば、４８Ｍｂｐｓや５４Ｍｂｐｓ)の通信速度で通信しようとも、送信局には前記閾値（１２Ｍｂｐｓ）で通信できるＴＸＯＰの付与を保証する（従来技術においては、一度１２Ｍｂｐｓで受け入れても、勝手に２４Ｍｂｐｓなどに通信速度を上昇させるので、この場合２４Ｍｂｐｓ以上の通信速度でしか通信できないＴＸＯＰに変更されてしまう。）。

また、送信局において、高速送信モードと低速送信モードとを設定す

る場合、(a) 高速送信モードになった送信局は、最小送信レート（前記説明では、たとえば３６Ｍｂｐｓ）以上で通信し（制御局に３６Ｍｂｐｓで送信することが受け入れられなかったら、たとえば４８Ｍｂｐｓや５４Ｍｂｐｓでもう一度制御局から許可を得ようとする。）、(b) 低速送信モードになった送信局は、最小送信レート（前記説明では、たとえば１２Ｍｂｐｓ）以上で通信する（制御局に１２Ｍｂｐｓで送信することが受け入れられなかったら、たとえば２４Ｍｂｐｓ、３６Ｍｂｐｓ、４８Ｍｂｐｓ、又は５４Ｍｂｐｓでもう一度制御局から許可を得ようとする。）。

本発明は、前記２種類の動作モード（台数優先モード・距離優先モードと、高速送信モード・低速送信モードとの２種類の動作モードを意味する。）の場合に限定されるものではなく、これら２種類の動作モードの組み合わせも含む。

（制御局の構成）

ここで、本実施の形態で使用した前記制御局について図１３を参照しながら、以下に簡単に説明する。

前記制御局は、主として、受信部１、送信部２、スケジューリング部３、送信／受信パケット制御部４、表示部５、及びインターフェース部６から構成されている。

前記受信部１は、Ｔｓｅｃ及びＱｏＳ　Ｎｕｌｌの受信を行うために設けられている。前記送信部２は、ＣＦ－Ｐｏｌｌを送信するために設けられている。前記送信／受信パケット制御部４は、ＣＦ－Ｐｏｌｌの送信タイミングの管理を行い前記スケジューリング部３に必要なデータのリクエストをすると共に、Ｔｓｅｃ／ＱｏＳ　Ｎｕｌｌの中から必要

なデータを抽出して前記スケジューリング部３に送るために設けられている。

前記インターフェース部６は、入力したユーザのモード変更操作を前記送信／受信パケット制御部４に送るために設けられている。また、前記表示部５は、前記制御部から通知された現在の設定モード（距離優先モードか台数優先モードのいずれか一方）の表示、及び／又は前記制御部から通知された制御局のモード変更要求の表示、及び／又は現在受け付けている送信局の設定モード及び／又はその変更通知（高速送信モードか低速送信モードのいずれか一方）の表示のために設けられている。

前記スケジューリング部３（スケジューラ）は、（１）ＴＳｐｅｃからストリームを受け入れるか否かを判断するため、（２）ＱｏＳ　Ｎｕｌｌ からＴＸＯＰの設定の更新を行うため、及び（３）ＣＦ－Ｐｏｌｌ送信リクエストを受信して必要なデータを前記の送信／受信パケット制御部４に送るために設けられている。

前記スケジューリング部３は、図１４に示すように、主として、ストリーム受け入れ判定部７、ＴＸＯＰ設定計算部８、ポーリングリスト（Polling list）制御部９、要求量処理部１０、ＣＦ－Ｐｏｌｌ送信部１１、及びＱｏＳ　Ｎｕｌｌ受信部１２から構成されている。

前記ストリーム受け入れ判定部７は、現在の通信帯域の状況からストリーム（新規ＴＳｐｅｃ）を受け入れるか否かを判断している。前記ＴＸＯＰ設定計算部８は、ＴＳｐｅｃ／ＱｏＳ　Ｎｕｌｌに基づいてＴＸＯＰの計算を行い、ポーリングリストを作成してＴＸＯＰを設定している。

前記ポーリングリスト制御部９は、前記のＴＸＯＰ設定計算部８から

設定されたＴＸＯＰとポーリングインターバルで残った時間をどの送信局に割り当てるかを判定して前記ＣＦ－Ｐｏｌｌ送信部１１に伝えるために設けられている。

前記の要求量処理部１０は、ＣＦ－Ｐｏｌｌを投げた時間とＱｏＳ　Ｎｕｌｌを受信した時間とからＴＸＯＰの使用時間を計算し、同時にＱｏＳ　Ｎｕｌｌの中身を処理して前記ＴＸＯＰ設定計算部８と前記ポーリングリスト制御部９とにそれぞれ報告するために設けられている。

前記ＣＦ－Ｐｏｌｌ送信部１１は、ＣＦ－Ｐｏｌｌを送信するために設けられ、前記ＱｏＳ　Ｎｕｌｌ受信部１２は、ＱｏＳ　Ｎｕｌｌを受信するために設けられている。

（送信局の構成）

次に、本実施の形態で使用した前記送信局（端末送信局）について図１５を参照しながら、以下に簡単に説明する。

前記送信局は、主として、受信部１３、送信部１４、送信／受信パケット制御部１５、表示部１６、及びインターフェース部１７から構成されている。

前記受信部１３は、ＣＦ－Ｐｏｌｌの受信を行うために設けられている。前記送信部１４は、ストリームデータ・ＱｏＳ　Ｎｕｌｌの送信を行うために設けられている。前記送信／受信パケット制御部１６は、ＣＦ－Ｐｏｌｌを受信してＴＸＯＰ時間を管理すると共に、ＴＸＯＰの残り時間に応じてストリームデータ・ＱｏＳ　Ｎｕｌｌを選択して送信するために設けられている。

前記インターフェース部１７は、入力したストリームデータを前記の送信／受信パケット制御部１５に送るために設けられている。また、前

記の表示部１６は、前記制御部から通知された制御局の設定モード（距離優先モードか台数優先モードのいずれか一方）の表示、及び／又は送信局及び／又は受信局が制御局に対して要求しているモード（距離優先モードか台数優先モードのいずれか一方）の表示、及び／又は制御局の設定モードの変更通知の表示、及び／又は制御局の設定モードの変更拒否通知及び／又は拒否理由の表示、及び／又は送信局の設定モード（高速送信モードか低速送信モードのいずれか一方）の表示、及び／又は前記制御部から通知された送信局のモード変更要求を表示するために設けられている。

（受信局の構成）

次に、本実施の形態で使用した前記受信局（端末受信局）について図１６を参照しながら、以下に簡単に説明する。

前記受信局は、主として、受信部１８、送信部１９、送信／受信パケット制御部２０、表示部２１、及びインターフェース部２２から構成されている。

前記受信部１８は、ストリームデータの受信を行うために設けられている。前記送信部１９は、Ａｃｋの送信を行うために設けられている。前記送信／受信パケット制御部２０は、ストリームデータを受信すると共に、必要に応じてＡｃｋを返送するために設けられている。

前記インターフェース部２２は、ストリームデータを外部に出力するために設けられている。また、前記の表示部２１は、前記制御部から通知された制御局の設定モード（距離優先モードか台数優先モードのいずれか一方）、及び／又は受信局が制御局に対して要求しているモード（距離優先モードか台数優先モードのいずれか一方）の表示、及び／又は

制御局の設定モードの変更通知の表示、及び／又は制御局の設定モードの変更拒否通知及び／又は拒否理由の表示、及び／又は送信局の設定モード（高速送信モードか低速送信モードのいずれか一方）、及び／又は受信局が送信局に対して要求しているモード（高速送信モードか低速送信モードのいずれか一方）の表示、及び／又は前記制御部から通知された送信局のモード変更通知を表示するために設けられている。

以上のように、本発明のスケジューリング方法は、上記の課題を解決するために、無線などの媒体を用いてデータの送受信を行う複数の通信局が存在する場合に、データの送信ができる送信局は、その時点で送信権を有している送信局のみとし、上記送信局はバッファ状況または送信権を付与して欲しい時間の情報を制御局に対して通知し、上記制御局は上記情報に基づいて送信権を付与する時間を調節することにより帯域を管理する通信管理システムにおけるスケジューリング方法において、上記制御局は、周期的な間隔で各送信局に送信権を付与するように制御する方法である。

複数の通信局が存在する場合、データの送信ができるのは、その時点で送信権を有する送信局のみであり、上記制御局は、送信局から通知されてきた情報に基づいて、送信権を付与する時間を調節している。この際、一般的な方法として、制御局による送信局への送信権の付与の制御が非周期的な間隔で行われている場合、制御局においては、複数存在する送信局に対して送信権を付与する順番及び付与する時間などを管理する情報量が無限に多くなってしまう。

そこで、上記スケジューリング方法によれば、制御局によって、周期的な間隔で各送信局に送信権を付与するように制御される。このように

制御局が周期的な間隔で送信権を付与する時間情報を制御することによって、制御局は、周期的な間隔の間だけ、複数存在する送信局に対して送信権を付与する際の順番及び付与する時間などの情報を管理すればよいことになり、管理する情報量を確実に減少させることが可能となる。

また、送信局から通知されてきた情報を反映して送信権を付与する時間を調節することが周期的な間隔でできるため、通信状況が悪い送信局に対して、最低でも次の周期では必要な措置を講じることが可能となる。

上記スケジューリング方法において、上記制御局は、周期的な間隔の最後部に空いた期間が存在する場合は、送信局に再度送信権を付与することが好ましい。

この場合、周期的な間隔で各送信局は送信権を付与されるが、該間隔の最後に空いた期間ができると、その期間、送信局に再度送信権が付与される。これによって、通信帯域の無駄を確実に無くし、通信帯域の有効利用を図ることが可能となる。

上記スケジューリング方法において、上記送信局に再度送信権を付与する場合に、該送信局からのバッファ状況または送信権を付与して欲しい時間の情報を考慮して再度送信権を付与する、または送信局の過去の実績値を考慮して再度送信権を付与する、または送信局毎に優先度を設定しておき、上記優先度を考慮して再度送信権を付与する、またはこれらのうち２つ以上組み合わせることによって再度送信権を付与することが好ましい。

この場合、通信帯域の無駄を確実に無くし、通信帯域の有効利用を図ることができると共に、通信環境が悪く、及び／又は、優先度が高い送

信局に送信権が再度付与されるので、送信権が付与された送信局においては迅速なエラー復帰が実現できる。

上記スケジューリング方法において、上記制御局は、周期的な間隔に空いた期間が存在する場合は、送信局に付与する時間を調節した結果と上記空いた期間を足して送信権を付与する時間とすることが好ましい。

この場合、周期的な間隔に空いた期間が存在すると、送信局に送信権を付与する際に、上記空いた時間と付与する時間の調節の結果とを足した合計時間を付与することになる。これによって、通信帯域に余裕のあるデータの送信ができる。

上記スケジューリング方法において、上記空いた期間を足して送信権を付与する時間とする場合に、送信局からのバッファ状況または送信権を付与して欲しい時間の情報を考慮して空いた期間を足して送信権を付与する時間とする、または送信局の過去の実績値を考慮して空いた期間を足して送信権を付与する時間とする、または送信局毎に優先度を設定しておき、上記優先度を考慮して空いた期間を足して送信権を付与する時間とする、またはこれらのうち２つ以上組み合わせることによって空いた期間を足して送信権を付与する時間としても良い。

この場合、通信帯域に余裕のあるデータの送信ができると共に、通信環境が悪く、及び／又は、優先度が高い送信局に送信権を付与する時間を増やすことができるので、付与された送信局においては迅速なエラー復帰が実現できる。

本発明に係る他のスケジューリング方法は、上記課題を解決するために、無線などの媒体を用いてデータの送受信を行う複数の通信局が存在する場合に、データの送信ができる送信局は、その時点で送信権を有し

ている送信局のみとし、上記送信局はバッファ状況または送信権を付与して欲しい期間の情報を制御局に対して通知し、上記制御局は上記情報に基づいて送信権を付与する時間を調節することにより帯域を管理する通信管理システムにおけるスケジューリング方法において、バッファ状況または送信権を付与して欲しい期間の情報に基づいて通信状況が悪いと判断された送信局の影響を他の送信局が受けないように制御する方法である。

無線などの媒体を用いてデータの送受信を行う複数の通信局が存在する場合、送信局からのバッファ状況または送信権を付与して欲しい期間の情報を基に、制御局が送信権を付与する時間にそのまま反映していくと、通信状況の悪い送信局は、通信状況の悪くない送信局に影響を及ぼすことになる。

そこで、上記の方法によれば、通信状況の悪い送信局の影響を他の送信局が受けないようにスケジューリングが制御される。これにより、通信状況の悪くない送信局は、通信状況の悪い送信局から悪影響を受けることなく、送信を継続して行える。その結果、システムの信頼性が向上する。

上記スケジューリング方法において、上記制御局は、上記送信局に対して付与する時間の上限値を設定しておき、付与する時間の調節の結果が該上限値を上回った場合には、上記送信局に対して付与する時間を上限値以上に伸ばさないように制御することが好ましい。

この場合、各送信局に対して付与する時間の上限値が設定される。そして、通信状況が悪い送信局からのバッファ状況または送信権を付与して欲しい期間の情報に基づいて付与する時間の調節を行った結果が、上

記上限値を上回っていた場合は、付与する時間を上限値以上には伸ばさないように制御される。これによって、通信状況が悪い送信局の悪い影響を通信状況が正常な送信局が受けることを確実に回避することができる。

上記スケジューリング方法において、上記制御局は、上記送信局に対して付与する時間の下限値を設定しておき、付与する時間の調節の結果が該下限値を下回った場合には、上記送信局に対して付与する時間を下限値以下に縮めないように制御することが好ましい。

この場合、各送信局に対して付与する時間の下限値が設定される。データレートが一定でないデータの送信を行っている送信局が存在する場合には、上記送信局からのバッファ状況または送信権を付与して欲しい期間の情報に基づいて付与する時間の調節を行った結果が大きく変動することが考えられる。そのような場合においても、上記下限値を下回っていた場合は、付与する時間を下限値以下には縮めないように制御される。これによって、最低限の送信権が付与される時間が保証されることになるので、システムとして安定してデータを送信することができ、信頼性が著しく向上する。

上記スケジューリング方法において、上記制御局は、上記周期的な間隔で各送信局に付与する時間の調節の結果を合計したものが上記間隔に収まらない場合には、付与する時間の調節の結果が基準値から最も離れている送信局に付与する時間を優先的に削減して、上記間隔の中に収まるように制御するようにしてもよい。

通信状況が悪い送信局が存在し、各送信局に付与する時間の調節の結果を合計したものが上記間隔に収まらない場合があるが、この場合、そ

のまま通信状況が悪い送信局に送信権を付与していくと、通信状況が正常な他の送信局に悪影響を及ぼすことになる。

そこで、このような場合、上記スケジューリング方法によれば、送信局毎に時間の調節を行った結果が基準値からの差を求め、上記差の最も大きい送信局に付与する時間を優先的に削減していく。これにより、上記差の大きい送信局ほど所望の送信を行うことはできなくなるが、他の送信局は悪影響を受けることなく、継続して送信を行うことができる。

本発明に係る更に他のスケジューリング方法は、無線などの媒体を用いてデータの送受信を行う複数の通信局が存在する場合に、データの送信ができる送信局は、その時点で送信権を有している送信局のみとし、上記送信局はバッファ状況または送信権を付与して欲しい期間の情報を制御局に対して通知し、上記制御局は上記情報に基づいて送信権を付与する時間を調節することにより帯域を管理する通信管理システムにおけるスケジューリング方法において、上記制御局では距離優先モードまたは台数優先モードの切り替えができる方法である。

一般に、伝送距離を長くすることと、多数の送信局（ストリーム）をサポートすることとは、相反する事項である。したがって、従来は、ユーザの意図を認識して、距離を優先して送信局に送信権を付与していくか、複数の送信局（ストリーム）をサポートすることを優先して送信局に送信権を与えていくかの指針がなかった。

そこで、上記スケジューリング方法によれば、上記制御局で距離優先モードあるいは台数優先モードの切り替えができる。これによって、ユーザの意図通りのモード設定を行うことができる。

なお、本発明は上述した具体例に限定されるものではなく、請求の範

囲に示した範囲で種々の変更が可能であり、異なる具体例にそれぞれ開示された技術的手段を適宜組み合わせて得られるものについても本発明の技術的範囲に含まれる。

発明の詳細な説明の項においてなされた具体的な実施態様または実施例は、あくまでも、本発明の技術内容を明らかにするものであって、そのような具体例にのみ限定して狭義に解釈されるべきものではなく、本発明の精神と特許請求事項との範囲内で、いろいろと変更して実施することができるものである。

産業上の利用の可能性

本発明に係る通信管理方法は、例えば家庭用電化製品に無線通信機能が内蔵され、これらを家庭内ＬＡＮとして相互に接続するようなネットワークシステムなどに好適に用いることができるものである。より具体的には、ＤＶＤプレイヤー、ケーブルテレビジョン用モデムなどの、映像データを出力する装置、および、このような映像データに基づいて映像を表示するディスプレイ装置などが通信ネットワークを介して接続されるシステムなどに適用することが可能である。

請　求　の　範　囲

１．複数の通信局と、前記通信局の送信権を制御する制御局から構成される通信システムにおいて前記制御局が行う通信管理方法であって、

少なくとも１つの前記通信局からの送信権要求に基づいて、該通信局に対して、所定の期間内で送信権付与期間を割り当てるとともに、

前記所定の期間が予め特定の長さに限定されていることを特徴とする通信管理方法。

２．前記所定の期間が連続的に設定されるとともに、前記所定の期間の連続が、周期性を有するように設定されることを特徴とする請求の範囲１記載の通信管理方法。

３．複数の通信局と前記通信局の送信権を制御する制御局から構成される通信システムにおいて前記制御局が行う通信管理方法であって、

少なくとも１つの前記通信局からの送信権要求に基づいて、該通信局に対して、所定の期間内で送信権付与期間を割り当てるとともに、

前記所定の期間内で送信権を割り当てた通信局の全てが送信権付与期間を終了するか、あるいは送信権付与期間内に送信を終了した時点で、少なくとも１つの前記通信局に対して、前記所定の期間内において再度送信権を割り当てることを特徴とする通信管理方法。

４．前記通信局からのバッファ状況または送信権を割り当てて欲しい時間の情報を考慮するか、前記通信局に送信権を割り当ててきた実績値を考慮するか、前記通信局毎に優先度を設定しておき、前記優先度を考慮するか、またはこれらのうち２つ以上組み合わせることによって、前記所定の期間内において再度送信権を割り当てることを特徴とする請求

の範囲３記載の通信管理方法。

５．複数の通信局と前記通信局の送信権を制御する制御局から構成される通信システムにおいて前記制御局が行う通信管理方法であって、

少なくとも１つの前記通信局からの送信権要求に基づいて、該通信局に対して、所定の期間内で送信権付与期間を割り当てるとともに、

前記所定の期間内で割り当てる送信権付与期間を、それ以前の各通信局の通信状況および／または各通信局の性質に基づいて設定することを特徴とする通信管理方法。

６．前記通信局からのバッファ状況または送信権を割り当てて欲しい時間の情報を考慮するか、前記通信局に送信権を割り当ててきた実績値を考慮するか、前記通信局毎に優先度を設定しておき、前記優先度を考慮するか、またはこれらのうち２つ以上組み合わせることによって前記送信権の割り当て期間を設定することを特徴とする請求の範囲５記載の通信管理方法。

７．複数の通信局と前記通信局の送信権を制御する制御局から構成される通信システムにおいて前記制御局が行う通信管理方法であって、

少なくとも１つの前記通信局からの送信権要求に基づいて、該通信局に対して、所定の期間内で送信権付与期間を割り当てるとともに、

前記送信権を与える期間には上限値および／または下限値があることを特徴とする通信管理方法。

８．前記通信局毎に送信権付与期間に関する基準値を予め設定しておき、

前記送信権付与期間を設定した結果、前記所定の期間内に送信権の割り当てができない場合に、前記基準値から最も離れている通信局に対す

る送信権付与期間を優先的に削減することによって、前記所定の期間内に送信権の割り当てができるように制御することを特徴とする請求の範囲６または７記載の通信管理方法。

９．複数の通信局と前記通信局の送信権を制御する制御局から構成される通信システムにおいて前記制御局が行う通信管理方法であって、

少なくとも１つの前記通信局からの送信権要求に基づいて、該通信局に対して、所定の期間内で送信権付与期間を割り当てるとともに、

動作モードとして、距離優先モードまたは台数優先モードの切り替えを行うことを特徴とする通信管理方法。

１０．送信局が通知する送信レートの最低値を示す最小送信レートを受け入れるか否かを判断する閾値を設定することを特徴とする請求の範囲９記載の通信管理方法。

１１．距離優先モードまたは台数優先モードに応じて前記閾値を設定することを特徴とする請求の範囲１０記載の通信管理方法。

１２．送信局または受信局からモード切り替え要求を受信することを特徴とする請求の範囲９記載の通信管理方法。

１３．動作モードを切り替えた場合、送信局または受信局にその旨を通知することを特徴とする請求の範囲９ないし１２のいずれか一項に記載の通信管理方法。

１４．動作モードを切り替えない場合、その旨を前記制御局が備える表示手段に表示することを特徴とする請求の範囲９ないし１３のいずれか一項に記載の通信管理方法。

１５．動作モードを切り替えない場合、その理由を前記制御局が備える表示手段に表示することを特徴とする請求の範囲９ないし１４のいず

れか一項に記載の通信管理方法。

１６．動作モードを切り替えない場合、送信局および／または受信局にその旨を通知することを特徴とする請求の範囲９ないし１５のいずれか一項に記載の通信管理方法。

１７．動作モードを切り替えない場合、送信局および／または受信局にその理由を通知することを特徴とする請求の範囲９ないし１６のいずれか一項に記載の通信管理方法。

１８．前記制御局が備える表示手段に現在の動作モードを表示すると共に、送信局または受信局が要求してきた動作モードを表示することを特徴とする請求の範囲１２記載の通信管理方法。

１９．複数の通信局と前記通信局の送信権を制御する制御局から構成される通信システムが備える制御局であって、

前記複数の通信局からの送信権要求を受信する受信部と、

前記複数の通信局の少なくとも一部に対して送信権を付与する情報を送信する送信部と、

請求項１ないし８のいずれか一項に記載の通信管理方法を実行するスケジューリング部とを備えていることを特徴とする制御局。

２０．複数の通信局と前記通信局の送信権を制御する制御局から構成される通信システムが備える制御局であって、

前記複数の通信局からの送信権要求を受信する受信部と、

前記複数の通信局の少なくとも一部に対して送信権を付与する情報を送信する送信部と、

請求の範囲９ないし１８のいずれか一項に記載の通信管理方法を実行するスケジューリング部とを備えていることを特徴とする制御局。

２１．複数の通信局と前記通信局の送信権を制御する請求の範囲２０に記載の制御局から構成される通信システムにおいて前記通信局が行う通信管理方法であって、

前記制御局が距離優先モードまたは台数優先モードで制御しているのかを前記通信局が備える表示手段に表示することを特徴とする通信管理方法。

２２．複数の通信局と前記通信局の送信権を制御する請求の範囲１９または２０に記載の制御局から構成される通信システムにおいて前記通信局が行う通信管理方法であって、

前記通信システムにおける通信ネットワークに接続できない送信局が存在する場合に、その理由を前記通信局が備える表示手段に表示することを特徴とする通信管理方法。

２３．複数の通信局と前記通信局の送信権を制御する請求の範囲２０に記載の制御局から構成される通信システムにおいて前記通信局が行う通信管理方法であって、

送信を行う場合に、前記制御局に対して、動作モードを距離優先モードまたは台数優先モードに切り替えることを要求することを特徴とする通信管理方法。

２４．送信を行う場合に、前記制御局の現在の動作モードを前記通信局が備える表示手段に表示すると共に、前記制御局に切り替え要求した動作モードを前記表示手段に表示することを特徴とする請求の範囲２３記載の通信管理方法。

２５．前記制御局から、動作モードが切り替えられた旨を受信した際に、その通知された内容を前記通信局が備える表示手段に表示すること

を特徴とする請求の範囲２３または２４記載の通信管理方法。

２６．前記制御局から、自局から送信したモード切り替え要求が拒否された旨を受信した際に、その旨を前記通信局が備える表示手段に表示することを特徴とする請求の範囲２３、２４、または２５記載の通信管理方法。

２７．前記制御局から、自局から送信したモード切り替え要求が拒否された旨を受信した際に、その理由を前記通信局が備える表示手段に表示することを特徴とする請求の範囲２３ないし２６のいずれか一項に記載の通信管理方法。

２８．複数の通信局と前記通信局の送信権を制御する請求の範囲２０に記載の制御局から構成される通信システムにおいて前記通信局が行う通信管理方法であって、

送信局からデータを受信する場合に、前記制御局に対して、動作モードを距離優先モードまたは台数優先モードに切り替えることを、前記送信局を介して要求することを特徴とする通信管理方法。

２９．受信を行う場合に、前記制御局の現在の動作モードを前記通信局が備える表示手段に表示すると共に、前記制御局に切り替え要求した動作モードを前記表示手段に表示することを特徴とする請求の範囲２８記載の通信管理方法。

３０．前記制御局から、動作モードが切り替えられた旨を送信局を介して受信した際に、その通知された内容を前記通信局が備える表示手段に表示することを特徴とする請求の範囲２８または２９記載の通信管理方法。

３１．前記制御局から、自局から送信したモード切り替え要求が拒否

された旨を受信した際に、その旨を前記通信局が備える表示手段に表示することを特徴とする請求の範囲２８、２９、または３０記載の通信管理方法。

３２．前記制御局から、自局から送信したモード切り替え要求が拒否された旨を受信した際に、その理由を前記通信局が備える表示手段に表示することを特徴とする請求の範囲２６ないし３１のいずれか一項に記載の通信管理方法。

３３．複数の通信局と前記通信局の送信権を制御する請求の範囲１９または２０に記載の制御局から構成される通信システムにおいて前記通信局が行う通信管理方法であって、

送信を行う際の動作モードとして、高速送信モードおよび低速送信モードに切替可能であることを特徴とする通信管理方法。

３４．送信レートの最低値を示す最小送信レートが設定されていることを特徴とする請求の範囲３３記載の通信管理方法。

３５．高速送信モードまたは低速送信モードに応じて前記最小送信レートが設定されることを特徴とする請求の範囲３４記載の通信管理方法。

３６．動作モードを切り替えた場合、前記制御局と、送信先となる受信局とに、その旨をそれぞれ通知することを特徴とする請求の範囲３３記載の通信管理方法。

３７．現在の動作モードを前記通信局が備える表示手段に表示することを特徴とする請求の範囲３３ないし３６のいずれか一項に記載の通信管理方法。

３８．前記制御局から、動作モードが切り替えられた旨を受信した際

に、その通知された内容を前記通信局が備える表示手段に表示することを特徴とする請求の範囲３３記載の通信管理方法。

３９．請求の範囲３３ないし３８のいずれか一項に記載の通信管理方法を行う送信局としての通信局から受信を行う受信局としての通信局が行う通信管理方法であって、

前記送信局の現在の動作モードを前記受信局としての通信局が備える表示手段に表示することを特徴とする通信管理方法。

４０．前記制御局から、動作モードが切り替えられた旨を受信した際に、その通知された内容を前記受信局としての通信局が備える表示手段に表示することを特徴とする請求の範囲３９記載の通信管理方法。

４１．前記送信局の動作モードを高速送信モードまたは低速送信モードに切り替えることを要求することを特徴とする請求の範囲３９記載の通信管理方法。

４２．複数の通信局と前記通信局の送信権を制御する制御局から構成される通信システムが備える通信局であって、

前記通信局および／または前記制御局に対して情報の送信および／または受信を行う送受信部と、

請求の範囲２１ないし４１のいずれか一項に記載の通信管理方法を実行するスケジューリング部とを備えていることを特徴とする通信局。

４３．請求の範囲３３ないし３８のいずれか一項に記載の通信管理方法を行う送信局としての通信局の送信権を制御する制御局が行う通信管理方法であって、

前記送信局の動作モードを前記制御局が備える表示手段に表示することを特徴とする通信管理方法。

４４．複数の通信局と前記通信局の送信権を制御する制御局から構成される通信システムが備える制御局であって、

前記複数の通信局からの送信権要求を受信する受信部と、

前記複数の通信局の少なくとも一部に対して送信権を付与する情報を送信する送信部と、

請求の範囲４３記載の通信管理方法を実行するスケジューリング部とを備えていることを特徴とする制御局。

４５．請求の範囲１ないし１８、２１ないし４１、および４３のいずれか一項に記載の通信管理方法をコンピュータに実行させることを特徴とする通信管理プログラム。

４６．請求の範囲４５に記載の通信管理プログラムを記録した記録媒体。

図 1

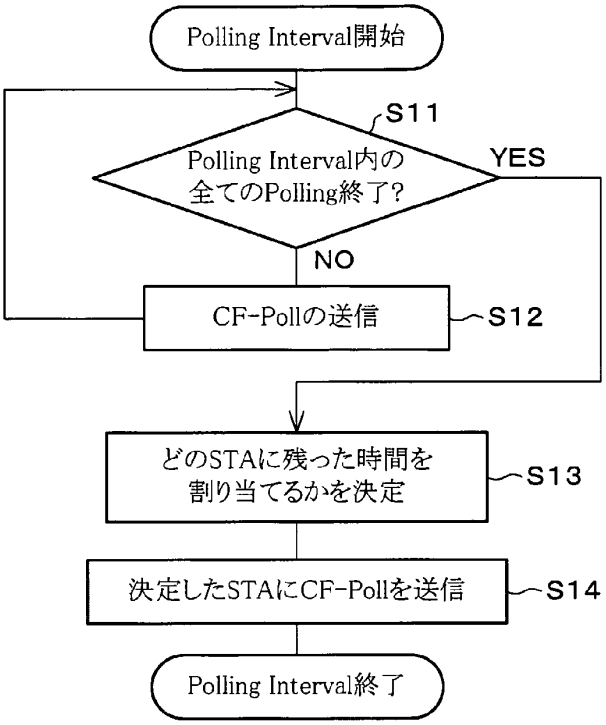

Polling Interval開始
S11
Polling Interval内の
全てのPolling終了?
YES
NO
CF-Pollの送信
S12
どのSTAに残った時間を
割り当てるかを決定
S13
決定したSTAにCF-Pollを送信
S14
Polling Interval終了

図２（ａ）

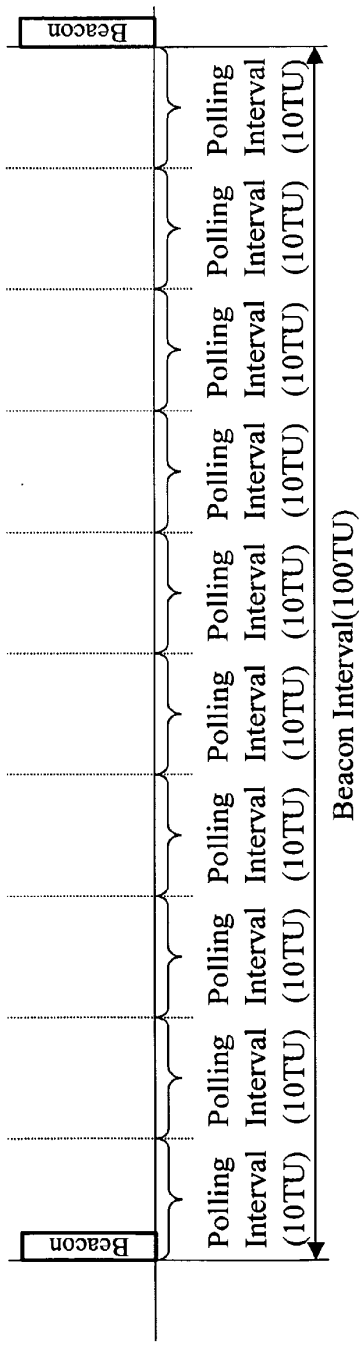
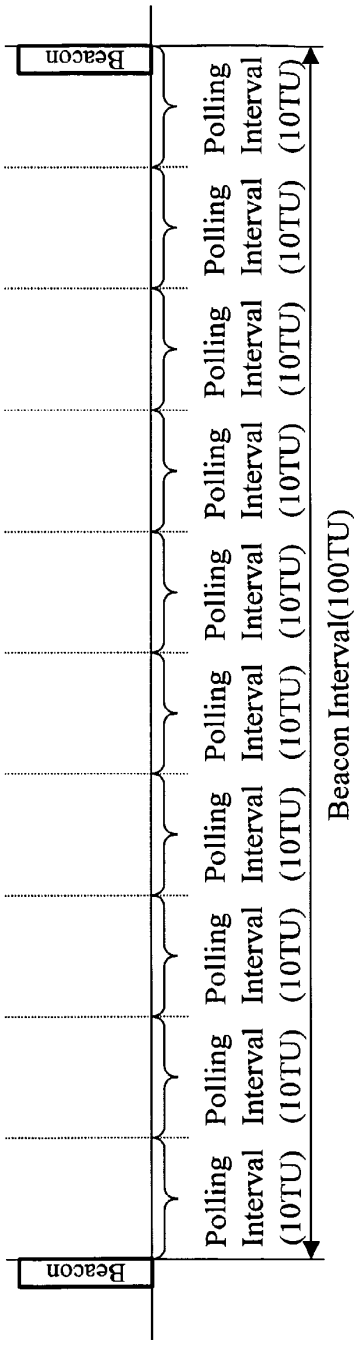

Beacon
Beacon
Polling Interval (10TU)
Polling Interval (10TU)
Polling Interval (10TU)
Polling Interval (10TU)
Polling Interval (10TU)
Polling Interval (10TU)
Polling Interval (10TU)
Polling Interval (10TU)
Polling Interval (10TU)
Polling Interval (10TU)
Beacon Interval(100TU)

図２（ｂ）


Beacon
Beacon
Polling Interval (10TU)
Polling Interval (10TU)
Polling Interval (10TU)
Polling Interval (10TU)
Polling Interval (10TU)
Polling Interval (10TU)
Polling Interval (10TU)
Polling Interval (10TU)
Polling Interval (10TU)
Polling Interval (10TU)
Beacon Interval(100TU)

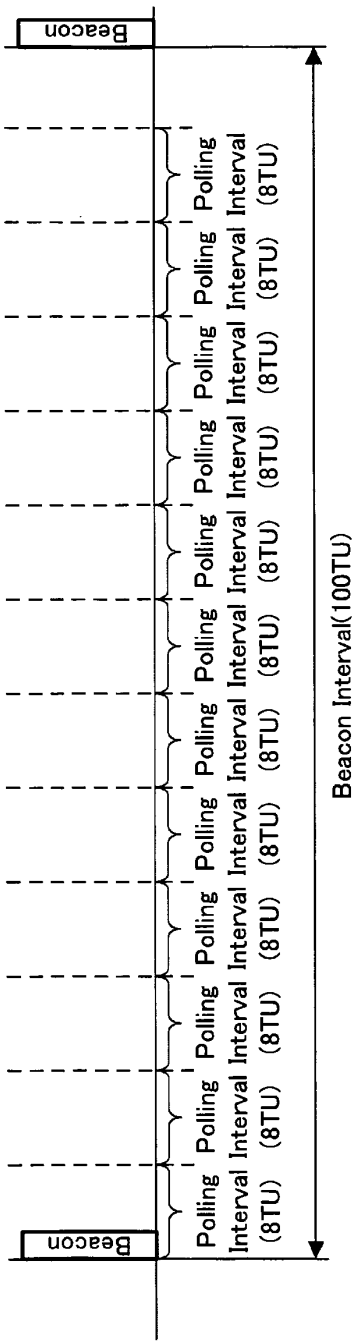

Beacon
Polling Interval (8TU)
Beacon Interval(100TU)

図３（ａ）

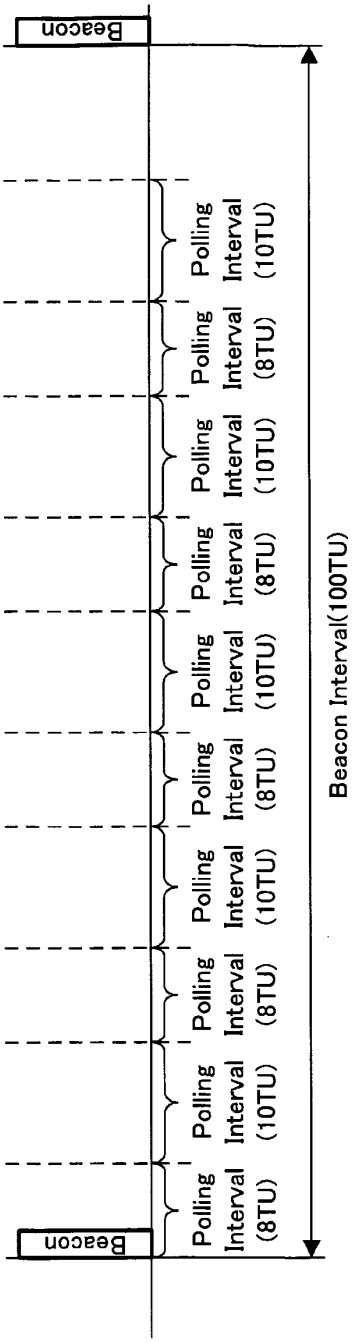

Beacon
Polling Interval (8TU)
Polling Interval (10TU)
Beacon Interval(100TU)

図３（ｂ）

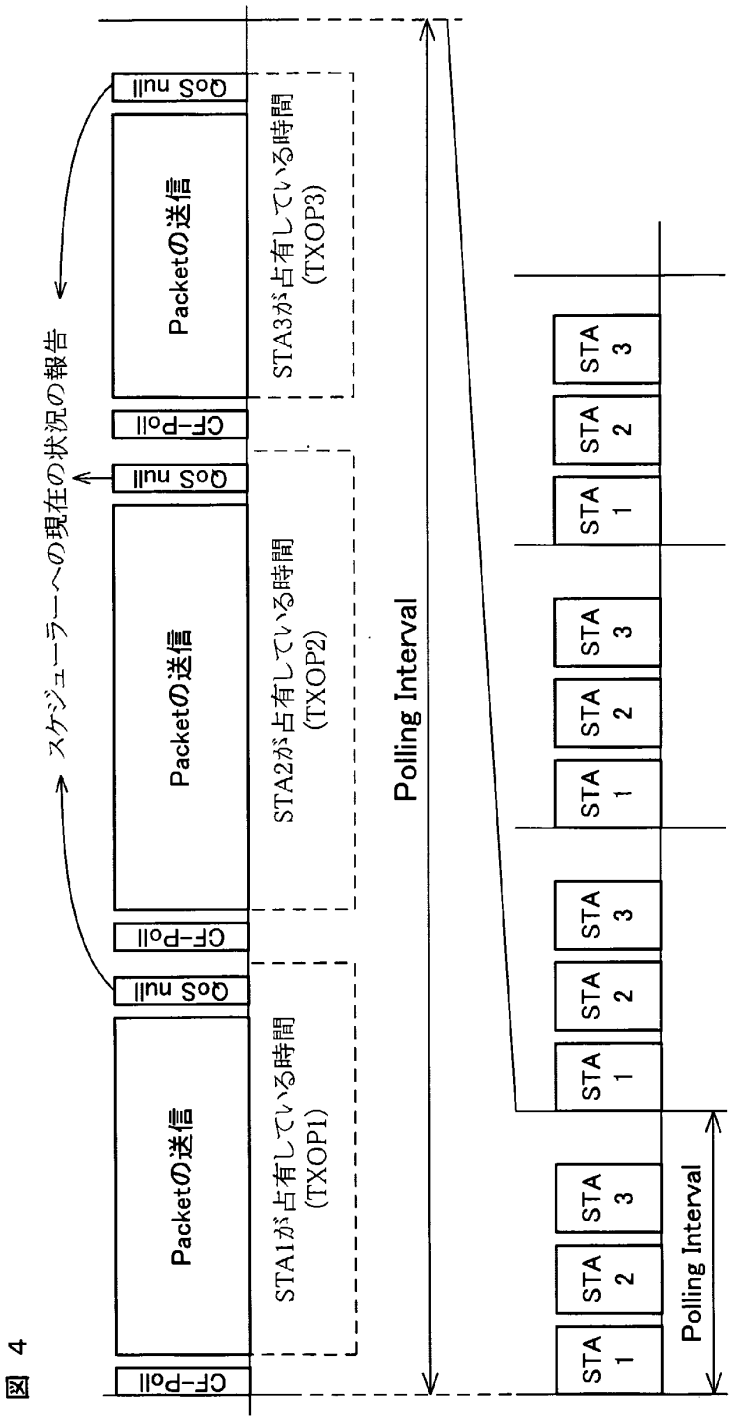

CF-Poll
Packetの送信
STA1が占有している時間
(TXOP1)
QoS null
CF-Poll
Packetの送信
STA2が占有している時間
(TXOP2)
QoS null
CF-Poll
Packetの送信
STA3が占有している時間
(TXOP3)
QoS null
スケジューラーへの現在の状況の報告
Polling Interval
STA 1
STA 2
STA 3
Polling Interval

図 4

図 5

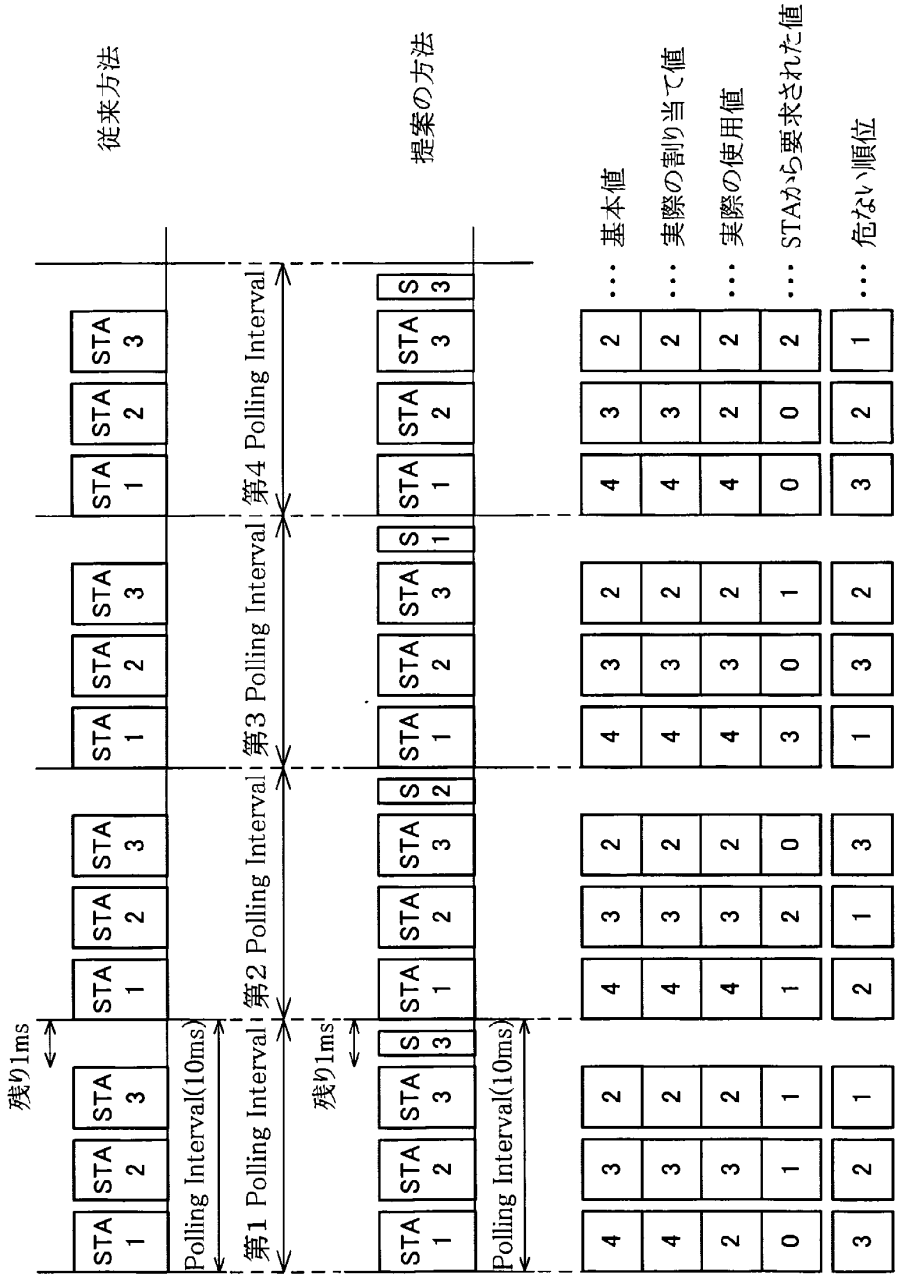

従来方法
提案の方法
残り1ms
Polling Interval(10ms)
第1 Polling Interval
第2 Polling Interval
第3 Polling Interval
第4 Polling Interval
STA 1
STA 2
STA 3
S 1
S 2
S 3
… 基本値
… 実際の割り当て値
… 実際の使用値
… STAから要求された値
… 危ない順位

図 6

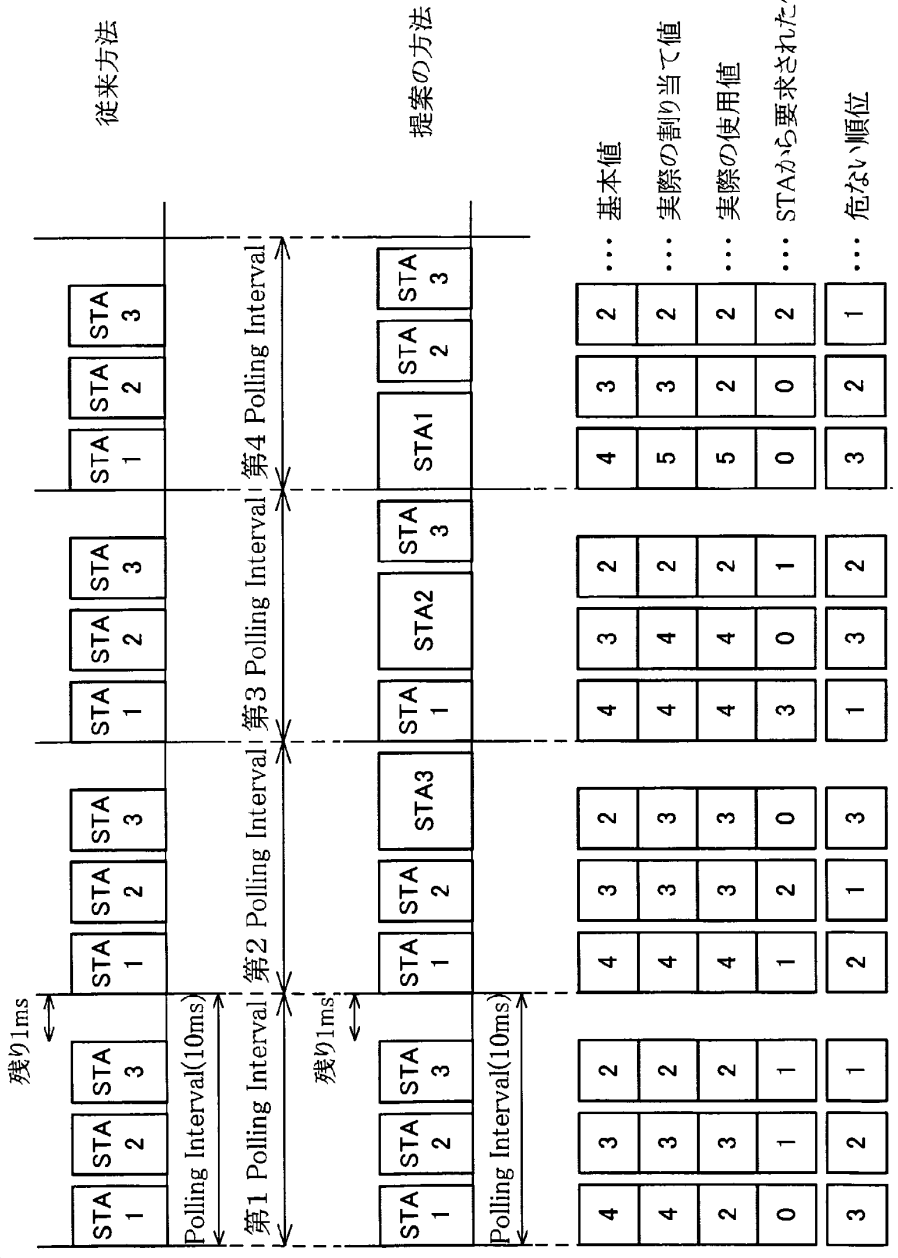

従来方法
提案の方法
残り1ms
Polling Interval(10ms)
第1 Polling Interval
第2 Polling Interval
第3 Polling Interval
第4 Polling Interval
STA 1
STA 2
STA 3
STA1
STA2
STA3
… 基本値
… 実際の割り当て値
… 実際の使用値
… STAから要求された値
… 危ない順位

図 7

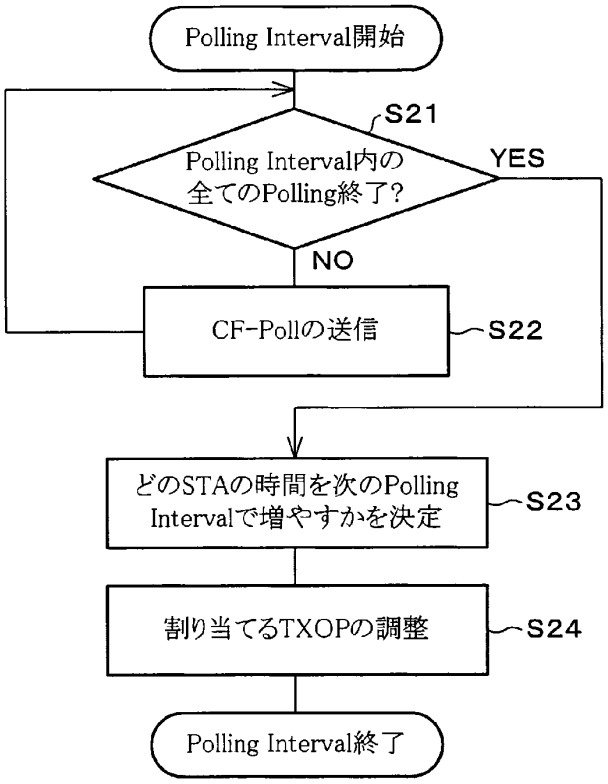
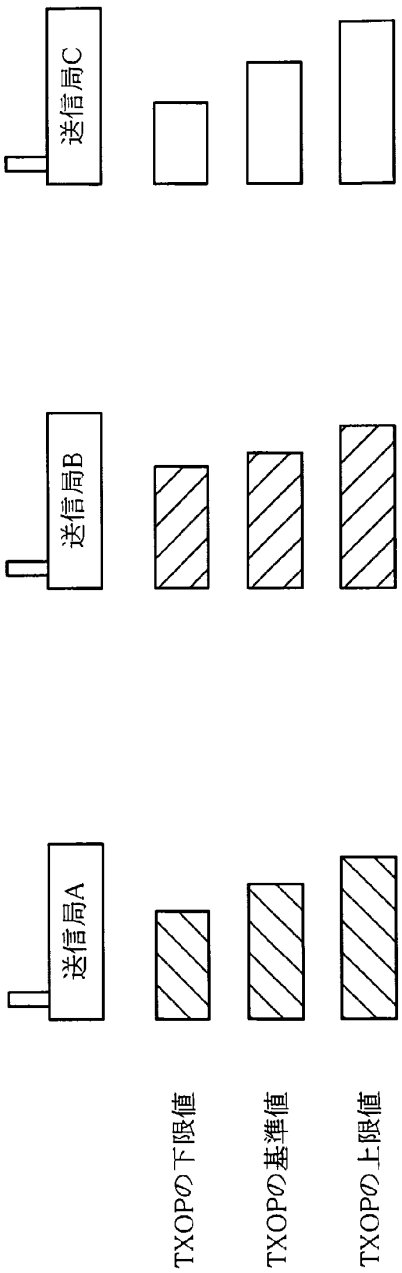

Polling Interval開始
S21
Polling Interval内の
全てのPolling終了?
YES
NO
CF-Pollの送信
S22
どのSTAの時間を次のPolling
Intervalで増やすかを決定
S23
割り当てるTXOPの調整
S24
Polling Interval終了

図 8



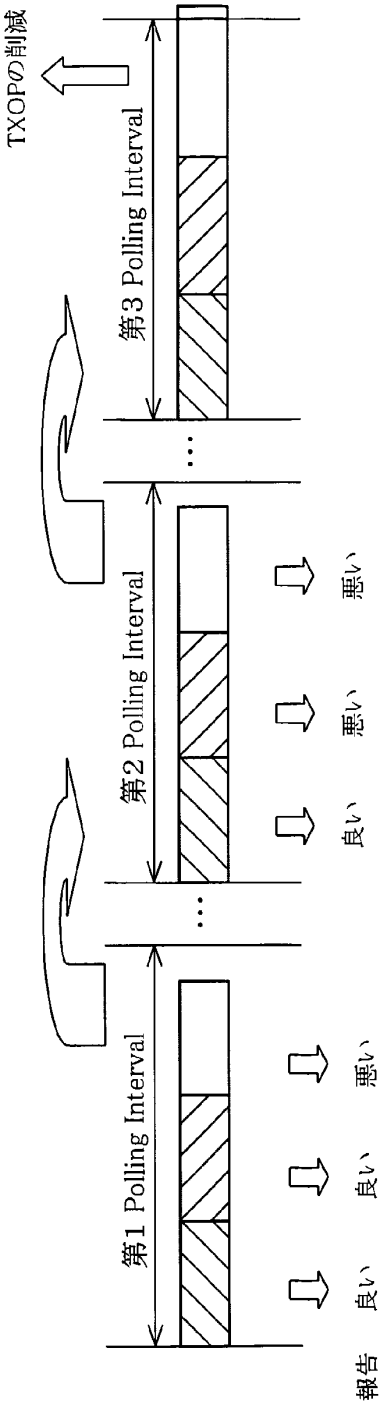

TXOPの削減
第3 Polling Interval
第2 Polling Interval
第1 Polling Interval
良い、悪い
良い、悪い
良い、悪い
報告

図 9

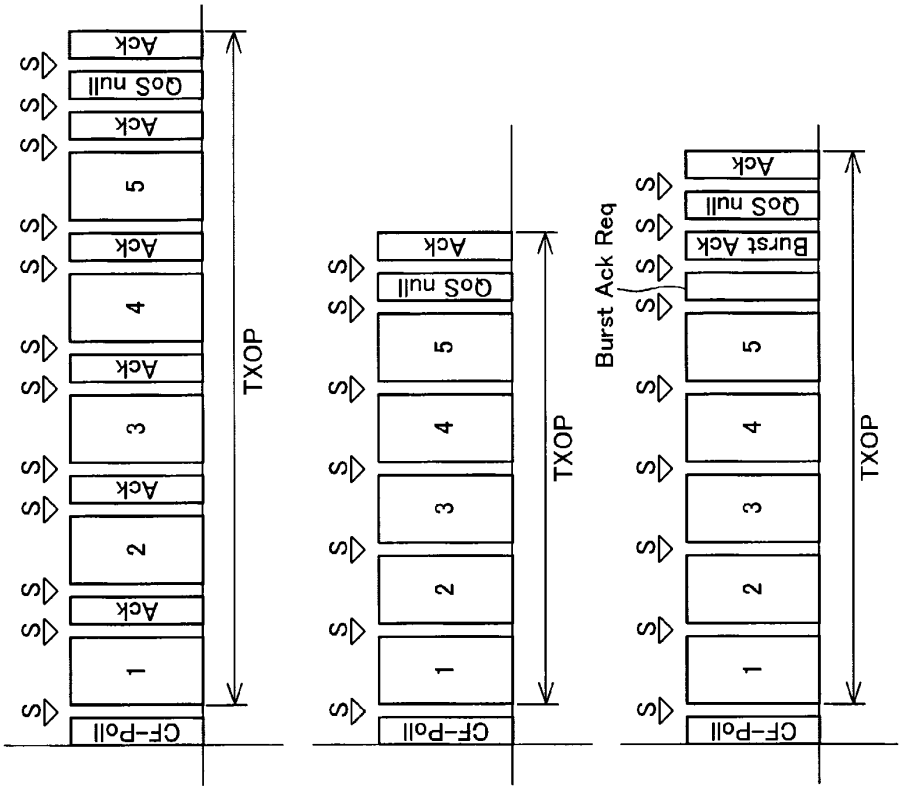
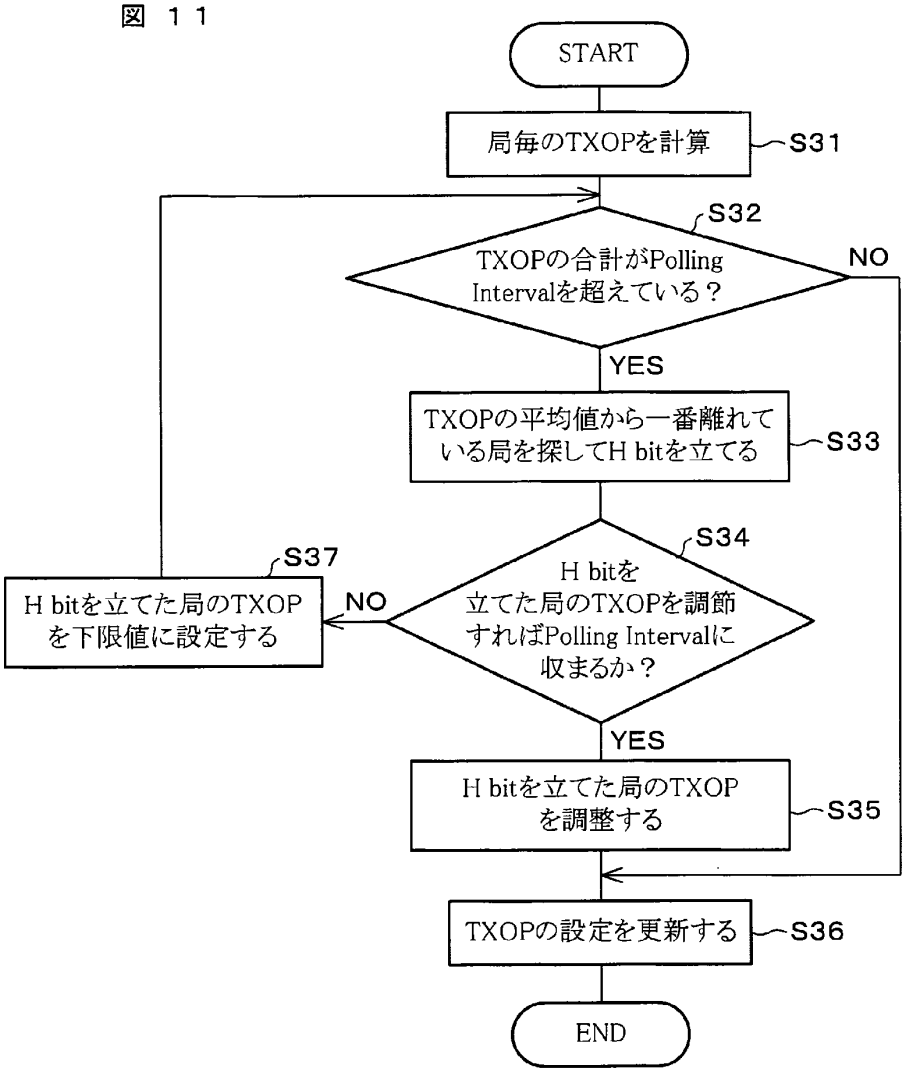

CF-Poll
1
Ack
2
Ack
3
Ack
4
Ack
5
Ack
QoS null
Ack
TXOP
Normal Ack
CF-Poll
1
2
3
4
5
QoS null
Ack
TXOP
No Ack
Burst Ack Req
CF-Poll
1
2
3
4
5
Burst Ack
QoS null
Ack
TXOP
Burst Ack

図 10

図 11


START
局毎のTXOPを計算
S31
S32
TXOPの合計がPolling Intervalを超えている？
NO
YES
TXOPの平均値から一番離れている局を探してH bitを立てる
S33
S34
H bitを立てた局のTXOPを調節すればPolling Intervalに収まるか？
S37
H bitを立てた局のTXOPを下限値に設定する
NO
YES
H bitを立てた局のTXOPを調整する
S35
TXOPの設定を更新する
S36
END

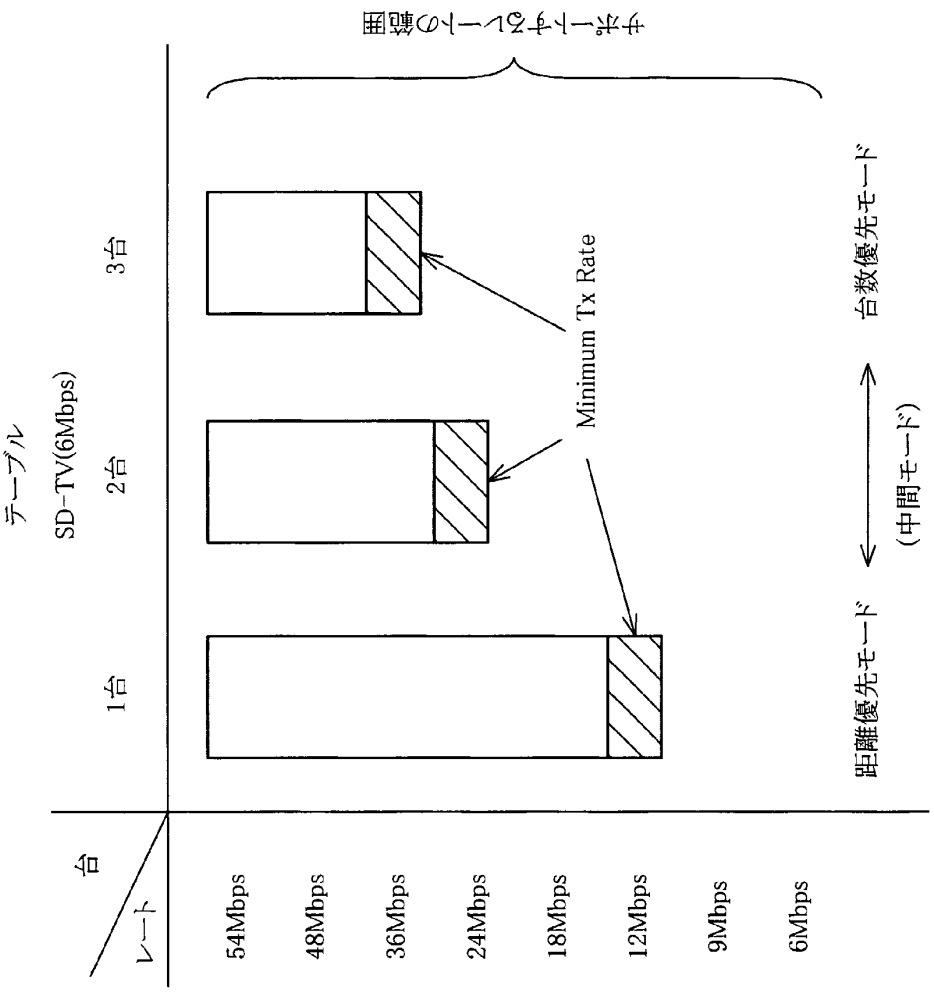

テーブル
SD-TV(6Mbps)
1台
2台
3台
台
レート
54Mbps
48Mbps
36Mbps
24Mbps
18Mbps
12Mbps
9Mbps
6Mbps
Minimum Tx Rate
サポートするレートの範囲
距離優先モード
(中間モード)
台数優先モード

図１２

図 １３

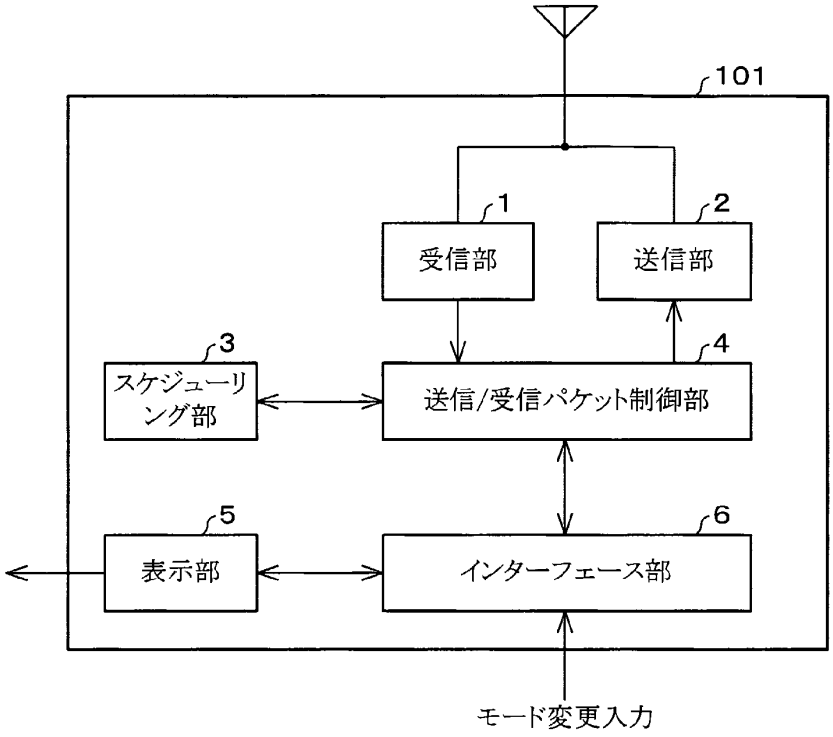

101
1
受信部
2
送信部
3
スケジューリング部
4
送信/受信パケット制御部
5
表示部
6
インターフェース部
モード変更入力

図 １４

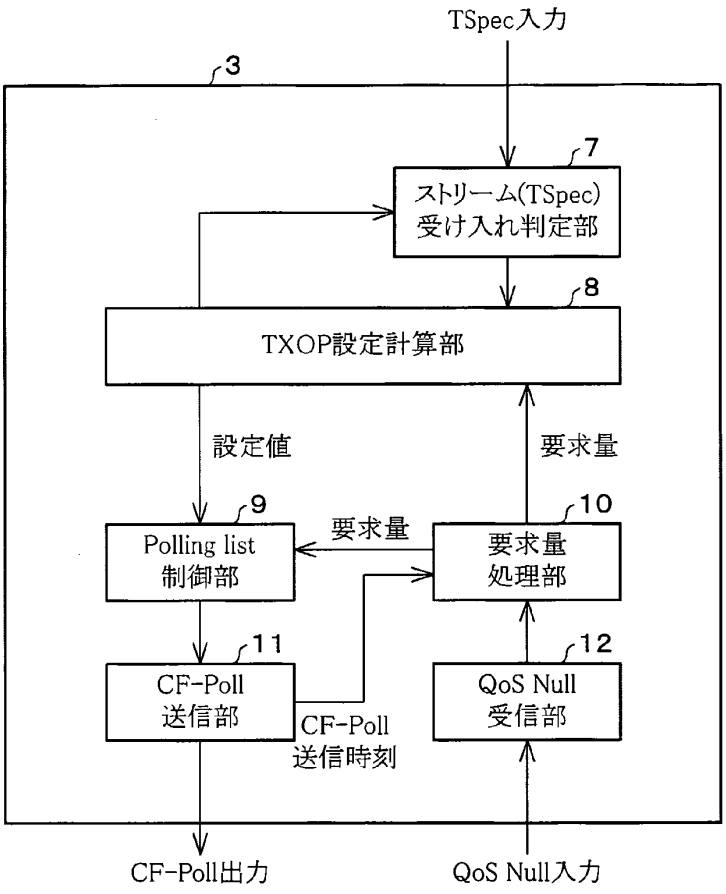

TSpec入力
3
7
ストリーム(TSpec)
受け入れ判定部
8
TXOP設定計算部
設定値
要求量
9
10
Polling list
制御部
要求量
要求量
処理部
11
12
CF-Poll
送信部
CF-Poll
送信時刻
QoS Null
受信部
CF-Poll出力
QoS Null入力

図 １５

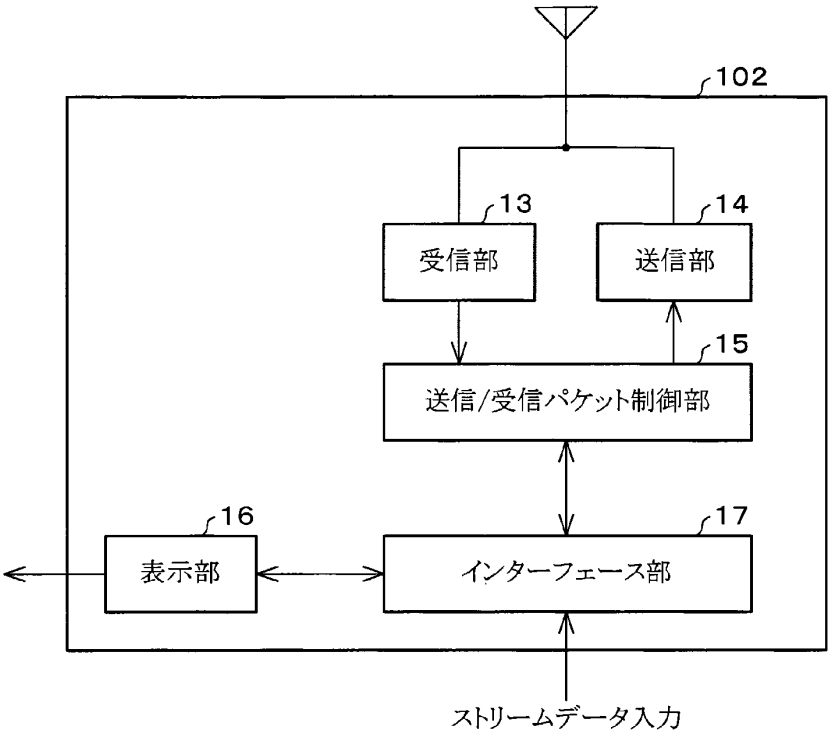

102
13
受信部
14
送信部
15
送信/受信パケット制御部
16
表示部
17
インターフェース部
ストリームデータ入力

図 １６

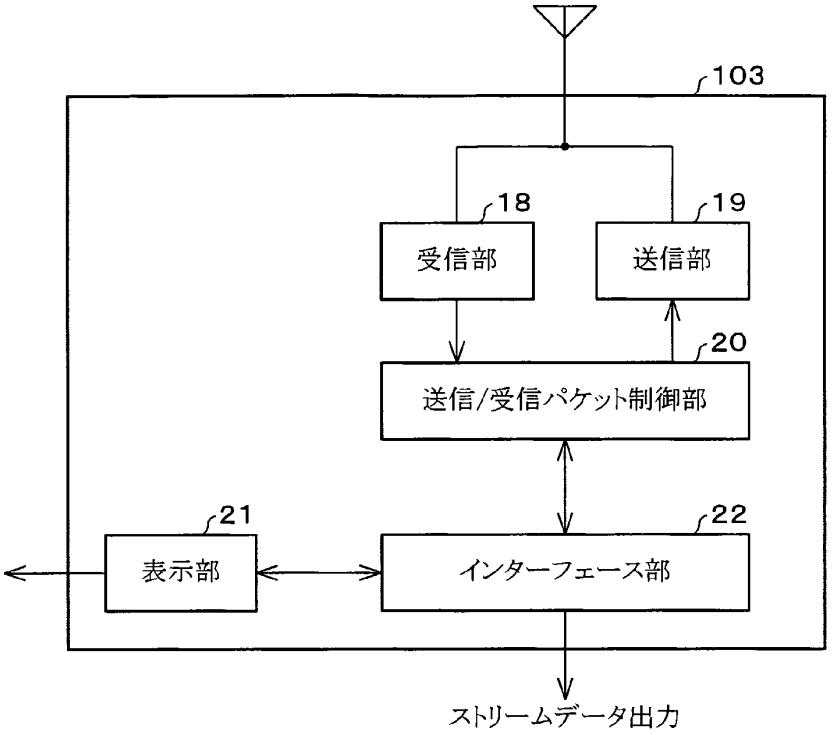

103
18
19
受信部
送信部
20
送信/受信パケット制御部
21
22
表示部
インターフェース部
ストリームデータ出力

図 17

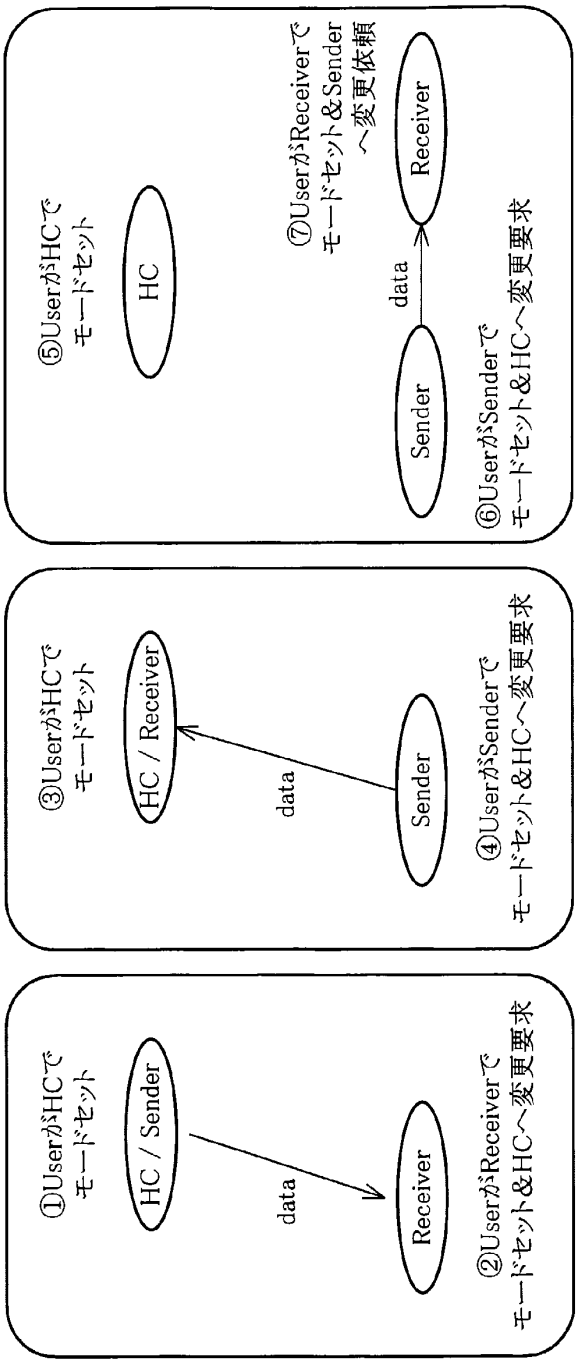
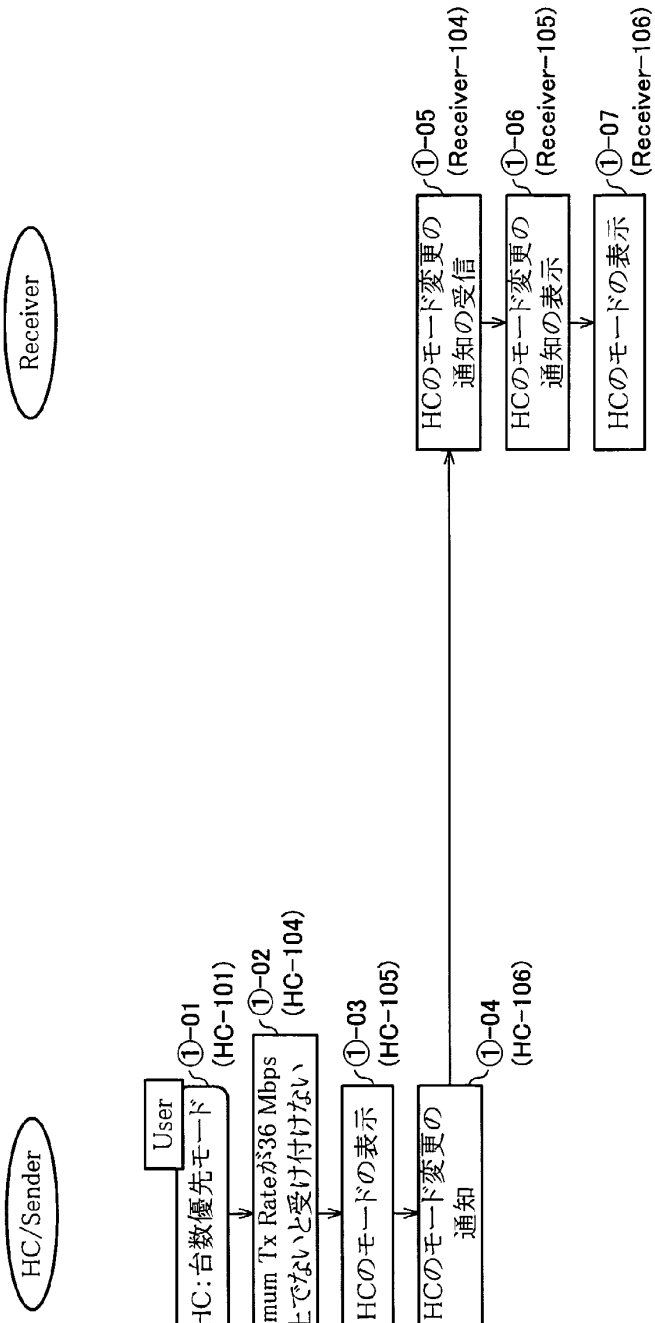

①UserがHCで
モードセット
HC / Sender
data
Receiver
②UserがReceiverで
モードセット&HCへ変更要求
③UserがHCで
モードセット
HC / Receiver
data
Sender
④UserがSenderで
モードセット&HCへ変更要求
⑤UserがHCで
モードセット
HC
⑦UserがReceiverで
モードセット&Sender
へ変更依頼
data
Sender
Receiver
⑥UserがSenderで
モードセット&HCへ変更要求

図 18


HC/Sender
Receiver
User
①-01 (HC-101)
HC：台数優先モード
①-02 (HC-104)
Minimum Tx Rateが36 Mbps以上でないと受け付けない
①-03 (HC-105)
HCのモードの表示
①-04 (HC-106)
HCのモード変更の通知
①-05 (Receiver-104)
HCのモード変更の通知の受信
①-06 (Receiver-105)
HCのモード変更の通知の表示
①-07 (Receiver-106)
HCのモードの表示

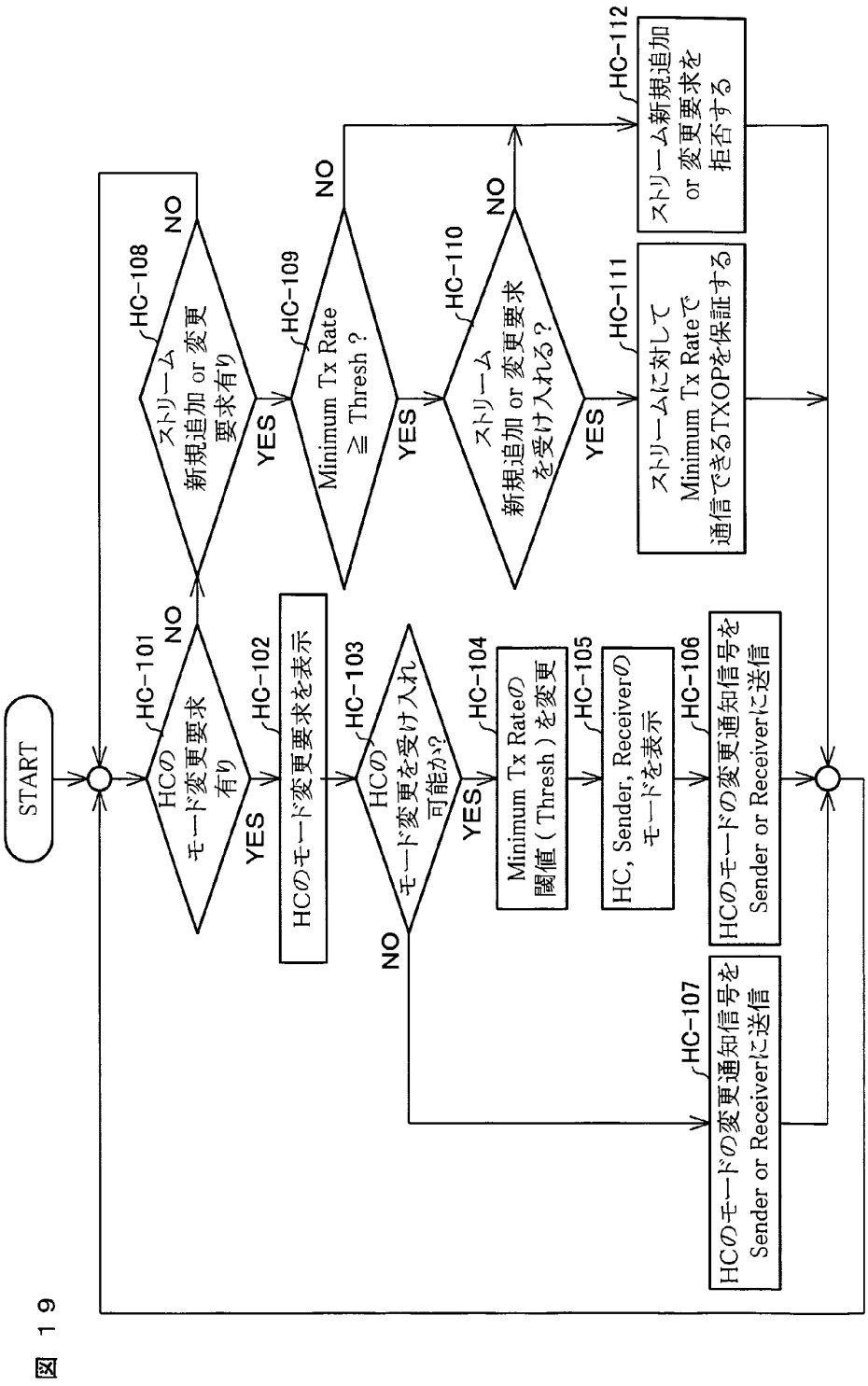

START
HC-101
HCの
モード変更要求
有り
NO
YES
HC-102
HCのモード変更要求を表示
HC-103
HCの
モード変更を受け入れ
可能か?
YES
NO
HC-104
Minimum Tx Rateの
閾値(Thresh)を変更
HC-105
HC, Sender, Receiverの
モードを表示
HC-106
HCのモードの変更通知信号を
Sender or Receiverに送信
HC-107
HCのモードの変更通知信号を
Sender or Receiverに送信
HC-108
ストリーム
新規追加 or 変更
要求有り
NO
YES
HC-109
Minimum Tx Rate
≧ Thresh ?
NO
YES
HC-110
ストリーム
新規追加 or 変更要求
を受け入れる?
NO
YES
HC-111
ストリームに対して
Minimum Tx Rateで
通信できるTXOPを保証する
HC-112
ストリーム新規追加
or 変更要求を
拒否する

図 19

図 20

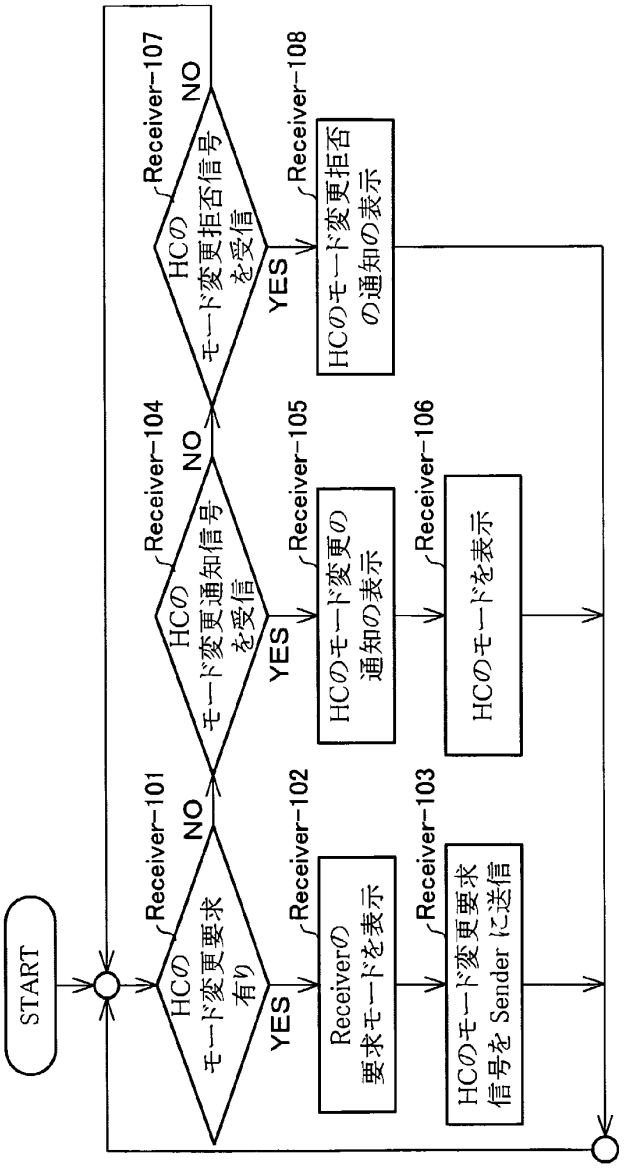

START
Receiver−101
HCの
モード変更要求
有り
YES
NO
Receiver−102
Receiverの
要求モードを表示
Receiver−103
HCのモード変更要求
信号を Sender に送信
Receiver−104
HCの
モード変更通知信号
を受信
YES
NO
Receiver−105
HCのモード変更の
通知の表示
Receiver−106
HCのモードを表示
Receiver−107
HCの
モード変更拒否信号
を受信
YES
NO
Receiver−108
HCのモード変更拒否
の通知の表示

図 21

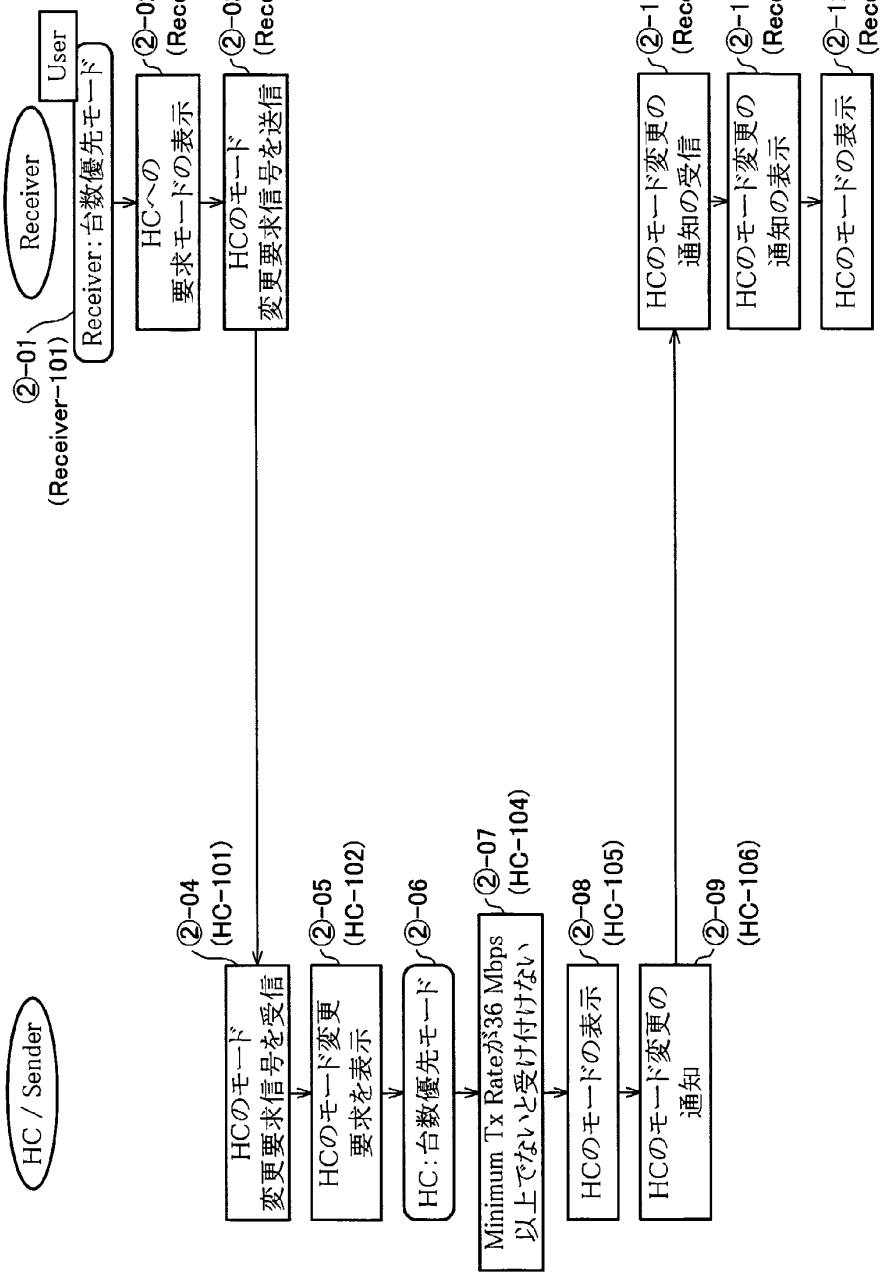

HC / Sender
Receiver
User
②-01 (Receiver-101)
Receiver:台数優先モード
②-02 (Receiver-102)
HCへの要求モードの表示
②-03 (Receiver-103)
HCのモード変更要求信号を送信
②-04 (HC-101)
HCのモード変更要求信号を受信
②-05 (HC-102)
HCのモード変更要求を表示
②-06
HC:台数優先モード
②-07 (HC-104)
Minimum Tx Rateが36 Mbps以上でないと受け付けない
②-08 (HC-105)
HCのモードの表示
②-09 (HC-106)
HCのモード変更の通知
②-10 (Receiver-104)
HCのモード変更の通知の受信
②-11 (Receiver-105)
HCのモード変更の通知の表示
②-12 (Receiver-106)
HCのモードの表示

図 22

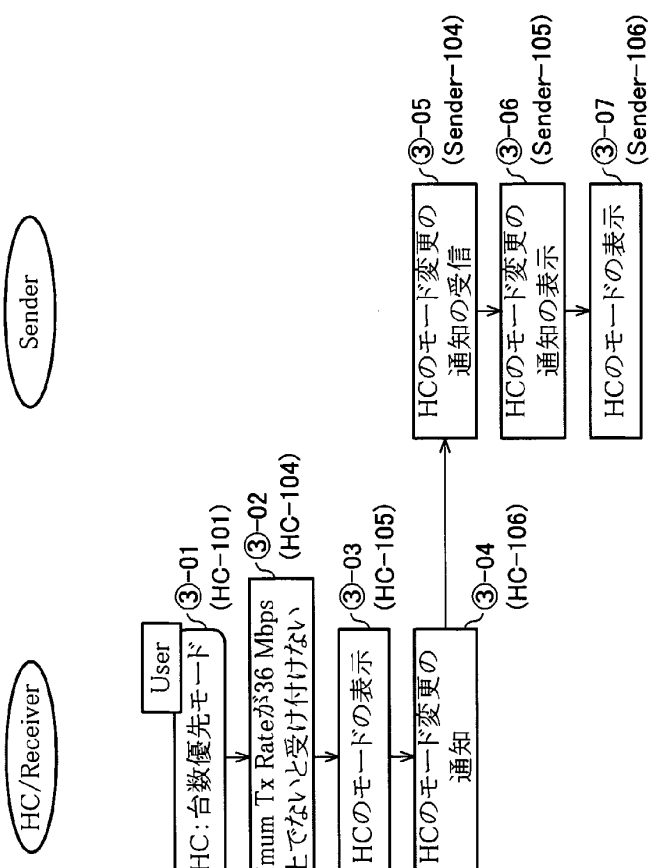

HC/Receiver
Sender
User
HC:台数優先モード
③-01 (HC-101)
Minimum Tx Rateが36 Mbps以上でないと受け付けない
③-02 (HC-104)
HCのモード表示
③-03 (HC-105)
HCのモード変更の通知
③-04 (HC-106)
HCのモード変更の通知の受信
③-05 (Sender-104)
HCのモード変更の通知の表示
③-06 (Sender-105)
HCのモードの表示
③-07 (Sender-106)

図 23

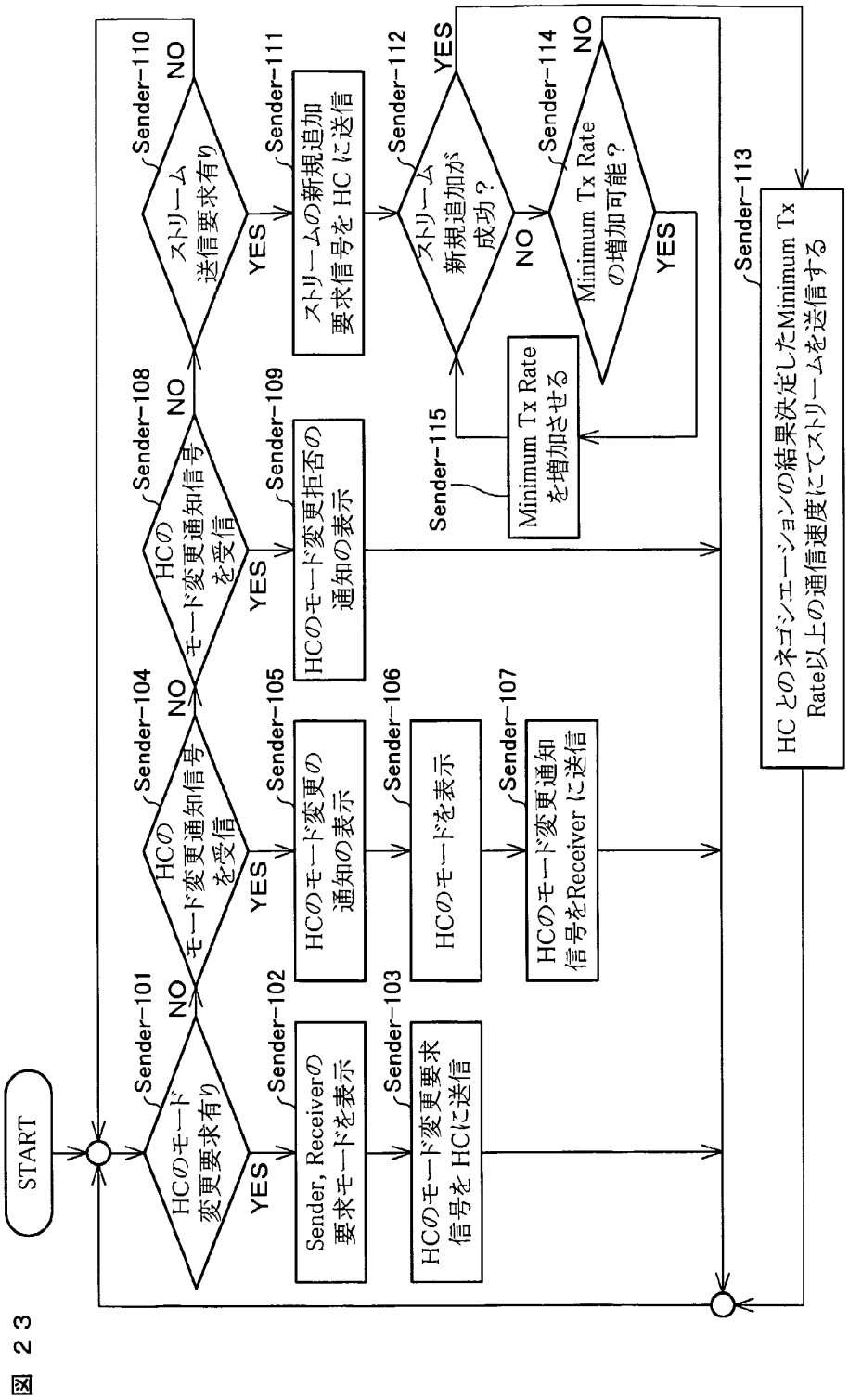

START
Sender-101
HCのモード変更要求有り
NO
YES
Sender-102
Sender, Receiverの要求モードを表示
Sender-103
HCのモード変更要求信号を HCに送信
Sender-104
HCのモード変更通知信号を受信
NO
YES
Sender-105
HCのモード変更の通知の表示
Sender-106
HCのモードを表示
Sender-107
HCのモード変更通知信号をReceiver に送信
Sender-108
HCのモード変更通知信号を受信
NO
YES
Sender-109
HCのモード変更拒否の通知の表示
Sender-110
ストリーム送信要求有り
NO
YES
Sender-111
ストリームの新規追加要求信号を HC に送信
Sender-112
ストリーム新規追加が成功？
YES
NO
Sender-115
Minimum Tx Rateを増加させる
Sender-114
Minimum Tx Rateの増加可能？
NO
YES
Sender-113
HC とのネゴシエーションの結果決定したMinimum Tx Rate以上の通信速度にてストリームを送信する

図 24

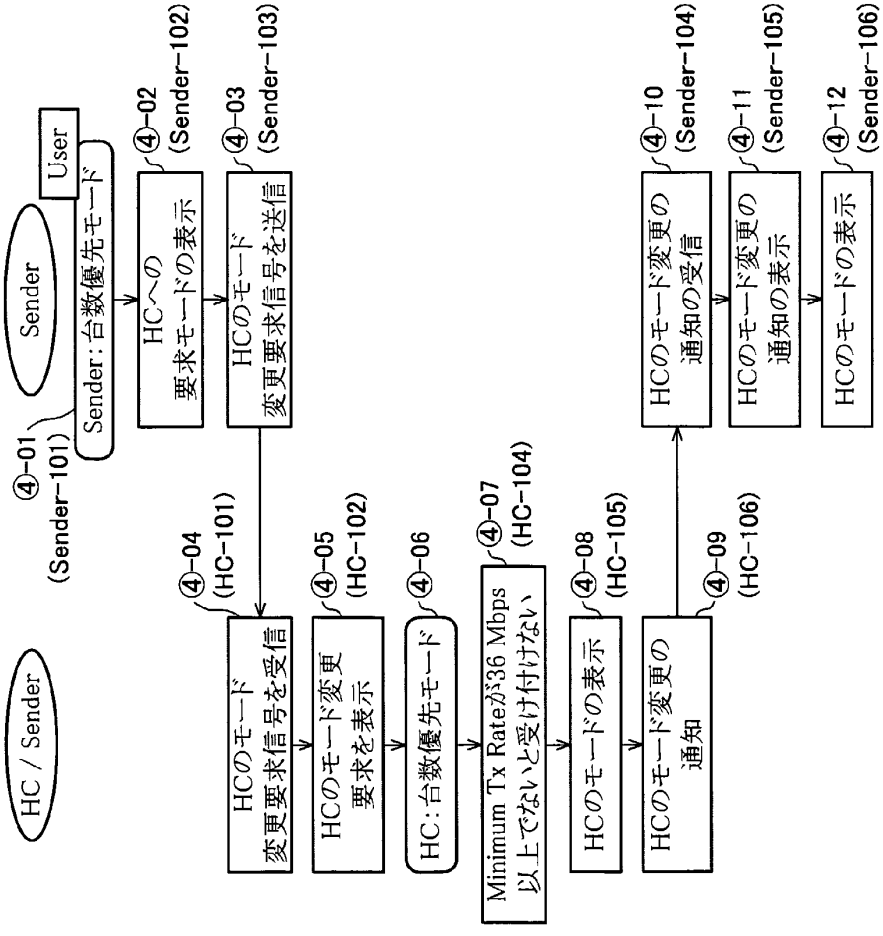

HC / Sender
Sender
User
④-01 (Sender-101)
Sender：台数優先モード
④-02 (Sender-102)
HCへの要求モードの表示
④-03 (Sender-103)
HCのモード変更要求信号を送信
④-04 (HC-101)
HCのモード変更要求信号を受信
④-05 (HC-102)
HCのモード変更要求を表示
④-06
HC：台数優先モード
④-07 (HC-104)
Minimum Tx Rateが36 Mbps以上でないと受け付けない
④-08 (HC-105)
HCのモードの表示
④-09 (HC-106)
HCのモード変更の通知
④-10 (Sender-104)
HCのモード変更の通知の受信
④-11 (Sender-105)
HCのモード変更の通知の表示
④-12 (Sender-106)
HCのモードの表示

図 25

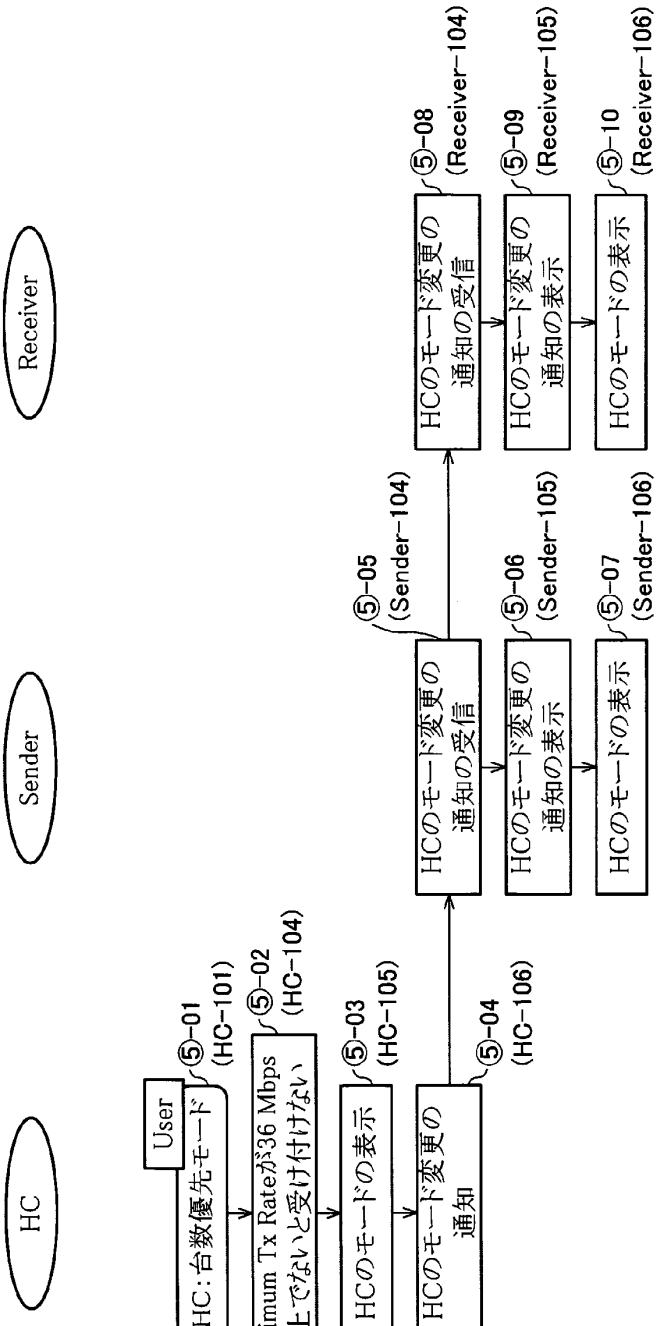

HC
Sender
Receiver
User
HC：台数優先モード
⑤-01 (HC-101)
Minimum Tx Rateが36 Mbps以上でないと受け付けない
⑤-02 (HC-104)
HCのモード変更の表示
⑤-03 (HC-105)
HCのモード変更の通知
⑤-04 (HC-106)
HCのモード変更の通知の受信
⑤-05 (Sender-104)
HCのモード変更の通知の表示
⑤-06 (Sender-105)
HCのモードの表示
⑤-07 (Sender-106)
HCのモード変更の通知の受信
⑤-08 (Receiver-104)
HCのモード変更の通知の表示
⑤-09 (Receiver-105)
HCのモードの表示
⑤-10 (Receiver-106)

図 26

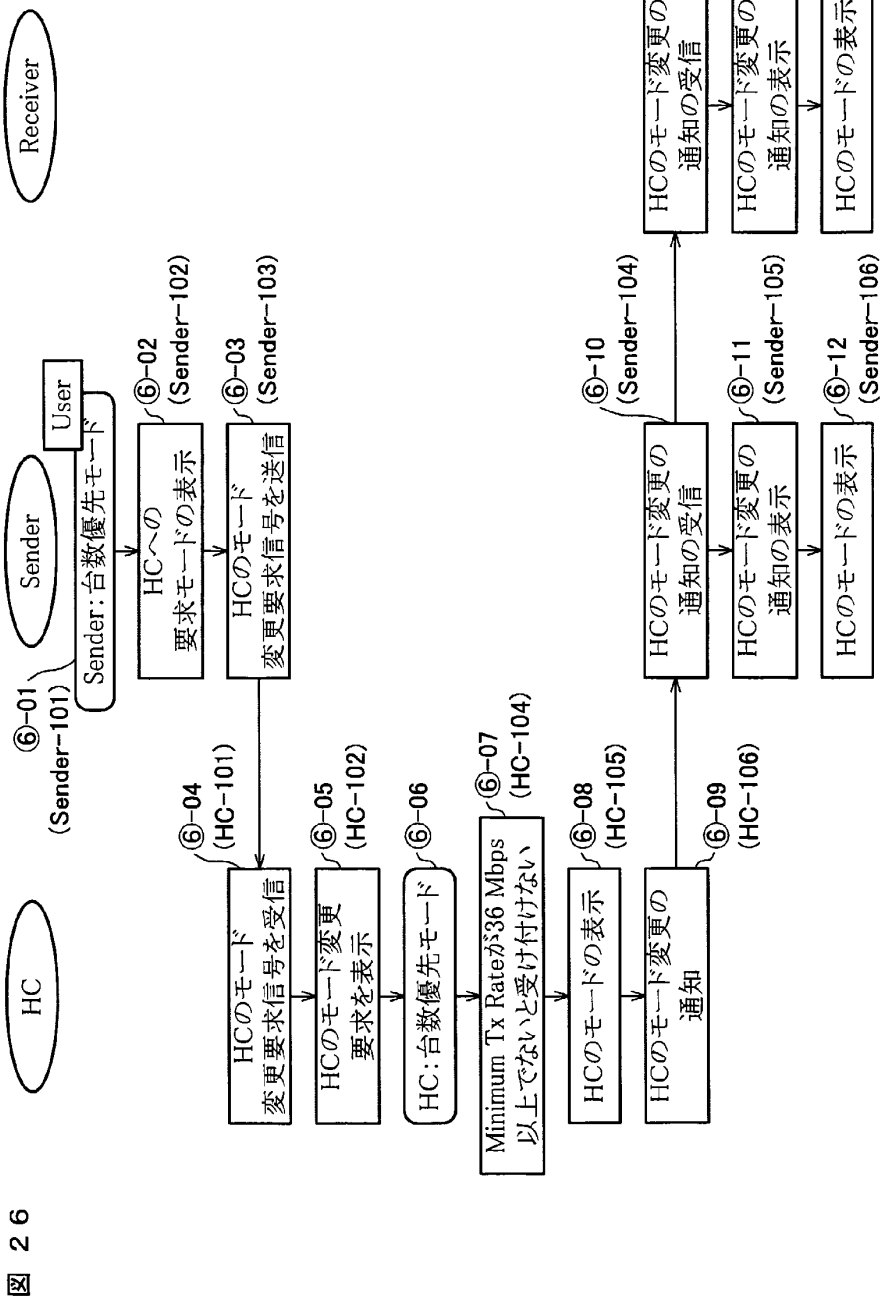

HC
Sender
User
Receiver
⑥-01 (Sender-101)
Sender：台数優先モード
⑥-02 (Sender-102)
HCへの要求モードの表示
⑥-03 (Sender-103)
HCのモード変更要求信号を送信
⑥-04 (HC-101)
HCのモード変更要求信号を受信
⑥-05 (HC-102)
HCのモード変更要求を表示
⑥-06
HC：台数優先モード
⑥-07 (HC-104)
Minimum Tx Rateが36 Mbps以上でないと受け付けない
⑥-08 (HC-105)
HCのモードの表示
⑥-09 (HC-106)
HCのモード変更の通知
⑥-10 (Sender-104)
HCのモード変更の通知の受信
⑥-11 (Sender-105)
HCのモード変更の通知の表示
⑥-12 (Sender-106)
HCのモードの表示
⑥-13 (Receiver-104)
HCのモード変更の通知の受信
⑥-14 (Receiver-105)
HCのモード変更の通知の表示
⑥-15 (Receiver-106)
HCのモードの表示

図 27

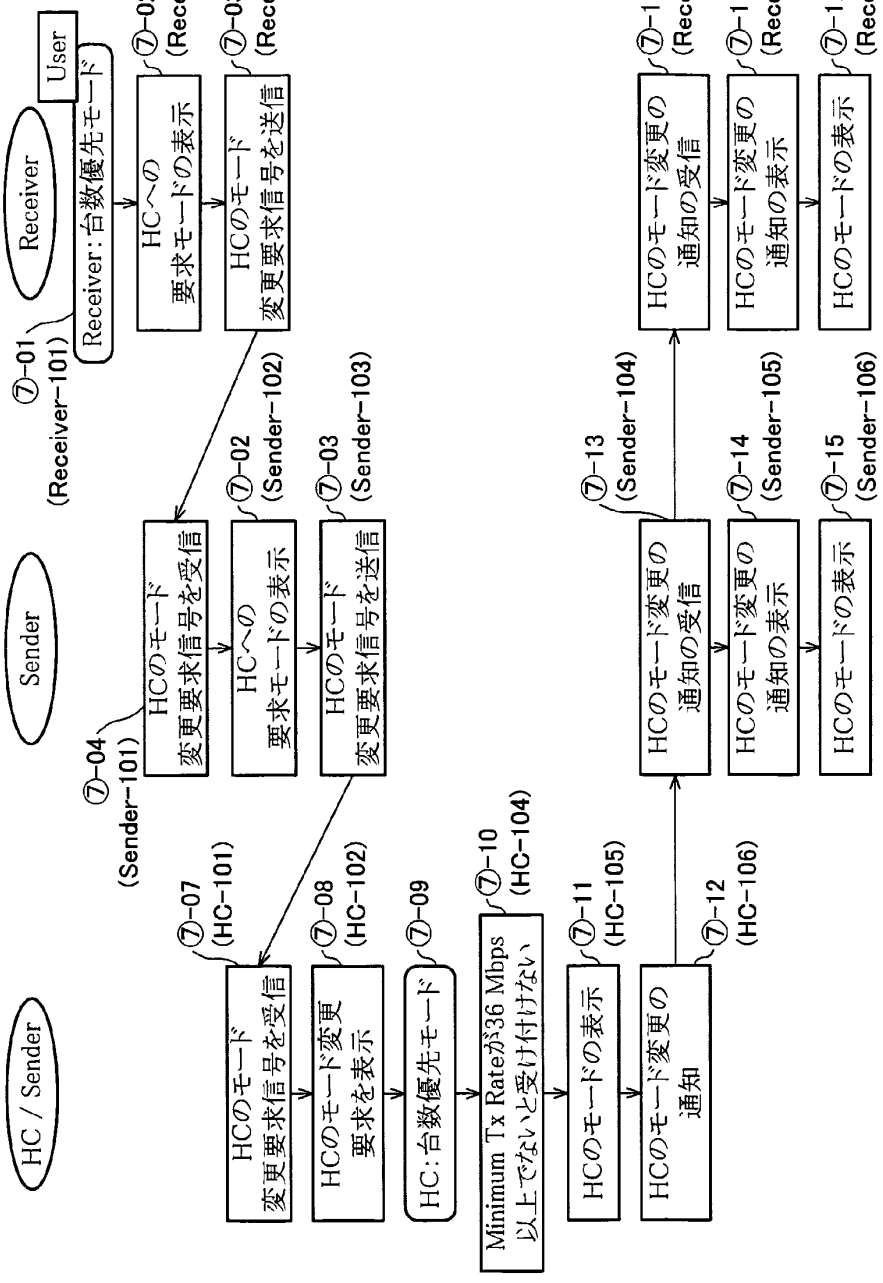

HC / Sender
Sender
Receiver
User
⑦-01 (Receiver-101)
Receiver：台数優先モード
⑦-02 (Receiver-102)
HCへの要求モードの表示
⑦-03 (Receiver-103)
HCのモード変更要求信号を送信
⑦-04 (Sender-101)
HCのモード変更要求信号を受信
⑦-02 (Sender-102)
HCへの要求モードの表示
⑦-03 (Sender-103)
HCのモード変更要求信号を送信
⑦-07 (HC-101)
HCのモード変更要求信号を受信
⑦-08 (HC-102)
HCのモード変更要求を表示
⑦-09
HC：台数優先モード
⑦-10 (HC-104)
Minimum Tx Rateが36 Mbps以上でないと受け付けない
⑦-11 (HC-105)
HCのモードの表示
⑦-12 (HC-106)
HCのモード変更の通知
⑦-13 (Sender-104)
HCのモード変更の通知の受信
⑦-14 (Sender-105)
HCのモード変更の通知の表示
⑦-15 (Sender-106)
HCのモードの表示
⑦-10 (Receiver-104)
HCのモード変更の通知の受信
⑦-11 (Receiver-105)
HCのモード変更の通知の表示
⑦-12 (Receiver-106)
HCのモードの表示

図 28

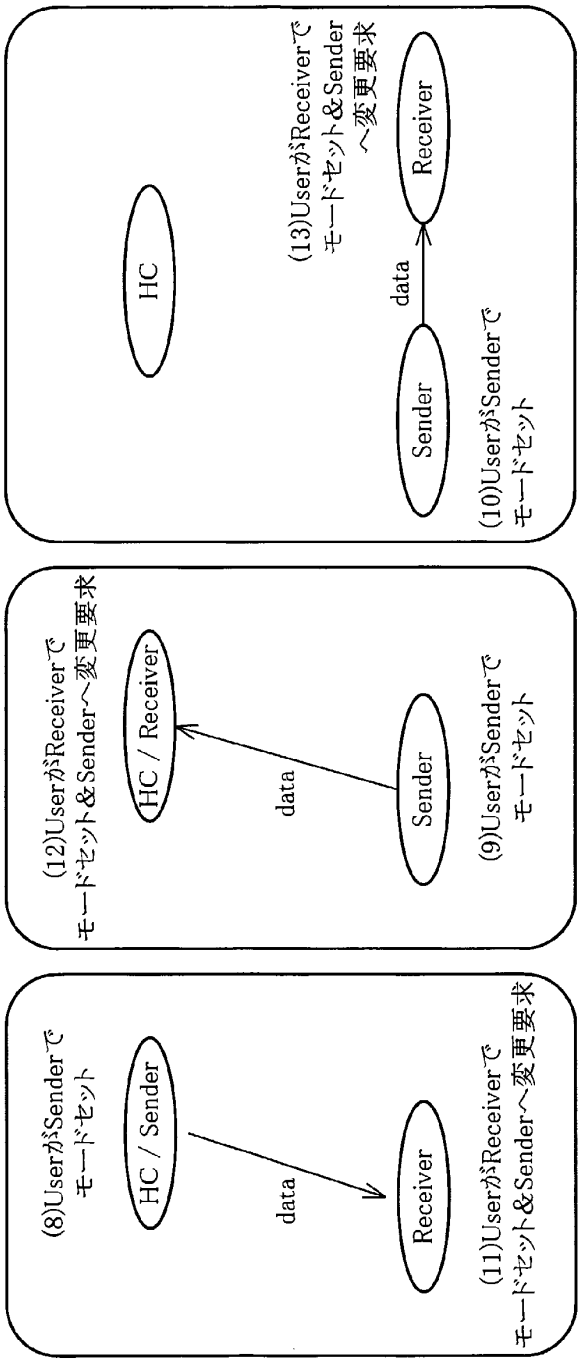
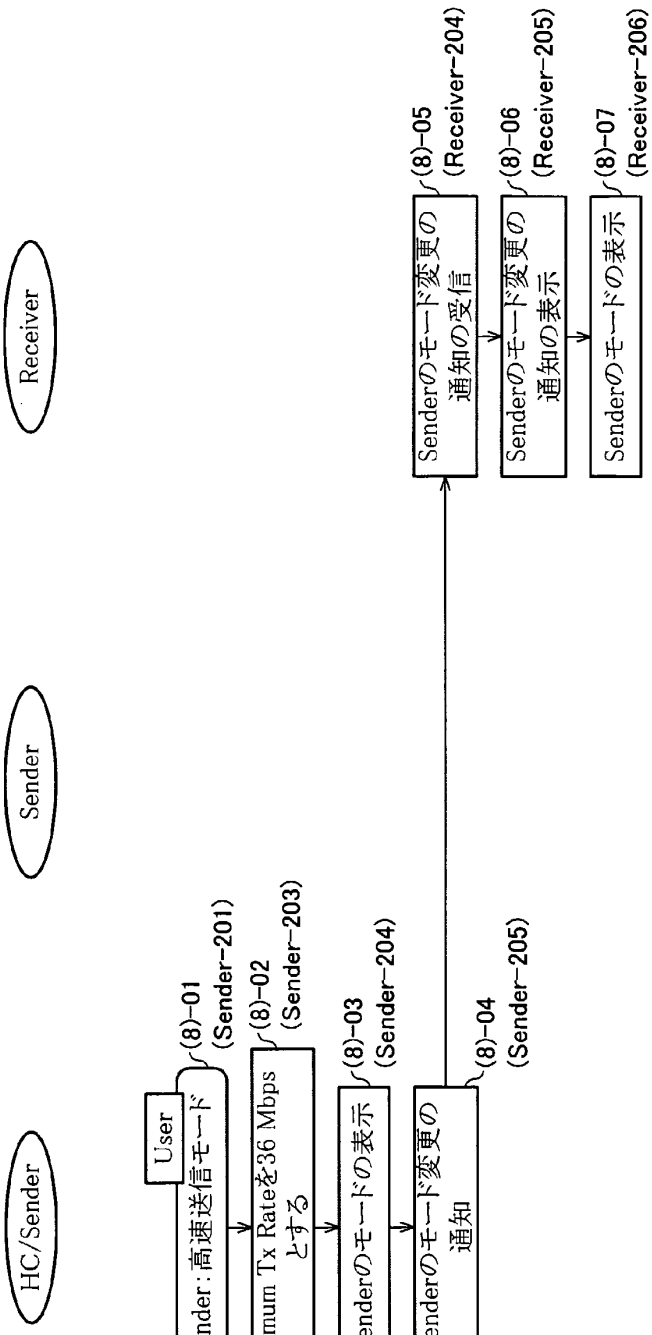

(8)UserがSenderで
モードセット
HC / Sender
data
Receiver
(11)UserがReceiverで
モードセット&Senderへ変更要求
(12)UserがReceiverで
モードセット&Senderへ変更要求
HC / Receiver
data
Sender
(9)UserがSenderで
モードセット
HC
(13)UserがReceiverで
モードセット&Sender
へ変更要求
data
Receiver
Sender
(10)UserがSenderで
モードセット

図 29


HC/Sender
Sender
Receiver
User
Sender：高速送信モード
(8)-01
(Sender-201)
Minimum Tx Rateを36 Mbps
とする
(8)-02
(Sender-203)
Senderのモードの表示
(8)-03
(Sender-204)
Senderのモード変更の
通知
(8)-04
(Sender-205)
Senderのモード変更の
通知の受信
(8)-05
(Receiver-204)
Senderのモード変更の
通知の表示
(8)-06
(Receiver-205)
Senderのモードの表示
(8)-07
(Receiver-206)

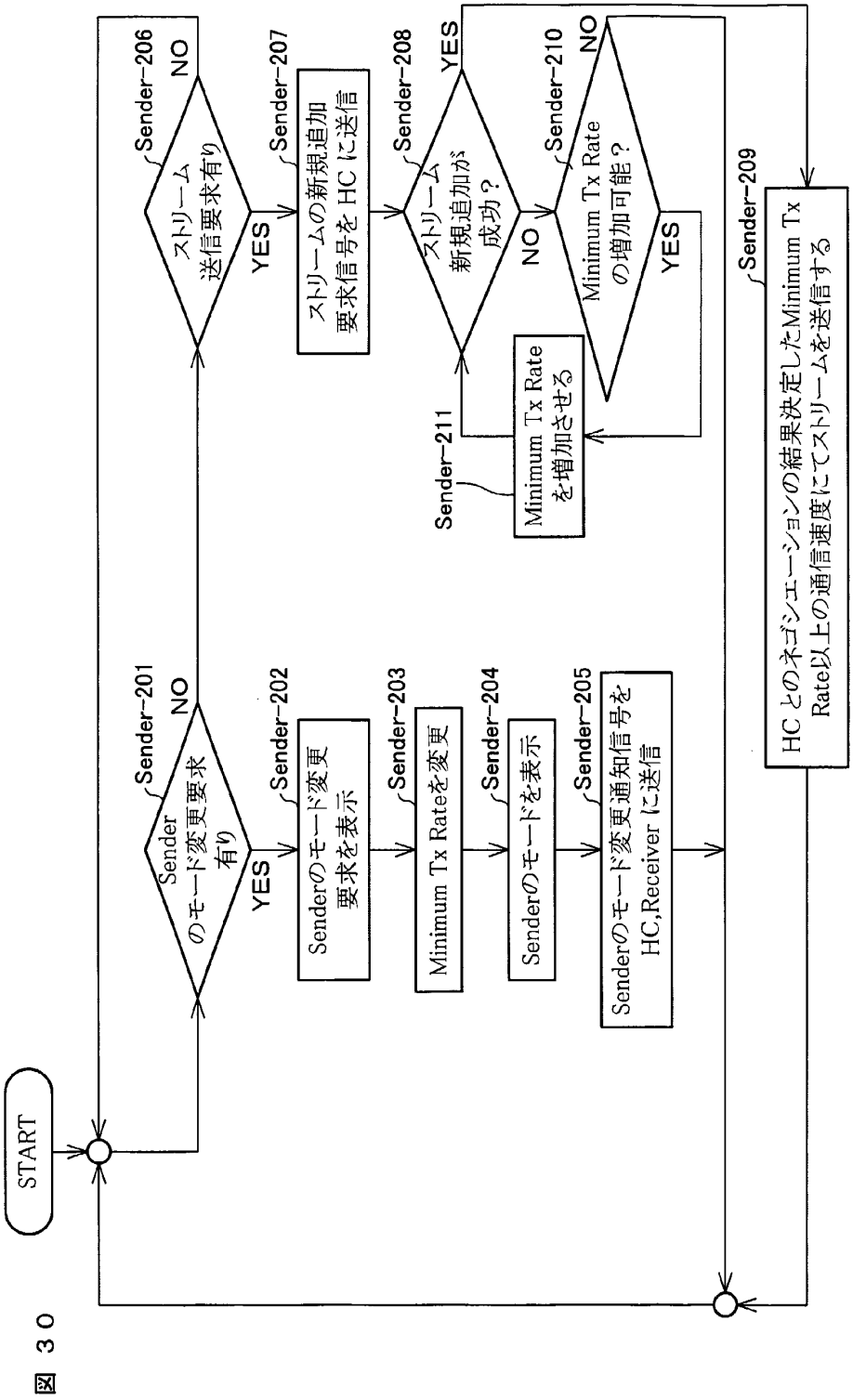

START
Sender-201
Sender のモード変更要求有り
NO
YES
Sender-202
Senderのモード変更要求を表示
Sender-203
Minimum Tx Rateを変更
Sender-204
Senderのモードを表示
Sender-205
Senderのモード変更通知信号をHC,Receiver に送信
Sender-206
ストリーム送信要求有り
NO
YES
Sender-207
ストリームの新規追加要求信号を HC に送信
Sender-208
ストリーム新規追加が成功？
YES
NO
Sender-210
Minimum Tx Rate の増加可能？
NO
YES
Sender-211
Minimum Tx Rate を増加させる
Sender-209
HC とのネゴシエーションの結果決定したMinimum Tx Rate以上の通信速度にてストリームを送信する

図 30

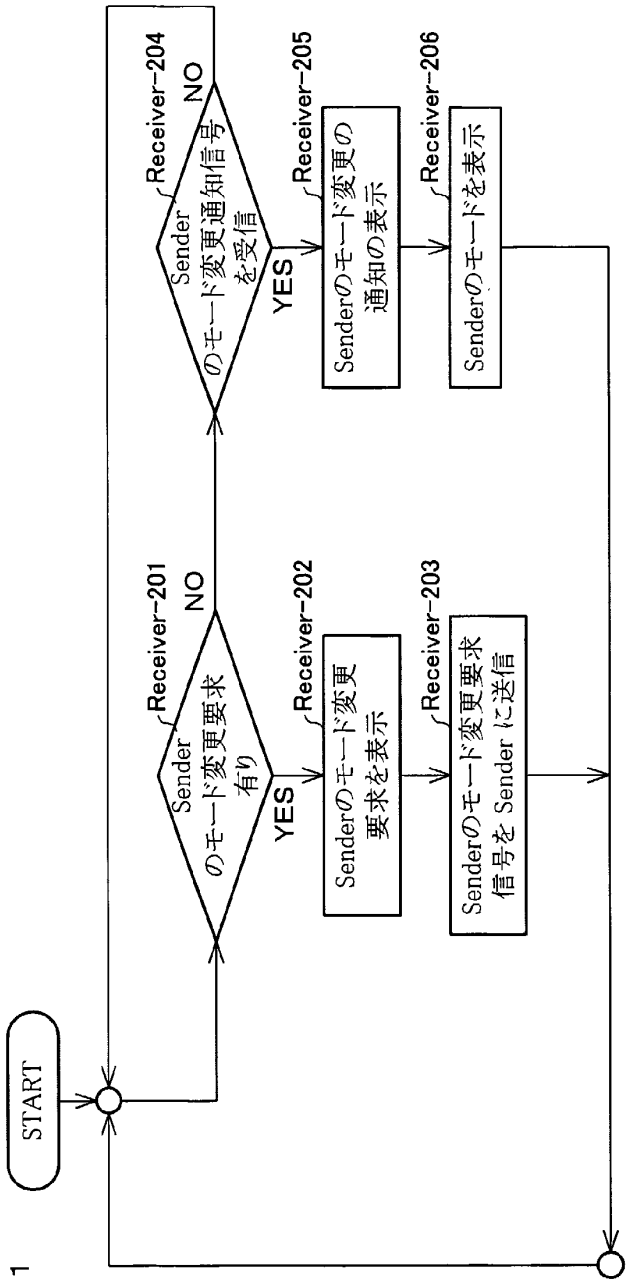

START
Receiver-201
Sender
のモード変更要求
有り
NO
YES
Receiver-202
Senderのモード変更
要求を表示
Receiver-203
Senderのモード変更要求
信号を Sender に送信
Receiver-204
Sender
のモード変更通知信号
を受信
NO
YES
Receiver-205
Senderのモード変更の
通知の表示
Receiver-206
Senderのモードを表示

図３１

図３２

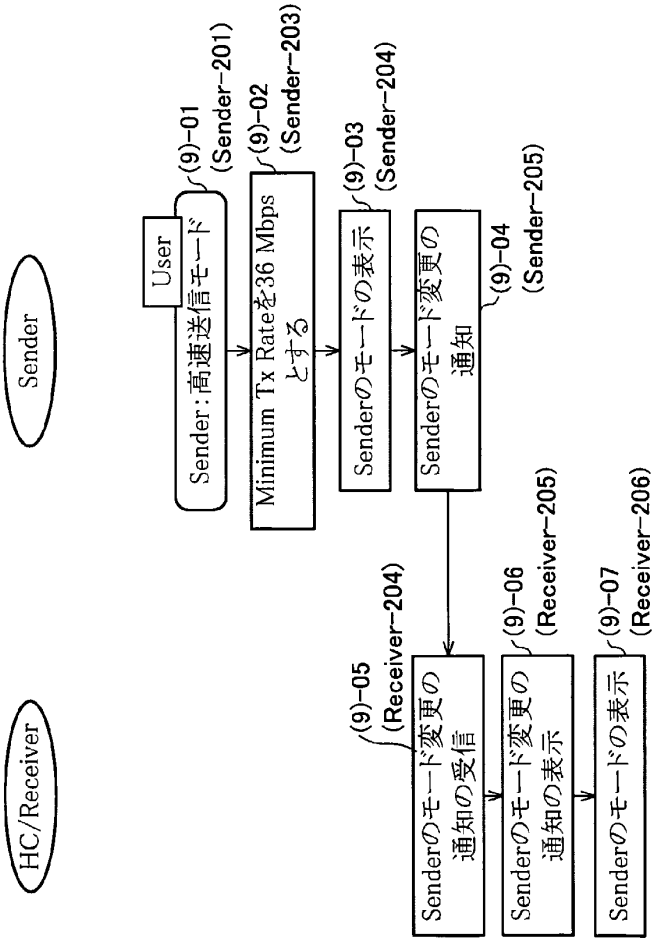
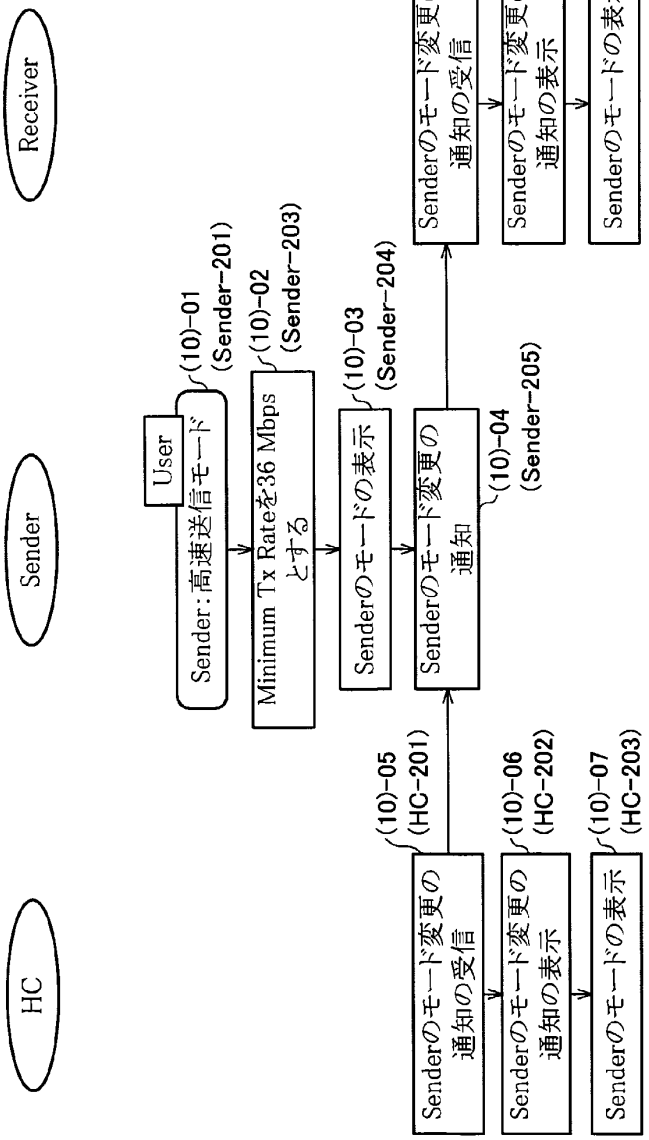

Sender
HC/Receiver
User
Sender:高速送信モード
(9)-01
(Sender-201)
Minimum Tx Rateを36 Mbps
とする
(9)-02
(Sender-203)
Senderのモード表示
(9)-03
(Sender-204)
Senderのモード変更の
通知
(9)-04
(Sender-205)
Senderのモード変更の
通知の受信
(9)-05
(Receiver-204)
Senderのモード変更の
通知の表示
(9)-06
(Receiver-205)
Senderのモード表示
(9)-07
(Receiver-206)

図３３


HC
Sender
Receiver
User
Sender：高速送信モード
(10)-01 (Sender-201)
Minimum Tx Rateを36 Mbpsとする
(10)-02 (Sender-203)
Senderのモード表示
(10)-03 (Sender-204)
Senderのモード変更の通知
(10)-04 (Sender-205)
Senderのモード変更の通知の受信
(10)-05 (HC-201)
Senderのモード変更の通知の表示
(10)-06 (HC-202)
Senderのモードの表示
(10)-07 (HC-203)
Senderのモード変更の通知の受信
(10)-08 (Receiver-204)
Senderのモード変更の通知の表示
(10)-09 (Receiver-205)
Senderのモードの表示
(10)-10 (Receiver-206)

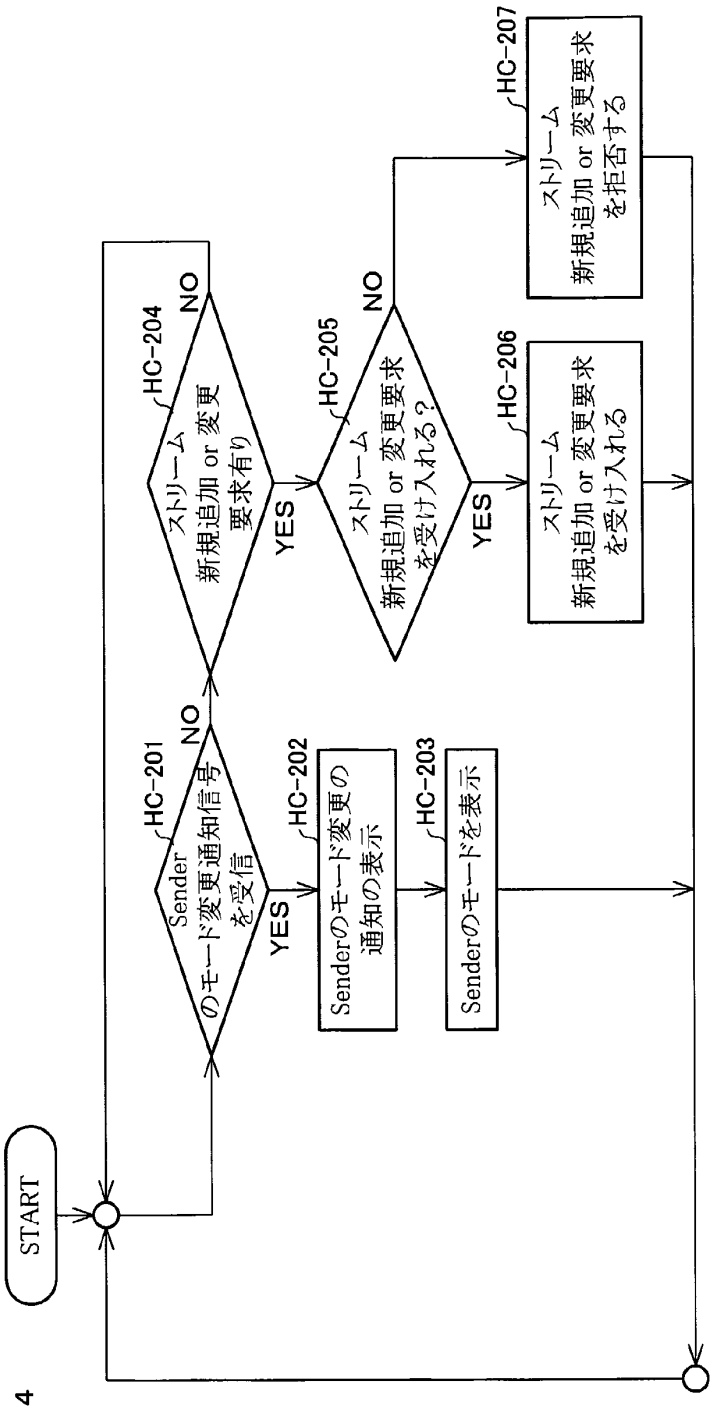

START
HC-201
Sender
のモード変更通知信号
を受信
NO
YES
HC-202
Senderのモード変更の
通知の表示
HC-203
Senderのモードを表示
HC-204
ストリーム
新規追加 or 変更
要求有り
NO
YES
HC-205
ストリーム
新規追加 or 変更要求
を受け入れる？
NO
YES
HC-206
ストリーム
新規追加 or 変更要求
を受け入れる
HC-207
ストリーム
新規追加 or 変更要求
を拒否する

図３４

図 35

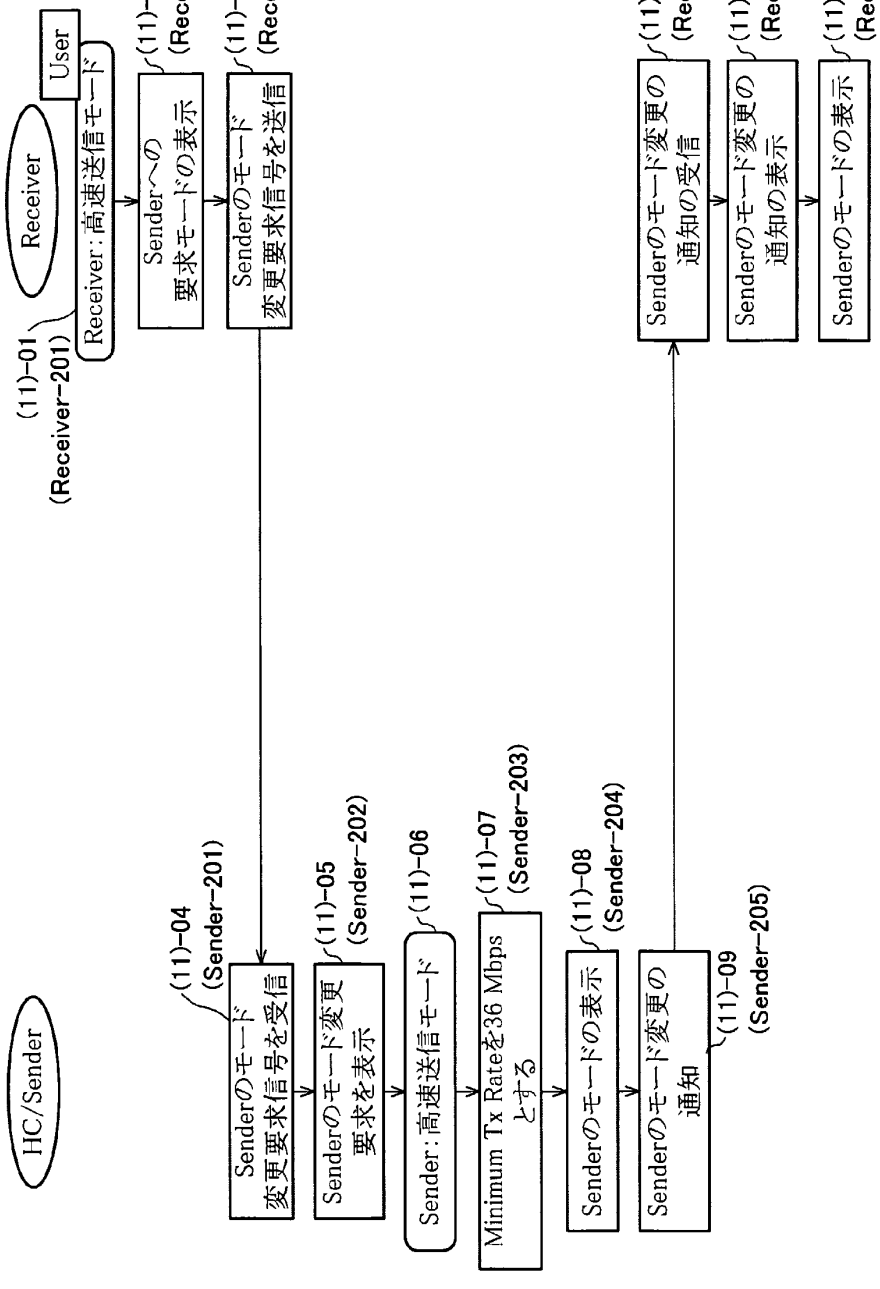

HC/Sender
Receiver
User
(11)-01
(Receiver-201)
Receiver：高速送信モード
(11)-02
(Receiver-202)
Senderへの
要求モードの表示
(11)-03
(Receiver-203)
Senderのモード
変更要求信号を送信
(11)-04
(Sender-201)
Senderのモード
変更要求信号を受信
(11)-05
(Sender-202)
Senderのモード変更
要求を表示
(11)-06
Sender：高速送信モード
(11)-07
(Sender-203)
Minimum Tx Rateを36 Mbps
とする
(11)-08
(Sender-204)
Senderのモードの表示
(11)-09
(Sender-205)
Senderのモード変更の
通知
(11)-10
(Receiver-204)
Senderのモード変更の
通知の受信
(11)-11
(Receiver-205)
Senderのモード変更の
通知の表示
(11)-12
(Receiver-206)
Senderのモードの表示

図 36

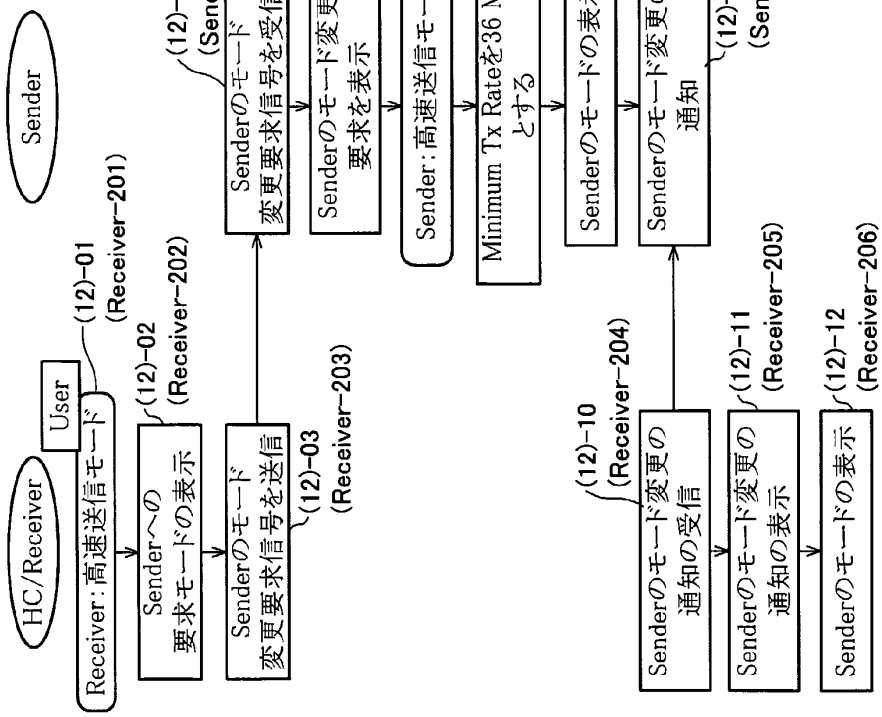

HC/Receiver
User
Sender
Receiver:高速送信モード
(12)-01
(Receiver-201)
Senderへの
要求モードの表示
(12)-02
(Receiver-202)
Senderのモード
変更要求信号を送信
(12)-03
(Receiver-203)
Senderのモード
変更要求信号を受信
(12)-04
(Sender-201)
Senderのモード変更
要求を表示
(12)-05
(Sender-202)
Sender:高速送信モード
(12)-06
Minimum Tx Rateを36 Mbps
とする
(12)-07
(Sender-203)
Senderのモードの表示
(12)-08
(Sender-204)
Senderのモード変更の
通知
(12)-09
(Sender-205)
Senderのモード変更の
通知の受信
(12)-10
(Receiver-204)
Senderのモード変更の
通知の表示
(12)-11
(Receiver-205)
Senderのモードの表示
(12)-12
(Receiver-206)

図 37

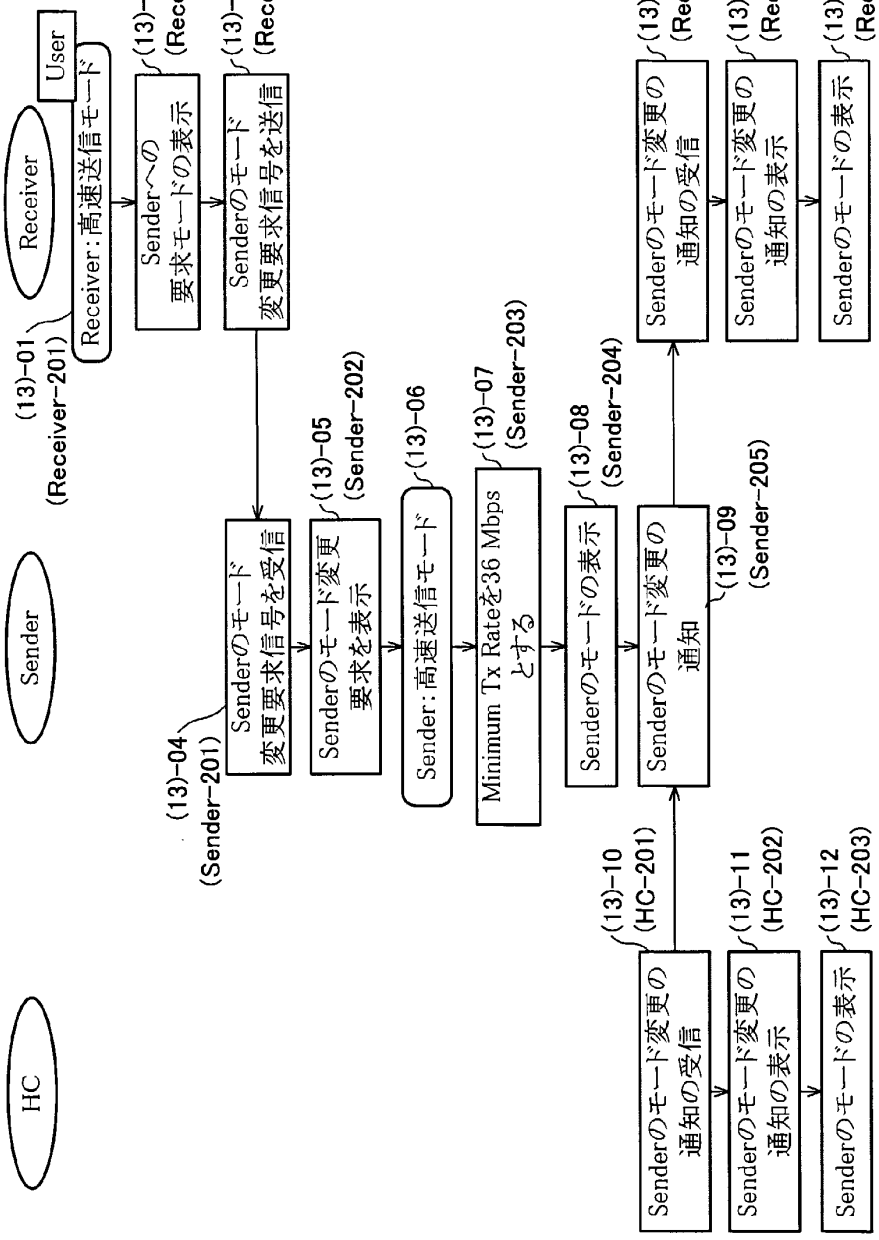

HC
Sender
Receiver
User
(13)-01 (Receiver-201)
Receiver：高速送信モード
Senderへの要求モードの表示
(13)-02 (Receiver-202)
Senderのモード変更要求信号を送信
(13)-03 (Receiver-203)
(13)-04 (Sender-201)
Senderのモード変更要求信号を受信
Senderのモード変更要求を表示
(13)-05 (Sender-202)
(13)-06
Sender：高速送信モード
Minimum Tx Rateを36 Mbpsとする
(13)-07 (Sender-203)
Senderのモードの表示
(13)-08 (Sender-204)
Senderのモード変更の通知
(13)-09 (Sender-205)
Senderのモード変更の通知の受信
(13)-10 (HC-201)
Senderのモード変更の通知の表示
(13)-11 (HC-202)
Senderのモードの表示
(13)-12 (HC-203)
Senderのモード変更の通知の受信
(13)-13 (Receiver-204)
Senderのモード変更の通知の表示
(13)-14 (Receiver-205)
Senderのモードの表示
(13)-15 (Receiver-206)

図 ３８

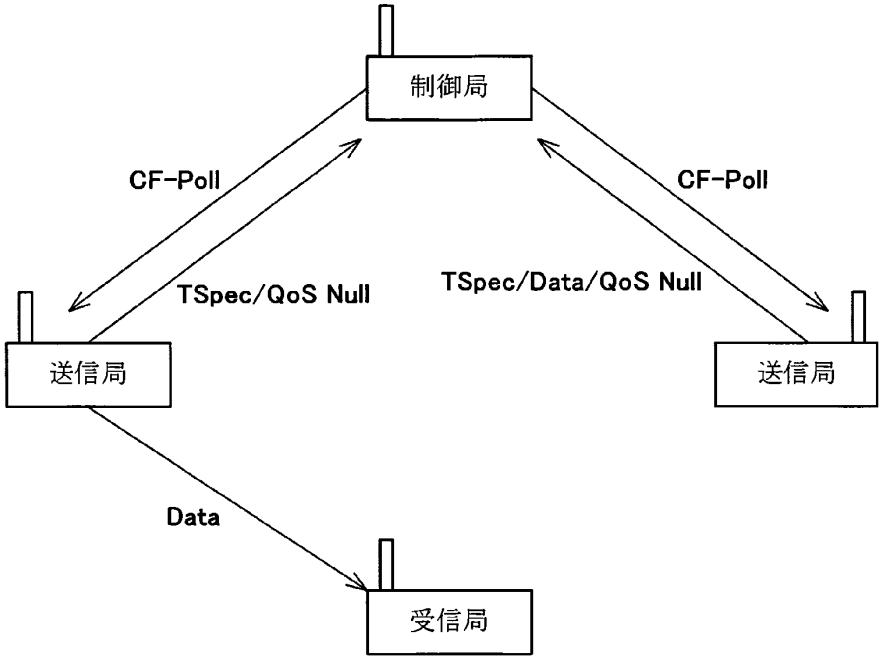
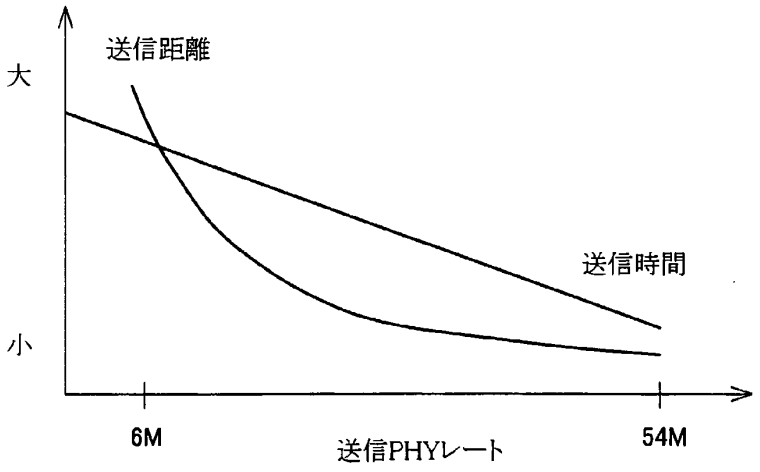

制御局
CF-Poll
CF-Poll
TSpec/QoS Null
TSpec/Data/QoS Null
送信局
送信局
Data
受信局

図 ３９



INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP03/02276

A. CLASSIFICATION OF SUBJECT MATTER
Int.Cl[7] H04L12/28

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
Int.Cl[7] H04L12/28

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Jitsuyo Shinan Koho	1922-1996	Toroku Jitsuyo Shinan Koho	1994-2003
Kokai Jitsuyo Shinan Koho	1971-2003	Jitsuyo Shinan Toroku Koho	1996-2003

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X A	JP 2000-324163 A (Matsushita Electric Industrial Co., Ltd.), 24 November, 2000 (24.11.00), Full text (Family: none)	1,2,19 8
X Y A	JP 2000-115198 A (Matsushita Electric Industrial Co., Ltd.), 21 April, 2000 (21.04.00), Full text & EP 986216 A2	5-7,19 3,4 8
Y	JP 2000-152337 A (Canon Inc.), 30 May, 2000 (30.05.00), Full text (Family: none)	33-46

☒ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

* Special categories of cited documents:
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"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
16 May, 2003 (16.05.03)	10 June, 2003 (10.06.03)
Name and mailing address of the ISA/ Japanese Patent Office Facsimile No.	Authorized officer Telephone No.

Form PCT/ISA/210 (second sheet) (July 1998)

INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP03/02276

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y A	JP 2000-165414 A (Samsung Electronics Co., Ltd.), 16 June, 2000 (16.06.00), Full text & KR 2000-32876 A & & CN 1258150 A	3,4 8
A	JP 2002-94523 A (Ricoh Co., Ltd.), 29 March, 2002 (09.03.02), Full text (Family: none)	9-18,20-32, 42,45,46
A	JP 11-55286 A (Kokusai Electric Co., Ltd.), 26 February, 1999 (26.02.99), Full text (Family: none)	9-18,20-32, 42,45,46
A	JP 2000-22714 A (Kokusai Electric Co., Ltd.), 21 January, 2000 (21.01.00), Full text (Family: none)	9-18,20-32, 42,45,46
A	JP 2000-92023 A (Canon Inc.), 31 March, 2000 (31.03.00), Full text (Family: none)	9-18,20-32, 42,45,46
A	WO 02/32175 A1 (Sony Corp.), 18 April, 2002 (18.04.02), Full text (Family: none)	9-18,20-46

Form PCT/ISA/210 (continuation of second sheet) (July 1998)

国際調査報告	国際出願番号　PCT／JP03／02276

A.　発明の属する分野の分類（国際特許分類（IPC））

Int. Cl⁷ H04L12／28

B.　調査を行った分野

調査を行った最小限資料（国際特許分類（IPC））

Int. Cl⁷ H04L12／28

最小限資料以外の資料で調査を行った分野に含まれるもの

日本国実用新案公報	1922－1996年
日本国公開実用新案公報	1971－2003年
日本国登録実用新案公報	1994－2003年
日本国実用新案登録公報	1996－2003年

国際調査で使用した電子データベース（データベースの名称、調査に使用した用語）

C.　関連すると認められる文献

引用文献のカテゴリー＊	引用文献名　及び一部の箇所が関連するときは、その関連する箇所の表示	関連する請求の範囲の番号
X	JP 2000－324163 A（松下電器産業株式会社）2000．11．24，全文（ファミリーなし）	1, 2, 19
A		8
X	JP 2000－115198 A（松下電器産業株式会社）2000．04．21，全文 & EP 986216 A2	5-7, 19
Y		3, 4
A		8

☒ C欄の続きにも文献が列挙されている。　☐ パテントファミリーに関する別紙を参照。

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「&」同一パテントファミリー文献

国際調査を完了した日	国際調査報告の発送日
16．05．03	10.06.03

国際調査機関の名称及びあて先	特許庁審査官（権限のある職員）	
日本国特許庁（ISA／JP） 郵便番号100－8915 東京都千代田区霞が関三丁目4番3号	高橋　真之	5X　3140
	電話番号　03－3581－1101　内線　3594	

様式PCT／ISA／210（第2ページ）（1998年7月）

国際調査報告	国際出願番号　ＰＣＴ／ＪＰ０３／０２２７６

C（続き）．　関連すると認められる文献

引用文献のカテゴリー＊	引用文献名　及び一部の箇所が関連するときは、その関連する箇所の表示	関連する請求の範囲の番号
X	ＪＰ　２０００－１５２３３７　Ａ（キヤノン株式会社） ２０００．０５．３０，全文（ファミリーなし）	33-46
Y	ＪＰ　２０００－１６５４１４　Ａ（三星電子株式会社） ２０００．０６．１６，全文 ＆　ＫＲ　２０００－３２８７６　Ａ ＆　ＣＮ　１２５８１５０　Ａ	3,4
A		8
A	ＪＰ　２００２－９４５２３　Ａ（株式会社リコー） ２００２．０３．２９，全文（ファミリーなし）	9-18,20-32, 42,45,46
A	ＪＰ　１１－５５２８６　Ａ（国際電気株式会社） １９９９．０２．２６，全文（ファミリーなし）	9-18,20-32, 42,45,46
A	ＪＰ　２０００－２２７１４　Ａ（国際電気株式会社） ２０００．０１．２１，全文（ファミリーなし）	9-18,20-32, 42,45,46
A	ＪＰ　２０００－９２０２３　Ａ（キヤノン株式会社） ２０００．０３．３１，全文（ファミリーなし）	9-18,20-32, 42,45,46
A	ＷＯ　０２／３２１７５　Ａ１（ソニー株式会社） ２００２．０４．１８，全文（ファミリーなし）	9-18,20-46

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
24 November 2005 (24.11.2005)

PCT

(10) International Publication Number
WO 2005/112488 A2

(51) International Patent Classification[7]: H04Q 7/20

(21) International Application Number:
PCT/US2005/015986

(22) International Filing Date: 9 May 2005 (09.05.2005)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
60/569,014 7 May 2004 (07.05.2004) US

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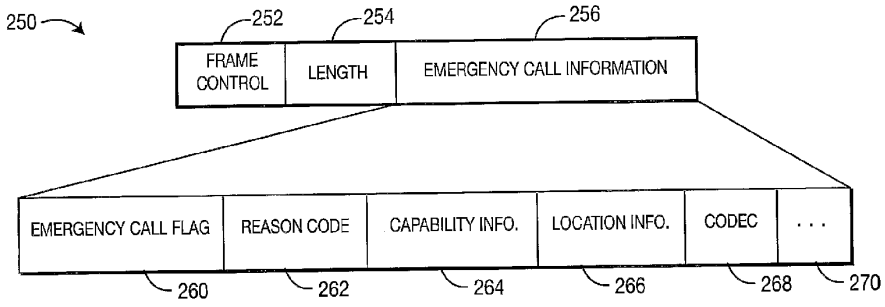
(81) Designated States *(unless otherwise indicated, for every kind of national protection available)*: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NA, NG, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SM, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW.

(84) Designated States *(unless otherwise indicated, for every kind of regional protection available)*: ARIPO (BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IS, IT, LT, LU, MC, NL, PL, PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:
— *without international search report and to be republished upon receipt of that report*

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(54) **Title:** SUPPORTING EMERGENCY CALLS ON A WIRELESS LOCAL AREA NETWORK



(57) **Abstract:** A device for identifying an emergency call in a wireless local area network includes an indicator to identify a call as an emergency call. The indicator can be a bit flag or an information element. The information element can include location information regarding the location of the station that placed the emergency call. This information can be used to locate the caller. The location information can be transmitted from the station to an access point separately from an emergency call.

WO 2005/112488 A2

[0001] # SUPPORTING EMERGENCY CALLS ON A WIRELESS LOCAL AREA NETWORK

[0002] ## FIELD OF INVENTION

[0003] The present invention generally relates to wireless local area networks (WLANs), and more particularly, to supporting emergency calls in a WLAN.

[0004] ## BACKGROUND

[0005] Existing 802 technology (802.11 WLANs, 802.15 wireless personal area networks (WPANs), etc.) traditionally does not have to support emergency calls like cellular does. For cellular, support of emergency calls often resulted from regulatory requirements imposed on the technology and is therefore widely implemented in most of today's deployed wireless cellular networks and handsets. Support for emergency calls involves many aspects across all communication layers, especially signaling support and mandated procedures, which are non-existent for 802.11 and 802.15 technologies. With the advent of voice over Internet Protocol (VoIP) in WLANs and increased everyday usage of WLANs, support for emergency calls in WLANs will become necessary.

[0006] Even "fixed" VoIP phone service offerings for the residential market have limited emergency call support. Number location information cannot always be tracked by a dispatcher in a public safety answering point (PSAP), call back is not always possible, and address registration may be required upon purchase of the equipment. When the VoIP phone is moved to a new location, the emergency call will still be sent based on the registered address location. The registered address can be changed in principle, but delays are at least on the order of days or weeks in updating the information at the PSAP. In addition, some users might not update their registration information in a timely manner, if at all.

[0007] This situation worsens with more mobility as enabled by VoIP phones using WLANs. WLAN based VoIP phones can work from any location and the user can

be expected to roam seamlessly between locations, such as from an office to a home to public hotspots, etc.

[0008] Certain 802.11-specific issues exist, including radio access, access point (AP) location, caller location, and emergency call admission. In regard to radio access, no priorities for emergency calls currently exist in the 802.11 standards, and there is no means to distinguish an emergency call from a regular call for the WLAN access network. The location of an AP or a STA is currently unknown to the network in a non-proprietary manner, even if for example, the AP's identification can easily be determined. It is also not currently possible to map the caller's location in a non-proprietary manner.

[0009] In regard to admission, a tightly managed WLAN may prevent emergency callers from establishing an emergency call if the caller is not authorized to enter the network. The normal connection procedure between a STA and an AP requires the STA to send an Association request, followed by negotiation with the AP prior to associating the STA to the AP. If the STA is unable to indicate that it is making an emergency call, it would have to go through the entire association procedure to determine if it could be admitted. As an example of this type of difficulty, if a STA does not have the proper password or authentication credentials to access the system (if the AP is configured to require passwords or require authentication credentials, as might exist for example with a private hotspot or enterprise/office WLAN), the AP will bluntly refuse the STA's association request. But even if the STA has the proper password or authentication credentials, the AP could still refuse admittance to the network based on its configured maximum capacity for voice users. In this case, the right decision for the AP would be to admit this new emergency call (at the highest priority) and to discontinue another existing voice call. Because the AP currently lacks means to make this distinction in the first place, such a feature cannot be implemented with existing state-of-the-art WLAN technology. Contrast this with the operation of a cellular system, in which any device can make an emergency call, even a device without a SIM card.

[0010] SUMMARY

[0011] The present invention proposes various system operation aspects for enabling emergency call handling support with 802.11 and 802.15 technology. Some of the proposals pertain to new L2 signaling messages or information elements to indicate emergency calls to APs. New procedures and control mechanisms are proposed for emergency situations. In addition, procedures for dual-mode (WLAN and second generation (2G) or third generation (3G) cellular) implementations are addressed. Because emergency call requirements are often coupled to regulatory requirements on location reporting of the emergency caller's position, means and signaling procedures are proposed to allow requesting and reporting of geographic positions in a WLAN network. The position information can be coupled to emergency calls or can be implemented separately.

[0012] A benefit of a STA being able to identify an emergency call is that simple logic can be installed at the AP that allows the AP to distinguish between a STA that it should treat normally (i.e., should follow regular association procedures) and a STA that should be admitted under all circumstances, regardless of how the network is configured (i.e., bypass any security requirements to admit an emergency call).

[0013] A device for identifying an emergency call in a wireless local area network includes an indicator to identify a call as an emergency call. The indicator can be a bit flag or an information element.

[0014] A device for reporting location information of a station in a wireless local area network includes a location information field.

[0015] A method for placing an emergency call by a STA on a WLAN begins by the STA placing the emergency call. A determination is made whether the STA is capable of operating on a cellular network. The emergency call is continued on the cellular network if the STA is capable of operating on the cellular network. Then, a determination is made whether the emergency call was completed on the cellular network. If the emergency call was not completed on the cellular network, then the emergency call is continued on the WLAN.

[0016] A method for locating a user placing an emergency call from a STA on a WLAN begins with the user placing the emergency call on the STA. Emergency signal frames are transmitted from the STA for a predetermined period of time, whereby the emergency signal frames can be received by an emergency worker to locate the user.

[0017] A method for locating a user placing an emergency call from a STA on a WLAN begins with the user placing the emergency call on the STA. Emergency signal frames are transmitted from the STA and are received by an emergency worker. A determination is made whether the emergency worker is within a predetermined range of the user. When the emergency worker is within the predetermined range, a direct connection between the user and the emergency worker is established.

[0018] A method for supporting an emergency call in a WLAN begins by placing an emergency call by a STA on the WLAN. The emergency call is received by an AP on the WLAN. A determination is made whether the STA has sufficient capabilities to complete the emergency call. The AP acts as a proxy for the STA if the STA does not have sufficient capabilities to complete the emergency call.

[0019] A method for maintaining location information at an AP for a STA in a WLAN includes receiving location information from the STA at the AP and storing the location information at the AP.

[0020] A method for maintaining location information at an AP for a STA in a WLAN begins with the AP polling the STA to receive location information. The location information is reported from the station to the AP and is stored at the AP.

[0021] A method for placing an emergency call on a WLAN begins by sending a ready to send (RTS) frame from a STA making the emergency call to an AP, the RTS frame containing an indicator that the STA is making an emergency call. The RTS frame is received at the AP and non-emergency STAs are backed off, whereby the STA making the emergency call can access the network prior to the non-emergency STAs.

[0022] BRIEF DESCRIPTION OF THE DRAWINGS

[0023] A more detailed understanding of the invention may be had from the

following description of a preferred embodiment, given by way of example, and to be understood in conjunction with the accompanying drawings, wherein:

[0024] Figure 1 is a diagram of a standard medium access control (MAC) frame;

[0025] Figure 2A is a diagram of a MAC frame with a bit flag indicating an emergency call;

[0026] Figure 2B is a diagram of a MAC frame with an information element (IE) indicating an emergency call;

[0027] Figure 3 is a diagram of a standard ready to send (RTS) frame;

[0028] Figure 4A is a diagram of a RTS frame with a bit flag indicating an emergency call;

[0029] Figure 4B is a diagram of a RTS frame with an IE indicating an emergency call;

[0030] Figure 5 is a flowchart of a method for using a RTS frame as shown in Figures 4A or 4B;

[0031] Figure 6 is a flowchart of a method for switching radio technologies to complete an emergency call;

[0032] Figure 7 is a diagram of a SOS beacon frame indicating an emergency call;

[0033] Figure 8 is a flowchart of a method for transmitting and using the SOS frame shown in Figure 7; and

[0034] Figure 9 is a flowchart of a method to determine whether to apply a proxy function.

[0035] DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0036] Hereafter, the term "station" (STA) includes, but is not limited to, a wireless transmit/receive unit, a user equipment, a fixed or mobile subscriber unit, a pager, or any other type of device capable of operating in a wireless environment. When referred to hereafter, the term "access point" (AP) includes, but is not limited to, a base station, a Node B, a site controller, or any other type of interfacing device in a

wireless environment.

[0037] The present invention is applicable to all WLANs, personal area networks (PANs), and metropolitan area networks (MANs), but in particular to 802.11-based WLANs, 802.15-based wireless PANs, 802.16/20 based wireless MANs, and equivalents thereto. In one realization, the present invention is applicable to WTRUs implementing a combination of these access technologies including WLAN, PAN, MAN, and cellular multi-mode WTRUs.

[0038] The present invention for handling emergency support will be described hereinafter as being grouped into three major areas. This is, however, for convenience of explanation and should not be taken as a limitation of the invention.

[0039] I. Air interface related signaling/support and procedures

[0040] A. Indication of emergency calls in MAC frames and MAC signaling messages

[0041] A standard MAC frame 100 is shown in Figure 1. The MAC frame 100 includes a frame control field 102, a duration/ID field 104, one or more address fields 106a-106d, a sequence control field 108, a quality of service (QoS) control field 110, a frame body 112, and a frame check sequence (FCS) field 114. The QoS control field 110 is divided into a plurality of subfields, as shown.

[0042] A priority for emergency calls can be indicated in MAC frames by a bit flag, by an emergency message type IE, by an emergency message field part on an existing or new IE, or by an emergency call code implemented using a reserved (currently unused) value in any existing IE or field of a MAC frame. The indicator allows an AP to know that it needs to admit the emergency call. For similar purposes, QoS priorities or requirements are indicated by means of QoS classes (for example DiffServ). Any existing MAC frame type (control, management, or data) can be modified to include the emergency call indicator. The emergency call indicator can be added to any location in the MAC frame, in the header or the body using any of the mechanisms described.

[0043] As shown in Figure 2A, a MAC frame 200 includes fields 202-214, which are the same as fields 102-114 described above in connection with Figure 1. In one embodiment, a simple bit flag 220 is used to indicate to the receiver that this is an emergency call. As shown in Figure 2A, one possible location for the bit flag 220 is in the reserved bit (bit 7) of the QoS control field 210. A person of ordinary skill in the art would note that it is possible to place the bit flag 220 in any currently reserved location in any of the existing header or frame body fields in the MAC frame.

[0044] As shown in Figure 2B, a MAC frame 250 includes a frame control field 252, a length field 254, and an emergency call IE 256 to indicate an emergency call. The emergency call IE 256 can include, but is not limited to, an emergency call flag 260, a reason code field 262, a capability information field 264, a location information field 266, a voice codec application field 268, and additional fields 270. The emergency call IE 256 can be added to any MAC frame. In addition, the information contained in the emergency call IE 256 can be added to an existing IE type.

[0045] The emergency call flag 260 can be a simple indicator (e.g., a bit flag) to identify that the call is an emergency call. The reason code field 262 indicates the reason for the emergency call (e.g., fire, medical emergency, etc.). The capability information field 264 includes the capabilities of the STA placing the emergency call and is used to assist in completing the emergency call as quickly as possible. The location information field 266 contains the location of the STA placing the emergency call. The voice codec application field 268 identifies the voice codec used by the STA, and is used in case there is any incompatibility between the STA and the AP attempting to handle the emergency call. Additional information that can be included into the emergency call IE (as fields 270) are timestamps and WTRU and/or operator service capability information.

[0046] Existing MAC frames under 802.11e have call priorities. The Transmission Specification (TSPEC) IE includes a three bit priority subfield in a transmission specification information field. The principles of the present invention can also be implemented in the TSPEC IE by defining a value for an emergency call. In

cellular systems, a similar mechanism (a signaling frame) is used to send the call parameters to the network and includes a reserved field to identify emergency calls.

[0047] B. Location information

[0048] Location information can also be attached to these new MAC frames 200, 250 (e.g., in the location information field 266), in addition to conveying the emergency call establishment reason. For example, the AP or STA can use the basic service set (BSS) ID, the AP or STA MAC addresses, static or dynamically assigned IP addresses, or global positioning system (GPS) information from an AP or STA implementing this functionality, and forward this information to the emergency call center. It is noted that the location information can also be conveyed separately from the emergency call information.

[0049] Other means of locating the emergency STA include, but are not limited to, identifying the STA placing the emergency call by caller ID, utilizing a callback number, and using known addresses to help locate the STA by the emergency call center (e.g., using the MAC addresses of the current point of attachment for the STA, such as the AP or the network ID, or AP geographical coordinates).

[0050] For example, a MAC signaling mechanism for a WLAN can be used where the AP can request the position from a STA. The STA would report back to the AP with its position. One possible implementation includes the use of assisted GPS (A-GPS) coordinates, that are currently in widespread use in cellular handsets. Multiple positioning methods can be supported for different access networks, including, but not limited to, uplink time difference of arrival (U-TDOA), enhanced observed time difference (E-OTD), idle period downlink observed time difference of arrival (IPDL-OTDOA), A-GPS, Universal Geographic Coordinates (for example, as defined in IEEE standard 802.11k or IETF RFC 3825) and methods using WLAN AP locations, cell site, or sector information and timing advance or roundtrip time measurements. While the preceding examples of conveying location information have been particularly

mentioned, one skilled in the art would note that any format to convey geographic coordinates can be used.

[0051] The emergency call functions can be performed independently from (yet complementary with) the location reporting functions. To illustrate, it is possible to: (1) attach location information to the emergency call signaling frames when the STA actually issues the emergency call, and (2) signal location updates as a stand-alone functionality without an emergency call. An example of the latter would be to keep the AP informed and updated about the latest STA position either periodically (e.g., every few seconds), polled as part of the AP background operation, or by unsolicited regular location reporting by the STA to the AP. Maintaining location information at the AP may be preferable because when the STA issues the emergency call, the AP already has a reasonably recent estimate of the STA's position, such that the STA is not required to explicitly piggyback its location onto the emergency call request.

[0052] For example, such stand-alone STA location information reporting can be used to allow implementation of location-dependent services in a WLAN network, in parallel to addressing regulatory requirements.

[0053] As such, the position information can also be provided to location services (LCS) applications existing within an interworking WLAN (I-WLAN), public land mobile network (PLMN), or in the STA. In addition, the originating party's serving cell identity or serving AP identity can be provided to the LCS client.

[0054] C. Extend the existing RTS/CTS frame exchange mechanism and procedure

[0055] A standard RTS frame 300 is shown in Figure 3. The RTS frame 300 includes a frame control field 302, a duration field 304, a receiver address (RA) field 306, a transmitter address (TA) field 308, and a FCS field 310.

[0056] A STA that wants to transmit an emergency call transmits an extended RTS frame 400 containing a special signaling flag as shown in Figure 4A or an extended RTS frame 450 containing a new IE as shown in Figure 4B.

[0057] Figure 4A shows an RTS frame 400. Fields 402-410 of the RTS frame 400 are the same as fields 302-310 of the RTS frame 300 described above in connection with Figure 3. The frame control field 402 has several subfields, including a protocol version subfield 412, a type subfield 414, a subtype subfield 416, a to distribution system (DS) subfield 418, a from DS subfield 420, a more fragments subfield 422, a retry subfield 424, a power management subfield 426, a more data subfield 428, a Wired Equivalent Privacy (WEP) subfield 430, and an order subfield 432.

[0058] The signaling flag can be added to any reserved bit in the RTS frame 400. Potential locations for the reserved bit include the protocol version subfield 412, the type subfield 414, and the subtype field 416. It is noted that one skilled in the art could place the signaling flag in any reserved bit in the RTS frame 400.

[0059] Figure 4B shows an extended RTS frame 450, including a frame control field 452, a duration field 454, a RA field 456, a TA field 458, a purpose IE 460, and a FCS field 462. The purpose IE 460 can be similar in content to the emergency call IE 256, described above. All STAs receiving the extended RTS frame 450 are then required to stop any transmission attempt for a pre-determined amount of time to idle the wireless medium and to give the STA in emergency an opportunity to transmit.

[0060] In one embodiment, upon receipt of an extended RTS frame, the receiving STAs enter a modified backoff process in order to give the STA placing the emergency call a higher probability to succeed in obtaining access to the medium. Two implementations of modifying the backoff process are possible: (1) shortening the backoff time for the STA placing the emergency call relative to other STAs, or (2) lengthening the backoff time for non-emergency STAs. In either implementation, the end result is that the emergency STA has a shorter backoff time than non-emergency STAs.

[0061] A method 500 for using the RTS frame 400 or 450 is shown in Figure 5. The purpose of the method 500 is to idle the transmission medium in order to permit a STA to transmit an emergency call. The method begins with a STA placing an emergency call by sending a RTS frame 400 or 450 (step 502). An AP receives the RTS

frame (step 504) and responds to the STA with a standard CTS frame (step 506). The backoff type to be used by the AP is determined (step 508). There are two possible backoff types, both of which would permit the STA placing the emergency call to access the medium prior to all other STAs waiting to transmit.

[0062] If the backoff type is that the STA in emergency (i.e., the STA placing the emergency call) has a shorter backoff time, then the STA in emergency waits for the shortened backoff time (step 510) and then transmits the emergency call (step 512). All other STAs that are attempting to access the medium wait for the standard backoff time (step 514) and are then able to transmit (step 516). The method then terminates (step 518).

[0063] If the backoff type is that all other STAs have a longer backoff time (step 508), then the STA in emergency waits for the standard backoff time (step 520) and transmits the emergency call (step 522). All of the other STAs wait for a longer backoff time (step 524) and are then able to transmit (step 516). The method then terminates (step 518).

[0064] In general, when a STA enters a backoff procedure, the STA attempts to transmit randomly in one out of a series of N timeslots. If there is a transmission collision, the STA will backoff again and increase the value of N, up to a predetermined maximum value for N. Before a STA can attempt to transmit, the STA must wait for M timeslots. This basic procedure provides any STA an equal chance of winning access to the medium. In 802.11e, to implement QoS, there are two ways to ensure that a particular station has a greater chance of winning access to the medium. The first is to reduce the value of M, thereby giving the STA a shorter wait time. The second is to use a smaller value for N, which increases the chances that a STA will be able to transmit in a particular timeslot.

[0065] In the method 500, there are several possible means for a STA to know which backoff value to use. A first means is to use hard-coded values for M and N in connection with an emergency call, such that these hard-coded values for M and N will be used by a STA in emergency. A second means is to explicitly signal values for M and

N from the AP to the STA in emergency. The AP would typically send those parameters to the STA by either using broadcast or dedicated management frames during normal system operation. STAs read the emergency call-related configuration parameters to be used in case they need to set up an emergency call. One example is that the AP, as part of the Beacon or Probe Response management frames, sends other BSS configuration values to all STAs in its BSS. Adding the emergency call-related M and N parameters is a natural extension to these. For example, 802.11e QoS-related configuration parameters per access category (backoff values, windows, etc.) to be used by all STAs in the BSS are signaled today by the AP using a similar mechanism.

[0066] A third means is a combination of the first and second means, by which a STA has hard-coded default values for M and N that it uses normally, and if the STA is in emergency, the AP will signal new values for M and N to override the hard-coded default values. One skilled in the art could envision additional means for communicating the appropriate backoff times to a STA in emergency and all other STAs seeking access to the medium.

[0067] D. Mandated switch-over to another radio technology for dual-mode WLAN STAs (for example 3G and WLAN)

[0068] In case of an emergency, a dual-mode WLAN STA will attempt any emergency call first on the cellular network, instead of on the WLAN. This is in principle a "hard-coded" procedure in the STA alone. A method 600 for implementing this procedure is shown in Figure 6.

[0069] The method 600 begins by the user making an emergency call at the STA (step 602). A determination is made whether the STA is capable of operating on a cellular network or a WLAN (step 604). If the STA is operating on a cellular network (i.e., is currently connected to the cellular network), then the STA remains on the cellular network for the emergency call (step 606). If the STA is capable of operating on the cellular network, but is not presently connected to the cellular network, then the STA establishes a connection to the cellular network (step 608) and makes the

emergency call on the cellular network (step 606). If the STA is operating on a WLAN, then the STA switches to the cellular network to make the emergency call (step 610).

[0070] After the emergency call has been placed, a determination is made whether the emergency call went through on the cellular network (step 612). If so, then the method 600 terminates (step 614). If the emergency call did not go through on the cellular network, then the STA switches to the WLAN to make the call (step 616) and the method terminates (step 614).

[0071] In case an emergency call needs to be issued by a dual-mode WLAN-cellular handset, the preferred procedure is to have the handset fallback onto the cellular modem (i.e., establish the emergency call on a cellular radio link), because emergency call support may not be available or may be less reliable over the WLAN.

[0072] Alternatives for the method 600 include: (1) establishing a preferred, mandated, or recommended order of radio technologies (e.g., WLAN or cellular) to switch to when attempting to send an emergency call; (2) the system operator configures emergency call behavior on a SIM card or similar device for dual mode handsets; (3) maintain a VoIP call on the cellular network or move the call onto a traditional circuit switched voice channel in case of an emergency; (4) the system operator signals a preferred local order of radio technologies over the wireless interface; or (5) the user manually configures the policy setting.

[0073] E. Bypassing authentication and security when attempting an emergency call

[0074] A procedure is mandated that any 802.xx STA seeking to establish an emergency call in a WLAN must be allowed by the AP. This includes bypassing authentication like 802.1x and other security measures on the network side. This procedure could be triggered by using the extended RTS/CTS method 500 (as shown in Figure 5) or by a bit flag, IE, header, reserved information field, or bit/sequence value in the MAC frame (as shown in Figures 2A and 2B).

[0075] II. WTRU behavior / procedure in case of emergency

[0076] A. WLAN sends SOS beacon signal to facilitate in finding the caller

[0077] A procedure is mandated in the STA or configured by the network that once the emergency call is over (or even during), the STA and/or the involved AP start transmitting SOS type signaling frames 700 as shown in Figure 7 on regular intervals.

[0078] An SOS signaling frame 700 is a modified version of a Probe Request frame. The SOS signaling frame 700 includes a frame control field 702, a duration field 704, a destination address (DA) field 706, a source address (SA) field 708, a BSSID field 710, a sequence control field 712, a SSID IE 714, a supported rates IE 716, and an emergency call IE 718. The emergency call IE 718 can be the same as the emergency call IE 256 described above in connection with Figure 2B. It is noted that the supported rates IE 716 is optional, and can be eliminated from the SOS signaling frame 700 without affecting its functionality.

[0079] In one embodiment, the SOS signal frame can be defined as a Probe Request frame sent with short interframe space (SIFS) priority or priority interframe space (PIFS) priority, to ensure access to the medium. The SOS signal frame contains new emergency call related elements in emergency call IE, such as 911 ID (e.g., caller ID), equipment details (such as international mobile equipment identification (IMEI)), network affiliations, user name, and emergency reason code. The reason code may be obtained by the device prompting the user to identify the reason for the emergency call (e.g., "press 1 if fire emergency", etc.). A reason code would provide some ability to handle the emergency in case there is no way to terminate the in-progress call.

[0080] The SOS signal frame can be scheduled for transmission every 100 mSec or so to facilitate location logging and tracking. An AP would be required to log any SOS signal frame reception with a timestamp and details of the signal. The signal strength details include signal strength, signal quality, antenna azimuth and gain, and caller details such as IMEI, user name (if available), and other 802.11 device information useful for identity and capability purposes. An AP receiving an SOS signal frame would also be required to report the event to an emergency network node

responsible for emergency response, radio resource coordination, location, and tracking of the calling device.

[0081] This is an active probing mechanism where the SOS signaling frames are sent and can be received by emergency workers as they approach the caller. One analogy is the emergency beacon in the black box of an airplane. A new MAC frame can be introduced for this purpose or an existing MAC frame, for example a probe request frame, can be extended by new IEs (such as the emergency call IE 256) to fulfill this purpose.

[0082] A method 800 for utilizing a SOS signaling frame is shown in Figure 8. The user makes an emergency call from a STA (step 802). The STA begins to transmit SOS frames (step 804). Based on the desired implementation, the SOS frames can either be sent as probes or be used to establish a direct connection with an emergency worker (step 806).

[0083] If the SOS frames are to be sent as probes, a transmission period is set and a determination is made whether the end of the transmission period has been reached (step 810). If the transmission period has not ended, then the STA continues transmitting the SOS frames (step 812) and the method returns to step 810. If the end of the transmission period has been reached (step 810), then the STA stops transmitting the SOS frames (step 814) and the method terminates (step 816).

[0084] If the SOS frames are to be used to establish a direct connection with an emergency worker (step 806), then a determination is made whether the emergency worker in within range of the STA (step 820). If the emergency worker is not within range of the STA, then the STA continues transmitting SOS frames (step 822) and the method continues with step 820. If the emergency worker is within range of the STA (step 820), then the STA stops transmitting SOS frames and establishes a direction connection between the caller and the emergency worker (step 824) and the method terminates (step 816).

[0085] In a first alternative (steps 810-814), the SOS frames transmitted by the STA could be triggered by signaling from the AP or higher layer protocols like session

initiation protocol (SIP) once the emergency call is over. The duration/frequency of the SOS frames are contained in this trigger signal. Sending the SOS frames after the emergency call is over prevents transmission of unnecessary SOS frames in case the emergency call was a mistake or if there was no need for an emergency worker to come in response to the call.

[0086] In a second alternative (steps 820-824), a direct VoIP connection between the emergency worker and the caller is established when they are within range of each other. Other STAs that hear the SOS frames may treat the SOS frames like the extended RTS frame described above in connection with Figures 4A, 4B, and 5 (i.e., the other STAs will not try to access the medium, so that the emergency caller has better access to the bandwidth).

[0087] B. Network (for example, the AP) implements a call back functionality to handle emergency calls

[0088] Once an emergency call is established, the WLAN maintains an active connection to the user that initiated the emergency call for a certain period after the emergency call is over in case of call back. This functionality may be transparent to the user.

[0089] III. Functionality in the infrastructure

[0090] A. Proxy function

[0091] A method 900 for determining whether an AP needs to act as a proxy for the STA is shown in Figure 9. The STA makes an emergency call (step 902) and the AP receives the emergency call (step 904). A determination is made whether the STA has the capabilities to complete the emergency call based on the network used to carry the call (step 906). The AP checks if the STA has all required functionality (e.g., SIP/H.323 protocol termination, vocoder, etc.) to support the call. This information may be indicated as part of the MAC frame (e.g., MAC frames 200, 250) or it may be part of the subscriber information in the network that the AP can access.

[0092] If the STA has all of the necessary capabilities, then the STA proceeds with the call as normal (step 908). The AP can add location information to the call as necessary, including the location of the STA and/or the location of the AP (such as the network ID, the AP's MAC address, etc.) (step 910). The method then terminates (step 912).

[0093] If the STA does not have all of the necessary capabilities to complete the call (step 906), then the AP acts as a proxy for the STA, providing any necessary functionality (step 914). The AP adds location information to the call as needed (step 910) and the method terminates (step 912).

[0094] If the AP determines that the STA does not have all the required functionality to fully complete the emergency call in the current environment, then the AP will act as a proxy for the STA (step 914). For example, if the STA does not have SIP protocol support, then the AP can act as a SIP proxy for the STA. As another example, if the STA has SIP support but the network only supports H.323, then the AP can interwork the SIP messages from the STA to H.323 messages to the rest of the network. In the extreme case that the STA does not even have a vocoder, the AP can download a thin vocoder client to the STA and interwork to more standard vocoders elsewhere in the network.

[0095] Another method is that the AP spoofs (i.e., reads the contents and/or type information even if it is officially not supposed to) on the contents of the IP packets that are used for signaling or normal traffic by the STA and its correspondent in the network. For example, SIP signaling protocol messages over IP are typically used today for call handling. Such SIP signaling contains useful information, such as capability information and destination addresses, for the AP to fulfill its role as proxy. In addition to the previously described methods, if the AP extracts such information from spoofing on the STA-remote destination higher layer (i.e., above L2 MAC) message contents, it can fulfill its role more efficiently. A person skilled in the art would recognize that SIP is one example of a management protocol for IP-based calls, and that other equivalent

protocols exist and are widely used in the industry. Therefore, this method is not limited to SIP alone.

[0096] B. Linking an AP to an emergency call center

[0097] Once an AP learns of a STA making an emergency call, the AP needs to establish a link to an emergency call center in order to properly route the call from the STA. There are several possible transfer mechanisms to get the emergency call from the AP to the call center. For example, the AP can communicate with a gateway, linking it to the call center.

[0100] The emergency network node concept can be extended to include an emergency response operations center with man-in-the-loop capability. The emergency network node would be an extended service set (ESS) or network tailored to the infrastructure application. For example, on a university campus, the designated emergency network node would be the campus police department. As another example, in a manufacturing plant, the emergency network node would be the security office. The emergency network node would include an operator who would receive the VoIP call, log call information, screen calls, and then place an emergency call on a public switched telephone network (PSTN) to alert the appropriate authorities.

[0101] The emergency network node concept can be further extended to include an automated node with a direct line to a PSTN. The automated node would act as voice circuit bridge to dial and connect the wireless caller to the PSTN emergency center.

[0102] The method for connection to the emergency network node could be extended to include the ability to route and handle a call without authentication, authorization, or security features. This would permit a direct unencrypted connection or a tunneled connection between the wireless caller and the emergency network node.

[0103] The function of the emergency network node could be extended to include call handing, call handoff, and roaming coordination. This functionality would preauthorize resources in neighbor APs (APs adjacent to the AP serving the wireless

call), so that the caller may roam without losing the wireless connection and without the need to reestablish a new emergency call when moving across AP boundaries, thus eliminating duplicate calls on same emergency.

[0104] The concepts of the present invention can be extended beyond the specific examples illustrated above. For example, the present invention can be extended to mesh networks and ad-hoc networks. As an alternative, instead of a human user, the present invention can be extended to machine-to-machine usage scenarios for emergency handling with WLANs. One possibility would be using 802.11 in home security systems, i.e., a WLAN is used in place of hard wired telephone lines (that can be cut). In this example, instead of a human user generating a WLAN emergency call, the home security system auto-generates an emergency call to a security call center when someone breaks in. Alternatively, the home security system could start sending emergency SOS frames, as described above.

[0105] Although the features and elements of the present invention are described in the preferred embodiments in particular combinations, each feature or element can be used alone (without the other features and elements of the preferred embodiments) or in various combinations with or without other features and elements of the present invention.

* * *

CLAIMS

What is claimed is:

1. A device for identifying an emergency call in a wireless local area network, comprising:

an indicator to identify a call as an emergency call.

2. The device according to claim 1, wherein said indicator is a bit flag.

3. The device according to claim 2, wherein said bit flag is located in a medium access control frame.

4. The device according to claim 2, wherein said bit flag is located in a request to send frame.

5. The device according to claim 1, wherein said indicator is an information element.

6. The device according to claim 5, wherein said information element includes an emergency call flag.

7. The device according to claim 5, wherein said information element includes a reason code.

8. The device according to claim 5, wherein said information element includes a capability information field, identifying the capabilities of a station placing the emergency call.

9. The device according to claim 5, wherein said information element includes a location information field, containing information to locate a station placing the emergency call.

10. The device according to claim 5, wherein said information element includes a voice codec field, to identify the codec used by a station placing the emergency call.

11. A device for reporting location information of a station in a wireless local area network, comprising:

a location information field.

12. The device according to claim 11, wherein said location information field is located in a medium access control frame.

13. The device according to claim 11, wherein said location information field is periodically transmitted from the station to the network.

14. The device according to claim 11, wherein said location information field is transmitted from the station to the network at a time determined by the station.

15. The device according to claim 11, wherein said location information field is transmitted from the station to an access point (AP) on the network when the station is polled by the AP.

16. The device according to claim 11, wherein said location information field is transmitted from the station to an access point (AP) on the network when the AP sends a request to the station for location information.

17. A method for placing an emergency call by a station on a wireless local area network (WLAN), comprising the steps of:

placing the emergency call by the station;

determining whether the station is capable of operating on a cellular network;

continuing the emergency call on the cellular network if the station is capable of operating on the cellular network;

determining whether the emergency call was completed on the cellular network; and

continuing the emergency call on the WLAN if the emergency call was not completed on the cellular network.

18. A method for locating a user placing an emergency call from a station on a wireless local area network, comprising the steps of:

placing the emergency call on the station; and

transmitting emergency signal frames from the station for a predetermined period of time, whereby the emergency signal frames can be received by an emergency worker to locate the user.

19. A method for locating a user placing an emergency call from a station on a wireless local area network, comprising the steps of:

placing the emergency call on the station;

transmitting emergency signal frames from the station;

receiving the emergency signal frames by an emergency worker;

determining whether the emergency worker is within a predetermined range of the user; and

establishing a direct connection between the user and the emergency worker when the emergency worker is within the predetermined range.

20. A method for supporting an emergency call in a wireless local area network (WLAN), comprising the steps of:

placing an emergency call by a station on the WLAN;

receiving the emergency call by an access point (AP) on the WLAN;

determining if the station has sufficient capabilities to complete the emergency call; and

having the AP act as a proxy for the station if the station does not have sufficient capabilities to complete the emergency call.

21. The method according to claim 20, further comprising the step of:

adding location information to the emergency call by the AP.

22. The method according to claim 20, further comprising the step of:

monitoring traffic on the WLAN by the AP, whereby the AP learns the capability information of stations on the WLAN such that the AP can act as a proxy for a station.

23. A method for maintaining location information at an access point (AP) for a station in a wireless local area network, comprising the steps of:

receiving location information from the station at the AP; and

storing the location information at the AP.

24. A method for maintaining location information at an access point (AP) for a station in a wireless local area network, comprising the steps of:

polling the station by the AP to receive location information;

reporting location information from the station to the AP; and

storing the location information at the AP.

25. The method according to claim 24, wherein the polling step is performed periodically.

26. A method for placing an emergency call on a wireless local area network, comprising the steps of:

sending a ready to send (RTS) frame from a station making the emergency call to an access point (AP), the RTS frame containing an indicator that the station is making an emergency call;

receiving the RTS frame at the AP;

backing off non-emergency stations, whereby the station making the emergency call can access the network prior to the non-emergency stations.

27. The method according to claim 26, wherein the backing off step includes having the station making the emergency call wait for a shorter period of time than non-emergency stations before attempting to access the network.

28. The method according to claim 26, wherein the backing off step includes having non-emergency stations wait for a longer period of time than the station making the emergency call before attempting to access the network.

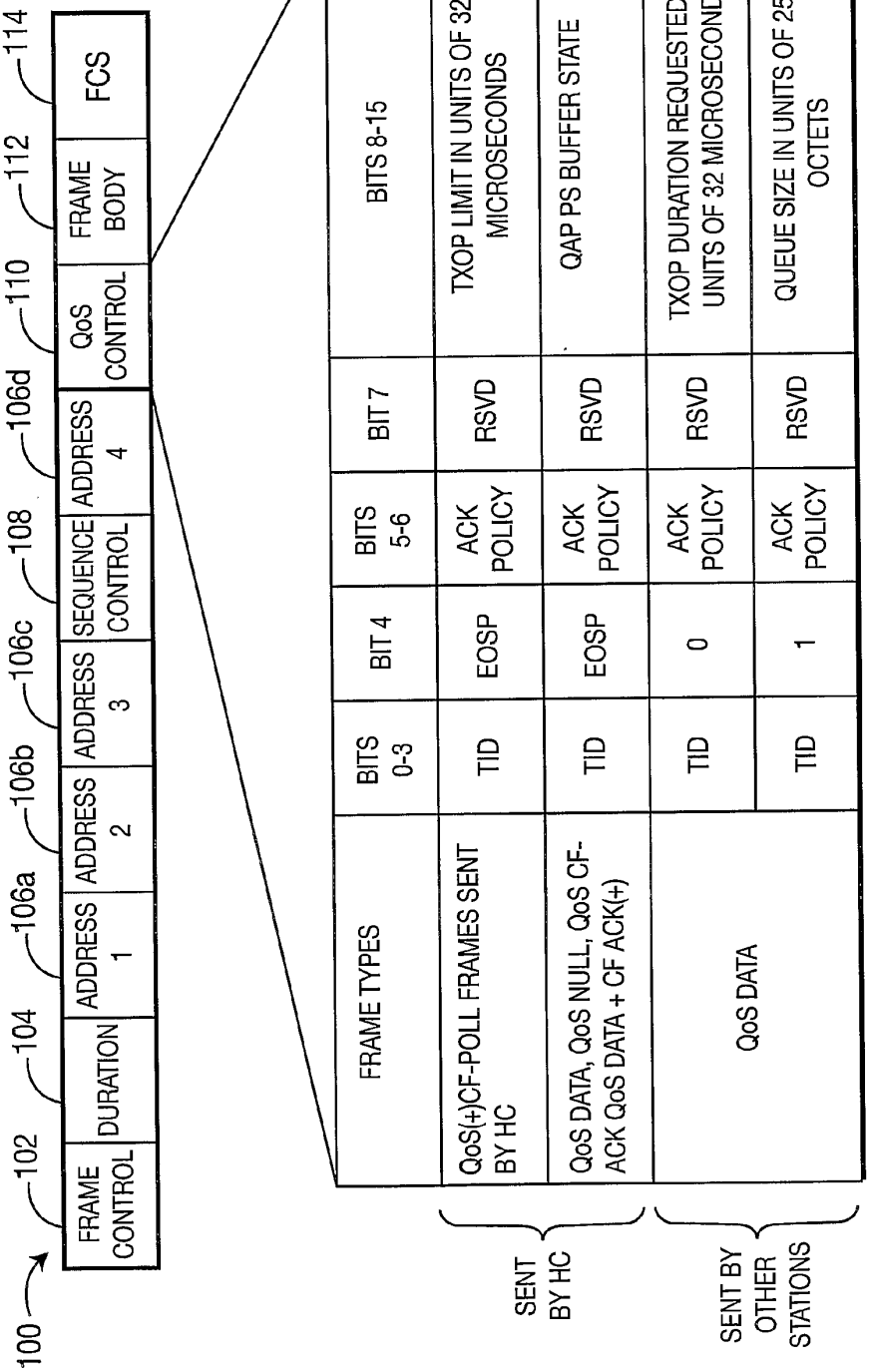


FIG. 1
PRIOR ART

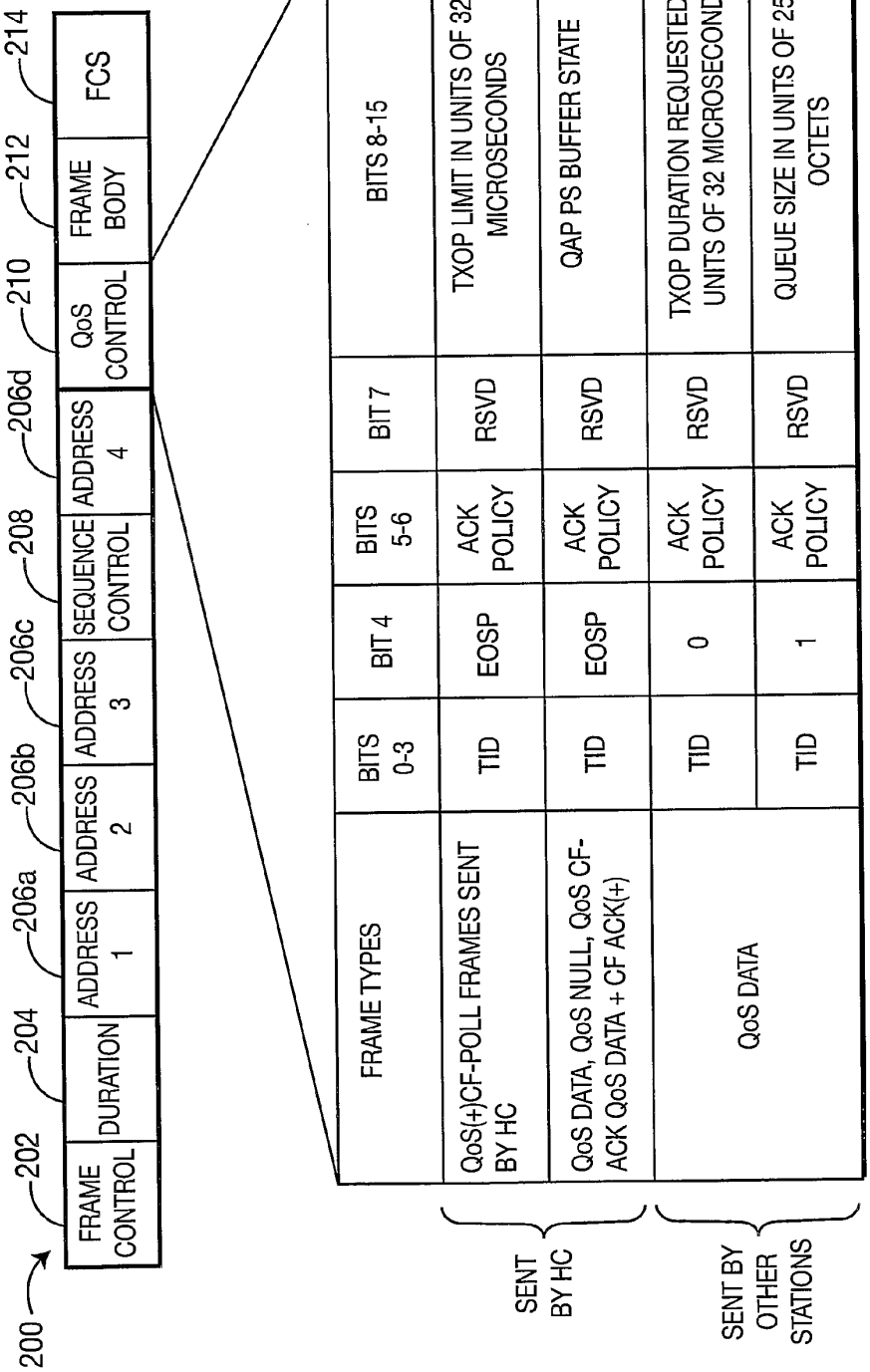

200
FRAME CONTROL
202
DURATION
204
ADDRESS 1
206a
ADDRESS 2
206b
ADDRESS 3
206c
SEQUENCE CONTROL
208
ADDRESS 4
206d
QoS CONTROL
210
FRAME BODY
212
FCS
214
FRAME TYPES
BITS 0-3
BIT 4
BITS 5-6
BIT 7
BITS 8-15
QoS(+)CF-POLL FRAMES SENT BY HC
TID
EOSP
ACK POLICY
RSVD
TXOP LIMIT IN UNITS OF 32 MICROSECONDS
QoS DATA, QoS NULL, QoS CF-ACK QoS DATA + CF ACK(+)
TID
EOSP
ACK POLICY
RSVD
QAP PS BUFFER STATE
QoS DATA
TID
0
ACK POLICY
RSVD
TXOP DURATION REQUESTED IN UNITS OF 32 MICROSECONDS
TID
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ACK POLICY
RSVD
QUEUE SIZE IN UNITS OF 256 OCTETS
SENT BY HC
SENT BY OTHER STATIONS

FIG. 2A

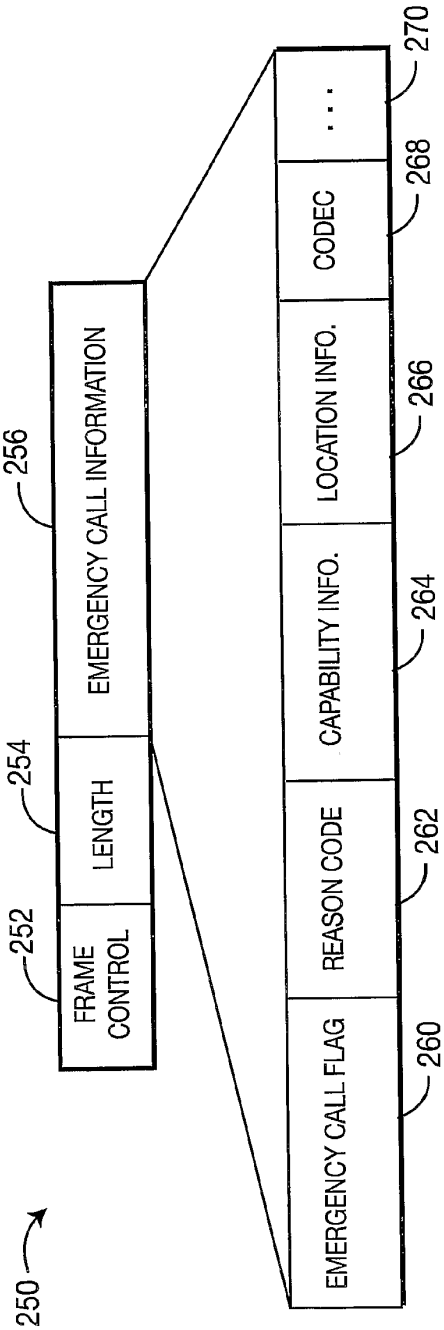


FIG. 2B

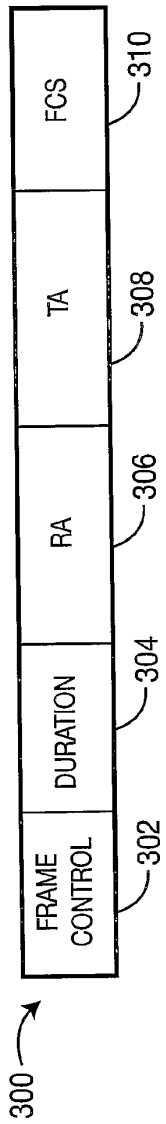


FIG. 3
PRIOR ART

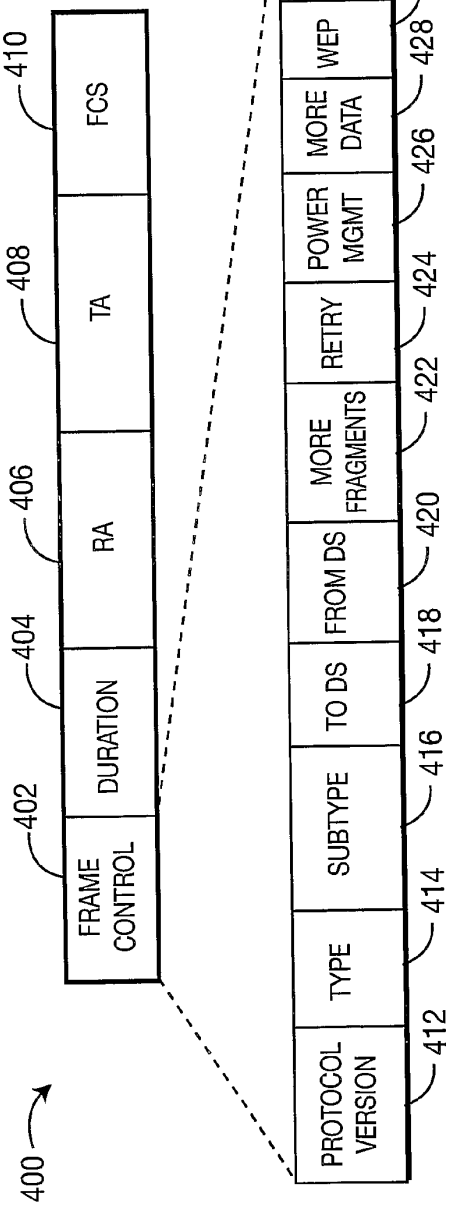


FIG. 4A

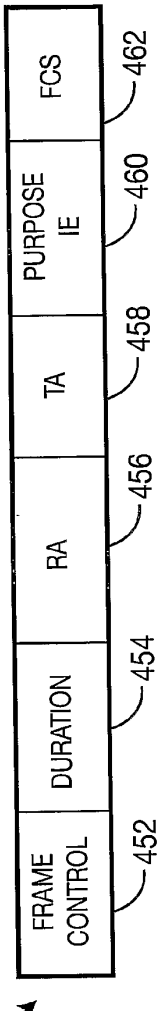


FIG. 4B

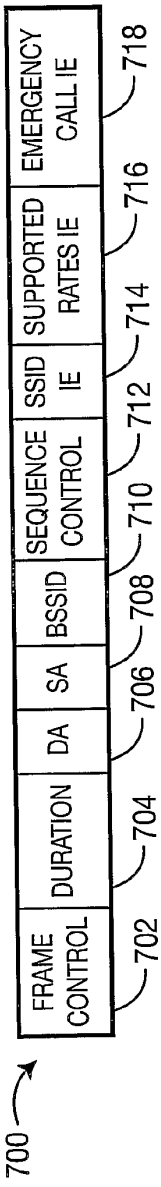
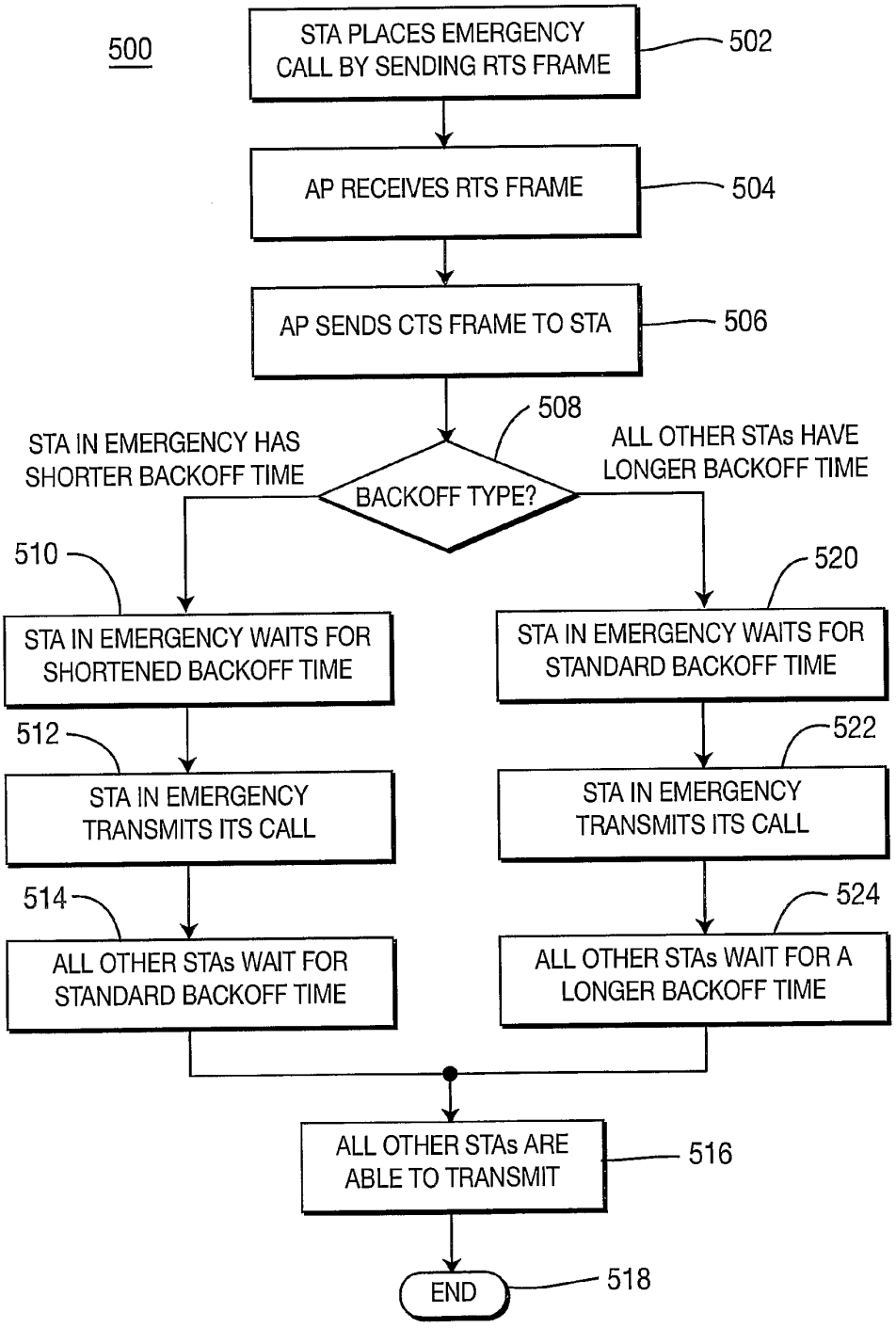


FIG. 7

FIG. 5


500
STA PLACES EMERGENCY CALL BY SENDING RTS FRAME
502
AP RECEIVES RTS FRAME
504
AP SENDS CTS FRAME TO STA
506
508
BACKOFF TYPE?
STA IN EMERGENCY HAS SHORTER BACKOFF TIME
ALL OTHER STAs HAVE LONGER BACKOFF TIME
510
STA IN EMERGENCY WAITS FOR SHORTENED BACKOFF TIME
512
STA IN EMERGENCY TRANSMITS ITS CALL
514
ALL OTHER STAs WAIT FOR STANDARD BACKOFF TIME
520
STA IN EMERGENCY WAITS FOR STANDARD BACKOFF TIME
522
STA IN EMERGENCY TRANSMITS ITS CALL
524
ALL OTHER STAs WAIT FOR A LONGER BACKOFF TIME
ALL OTHER STAs ARE ABLE TO TRANSMIT
516
END
518

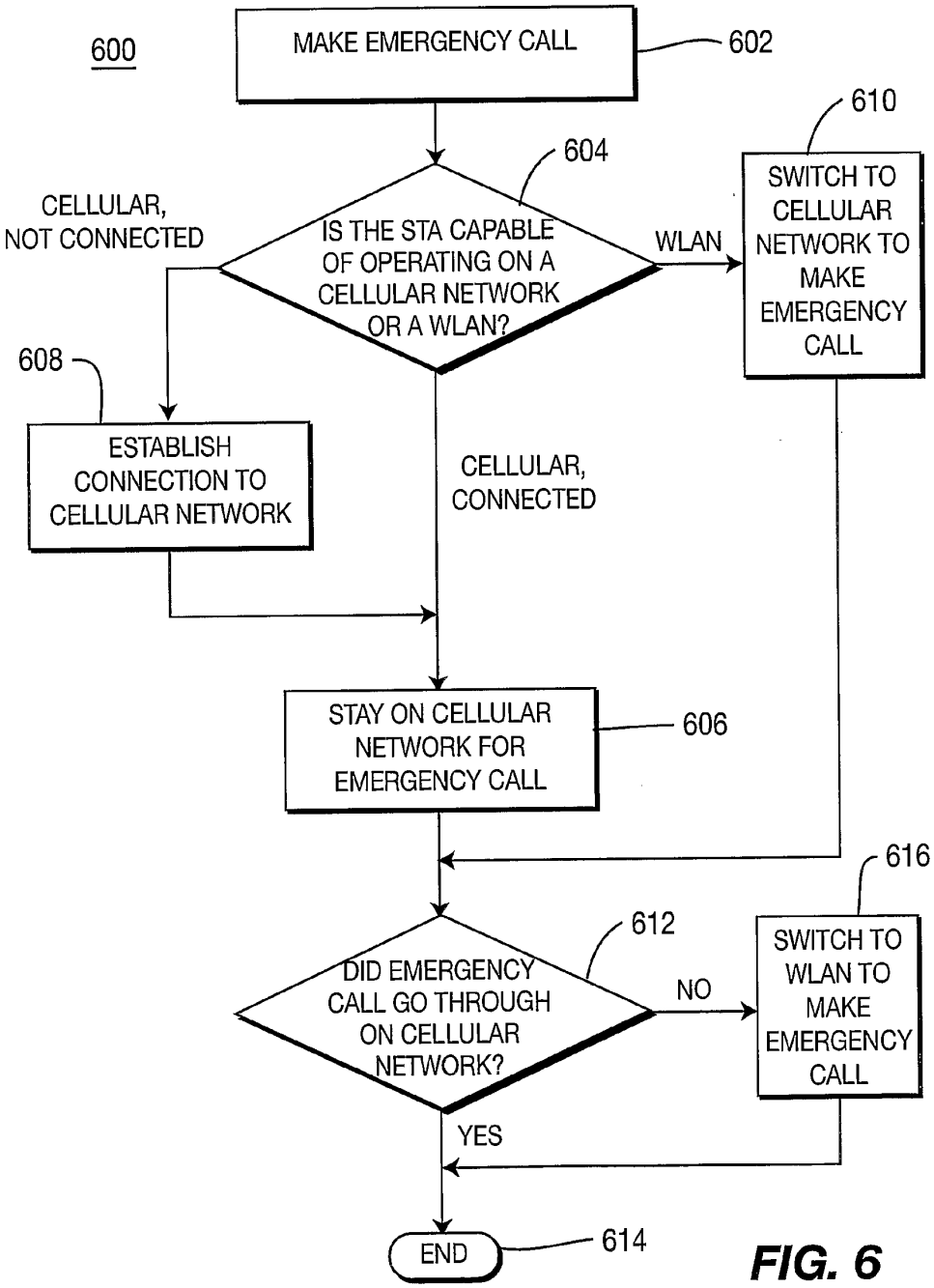

600
MAKE EMERGENCY CALL
602
610
604
CELLULAR, NOT CONNECTED
IS THE STA CAPABLE OF OPERATING ON A CELLULAR NETWORK OR A WLAN?
WLAN
SWITCH TO CELLULAR NETWORK TO MAKE EMERGENCY CALL
608
ESTABLISH CONNECTION TO CELLULAR NETWORK
CELLULAR, CONNECTED
STAY ON CELLULAR NETWORK FOR EMERGENCY CALL
606
616
612
DID EMERGENCY CALL GO THROUGH ON CELLULAR NETWORK?
NO
SWITCH TO WLAN TO MAKE EMERGENCY CALL
YES
END
614

FIG. 6

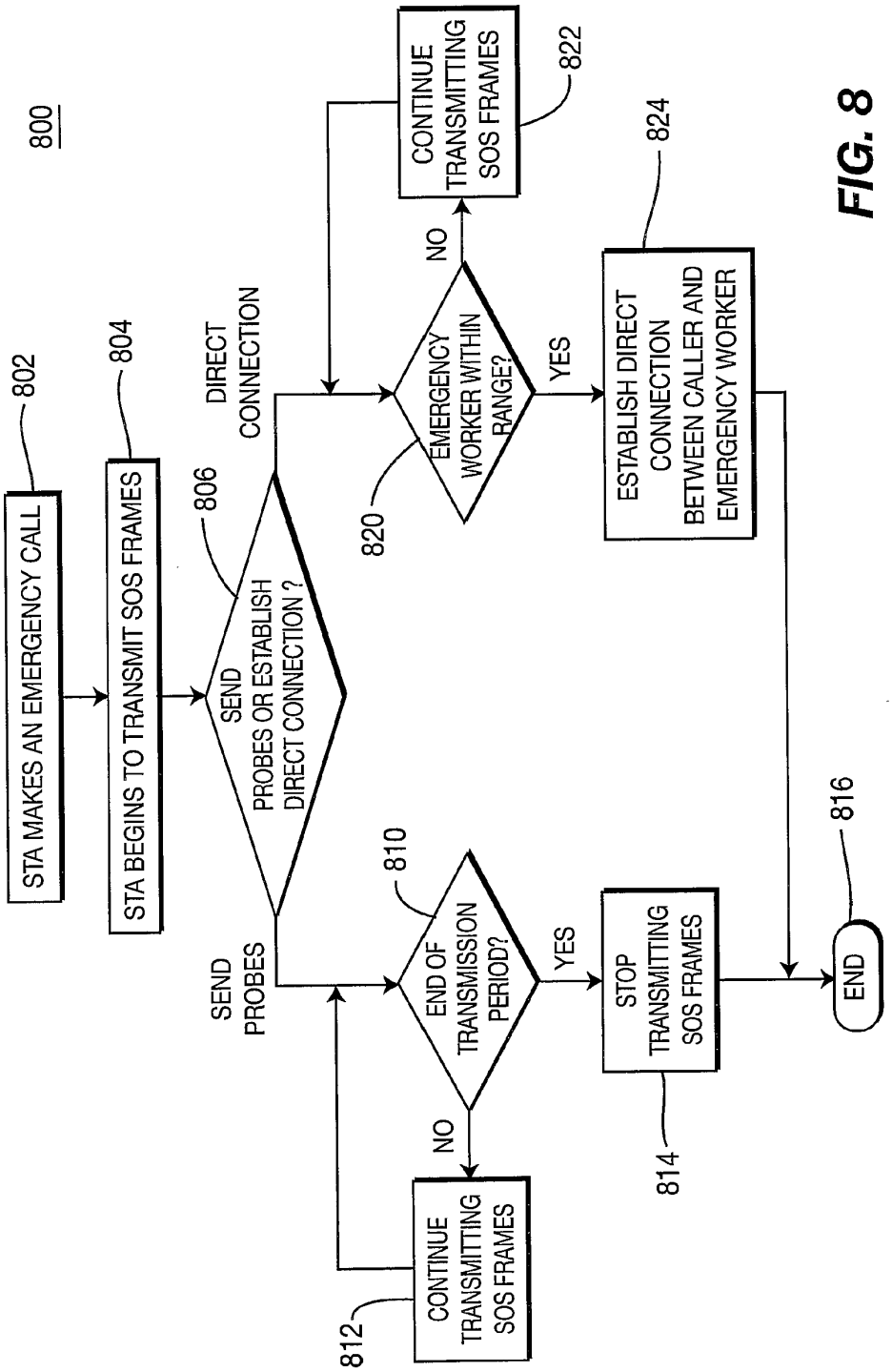

800
802
STA MAKES AN EMERGENCY CALL
804
STA BEGINS TO TRANSMIT SOS FRAMES
806
SEND PROBES OR ESTABLISH DIRECT CONNECTION ?
SEND PROBES
DIRECT CONNECTION
820
EMERGENCY WORKER WITHIN RANGE?
NO
822
CONTINUE TRANSMITTING SOS FRAMES
YES
824
ESTABLISH DIRECT CONNECTION BETWEEN CALLER AND EMERGENCY WORKER
810
END OF TRANSMISSION PERIOD?
NO
812
CONTINUE TRANSMITTING SOS FRAMES
YES
814
STOP TRANSMITTING SOS FRAMES
816
END

FIG. 8

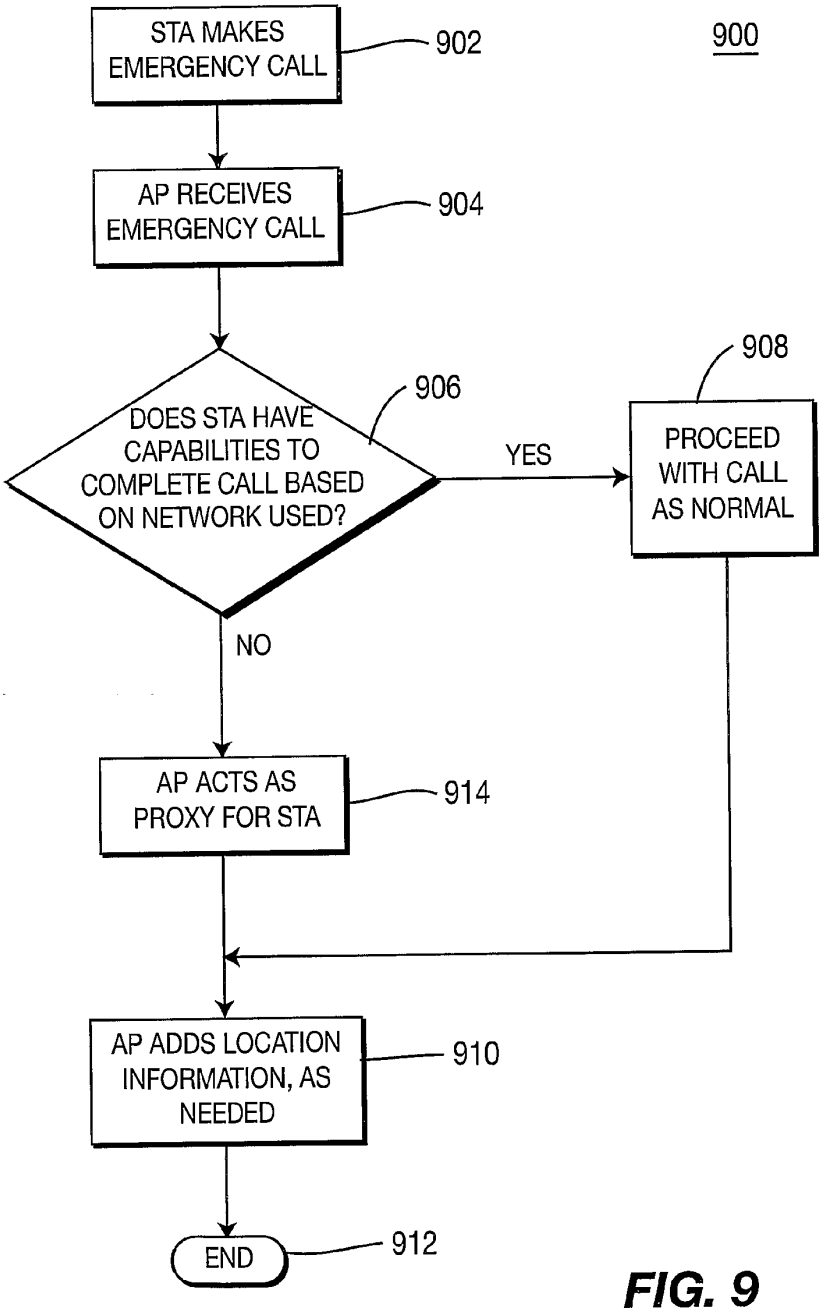

900
STA MAKES EMERGENCY CALL
902
AP RECEIVES EMERGENCY CALL
904
DOES STA HAVE CAPABILITIES TO COMPLETE CALL BASED ON NETWORK USED?
906
YES
PROCEED WITH CALL AS NORMAL
908
NO
AP ACTS AS PROXY FOR STA
914
AP ADDS LOCATION INFORMATION, AS NEEDED
910
END
912

FIG. 9

(19)대한민국특허청(KR)
(12) 공개특허공보(A)

(51) 。Int. Cl.[7]
H04L 12/28

(11) 공개번호 10-2005-0013872
(43) 공개일자 2005년02월05일

(21) 출원번호 10-2003-0052456
(22) 출원일자 2003년07월29일

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(54) 씨에스엠에이/씨에이 기반 무선 랜 시스템의 매체 접근제어 방법 및 그 방법을 수행하는 단말

요약

본 발명에 따른 CSMA/CA 기반 무선 랜 시스템의 매체 접근 제어 방법은 데이터를 송수신하고자 하는 임의의 단말이 DIFS를 IFS(Interframe Space)로 이용한 CSMA/CA 알고리즘을 사용하여 전송 경쟁에서 점유한 매체를 통해 요청 신호 프레임을 임의의 단말 또는 AP에 전송하는 단계와, 상기 요청 신호 프레임을 수신한 단말 또는 AP가 이 프레임을 송신한 단말에게 SIFS를 IFS(Interframe Space)로 하여점유한 매체를 통해 응답 신호 프레임을 전송하는 단계를 수행함으로써, 요청신호(Request)를 수신하는 단말(또는 AP)에게 경쟁이 없는 매체 접근 권한을 부여할 수 있다. 이에 따라 종래에 BSS를 구성하는 임의의 단말에 대해서 AP 와의 양방향 통신시 평균적으로 동일한 업스트림 지연, 다운 스트림 지연을 가짐으로 인해 다운 스트림의 지연증가로 인해 발생되던 서비스 품질 저하를 막을 수 있다.

대표도

도 10

색인어

DIFS, SIFS, 경쟁기반, AP, WLAN, IEEE 802.11, 매체접근

명세서

도면의 간단한 설명

도 1은 IEEE 802.11 규격에 정의된 DCF의 접근 제어 방식을 설명하기 위한 도면.

도 2는 DCF로 동작하는 인프라 스트럭쳐 모드의 무선 랜에 실시시간성 데이터인 음성 트래픽을 처리하는 단말이 연결되는 무선랜 VoIP 시스템의 한 예를 보여 주는 도면.

도 3은 ESS를 구성하는 임의의 BSS 내에 여러 대의 음성 단말이 연결되어 있을 때, AP 및 각 단말의 TX 큐로 유입되는 데이터 패킷을 보여 주는 도면.

도 4는 저부하 조건에서 매체들에 접근하는 각 단말들의 타이밍도.

도 5는 고부하 조건의 경우에 AP 와 각 단말들이 매체들을 공유하는 타이밍도.

도 6은 IEEE 802.11 표준의 MAC 프레임의 형식을 나타내는 도면.

도 7은 도 6에 도시된 프레임 제어 필드의 상세한 구성을 나타내는 도면.

도 8은 타입(type) 필드와 서브 타입(subtype) 필드의 조합을 나타내는 도면.

도 9는 도 8의 프레임에 본 발명에 따라 더 추가되는 서브 타입의 데이터 프레임들을 보여주는 도면.

도 10 내지 도 14는 본 발명에 따른 Request-Ack 교환에 의한 데이터 전송을 보여주는 타이밍도.

발명의 상세한 설명

발명의 목적

발명이 속하는 기술 및 그 분야의 종래기술

본 발명은 경쟁에 기반한 무선 랜 시스템 및 MAC(Medium Access Control) 프로토콜에 관한 것으로, 특히 두 단말간 양방향 통신시 경쟁 기반 요청신호(contention based request)와 경쟁 기반 응답신호(contention based acknowledgemet)의 교환 절차에 의해 데이터를 전송하여 두 단말이 동등한 전송 기회를 갖고 매체 접근 지연(medium access delay)을 줄이는 방법에 관한 것이다.

IEEE의 무선 랜 표준은 'Standard for Information technology- Telecommunications and information exchange between systems-Local and metropolitan area networks-Specific requirements-Part 11: Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) Specifications' 1999 Edition 을 따르고 있다.

이하에서는 줄여서 IEEE 802.11로 표기하도록 한다. IEEE 802.11 표준에는 무선 랜을 구성하는 물리 계층과 매체 접근 제어(Medium Access Control, MAC)에 관한 규정이 정의되어 있다.

MAC 계층은 공유 매체를 사용하는 단말 또는 장치가 매체를 이용/접근할 때 준수해야 할 순서(Order)와 규칙을 정의함으로써 효율적으로 매체의 용량을 이용하게 만든다. IEEE 802.11 는 Distributed Coordination Function(DCF)와 Point Coordination Function(PCF)라는 두 가지 접근 제어 방식(access mechanism)을 정의하였다.

PCF는 폴링(Polling)방식에 기반한 중앙 집중적인 매체 접근 제어 방식으로서 BSS를 관장하는 Point Coordinator (PC) 가 BSS 에 속하는 모든 단말들의 Medium Access 를 제어하는 방식이다. PCF mode 에서는 CFP 와 CP 가 번갈아 가면서 반복되며, CFP 구간에서는 PC 로부터 Poll 을 받은 단말만이 전송 기회를 가질 수 있다. 이 방식을 사용하면, PC 가 폴링 리스트(Polling List)에 따라 데이터를 보내고자 하는 단말에게 경쟁 없는(Contention-Free) 전송 기회를 부여할 수 있으므로, 무선 랜에서의 실시간 서비스가 가능하지만, PCF 구현의 복잡성, 매체의 비효율적 이용 등의 이유로 실제 상용화는 미미하다.

도 1은 IEEE 802.11 규격에 정의된 DCF의 접근 제어 방식을 설명하기 위한 도면이다.

DCF은 도 1에 도시된 바와 같이 IEEE 802.11 규격에 기본사항으로 정의된 접근 제어 방식으로 CSMA/CA라고 알려진 경쟁에 기반한 알고리즘을 사용하고 있다.

CSMA/CA 기반의 무선랜 시스템에서는 단말이 매체가 사용중인지를 검사하여 매체가 사용중인 경우 일정시간 기다렸다가 일정 시간후에 매체가 미사용중인 경우에 백오프 타임을 감소시킨다. 이와 같이 각 단말이 트래픽을 개시하기 위해 기다리는 일정 시간을 IFS(interframe space)라 한다. 도면에 도시된 바와 같이 MAC 프로토콜 트래픽에는 크게 세 가지의 IFS가 있다. DIFS는 DCF interframe space을 나타내며, PIFS는 PCF interframe space를 나타내며, SIFS는 Short interframe space을 나타낸다.

여기서는 DCF 방식을 사용하는 단말이 프레임을 보내는 예를 가지고 설명하도록 한다. DCF 방식을 사용하는 단말은 프레임을 보내기 전에 우선 매체가 사용 중인지를 검사한다. 만약 매체가 DIFS(DCF interframe space)보다 크거나 같은 시간 동안 미사용(Idle)상태이면, 프레임을 전송할 수 있게 된다.

이와 반대로 매체가 사용(busy) 중이면, 단말은 백오프 절차를 개시하게 되고 백오프 타이머의 값이 0으로 되면, 비로소 매체를 점유하여 프레임을 전송한다.

백오프 절차시에는 백오프 타이머(Backoff Timer)에 랜덤(random)한 백오프 타임값을 할당한다. 백오프 타임은 다음의 관계식을 따른다.

Backoff Time = random() * slottime

(random()= [0, CW] 구간에서 uniform 한 확률 분포를 갖는 랜덤한 정수)

(CW = Contention Window, CWmin <= CW <= CWmax)

백오프 타이머는 매체가 슬롯타임(slottime)동안 미사용(idle) 상태로 지속될 때마다 슬롯타임 만큼 감소하며, 매체가 어느 한 순간이라도 사용중(Busy)상태 가 되면, 감소를 중지한다.

백오프 타이머는 매체가 DIFS 동안 미사용(idle) 상태가 되고 난 후부터 다시 슬롯타임 만큼씩 감소할 수 있다. 이 때의 백오프 타임은 생성된 값이 아니라 매체 사용중 상태 바로 전에 백오프 타이머가 가졌던 값이다.

아울러, 임의의 단말에 설정된 백오프 타임은 매체가 미사용 상태에서 타임슬롯만큼 감소하게 되는데, 전송 경쟁에서 실패하여 재전송 경쟁을 수행해야 할 경우 이전 경쟁과정에서 감소된 값으로부터 타임슬롯만큼씩 감소하게 된다. 이렇게 하여 단말은 백오프 타이머가 0 이 되면 비로소 전송할 수 있다.

전송에 성공한 단말은 비록 큐가 비어있더라도, 즉 전송할 데이터가 없더라도 백오프 절차에 따라 백오프 타이머 랜덤한 백오프 타임을 할당한다. 이로 인해, 각 단말은 프레임 전송과 프레임 전송 사이에 반드시 한 번의 백오프 타임이 필요하다.

IEEE 802.11에서 에러(Error) 복구는 'positive acknowledgment scheme'을 이용한 재전송에 의해 가능하다. 에러 없이 프레임을 수신한 단말은 프레임 수신 후 SIFS 동안의 미사용(Idle) 상태가 지난 다음에 ACK 프레임을 보내게 되어 있다. 프레임을 송신한 단말은 ACK 프레임의 유무에 근거하여 자신이 전송한 프레임이 성공적으로 수신되었는지 여부를 알 수 있다.

DCF 는 Ad-hoc 구성이나, Infrastructure 구성의 무선 랜 어디에서나 사용할 수 있는 매체 접근(Medium access) 규칙이다. 폴링 방식에 비해 구현이 쉽고, 스케쥴링(Scheduling)과 같은 복잡한 계산을 해야 하는 PC도 필요로 하지 않으며, 굉장 히 유연한(Flexible) 특성이 있어서 매체가 이 타 단말에 의해 점유되지 않으면, 전송할 데이터가 많은 단말이 많은 대역을 사용할 수도 있다. 또한, 기본적으로 모든 단말에게 공평한 전송 기회를 부여할 수 있다.

공평성(Fairness)은 표준에서 정의된 백오프 절차에 의해서 이루어진다. 앞에서 언급한 바와 같이 모든 단말들은 최초 전송 경쟁에서 랜덤한 백오프 타임을 가져야 하며, 모두 똑같은 분배함수(distribution function)를 사용하기 때문에 경쟁에서 승리할 확률은 모두 같다. 만약, 임의의 단말이 전송 경쟁에서 지게 되면, 그 단말은 새로운 전송 경쟁에서는 지난 번 경쟁에서 감소되었던 백오프 타임을 사용하게 된다. 그렇게 때문에 새로운 경쟁에서는 여러 번 전송 기회를 갖지 못한 단말이 새로 백오프 타임이 정해진 단말, 즉 바로 전에 전송할 기회를 잡았던 단말에 비해 경쟁에서 승리할 확률이 높다. 결국 긴 시간 동안 관찰하였을 때, 각 단말은 동일한 전송기회를 갖게 된다.

모든 단말에게 공평한 전송 기회를 부여한다는 공평성(Fairness)은 각 단말에게 골고루 전송기회를 부여하여 특정 단말이 상당 시간 동안 지속적으로 데이터를 보내지 못하는 현상(Starving 현상)을 없애 주는 이점을 줄 수 있다. 그렇

지만, 음성 트래픽(Voice Traffic)과 같은 양방향의 실시간성 데이터를 다루는 단말에게는 원하지 않는 접근 지연(access delay)을 발생시킬 수 있다.

무선 랜에서 실시간성 데이터를 송수신하는 단말들은 보내고자 하는 데이터를 적절한 지연내에 전송하여야 하고, 필요한 데이터를 송신측 단말로부터 제한된 시간 내에 수신하여야 한다. 특히 양방향성을 갖는 음성 트래픽을 처리하는 단말의 경우, 제 때에 송신, 수신할 수 있도록 시스템이 구성되어야 한다.

한편, DCF는 기본적으로 단말 간 공평한 경쟁을 유도하기 때문에 BSS(Basic Service Set)에서 서비스를 받는 단말의 수가 많아지면 각 단말이 갖는 평균적인 접근 지연이 길어지며, 이것이 DCF 모드의 BSS에서 동시에 송,수신 서비스를 할 수 있는 실시간 단말의 수를 제한하는 요인이 된다.

도 2는 DCF로 동작하는 인프라 구조 모드(Infrastructure mode)의 무선 랜에 실시시간성 데이터인 음성 트래픽을 처리하는 단말이 연결되는 무선랜 VoIP 시스템의 한 예를 보여 주고 있다.

AP 내의 임의의 단말은 게이트 웨이(Gateway)를 통하여 외부의 인터넷(Internet)망에 연결된 VoIP 폰과 음성 정보를 주고 받을 수 있으며, 지역(Local)망을 구성하는 분배 시스템(Distribution System:DS)이 여러 AP 들과 게이트웨이를 연결시켜 준다.

도 3은 ESS(extended service set)를 구성하는 임의의 BSS 내에 여러 대의 음성 단말이 연결되어 있을 때, AP 및 각 단말의 TX 큐(queue)로 유입되는 데이터 패킷을 보여 준다.

음성 단말의 응용 계층(application layer)은 일정한 주기와 일정한 크기로 음성 패킷을 만들어 하위 계층으로 전송하는 것으로 가정하였다. 하위 계층으로 보내진 음성 패킷은 여러 프로토콜 계층을 거쳐 MAC으로 전달되며, 상위 계층으로부터 패킷을 받은 MAC은 수신한 패킷을 큐에 저장한다. MAC은 전송 기회를 얻게 되면, 큐에 저장된 데이터를 IEEE 802.11 frame 으로 만들에 AP에 전송한다.

한편, AP로부터 각 단말로의 전송은 약간 다르다. AP는 DS로부터 각 음성 단말로 전송하여야 할 모든 프레임들을 받게 된다. 이 때, AP는 한 번의 전송기회 당 하나의 단말에게만 전송을 할 수 있다.

각각의 음성 단말에서 생성되는 데이터가 T_codec의 주기로 단말의 TX 큐에 보내진다면, 각각의 음성 단말들은 T_codec당 한 번씩 매체에 접근하여 할 것이고, 음성 단말의 전송 주기 T_upstream는 T_codec이 될 것이다. 그런데, DS 외부에 위치하고 있는 단말의 어플리케이션(application) 또한 BSS 내에 위치한 음성 단말의 어플리케이션과 동일하다고 쉽게 가정할 수 있으므로, DS 내에서 서비스 중인 음성 단말의 수가 N 개라면, DS로부터 AP(의 TX 큐)에 도착하는 프레임의 도착 주기인 T_from_ds는 T_from_ds = T_codec/N 이 될 것이고, AP는 매체들이 허락하는 한 T_codec/N 당 한 번씩 매체들에 접근하려고 할 것이다. 즉, AP 의 전송주기를 T_ap라 하면, 여건이 허락하는 한 T_ap = T_from_ds = T_codec/N 가 되도록 전송을 시도할 것이다. 이 때, 임의의 단말이 AP 로부터 필요한 음성 패킷을 수신받는 주기를 나타내는 T_downstream은 T_downstream = T_ap * N 이 된다.

정상적인 서비스를 위해 임의의 음성 단말이 전송시 가질 수 있는 최대 허용 접근 지연은 앞의 가정에 의해 AP가 해당 음성 단말에게 전송 시 가질 수 있는 최대 허용 접근 지연과 동일하게 되고, 이를 T_permitted라고 하자. 그러면, 정상적인 서비스를 위해서 다음의 '음성 통화 서비스 기준'이 만족되어야 한다.

T_upstream < T_permitted

T_downstream = T_ap * N < T_permitted

일반적인 경우 T_permitted > k * T_codec 을 만족한다.

여기서 k >= 1 이다.

<저부하 조건에서의 매체 점유>

저부하 조건(Low Load condition)에서의 매체 점유에 대하여 살펴보도록 한다.

매체를 점유하고자 하는 단말의 갯수가 아주 적고, 그 단말들이 사용하는 매체의 대역폭이 매체가 제공할 수 있는 최대 대역폭보다 상당히 작을 경우, 즉 매체들이 저부하 조건일 경우에 AP 및 각 음성 단말은 데이터가 큐에 도착하는 주기보다 짧은 접근 지연을 갖게 될 것이다.

따라서, 새로운 음성 패킷이 TX 큐로 입력되기 전에 현재의 음성 패킷이 MAC 프레임에 실려 전송되어 하나의 음성 패킷당 하나의 MAC 프레임이 사용되므로, 다음의 조건을 만족하게 된다.

T_upstream[Low_load] = T_codec

T_downstream[Low_load] = T_ap[Low_load] * N = T_from_ds * N = T_codec

즉, T_upstream[Low_load] = T_downstream[Low_load] < T_permitted

도 4는 저부하 조건에서 매체들에 접근하는 각 단말들의 타이밍도이다.

도 4를 참조하면, 각각의 음성 단말이 수신하는 음성 데이터는 모두 AP에 의해 전송되므로, AP 는 임의의 음성 단말보다 N 배 더 많이 매체에 접근한다. 여기서, N 은 AP 와 통신 중인 음성 단말 수를 나타낸다.

물론, T_upstream < T_permitted 이고, T_downstream = T_ap * N < T_permitted가 되기 때문에, 음성 단말들은 허용가능한 접근 지연을 가지면서 실시간 데이터를 전송하거나 수신할 수 있는 상황이다. 매 번의 MAC 프레임 전송에 대해 ACK 프레임이 뒤따르고 있다.

<고부하 조건에서의 매체 점유>

다음으로 고부하 조건(High Load condition)에서의 매체 점유에 대하여 설명하도록 한다.

매체들을 점유하고자 하는 단말의 갯수가 아주 많고, 그 단말들이 사용하는 매체들의 대역폭이 매체들이 제공할 수 있는 최대 대역폭중에 상당한 부분을 차지하는 경우 즉, 고부하 조건일 경우에 접근 지연이 증가한다.

즉, 전송 경쟁에 참여하는 단말의 갯수가 많아지고, 매체의 대역폭 사용률이 증가하게 되면, 단말 간 전송경쟁이 심화되어 각 단말 (AP 포함) 이 겪는 접근 지연이 증가하게 된다. 접근 지연이 증가하게 되면, 각 음성 단말 (AP)의 TX 큐에는 응용 계층(DS)로부터 온 다수의 음성 패킷이 쌓이게 된다. 이러한 상황이 되면, DCF 의 공평성(Fairness)이 갖는 특성으로 인해, AP를 포함한 모든 음성 단말은 단위 시간당 동일한 전송기회를 갖는 방향으로 매체 접근의 순서가 정해진다.

즉, T_ap[Low_load] = T_upstream[Low_ load]/N 에서 T_ap[High_load] ≒ T_upstream[High_load]로 변화된다. 그러면, 네크워크에 속해있는 각 단말의 업스트림(Upstream) 주기와 다운 스트림(Downstream) 주기와의 관계는 다음과 같이 바 뀌게 된다.

T_downstream [High_load] = T_ap [High_load] * N≒ T_upstream [High_load] * N

위의 식에서 보듯이 고부하 조건에서 T_downstream > T_upstream이 되며, 이는 T_upstream < T_permitted 가 될 수 있지만, T_downstream > T_permitted 이 되어, 음성 통화 서비스가 제대로 동작하지 않을 수 있다는 것을 의미한다.

즉, 고부하 조건의 경우, 다운 스트림의 접근 지연이 업스트림의 접근 지연보다 크게 되어 다운 스트림 지연에 의해 실시간 서비스가 제한된다. 특히, 각 단말이 느끼는 다운 스트림 지연은 AP 의 전송주기 (=T_ap) 의 N 배가 되므로, AP 에 연계된 Voice 단말수 (=N) 이 클수록 이러한 현상은 심화된다.

도 5는 고부하 조건의 경우에 AP 와 각 단말들이 매체들을 공유하는 타이밍도이다. 도면에서는 단순성을 위하여 ACK 프레임이 생략되었다. 음성 단말 뿐만 아니라, 일반 데이터를 송신하는 단말도 BSS내에 존재하는 것으로 가정하였다.

업스트림의 주기와 다운 스트림의 주기가 같으려면, AP는 각 단말이 갖는 전송 기회의 1/N 배에 해당하는 전송주기를 가져야 하지만, 극심한 전송경쟁으로 야기된 공정성 특성에 의해 각 단말의 업스트림 주기보다 다운 스트림 주기가 월등히 길게 된다. 이에 따라 실시간 서비스가 이루어질 수 없는 문제점이 있다.

발명이 이루고자 하는 기술적 과제

본 발명의 목적은 이러한 문제점을 해결하기 위한 것으로, 요청신호(Request)와 응답신호(ACK)의 교환에 의해 요청 프레임을 받는 쪽 단말(AP 포함)에게 경쟁이 없는 매체 접근 권한을 부여하여 BSS를 구성하는 임의의 단말에 대해서

AP와의 양방향 통신시 평균적으로 동일한 송, 수신 지연과 송, 수신의 기회를 갖게 하는 CSMA/CA 기반 무선 랜 시스템의 매체 접근 제어 방법 및 그 방법을 수행하는 단말을 제공하는데 그 목적이 있다.

발명의 구성 및 작용

이러한 목적을 달성하기 위한 본 발명의 일측면에 따르면, 데이터를 송수신하고자 하는 임의의 단말이 DIFS를 IFS(Interframe Space)로 이용한 CSMA/CA 알고리즘을 사용하여 전송 경쟁에서 점유한 매체를 통해 요청 신호 프레임을 임의의 단말 또는 AP에 전송하는 단계와, 상기 요청 신호 프레임을 수신한 단말 또는 AP가 이 프레임을 송신한 단말에게 SIFS를 Interframe Space로 하여 점유한 매체를 통해 응답 신호 프레임을 전송하는 단계를 수행하는 CSMA/CA 기반 무선 랜 시스템의 매체 접근 제어 방법을 제공한다.

본 발명의 다른 측면에 따르면, 요청신호 프레임을 전송하고자 하는 경우, 해당 프레임의 프레임 제어 필드에 해당 프레임이 요청 신호 프레임을 표시하기 위한 값으로 코딩하는 단계와, DIFS를 Interframe Space로 이용한 CSMA/CA 알고리즘을 사용하여 전송 경쟁에서 점유한 매체를 통해 상기 요청 신호 프레임을 임의의 단말 또는 AP에 전송하는 단계와, 상기 임의의 단말 또는 AP로부터 임의의 프레임이 수신되는 경우, 수신된 프레임의 프레임 제어 필드를 분석하는 단계와, 분석결 과에 따라 해당 프레임을 전송한 단말 또는 AP에 응답 신호 프레임을 전송하고자 하는 경우, 해당 프레임의 프레임 제어 필드에 해당 프레임이 응답 신호 프레임을 표시하기 위한 값으로 코딩하는 단계와, SIFS를 Interframe Space로 하여 점유한 매체를 통해 상기 응답 신호 프레임을 임의의 단말 또는 AP에 전송하는 단계를 포함하는 CSMA/CA 기반 무선 랜 시스템에서 단말의 매체 접근 방법을 제공한다.

이하, 첨부된 도면을 참조하여 본 발명을 상세히 설명하도록 한다.

도 6은 IEEE 802.11 표준에 정의된 MAC 프레임의 형식을 나타낸다.

도시된 바와 같이, 본 발명에 따른 각 프레임들은 모두 IEEE 802.11에서 정의한 MAC 프레임 타입과 동일한 형식(Format)을 사용하며, 이에 따라 기존의 BSS 시스템과 호환이 보장되어 쉽게 접목시킬 수 있다. 이와 같이 본 발명에 따른 각 프레임들의 타입은 기본적으로는 IEEE 802.11에서 정의한 데이터 타입을 따른다.

도 6을 참조하면, IEEE 802.11 표준에 정의된 MAC 프레임은 MAC 헤더와, 프레임 타입에 특정된 정보를 가지는 프레임 바디(frame body)와, 프레임 체크 시퀀스(frame check sequence:FCS)로 이루어진다.

그중에서, MAC 헤더는 프레임 제어(frame control) 필드, 듀레이션(duration) 필드, 주소(address) 필드, 시퀀스 제어(sequence control) 필드로 이루어진다.

이중에서 프레임 제어 필드는 그 프레임의 특성을 표시하는 필드로서 프레임 필드를 분석하면, 프레임의 성격, 전력 관리 등에 관한 여러 가지 정보를 알 수 있다. 따라서, AP와 단말은 서로간에 주고 받는 프레임중에서 프레임 제어 필드를 분 석하여 자신에게 프레임을 전송한 상대방의 상태를 알 수 있다.

도 7은 도 6에 도시된 프레임 제어 필드의 상세한 구성을 나타낸다.

도 7을 참조하면, 프레임 제어 필드는 프로토콜 버전(protocol version) 필드, 타입(type) 필드, 서브 타입(subtype) 필드, (To DS) 필드, (From DS) 필드, 추가 분할(More Fragments) 필드, 재시도(Retry) 필드, 전력 관리(Power management) 필드, 추가 데이터(More Data) 필드, WEP(Wired Equipment Privacy) 필드, 순서(Order) 필드로 이루어진다.

이러한 필드중에서 타입(type) 필드는 2비트로 이루어져 있고, 서브 타입(subtype) 필드는 4비트로 이루어져 있다. 타입(type) 필드와 서브 타입(subtype) 필드는 그 프레임의 성격을 나타낸다. 즉, 각 프레임의 성격은 크게 제어(control) 프레임, 데이터(data) 프레임, 관리 프레임(management)으로 구분된다.

도 8은 타입(type) 필드와 서브 타입(subtype) 필드의 조합을 나타낸다.

도 8을 참조하면, 타입(type) 필드와 서브 타입(subtype) 필드에 설정된 값에 따라, 각각의 프레임의 어떠한 기능을 수행하는 프레임인지를 알 수 있다.

그중에서, 타입(type) 필드의 값이 '10'이면 데이터 프레임을 알 수 있다. 아울러, 서브 타입(subtype) 필드의 값이 '1000 -1111' 인 경우는 아직 미사용인 것을 알 수 있다. 따라서, 본 발명에서는 서브 타입의 필드값중에서 아직 미사용인 값을 정의하여 요청 신호(Request)와 응답신호(Ack)의 교환에 사용하는 것이다.

따라서, 도시된 바와 같이 요청 신호(Request)와 응답신호(Ack)를 교환하는 절차중에서 도면에 도시된 규격을 따름과 아울러, 도시되지 않는 Data + CB-Request, CB-Request (no data), Data + CB-Ack, CB-Ack (no data)의 4가지의 값을 더 정의하여 사용하는 것이다.

도 9는 본 발명에 따라 도 8의 프레임에 더 추가되는 서브 타입의 데이터 프레임들을 보여주고 있다.

도 9를 참조하면, 서브 타입의 값을 설정하여 Data + CB-Request, CB-Request (no data), Data + CB-Ack, CB-Ack (no data)의 4가지 값을 추가하였다. 여기에서, 서브 타입의 값은 차례대로 1000, 1001, 1010, 1011로 설정되어 있다. 그러나, 이 값들은 임의로 결정된 것으로 한 것으로, 도면에 도시된 바에 국한되지 않고 필요에 따라 얼마든지 변경하여 설정할 수 있다.

본 발명에서는 Ad-hoc 구성, 인프라 스트럭쳐(Infrastructure) 구성을 가지는 무선 랜에서 각 프레임들은 다음과 같은 운용 원칙을 규정한다.

먼저, Data + CB-Request 프레임, CB-Request (no data) 프레임은 AP를 제외한 모든 단말(Station)에 의해 전송된다.

다음으로, Data + CB-Ack 프레임, CB-Ack (no data) 프레임은 AP를 포함한 모든 단말에 의해 전송된다.

따라서, AP가 사용되는 BSS에서는 단말만이 Data + CB-Request 프레임과 CB-Request (no data) 프레임을 전송할 수 있다.

아울러, 본 발명에 따른 요청 신호(Request)와 응답신호(Ack)의 교환 방식은 다음과 같은 절차를 따른다.

먼저, 경쟁 기반의 무선 랜 시스템에서 Request-Ack 교환 방식을 이용하여 데이터를 송수신하고자 하는 단말은 시스템에서 규정한 경쟁 방법에 의해 Data + CB-Request 프레임 또는 CB-Request (no data) 프레임을 원하는 단말 또는 AP에 전송한다.

IEEE 802.11에 기반한 무선 랜에서 Request 프레임을 전송하고자 하는 단말은 여타 데이터 프레임과 마찬가지로 DIFS를 Interframe Space로 이용한다.

그다음, Data + CB-Request 프레임 또는 CB-Request (no data) 프레임을 수신한 단말 또는 AP 는 이 프레임을 송신한 단말에게 Data + CB-Ack 프레임 또는 CB-Ack (no data) 프레임을 전송한다.

이 때, Data + CB-Ack 프레임 또는 CB-Ack (no data) 프레임을 전송하는 단말은 수신한 프레임의 Frame Check Sequense(FCS)가 맞으면, SIFS 동안 매체가 미사용(Idle) 상태임을 확인한 다음 곧바로 전송한다. 이때, SIFS를 사용하는 이유는 가장 짧은 IFS를 사용함으로써 다른 단말과의 전송 경쟁없이 매체에 접근할 수 있도록 하기 위해서이다.

그 다음, Data + CB-Request 프레임 또는 CB-Request (no data) 프레임을 전송한 단말은 프레임 전송 후 SIFS 기간이 지나도록 프레임의 목적지 단말로부터 아무 반응을 받지 못하면, 전송 실패로 간주하고 DCF 에 정의되어 있는 Exponential Random Backoff 절차에 따라 Contention Window (CW)를 증가시켜야 한다.

이어, Data + CB-Ack 프레임을 수신한 단말은 수신한 프레임의 FCS 가 맞으면, SIFS동안 기다렸다가 이 프레임을 송신한 단말에게 CB-Ack 프레임을 전송한다.

한편, Data + CB-Ack 프레임을 송신한 단말은 프레임 전송 후 SIFS 기간이 지나도록 프레임의 목적지 단말로부터 아무런 응답신호를 수신하지 못하면, 전송 실패로 간주하고 Request-Ack 절차를 끝낸다. 단, 이 때는 CW를 증가시키지 않는다.

이와 같이, Request-Ack 교환은 Data + CB-Request 프레임 또는 CB-Request 프레임에 의해 시작되며, 이 프레임의 전송은 철저하게 경쟁에 기반한 CSMA/CA 알고리즘에 기반하므로, PCF 에서와 같이 특별한 관리를 위한 포인트 코디네이터(Point Coordinator) 가 필요하지 않다. 또한, Request-Ack 교환 절차는 CSMA/CA 알고리즘을 준수하기만 하면 언제든지 개시할 수 있으며, BSS 내에서 Request-Ack 방식을 지원하는 단말과 그렇지 않은 단말이 혼재해 있어도 무관하다.

왜냐하면, 본 발명에서 사용하는 MAC 프레임의 형식은 기본적으로 IEEE 802.11 표준에 정의된 규격을 따르고, 프레임중에서 기존에 미사용중인 서브 타입 필드를 본 발명에 따른 Request-Ack 교환 절차에 이용하기 때문이다. 즉,

BSS내에 본 발명에 따른 Request-Ack 방식을 지원하는 단말에 대하여 본 발명에 따른 매체 접근 절차를 수행하고 본 발명에 따른 Request-Ack 방식을 지원하지 않는 단말에 대하여는 종래의 절차에 따라 매체 접근 절차를 수행하면 된다.

한편, 본 발명에 따른 Request-Ack 방식을 지원하는 단말들은 요청신호 프레임을 전송하고자 하는 경우, 해당 프레임의 프레임 제어 필드에 해당 프레임이 요청 신호 프레임을 표시하기 위한 값으로 코딩한다.

단말은 DIFS를 IFS(Interframe Space)로 이용한 CSMA/CA 알고리즘을 사용하 여 전송 경쟁에서 점유한 매체를 통해 상기 요청 신호 프레임을 임의의 단말 또는 AP에 전송한다.

한편, 임의의 단말 또는 AP로부터 임의의 프레임이 수신되는 경우, 수신된 프레임의 프레임 제어 필드를 분석하고, 그 분석결과에 따라 해당 프레임을 전송한 단말 또는 AP에 응답 신호 프레임을 전송하고자 하는 경우, 해당 프레임의 프레임 제어 필드에 해당 프레임이 응답 신호 프레임을 표시하기 위한 값으로 코딩한다.

코딩이 이루어지면, 단말은 SIFS 를 Interframe Space로 하여 점유한 매체를 통해 상기 응답 신호 프레임을 임의의 단말 또는 AP에 전송한다.

도 10 내지 도 14는 Request-Ack 교환에 의한 데이터 전송을 보여주는 타이밍도이다. 도면에서 가로축의 위쪽은 단말의 동작을 나타내며, 가로축의 아래쪽은 AP의 동작을 나타낸다.

도 10 내지 도 13에서 보여주는 바와 같이 Request-ACK 교환에 의한 전송은 Request frame 을 송신하는 단말이 목적지 단말 또는 AP 로 전송할 Data 를 보유하고 있는지의 유무와 Request frame 을 수신하는 단말 또는 AP 가 송신지 단말로 전송할 Data 를 보유하고 있는지의 유무에 따라 4가지 경우의 수를 갖는다. 도 10은 Request frame 을 전송하는 단말과 수신하는 단말 또는 AP 가 모두 전송할 Data 를 보유하고 있는 경우에 일어나는 경우를 보여주며, 도 11은 Request frame 을 전송하는 단말은 Data 를 보유하고 있으나, 수신하는 단말 또는 AP 는 전송할 Data 는 없고 단지 수신한 Data 에 대한 ACK 만 전송하는 경우를 보여준다. 도 12는 Request frame 을 전송하는 단말은 Data 를 보유하고 있지 않으나, 수신한 단말 또 는 AP 는 전송할 Data 가 있는 경우이며, 도 13은 Request frame 을 송신하는 단말과 수신하는 단말 또는 AP 모두 전송할 data 가 없는 경우를 보여준다.

이와 같이 Data + CB-Request 또는 CB-Request(no data) 프레임을 수신한 AP는 SIFS 후 곧바로 Data + CB-Ack를 전송함으로써 경쟁없이 매체에 접근하고 있다.

또한 CB-Request와 CB-Ack교환을 이용한 단말이 갖는 송신 기회 및 수신 기회는 동일하기 때문에 도 14에서 볼 수 있는 바와 같이 업스트림 주기 및 다운 스트림 주기는 평균적으로 동일함을 알 수 있다. 단, 여기서 송신 기회 및 수신 기회가 동일하기 위해서는 AP가 Request-Ack 방식을 이용하는 단말에 대해서 Request를 받기 전에는 먼저 데이터를 전송하지 않는다고 가정하였다. 이러한 가정이 유효하기 위해서는 AP에서 Request-Ack 방식을 지원하는 단말과 통신할 때는 오직 Request-Ack 절차에 의해서만 데이터의 송,수신이 발생한다는 단말과 AP 간의 상호약속이 필요하다. 그렇지 않을 경우, AP 가 DCF 모드에서 데이터 프레임을 이용하여 Request-Ack 방식을 지원하는 단말에게 데이터를 전송할 수 있으므로 단말입장에서 볼 때 수신 횟수가 송신 횟수보다 많을 수 있다. 본 발명에서는 위에서 언급한 AP 와 단말간의 상호약속에 대해서는 설명을 생략하기로 한다.

Request-Ack 방식의 또 다른 특징은 기존의 IEEE 802.11 DCF 방식과 비교해서 단말과 AP 간 또는 단말과 단말간의 데이터 교환시 필요한 경쟁 횟수 및 상호 교환하는 프레임의 수가 감소한다는 것이다. 이에 따라 오버헤드(Overhead)가 줄어듦으로써 무선 대역폭을 효율적으로 사용할 수 있다.

예를 들어 AP 와 단말이 한 번씩 서로에게 데이터를 전송한다고 가정해 보면, 기존의 DCF의 경우에는 한 번의 데이터 전송시 한번의 경쟁 구간 + Data 프레임 + SIFS + Ack 프레임이 필요하므로, 총 2 번의 경쟁 구간과 2 * (Data Frame + SIFS + Ack Frame) 이 필요하다.

이에 반하여, 본 발명에서 제안한 Request-Ack 방식의 경우에는 한 번의 경쟁 구간과 (Data + CB-Request Frame) + (Data + CB-Ack Frame) + CB-Ack Frame + 2SIFS 이 필요할 뿐이다.

이상에서 설명한 본 발명은 본 발명이 속하는 기술분야에서 통상의 지식을 가진 자에 있어 본 발명의 기술적 사상을 벗어나지 않는 범위내에서 여러 가지 치환, 변경이 가능하므로 전술한 실시예 및 첨부된 도면에 한정되는 것이 아니다.

발명의 효과

본 발명에 의하면, 먼저 요청신호(Request)를 수신하는 단말(또는 AP)에게 경쟁이 없는 매체 접근 권한을 부여할 수 있다. 이에 따라 종래에 BSS를 구성하는 임의의 단말에 대해서 AP 와의 양방향 통신시 평균적으로 동일한 업스트림 지연, 다운 스트림 지연을 가짐으로 인해 다운 스트림의 지연증가로 인해 발생되던 서비스 품질 저하를 막을 수 있다.

또한, 단말에서 운영되는 어플리케이션이 필요로 하는 데이터의 수신을 수동적으로 기다리는 것이 아니라 상대 단말 또는 AP 에게 능동적으로 요청할 수 있고, 단말과 AP 간 또는 단말과 단말간의 데이터 교환시 필요한 경쟁 횟수 및 상호 교환 하는 프레임 수를 감소시켜 충돌과 오버 헤드로 인한 쓰루풋(Throughput)의 저하를 줄일 수 있다.

(57) 청구의 범위

청구항 1.
데이터를 송수신하고자 하는 임의의 단말이 DIFS를 IFS(Interframe Space)로 이용한 CSMA/CA 알고리즘을 사용하여 전송 경쟁에서 점유한 매체를 통해 요청 신호 프레임을 임의의 단말 또는 AP에 전송하는 단계와,

상기 요청 신호 프레임을 수신한 단말 또는 AP가 이 프레임을 송신한 단말에게 SIFS를 IFS(Interframe Space)로 사용하여 점유한 매체를 통해 응답 신호 프레임을 전송하는 단계를 수행하는 CSMA/CA 기반 무선 랜 시스템의 매체 접근 제어 방법.

청구항 2.
제 1항에 있어서, 상기 요청 신호 프레임은,

요청 신호만을 포함하는 프레임이거나, 요청신호와 데이터를 포함하는 프레임중의 하나인 CSMA/CA 기반 무선 랜 시스템의 매체 접근 제어 방법.

청구항 3.
제 1항에 있어서, 상기 응답 신호 프레임은,

응답 신호만을 포함하는 프레임이거나, 응답신호 및 데이터를 포함하는 프레임중의 하나인 CSMA/CA 기반 무선 랜 시스템의 매체 접근 제어 방법.

청구항 4.
제 1항에 있어서,

상기 요청 신호 프레임을 전송한 단말은 프레임 전송 후 SIFS 기간이 지나도록 프레임의 목적지 단말로부터 응답신호를 수신하지 못하는 경우, 전송 실패로 간주하고 DCF에 정의되어 있는 익스포넨셜 랜덤 백오프 절차에 따라 컨텐션 윈도우(Contention Window:CW)를 증가시키는 단계를 더 포함하는 CSMA/CA 기반 무선 랜 시스템의 매체 접근 제어 방법.

청구항 5.
제 3항에 있어서, 상기 응답 신호 프레임이 응답신호 및 데이터를 포함하는 프레임인 경우,

상기 응답 신호 프레임을 수신한 단말은 SIFS를 IFS(Interframe Space)로 하여 점유한 매체를 통해 이 프레임을 송신한 단말에게 응답신호 프레임을 전송하는 단계를 더 포함하는 CSMA/CA 기반 무선 랜 시스템의 매체 접근 제어 방법.

청구항 6.
제 3항에 있어서, 상기 응답 신호 프레임이 응답신호 및 데이터를 포함하는 프레임인 경우,

상기 응답 신호 프레임을 송신한 단말은 응답 신호 프레임을 전송한 후 SIFS 기간이 지나도록 프레임의 목적지 단말로부터 응답 신호 프레임을 수신하지 못하면 전송 실패로 간주하고 요청-응답 절차를 종료하는 CSMA/CA 기반 무선 랜 시스템의 매체 접근 제어 방법.

청구항 7.
제 1항에 있어서, 상기 요청 신호를 전송하는 단말은,

CSMA/CA 기반 무선 랜 시스템에서 AP를 제외한 모든 단말중의 하나이고,

상기 응답신호를 전송하는 단말은 AP를 포함한 모든 단말중의 하나인 CSMA/CA 기반 무선 랜 시스템의 매체 접근 제어 방법.

청구항 8.
요청신호 프레임을 전송하고자 하는 경우, 해당 프레임의 프레임 제어 필드에 해당 프레임이 요청 신호 프레임을 표시하기 위한 값으로 코딩하는 단계와,

DIFS를 IFS(Interframe Space)로 이용한 CSMA/CA 알고리즘을 사용하여 전송 경쟁에서 점유한 매체를 통해 상기 요청 신호 프레임을 임의의 단말 또는 AP에 전송하는 단계와,

상기 임의의 단말 또는 AP로부터 임의의 프레임이 수신되는 경우, 수신된 프레임의 프레임 제어 필드를 분석하는 단계와,

분석결과에 따라 해당 프레임을 전송한 단말 또는 AP에 응답 신호 프레임을 전송하고자 하는 경우, 해당 프레임의 프레임 제어 필드에 해당 프레임이 응답 신호 프레임을 표시하기 위한 값으로 코딩하는 단계와,

SIFS를 IFS(Interframe Space)로 하여 점유한 매체를 통해 상기 응답 신호 프레임을 임의의 단말 또는 AP에 전송하는 단계를 포함하는 CSMA/CA 기반 무선 랜 시스템에서 단말의 매체 접근 방법.

청구항 9.
제 8항에 있어서, 상기 요청 신호 프레임은,

요청 신호만을 포함하는 프레임이거나, 요청신호와 데이터를 포함하는 프레임중의 하나인 CSMA/CA 기반 무선 랜 시스템에서 단말의 매체 접근 방법.

청구항 10.
제 8항에 있어서, 상기 응답 신호 프레임은,

응답 신호만을 포함하는 프레임이거나, 응답신호 및 데이터를 포함하는 프레임중의 하나인 CSMA/CA 기반 무선 랜 시스템에서 단말의 매체 접근 방법.

청구항 11.
제 8항에 있어서,

상기 요청 신호 프레임을 전송한 경우, 프레임 전송 후 SIFS 기간이 지나도록 프레임의 목적지 단말로부터 응답신호를 수신하지 못하는 경우, 전송 실패로 간주하고 DCF에 정의되어 있는 익스포넨셜 랜덤 백오프 절차에 따라 컨텐션 윈도우(Contention Window:CW)를 증가시키는 단계를 더 포함하는 CSMA/CA 기반 무 선 랜 시스템에서 단말의 매체 접근 방법.

청구항 12.
제 8항에 있어서,

상기 응답 신호 프레임을 송신한 경우, 응답 신호 프레임을 전송한 후 SIFS 기간이 지나도록 프레임의 목적지 단말로부터 응답 신호 프레임을 수신하지 못하면 전송 실패로 간주하고 요청-응답 절차를 종료하는 CSMA/CA 기반 무선 랜 시스템에서 단말의 매체 접근 방법.

청구항 13.
제 8항에 있어서, 상기 요청 신호를 전송하는 단말은,

CSMA/CA 기반 무선 랜 시스템에서 AP를 제외한 모든 단말중의 하나이고,

상기 응답신호를 전송하는 단말은 AP를 포함한 모든 단말중의 하나인 CSMA/CA 기반 무선 랜 시스템에서 단말의 매체 접근 방법.

청구항 14.
제 8항에 있어서, 상기 코딩하는 단계에서,

프레임 제어 필드의 서브타입 필드의 값을 임의의 값으로 코딩하여 해당 프레임이 요청 신호 프레임 또는 응답 신호 프레임인지를 나타내는 CSMA/CA 기반 무선 랜 시스템에서 단말의 매체 접근 방법.

청구항 15.
프로그램이 저장되어 있는 메모리와, 상기 메모리에 결합되어 상기 프로그램을 실행하는 프로세서를 포함하되,

상기 프로세서는, 상기 프로그램에 의해,

요청신호 프레임을 전송하고자 하는 경우, 해당 프레임의 프레임 제어 필드에 해당 프레임이 요청 신호 프레임을 표시하기 위한 값으로 코딩하는 단계와,

DIFS를 IFS(Interframe Space)로 이용한 CSMA/CA 알고리즘을 사용하여 전송 경쟁에서 점유한 매체를 통해 상기 요청 신호 프레임을 임의의 단말 또는 AP에 전송하는 단계와,

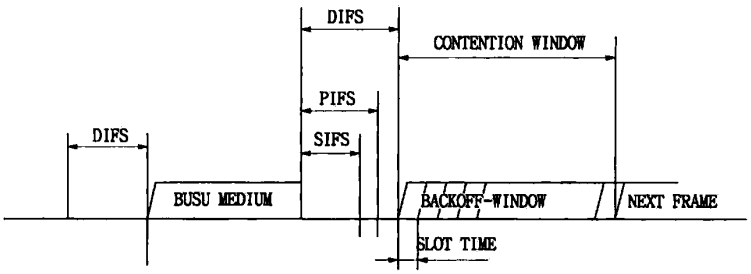
상기 임의의 단말 또는 AP로부터 임의의 프레임이 수신되는 경우, 수신된 프레임의 프레임 제어 필드를 분석하는 단계와,

분석결과에 따라 해당 프레임을 전송한 단말 또는 AP에 응답 신호 프레임을 전송하고자 하는 경우, 해당 프레임의 프레임 제어 필드에 해당 프레임이 응답 신호 프레임을 표시하기 위한 값으로 코딩하는 단계와,

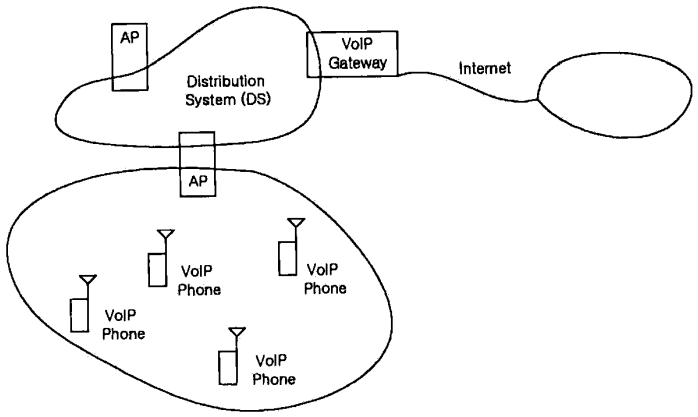
SIFS를 IFS(Interframe Space)로 하여 점유한 매체를 통해 상기 응답 신호 프레임을 임의의 단말 또는 AP에 전송하는 단계를 수행하는 CSMA/CA 기반 무선 랜 시스템의 단말.

도면

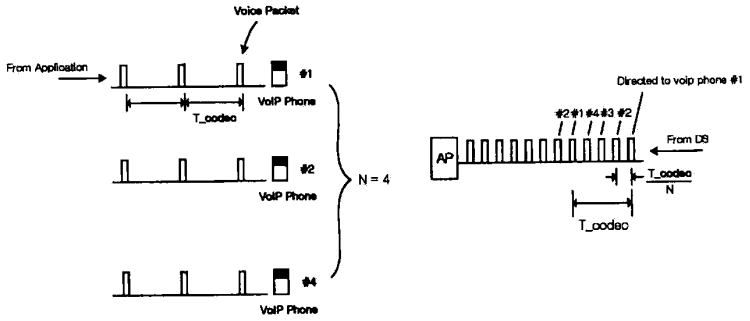
도면1



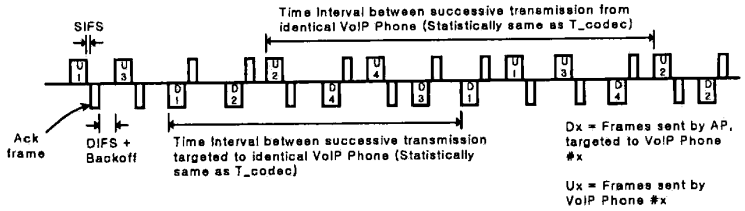
도면2



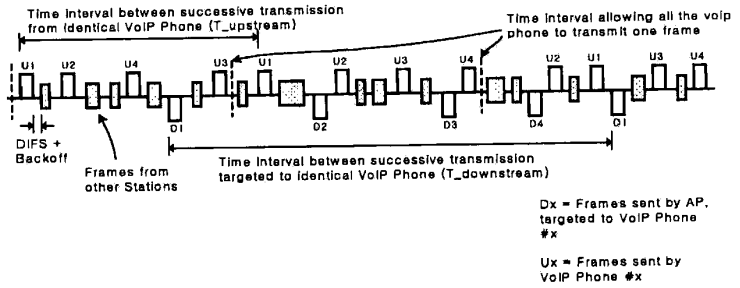
도면3



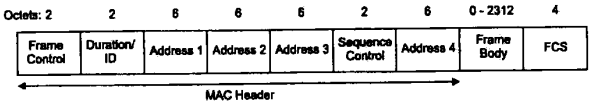
도면4



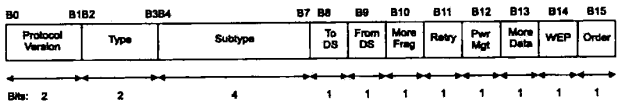
도면5



도면6



도면7



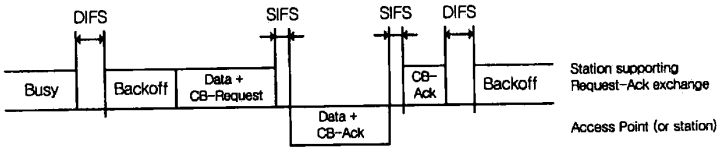
도면8

Type value b3 b2	Type description	Subtype value b7 b6 b5 b4	Subtype description
00	Management	0000	Association request
00	Management	0001	Association response
00	Management	0010	Reassociation request
00	Management	0011	Reassociation response
00	Management	0100	Probe request
00	Management	0101	Probe response
00	Management	0110-0111	Reserved
00	Management	1000	Beacon
00	Management	1001	Announcement traffic indication message (ATIM)
00	Management	1010	Disassociation
00	Management	1011	Authentication
00	Management	1100	Deauthentication
00	Management	1101-1111	Reserved
01	Control	0000-1001	Reserved
01	Control	1010	Power Save (PS)-Poll
01	Control	1011	Request To Send (RTS)
01	Control	1100	Clear To Send (CTS)
01	Control	1101	Acknowledgment (ACK)
01	Control	1110	Contention-Free (CF)-End
01	Control	1111	CF-End + CF-Ack
10	Data	0000	Data
10	Data	0001	Data + CF-Ack
10	Data	0010	Data + CF-Poll
10	Data	0011	Data + CF-Ack + CF-Poll
10	Data	0100	Null function (no data)
10	Data	0101	CF-Ack (no data)
10	Data	0110	CF-Poll (no data)
10	Data	0111	CF-Ack + CF-Poll (no data)
10	Data	1000-1111	Reserved
11	Reserved	0000-1111	Reserved

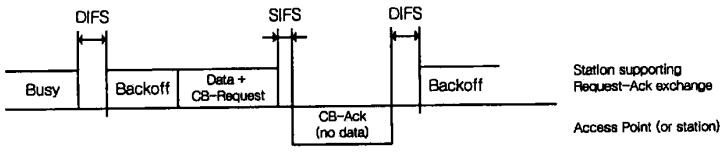
도면9

Type value b3 b2	Type description	Subtype value b7 b6 b5 b4	Subtype description
10	Data	1000	Data + CB-Request
10	Data	1001	CB-Request (no data)
10	Data	1010	Data + CB-Ack
10	Data	1011	CB-Ack (no data)

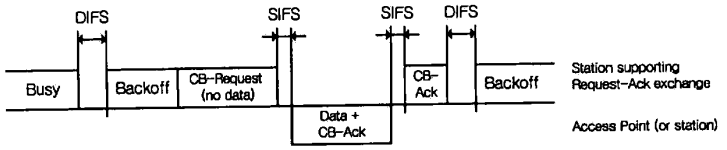
도면10



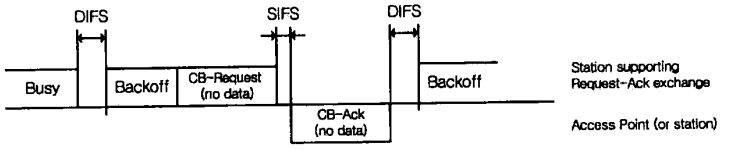
도면11



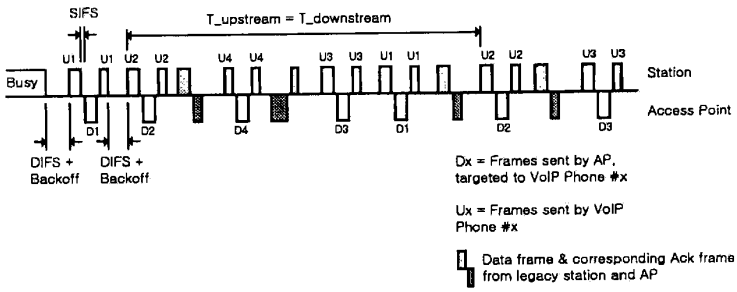
도면12



도면13



도면14



(19)대한민국특허청(KR)
(12) 공개특허공보(A)

(51) 。Int. Cl.[7]
H04L 12/28

(11) 공개번호 10-2005-0023940
(43) 공개일자 2005년03월10일

(21) 출원번호 10-2003-0061510
(22) 출원일자 2003년09월03일

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(54) 애드 혹 무선랜에서 데이터 스트리밍 방법

요약

본 발명은 애드 혹 무선랜에서 데이터 스트리밍을 전송하는 방법에 관한 것이다.

본 발명에 따른 애드 혹 무선랜에서 데이터 스트리밍 방법은 하나 또는 그 이상의 스테이션에 스트리밍 데이터를 전송하기를 요구하는 하나 또는 그 이상의 스트리밍 요청 프레임을 수신하는 단계와, 스트리밍 데이터를 실은 프레임들을 짧은 프레임간 간격으로 상기 하나 또는 그 이상의 스테이션에 송신하는 단계를 포함한다.

본 발명에 따르면, 기존의 무선랜의 표준 방식을 크게 수정하지 않고도 애드 혹 무선랜에서 스트리밍 데이터를 안정적으로 전송할 수 있다.

대표도

도 5

색인어

무선랜, 애드 혹, SIFS, 스트리밍, 확인응답, 제어정보

명세서

도면의 간단한 설명

도 1은 본 발명의 일 실시예에 따른 데이터 스트리밍 환경을 개략적으로 보여주는 도면이다.

도 2는 본 발명의 다른 실시예에 따른 데이터 스트리밍 환경을 개략적으로 보여주는 도면이다.

도 3은 본 발명의 또 다른 실시예에 따른 데이터 스트리밍 환경을 개략적으로 보여주는 도면이다.

도 4는 도 2의 환경에서 스트리밍 데이터가 전송되는 모습을 보여주는 도면이다.

도 5는 본 발명의 일 실시예에 따른 스트리밍 서비스 스테이션과 스트리밍 데이터를 수신하는 스테이션간의 스트리밍 과정을 보여주는 도면이다.

도 6은 본 발명의 일 실시예에 따른 스트리밍 서비스 스테이션과 수신 스테이션간의 제어정보 송수신 과정을 보여주는 도면이다.

도 7은 본 발명의 일 실시예에 따른 수신 스테이션의 어플케이션 계층에서의 동작을 보여주는 흐름도이다.

도 8은 본 발명의 일 실시예에 따른 수신 스테이션의 매체접근제어 계층에서의 동작을 보여주는 흐름도이다.

도 9는 본 발명의 일 실시예에 따른 스트리밍 서비스 스테이션의 매체접근 제어 계층에서의 동작을 보여주는 흐름도이다.

도 10은 본 발명의 일 실시예에 따른 스트리밍 서비스 스테이션의 어플리케이션 계층에서의 동작을 보여주는 흐름도이다.

도 11은 본 발명에 따라 새로 정의한 제어정보를 싣고 있는 확인응답 프레임의 일 실시예를 보여주는 도면이다.

도 12는 스트리밍 데이터가 이상적으로 전송되는 채널의 구성을 보여주는 도면이다.

도 13은 스트리밍 데이터 전송 중에 타겟 비콘 전송시간이 된 경우의 채널의 구성을 보여주는 도면이다.

도 14는 일반 데이터 전송 중에 타겟 비콘 전송시간이 되어 비콘 충돌이 발생하는 경우의 채널의 구성을 보여주는 도면이다.

도 15는 스트리밍 데이터의 전송 시작 시점에 타겟 비콘 전송시간이 되어 랜덤 지연 값이 0인 스테이션이 전송한 비콘과 충돌이 생기는 경우의 채널의 구성을 보여주는 도면이다.

발명의 상세한 설명

발명의 목적

발명이 속하는 기술 및 그 분야의 종래기술

본 발명은 애드 혹 무선랜에서 데이터 스트리밍을 전송하는 방법에 관한 것이다.

최근에 멀티미디어 기술이 발전하고 있으며, 멀티미디어 콘텐츠의 수요가 증가하고 있다. 멀티미디어 콘텐츠의 수요가 증가함에 따라 멀티미디어 콘텐츠를 담은 스트리밍 데이터를 전송해야할 경우가 증가하고 있다. 종전까지 데이터 스트리밍 서비스는 주로 유선 인터넷을 통해 제공되었으나, 최근에 무선랜 기술의 발달과 무선랜 제품의 보급이 증가함에 따라 무선랜을 통한 데이터 스트리밍 서비스의 수요가 증가하고 있다. 한편, 애드 혹 환경의 무선랜에서 스테이션들간의 데이터 송수신은 경쟁적으로 이루어지고 있다. 이에 따라 애드 혹 환경의 무선랜에서 데이터 스트리밍을 하고자 할 때는 스트리밍 데이터를 실은 프레임을 경쟁적으로 전송하여야 하는데 항상 프레임 전송이 보장되는 것은 아니다. 스트리밍 데이터의 전송은 실시간적으로 되어야 그 목적을 달성할 수 있는데, 경쟁적 채널 환경에서는 실시간적 데이터 전송이 보장되지 않는다. 따라서 종전의 802.11 규격에 따른 스트리밍 데이터를 전송은 송신 및 수신 스테이션의 두 스테이션이 존재할 경우에만 가능했었다. 즉, 송신 및 수신 스테이션 이외의 스테이션들이 존재하는 경우에는 실시간적으로 데이터 송수신이 보장되기는 어려웠다. 상술한 문제점에 따라 애드 혹 무선랜 환경에서 멀티미디어 콘텐츠와 같은 스트리밍 데이터를 안정적이며 실시간적으로 무선으로 송수신하기 위한 스트리밍 데이터를 송수신방법이 필요하다.

한편, 스트리밍 데이터를 송수신할 수 있는 경우라도 필요에 따라 스트리밍의 중단 및 새로운 스트리밍 데이터의 전송 등을 요청할 수 있는 방법이 필요하다.

발명이 이루고자 하는 기술적 과제

본 발명은 상술한 필요성에 의해 안출된 것으로서, 애드 혹 무선랜에서 스트리밍 데이터를 송수신할 수 있는 방법을 제공하는 것을 목적으로 한다. 또한, 본 발명은 스트리밍 데이터 송수신 중에 스트리밍의 변경 등을 요구하는 제어정보를 송신기에 전달하는 방법을 제공하는 것을 다른 목적으로 한다.

발명의 구성 및 작용

상기 목적을 달성하기 위하여, 본 발명에 따른 애드 혹 무선랜에서 데이터 스트리밍 방법은 스테이션에 제1스트리밍 데이터를 전송하기를 요구하는 스트리밍 요청 프레임을 수신하는 단계, 및 제1스트리밍 데이터를 실은 프레임들을 짧은 프레임간 간격으로 상기 스테이션에 송신하는 단계를 포함한다.

상기 스트리밍 요청 프레임은 상기 스테이션에 의해 전송되는 것이 바람직하다. 한편, 상기 스테이션으로부터 소정의 제어정보를 싣고 있는 확인응답을 수신하면 상기 제어정보에 따른 소정의 동작을 수행하는 단계를 더 포함할 수 있는데, 상기 수신받은 확인응답이 싣고 있는 제어정보는 제2 스트리밍 데이터의 전송을 요구하는 스트리밍 요청이고, 상기 제어정보에 따라 상기 스테이션에 제2 스트리밍 데이터를 실은 프레임들을 짧은 프레임간 간격으로 송신한다.

상기 목적을 달성하기 위하여, 본 발명에 따른 애드 혹 무선랜에서 데이터 스트리밍의 다른 방법은 제1스테이션에 제1스트리밍 데이터를 전송하기를 요구하는 제1스트리밍 요청 프레임을 수신하는 단계와, 제2스테이션에 제2스트리밍 데이터를 전송하기를 요구하는 제2스트리밍 요청 프레임을 수신하는 단계, 및 상기 제1스테이션에는 제1스트리밍 데이터를 실은 프레임들을 그리고 상기 제2스테이션에는 제2스트리밍 데이터를 실은 프레임들을 소정의 순서로 짧은 프레임간 간격으로 송신하는 단계를 포함한다.

상기 제1스트리밍 요청 프레임은 상기 제1스테이션에 의해 송신된 스트리밍 요청 프레임이고 상기 제2스트리밍 요청 프레임은 상기 제2스테이션에 의해 송신된 스트리밍 요청 프레임인 것이 바람직하다. 한편, 상기 제1스테이션 또는 상기 제2스테이션으로부터 소정의 제어정보를 싣고 있는 확인응답을 수신하면 상기 제어정보에 따른 소정의 동작을 수행하는 단계를 더 포함할 수 있는데, 상기 제어정보는 제3 스트리밍 데이터의 전송을 요구하는 스트리밍 요청이고, 상기 제어정보를 싣고 있는 확인 응답을 송신한 스테이션에 제3 스트리밍 데이터를 실은 프레임들을 짧은 프레임간 간격으로 송신한다.

한편, 상기 목적을 달성하기 위하여, 본 발명에 따른 애드 혹 무선랜에서 데이터 스트리밍 방법은 스트리밍 데이터를 수신하는 스테이션의 입장에서 보면 제1스트리밍 데이터의 전송을 요구하는 스트리밍 요청 프레임을 생성하여 스트리밍 서비스 스테이션에 송신하는 단계, 및 상기 스트리밍 서비스 스테이션이 송신한 제1스트리밍 데이터를 실은 짧은 프레임간 간격으로 송신되는 프레임들을 수신하는 단계를 포함한다.

한편, 스트리밍 데이터를 수신 중에 제어신호를 보낼 때는 상기 수신된 스트리밍 데이터에 대한 확인응답 프레임에 제어정보를 실어 보내는 방법을 사용하는 것이 바람직하다. 상기 제어정보는 제2스트리밍 데이터의 전송을 요구하는 제어정보일 수 있고 상기 스트리밍 서비스 스테이션이 송신한 제2스트리밍 데이터를 실은 짧은 프레임간 간격으로 송신되는 프레임들을 수신한다.

상기 목적을 달성하기 위하여, 본 발명에 따른 애드 혹 무선랜에서 데이터 스트리밍 시스템은 적어도 하나 이상의 스트리밍 데이터를 전송하기를 요구하는 적어도 하나 이상의 스트리밍 요청 프레임을 수신하여 상기 요구받은 스트리밍 데이터를 실은 프레임들을 짧은 프레임간 간격으로 적어도 하나 이상의 스테이션에 송신하는 스트리밍 서비스 스테이션, 및 스트리밍 서버에서 짧은 프레임간 간격으로 송신하는 적어도 하나 이상의 스트리밍 데이터를 실은 프레임들을 수신하는 적어도 하나 이상의 스테이션들을 포함한다.

이하, 첨부된 도면을 참조하여 본 발명의 바람직한 실시예를 상세히 설명한다.

도 1 내지 도 3은 각각 본 발명의 실시예에 따른 데이터 스트리밍 환경을 개략적으로 보여주는 도면이다.

종전에는 경쟁적 환경에서는 멀티미디어 데이터와 같이 실시간적 스트리밍 데이터를 전송하기에 곤란한 점이 있었으나, 도 1 내지 도 3에서는 스트리밍 데이터 전송이 가능한 상황을 보여주고 있다. 먼저, 도 1은 두 스테이션간의 스트리밍 데이터 전송의 모습을 보여준다. 스테이션 A로부터 스트리밍 데이터를 전송받고자 하는 스테이션 B는 먼저 스테이션 A에 스트리밍 요청 프레임을 경쟁적으로 전송한다. 스트리밍 요청 프레임을 수신한 스테이션 A는 스트리밍 데이터를 스테이션 B에 전송한다. 스트리밍 데이터를 전송할 때는 짧은 프레임간 간격(Short InterFrame Space; 이하, SIFS라 함)으로 프레임들을 전송한다. 스테이션 A가 스테이션 B에 SIFS 간격으로 프레임들을 전송하면 스테이션 C와 스테이션 D는 항상 경쟁에서 지게되고 이에 따라 프레임을 전송할 수 없게 된다.

도 2는 하나의 스테이션에서 두 개의 스테이션에 스트리밍 데이터를 전송하는 모습을 보여준다. 먼저, 스테이션 B와 스테이션 C는 각각 경쟁적으로 스테이션 A에 스트리밍 요청 프레임을 전송한다. 스테이션 B 및 스테이션 C로부터 받은 스트리밍 요청 프레임들에 실려있는 정보에 따라 스테이션 A는 스테이션 B에 제1스트리밍 데이터를 전송하고 스테이션 C에 제2스트리밍 데이터를 전송한다. 상기 스트리밍 데이터를 전송할 때 각 프레임들은 SIFS 간격으로 전송하여 다른 스테이션들이 프레임 송신을 할 수 없도록 한다.

도 3은 하나의 스테이션에서 두 개의 스테이션에 스트리밍 데이터를 전송하는 다른 모습을 보여준다. 도 2에서와 같이 스테이션 B와 스테이션 C는 각각 제1스트리밍 요청 프레임과 제2스트리밍 요청 프레임을 스테이션 A에 전송하고, 스테이션 A로부터 각각 제1스트리밍 데이터와 제2스트리밍 데이터를 수신한다. 스트리밍 데이터 수신 중에 스테이션 B는 새로운 스트리밍 데이터를 스테이션 A로부터 받기 위하여 제3스트리밍 요청 프레임을 스테이션 A에 전송한다. 스테이션 A는 스트리밍 데이터를 스테이션 B에 전송한다. 한편, 스트리밍 데이터 수신 중에 새로운 스트리밍 데이터를 요청하는 스트리밍 요청 프레임을 송신할 때는 SIFS 간격의 프레임들이 끝난 후에 경쟁적으로 보낼 수도 있지만 수신받은 스트리밍 데이터 프레임에 대한 확인응답 프레임을 전송할 때 새로운 스트림밍을 요청하는 정보를 담아 보내는 것이 바람직하다. 상기 스트리밍 데이터를 전송할 때 각 프레임들은 SIFS 간격으로 전송하여 다른 스테이션들이 프레임 송신을 할 수 없도록 한다.

상기 도 1 내지 도 3에서 상기 스트리밍 요청 프레임은 일반 데이터 프레임의 데이터를 실을 수 있는 채널정보에 스트리밍 데이터를 전송하는 스테이션 A의 어플리케이션이 인식할 수 있는 파라미터를 넣어 송신하는 것이 바람직하다. 그러나 스트리밍 요청 프레임은 일반 데이터 프레임인 것은 예시적인 것으로서 본 발명의 기술적 사상은 이에 한정되지는 않는다. 복수의 스트리밍 요청 프레임들을 수신한 스테이션은 각 스테이션들에 전송할 스트리밍 데이터를 적절한 순서에 따라 전송한다.

도 4는 도 2의 환경에서 스트리밍 데이터가 전송되는 모습을 보여주는 도면이다.

도 4에서 B는 비콘 프레임, Data는 데이터 프레임, A는 확인응답 프레임을 의미한다. DIFS는 분산 프레임간 간격(Distributed InterFrame Space)로서 경쟁 기반의 서비스에서 아토믹 교환(하나의 프레임과 이에 대한 확인응답 프레임) 사이를 구분하기 위해서 사용되는 프레임 간격을 말하고, Backoff는 DIFS가 지난 후에 스테이션들이 일시에 프레임을 전송하여 생길 충돌을 방지하기 위하여 랜덤한 시간이 지난 후에 프레임을 전송하도록 하기 위한 시간을 의미한다.

도 4에서는 다섯 개의 스테이션이 있는 기본 서비스 셋에서 스트리밍 소스인 스테이션과 스트리밍 데이터를 전송받기 위한 HD급 수신기인 스테이션과 SD급 수신기인 스테이션이 있고, 이 외에도 일반 스테이션이 두 개 더 있다. HD 수신기와 SD 수신기는 각각 스트리밍 소스에 스트리밍 요청 프레임을 전송하고 스트리밍 소스는 스트리밍 데이터를 전송하는 모습이다. HD 수신기는 고화질이므로 실시간으로 많은 데이터를 수신해야 하나 SD 수신기는 상대적으로 적은 데이터를 수신해도 된다. 스트리밍 소스는 스트리밍 요청 프레임에 의해 요구받은 수준의 스트리밍 데이터를 실은 프레임들을 적절한 순서로 각각 HD 수신기와 SD 수신기에 전송한다.

스트리밍 데이터를 실은 프레임 및 이에 대한 확인응답 프레임과 다음 스트리밍 데이터를 실은 프레임 및 이에 대한 확인응답 프레임은 DIFS보다 짧은 SIFS 간격으로 하여 다른 일반 스테이션들이 데이터 데이터를 전송할 수 없도록 한다.

스트리밍 데이터 전송이 끝나면 다른 스테이션들은 경쟁적으로 DIFS 및 Backoff 시간이 지난 후에 데이터를 전송할 수 있다.

도 5는 본 발명의 일 실시예에 따른 스트리밍 서비스 스테이션과 스트리밍 데이터를 수신하는 스테이션간의 스트리밍 과정을 보여주는 도면이다.

먼저 수신 스테이션의 어플리케이션층에서 전송받고자 하는 스트리밍 데이터의 송신을 요구하는 스트리밍 요청을 매체접근제어(Medium Access Control; 이하, MAC이라 함)층에 전달하면 MAC층에서 적절한 헤더와 테일을 붙여 스트리밍 요청 프레임을 생성하고 이를 스트리밍 서비스 스테이션에 경쟁 방식으로 전송한다. 스트리밍 서비스 스테이션의 MAC층은 스트리밍 요청 프레임의 헤더와 테일을 떼고 스트리밍 요청을 어플리케이션층으로 전달한다. 스트리밍 서비스 스테이션의 어플리케이션층은 스트리밍 요청에 따라 MAC층을 스트리밍 온 상태로 바꾸도록 요청하고 MAC층은 스트리밍 온 상태로 된다. MAC층은 스트리밍 온 상태로 되면 어플리케이션에서 전달받은 스트리밍 데이터를 수신 스테이션에 전송하고, 수신 스테이션은 스트리밍 데이터를 수신하여 재생한다. 상기 스트리밍 요청 프레임은 일반 데이터 프레임인 것이 바람직하며, 채널정보에 스트리밍 서비스 스테이션의 어플리케이션이 스트리밍 데이터의 전송요청을 인식할 수 있도록 하는 파라미터를 담고 있다.

도 6은 본 발명의 일 실시예에 따른 스트리밍 서비스 스테이션과 수신 스테이션간의 제어정보 송수신 과정을 보여주는 도면이다.

도 5에서와 같이 스트리밍 데이터를 송신받는 수신 스테이션에서 스트리밍 데이터를 수신받는 도중에 스트리밍 서비스 스테이션에 여러 가지 제어정보를 보낼 필요성이 있다. 예를 들면, 스트리밍 데이터의 중단을 요구, 다른 스트리밍 데이터의 전송을 요구, 또는 해상도를 달리한 스트리밍 데이터의 요구 등이 제어정보에 해당할 수 있다. 도 6에서는 이러한 경우에 제어정보를 스트리밍 서비스 스테이션에 전송하는 방법을 보여준다. 먼저 수신 스테이션의 어플리케이션층은 사용자의 명령에 따라 제어정보를 MAC층에 전달한다. MAC층은 기존의 확인응답 프레임에 제어정보를 실어서 새로운 확인응답 프레임을 생성한다. 한편, 스트리밍 서비스 스테이션으로부터 스트리밍 데이터를 수신받으면 이에 대한 확인응답 프레임을 전송할 때 상기 제어정보를 포함하도록 생성된 새로운 타입의 확인응답 프레임을 스트리밍 서비스 스테이션에 전송한다. 스트리밍 서비스 스테이션은 수신받은 새로운 타입의 확인응답 프레임에서 제어정보를 추출하고 이를 실행한다. 스트리밍 서비스 스테이션과 수신 스테이션의 어플리케이션층 및 맥층에서의 보다 상세한 동작은 도 7 내지 도 10을 참조하여 설명한다.

도 7은 본 발명의 일 실시예에 따른 수신 스테이션의 어플케이션 계층에서의 동작을 보여주는 흐름도이다.

먼저 수신기의 어플리케이션은 동작을 위하여 초기화된다(S100). 초기화되면 어플리케이션은 사용자로부터의 명령이나 MAC층에서부터의 데이터를 전달받기 위하여 대기 상태에 있다. 먼저 사용자로부터 스트리밍 시작 요청 명령을 받은 경우에(S110), 스트리밍 요청을 생성한다(S112). 스트리밍 요청에는 송신기(스트리밍 서비스 스테이션)로부터 전송받고자 하는 스트리밍 데이터에 대한 다양한 정보, 예를 들면, 스트리밍 데이터 파일의 이름, 해상도, 전송시작 시각 등의 데이터 스트리밍을 위한 다양한 정보를 포함한다. 생성된 스트리밍 요청은 MAC층에 전달한다(S114). 한편, MAC층으로부터 스트리밍 데이터를 전달받으면(S140), 스트리밍 데이터를 재생한다(S142). 스트리밍 데이터를 전달받아 재생하는 중에 사용자로부터 재생 중지나, 다른 스트리밍 데이터의 재생 등의 제어명령을 받으면(S120), 제어정보를 생성하여(S122) MAC층에 전달한다(S124).

도 8은 본 발명의 일 실시예에 따른 수신 스테이션의 매체접근제어 계층에서의 동작을 보여주는 흐름도이다.

수신기 MAC은 동작을 위하여 초기화된다(S200). 초기화 이후에 MAC은 어플리케이션층에서 전달받은 데이터에 헤더 및 테일을 붙여 프레임을 생성하여 외부 스테이션에 전송하거나 외부로부터 전송받은 프레임에서 필요한 데이터를 추출하여 어플리케이션층에 전달할 수 있게 된다. 먼저 어플리케이션층으로부터 스트리밍 요청을 받으면(S210), 스트림 요청 프레임을 생성하여 송신 스테이션(스트리밍 서비스 스테이션)에 전송한다(S212). 한편, 어플리케이션으로부터 제어정보를 전달받으면(S220), 전달받은 제어정보를 포함하는 확인응답 프레임을 생성하고(S222), 확인응답 프레임을 전송할 시간이 되었는지를 판단하여(S224), 확인응답 프레임 전송시간에 제어정보를 싣고 있는 확인응답 프레임을 송신기에 전송한다(S226). 한편, 스트리밍 데이터 프레임을 수신한 경우에(S240), 스트리밍 데이터를 추출하여 어플리케이션층으로 전달한다(S242).

도 9는 본 발명의 일 실시예에 따른 스트리밍 서비스 스테이션의 매체접근 제어 계층에서의 동작을 보여주는 흐름도이다.

송신기 MAC은 동작을 위하여 초기화된다(S300). 초기화 이후에 MAC은 어플리케이션층에서 전달받은 데이터에 헤더 및 테일을 붙여 프레임을 생성하여 외부 스테이션에 전송하거나, 외부로부터 전송받은 스트리밍 요청 프레임 또는 제어정보를 포함한 확인응답 프레임에서 필요한 데이터를 추출하여 어플리케이션층에 전달할 수 있게 된다. 먼저, 송신기로부터 스트리밍 요청 프레임을 수신하면(S310), 스트리밍 요청을 추출하여 상위 어플리케이션층에 전달한다(S312). 제어정보를 포함한 확인응답 프레임을 수신하면(S320), 상기 수신한 확인응답 프레임에서 제어정보를 추출하여(S322) 상위 어플리케이션층에 전달한다(S324). 한편, 어플리케이션층으로부터 데이터 스트리밍을 준비하라는 스트리밍 업 요청을 받으면(S330), 스트리밍 온 상태로 설정하고(S334) 어플리케이션층에 스트리밍 업 설정사실을 알리는 스트리밍 업 응답을 전달한다(S336). 한편, 스트리밍 데이터를 상위 어플리케이션층으로부터 전달받으면(S340), 스트리밍 업 상태인지를 확인하여(S342) 스트리밍 업 상태라면 헤더와 테일을 붙여 스트리밍 데이터 프레임을 생성하고 SIFS 간격으로 스트리밍 데이터 프레임을 송신한다(S344). 본 발명에서 SIFS 간격으로 프레임을 전송한다는 말의 의미는 프레임을 전송하고 이에 대한 응답을 받은 후에 SIFS동안 기다린 후에 프레임을 전송하는 것을 의미한다.

도 10은 본 발명의 일 실시예에 따른 송신기(스트리밍 서비스 스테이션)의 어플리케이션 계층에서의 동작을 보여주는 흐름도이다.

먼저 송신기의 어플리케이션은 동작을 위하여 초기화된다(S100). 초기화 이후에 스트리밍 요청을 MAC층으로부터 전달받으면(S410), 스트리밍 세션을 셋업하고(S412) MAC에 스트리밍 업 요청을 전달한다(S414). MAC층으로부터 스트리밍 업을 설정했다는 스트리밍 업 응답을 받으면(S430), MAC층에 스트리밍 데이터를 전달한다(S432). 한편, MAC으로부터 새로운 스트리밍 데이터의 전송을 요구하는 제어정보를 전달받으면(S420), 세션세팅을 갱신하고(S422) 갱신된 새로운 스트리밍 데이터를 전달한다(S424). 한편, 도 10에는 도시되지 않으나 제어정보가 데이터 스트리밍의 중단을 요청하는 것일 경우에는 MAC층에 스트리밍 전달을 중단한다.

도 11은 본 발명에 따라 새로 정의한 제어정보를 싣고 있는 확인응답 프레임의 일 실시예를 보여주는 도면이다. 도 11의 확인응답 프레임은 802.11의 규격을 만족하는 프레임이다.

제어정보를 싣고 있는 새로운 확인응답 프레임은 크게 프레임 제어 2바이트와, 지속기간 2바이트와, 수신주소 6바이트와, 정보를 싣는 채널정보 4바이트, 및 에러체크를 위한 프레임 체크 시퀀스(Frame Check Sequence: 이하, FCS라 함) 4바이트로 구성된다. 채널정보는 스트림을 구별하기 위한 스트림 인덱스와, HD급인지 SD급인지 등의 스트림의 해상도를 나타내는 퀄리티와, 전송받고자 하는 채널, 및 기타 스트림을 정의하기 위한 파라미터들을 포함할 수 있다. 스트림파라미터는 5.1 채널, 돌비음향, 와이드화면 또는 일반화면, 버퍼링 타임 등의 정보를 실을 수 있다.

프레임 제어 필드의 첫 2비트는 프로토콜 버전을 나타낸다. 그 다음 2비트는 프레임의 유형(type)을, 그리고 4비트는 부유형(subtype)을 나타내는데 확인응답 프레임은 제어 유형이므로 01값을, 그리고 새로운 확인응답 프레임이므로 기존에 사용하지 않고 예약되어 있는 0000 내지 1001의 값 중에 하나를 갖도록 한다. 프레임 제어에는 이외에도 ToDS, FromDS 각각 1비트, 추가조각, 재시도, 전력관리, 추가데이터, WEP(Wired Equivalent Privacy), 및 순서를 위한 각 1비트를 가지고 있다.

지속필드는 네트워크 할당 벡터(Network Allocation Vector: 이하, NAV라 함) 설정을 위하여 사용될 수 있다. NAV를 설정하려면 마지막 비트(15번 비트)의 값을 0으로 설정하고, 데이터 전송을 위하여 필요한 시간(마이크로초)을 설정한다.

수신 스테이션주소는 이더넷과 마찬가지로 프레임의 연산을 위하여 상위 프로토콜 계층으로 전달하는 스테이션에 해당하는 48비트 IEEE MAC 식별자이다.

마지막으로 FCS는 수신된 프레임의 무결성을 검사하기 위하여 사용되는 필드로서 종종 순환 잉여 검사(Cyclic Redundancy Check: CRC)라고 부른다. 프레임이 무선으로 전송할 때, FCS는 라디오주파수나 적외선으로 전송하기에 앞서 계산된다.

한편, 수신 스테이션은 FCS를 수신된 프레임으로부터 계산하고 수신된 FCS와 비교하는데, 둘이 일치하면 프레임은 전송 과정에서 이상이 없는 것으로 판단한다.

이상이 없는 경우에 수신 스테이션은 송신 스테이션에 확인응답을 보낸다.

도 12 내지 도 15는 각각 다른 상황에 따른 채널의 구성을 보여주는 도면이다.

먼저, 도 12는 스트리밍 데이터가 이상적으로 전송되는 채널의 구성을 보여주는 도면이다. 도면에서 B는 비콘 프레임을, S는 SIFS를, D는 DIFS를 BO는 Backoff시간을 의미하며, Data는 전송되는 데이터 프레임과 SIFS 후에 이에 대한 확인응답을 받는 것까지를 포함하는 개념으로 설명한다.

송신기는 수신기로부터 스트리밍 요청 프레임을 수신한 상태에서 비콘 프레임이 전송되면 SIFS 후에 바로 데이터 프레임을 수신기에 전송한다. 애드 혹 무선랜에서 모든 스테이션들은 DIFS와 Backoff 시간이 지난 후에 데이터를 전송해야 한다. 이 때 스트리밍 업이 설정된 송신기가 SIFS 후에 데이터 프레임을 전송하면 다른 스테이션들은 필연적으로 채널 경쟁에서 지게 된다. 이 후에도 송신기는 계속 SIFS 간격으로 데이터 프레임을 전송한다. 송신기의 데이터 프레임 전송이 끝나면, 다른 스테이션들은 DIFS 및 Backoff가 지난 후에 경쟁적으로 데이터 프레임을 전송한

다. 그러다가 타겟 비콘 전송 시간(Target Beacon Transmission Time; 이하, TBTT라 함)이 되면, 스테이션들 중에서 어느 한 스테이션이 랜덤 지연(Random Delay) 후에 경쟁적으로 비콘을 전송한다. 송신기는 비콘을 수신하면, SIFS 후에 다시 데이터 프레임을 SIFS 간격으로 전송한다.

도 13은 스트리밍 데이터 전송 중에 타겟 비콘 전송시간이 된 경우의 채널의 구성을 보여주는 도면이다. 송신기의 스트리밍 데이터를 실은 프레임 전송 중에 TBTT가 되면 스테이션은 랜덤 지연을 무시하고 우선적으로 비콘을 송신하고 계속 스트리밍 데이터를 실은 프레임을 SIFS 간격으로 송신할 수 있다.

도 14는 일반 데이터 전송 중에 타겟 비콘 전송시간이 되어 비콘 충돌이 발생하는 경우의 채널의 구성을 보여주는 도면이다. 일반 데이터 전송 중에 TBTT가 발생되어 비콘 충돌이 생기는 경우에 송신기는 랜덤 지연을 무시하고 바로 비콘 프레임을 전송하고 난 후에 SIFS 간격으로 프레임을 전송할 수 있다.

도 15는 스트리밍 데이터의 전송 시작 시점에 타겟 비콘 전송시간이 되어 랜덤 지연 값이 0인 스테이션이 전송한 비콘과 충돌이 생기는 경우의 채널의 구성을 보여주는 도면이다.

도 15에서 SR/HD1, 및 SR/HD2는 각각 HD급의 스트리밍 요청을 요청하는 프레임을 나타내고, Data/HD1, 및 Data/HD2는 각각 HD급의 스트리밍 데이터를 실은 프레임을 나타낸다. 스트리밍 데이터를 전송받고자 하는 각 수신기들은 스테이션들의 프레임 전송 후에 DIFS 및 Backoff를 기다린 후에 경쟁적으로 스트림 요청 프레임을 전송한다. 스트림 요청 프레임을 수신한 송신기는 일정 시간동안 스트리밍 데이터를 준비한 후에 SIFS 간격으로 스트리밍 데이터를 실은 프레임들을 각각의 수신기에 송신한다. 한편, TBTT가 우연히도 다른 스테이션의 데이터 전송이 끝난 후에 발생하고 송신기가 랜덤 지연을 무시하고 비콘을 전송할 때 우연히 랜덤 지연 값이 0인 스테이션이 전송한 비콘과 충돌하는 경우가 생길 수 있다. 이러한 경우에 새로운 비콘을 전송하도록 할 수도 있으나 비콘의 전송을 무시하고 스트리밍 데이터를 SIFS 간격으로 각 수신기에 전송하는 것이 바람직하다. 왜냐하면, 본 발명에서 비콘은 각 스테이션의 동기화를 위한 타임 스탬프를 제공하는 역할에 그치고, 타임 스탬프는 비록 비콘을 한번 수신하지 못한 상태라도 스테이션들 간의 오차가 크게 발생하지 않기 때문이다.

본 발명이 속하는 기술분야의 통상의 지식을 가진 자는 본 발명이 그 기술적 사상이나 필수적인 특징을 변경하지 않고서 다른 구체적인 형태로 실시될 수 있다는 것을 이해할 수 있을 것이다. 따라서 이상에서 기술한 실시예들은 모든 면에서 예시적인 것이며 한정적이 아닌 것으로 이해해야만 한다. 본 발명의 범위는 상기 상세한 설명보다는 후술하는 특허청구의 범위에 의하여 나타내어지며, 특허청구의 범위의 의미 및 범위 그리고 그 균등 개념으로부터 도출되는 모든 변경 또는 변형된 형태가 본 발명의 범위에 포함되는 것으로 해석되어야 한다.

발명의 효과

본 발명에 따르면, 기존의 무선랜의 표준 방식을 크게 수정하지 않고도 애드 혹 무선랜에서 스트리밍 데이터를 안정적으로 전송할 수 있다. 한편, 본 발명은 스트리밍 데이터가 SIFS 간격으로 전송되는 도중이라도 확인응답 프레임에 제어정보를 실어 보냄으로써 수신기는 스트리밍 데이터가 전송되는 도중이라도 송신기에 스트리밍 변경이나 중단 등의 제어정보를 보낼 수 있다.

(57) 청구의 범위

청구항 1.

소정의 스테이션에 제1스트리밍 데이터를 전송하도록 요구하는 스트리밍 요청 프레임을 수신하는 단계; 및

상기 제1스트리밍 데이터를 실은 프레임들을 짧은 프레임간 간격으로 상기 스테이션에 송신하는 단계;

를 포함하는 애드 혹 무선랜에서 데이터 스트리밍 방법

청구항 2.

제1항에 있어서, 상기 스트리밍 요청 프레임은 상기 스테이션에 의해 송신된 스트리밍 요청 프레임인 것을 특징으로 하는 애드 혹 무선랜에서 데이터 스트리밍 방법

청구항 3.

제2항에 있어서, 상기 스테이션으로부터 소정의 제어정보를 싣고 있는 확인응답을 수신하면 상기 제어정보에 따른 동작을 수행하는 단계를 더 포함하는 것을 특징으로 하는 애드 혹 무선랜에서 데이터 스트리밍 방법

청구항 4.

제3항에 있어서, 상기 수신받은 확인응답이 싣고 있는 제어정보는 제2 스트리밍 데이터의 전송을 요구하는 스트리밍 요청이고, 상기 제어정보에 따른 동작은 상기 스테이션에 상기 제2 스트리밍 데이터를 실은 프레임들을 짧은 프레임간 간격으로 송신하는 것임을 특징으로 하는 애드 혹 무선랜에서 데이터 스트리밍 방법

청구항 5.

제1스테이션에 제1스트리밍 데이터를 전송하도록 요구하는 제1스트리밍 요청 프레임을 수신하는 단계와;

제2스테이션에 제2스트리밍 데이터를 전송하도록 요구하는 제2스트리밍 요청 프레임을 수신하는 단계; 및

상기 제1스테이션에는 상기 제1스트리밍 데이터를 실은 프레임들을 그리고 상기 제2스테이션에는 상기 제2스트리밍 데이터를 실은 프레임들을 소정의 순서에 따라 짧은 프레임간 간격으로 송신하는 단계;

를 포함하는 애드 혹 무선랜에서 데이터 스트리밍 방법

청구항 6.

제5항에 있어서, 상기 제1스트리밍 요청 프레임은 상기 제1스테이션에 의해 송신된 스트리밍 요청 프레임이고 상기 제2스트리밍 요청 프레임은 상기 제2스테이션에 의해 송신된 스트리밍 요청 프레임인 것을 특징으로 하는 애드 혹 무선랜에서 데이터 스트리밍 방법

청구항 7.

제6항에 있어서, 상기 제1스테이션 또는 상기 제2스테이션으로부터 소정의 제어정보를 싣고 있는 확인응답을 수신하면 상기 제어정보에 따른 동작을 수행하는 단계를 더 포함하는 것을 특징으로 하는 애드 혹 무선랜에서 데이터 스트리밍 방법

청구항 8.

제7항에 있어서, 상기 수신받은 확인응답이 싣고 있는 제어정보는 제3 스트리밍 데이터의 전송을 요구하는 스트리밍 요청이고, 상기 제어정보에 따른 동작은 상기 제어정보를 싣고 있는 확인 응답을 송신한 스테이션에 상기 제3 스트리밍 데이터를 실은 프레임들을 짧은 프레임간 간격으로 송신하는 것임을 특징으로 하는 애드 혹 무선랜에서 데이터 스트리밍 방법

청구항 9.

제1스트리밍 데이터의 전송을 요구하는 스트리밍 요청 프레임을 생성하여 스트리밍 서비스 스테이션에 송신하는 단계; 및

상기 제1스트리밍 데이터를 실은 짧은 프레임간 간격으로 송신되는 프레임들을 상기 스트리밍 서비스 스테이션으로부터 수신하는 단계;

를 포함하는 애드 혹 무선랜에서 데이터 스트리밍 방법

청구항 10.

제9항에 있어서, 상기 프레임들을 수신하는 동안 소정의 제어정보를 실어서 상기 수신된 프레임들에 대한 확인응답 프레임을 생성하고 상기 생성된 확인응답 프레임을 상기 스트리밍 서비스 스테이션에 송신하는 단계를 더 포함하는 것을 특징으로 하는 애드 혹 무선랜에서 데이터 스트리밍 방법

청구항 11.

제10항에 있어서, 상기 제어정보는 제2스트리밍 데이터의 전송을 요구하는 제어정보이고, 상기 제2스트리밍 데이터를 실은 짧은 프레임간 간격으로 송신되는 프레임들을 상기 스트리밍 서비스 스테이션으로부터 수신하는 단계를 더 포함하는 것을 특징으로 하는 애드 혹 무선랜에서 데이터 스트리밍 방법

청구항 12.

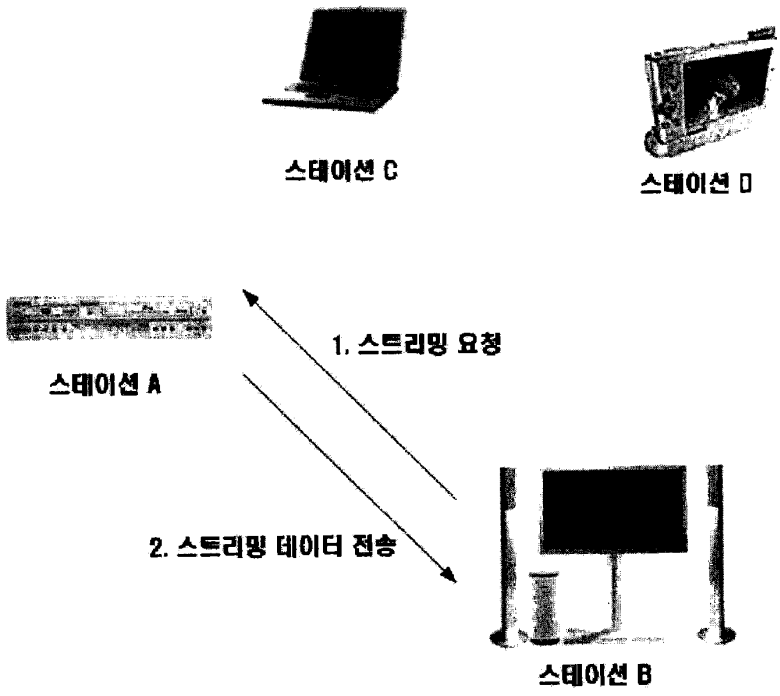
적어도 하나 이상의 스트리밍 데이터를 전송하도록 요구하는 적어도 하나 이상의 스트리밍 요청 프레임을 수신하여 상기 요구받은 스트리밍 데이터를 실은 프레임들을 짧은 프레임간 간격으로 적어도 하나 이상의 스테이션에 송신하는 스트리밍 서비스 스테이션; 및

스트리밍 서비스 스테이션으로부터에서 짧은 프레임간 간격으로 송신된 적어도 하나 이상의 스트리밍 데이터를 실은 프레임들을 수신하는 적어도 하나 이상의 스테이션들;

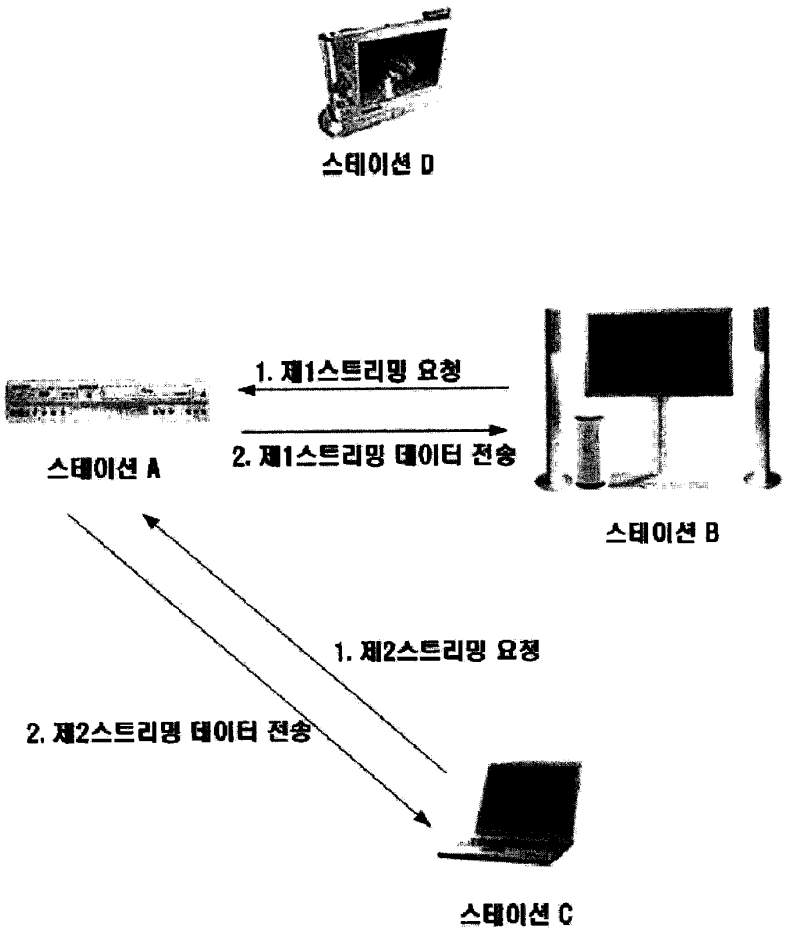
을 포함하는 애드 혹 무선랜에서 데이터 스트리밍 시스템

도면

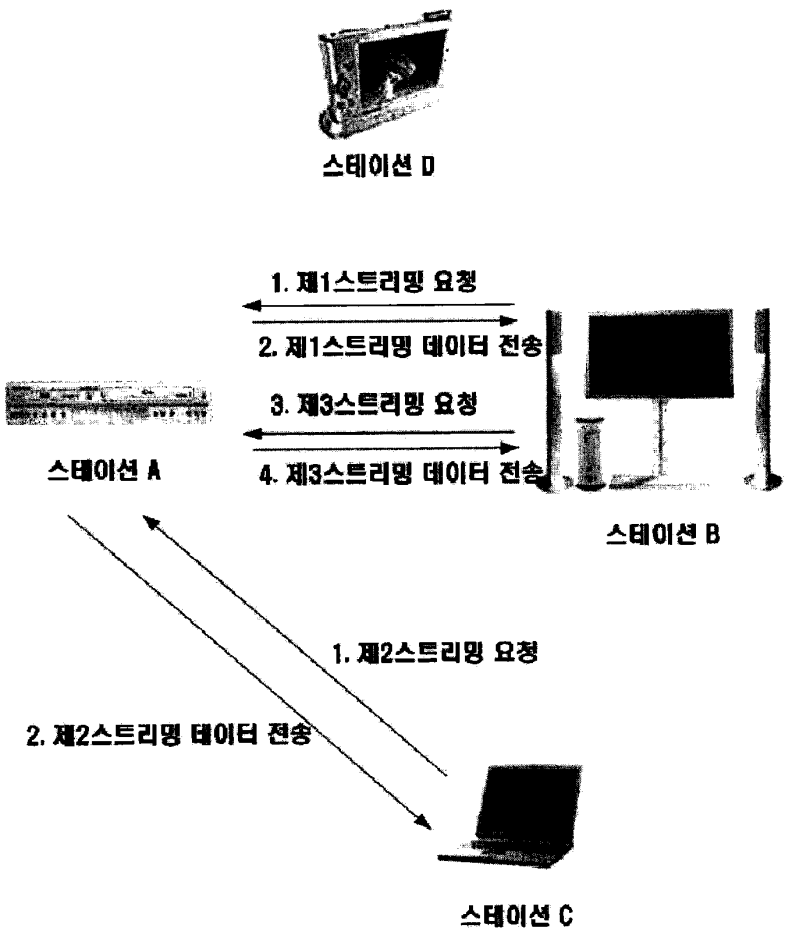
도면1



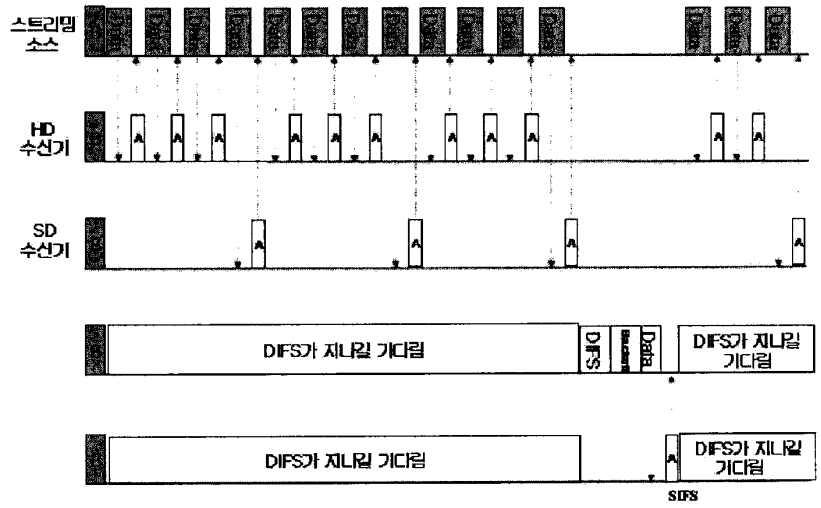
도면2


스테이션 D
1. 제1스트리밍 요청
2. 제1스트리밍 데이터 전송
스테이션 A
스테이션 B
1. 제2스트리밍 요청
2. 제2스트리밍 데이터 전송
스테이션 C

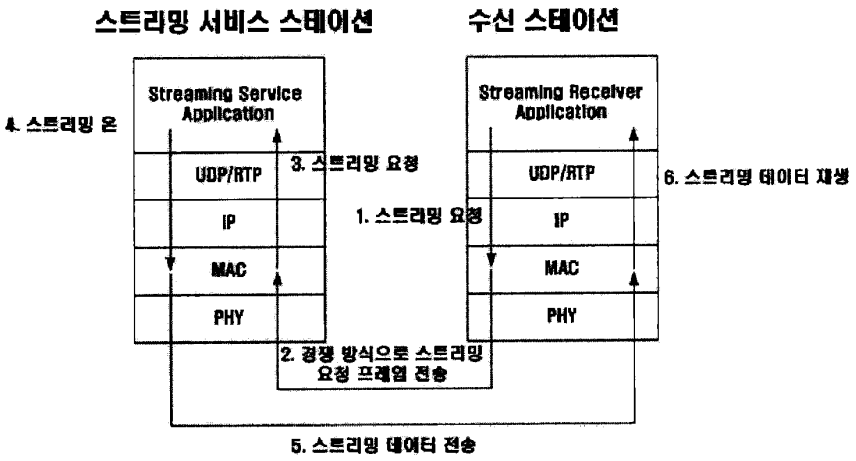
도면3


스테이션 D
1. 제1스트리밍 요청
2. 제1스트리밍 데이터 전송
3. 제3스트리밍 요청
4. 제3스트리밍 데이터 전송
스테이션 A
스테이션 B
1. 제2스트리밍 요청
2. 제2스트리밍 데이터 전송
스테이션 C

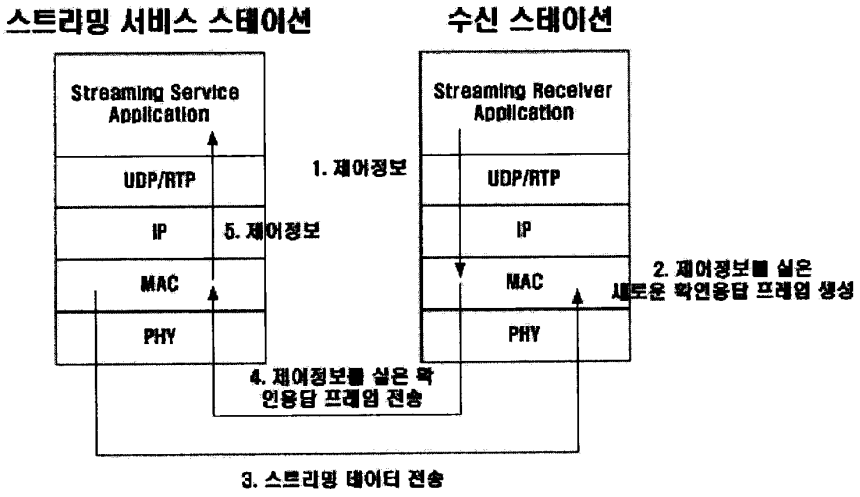
도면4


스트리밍 소스
HD 수신기
SD 수신기
DIFS가 지나길 기다림
SIFS
DIFS가 지나길 기다림
DIFS가 지나길 기다림
DIFS가 지나길 기다림
SIFS

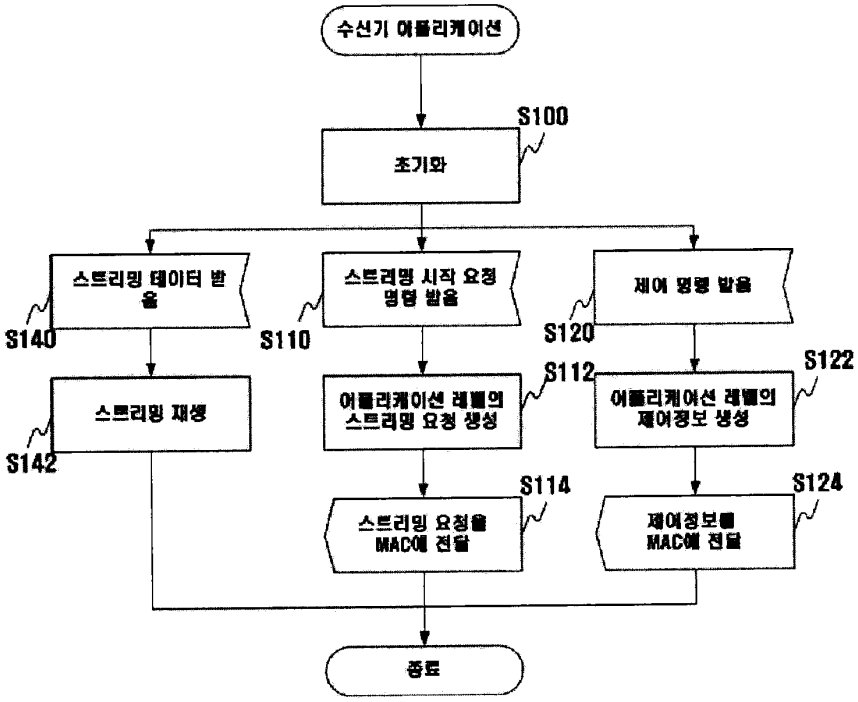
도면5


스트리밍 서비스 스테이션
수신 스테이션
Streaming Service Application
Streaming Receiver Application
4. 스트리밍 온
3. 스트리밍 요청
1. 스트리밍 요청
6. 스트리밍 데이터 재생
UDP/RTP
IP
MAC
PHY
UDP/RTP
IP
MAC
PHY
2. 경쟁 방식으로 스트리밍 요청 프레임 전송
5. 스트리밍 데이터 전송

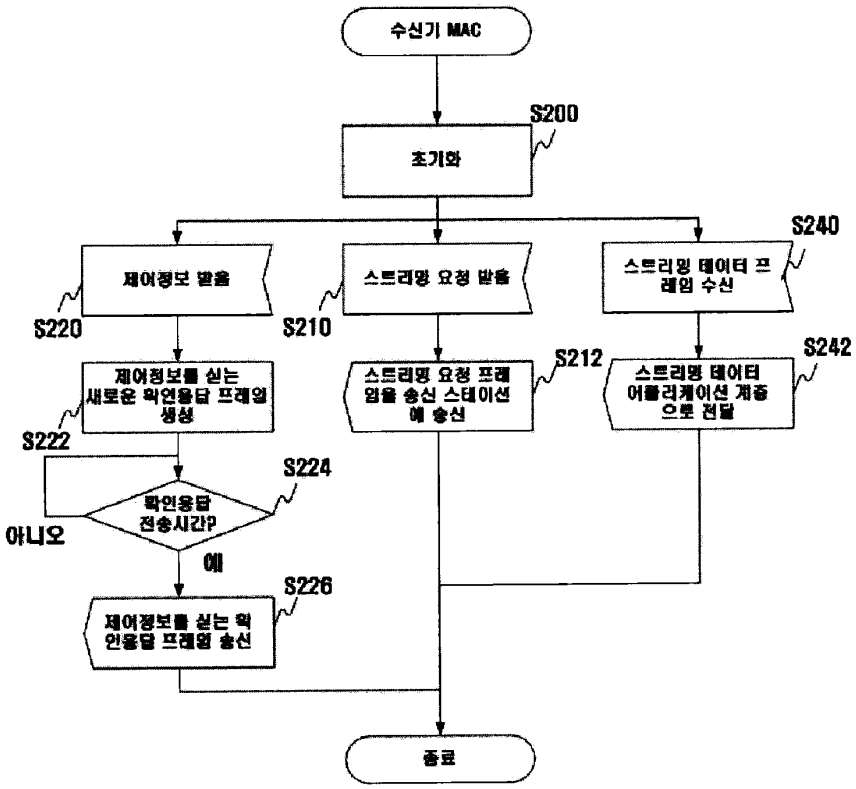
도면6


스트리밍 서비스 스테이션
수신 스테이션
Streaming Service Application
UDP/RTP
IP
MAC
PHY
Streaming Receiver Application
UDP/RTP
IP
MAC
PHY
1. 제어정보
5. 제어정보
2. 제어정보를 실은 새로운 확인응답 프레임 생성
4. 제어정보를 실은 확인응답 프레임 전송
3. 스트리밍 데이터 전송

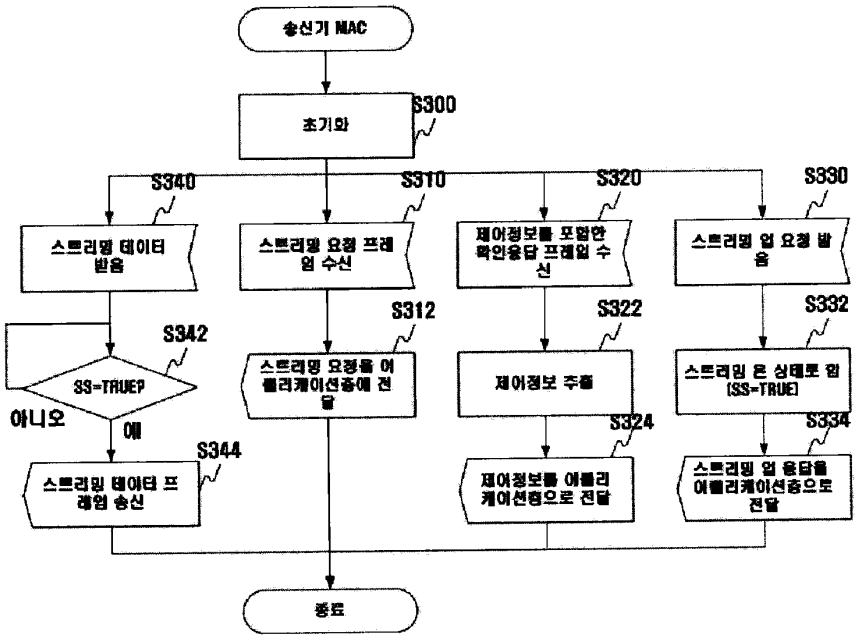
도면7


수신기 어플리케이션
S100
초기화
스트리밍 데이터 받음
S140
스트리밍 재생
S142
스트리밍 시작 요청 명령 발생
S110
어플리케이션 레벨의 스트리밍 요청 생성
S112
스트리밍 요청을 MAC에 전달
S114
제어 명령 발생
S120
어플리케이션 레벨의 제어정보 생성
S122
제어정보를 MAC에 전달
S124
종료

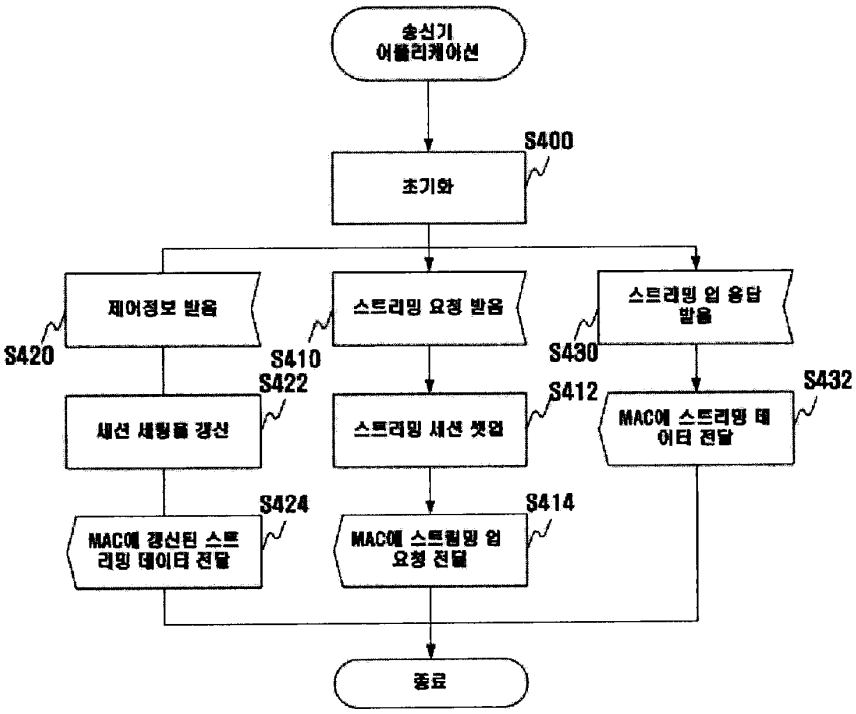
도면8


수신기 MAC
S200
초기화
S240
제어정보 받음
스트리밍 요청 받음
스트리밍 데이터 프레임 수신
S220
S210
제어정보를 싣는 새로운 확인응답 프레임 생성
스트리밍 요청 프레임을 송신 스테이션에 송신
S212
스트리밍 데이터 어플리케이션 계층으로 전달
S242
S222
S224
확인응답 전송시간?
아니오
예
S226
제어정보를 싣는 확인응답 프레임 송신
종료

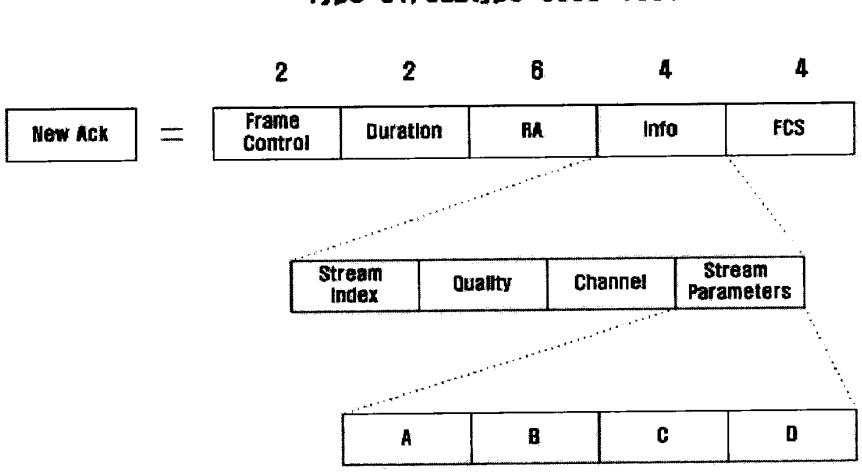
도면9


송신기 MAC
초기화
S300
S340
S310
S320
S330
스트리밍 데이터 받음
스트리밍 요청 프레임 수신
제어정보를 포함한 확인응답 프레임 수신
스트리밍 입 요청 받음
S342
S312
S322
S332
SS=TRUE?
스트리밍 요청을 어플리케이션층에 전달
제어정보 추출
스트리밍 은 상태로 입 (SS=TRUE)
아니오
예
S344
S324
S334
스트리밍 데이터 프레임 송신
제어정보를 어플리케이션층으로 전달
스트리밍 입 응답을 어플리케이션층으로 전달
종료

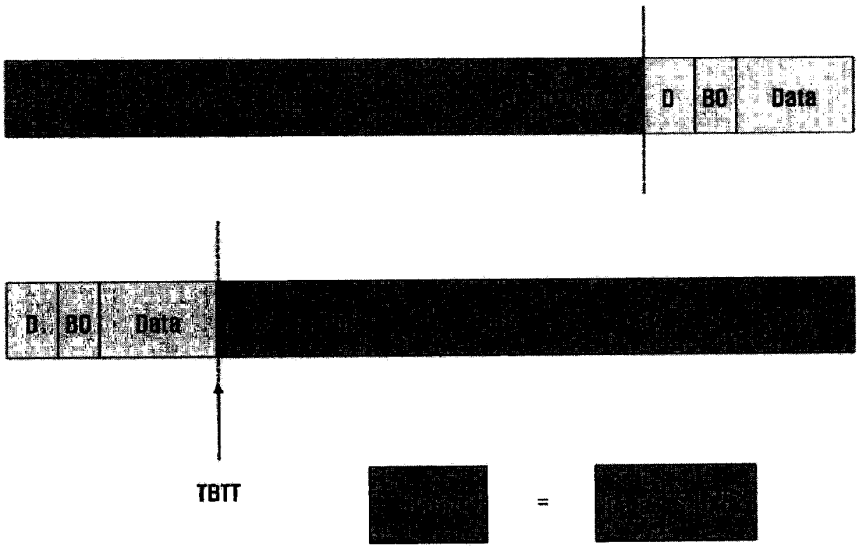
도면10


송신기
어플리케이션
S400
초기화
제어정보 받음
스트리밍 요청 받음
스트리밍 업 응답 받음
S420
S410
S430
S422
S412
S432
세션 세팅을 갱신
스트리밍 세션 셋업
MAC에 스트리밍 데이터 전달
S424
S414
MAC에 갱신된 스트리밍 데이터 전달
MAC에 스트리밍 업 요청 전달
종료

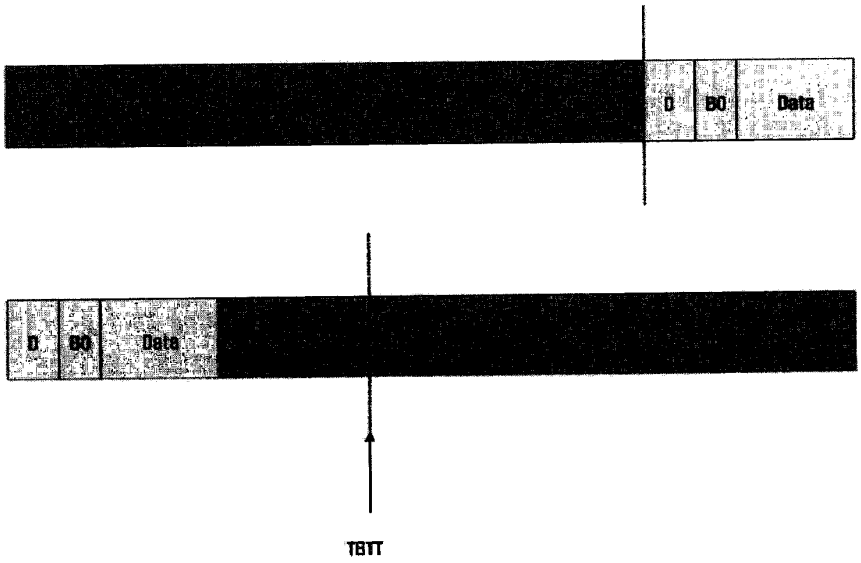
도면11


Type=01, subtype=0000~1001
2
2
6
4
4
New Ack
=
Frame Control
Duration
RA
Info
FCS
Stream Index
Quality
Channel
Stream Parameters
A
B
C
D

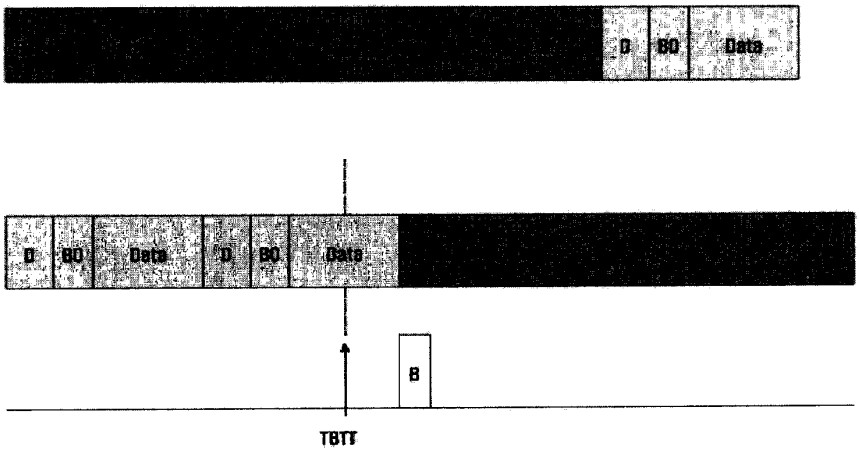
도면12



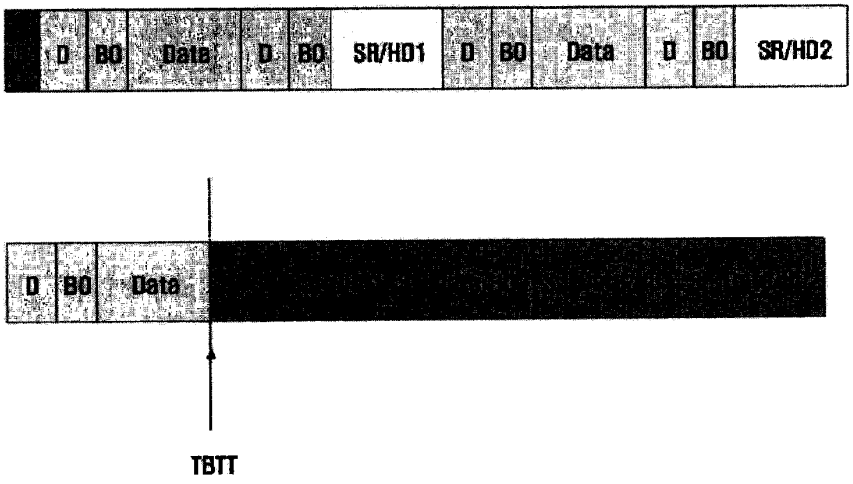
도면13



도면14


D
BO
Data
D
BO
Data
D
BO
Data
B
TBTT

도면15


D
BO
Data
D
BO
SR/HD1
D
BO
Data
D
BO
SR/HD2
D
BO
Data
TBTT

Atty. Dkt. No. 088245-2616

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant:	Menzo Wentink
Title:	TRANSMIT ANNOUNCEMENT INDICATION
Appl. No.:	11/627,181
Filing Date:	1/25/2007
Examiner:	Abdulla A. Riyami
Art Unit:	2474
Confirmation Number:	1464

SUPPLEMENTAL INFORMATION DISCLOSURE STATEMENT UNDER 37 CFR §1.56

Mail Stop Amendment
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Commissioner:

Applicant submits herewith documents for the Examiner's consideration in accordance with 37 CFR §§1.56, 1.97 and 1.98.

Applicant respectfully requests that each listed document be considered by the Examiner and be made of record in the present application and that an initialed copy of Form PTO/SB/08 be returned in accordance with MPEP §609.

The submission of any document herewith is not an admission that such document constitutes prior art against the claims of the present application or that such document is considered material to patentability as defined in 37 CFR §1.56(b). Applicant does not waive

any rights to take any action which would be appropriate to antedate or otherwise remove as a competent reference any document submitted herewith.

FOREIGN LANGUAGE DOCUMENTS

An English translation of the foreign-language document is being provide if readily available. However, the absence of such translation does not relieve the PTO from its duty to consider the submitted foreign language document (37 CFR §1.98 and MPEP §609).

TIMING OF THE DISCLOSURE

The listed documents are being submitted in compliance with 37 CFR §1.97(b), before the mailing of a first Office action after the filing of a RCE.

Although Applicant believes that no fee is required, the Commissioner is hereby authorized to charge any additional fees which may be due to Deposit Account No. 19-0741.

Respectfully submitted,

Date April 26, 2012

By: /Christopher L. Kalafut/

FOLEY & LARDNER LLP
Customer Number: 23524
Telephone: (608) 258-4286
Facsimile: (608) 258-4258

Christopher L. Kalafut
Attorney for Applicant
Registration No. 57,946

Atty. Dkt. No. 088245-2616

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant:	Menzo Wentink
Title:	TRANSMIT ANNOUNCEMENT INDICATION
Appl. No.:	11/627,181
Appl. Filing Date:	1/25/2007
Examiner:	Abdulla A. Riyami
Art Unit:	2474
Confirmation Number:	1464

REQUEST FOR CONTINUED EXAMINATION (RCE) TRANSMITTAL

Mail Stop RCE
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Commissioner:

This is a Request for Continued Examination (RCE) under 37 C.F.R. § 1.114 of the above-identified application. This RCE and the enclosed items listed below are being filed prior to the earliest of: (1) payment of the issue fee (unless a petition under 37 C.F.R. § 1.313 is granted); (2) abandonment of the application; or (3) the filing of a notice of appeal to the U.S. Court of Appeals for the Federal Circuit under 35 U.S.C. §141, or the commencement of a civil action under 35 U.S.C. §145 or §146 (unless the appeal or civil action is terminated).

1. Submission **required** under 37 C.F.R. §1.114: (check items that apply)

a. Previously submitted:

[**X**] Please enter and consider the amendment and/or reply previously filed on December 21, 2011 .

[ ] Please consider the Affidavit(s)/Declaration(s) previously filed on __ but not considered.

[ ] Please consider the arguments in the Appeal Brief or Reply previously filed on __.

[ ] Other __.

b. Enclosed are:

[**X**] Amendment/Reply previously filed on December 21, 2011.

[ ] Affidavit(s)/Declaration(s).

[ ] Information Disclosure Statement.

[ ] Form PTO/SB/08 with copies of ___ listed reference(s).

[ ] Other .

Miscellaneous:

[ ] Suspension of action of the above-identified application is requested under 37 C.F.R. § 1.103(c) for a period of __ months.

The filing fee is calculated below:

	Claims as Amended		Previously Paid For	Extra Claims Present		Rate		Fee Totals
RCE Fee 1.17(e):						$930.00	=	$930.00
Total Claims:	46	-	46	= 0	x	$60.00	=	$0.00
Independents	6	-	6	= 0	x	$250.00	=	$0.00
First presentation of any Multiple Dependent Claims:					+	$450.00	=	$0.00
CLAIMS FEE TOTAL:							=	$930.00

[ ] Applicant hereby petitions for an extension of time under 37 C.F.R. §1.136(a) for the total number of months checked below:

[ ]	Extension for response filed within the first month:	$150.00	0	$0.00
[ ]	Extension for response filed within the second month:	$560.00		$0.00
[ ]	Extension for response filed within the third month:	$1,270.00		$0.00
[ ]	Extension for response filed within the fourth month:	$1,980.00		$0.00
[ ]	Extension for response filed within the fifth month:	$2,690.00		$0.00
			EXTENSION FEE SUBTOTAL:	$0.00
			EXTENSION FEE ALREADY PAID: -	$0.00
			EXTENSION FEE TOTAL	$0.00
			CLAIMS AND EXTENSION FEE TOTAL:	$930.00
[ ]	Small Entity Fees Apply (subtract ½ of above):			$0.00
[ ]	Suspension of action requested under 37 C.F.R. § 1.103(c)			$0.00
			TOTAL FEE:	$930.00

The above-identified fees of $930.00 are being paid by credit card via EFS-Web.

The Commissioner is hereby authorized to charge any additional fees which may be required regarding this application under 37 C.F.R. §§ 1.16-1.17, or credit any overpayment, to Deposit Account No. 19-0741. Should no proper payment be enclosed herewith, as by the credit card payment instructions in EFS-Web being incorrect or absent, resulting in a rejected or incorrect credit card transaction, the Commissioner is authorized to charge the unpaid amount to Deposit Account No. 19-0741.

Please direct all correspondence to the undersigned attorney or agent indicated below.

Respectfully submitted,

Date January 31, 2012

By _____

FOLEY & LARDNER LLP
Customer Number: 23524
Telephone: (608) 258-4292
Facsimile: (608) 258-4258

Paul S. Hunter
Attorney for Applicant
Registration No. 44,787

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant: Menzo Wentink

Title: TRANSMIT ANNOUNCEMENT INDICATION

Appl. No.: 11/627,181

Filing Date: 01/25/2007

Examiner: Abdulla A. Riyami

Art Unit: 2474

Confirmation Number: 1464

COPY

AMENDMENT AND REPLY UNDER 37 CFR 1.116

Mail Stop AF
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

This communication is responsive to the Final Office Action dated November 7, 2011, concerning the above-referenced patent application, making January 7, 2011, two months from the mailing date. Accordingly, this response is timely filed.

Amendments to the Claims are reflected in the listing of claims which begins on page 2 of this document.

Remarks/Arguments begin on page 9 of this document.

Please amend the application as follows:

Amendments to the Claims:

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

1. (Currently Amended) A method comprising:

transmitting a first communication frame from a first station to a second station;

wherein the first communication frame comprises an address of the second station and a transmit announcement indication indicating that a second communication frame intended for the second station will follow the first communication frame and that the second communication frame will not include [[an]] the address of the second station.

2. (Original) The method of claim 1, wherein the second communication frame follows after a short inter frame space (SIFS) after the first communication frame with the transmit announcement indication.

3. (Original) The method of claim 1, wherein the second communication frame follows after a short inter frame space (SIFS) after a response to the first communication frame with the transmit announcement indication.

4. (Original) The method of claim 1, wherein the transmit announcement indication comprises a zero-length frame.

5. (Previously Presented) The method of claim 1, wherein transmitting the first communication frame comprises providing the transmit announcement indication with a request to send (RTS) frame.

6. (Original) The method of claim 5, further comprising receiving, by the first station, a clear to send (CTS) frame from the second station after the first station has transmitted the transmit announcement indication with the RTS frame.

7. (Previously Presented) The method of claim 6, further comprising transmitting the second communication frame from the first station to the second station, wherein the second communication frame does not include the address of the second station.

8. (Previously Presented) The method of claim 1, wherein transmitting the first communication frame comprises providing the transmit announcement indication in a quality of service null (QoS-null) frame.

9. (Original) The method of claim 8, further comprising receiving, by the first station, an acknowledgement (ACK) frame from the second station after the first station has transmitted the transmit announcement indication with the QoS-null frame.

10. (Original) The method of claim 9, further comprising transmitting the second communication frame associated with the transmit announcement indication.

11. (Original) The method of claim 1, wherein providing the transmit announcement indication comprises providing the transmit announcement indication with a clear to send (CTS) frame.

12. (Original) The method of claim 11, further comprising transmitting the second communication frame associated with the transmit announcement indication.

13. (Currently Amended) A non-transitory computer-readable medium having instructions stored thereon that, if executed by a computing device, cause the computing device to perform operations comprising:

transmitting a first communication frame from a first station to a second station;

wherein the first communication frame comprises an address of the second station and a transmit announcement indication indicating that a second communication frame intended for the second station will follow the first communication frame and that the second communication frame will not include [[an]] the address of the second station.

14. (Previously Presented) The computer-readable medium of claim 13, wherein the transmit announcement indication comprises a zero-length frame.

15. (Previously Presented) The computer-readable medium of claim 13, wherein transmitting the first communication frame comprises providing the transmit announcement indication with a request to send (RTS) frame.

16. (Previously Presented) The computer-readable medium of claim 15, wherein the operations further comprise receiving a clear to send (CTS) frame from the second station after the first station has transmitted the transmit announcement indication with the RTS frame.

17. (Previously Presented) The computer-readable medium of claim 16, wherein the operations further comprise transmitting the second communication frame associated with the transmit announcement indication.

18. (Currently Amended) A system comprising:

a transmitter configured to:

transmit a first communication frame from a first station to a second station;

wherein the first communication frame comprises an address of the second station and a transmit announcement indication indicating that a second communication frame intended for the second station will follow the first communication frame and that the second communication frame will not include [[an]] the address of the second station.

19. (Original) The system of claim 18, wherein the transmit announcement indication comprises a zero-length frame.

20. (Original) The system of claim 18, wherein the transmitter is further configured to provide the transmit announcement indication with a request to send (RTS) frame.

21. (Original) The system of claim 20, further comprising a receiver configured to receive, by the first station, a clear to send (CTS) frame from the second station after the first station has transmitted the transmit announcement indication with the RTS frame.

22. (Original) The system of claim 21, wherein the transmitter is further configured to transmit frame second communication frame associated with the transmit announcement indication.

23. (Original) The system of claim 18, wherein the first station comprises one of a wireless radio, desktop computer, portable computer, laptop computer, multi-media players, personal digital assistant (PDA), printer, fax machine, scanner, hub, switch, router, set-top box, and television with communication capability.

24. (Previously Presented) The method of claim 1, wherein the second communication frame comprises a physical layer (PHY) header without a media access control (MAC) portion.

25. (Previously Presented) The method of claim 1, wherein the transmit announcement indication comprises a bit inside a MAC header field.

26. (Previously Presented) The method of claim 25, wherein the bit comprises an high throughput-control field.

27. (Previously Presented) The method of claim 1, wherein the transmit announcement indication is located within one of a data frame, a management frame, or a control frame.

28. (Previously Presented) The method of claim 1, wherein the transmit announcement indication precedes a zero-length frame.

29. (Currently Amended) A method comprising:

receiving a first communication frame from a first station at a second station, wherein the first communication frame includes an address of the second station and a transmit announcement indication that indicates that a second communication frame intended for the second station will follow the first communication frame and that the second communication frame will not include [[an]] the address of the second station.

30. (Previously Presented) The method of claim 29, further comprising receiving, at the second station, the second communication frame after a short inter frame space (SIFS) that follows the first communication frame.

31. (Previously Presented) The method of claim 29, further comprising receiving, at the second station, the second communication frame after a short inter frame space (SIFS) that follows a response to the first communication frame.

32. (Previously Presented) The method of claim 29, wherein the transmit announcement indication comprises a zero-length frame.

33. (Previously Presented) The method of claim 29, wherein receiving the first communication frame comprises receiving the transmit announcement indication with a request to send (RTS) frame.

34. (Previously Presented) The method of claim 33, further comprising transmitting a clear to send (CTS) frame from the second station to the first station in response to receiving the RTS frame.

35. (Previously Presented) The method of claim 29, wherein receiving the first communication frame comprises receiving the transmit announcement indication in a quality of service null (QoS-null) frame.

36. (Previously Presented) The method of claim 35, further comprising receiving an acknowledgement (ACK) frame at the second station from the first station.

37. (Previously Presented) The method of claim 29, wherein receiving the first communication frame comprises receiving the transmit announcement indication with a clear to send (CTS) frame.

38. (Currently Amended) A non-transitory computer-readable medium having instructions stored thereon that, if executed by a computing device, cause the computing device to perform operations comprising:

receiving a first communication frame from a first station, wherein the first communication frame includes an address of the second station and a transmit announcement indication that indicates that a second communication frame will follow the first communication frame and that the second communication frame will not include [[an]] the address of the second station.

39. (Previously Presented) The computer-readable medium of claim 38, wherein the transmit announcement indication comprises a zero-length frame.

40. (Previously Presented) The computer-readable medium of claim 38, wherein the receiving the first communication frame comprises receiving the transmit announcement indication with a request to send (RTS) frame.

41. (Previously Presented) The computer-readable medium of claim 40, wherein the operations further comprise transmitting a clear to send (CTS) frame to the first station in response to the RTS frame.

42. (Currently Amended) A system comprising:

a receiver configured to receive a first communication frame from a first station at a second station, wherein the first communication frame includes an address of the second station and a transmit announcement indication that indicates that a second communication frame

intended for the second station will follow the first communication frame and that the second communication frame will not include [[an]] the address of the second station.

43. (Previously Presented) The system of claim 42, wherein the transmit announcement indication comprises a zero-length frame.

44. (Previously Presented) The system of claim 43, wherein the receiver is further configured to receive the transmit announcement indication with a request to send (RTS) frame.

45. (Previously Presented) The system of claim 44, further comprising a transmitter configured to transmit a clear to send (CTS) frame from the second station to the first station in response to the RTS frame.

46. (Previously Presented) The system of claim 42, wherein the second station comprises one of a wireless radio, desktop computer, portable computer, laptop computer, multi-media players, personal digital assistant (PDA), printer, fax machine, scanner, hub, switch, router, set-top box, and television with communication capability.

REMARKS

Applicant respectfully requests reconsideration of the present application in view of the foregoing amendments and in view of the reasons that follow. Claims 1, 13, 18, 29, 38 and 42 are amended. *The amendment should be entered because the amendment merely clarifies the claim language and places this application in a better condition for appeal.* The amendment does not add new matter and does not require a new search. Claims 1-46 are pending in the present Application.

I. Interview Summary

Applicant thanks the Examiner for the courtesies extended in the interviews conducted on November 2 and 3, 2011. The Examiner and Applicant's representative discussed clarifying the claim language as presented in the above amendment. No agreement as to the allowability of the claims was reached.

II. Claim Rejections Under 35 U.S.C. § 103

A. Claims 1-3, 5-13, 15-18, 20-27, 29-31, 33-38, 40-42, and 46

On page 3 of the Office Action, Claims 1-3, 5-13, 15-18, 20-27, 29-31, 33-38, 40-42, and 46 were rejected under 35 U.S.C. § 103 as being unpatentable over U.S. Publication No. 2008/0298306 to Larsson ("Larsson") in view of U.S. Publication No. 2005/0114749 to Yonge ("Yonge"). Applicant respectfully disagrees. Larsson and Yonge, alone or in combination, do not disclose at least the features "a transmit announcement indication indicating that a second communication frame intended for the second station will follow the first communication frame and that the second communication frame will not include an address of the second station," as recited by amended Claim 1. Independent Claims 13, 18, 29, 38 and 42 include similar features.

Larsson discloses "improved support for link adaptation in wireless networks." (Para. [0012]). In particular, paragraph [0018] of Larsson, cited by the Examiner, discloses (with underlining added):

> More particularly, a designated originating node sends a first message, including an indication of a current transmit duration, sometimes also referred to as a tentative transmit duration, for transfer of a predetermined amount of information, to at least a designated receiving node. The current transmit duration corresponds to a currently assumed data link rate, sometimes also referred to as a tentative link rate. The designated receiving node selects a desired data link rate for subsequent communication from the originating node, and then determines an updated transmit duration according to the selected data link rate. The receiving node sends a second message, including an indication of the updated transmit duration, to at least the designated originating node, and the originating node then determines an updated data link rate in response to the updated transmit duration.

Further, describing the frame types of FIG. 3 of Larsson, paragraph [0082] of Larsson, discloses (with underlining added):

> The frame format used in IEEE 802.11 is illustrated in FIG. 3. The RTS frame comprises a frame control field, a duration field, a Receiver Address (RA) field, a Transmitter Address (TA) field and a Frame Check Sequence (FCS). The CTS and ACK frames, likewise, each comprises frame control, duration, RA and FCS fields. Finally, the payload frame contains the frame control field, duration field, address fields, a sequence control field, a frame body and a FCS field.

Thus, Larsson merely discloses a scheme for establishing a data transmission rate. Further, Larsson discloses that each frame transmitted from the transmitter includes an address field.

In contrast, amended Claim 1 recites "a transmit announcement indication indicating that a second communication frame intended for the second station will follow the first communication frame and that the second communication frame will not include an address of the second station." A scheme for establishing a data transmission rate, as in Larsson, is not equivalent to "a transmit announcement indication indicating that a second communication frame intended for the second station will follow the first communication frame," as recited in Claim 1.

The indicator in Larsson merely establishes the transmission rate (i.e., duration). Further, since each frame of Larsson has an address field, Larsson cannot teach "a transmit announcement indication indicating ... that the second communication frame will not include an address of the second station," as recited in Claim 1.

Yonge discloses "transmitting a group of bits from a transmitting station to a receiving station, wherein the group of bits comprises information bits and error checking bits, and communicating additional bits from the transmitting station to the receiving station without transmitting the additional bits." (Para [0004]). In particular, paragraph [0004] discloses (with underlining added):

> Communicating the additional bits comprises, at the transmitting station, deriving the error checking bits from the additional bits using an error checking process; and at the receiving station, using the same or a related error checking process to process candidate bits known to the receiving station, and comparing the output of the error checking process to the error checking bits received from the transmitting station to determine if the candidate bits correspond to the additional bits.

Paragraph [0016] discloses (with underlining added):

> ...a transmitting station may use an error checking process to encode a block of data to be transmitted into a substantially unique code (which could be termed error checking bits) that is substantially unique to the communication and send the unique code along with the block of data to a receiving station. The receiving station then processes the received block of data and unique code using the same or related error checking process to determine whether the received block of data has been received without error.

Paragraphs [0020]-[0022] provide an example of how the system of Yonge transmits data frames (with underlining and emphasis added):

> As shown in FIG. 2, MAC 12 has a task of sending a message frame 102 with a block of data 104 to MAC 14 via medium 3

without directly specifying a destination address 108 for MAC 14. Both MAC 14 and MAC 16 will receive the message and MAC 14 should behave as if the message 102 is intended for MAC 14 while MAC 16 should function as if the message frame 102 is not intended for MAC 16. In the message frame 102, MAC 12 sends block of data 104 **and error checking code 106**. MAC 12 generates the error checking code 106 as if the block of data 104 were sent with the address 108 for MAC 14. Upon receipt of the message frame 102, MAC 14 determines that the message frame 102 is intended for MAC 14**, and MAC 16 determines that the message is not intended for MAC 16.** MAC 14 and MAC 16 make this determination by inserting each receiving station's address 112 into an augmented message 110 (containing the received block of data and the receiving station's address) and using error checking code 106 against the augmented message 110 to check for errors. If there are no errors using this augmented message 110, **then the inserted address 112 is assumed to be the destination address 108**. In this example, MAC 14 has no errors and MAC 16 has errors.

...Both MAC 14 and 16 read the data portion 204 and the error code 206 of the message 202. In the example where error code 206 is a CRC, both MAC 14 and 16 apply the 8-, 16- or 32-bit polynomial to an augmented message 212 representing the combination of the received data portion 204 and address 214 of either MAC 14 or 16. Both MAC 14 and 16 check for errors using the augmented message 212. MAC 14 finds no error in the augmented message 212 so MAC 14 detects that the RTS message is intended for MAC 14. By making this successful match, MAC 14 not only knows that the RTS message 202 is intended for MAC 14 but also that the message was received without transmission errors. MAC 14 responds to the RTS by sending a CTS message to medium 3 with MAC 12 as its intended recipient without including address 210 of MAC 12 in the message body. The CTS message has an error code that is derived from the data portion of the CTS message in addition to the destination address 210 of MAC 12. Alternatively, the CTS message can use one or both of the source address (address of station generating the CTS) and destination address (address of station that is the intended recipient of the CTS) in the CRC computation. MACs 12 and 16 receive the CTS message on medium 3 and MAC 12 detects that the CTS message is intended for MAC 12 by augmenting the message with its

> address 210 and calculating that the augmented message is error free as described previously.
>
> ... As shown in FIG. 4, MAC 12 sends a message frame 302 containing an acknowledgement of a receipt of a packet. MAC 14 originally sent the packet to MAC 12 so the packet acknowledgement conveys a source address identification for MAC 12. Upon receipt of this acknowledgement, MAC 14 can match the acknowledgement to a packet sent by MAC 14 to MAC 12. The acknowledgement message 302 is intended for MAC 14 but both MAC 14 and 16 receive the message 302 on medium 3. MAC 12 generates the message 302 by generating error code 306 as if the source address 310 (address of MAC 12) and the destination address 308 (address of MAC 14) were part of a block of data for the message 302 without transmitting the source address 310 and the destination address 308. Alternatively, the acknowledgement can also use only the destination address or only the source address in the CRC computation. The intended receiver knows the address of the station that is supposed to send the response, and thus the acknowledgment mechanism can use one or both of the destination address and source address. Upon receipt of the message, both MAC 14 and MAC 16 insert their addresses into an augmented message 312 as potential destination address 316. Both MAC 14 and MAC 16 also insert addresses into an augmented message 312 of stations where MAC 14 and 16 previously sent unacknowledged packets as potential source addresses 314. MAC 14 and 16 then check their augmented messages 312 against the received error code 306 in the message to see if there is a match. In this case, MAC 14 has a match for the destination address 316 and a source address 314 for the packet previously sent to MAC 12.

Thus, Yonge discloses transmitting a date frame including data along with an error code. Each receiving station checks its own address against the error code. A receiving station where no error is detected based on the error code determines that the data frame was intended for that receiving station. Receiving stations that detect an error determine that the data frame was not intended for those receiving stations.

In contrast, amended Claim 1 recites "a transmit announcement indication indicating that a second communication frame intended for the second station will follow the first

communication frame and that the second communication frame will not include an address of the second station." A date frame including data along with an error code, as in Yonge, is not equivalent to "a transmit announcement **indication indicating that a second communication frame intended for the second station will follow the first communication frame**," as recited in Claim 1. In Yonge data frames are sent without any indication of what will follow. Each receiving station in Yonge makes a determination of whether or not the data frame is intended for the particular receiving station. Further, the unique error codes sent by the transmitting station of Yonge are substantially equivalent to a destination address. Therefore, Yonge does not disclose at least the features "a transmit announcement indication indicating that a second communication frame intended for the second station will follow the first communication frame and that the second communication frame will not include an address of the second station," as recited by amended Claim 1.

An obviousness rejection cannot be properly maintained where the references cited do not disclose each and every claim element. For at least these reasons, Claim 1 is patentable over Larsson and Yonge. Independent Claims 13, 18, 29, 38 and 42 include similar features and are patentable over Larsson and Yonge for at least the same reasons. Claims 2-3, 5-12, 15-17, 20-27, 30-31, 33-37, 40-41, and 46 depend from one of independent Claims 1, 13, 18, 29, 38 and 42. Therefore, Applicant respectfully requests withdrawal of the rejection of Claims 1-3, 5-13, 15-18, 20-27, 29-31, 33-38, 40-42, and 46 under 35 U.S.C. § 103.

B. Claims 4, 19, 28, 32, 39, and 43-45

On page 21 of the Office Action, Claims 4, 19, 28, 32, 39, and 43-45 were rejected under 35 U.S.C. 103(a) as being unpatentable over Larsson and Yonge in view of U.S. Publication No. 2005/0265393 to Fischer *et al.* ("Fischer"). Applicant respectfully disagrees. Larsson and Fischer, alone or in combination, do not disclose or suggest at least the features "a transmit announcement indication indicating that a second communication frame intended for the second station will follow the first communication frame and that the second communication frame will

not include an address of the second station," as recited by amended Claim 1. Independent Claims 13, 18, 29, 38 and 42 include similar features.

As discussed above in **Section II.B.**, Larsson and Yonge do not disclose at least the features "a transmit announcement indication indicating that a second communication frame intended for the second station will follow the first communication frame and that the second communication frame will not include an address of the second station," as recited by amended Claim 1.

Fischer discloses "canceling and/or trimming a medium reservation in a communication system that employs a protocol that supports a reservation of a shared communication medium." (Para. [0009]). In particular, paragraph [0040] of Fischer, cited by the Examiner, discloses:

> In some embodiments according to some aspects of the present invention, at the end of a sequence of frame transmissions and/or frame exchanges sent during a period of reservation of the communication medium, a portion of a complete frame, which may be used as a Signaling frame, may be sent by the holder of the reservation that may include, for example, one or more items (e.g., one of two items). A first item may include, for example, a physical layer preamble, a physical layer header and no MAC fields. The physical layer header may indicate, for example, that the MAC portion of the frame is NULL or ZERO length. A second item may include, for example, a physical layer header only in which the physical layer header indicates that the MAC portion of the frame is NULL or ZERO length. The NULL- or ZERO-length-indicated MAC frame may signal to the node which sent the reservation confirmation message that the sending node may now send a reservation cancellation message. In some embodiments according to some aspects of the present invention, the physical layer header might not include, for example, MAC layer addressing information. The addressing may be implicit or inferred. For example, the sending node, which sent the original reservation confirmation message that is implicitly addressed by the NULL physical layer header, may send the explicit reservation cancellation frame.

Further, paragraph [0046] of Fischer, cited by the Examiner, discloses:

> Some embodiments according to some aspects of the present invention provide an option such that receivers that receive the ZERO-value reservation request frame (e.g., an RTS frame as set forth in IEEE 802.11) may cancel any remaining reservation.

However, Fischer does not disclose at least the features "a transmit announcement indication indicating that a second communication frame intended for the second station will follow the first communication frame and that the second communication frame will not include an address of the second station," as recited by amended Claim 1.

An obviousness rejection cannot be properly maintained where the references cited do not disclose each and every claim element. For at least these reasons, Claim 1 is patentable over Larsson, Yonge and Fischer, alone or in combination. Independent Claims 13, 18, 29, 38 and 42 include similar features and are patentable over Larsson, Yonge and Fischer for at least the same reasons. Claims 4, 19, 28, 32, 39, and 43-45 depend from one of independent Claims 1, 13, 18, 29, 38 and 42. Therefore, Applicant respectfully requests withdrawal of the rejection of Claims 4, 19, 28, 32, 39, and 43-45 under 35 U.S.C. § 103.

* * *

Applicant believes that the present application is now in condition for allowance. Favorable reconsideration of the application as amended is respectfully requested.

The Examiner is invited to contact the undersigned by telephone if it is felt that a telephone interview would advance the prosecution of the present application.

The Commissioner is hereby authorized to charge any additional fees which may be required regarding this application under 37 C.F.R. §§ 1.16-1.17, or credit any overpayment, to Deposit Account No. 19-0741. Should no proper payment be enclosed herewith, as by the credit card payment instructions in EFS-Web being incorrect or absent, resulting in a rejected or incorrect credit card transaction, the Commissioner is authorized to charge the unpaid amount to Deposit Account No. 19-0741. If any extensions of time are needed for timely acceptance of

papers submitted herewith, Applicant hereby petitions for such extension under 37 C.F.R. §1.136 and authorizes payment of any such extensions fees to Deposit Account No. 19-0741.

Respectfully submitted,

Date December 21, 2011

By */Eric N. Huston/*

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Attorney for Applicant
Registration No. 65,684

Electronic Patent Application Fee Transmittal	
Application Number:	11627181
Filing Date:	25-Jan-2007
Title of Invention:	Transmit Announcement Indication
First Named Inventor/Applicant Name:	Menzo Wentink
Filer:	Paul S. Hunter/Charmaine Teuschler
Attorney Docket Number:	088245-2616
Filed as Large Entity	

Utility under 35 USC 111(a) Filing Fees

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Miscellaneous:				
Request for continued examination	1801	1	930	930
		Total in USD ($)		**930**

Electronic Acknowledgement Receipt

EFS ID:	11959871
Application Number:	11627181
International Application Number:	
Confirmation Number:	1464
Title of Invention:	Transmit Announcement Indication
First Named Inventor/Applicant Name:	Menzo Wentink
Customer Number:	23524
Filer:	Paul S. Hunter/Charmaine Teuschler
Filer Authorized By:	Paul S. Hunter
Attorney Docket Number:	088245-2616
Receipt Date:	31-JAN-2012
Filing Date:	25-JAN-2007
Time Stamp:	11:11:33
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	Credit Card
Payment was successfully received in RAM	$930
RAM confirmation Number	9876
Deposit Account	
Authorized User	

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)

1		2616RCE13112.pdf	875415 9674b98c42a583d55e9f01276e26c1ff4992970d	yes	21
	Multipart Description/PDF files in .zip description				
	Document Description		**Start**	**End**	
	Request for Continued Examination (RCE)		1	4	
	Amendment Submitted/Entered with Filing of CPA/RCE		5	21	
Warnings:					
Information:					
2	Fee Worksheet (SB06)	fee-info.pdf	30180 d60c9d66f8af3387faabba80ac901903552059a5	no	2
Warnings:					
Information:					
		Total Files Size (in bytes):	905595		

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

<u>New Applications Under 35 U.S.C. 111</u>
If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

<u>National Stage of an International Application under 35 U.S.C. 371</u>
If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

<u>New International Application Filed with the USPTO as a Receiving Office</u>
If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

PTO/SB/06 (07-06)
Approved for use through 1/31/2007. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875	Application or Docket Number 11/627,181	Filing Date 01/25/2007	☐ To be Mailed

APPLICATION AS FILED – PART I

	(Column 1)	(Column 2)	SMALL ENTITY ☐		OR	OTHER THAN SMALL ENTITY	
FOR	NUMBER FILED	NUMBER EXTRA	RATE ($)	FEE ($)		RATE ($)	FEE ($)
☐ BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A	N/A			N/A	
☐ SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A	N/A			N/A	
☐ EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A			N/A	
TOTAL CLAIMS (37 CFR 1.16(i))	minus 20 =	*	X $ =		OR	X $ =	
INDEPENDENT CLAIMS (37 CFR 1.16(h))	minus 3 =	*	X $ =			X $ =	
☐ APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is $250 ($125 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).						
☐ MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))							
* If the difference in column 1 is less than zero, enter "0" in column 2.			TOTAL			TOTAL	

APPLICATION AS AMENDED – PART II

AMENDMENT	01/31/2012	(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	SMALL ENTITY RATE ($)	ADDITIONAL FEE ($)	OR	OTHER THAN SMALL ENTITY RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	* 46	Minus	** 46	= 0	X $ =		OR	X $60=	0
	Independent (37 CFR 1.16(h))	* 6	Minus	***6	= 0	X $ =		OR	X $250=	0
	☐ Application Size Fee (37 CFR 1.16(s))									
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
						TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE	0

AMENDMENT		(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	RATE ($)	ADDITIONAL FEE ($)		RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	*	Minus	**	=	X $ =		OR	X $ =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=	X $ =		OR	X $ =	
	☐ Application Size Fee (37 CFR 1.16(s))									
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
						TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE	

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.

** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".

*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".

The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1.

Legal Instrument Examiner:
/VIKKI GRAY/

This collection of information is required by 37 CFR 1.16. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
11/627,181	01/25/2007	Menzo Wentink	088245-2616	1464

23524 7590 01/06/2012

FOLEY & LARDNER LLP
150 EAST GILMAN STREET
P.O. BOX 1497
MADISON, WI 53701-1497

EXAMINER	
RIYAMI, ABDULLA A	
ART UNIT	PAPER NUMBER
2474	
MAIL DATE	DELIVERY MODE
01/06/2012	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Examiner-Initiated Interview Summary	Application No.	Applicant(s)	
	11/627,181	WENTINK, MENZO	
	Examiner	Art Unit	
	ABDULLAH RIYAMI	2474	

All participants (applicant, applicant's representative, PTO personnel):

(1) *ABDULLAH RIYAMI*. (3)_____.

(2) *Attorney Eric Huston (Reg. No. 65684)*. (4)_____.

Date of Interview: *28 December 2008*.

Type: ☒ Telephonic ☐ Video Conference
☐ Personal [copy given to: ☐ applicant ☐ applicant's representative]

Exhibit shown or demonstration conducted: ☐ Yes ☒ No.
If Yes, brief description: _____.

Issues Discussed ☐101 ☐112 ☐102 ☐103 ☒Others
(For each of the checked box(es) above, please describe below the issue and detailed description of the discussion)

Claim(s) discussed: *1, 13, 18, 29, 38, and 42*.

Identification of prior art discussed: *Larsson (US 2008/0298306 A1) and Yonge, III et al. (US 2005/0114749 A1)*.

Substance of Interview
(For each issue discussed, provide a detailed description and indicate if agreement was reached. Some topics may include: identification or clarification of a reference or a portion thereof, claim interpretation, proposed amendments, arguments of any applied references etc...)

Discussed how the newly added limitations "first communication frame comprises an address of the second station … and that the second communication frame will not include the address of the second station" in independent claims 1, 13, 18, 29, 38, and 42, raises new issues that would require further search and consideration. Also discussed the applicability of the prior art. Attorney understood Examiner's reasoning.

Applicant recordation instructions: It is not necessary for applicant to provide a separate record of the substance of interview.

Examiner recordation instructions: Examiners must summarize the substance of any interview of record. A complete and proper recordation of the substance of an interview should include the items listed in MPEP 713.04 for complete and proper recordation including the identification of the general thrust of each argument or issue discussed, a general indication of any other pertinent matters discussed regarding patentability and the general results or outcome of the interview, to include an indication as to whether or not agreement was reached on the issues raised.

☐ Attachment

/Abdullah Riyami/ Examiner, Art Unit 2474	

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
11/627,181	01/25/2007	Menzo Wentink	088245-2616	1464

23524 7590 01/04/2012

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EXAMINER	
RIYAMI, ABDULLA A	
ART UNIT	PAPER NUMBER
2474	

MAIL DATE	DELIVERY MODE
01/04/2012	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Advisory Action Before the Filing of an Appeal Brief	**Application No.** 11/627,181	**Applicant(s)** WENTINK, MENZO	
	Examiner ABDULLAH RIYAMI	**Art Unit** 2474	

--The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

THE REPLY FILED 21 December 2011 FAILS TO PLACE THIS APPLICATION IN CONDITION FOR ALLOWANCE.

1. ☒ The reply was filed after a final rejection, but prior to or on the same day as filing a Notice of Appeal. To avoid abandonment of this application, applicant must timely file one of the following replies: (1) an amendment, affidavit, or other evidence, which places the application in condition for allowance; (2) a Notice of Appeal (with appeal fee) in compliance with 37 CFR 41.31; or (3) a Request for Continued Examination (RCE) in compliance with 37 CFR 1.114. The reply must be filed within one of the following time periods:
   a) ☐ The period for reply expires _____months from the mailing date of the final rejection.
   b) ☒ The period for reply expires on: (1) the mailing date of this Advisory Action, or (2) the date set forth in the final rejection, whichever is later. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of the final rejection.
   Examiner Note: If box 1 is checked, check either box (a) or (b). ONLY CHECK BOX (b) WHEN THE FIRST REPLY WAS FILED WITHIN TWO MONTHS OF THE FINAL REJECTION. See MPEP 706.07(f).

Extensions of time may be obtained under 37 CFR 1.136(a). The date on which the petition under 37 CFR 1.136(a) and the appropriate extension fee have been filed is the date for purposes of determining the period of extension and the corresponding amount of the fee. The appropriate extension fee under 37 CFR 1.17(a) is calculated from: (1) the expiration date of the shortened statutory period for reply originally set in the final Office action; or (2) as set forth in (b) above, if checked. Any reply received by the Office later than three months after the mailing date of the final rejection, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

NOTICE OF APPEAL

2. ☐ The Notice of Appeal was filed on _____. A brief in compliance with 37 CFR 41.37 must be filed within two months of the date of filing the Notice of Appeal (37 CFR 41.37(a)), or any extension thereof (37 CFR 41.37(e)), to avoid dismissal of the appeal. Since a Notice of Appeal has been filed, any reply must be filed within the time period set forth in 37 CFR 41.37(a).

AMENDMENTS

3. ☒ The proposed amendment(s) filed after a final rejection, but prior to the date of filing a brief, will not be entered because
   (a) ☒ They raise new issues that would require further consideration and/or search (see NOTE below);
   (b) ☐ They raise the issue of new matter (see NOTE below);
   (c) ☒ They are not deemed to place the application in better form for appeal by materially reducing or simplifying the issues for appeal; and/or
   (d) ☐ They present additional claims without canceling a corresponding number of finally rejected claims.
   NOTE: *The newly added limitations "first communication frame comprises an address of the second station … and that the second communication frame will not include the address of the second station" in independent claims 1, 13, 18, 29, 38, and 42, raises new issues that would require further search and consideration*. (See 37 CFR 1.116 and 41.33(a)).
4. ☐ The amendments are not in compliance with 37 CFR 1.121. See attached Notice of Non-Compliant Amendment (PTOL-324).
5. ☐ Applicant's reply has overcome the following rejection(s): _____.
6. ☐ Newly proposed or amended claim(s) _____ would be allowable if submitted in a separate, timely filed amendment canceling the non-allowable claim(s).
7. ☒ For purposes of appeal, the proposed amendment(s): a) ☒ will not be entered, or b) ☐ will be entered and an explanation of how the new or amended claims would be rejected is provided below or appended.
   The status of the claim(s) is (or will be) as follows:
   Claim(s) allowed: _____.
   Claim(s) objected to: _____.
   Claim(s) rejected: *1-46*.
   Claim(s) withdrawn from consideration: _____.

AFFIDAVIT OR OTHER EVIDENCE

8. ☐ The affidavit or other evidence filed after a final action, but before or on the date of filing a Notice of Appeal will not be entered because applicant failed to provide a showing of good and sufficient reasons why the affidavit or other evidence is necessary and was not earlier presented. See 37 CFR 1.116(e).
9. ☐ The affidavit or other evidence filed after the date of filing a Notice of Appeal, but prior to the date of filing a brief, will not be entered because the affidavit or other evidence failed to overcome all rejections under appeal and/or appellant fails to provide a showing a good and sufficient reasons why it is necessary and was not earlier presented. See 37 CFR 41.33(d)(1).
10. ☐ The affidavit or other evidence is entered. An explanation of the status of the claims after entry is below or attached.

REQUEST FOR RECONSIDERATION/OTHER

11. ☐ The request for reconsideration has been considered but does NOT place the application in condition for allowance because: _____.
12. ☐ Note the attached Information *Disclosure Statement*(s). (PTO/SB/08) Paper No(s). _____
13. ☐ Other: _____.

/Chi H Pham/
Supervisory Patent Examiner, Art Unit 2471

/Abdullah Riyami/
Examiner, Art Unit 2474

Atty. Dkt. No. 088245-2616

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant: Menzo Wentink

Title: TRANSMIT ANNOUNCEMENT INDICATION

Appl. No.: 11/627,181

Filing Date: 01/25/2007

Examiner: Abdulla A. Riyami

Art Unit: 2474

Confirmation Number: 1464

AMENDMENT AND REPLY UNDER 37 CFR 1.116

Mail Stop AF
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

This communication is responsive to the Final Office Action dated November 7, 2011, concerning the above-referenced patent application, making January 7, 2011, two months from the mailing date. Accordingly, this response is timely filed.

Amendments to the Claims are reflected in the listing of claims which begins on page 2 of this document.

Remarks/Arguments begin on page 9 of this document.

Please amend the application as follows:

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant:	Menzo Wentink
Title:	TRANSMIT ANNOUNCEMENT INDICATION
Appl. No.:	11/627,181
Filing Date:	01/25/2007
Examiner:	Abdulla A. Riyami
Art Unit:	2474
Confirmation Number:	1464

AMENDMENT AND REPLY UNDER 37 CFR 1.116

Mail Stop AF
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

This communication is responsive to the Final Office Action dated November 7, 2011, concerning the above-referenced patent application, making January 7, 2011, two months from the mailing date. Accordingly, this response is timely filed.

Amendments to the Claims are reflected in the listing of claims which begins on page 2 of this document.

Remarks/Arguments begin on page 9 of this document.

Please amend the application as follows:

Amendments to the Claims:

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

1. (Currently Amended) A method comprising:

transmitting a first communication frame from a first station to a second station;

wherein the first communication frame comprises an address of the second station and a transmit announcement indication indicating that a second communication frame intended for the second station will follow the first communication frame and that the second communication frame will not include [[an]] the address of the second station.

2. (Original) The method of claim 1, wherein the second communication frame follows after a short inter frame space (SIFS) after the first communication frame with the transmit announcement indication.

3. (Original) The method of claim 1, wherein the second communication frame follows after a short inter frame space (SIFS) after a response to the first communication frame with the transmit announcement indication.

4. (Original) The method of claim 1, wherein the transmit announcement indication comprises a zero-length frame.

5. (Previously Presented) The method of claim 1, wherein transmitting the first communication frame comprises providing the transmit announcement indication with a request to send (RTS) frame.

6. (Original) The method of claim 5, further comprising receiving, by the first station, a clear to send (CTS) frame from the second station after the first station has transmitted the transmit announcement indication with the RTS frame.

7. (Previously Presented) The method of claim 6, further comprising transmitting the second communication frame from the first station to the second station, wherein the second communication frame does not include the address of the second station.

8. (Previously Presented) The method of claim 1, wherein transmitting the first communication frame comprises providing the transmit announcement indication in a quality of service null (QoS-null) frame.

9. (Original) The method of claim 8, further comprising receiving, by the first station, an acknowledgement (ACK) frame from the second station after the first station has transmitted the transmit announcement indication with the QoS-null frame.

10. (Original) The method of claim 9, further comprising transmitting the second communication frame associated with the transmit announcement indication.

11. (Original) The method of claim 1, wherein providing the transmit announcement indication comprises providing the transmit announcement indication with a clear to send (CTS) frame.

12. (Original) The method of claim 11, further comprising transmitting the second communication frame associated with the transmit announcement indication.

13. (Currently Amended) A non-transitory computer-readable medium having instructions stored thereon that, if executed by a computing device, cause the computing device to perform operations comprising:

transmitting a first communication frame from a first station to a second station;

wherein the first communication frame comprises an address of the second station and a transmit announcement indication indicating that a second communication frame intended for the second station will follow the first communication frame and that the second communication frame will not include [[an]] the address of the second station.

14. (Previously Presented) The computer-readable medium of claim 13, wherein the transmit announcement indication comprises a zero-length frame.

15. (Previously Presented) The computer-readable medium of claim 13, wherein transmitting the first communication frame comprises providing the transmit announcement indication with a request to send (RTS) frame.

16. (Previously Presented) The computer-readable medium of claim 15, wherein the operations further comprise receiving a clear to send (CTS) frame from the second station after the first station has transmitted the transmit announcement indication with the RTS frame.

17. (Previously Presented) The computer-readable medium of claim 16, wherein the operations further comprise transmitting the second communication frame associated with the transmit announcement indication.

18. (Currently Amended) A system comprising:

a transmitter configured to:

transmit a first communication frame from a first station to a second station;

wherein the first communication frame comprises an address of the second station and a transmit announcement indication indicating that a second communication frame intended for the second station will follow the first communication frame and that the second communication frame will not include [[an]] the address of the second station.

19. (Original) The system of claim 18, wherein the transmit announcement indication comprises a zero-length frame.

20. (Original) The system of claim 18, wherein the transmitter is further configured to provide the transmit announcement indication with a request to send (RTS) frame.

21. (Original) The system of claim 20, further comprising a receiver configured to receive, by the first station, a clear to send (CTS) frame from the second station after the first station has transmitted the transmit announcement indication with the RTS frame.

22. (Original) The system of claim 21, wherein the transmitter is further configured to transmit frame second communication frame associated with the transmit announcement indication.

23. (Original) The system of claim 18, wherein the first station comprises one of a wireless radio, desktop computer, portable computer, laptop computer, multi-media players, personal digital assistant (PDA), printer, fax machine, scanner, hub, switch, router, set-top box, and television with communication capability.

24. (Previously Presented) The method of claim 1, wherein the second communication frame comprises a physical layer (PHY) header without a media access control (MAC) portion.

25. (Previously Presented) The method of claim 1, wherein the transmit announcement indication comprises a bit inside a MAC header field.

26. (Previously Presented) The method of claim 25, wherein the bit comprises an high throughput-control field.

27. (Previously Presented) The method of claim 1, wherein the transmit announcement indication is located within one of a data frame, a management frame, or a control frame.

28. (Previously Presented) The method of claim 1, wherein the transmit announcement indication precedes a zero-length frame.

29. (Currently Amended) A method comprising:

receiving a first communication frame from a first station at a second station, wherein the first communication frame includes an address of the second station and a transmit announcement indication that indicates that a second communication frame intended for the second station will follow the first communication frame and that the second communication frame will not include [[an]] the address of the second station.

30. (Previously Presented) The method of claim 29, further comprising receiving, at the second station, the second communication frame after a short inter frame space (SIFS) that follows the first communication frame.

31. (Previously Presented) The method of claim 29, further comprising receiving, at the second station, the second communication frame after a short inter frame space (SIFS) that follows a response to the first communication frame.

32. (Previously Presented) The method of claim 29, wherein the transmit announcement indication comprises a zero-length frame.

33. (Previously Presented) The method of claim 29, wherein receiving the first communication frame comprises receiving the transmit announcement indication with a request to send (RTS) frame.

34. (Previously Presented) The method of claim 33, further comprising transmitting a clear to send (CTS) frame from the second station to the first station in response to receiving the RTS frame.

35. (Previously Presented) The method of claim 29, wherein receiving the first communication frame comprises receiving the transmit announcement indication in a quality of service null (QoS-null) frame.

36. (Previously Presented) The method of claim 35, further comprising receiving an acknowledgement (ACK) frame at the second station from the first station.

37. (Previously Presented) The method of claim 29, wherein receiving the first communication frame comprises receiving the transmit announcement indication with a clear to send (CTS) frame.

38. (Currently Amended) A non-transitory computer-readable medium having instructions stored thereon that, if executed by a computing device, cause the computing device to perform operations comprising:

receiving a first communication frame from a first station, wherein the first communication frame includes an address of the second station and a transmit announcement indication that indicates that a second communication frame will follow the first communication frame and that the second communication frame will not include [[an]] the address of the second station.

39. (Previously Presented) The computer-readable medium of claim 38, wherein the transmit announcement indication comprises a zero-length frame.

40. (Previously Presented) The computer-readable medium of claim 38, wherein the receiving the first communication frame comprises receiving the transmit announcement indication with a request to send (RTS) frame.

41. (Previously Presented) The computer-readable medium of claim 40, wherein the operations further comprise transmitting a clear to send (CTS) frame to the first station in response to the RTS frame.

42. (Currently Amended) A system comprising:

a receiver configured to receive a first communication frame from a first station at a second station, wherein the first communication frame includes an address of the second station and a transmit announcement indication that indicates that a second communication frame

intended for the second station will follow the first communication frame and that the second communication frame will not include [[an]] the address of the second station.

43. (Previously Presented) The system of claim 42, wherein the transmit announcement indication comprises a zero-length frame.

44. (Previously Presented) The system of claim 43, wherein the receiver is further configured to receive the transmit announcement indication with a request to send (RTS) frame.

45. (Previously Presented) The system of claim 44, further comprising a transmitter configured to transmit a clear to send (CTS) frame from the second station to the first station in response to the RTS frame.

46. (Previously Presented) The system of claim 42, wherein the second station comprises one of a wireless radio, desktop computer, portable computer, laptop computer, multi-media players, personal digital assistant (PDA), printer, fax machine, scanner, hub, switch, router, set-top box, and television with communication capability.

REMARKS

Applicant respectfully requests reconsideration of the present application in view of the foregoing amendments and in view of the reasons that follow. Claims 1, 13, 18, 29, 38 and 42 are amended. *The amendment should be entered because the amendment merely clarifies the claim language and places this application in a better condition for appeal.* The amendment does not add new matter and does not require a new search. Claims 1-46 are pending in the present Application.

I. Interview Summary

Applicant thanks the Examiner for the courtesies extended in the interviews conducted on November 2 and 3, 2011. The Examiner and Applicant's representative discussed clarifying the claim language as presented in the above amendment. No agreement as to the allowability of the claims was reached.

II. Claim Rejections Under 35 U.S.C. § 103

A. Claims 1-3, 5-13, 15-18, 20-27, 29-31, 33-38, 40-42, and 46

On page 3 of the Office Action, Claims 1-3, 5-13, 15-18, 20-27, 29-31, 33-38, 40-42, and 46 were rejected under 35 U.S.C. § 103 as being unpatentable over U.S. Publication No. 2008/0298306 to Larsson ("Larsson") in view of U.S. Publication No. 2005/0114749 to Yonge ("Yonge"). Applicant respectfully disagrees. Larsson and Yonge, alone or in combination, do not disclose at least the features "a transmit announcement indication indicating that a second communication frame intended for the second station will follow the first communication frame and that the second communication frame will not include an address of the second station," as recited by amended Claim 1. Independent Claims 13, 18, 29, 38 and 42 include similar features.

Larsson discloses "improved support for link adaptation in wireless networks." (Para. [0012]). In particular, paragraph [0018] of Larsson, cited by the Examiner, discloses (with underlining added):

> More particularly, a designated originating node sends a first message, including an indication of a current transmit duration, sometimes also referred to as a tentative transmit duration, for transfer of a predetermined amount of information, to at least a designated receiving node. The current transmit duration corresponds to a currently assumed data link rate, sometimes also referred to as a tentative link rate. The designated receiving node selects a desired data link rate for subsequent communication from the originating node, and then determines an updated transmit duration according to the selected data link rate. The receiving node sends a second message, including an indication of the updated transmit duration, to at least the designated originating node, and the originating node then determines an updated data link rate in response to the updated transmit duration.

Further, describing the frame types of FIG. 3 of Larsson, paragraph [0082] of Larsson, discloses (with underlining added):

> The frame format used in IEEE 802.11 is illustrated in FIG. 3. The RTS frame comprises a frame control field, a duration field, a Receiver Address (RA) field, a Transmitter Address (TA) field and a Frame Check Sequence (FCS). The CTS and ACK frames, likewise, each comprises frame control, duration, RA and FCS fields. Finally, the payload frame contains the frame control field, duration field, address fields, a sequence control field, a frame body and a FCS field.

Thus, Larsson merely discloses a scheme for establishing a data transmission rate. Further, Larsson discloses that each frame transmitted from the transmitter includes an address field.

In contrast, amended Claim 1 recites "a transmit announcement indication indicating that a second communication frame intended for the second station will follow the first communication frame and that the second communication frame will not include an address of the second station." A scheme for establishing a data transmission rate, as in Larsson, is not equivalent to "a transmit announcement indication indicating that a second communication frame intended for the second station will follow the first communication frame," as recited in Claim 1.

The indicator in Larsson merely establishes the transmission rate (i.e., duration). Further, since each frame of Larsson has an address field, Larsson cannot teach "a transmit announcement indication indicating ... that the second communication frame will not include an address of the second station," as recited in Claim 1.

Yonge discloses "transmitting a group of bits from a transmitting station to a receiving station, wherein the group of bits comprises information bits and error checking bits, and communicating additional bits from the transmitting station to the receiving station without transmitting the additional bits." (Para [0004]). In particular, paragraph [0004] discloses (with underlining added):

> Communicating the additional bits comprises, at the transmitting station, deriving the error checking bits from the additional bits using an error checking process; and at the receiving station, using the same or a related error checking process to process candidate bits known to the receiving station, and comparing the output of the error checking process to the error checking bits received from the transmitting station to determine if the candidate bits correspond to the additional bits.

Paragraph [0016] discloses (with underlining added):

> ...a transmitting station may use an error checking process to encode a block of data to be transmitted into a substantially unique code (which could be termed error checking bits) that is substantially unique to the communication and send the unique code along with the block of data to a receiving station. The receiving station then processes the received block of data and unique code using the same or related error checking process to determine whether the received block of data has been received without error.

Paragraphs [0020]-[0022] provide an example of how the system of Yonge transmits data frames (with underlining and emphasis added):

> As shown in FIG. 2, MAC 12 has a task of sending a message frame 102 with a block of data 104 to MAC 14 via medium 3

without directly specifying a destination address 108 for MAC 14. Both MAC 14 and MAC 16 will receive the message and MAC 14 should behave as if the message 102 is intended for MAC 14 while MAC 16 should function as if the message frame 102 is not intended for MAC 16. In the message frame 102, MAC 12 sends block of data 104 **and error checking code 106**. MAC 12 generates the error checking code 106 as if the block of data 104 were sent with the address 108 for MAC 14. Upon receipt of the message frame 102, MAC 14 determines that the message frame 102 is intended for MAC 14**, and MAC 16 determines that the message is not intended for MAC 16**. MAC 14 and MAC 16 make this determination by inserting each receiving station's address 112 into an augmented message 110 (containing the received block of data and the receiving station's address) and using error checking code 106 against the augmented message 110 to check for errors. If there are no errors using this augmented message 110, **then the inserted address 112 is assumed to be the destination address 108**. In this example, MAC 14 has no errors and MAC 16 has errors.

...Both MAC 14 and 16 read the data portion 204 and the error code 206 of the message 202. In the example where error code 206 is a CRC, both MAC 14 and 16 apply the 8-, 16- or 32-bit polynomial to an augmented message 212 representing the combination of the received data portion 204 and address 214 of either MAC 14 or 16. Both MAC 14 and 16 check for errors using the augmented message 212. MAC 14 finds no error in the augmented message 212 so MAC 14 detects that the RTS message is intended for MAC 14. By making this successful match, MAC 14 not only knows that the RTS message 202 is intended for MAC 14 but also that the message was received without transmission errors. MAC 14 responds to the RTS by sending a CTS message to medium 3 with MAC 12 as its intended recipient without including address 210 of MAC 12 in the message body. The CTS message has an error code that is derived from the data portion of the CTS message in addition to the destination address 210 of MAC 12. Alternatively, the CTS message can use one or both of the source address (address of station generating the CTS) and destination address (address of station that is the intended recipient of the CTS) in the CRC computation. MACs 12 and 16 receive the CTS message on medium 3 and MAC 12 detects that the CTS message is intended for MAC 12 by augmenting the message with its

address 210 and calculating that the augmented message is error free as described previously.

... As shown in FIG. 4, MAC 12 sends a message frame 302 containing an acknowledgement of a receipt of a packet. MAC 14 originally sent the packet to MAC 12 so the packet acknowledgement conveys a source address identification for MAC 12. Upon receipt of this acknowledgement, MAC 14 can match the acknowledgement to a packet sent by MAC 14 to MAC 12. The acknowledgement message 302 is intended for MAC 14 but both MAC 14 and 16 receive the message 302 on medium 3. MAC 12 generates the message 302 by generating error code 306 as if the source address 310 (address of MAC 12) and the destination address 308 (address of MAC 14) were part of a block of data for the message 302 without transmitting the source address 310 and the destination address 308. Alternatively, the acknowledgement can also use only the destination address or only the source address in the CRC computation. The intended receiver knows the address of the station that is supposed to send the response, and thus the acknowledgment mechanism can use one or both of the destination address and source address. Upon receipt of the message, both MAC 14 and MAC 16 insert their addresses into an augmented message 312 as potential destination address 316. Both MAC 14 and MAC 16 also insert addresses into an augmented message 312 of stations where MAC 14 and 16 previously sent unacknowledged packets as potential source addresses 314. MAC 14 and 16 then check their augmented messages 312 against the received error code 306 in the message to see if there is a match. In this case, MAC 14 has a match for the destination address 316 and a source address 314 for the packet previously sent to MAC 12.

Thus, Yonge discloses transmitting a date frame including data along with an error code. Each receiving station checks its own address against the error code. A receiving station where no error is detected based on the error code determines that the data frame was intended for that receiving station. Receiving stations that detect an error determine that the data frame was not intended for those receiving stations.

In contrast, amended Claim 1 recites "a transmit announcement indication indicating that a second communication frame intended for the second station will follow the first

communication frame and that the second communication frame will not include an address of the second station." A date frame including data along with an error code, as in Yonge, is not equivalent to "a transmit announcement **indication indicating that a second communication frame intended for the second station will follow the first communication frame**," as recited in Claim 1. In Yonge data frames are sent without any indication of what will follow. Each receiving station in Yonge makes a determination of whether or not the data frame is intended for the particular receiving station. Further, the unique error codes sent by the transmitting station of Yonge are substantially equivalent to a destination address. Therefore, Yonge does not disclose at least the features "a transmit announcement indication indicating that a second communication frame intended for the second station will follow the first communication frame and that the second communication frame will not include an address of the second station," as recited by amended Claim 1.

An obviousness rejection cannot be properly maintained where the references cited do not disclose each and every claim element. For at least these reasons, Claim 1 is patentable over Larsson and Yonge. Independent Claims 13, 18, 29, 38 and 42 include similar features and are patentable over Larsson and Yonge for at least the same reasons. Claims 2-3, 5-12, 15-17, 20-27, 30-31, 33-37, 40-41, and 46 depend from one of independent Claims 1, 13, 18, 29, 38 and 42. Therefore, Applicant respectfully requests withdrawal of the rejection of Claims 1-3, 5-13, 15-18, 20-27, 29-31, 33-38, 40-42, and 46 under 35 U.S.C. § 103.

B. Claims 4, 19, 28, 32, 39, and 43-45

On page 21 of the Office Action, Claims 4, 19, 28, 32, 39, and 43-45 were rejected under 35 U.S.C. 103(a) as being unpatentable over Larsson and Yonge in view of U.S. Publication No. 2005/0265393 to Fischer *et al.* ("Fischer"). Applicant respectfully disagrees. Larsson and Fischer, alone or in combination, do not disclose or suggest at least the features "a transmit announcement indication indicating that a second communication frame intended for the second station will follow the first communication frame and that the second communication frame will

not include an address of the second station," as recited by amended Claim 1. Independent Claims 13, 18, 29, 38 and 42 include similar features.

As discussed above in **Section II.B.**, Larsson and Yonge do not disclose at least the features "a transmit announcement indication indicating that a second communication frame intended for the second station will follow the first communication frame and that the second communication frame will not include an address of the second station," as recited by amended Claim 1.

Fischer discloses "canceling and/or trimming a medium reservation in a communication system that employs a protocol that supports a reservation of a shared communication medium." (Para. [0009]). In particular, paragraph [0040] of Fischer, cited by the Examiner, discloses:

> In some embodiments according to some aspects of the present invention, at the end of a sequence of frame transmissions and/or frame exchanges sent during a period of reservation of the communication medium, a portion of a complete frame, which may be used as a Signaling frame, may be sent by the holder of the reservation that may include, for example, one or more items (e.g., one of two items). A first item may include, for example, a physical layer preamble, a physical layer header and no MAC fields. The physical layer header may indicate, for example, that the MAC portion of the frame is NULL or ZERO length. A second item may include, for example, a physical layer header only in which the physical layer header indicates that the MAC portion of the frame is NULL or ZERO length. The NULL- or ZERO-length-indicated MAC frame may signal to the node which sent the reservation confirmation message that the sending node may now send a reservation cancellation message. In some embodiments according to some aspects of the present invention, the physical layer header might not include, for example, MAC layer addressing information. The addressing may be implicit or inferred. For example, the sending node, which sent the original reservation confirmation message that is implicitly addressed by the NULL physical layer header, may send the explicit reservation cancellation frame.

Further, paragraph [0046] of Fischer, cited by the Examiner, discloses:

> Some embodiments according to some aspects of the present invention provide an option such that receivers that receive the ZERO-value reservation request frame (e.g., an RTS frame as set forth in IEEE 802.11) may cancel any remaining reservation.

However, Fischer does not disclose at least the features "a transmit announcement indication indicating that a second communication frame intended for the second station will follow the first communication frame and that the second communication frame will not include an address of the second station," as recited by amended Claim 1.

An obviousness rejection cannot be properly maintained where the references cited do not disclose each and every claim element. For at least these reasons, Claim 1 is patentable over Larsson, Yonge and Fischer, alone or in combination. Independent Claims 13, 18, 29, 38 and 42 include similar features and are patentable over Larsson, Yonge and Fischer for at least the same reasons. Claims 4, 19, 28, 32, 39, and 43-45 depend from one of independent Claims 1, 13, 18, 29, 38 and 42. Therefore, Applicant respectfully requests withdrawal of the rejection of Claims 4, 19, 28, 32, 39, and 43-45 under 35 U.S.C. § 103.

* * *

Applicant believes that the present application is now in condition for allowance. Favorable reconsideration of the application as amended is respectfully requested.

The Examiner is invited to contact the undersigned by telephone if it is felt that a telephone interview would advance the prosecution of the present application.

The Commissioner is hereby authorized to charge any additional fees which may be required regarding this application under 37 C.F.R. §§ 1.16-1.17, or credit any overpayment, to Deposit Account No. 19-0741. Should no proper payment be enclosed herewith, as by the credit card payment instructions in EFS-Web being incorrect or absent, resulting in a rejected or incorrect credit card transaction, the Commissioner is authorized to charge the unpaid amount to Deposit Account No. 19-0741. If any extensions of time are needed for timely acceptance of

papers submitted herewith, Applicant hereby petitions for such extension under 37 C.F.R. §1.136 and authorizes payment of any such extensions fees to Deposit Account No. 19-0741.

Respectfully submitted,

Date December 21, 2011

By */Eric N. Huston/*

FOLEY & LARDNER LLP
Customer Number: 23524
Telephone: (608) 258-4205
Facsimile: (608) 258-4258

Eric N. Huston
Attorney for Applicant
Registration No. 65,684

Electronic Acknowledgement Receipt

EFS ID:	11674704
Application Number:	11627181
International Application Number:	
Confirmation Number:	1464
Title of Invention:	Transmit Announcement Indication
First Named Inventor/Applicant Name:	Menzo Wentink
Customer Number:	23524
Filer:	Eric N. Huston/Mary Schuster
Filer Authorized By:	Eric N. Huston
Attorney Docket Number:	088245-2616
Receipt Date:	21-DEC-2011
Filing Date:	25-JAN-2007
Time Stamp:	12:53:43
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1		R2FOA.pdf	839035 74d75026ee7dec838ddbf1db01be5d3ead4d9fed	yes	19

	Multipart Description/PDF files in .zip description		
	Document Description	**Start**	**End**
	Miscellaneous Incoming Letter	1	2
	Amendment After Final	3	19
Warnings:			
Information:			
	Total Files Size (in bytes):	839035	

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111
If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371
If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office
If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

Atty. Dkt. No. 088245-2616

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant: Menzo Wentink

Title: TRANSMIT ANNOUNCEMENT INDICATION

Appl. No.: 11/627,181

Filing Date: 01/25/2007

Examiner: Abdulla A. Riyami

Art Unit: 2474

Confirmation Number: 1464

AMENDMENT TRANSMITTAL

Mail Stop Amendment
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

Transmitted herewith is an amendment in the above-identified application.

[**X**] The fee required for additional claims is calculated below:

	Claims As Amended		Previously Paid For		Extra Claims Present		Rate		Additional Claims Fee
Total Claims:	46	-	46	=	0	x	$60.00	=	$0.00
Independent Claims:	6	-	6	=	0	x	$250.00	=	$0.00
First presentation of any Multiple Dependent Claims:						+	$450.00	=	$0.00

	CLAIMS FEE TOTAL =	$0.00

[ ] Applicant hereby petitions for an extension of time under 37 C.F.R. §1.136(a) for the total number of months checked below:

[ ] Extension for response filed within the first month:	$150.00	$0.00
[ ] Extension for response filed within the second month:	$560.00	$0.00
[ ] Extension for response filed within the third month:	$1,270.00	$0.00
[ ] Extension for response filed within the fourth month:	$1,980.00	$0.00
[ ] Extension for response filed within the fifth month:	$2,690.00	$0.00
EXTENSION FEE TOTAL:		$0.00
[ ] Statutory Disclaimer Fee under 37 C.F.R. 1.20(d):	$160.00	$0.00
CLAIMS, EXTENSION AND DISCLAIMER FEE TOTAL:		$0.00
[ ] Small Entity Fees Apply (subtract ½ of above):		$0.00
Extension Fees Previously Paid:		$0.00
TOTAL FEE:		$0.00

If any extensions of time are needed for timely acceptance of papers submitted herewith, applicant hereby petitions for such extension under 37 C.F.R. §1.136 and authorizes payment of any such extensions fees to Deposit Account No. 19-0741.

Please direct all correspondence to the undersigned attorney or agent at the address indicated below.

Respectfully submitted,

Date December 21, 2011

By _____*/Eric N. Huston/*_____

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Attorney for Applicant
Registration No. 65,684

PTO/SB/06 (07-06)
Approved for use through 1/31/2007. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

PATENT APPLICATION FEE DETERMINATION RECORD

Substitute for Form PTO-875

Application or Docket Number	Filing Date	☐ To be Mailed
11/627,181	01/25/2007	

APPLICATION AS FILED – PART I

	(Column 1)	(Column 2)	SMALL ENTITY ☐		OR	OTHER THAN SMALL ENTITY	
FOR	NUMBER FILED	NUMBER EXTRA	RATE ($)	FEE ($)		RATE ($)	FEE ($)
☐ BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A	N/A			N/A	
☐ SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A	N/A			N/A	
☐ EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A			N/A	
TOTAL CLAIMS (37 CFR 1.16(i))	minus 20 =	*	X $ =		OR	X $ =	
INDEPENDENT CLAIMS (37 CFR 1.16(h))	minus 3 =	*	X $ =			X $ =	
☐ APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is $250 ($125 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).						
☐ MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))							
* If the difference in column 1 is less than zero, enter "0" in column 2.			TOTAL			TOTAL	

APPLICATION AS AMENDED – PART II

AMENDMENT	12/21/2011	(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	SMALL ENTITY RATE ($)	ADDITIONAL FEE ($)	OR	OTHER THAN SMALL ENTITY RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	* 46	Minus	** 46	= 0	X $ =		OR	X $60=	0
	Independent (37 CFR 1.16(h))	* 6	Minus	***6	= 0	X $ =		OR	X $250=	0
	☐ Application Size Fee (37 CFR 1.16(s))									
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
						TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE	0

AMENDMENT		(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	RATE ($)	ADDITIONAL FEE ($)		RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	*	Minus	**	=	X $ =		OR	X $ =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=	X $ =		OR	X $ =	
	☐ Application Size Fee (37 CFR 1.16(s))									
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
						TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE	

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.

** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".

*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".

The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1.

Legal Instrument Examiner:
/PATSY ZIMMERMAN/

This collection of information is required by 37 CFR 1.16. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
11/627,181	01/25/2007	Menzo Wentink	088245-2616	1464

23524 7590 11/07/2011

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EXAMINER	
RIYAMI, ABDULLA A	
ART UNIT	PAPER NUMBER
2474	
MAIL DATE	DELIVERY MODE
11/07/2011	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	11/627,181	WENTINK, MENZO	
	Examiner	Art Unit	
	ABDULLAH RIYAMI	2474	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *23 August 2011*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.

4)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

5)☒ Claim(s) *1-46* is/are pending in the application.

5a) Of the above claim(s) _____ is/are withdrawn from consideration.

6)☐ Claim(s) _____ is/are allowed.

7)☒ Claim(s) *1-46* is/are rejected.

8)☐ Claim(s) _____ is/are objected to.

9)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

10)☐ The specification is objected to by the Examiner.

11)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

12)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

1. This is in response to an amendment filed on 08/23/2011.

2. Claims 1, 5, 7-8, 13-18, 29, 38-42 and 46 have been amended.

3. Claims 1-46 remain pending in the application.

Response to Arguments

4. Applicant's arguments with respect to claims 1-46 have been considered but are moot in view of the new ground(s) of rejection.

Claim Rejections - 35 USC § 103

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

6. The factual inquiries set forth in *Graham* v. *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

7. Claims 1-3, 5-13, 15-18, 20-27, 29-31, 33-38, 40-42, and 46 are rejected under 35 U.S.C. 103(a) as being unpatentable over Larsson (US 2008/0298306 A1) in view of Yonge, III et al. (US 2005/01147449 A1).

As per claim 1, Larsson discloses a method (see figure 3, RTS frame and CTS frame) comprising:

transmitting a first communication frame from a first station to a second station (see figure 3, RTS frame, see paragraph 18, lines 1-10, originating node sends a first message including transmit duration); wherein the first communication frame comprises a transmit announcement indication (see paragraph 18, lines 1-10, originating node sends a first message including transmit duration) indicating that a second communication frame intended for the second station will follow the first communication frame (see paragraph 28, lines 1-9, transmit duration information may be conveyed in different messages, such as, RTS-CTS message exchanges, see figure 5, RTS sent from source to destination, followed by data fragments).

Larsson does not expressly disclose that the second communication frame will not include an address of the second station.

However, the teaching that the second communication frame will not include an address of the second station is well known in the art, as evidenced by Yonge.

Yonge discloses the second communication frame will not include an address of the second station (notice in figure 2, data frame 102 sent without destination address i.e. address of second station, also notice in figure 3, RTS 202 is sent without destination address, notice in paragraphs 20 and 21, the sending MAC 12 needs to

know that another Mac 14 is listening before sending data messages such as that shown in figure 2, both the RTS and data messages can be sent over the medium without directly specifying a destination address of MAC 14).

At the time of the invention, it would have been obvious to one of ordinary skill in the art to use Yonge's teaching wherein the second communication frame will not include an address of the second station (notice in figure 2, data frame 102 sent without destination address i.e. address of second station, also notice in figure 3, RTS 202 is sent without destination address, notice in paragraphs 20 and 21, the sending MAC 12 needs to know that another Mac 14 is listening before sending data messages such as that shown in figure 2, both the RTS and data messages can be sent over the medium without directly specifying a destination address of MAC 14) as a modification in Larsson's method and system of using the transmit announcement indication (see paragraph 28, lines 1-9, transmit duration information may be conveyed in different messages, such as, RTS-CTS message exchanges). The motivation to combine would have been to have a method and system for reducing overhead by not requiring transferring of both source and destination addresses in the messages, thereby overall system is enhanced (see paragraph 9, Yonge).

As per claim 2, Larsson discloses wherein the second communication frame follows after a short inter frame space (SIFS) after the first communication frame with the transmit announcement indication (see figure 5, RTS sent from source to destination, followed by data fragments after SIFS, see paragraph 85, lines 5-9, SIFS is a time period used for separating transmissions).

As per claim 3, Larsson discloses wherein the second communication frame follows after a short inter frame space (SIFS) after a response to the first communication frame with the transmit announcement indication (see figure 5, RTS sent from source to destination, followed by data fragments after SIFS, see paragraph 85, lines 5-9, SIFS is a time period used for separating transmissions).

As per claim 5, Larsson discloses wherein transmitting the first communication frame comprises providing the transmit announcement indication with a request to send (RTS) frame (see paragraph 28, lines 1-9, transmit duration information may be conveyed in different messages, such as, RTS-CTS message exchanges).

As per claim 6, Larsson discloses receiving by the first station, a clear to send (CTS) frame from the second station after the first station has transmitted the transmit announcement indication with the RTS frame (see figure 5, RTS sent from source to destination, CTS received, followed by data fragments after SIFS).

As per claim 7, Larsson discloses transmitting the second communication frame from the first station to the second station (see figure 5, RTS sent from source to destination, followed by data fragments).

Larsson does not expressly disclose that the second communication frame will not include an address of the second station.

However, the teaching wherein the second communication frame will not include an address of the second station is well known in the art, as evidenced by Yonge.

Yonge discloses wherein the second communication frame will not include an address of the second station (notice in figure 2, data frame 102 sent without

destination address i.e. address of second station, also notice in figure 3, RTS 202 is sent without destination address, notice in paragraphs 20 and 21, the sending MAC 12 needs to know that another Mac 14 is listening before sending data messages such as that shown in figure 2, both the RTS and data messages can be sent over the medium without directly specifying a destination address of MAC 14).

At the time of the invention, it would have been obvious to one of ordinary skill in the art to use Yonge's teaching wherein the second communication frame will not include an address of the second station (notice in figure 2, data frame 102 sent without destination address i.e. address of second station, also notice in figure 3, RTS 202 is sent without destination address, notice in paragraphs 20 and 21, the sending MAC 12 needs to know that another Mac 14 is listening before sending data messages such as that shown in figure 2, both the RTS and data messages can be sent over the medium without directly specifying a destination address of MAC 14) as a modification in Larsson's method and system of using the transmit announcement indication (see paragraph 28, lines 1-9, transmit duration information may be conveyed in different messages, such as, RTS-CTS message exchanges). The motivation to combine would have been to have a method and system for reducing overhead by not requiring transferring of both source and destination addresses in the messages, thereby overall system is enhanced (see paragraph 9, Yonge).

As per claim 8, Larsson discloses wherein transmitting the first communication frame comprises providing the transmit announcement indication in a quality of service null (QoS-null) frame (see figure 3, RTS frame, see paragraph 18, lines 1-10, originating

node sends a first message including transmit duration or see paragraph 110, dummy control frame without address, with frame control and duration, where the duration field is the highest rate).

As per claim 9, Larsson discloses receiving by the first station an acknowledgement (ACK) frame from the second station after the first station has transmitted the transmit announcement indication with the QoS-null frame (see paragraph 124, end of data transmission is responded with an ACK).

As per claim 10, Larsson discloses transmitting the second communication frame associated with the transmit announcement indication (see figure 3, RTS frame, see paragraph 18, lines 1-10, originating node sends a first message including transmit duration)

As per claim 11, Larsson discloses wherein providing the transmit announcement indication comprises providing the transmit announcement indication with a clear to send (CTS) frame (see figure 5, RTS sent from source to destination, CTS received, followed by data fragments after SIFS)

As per claim 12, Larsson discloses further comprising transmitting the second communication frame associated with the transmit announcement indication (see figure 5, RTS sent from source to destination, CTS received, followed by data fragments after SIFS).

As per claim 13, Larsson discloses a non-transitory computer-readable medium having instructions stored thereon that if executed by a computing device cause the

computing device to perform operations (see figure 2a, transmitter T, see figure 3, RTS frame and CTS frame) comprising:

transmitting a first communication frame from a first station to a second station (see figure 3, RTS frame, see paragraph 18, lines 1-10, originating node sends a first message including transmit duration); and

wherein the first communication frame comprises a transmit announcement indication (see paragraph 18, lines 1-10, originating node sends a first message including transmit duration) indicating that a second communication frame intended for the second station will follow the first communication frame (see paragraph 28, lines 1-9, transmit duration information may be conveyed in different messages, such as, RTS-CTS message exchanges, see figure 5, RTS sent from source to destination, followed by data fragments).

Larsson does not expressly disclose that the second communication frame will not include an address of the second station.

However, the teaching that the second communication frame will not include an address of the second station is well known in the art, as evidenced by Yonge.

Yonge discloses the second communication frame will not include an address of the second station (notice in figure 2, data frame 102 sent without destination address i.e. address of second station, also notice in figure 3, RTS 202 is sent without destination address, notice in paragraphs 20 and 21, the sending MAC 12 needs to know that another Mac 14 is listening before sending data messages such as that

shown in figure 2, both the RTS and data messages can be sent over the medium without directly specifying a destination address of MAC 14).

At the time of the invention, it would have been obvious to one of ordinary skill in the art to use Yonge's teaching wherein the second communication frame will not include an address of the second station (notice in figure 2, data frame 102 sent without destination address i.e. address of second station, also notice in figure 3, RTS 202 is sent without destination address, notice in paragraphs 20 and 21, the sending MAC 12 needs to know that another Mac 14 is listening before sending data messages such as that shown in figure 2, both the RTS and data messages can be sent over the medium without directly specifying a destination address of MAC 14) as a modification in Larsson's method and system of using the transmit announcement indication (see paragraph 28, lines 1-9, transmit duration information may be conveyed in different messages, such as, RTS-CTS message exchanges). The motivation to combine would have been to have a method and system and non-transitory computer readable medium for reducing overhead by not requiring transferring of both source and destination addresses in the messages, thereby overall system is enhanced (see paragraph 9, Yonge).

As per claim 15, Larsson discloses wherein transmitting the first communication frame comprises providing the transmit announcement indication with a request to send (RTS) frame (see paragraph 28, lines 1-9, transmit duration information may be conveyed in different messages, such as, RTS-CTS message exchanges).

As per claim 16, Larsson discloses wherein the operations further comprise receiving a clear to send (CTS) frame from the second station after the first station has transmitted the transmit announcement indication with the RTS frame (see figure 5, RTS sent from source to destination, CTS received, followed by data fragments after SIFS).

As per claim 17, Larsson discloses wherein the operations further comprise transmitting the second communication frame associated with the transmit announcement indication (see figure 5, RTS sent from source to destination, CTS received, followed by data fragments after SIFS).

As per claim 18, Larsson discloses a system (see figure 3, RTS frame and CTS frame) comprising: a transmitter configured to (see figure 2a, transmitter T): transmit a first communication frame from a first station to a second station (see figure 3, RTS frame, see paragraph 18, lines 1-10, originating node sends a first message including transmit duration); wherein the first communication frame comprises a transmit announcement indication (see paragraph 18, lines 1-10, originating node sends a first message including transmit duration) indicating that a second communication frame intended for the second station will follow the first communication frame (see paragraph 28, lines 1-9, transmit duration information may be conveyed in different messages, such as, RTS-CTS message exchanges, see figure 5, RTS sent from source to destination, followed by data fragments).

Larsson does not expressly disclose that the second communication frame will not include an address of the second station.

However, the teaching that the second communication frame will not include an address of the second station is well known in the art, as evidenced by Yonge.

Yonge discloses the second communication frame will not include an address of the second station (notice in figure 2, data frame 102 sent without destination address i.e. address of second station, also notice in figure 3, RTS 202 is sent without destination address, notice in paragraphs 20 and 21, the sending MAC 12 needs to know that another Mac 14 is listening before sending data messages such as that shown in figure 2, both the RTS and data messages can be sent over the medium without directly specifying a destination address of MAC 14).

At the time of the invention, it would have been obvious to one of ordinary skill in the art to use Yonge's teaching wherein the second communication frame will not include an address of the second station (notice in figure 2, data frame 102 sent without destination address i.e. address of second station, also notice in figure 3, RTS 202 is sent without destination address, notice in paragraphs 20 and 21, the sending MAC 12 needs to know that another Mac 14 is listening before sending data messages such as that shown in figure 2, both the RTS and data messages can be sent over the medium without directly specifying a destination address of MAC 14) as a modification in Larsson's method and system of using the transmit announcement indication (see paragraph 28, lines 1-9, transmit duration information may be conveyed in different messages, such as, RTS-CTS message exchanges). The motivation to combine would have been to have a method and system for reducing overhead by not requiring

transferring of both source and destination addresses in the messages, thereby overall system is enhanced (see paragraph 9, Yonge).

As per claim 20, Larsson discloses wherein the transmitter is further configured to provide the transmit announcement indication with a request to send (RTS) frame (see paragraph 28, lines 1-9, transmit duration information may be conveyed in different messages, such as, RTS-CTS message exchanges).

As per claim 21, Larsson discloses a receiver configured to receive by the first station a clear to send (CTS) frame from the second station after the first station has transmitted the transmit announcement indication with the RTS frame (see paragraph 28, lines 1-9, transmit duration information may be conveyed in different messages, such as, RTS-CTS message exchanges).

As per claim 22, Larsson discloses wherein the transmitter is further configured to transmit frame second communication frame associated with the transmit announcement indication (see paragraph 28, lines 1-9, transmit duration information may be conveyed in different messages, such as, RTS-CTS message exchanges, see figure 5, RTS sent from source to destination, followed by data fragments).

As per claim 23, Larsson discloses wherein the first station comprises one of a wireless radio, desktop computer, portable computer, laptop computer, multi-media players, personal digital assistant (PDA), printer, fax machine, scanner, hub, switch, router, set-top box, and television with communication capability (see paragraph 26, line 4, IEEE 802.11 type networks).

As per claim 24, Larsson discloses wherein the second communication frame comprises a physical layer (PHY) header without a media access control (MAC) portion (see paragraph 110, lines 5-15, dummy control frame without any address fields, see also figure 3, address 4 does not exist).

As per claim 25, Larsson discloses wherein the transmit announcement indication comprises a bit inside a MAC header field (see figure 3, MAC header in RTS/CTS frame with duration field).

As per claim 26, Larsson discloses wherein the bit comprises an high throughput-control field (see figure 3, MAC header in RTS/CTS frame with duration field).

As per claim 27, Larsson discloses wherein the transmit announcement indication is located within one of a data frame (see paragraph 71, lines 5-10, transmit duration information indicated in data fragment), a management frame (see figure 3, management frame), or a control frame (see paragraph 28, lines 1-9, transmit duration information may be conveyed in different messages, such as, RTS-CTS message exchanges).

As per claim 29, Larsson discloses a method (see figure 3, RTS frame and CTS frame) comprising: receiving a first communication frame from a first station at a second station (see figure 3, RTS frame, see paragraph 18, lines 1-10, originating node sends a first message including transmit duration), wherein the first communication frame includes a transmit announcement indication that indicates that a second communication frame intended for the second station will follow the first communication frame (see paragraph 28, lines 1-9, transmit duration information may be conveyed in

different messages, such as, RTS-CTS message exchanges, see figure 5, RTS sent from source to destination, followed by data fragments).

Larsson does not expressly disclose that the second communication frame will not include an address of the second station.

However, the teaching that the second communication frame will not include an address of the second station is well known in the art, as evidenced by Yonge.

Yonge discloses the second communication frame will not include an address of the second station (notice in figure 2, data frame 102 sent without destination address i.e. address of second station, also notice in figure 3, RTS 202 is sent without destination address, notice in paragraphs 20 and 21, the sending MAC 12 needs to know that another Mac 14 is listening before sending data messages such as that shown in figure 2, both the RTS and data messages can be sent over the medium without directly specifying a destination address of MAC 14).

At the time of the invention, it would have been obvious to one of ordinary skill in the art to use Yonge's teaching wherein the second communication frame will not include an address of the second station (notice in figure 2, data frame 102 sent without destination address i.e. address of second station, also notice in figure 3, RTS 202 is sent without destination address, notice in paragraphs 20 and 21, the sending MAC 12 needs to know that another Mac 14 is listening before sending data messages such as that shown in figure 2, both the RTS and data messages can be sent over the medium without directly specifying a destination address of MAC 14) as a modification in Larsson's method and system of using the transmit announcement indication (see

paragraph 28, lines 1-9, transmit duration information may be conveyed in different messages, such as, RTS-CTS message exchanges). The motivation to combine would have been to have a method and system for reducing overhead by not requiring transferring of both source and destination addresses in the messages, thereby overall system is enhanced (see paragraph 9, Yonge).

As per claim 30, Larsson discloses receiving, at the second station, the second communication frame after a short inter frame space (SIFS) that follows the first communication frame (see paragraph 28, lines 1-9, transmit duration information may be conveyed in different messages, such as, RTS-CTS message exchanges, see figure 5, RTS sent from source to destination, followed by data fragments, after SIFS period).

As per claim 31, Larsson discloses receiving at the second station, the second communication frame after a short inter frame space (SIFS) that follows a response to the first communication frame (see paragraph 28, lines 1-9, transmit duration information may be conveyed in different messages, such as, RTS-CTS message exchanges, see figure 5, RTS sent from source to destination, followed by data fragments, after SIFS period).

As per claim 33, Larsson discloses wherein receiving the first communication frame comprises receiving the transmit announcement indication with a request to send (RTS) frame (see paragraph 28, lines 1-9, transmit duration information may be conveyed in different messages, such as, RTS-CTS message exchanges, see figure 5, RTS sent from source to destination).

As per claim 34, Larsson discloses transmitting a clear to send (CTS) frame from the second station to the first station in response to receiving the RTS frame(see paragraph 28, lines 1-9, transmit duration information may be conveyed in different messages, such as, RTS-CTS message exchanges, see figure 5, RTS sent from source to destination and CTS viceversa).

As per claim 35, Larsson discloses wherein receiving the first communication frame comprises receiving the transmit announcement indication in a quality of service null (QoS-null) frame (see figure 3, RTS frame, see paragraph 18, lines 1-10, originating node sends a first message including transmit duration or see paragraph 110, dummy control frame without address, with frame control and duration, where the duration field is the highest rate).

As per claim 36, Larsson discloses receiving an acknowledgement (ACK) frame at the second station from the first station (see paragraph 124, end of data transmission is responded with an ACK).

As per claim 37, Larsson discloses wherein receiving the first communication frame comprises receiving the transmit announcement indication with a clear to send (CTS) frame (see paragraph 96, lines 10-20, broadcast CTS with duration field to hidden terminals, see paragraph 124, transmit duration indicated in duration field of message such as CTS or ACK)

As per claim 38, Larsson discloses a non-transitory computer-readable medium having instructions stored thereon that if executed by a computing device cause the computing device to perform operations (see figure 2a, transmitter T, see figure 3, RTS

frame and CTS frame) comprising, receiving a first communication frame from a first station (see figure 3, RTS frame, see paragraph 18, lines 1-10, originating node sends a first message including transmit duration),

wherein the first communication frame includes a transmit announcement indication that indicates that a second communication frame will follow the first communication frame (see paragraph 28, lines 1-9, transmit duration information may be conveyed in different messages, such as, RTS-CTS message exchanges, see figure 5, RTS sent from source to destination, followed by data fragments).

Larsson does not expressly disclose that the second communication frame will not include an address of the second station.

However, the teaching that the second communication frame will not include an address of the second station is well known in the art, as evidenced by Yonge.

Yonge discloses the second communication frame will not include an address of the second station (notice in figure 2, data frame 102 sent without destination address i.e. address of second station, also notice in figure 3, RTS 202 is sent without destination address, notice in paragraphs 20 and 21, the sending MAC 12 needs to know that another Mac 14 is listening before sending data messages such as that shown in figure 2, both the RTS and data messages can be sent over the medium without directly specifying a destination address of MAC 14).

At the time of the invention, it would have been obvious to one of ordinary skill in the art to use Yonge's teaching wherein the second communication frame will not include an address of the second station (notice in figure 2, data frame 102 sent without

destination address i.e. address of second station, also notice in figure 3, RTS 202 is sent without destination address, notice in paragraphs 20 and 21, the sending MAC 12 needs to know that another Mac 14 is listening before sending data messages such as that shown in figure 2, both the RTS and data messages can be sent over the medium without directly specifying a destination address of MAC 14) as a modification in Larsson's method and system of using the transmit announcement indication (see paragraph 28, lines 1-9, transmit duration information may be conveyed in different messages, such as, RTS-CTS message exchanges). The motivation to combine would have been to have a method and system and non-transitory computer readable medium for reducing overhead by not requiring transferring of both source and destination addresses in the messages, thereby overall system is enhanced (see paragraph 9, Yonge).

As per claim 40, Larsson discloses wherein the receiving the first communication frame comprises receiving the transmit announcement indication with a request to send (RTS) frame (see paragraph 28, lines 1-9, transmit duration information may be conveyed in different messages, such as, RTS-CTS message exchanges, see figure 5, RTS sent from source to destination, followed by data fragments).

As per claim 41, Larsson discloses wherein the operations further comprise transmitting a clear to send (CTS) frame to the first station in response to the RTS frame (see paragraph 28, lines 1-9, transmit duration information may be conveyed in different messages, such as, RTS-CTS message exchanges, see figure 5, RTS sent from source to destination, followed by data fragments).

As per claim 42, Larsson discloses a system (see figure 3, RTS frame and CTS frame) comprising, a receiver configured to receive a first communication frame from a first station at a second station (see figure 3, RTS frame, see paragraph 18, lines 1-10, originating node sends a first message including transmit duration), wherein the first communication frame includes a transmit announcement indication that indicates that a second communication frame intended for the second station will follow the first communication frame (see paragraph 28, lines 1-9, transmit duration information may be conveyed in different messages, such as, RTS-CTS message exchanges, see figure 5, RTS sent from source to destination, followed by data fragments).

Larsson does not expressly disclose that the second communication frame will not include an address of the second station.

However, the teaching that the second communication frame will not include an address of the second station is well known in the art, as evidenced by Yonge.

Yonge discloses the second communication frame will not include an address of the second station (notice in figure 2, data frame 102 sent without destination address i.e. address of second station, also notice in figure 3, RTS 202 is sent without destination address, notice in paragraphs 20 and 21, the sending MAC 12 needs to know that another Mac 14 is listening before sending data messages such as that shown in figure 2, both the RTS and data messages can be sent over the medium without directly specifying a destination address of MAC 14).

At the time of the invention, it would have been obvious to one of ordinary skill in the art to use Yonge's teaching wherein the second communication frame will not

include an address of the second station (notice in figure 2, data frame 102 sent without destination address i.e. address of second station, also notice in figure 3, RTS 202 is sent without destination address, notice in paragraphs 20 and 21, the sending MAC 12 needs to know that another Mac 14 is listening before sending data messages such as that shown in figure 2, both the RTS and data messages can be sent over the medium without directly specifying a destination address of MAC 14) as a modification in Larsson's method and system of using the transmit announcement indication (see paragraph 28, lines 1-9, transmit duration information may be conveyed in different messages, such as, RTS-CTS message exchanges). The motivation to combine would have been to have a method and system for reducing overhead by not requiring transferring of both source and destination addresses in the messages, thereby overall system is enhanced (see paragraph 9, Yonge).

As per claim 46, Larsson discloses wherein the second station comprises one of a wireless radio (see paragraph 26, line 4, IEEE 802.11 type networks), desktop computer, portable computer (see paragraph 26, line 4, IEEE 802.11 type networks), laptop computer (see paragraph 26, line 4, IEEE 802.11 type networks), multi-media players, personal digital assistant (PDA) (see paragraph 26, line 4, IEEE 802.11 type networks), printer, fax machine, scanner, hub, switch (see paragraph 26, line 4, IEEE 802.11 type networks), router (see paragraph 26, line 4, IEEE 802.11 type networks), set-top box, and television with communication capability (see paragraph 26, line 4, IEEE 802.11 type networks).

8. Claims 4, 19, 28, 32, 39, and 43-45 are rejected under 35 U.S.C. 103(a) as being unpatentable over Larsson (US 2008/0298306 A1) in view of Yonge, III et al. (US 2005/01147449 A1) and Fischer et al. (US 2005/0265393 A1).

As per claim 4, Larsson as modified by Yonge disclose the transmit announcement indication (see paragraph 28, lines 1-9, transmit duration information may be conveyed in different messages, such as, RTS-CTS message exchanges, Larsson).

Larsson as modified by Yonge does not expressly disclose wherein the transmit announcement indication comprises a zero-length frame.

However the teaching wherein the transmit announcement indication comprises a zero-length frame, is well known in the art as evidenced by Fischer.

Fischer discloses the transmit announcement indication comprises a zero-length frame (see paragraph 40, lines 1-10, physical layer preamble indicating that MAC portion is zero or null, see paragraph 46, lines 1-4, zero value reservation request frame such as an RTS frame as set forth in 802.11, see frame format in figure 2).

At the time of the invention, it would have been obvious to one of ordinary skill in the art to use Fischer's teaching wherein the transmit announcement indication comprises a zero-length frame (see paragraph 40, lines 1-10, physical layer preamble indicating that MAC portion is zero or null, see paragraph 46, lines 1-4, zero value reservation request frame such as an RTS frame as set forth in 802.11, see frame format in figure 2) as a modification in Larsson's (as modified by Yonge) method and system of using the transmit announcement indication (see paragraph 28, lines 1-9,

transmit duration information may be conveyed in different messages, such as, RTS-CTS message exchanges). The motivation to combine would have been to have a method and system for cancelling or trimming a medium reservation in a communication system that employs a protocol that supports a reservation of a shared communication medium, thereby improving efficiency in the use of the communication medium (see paragraph 6 and 19, Fischer).

As per claim 19, Larsson as modified by Yonge disclose the transmit announcement indication (see paragraph 28, lines 1-9, transmit duration information may be conveyed in different messages, such as, RTS-CTS message exchanges, Larsson).

Larsson as modified by Yonge does not expressly disclose wherein the transmit announcement indication comprises a zero-length frame.

However the teaching wherein the transmit announcement indication comprises a zero-length frame, is well known in the art as evidenced by Fischer.

Fischer discloses the transmit announcement indication comprises a zero-length frame (see paragraph 40, lines 1-10, physical layer preamble indicating that MAC portion is zero or null, see paragraph 46, lines 1-4, zero value reservation request frame such as an RTS frame as set forth in 802.11, see frame format in figure 2).

At the time of the invention, it would have been obvious to one of ordinary skill in the art to use Fischer's teaching wherein the transmit announcement indication comprises a zero-length frame (see paragraph 40, lines 1-10, physical layer preamble indicating that MAC portion is zero or null, see paragraph 46, lines 1-4, zero value

reservation request frame such as an RTS frame as set forth in 802.11, see frame format in figure 2) as a modification in Larsson's (as modified by Yonge) method and system of using the transmit announcement indication (see paragraph 28, lines 1-9, transmit duration information may be conveyed in different messages, such as, RTS-CTS message exchanges). The motivation to combine would have been to have a method and system for cancelling or trimming a medium reservation in a communication system that employs a protocol that supports a reservation of a shared communication medium, thereby improving efficiency in the use of the communication medium (see paragraph 6 and 19, Fischer).

As per claim 28, Larsson as modified by Yonge disclose the transmit announcement indication (see paragraph 28, lines 1-9, transmit duration information may be conveyed in different messages, such as, RTS-CTS message exchanges, Larsson).

Larsson as modified by Yonge does not expressly disclose wherein the transmit announcement indication precedes a zero-length frame.

However the teaching wherein the transmit announcement indication precedes a zero-length frame, is well known in the art as evidenced by Fischer.

Fischer discloses the transmit announcement indication comprises a zero-length frame (see paragraph 40, lines 1-10, physical layer preamble indicating that MAC portion is zero or null, see paragraph 46, lines 1-4, zero value reservation request frame such as an RTS frame as set forth in 802.11, see frame format in figure 2).

At the time of the invention, it would have been obvious to one of ordinary skill in the art to use Fischer's teaching wherein the transmit announcement indication precedes a zero-length frame (see paragraph 40, lines 1-10, physical layer preamble indicating that MAC portion is zero or null, see paragraph 46, lines 1-4, zero value reservation request frame such as an RTS frame as set forth in 802.11, see frame format in figure 2) as a modification in Larsson's (as modified by Yonge) method and system of using the transmit announcement indication (see paragraph 28, lines 1-9, transmit duration information may be conveyed in different messages, such as, RTS-CTS message exchanges). The motivation to combine would have been to have a method and system for cancelling or trimming a medium reservation in a communication system that employs a protocol that supports a reservation of a shared communication medium, thereby improving efficiency in the use of the communication medium (see paragraph 6 and 19, Fischer).

As per claim 32, Larsson as modified by Yonge disclose the transmit announcement indication (see paragraph 28, lines 1-9, transmit duration information may be conveyed in different messages, such as, RTS-CTS message exchanges, Larsson).

Larsson as modified by Yonge does not expressly disclose wherein the transmit announcement indication comprises a zero-length frame.

However the teaching wherein the transmit announcement indication comprises a zero-length frame, is well known in the art as evidenced by Fischer.

Fischer discloses the transmit announcement indication comprises a zero-length frame (see paragraph 40, lines 1-10, physical layer preamble indicating that MAC portion is zero or null, see paragraph 46, lines 1-4, zero value reservation request frame such as an RTS frame as set forth in 802.11, see frame format in figure 2).

At the time of the invention, it would have been obvious to one of ordinary skill in the art to use Fischer's teaching wherein the transmit announcement indication comprises a zero-length frame (see paragraph 40, lines 1-10, physical layer preamble indicating that MAC portion is zero or null, see paragraph 46, lines 1-4, zero value reservation request frame such as an RTS frame as set forth in 802.11, see frame format in figure 2) as a modification in Larsson's (as modified by Yonge) method and system of using the transmit announcement indication (see paragraph 28, lines 1-9, transmit duration information may be conveyed in different messages, such as, RTS-CTS message exchanges). The motivation to combine would have been to have a method and system for cancelling or trimming a medium reservation in a communication system that employs a protocol that supports a reservation of a shared communication medium, thereby improving efficiency in the use of the communication medium (see paragraph 6 and 19, Fischer).

As per claim 39, Larsson as modified by Yonge disclose the transmit announcement indication (see paragraph 28, lines 1-9, transmit duration information may be conveyed in different messages, such as, RTS-CTS message exchanges, Larsson).

Larsson as modified by Yonge does not expressly disclose wherein the transmit announcement indication comprises a zero-length frame.

However the teaching wherein the transmit announcement indication comprises a zero-length frame, is well known in the art as evidenced by Fischer.

Fischer discloses the transmit announcement indication comprises a zero-length frame (see paragraph 40, lines 1-10, physical layer preamble indicating that MAC portion is zero or null, see paragraph 46, lines 1-4, zero value reservation request frame such as an RTS frame as set forth in 802.11, see frame format in figure 2).

At the time of the invention, it would have been obvious to one of ordinary skill in the art to use Fischer's teaching wherein the transmit announcement indication comprises a zero-length frame (see paragraph 40, lines 1-10, physical layer preamble indicating that MAC portion is zero or null, see paragraph 46, lines 1-4, zero value reservation request frame such as an RTS frame as set forth in 802.11, see frame format in figure 2) as a modification in Larsson's (as modified by Yonge) method and system of using the transmit announcement indication (see paragraph 28, lines 1-9, transmit duration information may be conveyed in different messages, such as, RTS-CTS message exchanges). The motivation to combine would have been to have a method and system for cancelling or trimming a medium reservation in a communication system that employs a protocol that supports a reservation of a shared communication medium, thereby improving efficiency in the use of the communication medium (see paragraph 6 and 19, Fischer).

As per claim 43, Larsson as modified by Yonge disclose the transmit announcement indication (see paragraph 28, lines 1-9, transmit duration information may be conveyed in different messages, such as, RTS-CTS message exchanges, Larsson).

Larsson as modified by Yonge does not expressly disclose wherein the transmit announcement indication comprises a zero-length frame.

However the teaching wherein the transmit announcement indication comprises a zero-length frame, is well known in the art as evidenced by Fischer.

Fischer discloses the transmit announcement indication comprises a zero-length frame (see paragraph 40, lines 1-10, physical layer preamble indicating that MAC portion is zero or null, see paragraph 46, lines 1-4, zero value reservation request frame such as an RTS frame as set forth in 802.11, see frame format in figure 2).

At the time of the invention, it would have been obvious to one of ordinary skill in the art to use Fischer's teaching wherein the transmit announcement indication comprises a zero-length frame (see paragraph 40, lines 1-10, physical layer preamble indicating that MAC portion is zero or null, see paragraph 46, lines 1-4, zero value reservation request frame such as an RTS frame as set forth in 802.11, see frame format in figure 2) as a modification in Larsson's (as modified by Yonge) method and system of using the transmit announcement indication (see paragraph 28, lines 1-9, transmit duration information may be conveyed in different messages, such as, RTS-CTS message exchanges). The motivation to combine would have been to have a method and system for cancelling or trimming a medium reservation in a communication

system that employs a protocol that supports a reservation of a shared communication medium, thereby improving efficiency in the use of the communication medium (see paragraph 6 and 19, Fischer).

As per claim 44, Larsson as modified by Yonge discloses wherein the receiver is further configured to receive the transmit announcement indication with a request to send (RTS) frame (see paragraph 28, lines 1-9, transmit duration information may be conveyed in different messages, such as, RTS-CTS message exchanges, see figure 5, RTS sent from source to destination, followed by data fragments, Larsson).

As per claim 45, Larsson as modified by Yonge discloses a transmitter configured to transmit a clear to send (CTS) frame from the second station to the first station in response to the RTS frame (see paragraph 28, lines 1-9, transmit duration information may be conveyed in different messages, such as, RTS-CTS message exchanges, see figure 5, RTS sent from source to destination, followed by data fragments, Larsson).

Conclusion

9. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. See form 892.

10. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to ABDULLAH RIYAMI whose telephone number is (571)270-3119. The examiner can normally be reached on Monday through Thursday 9am-5pm EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Aung Moe can be reached on (571) 272-7314. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/AUNG S. MOE/
Supervisory Patent Examiner, Art Unit 2474

/Abdullah Riyami/
Examiner, Art Unit 2474

Notice of References Cited	Application/Control No. 11/627,181	Applicant(s)/Patent Under Reexamination WENTINK, MENZO	
	Examiner ABDULLAH RIYAMI	Art Unit 2474	Page 1 of 2

U.S. PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	Classification
*	A	US-2005/0114749 A1	05-2005	Yonge et al.	714/752
*	B	US-2005/0147115 A1	07-2005	Li et al.	370/449
*	C	US-2005/0208956 A1	09-2005	Takagi et al.	455/464
*	D	US-2005/0243781 A1	11-2005	Vesuna et al.	370/338
*	E	US-2005/0265393 A1	12-2005	Fischer et al.	370/474
*	F	US-2006/0116076 A1	06-2006	Li et al.	455/041.2
*	G	US-2006/0187964 A1	08-2006	Li et al.	370/474
*	H	US-7,130,306 B1	10-2006	Loukas, Pasi Into	370/392
*	I	US-2007/0025388 A1	02-2007	Abhishek et al.	370/447
*	J	US-2007/0080781 A1	04-2007	Ginzburg et al.	340/007.21
*	K	US-2007/0115882 A1	05-2007	Wentink, Menzo	370/329
*	L	US-2008/0039046 A1	02-2008	Vilzmann et al.	455/296
*	M	US-2008/0298306 A1	12-2008	Larsson, Peter	370/328

FOREIGN PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Country	Name	Classification
	N					
	O					
	P					
	Q					
	R					
	S					
	T					

NON-PATENT DOCUMENTS

*		Include as applicable: Author, Title Date, Publisher, Edition or Volume, Pertinent Pages)
	U	
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	X	

*A copy of this reference is not being furnished with this Office action. (See MPEP § 707.05(a).)
Dates in MM-YYYY format are publication dates. Classifications may be US or foreign.

Notice of References Cited	Application/Control No. 11/627,181	Applicant(s)/Patent Under Reexamination WENTINK, MENZO	
	Examiner ABDULLAH RIYAMI	Art Unit 2474	Page 2 of 2

U.S. PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	Classification
*	A	US-2010/0142493 A1	06-2010	SAKODA et al.	370/336
	B	US-			
	C	US-			
	D	US-			
	E	US-			
	F	US-			
	G	US-			
	H	US-			
	I	US-			
	J	US-			
	K	US-			
	L	US-			
	M	US-			

FOREIGN PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Country	Name	Classification
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	P					
	Q					
	R					
	S					
	T					

NON-PATENT DOCUMENTS

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	W	
	X	

*A copy of this reference is not being furnished with this Office action. (See MPEP § 707.05(a).)
Dates in MM-YYYY format are publication dates. Classifications may be US or foreign.

Index of Claims	Application/Control No.	Applicant(s)/Patent Under Reexamination
	11627181	WENTINK, MENZO
	Examiner	Art Unit
	ABDULLAH RIYAMI	2474

✓	Rejected	-	Cancelled	N	Non-Elected	A	Appeal
=	Allowed	÷	Restricted	I	Interference	O	Objected

☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47

CLAIM		DATE								
Final	Original	05/18/2011	11/03/2011							
	1	✓	✓							
	2	✓	✓							
	3	✓	✓							
	4	✓	✓							
	5	✓	✓							
	6	✓	✓							
	7	✓	✓							
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	10	✓	✓							
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	35	✓	✓							
	36	✓	✓							

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CLAIM		DATE								
Final	Original	05/18/2011	11/03/2011							
	37	✓	✓							
	38	✓	✓							
	39	✓	✓							
	40	✓	✓							
	41	✓	✓							
	42	✓	✓							
	43	✓	✓							
	44	✓	✓							
	45	✓	✓							
	46	✓	✓							

PTO/SB/08 (09-06)
Approved for use through 03/31/2007. OMB 0651-0031
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Substitute for form 1449/PTO				*Complete if Known*	
INFORMATION DISCLOSURE STATEMENT BY APPLICANT				**Application Number**	11/627,181
Date Submitted: October 27, 2011				**Filing Date**	1/25/2007
				First Named Inventor	Menzo Wentink
(use as many sheets as necessary)				Art Unit	2474
				Examiner Name	Abdulla A. Riyami
Sheet	1	of	1	Attorney Docket Number	088245-2616

U.S. PATENT DOCUMENTS

Examiner Initials*	Cite No.[1]	Document Number Number-Kind Code[2] (*if known*)	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear

FOREIGN PATENT DOCUMENTS

Examiner Initials*	Cite No.[1]	Foreign Patent Document Country Code[3]-Number[4]-Kind Code[5] (*if known*)	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Documents	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear	T[6]
		JP-2003-009220 (with English abstract)	01-10-2003	KYOCERA CORP		
		JP-2004-128654 (with English abstract)	04-22-2004	SONY CORP.		

NON PATENT LITERATURE DOCUMENTS

Examiner Initials*	Cite No.[1]	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.) date, page(s), volume-issue number(s), publisher, city and/or country where published.	T[6]
		Office Action on Japanese Application 2008-552579, dated 8/30/2011 (English translation not available)	

Examiner Signature	/Abdulla Riyami/	Date Considered	11/03/2011

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4846-5656-1677.1

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /A.R./

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	11627181	WENTINK, MENZO
	Examiner	Art Unit
	ABDULLAH RIYAMI	2474

SEARCHED			
Class	Subclass	Date	Examiner
370	328,336,338,310,310.2,350,431,443,444,433,448,445,465,474,447	5/18/2011	AR
455	41.2,69,91,296	5/18/2011	AR
370	328,336,338,310,310.2,350,431,443,444,433,448,445,465,474,447	11/2/2011	AR
455	41.2,69,91,296	11/2/2011	AR

SEARCH NOTES		
Search Notes	Date	Examiner
Conducted East search (limited text search in class/subclass listed above)	5/18/2011	AR
Read IEEE documents related to subjec tmatter	5/18/2011	AR
Conducted updated East search (limited text search in class/subclass listed above)	11/2/2011	AR

INTERFERENCE SEARCH			
Class	Subclass	Date	Examiner

/ABDULLAH RIYAMI/ Examiner.Art Unit 2474	

EAST Search History

EAST Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
S1	29	transmi$9 near1 announc$10 near1 indicat$7	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2011/05/09 10:23
S2	54628	transmi$9 near1 indicat$7	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2011/05/09 10:43
S3	275	S2 same rts	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2011/05/09 10:44
S4	202	S3 and cts	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2011/05/09 10:44
S5	1371	(short$2 inter$frame$2 or short$2 inter$frame$3 or short inter frame$3)	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2011/05/09 10:45
S6	37	S3 and S5	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2011/05/09 10:46
S7	10434	(zero$length$2 or zero length$2 or zerolength$2 or zlf or null$data or null data)	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2011/05/09 11:26

S8	29	S7 same rts	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2011/05/09 11:26
S9	3	S7 same (without near1 mac)	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2011/05/09 12:04
S10	38541	370/328,336,338,310,310.2,350,431,443,444,433,448,445,465,474,447.ccls. or 455/41.2,69,91,296.ccls.	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2011/05/18 18:39
S11	54777	transmi$9 near1 indicat$7	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2011/05/18 18:40
S12	1382	(short$2 inter$frame$2 or short$2 inter$frame$3 or short inter frame$3)	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2011/05/18 18:40
S13	280	S11 and S12	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2011/05/18 18:40
S14	132	S10 and S13	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2011/05/18 18:40
S15	23774	(without or "not includ$5") near2 address$4	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2011/11/01 11:37
S16	57679	transmi$9 near1 indicat$7	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2011/11/01 11:37

S17	600	S15 and S16	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2011/11/01 11:37
S18	24941	(without or "not includ$5") near2 (address$4 or mac)	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2011/11/01 11:42
S19	11	S18 same S16	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2011/11/01 11:42
S20	24941	(without or "not includ$5"or "no need") near2 (address$4 or mac)	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2011/11/01 11:47
S21	26109	(without or "not includ$5" or "no need") near2 (address$4 or mac)	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2011/11/01 11:47
S22	12	S21 same S16	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2011/11/01 11:48
S23	755	S21 and S16	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2011/11/01 11:48
S24	26109	(without or "not includ$5" or "no need") near2 (address$4 or mac)	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2011/11/01 18:10
S25	35	S24 same rts	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2011/11/01 18:10

S26	683	S24 same subsequent	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2011/11/01 18:10
S27	92	S26 same (frame or packet)	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2011/11/01 18:11
S28	26109	(without or "not includ$5" or "no need") near2 (address$4 or mac)	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2011/11/01 21:10
S29	683	S28 same subsequent	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2011/11/01 21:10
S30	0	S29 same (anounc$10)	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2011/11/01 21:10
S31	0	S29 same (announc$10)	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2011/11/01 21:11
S33	42	qos-null	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2011/11/01 21:12
S34	5	S33 and S28	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2011/11/01 21:12
S35	41524	370/328,336,338,310,310.2,350,431,443,444,433,448,445,465,474,447.ccls. or 455/41.2,69,91,296.ccls.	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2011/11/01 22:20

S36	26109	(without or "not includ$5" or "no need") near2 (address$4 or mac)	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2011/11/01 22:20
S37	820	S36 and S35	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2011/11/01 22:20
S38	104	S37 and rts	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2011/11/01 22:21

11/3/2011 11:22:24 AM
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PTO/SB/08 (09-06)
Approved for use through 03/31/2007. OMB 0651-0031
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Substitute for form 1449/PTO				***Complete if Known***	
INFORMATION DISCLOSURE STATEMENT BY APPLICANT				**Application Number**	11/627,181
Date Submitted: October 27, 2011				**Filing Date**	1/25/2007
				First Named Inventor	Menzo Wentink
(use as many sheets as necessary)				Art Unit	2474
				Examiner Name	Abdulla A. Riyami
Sheet	1	of	1	Attorney Docket Number	088245-2616

U.S. PATENT DOCUMENTS

Examiner Initials*	Cite No.[1]	Document Number Number-Kind Code[2] (*if known*)	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear

FOREIGN PATENT DOCUMENTS

Examiner Initials*	Cite No.[1]	Foreign Patent Document Country Code[3]-Number[4]-Kind Code[5] (*if known*)	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Documents	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear	T[6]
		JP-2003-009220 (with English abstract)	01-10-2003	KYOCERA CORP		
		JP-2004-128654 (with English abstract)	04-22-2004	SONY CORP.		

NON PATENT LITERATURE DOCUMENTS

Examiner Initials*	Cite No.[1]	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.) date, page(s), volume-issue number(s), publisher, city and/or country where published.	T[6]
		Office Action on Japanese Application 2008-552579, dated 8/30/2011 (English translation not available)	

Examiner Signature		Date Considered	

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4846-5656-1677.1

Electronic Acknowledgement Receipt

EFS ID:	11277635
Application Number:	11627181
International Application Number:	
Confirmation Number:	1464
Title of Invention:	Transmit Announcement Indication
First Named Inventor/Applicant Name:	Menzo Wentink
Customer Number:	23524
Filer:	Eric N. Huston/Linda Anderson
Filer Authorized By:	Eric N. Huston
Attorney Docket Number:	088245-2616
Receipt Date:	27-OCT-2011
Filing Date:	25-JAN-2007
Time Stamp:	12:52:34
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1		Forref.pdf	2046925 6c23593ace7df65fc7ee31917fc8da0e38bfd5e5	yes	32

	Multipart Description/PDF files in .zip description		
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	Foreign Reference	1	14
	Foreign Reference	15	32

Warnings:					
Information:					
2		SuppIDSandNPL.pdf	324884 19d409099fc2f0a1f21164b731e10426c5278e4a	yes	8

	Multipart Description/PDF files in .zip description		
	Document Description	**Start**	**End**
	Transmittal Letter	1	3
	Information Disclosure Statement (IDS) Form (SB08)	4	4
	Non Patent Literature	5	8

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New Applications Under 35 U.S.C. 111
If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371
If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office
If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

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Cited Document 2

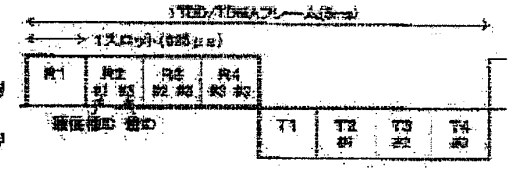
Bibliographic data: JP 2003009220 (A)

RADIO COMMUNICATION SYSTEM AND RADIO COMMUNICATION TERMINAL

Publication date:	2003-01-10
Inventor(s):	NAKAMURA YASUHIRO +
Applicant(s):	KYOCERA CORP +
Classification:	**- International:** ***H04J3/00; H04Q7/36;*** (IPC1-7): H04J3/00; H04Q7/36
	- European:
Application number:	JP20010192305 20010626
Priority number(s):	JP20010192305 20010626

Abstract of JP 2003009220 (A)

PROBLEM TO BE SOLVED: To provide a radio communication system for enabling a base station device side to optionally change incoming slot allocation by making the base station designate a transmission right of each incoming slot in an ongoing slot. SOLUTION: In this radio communication system which is provided with a plurality of base station devices for forming a radio communication zone and performing radio communication with a mobile device within the zone and in which a base station device transmits an ongoing signal to the mobile device at prescribed timing and the mobile device transmits an incoming signal to the base station device at prescribed timing different from that of the ongoing signal to perform communication, the ongoing signal is provided with a first area for including a code that can identify a mobile device to be the destination of the ongoing signal and a second area for including a code that can identify a mobile device to which a transmission right is given at transmitting timing of an incoming signal after the ongoing signal.



Last updated:
26.04.2011 Worldwide
Database 5.7.23; 93p

Cited Document 2

(19)日本国特許庁（ＪＰ）　(12)公開特許公報（Ａ）　(11)特許出願公開番号
特開2003－9220
（P2003－9220A）
(43)公開日　平成15年１月10日(2003.1.10)

(51)Int.Cl.⁷	識別記号	ＦＩ		テーマコード（参考）
Ｈ０４Ｑ　7/36		Ｈ０４Ｊ　3/00	Ｋ	５Ｋ０２８
Ｈ０４Ｊ　3/00		Ｈ０４Ｂ　7/26	１０５Ｄ	５Ｋ０６７

審査請求　未請求　請求項の数10　ＯＬ　（全 13 頁）

(21)出願番号　特願2001－192305(P2001－192305)

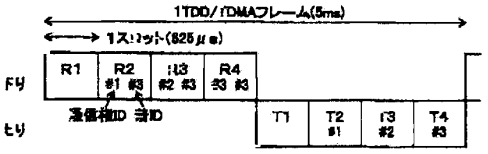
(22)出願日　平成13年６月26日(2001.6.26)

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Ｆターム(参考)　5K028 AA11 BB06 CC05 DD01 DD02
HH02 LL02 LL22 LL42 MM08
5K067 AA13 BB03 BB04 CC04 CC08
DD17 EE02 EE10 EE16 EE71
HH26

(54)【発明の名称】　無線通信システム及び無線通信端末装置

(57)【要約】
【課題】　上りスロット毎の送信権を、基地局装置が下りスロットにおいて指定することによって、上りスロットの割当を基地局装置側で任意に変更できる無線通信システムを提供する。
【解決手段】　無線通信ゾーンを形成し、無線通信ゾーン内で移動機と無線通信を行う複数の基地局装置を備え、基地局装置から移動機へ所定のタイミングで下りの信号を送信し、移動機から基地局装置へ下りの信号と異なる所定のタイミングで上りの信号を送信して通信を行う無線通信システムにおいて、下りの信号には、該下りの信号の宛先となる移動機を識別可能な符号を含ませる第一の領域と、該下りの信号以後の上りの信号の送信タイミングにおける送信権が付与される移動機を識別可能な符号を含ませる第二の領域とを設けた。



【特許請求の範囲】
【請求項１】 無線通信ゾーンを形成し、前記無線通信ゾーン内で端末装置と無線通信を行う複数の基地局装置を備え、前記基地局装置から前記端末装置へ所定のタイミングで下りの信号を送信し、前記端末装置から前記基地局装置へ前記下りの信号と異なる所定のタイミングで上りの信号を送信して通信を行う無線通信システムにおいて、
前記下りの信号には、該下りの信号の宛先となる端末装置を識別可能な符号を含ませる第一の領域と、該下りの信号以後の上りの信号の送信タイミングにおける送信権が付与される端末装置を識別可能な符号を含ませる第二の領域とを設けたことを特徴とする無線通信システム。
【請求項２】 前記基地局装置から端末装置へ送信される下りの信号は、所定のタイミングの下りスロットにおいて送信され、
前記端末装置から基地局装置へ送信される上りの信号は、前記下りスロットと異なる所定のタイミングの上りスロットにおいて送信され、
前記下りスロットには、該下りスロットの宛先となる端末装置を識別可能な符号と、該下りスロット以後の上りスロットにおける送信権が付与される端末装置を識別可能な符号とを含ませることを特徴とする請求項１に記載の無線通信システム。
【請求項３】 前記端末装置を識別可能な符号は、前記端末装置と前記基地局装置との間のパケット通信において使用され、パケット通信を開始するときに前記基地局装置から前記端末装置に付与されることを特徴とする請求項１又は２に記載の無線通信システム。
【請求項４】 前記上りの信号には、前記端末装置から上りの信号の送信が必要か否かを識別可能な通信継続フラグを含むことを特徴とする請求項１から３のいずれか一つに記載の無線通信システム。
【請求項５】 前記基地局装置には、前記上りの信号の送信権が所定時間付与されていない端末装置に対して、所定のタイミングで、上りの信号の送信の要否を問い合わせるポーリング手段を備えたことを特徴とする請求項１から４のいずれか一つに記載の無線通信システム。
【請求項６】 無線通信ゾーンを形成し、前記無線通信ゾーン内の端末装置との間で、基地局装置から端末装置へ所定のタイミングで下りの信号を送信し、端末装置から基地局装置へ前記下りの信号と異なる所定のタイミングで上りの信号を送信して無線通信を行う基地局装置において、
前記下りの信号には、
該下りの信号の宛先となる端末装置を識別可能な符号を含ませて、該下りの信号の宛先となる端末装置を特定するとともに、
該下りの信号以後の上りの信号の送信タイミングにおける送信権が付与される端末装置を識別可能な符号を含ませて、以後の送信タイミングにおける送信権を割り当てる端末装置を決定するＩＤ設定手段を備えることを特徴とする基地局装置。
【請求項７】 前記端末装置との間のパケット通信を開始するときに前記端末装置毎に符号を付与するＩＤ付与手段を備え、
前記端末装置を識別可能な符号として、前記ＩＤ付与手段によって付与された符号を用いることを特徴とする請求項６に記載の基地局装置。
【請求項８】 前記上りの信号の送信権が所定時間付与されていない端末装置に対して、所定のタイミングで、上りの信号の送信の要否を問い合わせるポーリング手段を備えたことを特徴とする請求項６又は７に記載の基地局装置。
【請求項９】 基地局装置によって形成された無線通信ゾーン内で、前記基地局装置からの所定のタイミングで送信される下りの信号を受信し、前記下りの信号と異なる所定のタイミングで前記基地局装置へ上りの信号を送信して無線通信を行う通信端末装置において、
前記下りの信号中で、該下りの信号以後の上りの信号の送信タイミングにおける送信権が付与される端末装置として自装置が指定されているときに、この指定された送信タイミングにおいて、前記基地局装置に対して信号を送信することを特徴とする通信端末装置。
【請求項１０】 前記端末装置が上りの信号の送信を休止している状態で、前記基地局装置から送信タイミングの指定がされたときは、前記基地局装置に対して送信データの有無を通知することを特徴とする請求項９に記載の通信端末装置。
【発明の詳細な説明】
【０００１】
【発明が属する技術分野】本発明は、送受信タイミングが予め定められている通信（例えば、ＴＤＭＡ通信）を行う無線通信システム、基地局装置及び無線通信端末装置に関し、特に、パケット通信時の送受信タイミング（送受信スロット）の割当に関する。
【０００２】
【従来の技術】デジタル方式の移動体通信においては、スロット毎にデータが区切られて送信される特性を利用して、音声通信の他に、常時回線を占有しないパケット方式によるデータ通信が行われている。
【０００３】このパケット通信時には、基地局装置が端末装置に送信スロットを割り当てて、端末装置は割り当てられたスロットにおいてデータを基地局装置に送信していた。この送信スロットの割当には、基地局装置が予約信号を送信し、一定量のスロットを端末装置に割り当てる方法（特開平１０－７９９７０号公報）や、基地局装置が空きスロット情報を報知し、端末装置が空きスロットを選択して基地局装置にランダムアクセスする方法（特開平１０－２０９９５６号公報）が提案されてい

る。

【0004】

【発明が解決しようとする課題】しかし、予約信号により送信スロットを割り当てる方法においては、既に割り当てられた送信スロットの割当は変更できないので、次にデータの送信を希望する端末装置が待たされることになり、スループットが低下する問題があった。また、一度割り当てた送信スロットの割当を変更するためには、再度、予約信号による送信スロットを割り当てるという、割当変更のための手順を踏まなければならないことから、動的な送信スロットの割当の変更をすることが困難であり、データ量の急激な変化に対応することが困難であった。

【0005】また、空きスロット情報を周期的に報知する方法は、送信信号の衝突はある程度低減されるが、端末装置から最初に送信される信号の衝突は避けられないので、スループットが低下する問題は残っている。

【0006】本発明は、上りスロット毎の送信権を、基地局装置が下りスロットにおいて指定することによって、上りスロットの割当を基地局装置側で任意に変更できる無線通信システムを提供することを目的とする。

【0007】

【課題を解決するための手段】第1の発明は、無線通信ゾーンを形成し、前記無線通信ゾーン内で端末装置（100）と無線通信を行う複数の基地局装置（200）を備え、前記基地局装置から前記端末装置へ所定のタイミング（例えば、下りスロット）で下りの信号を送信し、前記端末装置から前記基地局装置へ前記下りの信号と異なる所定のタイミング（例えば、上りスロット）で上りの信号を送信して通信を行う無線通信システムにおいて、前記下りの信号には、該下りの信号の宛先となる端末装置を識別可能な符号（例えば、着ＩＤ）を含ませる第一の領域と、該下りの信号以後の上りの信号の送信タイミングにおける送信権が付与される端末装置を識別可能な符号（例えば、通信権ＩＤ）を含ませる第二の領域とを設けたことを特徴とする。

【0008】第2の発明は、第1の発明において、前記基地局装置から端末装置へ送信される下りの信号は、所定のタイミングの下りスロットにおいて送信され、前記端末装置から基地局装置へ送信される上りの信号は、前記下りスロットと異なる所定のタイミングの上りスロットにおいて送信され、前記下りスロットには、該下りスロットの宛先となる端末装置を識別可能な符号（例えば、着ＩＤ）と、該下りスロット以後の上りスロットにおける送信権が付与される端末装置を識別可能な符号（例えば、通信権ＩＤ）とを含ませることを特徴とする。

【0009】第3の発明は、第1又は第2の発明において、前記端末装置を識別可能な符号は、前記端末装置と前記基地局装置との間のパケット通信において使用され、パケット通信を開始するときに前記基地局装置から前記端末装置に付与されることを特徴とする。

【0010】第4の発明は、第1から第3の発明において、前記上りの信号には、前記端末装置から上りの信号の送信が必要か否かを識別可能な通信継続フラグを含むことを特徴とする。

【0011】第5の発明は、第1から第4の発明において、前記基地局装置には、前記上りの信号の送信権が所定時間付与されていない端末装置に対して、所定のタイミングで、上りの信号の送信の要否を問い合わせるポーリング手段を備えたことを特徴とする。

【0012】第6の発明は、無線通信ゾーンを形成し、前記無線通信ゾーン内の端末装置との間で、基地局装置から端末装置へ所定のタイミングで下りの信号を送信し、端末装置から基地局装置へ前記下りの信号と異なる所定のタイミングで上りの信号を送信して無線通信を行う基地局装置において、前記下りの信号には、該下りの信号の宛先となる端末装置を識別可能な符号を含ませて、該下りの信号の宛先となる端末装置を特定するとともに、該下りの信号以後の上りの信号の送信タイミングにおける送信権が付与される端末装置を識別可能な符号を含ませて、以後の送信タイミングにおける送信権を割り当てる端末装置を決定するＩＤ設定手段を備えることを特徴とする。

【0013】第7の発明は、第6の発明において、前記端末装置との間のパケット通信を開始するときに前記端末装置毎に符号を付与するＩＤ付与手段を備え、前記端末装置を識別可能な符号として、前記ＩＤ付与手段によって付与された符号を用いることを特徴とする。

【0014】第8の発明は、第6又は第7の発明において、前記上りの信号の送信権が所定時間付与されていない端末装置に対して、所定のタイミングで、上りの信号の送信の要否を問い合わせるポーリング手段を備えたことを特徴とする。

【0015】第9の発明は、基地局装置によって形成された無線通信ゾーン内で、前記基地局装置からの所定のタイミングで送信される下りの信号を受信し、前記下りの信号と異なる所定のタイミングで前記基地局装置へ上りの信号を送信して無線通信を行う通信端末装置において、前記下りの信号中で、該下りの信号以後の上りの信号の送信タイミングにおける送信権が付与される端末装置として自装置が指定されているときに、この指定された送信タイミングにおいて、前記基地局装置に対して信号を送信することを特徴とする。

【0016】第10の発明は、第9の発明において、前記端末装置が上りの信号の送信を休止している状態で、前記基地局装置から送信タイミングの指定がされたときは、前記基地局装置に対して送信データの有無を通知することを特徴とする。

【0017】

【発明の作用および効果】第１の発明では、無線通信ゾーンを形成し、無線通信ゾーン内で端末装置と無線通信を行う複数の基地局装置を備え、基地局装置から端末装置へ所定のタイミングで下りの信号を送信し、端末装置から基地局装置へ下りの信号と異なる所定のタイミングで上りの信号を送信して通信を行う無線通信システムにおいて、下りの信号には、該下りの信号の宛先となる端末装置を識別可能な符号を含ませる第一の領域と、該下りの信号以後の上りの信号の送信タイミングにおける送信権が付与される端末装置を識別可能な符号を含ませる第二の領域とを設けたので、基地局側において、下りのタイミングと上りのタイミングとの割当の変更が容易となり、効率的な通信をすることができる。

【００１８】第２の発明では、基地局装置から端末装置へ送信される下りの信号は、所定のタイミングの下りスロットにおいて送信され、端末装置から基地局装置へ送信される上りの信号は、下りスロットと異なる所定のタイミングの上りスロットにおいて送信され、下りスロットには、該下りスロットの宛先となる端末装置を識別可能な符号と、該下りスロット以後の上りスロットにおける送信権が付与される端末装置を識別可能な符号とを含ませたので、ＴＤＭＡ方式の無線通信において、下りスロットと上りスロットとの割当を、基地局側で容易に変更することができ、効率的なスロットの割当をすることができる。

【００１９】第３の発明では、端末装置を識別可能な符号は、端末装置と基地局装置との間のパケット通信において使用され、パケット通信開始するときに基地局装置から端末装置に付与されるので、端末ＩＤより短い符号を付与することで、この端末装置を識別可能な符号の情報部における容量を低減することができる。

【００２０】第４の発明では、上りの信号には、端末装置からの以後の送信タイミングでの上りの信号の送信が必要か否かを識別可能な通信継続フラグを含むので、移動機側から通信終了を基地局側に報知して、送信タイミング毎に上りの送信スロットの割当を制御することができる。

【００２１】第５の発明では、基地局装置は、上りの信号の送信権が所定時間付与されていない端末装置に対して、所定のタイミングで、上りの信号の送信の要否を問い合わせるポーリング手段を備えたので、上りの信号の送信権が所定時間付与されていない休止中の端末装置において送信データが発生したときに、該端末装置に上りの信号の送信権を割り当てることができる。

【００２２】第６の発明では、無線通信ゾーンを形成し、無線通信ゾーン内の端末装置との間で、基地局装置から端末装置へ所定のタイミングで下りの信号を送信し、端末装置から基地局装置へ下りの信号と異なる所定のタイミングで上りの信号を送信して無線通信を行う基地局装置において、下りの信号には、該下りの信号の宛先となる端末装置を識別可能な符号を含ませて、該下りの信号の宛先となる端末装置を特定するとともに、該下りの信号以後の上りの信号の送信タイミングにおける送信権が付与される端末装置を識別可能な符号を含ませて、以後の送信タイミングにおける送信権を割り当てる端末装置を決定するＩＤ設定手段を備えるので、基地局装置において、下りのタイミングと上りのタイミングとの割当を任意に変更することができ、効率的な通信を実現することができる。

【００２３】第７の発明では、端末装置との間のパケットを開始するときに端末装置毎に符号を付与するＩＤ付与手段を備え、端末装置を識別可能な符号としてＩＤ付与手段によって付与された符号を用いるので、端末ＩＤより短い符号を付与することで、この端末装置を識別可能な符号の情報部における容量を低減することができる。

【００２４】第８の発明では、上りの信号の送信権が所定時間付与されていない端末装置に対して、所定のタイミングで、上りの信号の送信の要否を問い合わせるポーリング手段を備えるので、上りの信号の送信権が所定時間付与されていない休止中の端末装置において送信データが発生したときに、該端末装置に上りの信号の送信権を割り当てることができる。

【００２５】第９の発明では、基地局装置によって形成された無線通信ゾーン内で、基地局装置からの所定のタイミングで送信される下りの信号を受信し、下りの信号と異なる所定のタイミングで基地局装置へ上りの信号を送信して無線通信を行う通信端末装置において、下りの信号中で、該下りの信号以後の上りの信号の送信タイミングにおける送信権が付与される端末装置として自装置が指定されているときに、この指定された送信タイミングにおいて、基地局装置に対して信号を送信するので、通信端末装置がランダムに送信することがなく、送信データの衝突を低減することができる。

【００２６】第１０の発明では、端末装置が上りの信号の送信を休止している状態で、基地局装置から送信タイミングの指定がされたときは、基地局装置に対して送信データの有無を通知するので、基地局装置から送信権を割り当てられていない状態でも、送信データの衝突を避けながら、送信権を確保することができる。

【００２７】

【発明の実施の形態】次に、本発明の実施の形態について図面を参照して説明する。

【００２８】図１は、本発明の実施の形態の無線通信システムの構成図である。

【００２９】複数設置された基地局装置２００は、各々無線通信ゾーンを形成し、無線通信ゾーン内の無線通信端末装置としての移動機１００（例えば、携帯電話機）と無線通信を行う。この無線通信は通信チャネル（ＴＣＨ）において行われる音声通信の他に、ユーザパケット

チャネル（UPCH）において行われるパケット通信がある。

【００３０】パケット通信は、パケット通信登録要求処理又はパケットチャネル登録要求処理によって開始され、パケット通信登録解除処理によって終了する。本発明ではパケット通信中に移動機を識別するために移動機毎の識別符号としてにＩＤを付与している。また、パケット通信中に、送受信スロットをどの移動機１００に割り当てるかは、基地局装置２００が定める。すなわち、基地局装置２００から移動機１００に送信される下りの信号に、通信権ＩＤと着ＩＤとを含ませて、着ＩＤで当該下りスロットの宛先となる移動機を指定し、通信権ＩＤで対応する上りスロットを割り当てる移動機を指定している。

【００３１】基地局装置２００は、交換機３００に接続されており、交換機３００を介して他の通信網に接続されテイ留。そして、移動機１００は、基地局装置２００、交換機３００を介して他の通信網に接続されている通信端末装置と通信をする。このように交換機３００によって複数の基地局装置２００が接続されて移動体通信網を構成している。

【００３２】図２は、本発明の実施の形態の移動機のブロック図である。

【００３３】アンテナ１は送信部２及び受信部３に接続されており、基地局装置２００からの電波（下りの信号）を受信し、基地局装置２００に対し電波（上りの信号）を送信する。無線部２は送信部３及び受信部４により構成され、送信部３はアンテナ１から送信する高周波信号を生成する。受信部４はアンテナ１で受信した高周波信号に増幅、周波数変換等をして、ベースバンド信号としてバースバンド処理部５に出力する。

【００３４】ベースバンド処理部５はベースバンド信号を復調回路によって復調する。復調された信号は、符号化・復号化部（ＣＯＤＥＣ）６に送られ、符号化・復号化部６にて音声信号、データ信号に復号化される。また、符号化・復号化部６は音声信号、データ信号を符号化し、符号化された信号はベースバンド処理部５に送られ、変調される。変調された信号は、送信部３にて高周波信号に変換され、アンテナ１から送信される。

【００３５】符号化・復号化部６には、外部インターフェース部１３が接続されており、外部インターフェース部１３にはパーソナルコンピュータ等のデータ通信用の外部装置が接続される。外部インターフェース部１３に接続された外部装置からは、基地局装置に対してパケット通信（データ通信）で送信されるデータ（パケットデータ）が入力され、基地局装置からパケット通信（データ通信）で受信されたデータが出力される。

【００３６】制御部９は、無線部２、ベースバンド処理部５、符号化・復号化部６等の移動機１００の各部を制御する。具体的には、無線部２に対してチャネルを指定して、送受信周波数を制御する。また、所定の通信プロトコルに従って、基地局装置２００から着ＩＤによって指定された下りスロットを受信し、基地局装置２００から通信権ＩＤによって指定された上りスロットでデータを送信する。

【００３７】図３は、本発明の実施の形態の基地局装置のブロック図である。この基地局装置は、図２にて前述した移動機と類似の構成を有しており、同じ符号を付した構成は同様の動作をする。

【００３８】アンテナ１は送信部２及び受信部３に接続されており、移動機１００からの電波（上りの信号）を受信し、移動機１００に対し電波（下りの信号）を送信する。無線部２は送信部３及び受信部４により構成され、送信部３はアンテナ１から送信する高周波信号を生成する。受信部４はアンテナ１で受信した高周波信号に増幅、周波数変換等をして、ベースバンド信号としてバースバンド処理部５に出力する。

【００３９】ベースバンド処理部５はベースバンド信号を復調回路によって復調する。復調された信号は、符号化・復号化部（ＣＯＤＥＣ）６に送られ、符号化・復号化部６にて音声信号、データ信号に復号化される。また、符号化・復号化部６は音声信号、データ信号を符号化し、符号化された信号はベースバンド処理部５に送られ、変調される。変調された信号は、送信部３にて高周波信号に変換され、アンテナ１から送信される。

【００４０】また、基地局装置２００の符号化・復号化部６には、交換機３００が接続されている。基地局装置２００から交換機３００へは、基地局装置２００が受信した音声（データ）信号が出力される。また、交換機３００から基地局装置２００へは、基地局装置２００から送信する音声（データ）信号が入力される。さらに、基地局装置２００へは、基地局装置２００の動作を制御するための制御信号や、基地局装置２００から移動機１００へ送信する制御信号が、移動通信制御装置（図示省略）から入力される。

【００４１】制御部９は、無線部２、ベースバンド処理部５、符号化・復号化部６等の基地局装置２００の各部を制御する。具体的には、無線部２に対してチャネルを指定して、送受信周波数を制御する。また、所定の通信プロトコルに従って、パケット通信中の移動機１００に対して、着ＩＤによって下りスロットの宛先を指定し、通信権ＩＤによって上りスロットの割当を指定する。

【００４２】図４は、本発明の実施の形態の送受信スロット配置を示すタイミング図である。図４には、デジタルコードレス電話システムであるＰＨＳシステム（Ｐｅｒｓｏｎａｌ Ｈａｎｄｙｐｈｏｎｅ Ｓｙｓｔｅｍ）での、移動機から基地局装置（上り）、基地局装置から移動機（下り）のスロットの配置の例である。

【００４３】ＰＨＳシステムでは、１ＴＤＤ／ＴＤＭＡフレーム中に４つの受信スロット（下りスロット）と、

4つの送信スロット（上りスロット）とが配置されている。ある周波数において、受信スロット1（R1）及び送信スロット1（T1）が制御チャネルとして使用されているとき、通話に用いることができるスロットは送信、受信各3スロット（R2～R4、T2～T4）である。

【0044】移動機が受信する下りスロットには通信権IDと着IDとが含まれている。この通信権IDは、該通信権IDが含まれる受信スロットに対応する送信スロットにおいて、この通信権IDに対応する移動機に割り当てられており、この移動機が当該送信スロットでデータを送信することができることを意味する。また、着IDは、該着IDが含まれる受信スロットの宛先を示し、移動機は自局に割り当てられたID番号が着IDとなっている受信スロットを受信し、基地局装置から送信されてきたデータ領域を取得する。

【0045】すなわち、図4に示す例においては、受信スロット2（RX2）では通信権IDが#1であり、着IDが#3である。よって、この受信スロット（RX2）はID#3の移動機に対する信号であり、ID#3の移動機が受信スロット2を受信する。一方、受信スロット2（RX2）に含まれる通信権IDは#1であるため、この受信スロット（RX2）に対応する送信スロット（TX2）はID#1の移動機に割り当てられており、ID#1の移動機が送信スロット2においてデータを送信することができる。

【0046】同様に、受信スロット3（RX3）では通信権IDが#2であり、着IDが#3である。よって、この受信スロット（RX3）はID#3の移動機に対する信号であり、対応する送信スロット（TX3）はID#2の移動機に割り当てられている。さらに、受信スロット4（RX4）では通信権IDが#3であり、着IDが#3である。よって、この受信スロット（RX4）はID#3の移動機に対するメッセージであり、対応する送信スロット（TX4）はID#3の移動機に割り当てられている。

【0047】このように、下りスロットに通信権IDと着IDとを含ませることによって、下りスロット（移動機における受信スロット）と上りスロット（移動機における送信スロット）との割当を、基地局側で任意に制御することができる。

【0048】また、下りスロットの宛先である着IDと、上りスロットの送信元である通信権IDを別に設けたので、下りスロットと上りスロットとを別々に移動機に割り当てることができる。

【0049】なお、図4に示す例では、送信スロットと受信スロットとが対になって、受信スロットには対応する送信スロットの送信権IDしか含まれていないが、送信権IDがどの送信スロットに対応するかの対応関係が明確になっていればどのような構成をしてもよい。例えば、所定のタイミングで送信権IDを特定のスロットに含ませて集中的に移動機に送信するようにしてもよい。

【0050】図5は、本発明の実施の形態の受信スロット（下りスロット）のデータの構成を示す図である。

【0051】この受信スロットの信号は、基地局装置から移動機に対して送信されるもので、ヘッダー、160ビットの情報部、CRC符号で構成されている。ヘッダーには、移動機と基地局装置との距離によりバーストが衝突するのを防止する所定ビット数（所定時間）のガードタイム、キャリア同期及びクロック同期用のプリアンブルが含まれている。また、情報部には基地局装置から移動機へ送信するデータが含まれる。また、情報部の後には、データ領域の誤りを検出するCRC符号が付されている。

【0052】本発明では、情報部の一部を用い、情報部に通信権IDと着IDとを含ませている。この通信権IDと着IDとは、前述したように、通信権IDは送信スロットの通信権を付与する移動機を示し、着IDは受信スロットの宛先を示している。

【0053】また、図5に示す実施の形態では、通信権IDに8ビットを割り当てている。よって、256台までの移動機への送信スロットの割当を、この通信権IDによって制御することができる。

【0054】図6は、本発明の実施の形態の送信スロット（上りスロット）のデータの構成を示す図である。

【0055】この送信スロットの信号は、移動機から基地局装置に対して送信されるもので、図5で説明した受信スロットと同様に、ヘッダー、160ビットの情報部、CRC符号で構成されている。

【0056】本発明では、2ビットのデータで構成される通信継続フラグを、送信スロットの情報部の一部に設けている。この通信継続フラグは、以後の送信スロットの割当が必要か否かに関する情報として、「継続」、「終了」又は「データなし」のいずれかが設定される。

【0057】具体的には、この送信スロット以後にさらに送信すべきデータがあるときには、通信継続フラグには「継続」が設定される。そして、「継続」の通信フラグを受信した基地局装置は、受信スロットに当該移動機の通信権IDを設定して、以後の送信スロットを当該移動機に割り当てる。

【0058】また、この送信スロットでデータの送信が終了するときには、通信継続フラグには「終了」が設定される。そして、「終了」の通信フラグを受信した基地局装置は、当該移動機に対する、以後の送信スロットを割り当てない。

【0059】また、後述する基地局装置から、現在パケット通信でデータを送信していない移動機に対するポーリングに対して、移動機は通信継続フラグによって送信すべきデータの有無を送信する。具体的には、移動機から送信すべきデータがないときには通信継続フラグに

「データなし」を設定して送信する。

【００６０】図７は、本発明の実施の形態の基地局装置と移動局（端末）との送受信スロットの割当を示すタイミング図である。図７では、１台の基地局装置と３台の端末装置とがパケット通信をしている。

【００６１】基地局装置から端末装置に対して送信される下りの信号には、前述したように、通信権ＩＤと、着ＩＤとが含まれている。

【００６２】下りスロットＡでは、通信権ＩＤが＃１に、着ＩＤが＃３に設定されているので、この下り（受信）スロットＡの宛先はＩＤ＃３を有する端末３であり、この下りスロットＡに対応する上り（送信）スロットはＩＤ＃１を有する端末１に割り当てられている。

【００６３】同様に、下りスロットＢでは、通信権ＩＤが＃２に、着ＩＤが＃３に設定されているので、この下り（受信）スロットＢの宛先はＩＤ＃３を有する端末３であり、この下りスロットＢに対応する上り（送信）スロットはＩＤ＃２を有する端末２に割り当てられている。また、下りスロットＣでは、通信権ＩＤが＃３に、着ＩＤが＃３に設定されているので、この下り（受信）スロットＣの宛先はＩＤ＃３を有する端末３であり、この下りスロットＢに対応する上り（送信）スロットはＩＤ＃３を有する端末３に割り当てられている。

【００６４】すなわち、図７に示すスロットの割当状態では、移動機からの送信スロット（上り）は３台の移動機に均等に割り当てられているが、移動機に対する受信スロット（下り）は、全て端末装置３に割り当てられている。

【００６５】このように、下りスロットに通信権ＩＤと着ＩＤとを含ませることによって、下りスロット（移動機における受信スロット）と上りスロット（移動機における送信スロット）とを、関係付けることなく、別の移動機に割り当てることができる。

【００６６】図８は、本発明の実施の形態の基地局装置と移動機（端末）との送受信スロットの別の割当を示すタイミング図である。図８では、１台の基地局装置と２台の端末装置とがパケットによる通信中に、１台の端末装置が送信するデータがなく休止していたが、この端末装置からデータの送信を開始する状態を示す。

【００６７】本発明では基地局側で通信権ＩＤを指定することによって、この通信権ＩＤを有する端末に送信スロットを割り当てるので、通信権ＩＤが指定されていない端末は送信スロットを使用することができず、パケットの送信をすることができない。よって、現在送信スロットが割り当てられていない端末から送信すべきデータが発生したときに、その端末は何らかの方法でデータの送信を希望する（送信スロットの割当を希望する）旨を、基地局装置に通知しなければ、永遠にデータを送信することができないならない。そこで、送信スロットが割り当てられていない休止中の端末装置に対して、基地局装置から所定のタイミングで、端末装置から送信するデータの有無を問い合わせるポーリングをして、休止中の端末装置との間のパケット通信を行えるようにしている。

【００６８】これを図８を用いて説明する。下りスロットＡでは、通信権ＩＤが＃１に、着ＩＤが＃２に設定されているので、この下り（受信）スロットＡの宛先はＩＤ＃２を有する端末２であり、この下りスロットＡに対応する上り（送信）スロットはＩＤ＃１を有する端末１に割り当てられている。同様に、下りスロットＢでは、通信権ＩＤが＃２に、着ＩＤが＃２に設定されているので、この下り（受信）スロットＢの宛先はＩＤ＃２を有する端末２であり、この下りスロットＢに対応する上り（送信）スロットはＩＤ＃２を有する端末２に割り当てられている。

【００６９】このように、基地局装置から指定される通信権ＩＤによって、端末１及び端末２には送信スロットが割り当てられている。このとき端末３には送信スロットが割り当てられていないので、基地局装置は端末３に対して所定時間間隔（例えば、１秒間隔）で、端末３から送信すべきデータがあり、端末３が送信スロットの割当を希望するか否かを問い合わせるポーリングをする。

【００７０】端末３は、このポーリングに対して、送信スロットの割当を希望するか否か（送信すべきデータの有無）を返信する。すなわち、端末から送信すべきデータがあるときには通信継続フラグに「データなし」を設定して送信して、送信スロットの割当を要求し、端末から送信すべきデータがないときには通信継続フラグに「データなし」を設定して送信する。

【００７１】なお、図８に示すタイミング図では、当初、端末３には送信すべきデータも受信すべきデータもなかった状態を示したが、端末３が受信すべきデータはあっても、端末３から送信すべきデータがない場合でも、同様に基地局装置からポーリングをして、端末３に送信すべきデータの有無（送信スロットの割当の要否）を問い合わせる必要がある。

【００７２】図９は、本発明の実施の形態の基地局装置のＩＤ登録処理を示すフローチャートである。

【００７３】このＩＤ登録処理は、基地局装置が移動機にパケット通信時に移動機を特定するための識別符号（ＩＤ）を付与する処理であり、移動機から送信されるパケット通信登録要求又はパケットチャネル登録要求によって開始される。

【００７４】基地局装置が、移動機からパケット通信登録要求又はパケットチャネル登録要求を受信すると（Ｓ１０１）、現在使用されていないＩＤを選択する（Ｓ１０２）。本実施の形態ではＩＤは８ビットのデータで構成されているので、基地局装置は２５６台の移動機に対して同時にＩＤを付与することができる。そして、この２５６種類のＩＤから、現在、他の移動機に付与されて

いないＩＤを選択する（Ｓ１０７）。

【００７５】そして、ＩＤが選択できない（例えば、ＩＤの空きがない）場合には、ＩＤ取得不可と判断し（Ｓ１０３で”Ｎｏ”）、移動機に対してパケットチャネル割当拒否信号を送信する。

【００７６】一方、ＩＤが選択できた場合には、ＩＤ取得可と判断し（Ｓ１０３で”Ｙｅｓ”）、選択されたＩＤが移動機に割り当てられており、使用中であることを登録する（Ｓ１０４）。そして、上りＳＴＡＴＵＳと下りＳＴＡＴＵＳとを初期値に設定する（Ｓ１０５）。すなわち、上りＳＴＡＴＵＳを休止中とし、下りＳＴＡＴＵＳを休止中として、送受信すべきデータの発生を待つ。その後、移動機に対してパケットチャネル割当信号を送信して、その移動機に割り当てられたＩＤを通知する（Ｓ１０６）。

【００７７】以上説明した手順によって基地局装置の移動機毎のＩＤを登録して、移動機に付与されたＩＤを通知して、その後の基地局装置からの下りスロットの情報に、このＩＤを通信権ＩＤ、着ＩＤとして含ませることによって、基地局側で、下りスロットと上りスロットとの割当を制御することができる。

【００７８】図１０は、本発明の実施の形態の基地局装置から上りスロットにおいて送信されるバースト（移動機からの上りの信号）の受信処理を示すフローチャートである。

【００７９】基地局装置は、移動機からの上りの信号（送信スロット）を受信すると、その中に含まれているＩＤ（識別符号）を取得する（Ｓ１１１）。そして、このＩＤが先にこの送信スロットを割り当てるために通知したた通信権ＩＤと等しい、有効なＩＤであるか否かを確認する（Ｓ１１２）。そして、送信スロットに含まれるＩＤと通知した通信権ＩＤとが等しかった場合には、このＩＤが有効なものと判断して、ステップＳ１１３に進む。

【００８０】一方、送信スロットに含まれるＩＤと通知した通信権ＩＤとが等しくなかった場合には、ＩＤが無効なものと判断して（Ｓ１１２で”Ｎｏ”）、このスロットで送信されてきたデータ領域を受信する必要がないので、このバースト受信処理を終了する。

【００８１】ＩＤが有効であった場合には、上りの送信スロットに含まれている通信継続フラグを取得して、このフラグの内容を確認する（Ｓ１１３）。通信継続フラグの内容が「終了」であれば、この送信スロットで送信されてきたデータ領域は必要なものであるため、上りの送信スロットの情報部を受信して、データ領域を取得する（Ｓ１１４）。そして、上りＳＴＡＴＵＳを「休止中」に設定して、この移動機に対する送信スロットの割当を中止する（Ｓ１１５）。そして、このバースト受信処理を終了する。

【００８２】また、通信継続フラグの内容が「継続」であれば、この送信スロットで送信されてきたデータ領域は必要なものであるため、上りの送信スロットの情報部を受信して、データ領域を取得する（Ｓ１１６）。そして、上りＳＴＡＴＵＳを「通信中」に設定して、この移動機に対して継続して送信スロットを割り当てる（Ｓ１１７）。そして、このバースト受信処理を終了する。

【００８３】また、通信継続フラグの内容を内容が「データなし」であれば、この移動機に対して送信スロットを割り当てる必要がないので、上りＳＴＡＴＵＳを「休止中」に設定して（Ｓ１１８）、このバースト受信処理を終了する。

【００８４】図１１は、本発明の実施の形態の基地局装置が下りスロットにおいて受信するバースト（移動機への下りの信号）の送信処理を示すフローチャートである。

【００８５】基地局装置は、現在ＩＤを付与している全ての移動機について送信すべきデータの有無を判定する（Ｓ１２１）。そして、送信すべきデータがある移動機について下りのＳＴＡＴＵＳを「通信中」に更新し、送信すべきデータがない移動機について下りのＳＴＡＴＵＳを「休止中」に更新する（Ｓ１２２）。

【００８６】そして、現在、移動機に付与しているＩＤ中に、下りＳＴＡＴＵＳが「通信中」となっているものがあるか否かを判定する（Ｓ１２３）。下りＳＴＡＴＵＳが「通信中」のＩＤがなければ、送信すべきデータがないので、下りスロットに含まれる着ＩＤを”０”にセットして（Ｓ１２４）、移動機が当該バーストを受信したときに、この下り情報部を自局宛てではないものとして、廃棄できるようにしている。

【００８７】一方、現在付与しているＩＤ中に、下りＳＴＡＴＵＳが「通信中」となっているものがあれば、送信すべきデータがあるので、下りＳＴＡＴＵＳが「通信中」となっているＩＤを、順次選択して（Ｓ１２４）、下りスロットに含まれる着ＩＤに、その移動機のＩＤを設定する（Ｓ１２５）。これは、１つの下りスロットには１つの着ＩＤしか含ませることができず、１つの下りスロットでは１台の移動機に対してしかデータを送信できないことから、順次、下りＳＴＡＴＵＳが「通信中」の移動機を選択して、その移動機のＩＤを着ＩＤに設定するものである。

【００８８】そして、現在ＩＤを付与している全ての移動機について、上りＳＴＡＴＵＳが「通信中」となっているか否かを判定する（Ｓ１２７）。

【００８９】そして、現在付与しているＩＤ中に、上りＳＴＡＴＵＳが「通信中」となっているものがあるか否かを判定する（Ｓ１２８）。上りＳＴＡＴＵＳが「通信中」となっているＩＤがなければ、現在移動機から送信されてくるデータがないので、ステップＳ１３１に移行して、次の送信スロットでポーリングをする移動機のＩＤを選択する。このポーリングをする移動機のＩＤは、

各移動機のスロット割当ての優先度が同じであれば単純に各移動機に対して順番にポーリングされるが、各移動機のスロット割当ての優先度を異ならせて、優先度の高い移動機に対するポーリング頻度を高くするように構成することもできる。

【００９０】一方、現在付与しているＩＤ中に、上りＳＴＡＴＵＳが「通信中」となっているものがあれば、現在移動機から送信されてくるデータがあるので、ステップＳ１２９に進む。そして、上りＳＴＡＴＵＳが「休止中」となっている移動機に対するポーリング周期であるか（例えば、１秒が経過しているか）否かを判定する（Ｓ１２９）。そして、ポーリング周期であればステップＳ１３１に進み、前述したようにポーリングをする移動機のＩＤを選択する。

【００９１】そして、ポーリング周期でなければ、上りＳＴＡＴＵＳが「通信中」となっている移動機のうち、上りスロットの送信権を割り当てるＩＤを選択する（Ｓ１３０）。

【００９２】そして、ステップＳ１３０またはＳ１３１によって選択されたＩＤを、上り通信権ＩＤとして設定する（Ｓ１３２）。そして、基地局装置は移動機に対して、下りスロット（下りバースト）を送信する。

【００９３】このように、本発明のパケット通信システムでは、下りスロットの信号には、該下りスロットの宛先となる移動機を識別可能な着ＩＤと、上りスロットの送信権が付与される移動機を識別可能な通信権ＩＤとを含ませたので、基地局装置が下りスロットだけでなく、上りスロットの割当も自由に変更することができ、効率的なスロットの割当をして、通信のスループットを向上させることができる。特に、後に他の移動機から通信の希望が生じた場合でも、通信中の移動機に対するスロットの割当を変更して、現在通信中の移動機との通信の終了を待たずに、該移動機によるパケット通信を開始することができる。

【００９４】また、端末固有に付与された番号である端末ＩＤより短い符号をパケット通信開始時に付与して、着ＩＤと通信権ＩＤとして使用するので、この移動機を識別可能な符号の情報部における容量を低減することができ、情報部のデータ領域の容量を圧迫することによる伝送速度の低下を最小限に抑えることができる。

【００９５】また、上りスロットの信号には、移動機からの送信が必要か否かを識別可能な通信継続フラグを含むので、移動機側から通信の終了を基地局装置に報知することができ、割り当てられた送信スロットが残っているときには、残送信スロットを他の通信装置に割り当てて、スループットを向上させることができる。

【００９６】また、上りスロットの送信権が所定時間付与されていない休止中の移動機に対して、所定の下りスロットで、上りスロットの送信の要否（送信データの有無）を問い合わせるポーリングを行うので、上りスロットの送信権が所定時間付与されていない休止中の移動機において送信データが発生したときに、該移動機に上りスロットの送信権を割り当てることができる。また、移動機から送信すべきデータが生じた場合でも、移動機からランダムに送信要求を上げることがないので、送信要求の衝突によってスループットが低下することがなくなる。

【００９７】さらに、本実施の形態の基地局装置では、下りスロットの信号に、該下りスロットの宛先となる移動機を識別可能な着ＩＤを含ませるとともに、上りスロットの送信権が付与される移動機を識別可能な送信権ＩＤを含ませるＩＤ設定手段を備えるので、該下りスロットの宛先となる移動機を特定するとともに、以後の送信スロットの送信権を割り当てる移動機が決定されるので、基地局側において、下りのタイミングと上りのタイミングとの割当を自由に変更することができ、効率的な通信を実現することができる。

【００９８】また、本実施の形態の移動機では、送信権ＩＤに自装置が指定されているときに、この送信権ＩＤに対応する送信スロットにおいて、基地局装置に対して信号を送信するので、移動機がランダムに送信することによる、送信データの衝突を低減することができ、スループットを向上させることができる。

【００９９】さらに、上りＳＴＡＴＵＳが休止中で送信タイミングの指定がされた移動機は、基地局装置に対して送信データの有無を通知するので、基地局装置から送信権を割り当てられていない状態でも、送信データの衝突を避けながら、送信権を確保することができ、多数の移動機に対して効率的にスロットを割り当てることができる。

【図面の簡単な説明】

【図１】 本発明の実施の形態の無線通信システムの構成図である。

【図２】 本発明の実施の形態の移動機のブロック図である。

【図３】 本発明の実施の形態の基地局装置のブロック図である。

【図４】 本発明の実施の形態の送受信スロットのタイミング図である。

【図５】 本発明の実施の形態の下りスロットのデータの構成図である。

【図６】 本発明の実施の形態の上りスロットのデータの構成図である。

【図７】 本発明の実施の形態の送受信スロットの割当を示すタイミング図である。

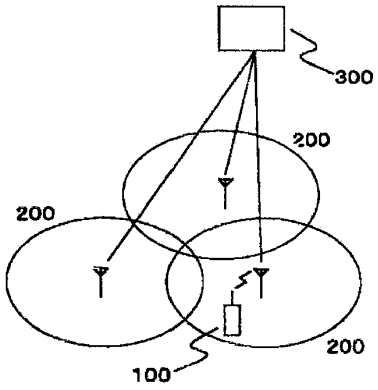
【図８】 本発明の実施の形態の送受信スロットの別の割当を示すタイミング図である。

【図９】 本発明の実施の形態の基地局装置のＩＤ登録処理のフローチャートである。

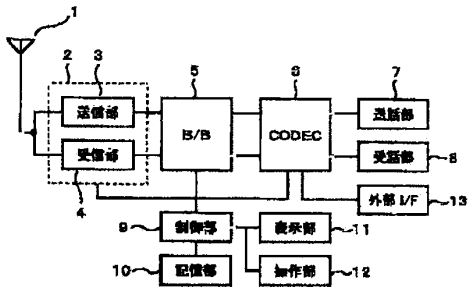
【図１０】 本発明の実施の形態の基地局装置の上りス

ロットの受信処理のフローチャートである。
【図１１】　本発明の実施の形態の基地局装置の下りスロットの送信処理のフローチャートである。
【符号の説明】
１　アンテナ
２　無線部
３　送信部
４　受信部
５　ベースバンド処理部
６　符号化・復号化部
７　送話部
８　受話部
９　制御部
１０　記憶部
１１　表示部
１２　操作部
１３　外部インターフェース部
１００　移動機（無線通信移動機）
２００　基地局装置
３００　移動通信制御局

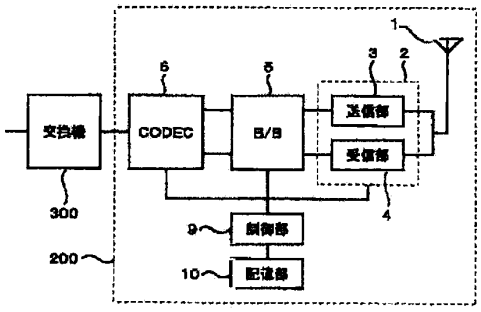
【図１】



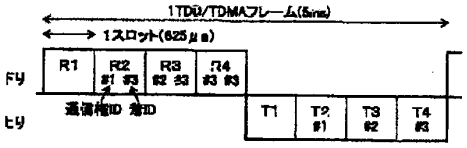
【図２】



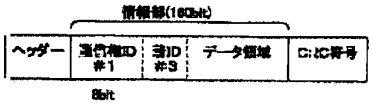
【図３】



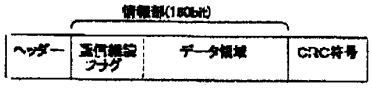
【図４】



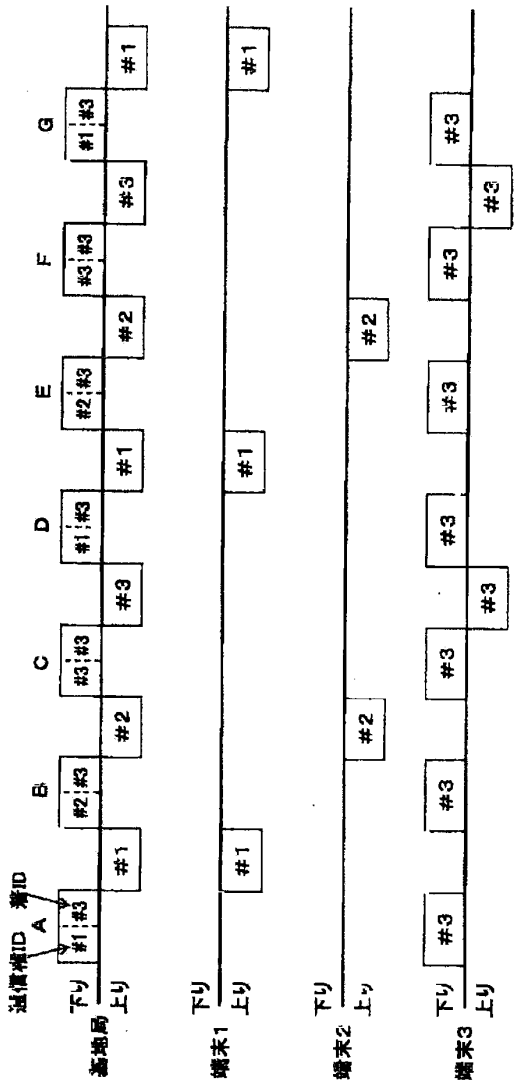
【図５】



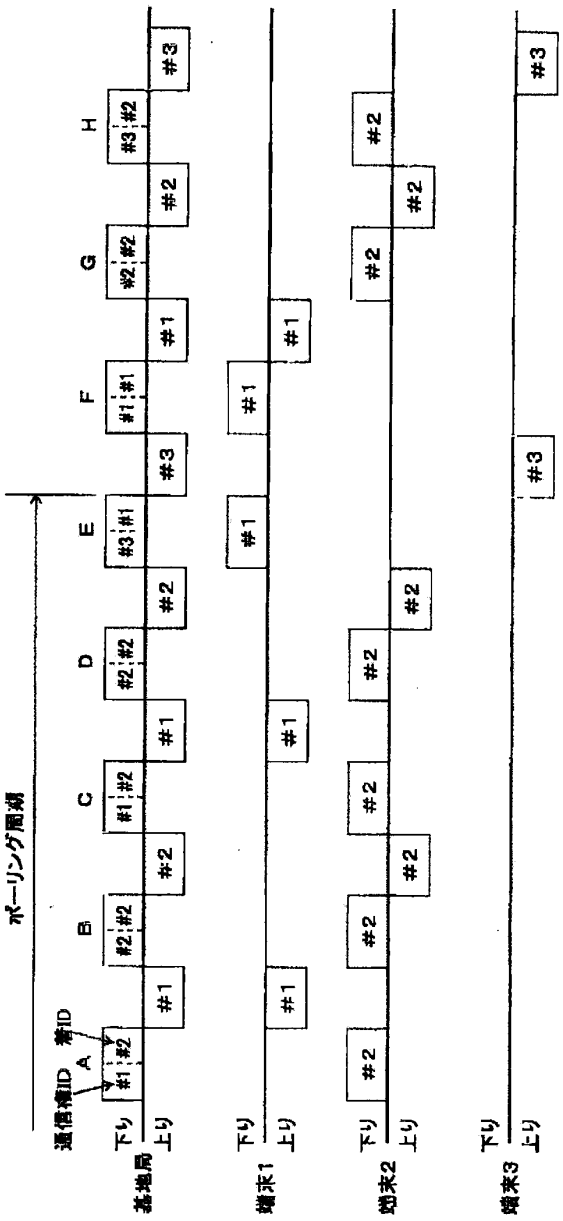
【図６】



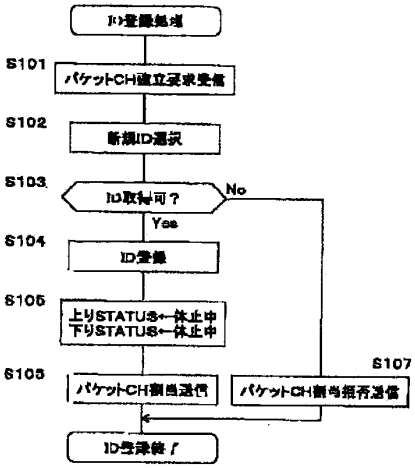
【図7】



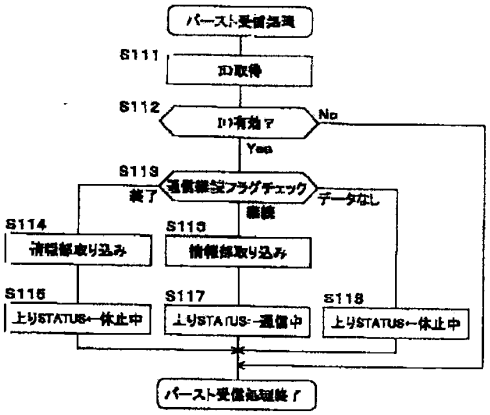
【図8】



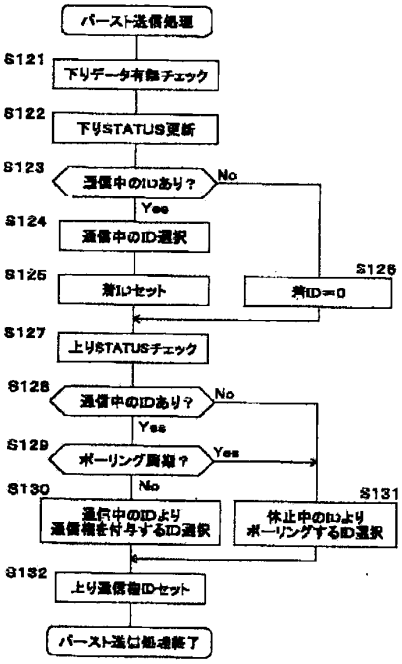
【図9】


ID登録処理
S101
パケットCH確立要求受信
S102
新規ID選択
S103
ID取得可？
No
Yes
S104
ID登録
S105
上りSTATUS←休止中
下りSTATUS←休止中
S106
パケットCH割当送信
S107
パケットCH割当拒否送信
ID登録終了

【図10】


バースト受信処理
S111
ID取得
S112
ID有効？
No
Yes
S113
通信継続フラグチェック
終了
継続
データなし
S114
情報部取り込み
S115
情報部取り込み
S116
上りSTATUS←休止中
S117
上りSTATUS←通信中
S118
上りSTATUS←休止中
バースト受信処理終了

【図11】


バースト送信処理
S121
下りデータ有無チェック
S122
下りSTATUS更新
S123
通信中のID有り？
No
Yes
S124
通信中のID選択
S125
着信セット
S126
着ID=0
S127
上りSTATUSチェック
S128
通信中のID有り？
No
Yes
S129
ポーリング周期？
Yes
No
S130
通信中のIDより
通信相手を付与するID選択
S131
休止中のIDより
ポーリングするID選択
S132
上り通信相IDセット
バースト送信処理終了

Espacenet

Cited Document /

Bibliographic data: JP 2004128654 (A)

WIRELESS COMMUNICATION SYSTEM

Publication date: 2004-04-22

Inventor(s): FUKUDA KUNIO +

Applicant(s): SONY CORP +

Classification:
- **International:** ***H04J11/00; H04L12/28;*** (IPC1-7): H04J11/00; H04L12/28
- **European:** H04L12/28W; H04W48/12; H04W56/00

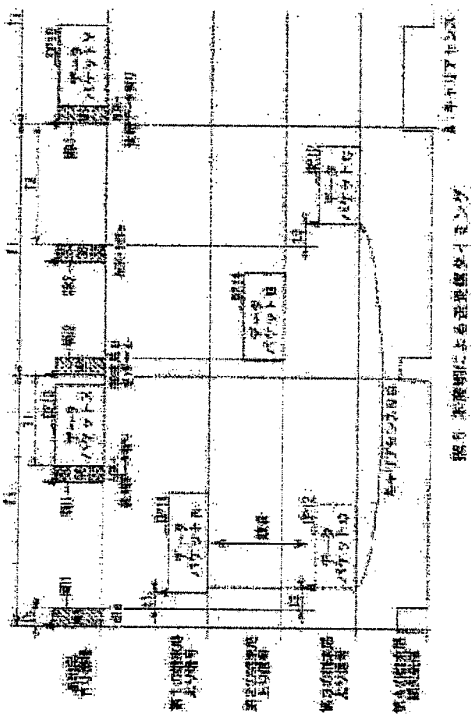
Application number: JP20020286885 20020930

Priority number(s): JP20020286885 20020930

Also published as:
- JP 3846715 (B2)
- EP 1548984 (A1)
- EP 1548984 (B1)
- US 2006030362 (A1)
- US 7412250 (B2)
- KR 20050047547 (A)
- KR 100948218 (B1)
- WO 2004032423 (A1)
- CN 1701564 (A)
- CN 100379214 (C)
- less

Abstract of JP 2004128654 (A)

PROBLEM TO BE SOLVED: To realize a wireless communication system in which transmission quality can be ensured by keeping a constant beacon period and intermittent reception can be carried out surely. ; SOLUTION: A wireless communication management unit transmits a beacon and a sub-beacon while including beacon interval information therein. Since a wireless terminal transmits transmission data such that transmission thereof ends before transmission of a main beacon is started based on the beacon interval information, transmission timings of the beacon and the transmission data are prevented from overlapping and the beacon period can be kept constant surely. Consequently, transmission quality can be ensured, the wireless terminal can perform intermittent reception surely and data transmission efficiency of the entire system can be enhanced. ; COPYRIGHT: (C)2004,JPO



Last updated:
26.04.2011 Worldwide
Database 5.7.23; 93p

(19)日本国特許庁(JP)　(12)公開特許公報(A)　(11)特許出願公開番号
特開2004-128654
(P2004-128654A)
(43)公開日　平成16年4月22日(2004.4.22)

(51)Int.Cl.[7]	F I		テーマコード（参考）
H04J 11/00	H04J 11/00	Z	5K022
H04L 12/28	H04L 12/28	300Z	5K033

審査請求 未請求　請求項の数 12　OL　（全 17 頁）

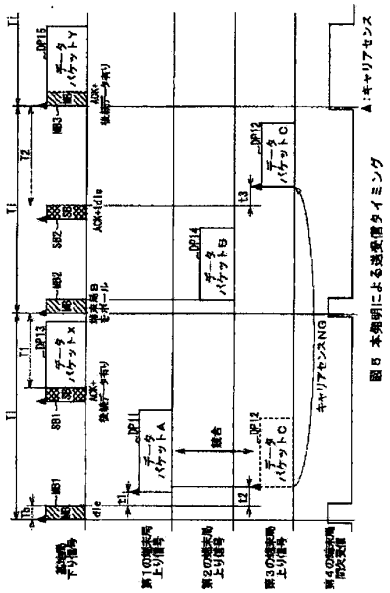
(21)出願番号　特願2002-286885(P2002-286885)
(22)出願日　平成14年9月30日(2002.9.30)

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Ｆターム(参考)　5K022 DD01 DD21 DD31
5K033 CB08 DA05 DA17

(54)【発明の名称】無線通信システム

(57)【要約】
【課題】ビーコン周期を一定に保ち、伝送品質を確保し得るとともに確実に間欠受信を行い得る無線通信システムを実現する。
【解決手段】無線通信管理装置は、メインビーコン及びサブビーコンにビーコン間隔情報を含めて送信する。そして無線端末装置はビーコン間隔情報に基づき、送信データがメインビーコンの送信開始前に送信完了するように送信データを分割して送信するようにしたことにより、ビーコンと送信データの送信タイミングが重なることを防止してビーコン周期を確実に一定にすることができる。これにより伝送品質を確保し得るとともに、無線端末装置の間欠受信を確実に行わせることができ、またシステム全体のデータ伝送効率を向上することができる。
【選択図】　図5



【特許請求の範囲】
【請求項１】
複数の無線端末装置と、当該無線端末装置間の通信を管理する無線通信管理装置とからなる無線通信システムにおいて、
上記無線通信管理装置は、上記無線通信システム内の同期を行うためのメインビーコンを一定間隔で送信するビーコン送信手段
を具え、
上記メインビーコンは、
次に上記メインビーコンが送信されるまでの時間間隔を示すビーコン間隔情報を含むとともに、
不特定の上記無線端末装置に対して送信を許可するアイドル情報と、特定の上記無線端末装置に対して送信を勧誘するポーリング情報と、特定の上記無線端末装置に対して上記ビーコンの送信後にデータを送信することを予告する送信予告情報と、特定の上記無線端末装置に対して当該無線端末装置が送信したデータの受信成功又は不成功を示す送達確認情報のうちの少なくとも１つを含む
ことを特徴とする無線通信システム。
【請求項２】
上記ビーコン送信手段は、
上記ビーコン間隔情報を含むとともに、上記アイドル情報と、上記ポーリング情報と、上記送信予告情報と、上記送達確認情報のうちの少なくとも１つを含むサブビーコンを、上記メインビーコンの間に送信する
ことを特徴とする請求項１に記載の無線通信システム。
【請求項３】
上記無線端末装置は、
受信した上記メインビーコン又は上記サブビーコンに含まれる上記ビーコン間隔情報と、送信データの送信所要時間とを比較し、当該送信所要時間が当該ビーコン間隔情報以上の場合は、分割後の上記送信データが次の上記メインビーコンの送信開始前に送信完了するように上記送信データを分割するデータ分割手段と、
上記送信データを送信するデータ送信手段と
を具えることを特徴とする請求項２に記載の無線通信システム。
【請求項４】
上記複数の無線端末装置のうちの一つが上記無線通信管理装置として動作して上記複数の無線端末装置間の通信を管理する
ことを特徴とする請求項１に記載の無線通信システム。
【請求項５】
複数の無線端末装置間で通信を行う無線通信システムを管理する無線通信管理装置において、
上記無線通信システム内の同期を行うためのメインビーコンを一定間隔で送信するメインビーコン送信手段を具え、
上記メインビーコンは、
次に上記メインビーコンが送信されるまでの時間を示すビーコン送信時間を含むとともに、
不特定の上記無線端末装置に対して送信を許可するアイドル情報と、特定の上記端末装置に対して送信を勧誘するポーリング情報と、特定の上記無線端末装置に対して上記ビーコンの送信後にデータを送信することを予告する送信予告情報と、特定の上記無線端末装置に対して当該端末装置が送信したデータの受信成功又は不成功を示す送達確認情報のうちの少なくとも１つを含む
ことを特徴とする無線通信管理装置。
【請求項６】
上記ビーコン送信手段は、上記ビーコン間隔情報を含むとともに、上記アイドル情報と、

上記ポーリング情報と、上記送信予告情報と、上記送達確認情報のうちの少なくとも１つを含むサブビーコンを、上記メインビーコンの間に送信する
ことを特徴とする請求項５に記載の無線通信管理装置。
【請求項７】
上記複数の無線端末装置のうちの一つが上記無線通信管理装置として動作して上記無線端末装置間の通信を管理する
ことを特徴とする請求項５に記載の無線通信管理装置。
【請求項８】
所定の無線通信管理装置の制御下で無線通信を行う無線端末装置において、
上記無線通信管理装置から一定間隔で送信されるメインビーコン及び当該メインビーコンの間に送信されるサブビーコンを受信する受信手段と、
受信した上記メインビーコン及び上記サブビーコンに含まれる、次に上記メインビーコンが送信されるまでの時間間隔を示すビーコン間隔情報と、送信データの送信所要時間とを比較し、上記送信所要時間が上記ビーコン間隔情報以上の場合は、分割後の上記送信データが次の上記メインビーコンの送信開始前に送信完了するように上記送信データを分割するデータ分割手段と、
上記送信データを送信するデータ送信手段と
を具えることを特徴とする無線端末装置。
【請求項９】
複数の無線端末装置と、当該複数の無線端末装置間の通信を管理する無線通信管理装置とからなる無線通信システムの通信制御方法において、
上記無線通信システム内の同期を行うためのメインビーコンを一定間隔で上記無線通信管理装置から送信し、
上記メインビーコンは、
次に上記メインビーコンが送信されるまでの時間間隔を示すビーコン間隔情報を含むとともに、
不特定の上記無線端末装置に対して送信を許可するアイドル情報と、特定の上記無線端末装置に対して送信を勧誘するポーリング情報と、特定の上記無線端末装置に対して上記ビーコンの送信後にデータを送信することを予告する送信予告情報と、特定の上記無線端末装置に対して当該無線端末装置が送信したデータの受信成功又は不成功を示す送達確認情報のうちの少なくとも１つを含む
ことを特徴とする通信制御方法。
【請求項１０】
上記ビーコン間隔情報を含むとともに、上記アイドル情報と、上記ポーリング情報と、上記送信予告情報と、上記送達確認情報のうちの少なくとも１つを含むサブビーコンを、上記メインビーコンの間に上記無線通信管理装置から送信する
ことを特徴とする請求項９に記載の通信制御方法。
【請求項１１】
上記無線端末装置は、
受信した上記メインビーコン又は上記サブビーコンに含まれる上記ビーコン間隔情報と、送信データの送信所要時間とを比較し、
当該送信所要時間が当該ビーコン間隔情報以上の場合は、分割後の上記送信データが次の上記メインビーコンの送信開始前に送信完了するように上記送信データを分割して上記送信データを送信する
ことを特徴とする請求項１０に記載の通信制御方法。
【請求項１２】
上記複数の無線端末装置のうちの一つが上記無線通信管理装置として動作して上記複数の無線端末装置間の通信を管理する
ことを特徴とする請求項９に記載の通信制御方法。
【発明の詳細な説明】

【０００１】
【発明の属する技術分野】
本発明は無線通信システムに関し、例えば無線ＬＡＮ（Ｌｏｃａｌ Ａｒｅａ Ｎｅｔｗｏｒｋ）システムに適用して好適なものである。
【０００２】
【従来の技術】
近年、ＩＥＥＥ（Ｉｎｓｔｉｔｕｔｅ ｏｆ Ｅｌｅｃｔｒｉｃａｌ ａｎｄ Ｅｌｅｃｔｒｏｎｉｃｓ Ｅｎｇｉｎｅｅｒｓ）８０２．１１ｂやＩＥＥＥ８０２．１１ａに代表される無線ＬＡＮシステムが広く利用されている。ＩＥＥＥ８０２．１１系の無線ＬＡＮシステムにおいては、そのアクセス方式としてＣＳＭＡ／ＣＡ（Ｃａｒｒｉｅｒ Ｓｅｎｓｅ ＭｕｌｔｉＰｌｅ Ａｃｃｅｓｓ／Ｃｏｌｌｉｓｉｏｎ Ａｖｏｉｄａｎｃｅ）方式を用いた自律分散系システムが採用されている（例えば、特許文献１参照）。
【０００３】
すなわち図９は、ＩＥＥＥ８０２．１１系無線ＬＡＮシステムのＯＳＩ（ＯＰｅｎＳＹＳｔｅｍ Ｉｎｔｅｒｃｏｎｎｅｃｔｉｏｎ）モデルにおける下位２レイヤのプロトコルスタックの例を示し、データリンク層９０１及び物理層９０２で構成される。
【０００４】
データリンク層９０１は、ＬＬＣ（Ｌｏｇｉｃａｌ Ｌｉｎｋ Ｃｏｎｔｒｏｌ）副層９０８とＭＡＣ（Ｍｅｄｉａ Ａｃｃｅｓｓ Ｃｏｎｔｒｏｌ）副層９０４とに分けられる。ＩＥＥＥの無線ＬＡＮシステムにおいては、ＬＬＣ副層９０８としてＩＥＥＥ８０２．２による論理リンク制御９０５が定義され、ＭＡＣ副層９０４としてＩＥＥＥ８０２．１１によるＣＳＭＡ／ＣＡ方式が定義されている。
【０００５】
また物理層９０２においては、２．４ＧＨｚ帯でＣＣＫ（ＣｏｍＰｌｉｍｅｎｔａｒｙ ＣｏｄｅＫｅｙｉｎｇ）と呼ばれるコーディング技術を用いた直接拡散方式のＩＥＥＥ８０２．１１ｂ（９０７）と、５ＧＨｚ帯でＯＦＤＭ（Ｏｒｔｈｏｇｏｎａｌ Ｆｒｅｑｕｅｎｃｙ Ｄｉｖｉｓｉｏｎ ＭｕｌｔｉＰｌｅｘ：直交周波数分割多重）方式を用いるＩＥＥＥ８０２．１１ａ（９０８）の２つが定義されている。
【０００６】
図１０は、ＩＥＥＥ８０２．１１のＣＳＭＡ／ＣＡ方式を用いた無線ＬＡＮシステムの送受信タイミングを示している。この無線ＬＡＮシステムは基地局及び第１～第４の端末局で構成され、第１、第２及び第３の端末局は通常の送受信モードで動作しているのに対し、第４の端末局は間欠受信モードで動作している。
【０００７】
基地局は、各端末局の同期確立及び各種制御情報の報知に用いるビーコン（ＢＣ１、ＢＣ２、ＢＣ３　）を、基本的にビーコン周期Ｔｉの間隔で定期的に送信する。このビーコン周期Ｔｉは、基地局からのポーリングによる非競合期間と、各端末局間のコンテンション（競合）による競合期間とに分けられる。非競合期間の長さはビーコンによって報知される。
【０００８】
非競合期間においては、基地局から送信されるポーリングで指定された端末局のみが送信を行うことができる。例えばポーリングＰＬ１は第１の端末局に対するポーリングであり、当該第１の端末局はポーリングＰＬ１の受信に応じてデータパケットＤＰ１を送信する。基地局は当該データパケットＤＰ１を正しく受信できた場合、ＡＣＫ（Ａｃｋｎｏｗｌｅｄｇｅｍｅｎｔ：送達確認）信号ＡＣ１を返信する。同様にポーリングＰＬ２は第２の端末局に対するポーリングであり、当該第２の端末局はポーリングＰＬ２の受信に応じてデータパケットＤＰ２を送信する。基地局は当該データパケットＤＰ２を正しく受信できた場合、ＡＣＫ信号ＡＣ２を返信する。ＡＶストリーム等のリアルタイム性が求められるデータについては、非競合期間に基地局の管理下で定期的に送受信するようにすることにより、伝送のＱｏＳ（Ｑｕａｌｉｔｙ ｏｆ Ｓｅｒｖｉｃｅ：サービス品質）を確保

することができる。
【０００９】
これに対して競合期間においては、各端末局はＡＣＫ信号の受信後、それぞれ乱数に基づく待機時間（以下、これをランダムバックオフ時間と呼ぶ）だけ待機した後にキャリアセンスを行い、他の端末局が送信していない場合に送信を行う。
【００１０】
すなわち送信待ちデータを有する第１及び第２の端末局は、ＡＣＫ信号ＡＣ２を受信すると、それぞれランダムバックオフ時間ｔ１及びｔ２だけ待機した後にキャリアセンスを行う。ここで、第１の端末局のランダムバックオフ時間ｔ１が第２の端末局のランダムバックオフ時間ｔ２よりも短かったことから、第１の端末局はキャリアセンスに成功してデータパケットＤＰ３を送信する。基地局はデータパケットＤＰ３の受信成功に応じてＡＣＫ信号ＡＣ３を返信する。これに対してキャリアセンスに失敗した第２の端末局は、ＡＣＫ信号ＡＣ３の受信後に再度キャリアセンスを行ってデータパケットＤＰ４を送信する。
【００１１】
一方、間欠受信モードで動作している第４の端末局は、基地局に同期してビーコン周期Ｔｉの間隔で間欠受信を行うことにより、基地局から送信される各ビーコンを受信する。そして第４の端末局は、自局に対する呼び出しがビーコンに含まれている場合、間欠受信モードを終了して通常の送受信モードに復帰する。
【００１２】
【特許文献１】
特開平１１－７４８８６号公報（第２～３頁、第１１図及び第１２図）
【００１３】
【発明が解決しようとする課題】
ここで、上述したＩＥＥＥ８０２．１１系のＣＳＭＡ／ＣＡ方式においては、端末局からのデータパケットの送信によって、基地局からのビーコンの送信が遅延する場合がある。
【００１４】
すなわち図１０において、ビーコン１０２から始まるビーコン周期Ｔｉの競合期間の末期に、第３の端末局からデータパケットＤＰ５が送信されている。このデータパケットＤＰ５はビーコン周期Ｔｉを越えて送信され続けたため、基地局は当該データパケットＤＰ５を最後まで受信しなければならず、これによりビーコンＢＣ２のビーコン周期Ｔｉ後に送信されるはずであったビーコンＢＣ３を送信することができない。
【００１５】
このため基地局は、ビーコン周期Ｔｉから遅延時間Δｔだけ遅延したタイミングでビーコンＢＣ４を送信することになり、ビーコン間隔が当該遅延時間Δｔだけ延びてしまう。このことは次の非競合期間の開始タイミングが遅れることを意味し、これにより非競合期間のＱｏＳを確保し得なくなるという問題がある。
【００１６】
また、間欠受信モードで動作している第４の端末局は、基地局に同期してビーコン周期Ｔｉの間隔でビーコンに対する間欠受信を行っている。このためビーコン間隔が延びると、ビーコンの送信タイミングと間欠受信タイミングとにずれが生じ、これにより間欠受信モードで動作している第４の端末局はビーコンを受信できなくなるという問題がある。
【００１７】
本発明は以上の点を考慮してなされたもので、ビーコン周期を一定に保ち、伝送品質を確保し得るとともに確実に間欠受信を行い得る無線通信システムを提供しようとするものである。
【００１８】
【課題を解決するための手段】
かかる課題を解決するため本発明においては、複数の無線端末装置と、当該複数の無線端末装置間の通信を管理する無線通信管理装置とからなる無線通信システムにおいて、無線通信システム内の同期を行うためのメインビーコンを一定間隔で送信するビーコン送信手

段を無線通信管理装置に設け、当該メインビーコンに、次にメインビーコンが送信されるまでの時間間隔を示すビーコン間隔情報を含めるとともに、不特定の無線端末装置に対して送信を許可するアイドル情報と、特定の無線端末装置に対して送信を勧誘するポーリング情報と、特定の無線端末装置に対してビーコンの送信後にデータを送信することを予告する送信予告情報と、特定の無線端末装置に対して当該無線端末装置が送信したデータの受信成功又は不成功を示す送達確認情報のうちの少なくとも１つを含めるようにした。

【００１９】

また、ビーコン間隔情報を含むとともに、アイドル情報と、ポーリング情報と、送信予告情報と、送達確認情報のうちの少なくとも１つを含むサブビーコンを、メインビーコンの間に送信するようにした。

【００２０】

そして、受信したメインビーコン又はサブビーコンに含まれるビーコン間隔情報と、送信データの送信所要時間とを比較し、当該送信所要時間が当該ビーコン間隔情報以上の場合は、分割後の送信データが上記メインビーコンの送信開始前に送信完了するように送信データを分割するデータ分割手段と、送信データを送信するデータ送信手段とを上記無線端末装置に設けるようにした。

【００２１】

メインビーコン及びサブビーコンにビーコン間隔情報を含めて送信し、無線端末装置は送信データがメインビーコンの送信開始前に送信完了するように送信データを分割して送信するようにしたことにより、ビーコンと送信データの送信タイミングが重なるのを防止してビーコン周期を確実に一定にすることができ、これにより伝送品質を確保し得るとともに確実に間欠受信を行わせることができ、またシステム全体のデータ伝送効率を向上することができる。

【００２２】

【発明の実施の形態】

以下図面について、本発明の一実施の形態を詳述する。

【００２３】

（１）無線ＬＡＮシステムの全体構成

図１において、１は全体として本発明による無線通信システムとしての無線ＬＡＮシステムを示し、無線通信管理装置としての基地局２と、第１～第４の端末局３（３Ａ～３Ｄ）とで構成される。基地局２及び各端末局３Ａ～３Ｄは、例えば５ＧＨｚ帯で、相互にＣＳＭＡ／ＣＡ方式による無線通信を行う。

【００２４】

実際上、無線端末装置としての端末局３Ａ～３ＤはＰＣカード型の無線ＬＡＮカードであり、それぞれ対応するノートブック型パーソナルコンピュータ（以下、これをノートパソコンと呼ぶ）４のＰＣカードスロットに挿着されている。一方、基地局２はインターネットやイントラネット等の外部ネットワーク５に接続されている。

【００２５】

そして無線ＬＡＮシステム１においては、基地局２及び各端末局３Ａ～３Ｄを介して、各ノートパソコン４の間、及び外部ネットワーク５に接続されたパーソナルコンピュータ等の情報処理装置と各ノートパソコン４との間でデータ通信を行うようになされている。

【００２６】

（２）基地局及び端末局の構成

次に、基地局２及び端末局３の構成を、それぞれ図２及び図３を用いて説明する。

【００２７】

図２に示すように基地局２においては、基地局通信制御部１１に対してネットワークインターフェース部１２、ＭＡＣ（Ｍｅｄｉａ Ａｃｃｅｓｓ Ｃｏｎｔｒｏｌ）制御部１３及びビーコン送信手段としてのＯＦＤＭ（Ｏｒｔｈｏｇｏｎａｌ Ｆｒｅｑｕｅｎｃｙ Ｄｉｖｉｓｉｏｎ Ｍｕｌｔｉｐｌｅｘ ：直交周波数分割多重）モデム部１４が接続されている。基地局通信制御部１１は後述する基地局通信制御部プログラムに従い、基地局

２の各部を統括的に制御する。

【００２８】

送受信部１５は、端末局３から送信されたＯＦＤＭ信号をアンテナ１６を介して受信し、受信ＯＦＤＭ変調信号としてＯＦＤＭモデム部１４に供給する。ＯＦＤＭモデム部１４は受信ＯＦＤＭ変調信号を復調し、受信データとしてＭＡＣ制御部１１に供給する。

【００２９】

ＭＡＣ制御部１１は受信データの無線フレームを分解し、ネットワークインターフェース部１２を介して外部ネットワーク５に供給するとともに、当該外部ネットワーク５からネットワークインターフェース部１２を介して供給された、端末局３あての送信データを、無線フレームに構成してＯＦＤＭモデム部１４に供給する。ビーコン送信手段としてのＯＦＤＭモデム部１４は送信データを変調してＯＦＤＭ変調信号を生成し、ビーコン送信手段としての送受信部１５及びアンテナ１６を介して送信する。

【００３０】

またＭＡＣ制御部１１は、ビーコンの制御、データ及び制御パケットのＭＡＣ制御、並びにＣＳＭＡ／ＣＡの制御を行う。

【００３１】

一方、図３に示すように端末局３においては、端末局通信制御部２１に対してホストインターフェース部２２、ＭＡＣ制御部２３及びＯＦＤＭモデム部２４が接続されている。端末局通信制御部２１は後述する端末局通信制御部プログラムに従い、端末局２の各部を統括的に制御する。

【００３２】

送受信部２５は、基地局２や他の端末局３から送信されたＯＦＤＭ信号をアンテナ２６を介して受信し、受信ＯＦＤＭ変調信号としてＯＦＤＭモデム部２４に供給する。ＯＦＤＭモデム部２４は受信ＯＦＤＭ変調信号を復調し、受信データとしてＭＡＣ制御部２１に供給する。

【００３３】

ＭＡＣ制御部２１は受信データの無線フレームを分解し、ホストインターフェース部２２を介してパーソナルコンピュータ４に供給するとともに、当該パーソナルコンピュータ４からホストインターフェース部２２を介して供給された、基地局２や他の端末局３あての送信データを、無線フレームに構成してＯＦＤＭモデム部２４に供給する。データ送信手段としてのＯＦＤＭモデム部２４は送信データを変調してＯＦＤＭ変調信号を生成し、データ送信手段としての送受信部２５及びアンテナ２６を介して送信する。

【００３４】

（３）本発明によるＣＳＭＡ／ＣＡ方式

本発明の無線ＬＡＮシステム１によるＣＳＭＡ／ＣＡ方式の特徴は、基地局２から定期的に送信されるビーコン（以下、これをメインビーコンと呼ぶ）に加えて、メインビーコンの間にサブビーコンを設け、次のメインビーコンまでの時間情報及び各種制御情報を、当該メイン及びサブビーコンを介して各端末局３に対して通知するようにした点にある。

【００３５】

メイン及びサブビーコンのフレームフォーマットは共通である。すなわち図４はメイン及びサブビーコンのフレームフォーマットを示し、プリアンブルによる物理層の同期を取るためのＰＨＹヘッダ４０１、ＭＡＣアドレス等が記入されたＭＡＣヘッダ４０２、制御データ４０３、及び誤りチェック用のＣＲＣ（Ｃｙｃｌｉｃ Ｒｅｄｕｎｄａｎｃｙ Ｃｏｄｅ）４０４で構成される。ここで、ビーコンフレームの時間長をビーコン長Ｔｂとする。

【００３６】

ＭＡＣヘッダ４０２は、基地局２の自局ＭＡＣアドレス４０５、ポーリング時におけるポーリング先の端末局３の端末局ＭＡＣアドレス４０６等で構成される。制御データ４０３は、ビーコン情報４０７、ＡＣＫ／ＮＡＫ情報４０８等で構成される。

【００３７】

ビーコン情報４０７は、以下の５つの情報要素から構成される。ビーコン種別情報４０９

は当該ビーコンの種別を通知するものであり、メインビーコンの場合は０、サブビーコンの場合は１が記入される。

【００３８】

アイドル情報４１０は回線の空き状態を通知するものであり、回線が空き状態で端末局からの上りパケットを受け付け可能であればアイドル状態として「１」が、それ以外（非アイドル状態）は「０」が記入される。アイドル状態は従来例における競合期間に相当し、非アイドル状態は従来例における非競合期間に相当する。

【００３９】

ビーコン間隔情報４１１には、次に送信されるであろうメインビーコンまでの時間を示すビーコン間隔Ｔｎが、例えばμ秒単位で記入される。このビーコン間隔情報４１１は、次に送信可能なデータパケットの有効パケット長と等価である。

【００４０】

送信予告情報としての後続データ情報４１２は、当該ビーコンに続く基地局２からの下りデータパケットの有無を通知するものであり、後続データが無い場合は「０」が、後続データが或る場合は「１」が記入される。

【００４１】

ポーリング情報４１３は、相手局ＭＡＣアドレス４０６で指定した端末局３に対してポーリングを行う場合はＰｏｌｌ有りとして「１」が、ポーリングを行わない場合はＰｏｌｌ無しとして「０」が記入される。

【００４２】

送達確認情報としてのＡＣＫ／ＮＡＫ情報４０８は２ビットで構成され、相手局ＭＡＣアドレス４０６で指定した端末局３に対するＡＣＫ又はＮＡＫ（Ｎｅｇａｔｉｖｅ　Ａｃｋｎｏｗｌｅｄｇｅｍｅｎｔ：非送達確認）信号を当該ビーコン内に含ませる場合は、ＡＣＫ／ＮＡＫ情報有りとして先頭ビットを「１」とする。そして、ＡＣＫ信号を当該ビーコン内に含ませる場合は後続ビットを「０」とし、ＮＡＫ信号を含ませる場合は後続ビットを「１」とする。またＡＣＫ又はＮＡＫ信号を当該ビーコン内に含ませない場合は、ＡＣＫ／ＮＡＫ情報無しとして先頭ビット及び後続ビットをそれぞれ「０」とする。

【００４３】

次に、無線ＬＡＮシステム１におけるメイン及びサブビーコン、並びにデータパケットの送受信タイミングの例を図５を用いて詳細に説明する。この場合図１０と同様に、第１～第３の端末局３Ａ～３Ｃは通常の送受信モードで動作し、第４の端末局３Ｄは間欠受信モードで動作している。

【００４４】

基地局２は、ビーコン周期Ｔｉの間隔で定期的にメインビーコンＭＢ１、ＭＢ２、ＭＢ３を送信していく。ビーコン周期Ｔｉの値は例えば２［ｍｓ］が用いられる。

【００４５】

図５において、まず基地局２は全ての端末局３に対する送信許可を示すメインビーコンＭＢ１を送信する。この状態は、図１０における競合期間に相当するものである。

【００４６】

すなわち当該メインビーコンＭＢ１においては、ビーコン種別情報４０９にはメインビーコンを示す「０」が、アイドル情報４１０にはアイドル状態を示す「１」が記入され、ビーコン間隔情報４１１には（１）式に従って算出した次のメインビーコンＭＢ２までのビーコン間隔Ｔｎが記入される。

【００４７】

Ｔｎ＝Ｔｉ－Ｔｂ－α　　（αはマージン）　　（１）

【００４８】

また、後続データ情報４１２には後続データが無いことを示す「０」が、ポーリング情報４１３にはＰｏｌｌ無しを示す「０」が、ＡＣＫ／ＮＡＫ情報４０８にはＡＣＫ／ＮＡＫ情報無しを示す「００」がそれぞれ記入される。

【００４９】

アイドル状態を示すメインビーコンＭＢ１の受信に応じて、送信待ちデータを有する第１の端末局３Ａ及び第３の端末局３Ｃは、それぞれランダムバックオフ時間ｔ１及びｔ２だけ待機した後にキャリアセンスを行う。

【００５０】

ここで、第１の端末局３Ａのランダムバックオフ時間ｔ１が第３の端末局３Ｃのランダムバックオフ時間ｔ２よりも短かったことから、第１の端末局３Ａはキャリアセンスに成功してデータパケットＤＰ１１を送信する。これに対して、キャリアセンスに失敗した第３の端末局３Ｃはデータパケットの送信を取り止める。

【００５１】

ちなみに図６はデータパケットのフレームフォーマットを示し、プリアンブルによる物理層の同期を取るためのＰＨＹヘッダ５０１、ＭＡＣアドレス等が記入されたＭＡＣヘッダ５０２、データ５０３、及び誤りチェック用のＣＲＣ４０４で構成される。ＭＡＣヘッダ５０２は、自局ＭＡＣアドレス５０５及び相手局ＭＡＣアドレス５０６、当該データパケットのデータ長５０７等で構成される。

【００５２】

基地局２はデータパケットＤＰ１１の受信成功に応じて、ＡＣＫ信号を含んだサブビーコンＳＢ１を送信する。

【００５３】

すなわち当該サブビーコンＳＢ１においては、ビーコン種別情報４０９にはサブビーコンを示す「１」が、ＡＣＫ／ＮＡＫ情報４０８にはＡＣＫ信号を示す「１０」が記入される。

【００５４】

また、ビーコン間隔情報４１１には（２）式に従って算出した次のメインビーコンＭＢ２までのビーコン間隔Ｔｎが記入される。

【００５５】

Ｔｎ＝Ｔ１－α　　（αはマージン）　　（２）

【００５６】

さらにこの場合、基地局２から端末局３に対する下りのデータパケットＤＰ１３があることから、サブビーコンＳＢ１の後続データ情報４１２には後続データが有ることを示す「１」が、アイドル情報４１０には非アイドル状態を示す「０」が、ポーリング情報４１３にはＰｏｌｌ無しを示す「０」がそれぞれ記入される。また、ＭＡＣヘッダ４０２内の相手局ＭＡＣアドレス４０６には、データパケットＤＰ１３の送信先端末局のＭＡＣアドレスが記入される。

【００５７】

これにより全ての端末局３は送信を禁止され、サブビーコンＳＢ１の相手局ＭＡＣアドレス４０６で指定された端末局３（本例では図５内の端末局ではない）のみがデータパケットＤＰ１３を待ち受ける。

【００５８】

そして基地局２は、サブビーコンＳＢ１に続いてデータパケットＤＰ１３を送信する。このとき基地局２は、当該データパケットＤＰ１３が次のメインビーコンＭＢ２までに納まるようにデータパケット長を調整する。

【００５９】

続いて基地局２は、メインビーコンＭＢ１の送信からビーコン周期Ｔｉ後に、メインビーコンＭＢ２を定期送信する。このとき基地局２は、第２の端末局３Ｂに対するポーリングを行う。

【００６０】

すなわち当該メインビーコンＭＢ２においては、ビーコン種別情報４０９にはメインビーコンを示す「０」が、ポーリング情報４１３にはＰｏｌｌ有りを示す「１」が、相手局ＭＡＣアドレス４０６にはポーリング先の第２の端末局３ＢのＭＡＣアドレスがそれぞれ記入される。

【００６１】
また、アイドル情報４１０には非アイドル状態を示す「１」が、ビーコン間隔情報４１１には（１）式に従って算出したビーコン間隔Ｔｎが、後続データ情報４１２には後続データが無いことを示す「０」が、ＡＣＫ／ＮＡＫ情報４０８にはＡＣＫ／ＮＡＫ情報無しを示す「００」が記入される。
【００６２】
ポーリング先の第２の端末局３Ｂは送信待ちデータを有していたため、メインビーコンＭＢ２の受信に応じてデータパケットＤＰ１４を送信する。このときポーリングされた第２の端末局３Ｂは、キャリアセンスを行うことなく即座にデータパケットＤＰ１４を送信することにより、キャリアセンスに伴う時間のロスを排除して無線ＬＡＮシステム１全体の伝送効率を向上するようになされている。
【００６３】
基地局２はデータパケットＤＰ１４の受信成功に応じて、ＡＣＫ信号を含むサブビーコンＳＢ２を送信する。このとき基地局２は、当該サブビーコンＳＢ２に続く下りデータパケットが無く、またいずれの端末局３に対するポーリングも発生していないことから、全ての端末局３に対して送信許可を与える。
【００６４】
すなわち当該サブビーコンＳＢ２においては、ビーコン種別情報４０９にはサブビーコンを示す「１」が、ＡＣＫ／ＮＡＫ情報４０８にはＡＣＫ信号を示す「１０」が記入される。
【００６５】
また、後続データ情報４１２には後続データ無しを示す「０」が、アイドル情報４１０にはアイドル状態を示す「１」が、ポーリング情報４１３にはＰｏｌｌ無しを示す「０」が記入され、ビーコン間隔情報４１１には次のメインビーコンＭＢ３までのビーコン間隔Ｔｎ（Ｔｎ＝Ｔ２－α）が記入される。
【００６６】
アイドル状態を示すメインビーコンＭＢ２の受信に応じて、前回のアイドル状態時にキャリアセンスを失敗した第３の端末局３Ｃは、ランダムバックオフ時間ｔ３だけ待機した後にキャリアセンスを行い、データパケットＤＰ１２を送信する。
【００６７】
続いて基地局２は、メインビーコンＭＢ２の送信からビーコン周期Ｔｉ後にメインビーコンＭＢ３を定期送信する。このメインビーコンＭＢ３には、データパケットＤＰ１２に対するＡＣＫ信号、間欠受信中の第４の端末局３Ｄに対する呼び出し、及び当該第４の端末局３Ｄに対する後続データの存在情報を含んでいる。
【００６８】
すなわち当該メインビーコンＭＢ３においては、ビーコン種別情報４０９にはメインビーコンを示す「１」が、ＡＣＫ／ＮＡＫ情報４０８にはＡＣＫ信号を示す「１０」が記入される。また、後続データ情報４１２には後続データ有りを示す「１」が、アイドル情報４１０には非アイドル状態を示す「０」が、ポーリング情報４１３にはＰｏｌｌ無しを示す「０」が、相手局ＭＡＣアドレス４０６には呼出先の第４の端末局３ＤのＭＡＣアドレスがそれぞれ記入される。
【００６９】
これにより、全ての端末局３は送信を禁止され、メインビーコンＭＢ３の相手局ＭＡＣアドレス４０６で指定された第４の端末局３Ｄのみが下りデータを待ち受ける。
【００７０】
ここで、第４の端末局３Ｄは間欠受信状態にあり、基地局２から送信されるメインビーコンのみを間欠受信している。そして、メインビーコンＭＢ３に当該第４の端末局３ＤのＭＡＣアドレスを記入することにより、第４の端末局３Ｄを間欠受信状態から通常の送受信状態に復帰させ、後続のデータパケットＤＰ１５を受信させることができる。
【００７１】

なお他の無線ＬＡＮシステムとの共存を考慮すると、全てのビーコンはその送信に先立ってキャリアセンスを実施することが望ましいが、これは本発明の本質ではない。

【００７２】

（４）基地局及び端末局の送受信処理

次に、上述した基地局２及び端末局３による送受信処理手順を、図７及び図８に示すフローチャートを用いて詳細に説明する。但しＡＣＫ／ＮＡＫ信号に基づくデータの再送処理と、端末局３の間欠受信処理については説明を省略する。

【００７３】

実際上基地局２においては、図示しないＲＯＭ（Ｒｅａｄ Ｏｎｌｙ Ｍｅｍｏｒｙ）に記憶されている基地局送受信制御プログラムを基地局通信制御部１１が読みだして実行することにより送受信処理を行う。

【００７４】

すなわち図７において、基地局２の基地局通信制御部１１はルーチンＲＴ１の開始ステップから入ってステップＳＰ１に移る。ステップＳＰ１において、ビーコン送信手段としての基地局通信制御部１１は、メインビーコンを送信した後ステップＳＰ２に移り、端末局３に対する下り送信データの有無を判断する。

【００７５】

ステップＳＰ２において下り送信データが存在する場合、基地局通信制御部１１はステップＳＰ３に移り、下りデータパケットのパケット長とメインビーコンに記入されたビーコン間隔Ｔｎ（すなわち有効パケット長）とを比較する。

【００７６】

ステップＳＰ３において、下りデータパケットのパケット長が有効パケット長以内であった場合、基地局通信制御部１１はステップＳＰ５に移り、当該下りデータパケットを送信した後ステップＳＰ８に移る。これに対して下りデータパケットのデータ長が有効パケット長より長い場合、基地局通信制御部１１はステップＳＰ４に移り、下りデータパケットを有効パケット長以内に分割した後、ステップＳＰ５で当該下りデータパケットを送信する。

【００７７】

一方、ステップＳＰ２において下り送信データが存在しない場合、基地局通信制御部１１はステップＳＰ６に移り、ポーリング先の特定の端末局３や不特定の端末局３からの上りデータパケットを所定時間待ち受ける。

【００７８】

ステップＳＰ６において上りデータパケットが到来しない場合、基地局通信制御部１１はステップＳＰ９に移る。これに対してステップＳＰ６において上りデータパケットが到来した場合、基地局通信制御部１１はステップＳＰ７に移って当該上りデータパケットを受信した後、次のステップＳＰ８に移る。

【００７９】

ステップＳＰ８において基地局通信制御部１１は、上りデータパケットの受信完了又は下りデータパケットの送信完了から次のメインビーコン送信までの時間を算出し、次のステップＳＰ９に移る。

【００８０】

ステップＳＰ９において、基地局通信制御部１１はステップＳＰ８の算出結果に基づき、次のメインビーコンまでの間に、マージンβ（データパケット長の最小値）を見込んでサブビーコンを送信できるか否かを判断する。

【００８１】

ステップＳＰ９においてサブビーコンが送信可能であると判断した場合、ビーコン送信手段としての基地局通信制御部１１はステップＳＰ１０に移ってサブビーコンを送信した後、ステップＳＰ２に戻る。これに対してステップＳＰ９においてサブビーコンが送信不可能であると判断した場合、基地局通信制御部１１はステップＳＰ１１に移ってメインビーコン周期Ｔｉまで待機した後、ステップＳＰ１に戻ってメインビーコンを送信する。

【００８２】
かくして基地局２は、メインビーコン周期Ｔｉ毎に定期的にメインビーコンを送信するとともに、当該メインビーコンの間にサブビーコンを送信する。
【００８３】
また端末局３においては、図示しないＲＯＭに記憶されている端末局送受信制御プログラムを端末局通信制御部２１が読みだして実行することにより送受信処理を行う。
【００８４】
すなわち図８において、端末局３の端末局通信制御部２１はルーチンＲＴ２１の開始ステップから入ってステップＳＰ２１に移る。ステップＳＰ２１において端末局通信制御部２１は、基地局２からのビーコン（メインビーコンあるいはサブビーコン）を待ち受け、当該ビーコンを受信すると、次のステップＳＰ２２に移る。
【００８５】
ステップＳＰ２２において端末局通信制御部２１は、受信したビーコンの後続データ情報４１２及び相手局ＭＡＣアドレス４０６を参照し、自局あての後続データの有無を判断する。
【００８６】
ステップＳＰ２２において自局あての後続データがある場合、端末局通信制御部２１はステップＳＰ２３に移り、下りデータパケットを受信した後ステップＳＰ２１に戻ってビーコンを待ち受ける。これに対してステップＳＰ２２において自局あての後続データがない場合、端末局通信制御部２１はステップＳＰ２４に移り、自局からの上り送信データの有無を判断する。
【００８７】
ステップＳＰ２４において上り送信データが存在しない場合、端末局通信制御部２１はステップＳＰ２１に戻ってビーコンを待ち受ける。これに対してステップＳＰ２２において上り送信データが存在する場合、端末局通信制御部２１はステップＳＰ２５に移り、上りデータパケットのパケット長とメインビーコンに記入されたビーコン間隔Ｔｎ（有効パケット長）とを比較する。
【００８８】
ステップＳＰ２５において、上りデータパケットのパケット長が有効パケット長以内であった場合、端末局通信制御部２１はステップＳＰ２７に移る。これに対して上りデータパケットのデータ長が有効パケット長より長い場合、データ分割手段としての端末局通信制御部２１はステップＳＰ２６に移り、上りデータパケットを有効パケット長以内に分割した後ステップＳＰ２７に移る。
【００８９】
ステップＳＰ２７において端末局通信制御部２１は、受信したビーコンのポーリング情報４１３を参照してポーリングの有無を判断する。
【００９０】
ステップＳＰ２７においてポーリング有りと判断した場合、端末局通信制御部２１はステップＳＰ２８に移り、受信したビーコンの相手局ＭＡＣアドレス４０６に基づいて当該ポーリングが自局あてか否かを判断する。
【００９１】
ステップＳＰ２８においてポーリングが自局あてではないと判断した場合、端末局通信制御部２１は上りデータパケットの送信を中止してステップＳＰ２１に戻る。これに対してステップＳＰ２８においてポーリングが自局あてであると判断した場合、端末局通信制御部２１はステップＳＰ３１に移り、キャリアセンスを行うことなく上りデータパケットを送信した後ステップＳＰ１に戻ってビーコンを待ち受ける。
【００９２】
一方、ステップＳＰ２７においてポーリング無しと判断した場合、端末局通信制御部２１はステップＳＰ２９に移り、乱数に基づくランダムバックオフ時間だけ待機した後、次のステップＳＰ３０に移る。

【００９８】
ステップＳＰ３０において、端末局通信制御部２１はキャリアセンスを実行する。そして、キャリアセンスに失敗した場合、端末局通信制御部２１はステップＳＰ２１に戻ってビーコンを待ち受ける。これに対してキャリアセンスに成功した場合、データ送信手段としての端末局通信制御部２１はステップＳＰ３１に移り、上りデータパケットを送信した後ステップＳＰ１に戻ってビーコンを待ち受ける。
【００９４】
かくして端末局３は、基地局２から送信されるビーコンに従って送信及び受信を行う。
【００９５】
（５）動作及び効果
以上の構成において、この無線ＬＡＮシステム１においては、基地局２から一定周期でメインビーコンを送信するとともに、当該メインビーコンの間に、次のメインビーコンまでの時間を示すビーコン間隔Ｔｎを記入したサブビーコンを適宜送信するようにした。また、当該ビーコン間隔Ｔｎをメインビーコンにも記入するようにした。
【００９６】
そして各端末局３は、送信するデータパケットのパケット長をメイン及びサブビーコンに記入されたビーコン間隔Ｔｎに基づいて調整し、次のメインビーコンの送信開始前にデータパケットが送信完了するようにした。
【００９７】
これにより、データパケットとメインビーコンの送信タイミングが重なるのを防止することができるとともに、システム全体のデータ伝送効率を向上することができる。また、基地局２はメインビーコンを確実に一定間隔で送信することができ、これにより伝送のＱｏＳを向上し得るとともに、端末局３は容易かつ確実に間欠受信を行うことができ、当該端末局３の消費電力を削減することができる。
【００９８】
さらに、メインビーコン及びサブビーコンにＡＣＫ／ＮＡＫ情報、アイドル情報、後続データ情報やポーリング情報等の各種制御情報を集約して送信するようにしたことにより、別途ポーリング信号やＡＣＫ信号等を独立して送信する必要が無くなり、これによってもシステム全体のデータ伝送効率を向上することができる。また、全ての端末局３の送信動作をビーコンの制御情報によって基地局２が全て管理することができ、これにより、ＡＶストリームのようなＱｏＳが求められる伝送と通常のパケット伝送とを両立した、使い勝手の良い無線ＬＡＮシステムを実現できるとともに、いわゆる隠れ端末問題を改善することができる。
【００９９】
（６）他の実施の形態
なお上述の実施の形態においては、無線通信管理装置としての基地局２が無線ＬＡＮシステム１全体を管理してメイン及びサブビーコンを送信するようにしたが、本発明はこれに限らず、端末局３のうちの一つが無線通信管理装置として動作してメイン及びサブビーコンを送信するようにしてもよい（いわゆるアドホック通信）。
【０１００】
また上述の実施の形態においては、基地局２の基地局通信制御部１１及び端末局３の端末局通信制御部２１が、それぞれＲＯＭに記憶されている基地局送受信制御プログラム及び端末局送受信制御プログラムに従って送受信処理を実行するようにしたが、本発明はこれに限らず、上述したプログラムが格納されているプログラム格納媒体を基地局２及び端末局３にインストールすることにより、上述の送受信処理を実行するようにしてもよい。
【０１０１】
この場合、上述したプログラムを基地局２及び端末局３にインストールするためのプログラム格納媒体としては、例えばＣＤ－ＲＯＭ（ＣｏｍＰａｃｔ Ｄｉｓｋ－Ｒｅａｄ Ｏｎｌｙ Ｍｅｍｏｒｙ ）やＤＶＤ（Ｄｉｇｉｔａｌ Ｖｅｒｓａｔｉｌｅ Ｄｉｓｋ）等のパッケージメディアのみならず、プログラムが一時的又は永続的に格納される半導体

メモリや磁気ディスク等で実現しても良い。また、これらプログラム格納媒体にプログラムを格納する手段としては、ローカルエリアネットワークやインターネット、ディジタル衛星放送等の有線及び無線通信媒体を用いても良い。

【０１０２】

【発明の効果】

上述のように本発明によれば、無線通信管理装置が次のメインビーコンまでの時間間隔を示すビーコン間隔情報をメインビーコン及びサブビーコンに含めて送信し、無線端末装置は当該ビーコン間隔情報に基づいて送信データがメインビーコンの送信開始前に送信完了するように送信データを分割して送信するようにしたことにより、ビーコンと送信データの送信タイミングが重なるのを防止してビーコン周期を確実に一定にすることができ、これにより伝送品質を確保し得るとともに確実に間欠受信を行わせることができ、またシステム全体のデータ伝送効率を向上することができる。

【図面の簡単な説明】

【図１】本発明による無線ＬＡＮシステムの全体構成を示す略線図である。

【図２】基地局の構成を示すブロック図である。

【図３】端末局の構成を示すブロック図である。

【図４】ビーコンのフレームフォーマットを示す略線図である。

【図５】本発明の無線ＬＡＮシステムにおける送受信タイミングを示すタイミングチャートである。

【図６】データパケットのフレームフォーマットを示す略線図である。

【図７】基地局の送受信処理手順を示すフローチャートである。

【図８】端末局の送受信処理手順を示すフローチャートである。

【図９】無線ＬＡＮシステムのプロトコルスタックを示す略線図である。

【図１０】従来の無線ＬＡＮシステムにおける送受信タイミングを示すタイミングチャートである。

【符号の説明】

１　無線ＬＡＮシステム、２　基地局、３　端末局、４　ノートパソコン、５　外部ネットワーク、１１　基地局通信制御部、１２　ネットワークインターフェース部、１３、２３　ＭＡＣ制御部、１４、２４　ＯＦＤＭモデム部、１５、２５　送受信部、１６、２６　アンテナ、２１　端末局通信制御部、２２　ホストインターフェース部。

【図１】

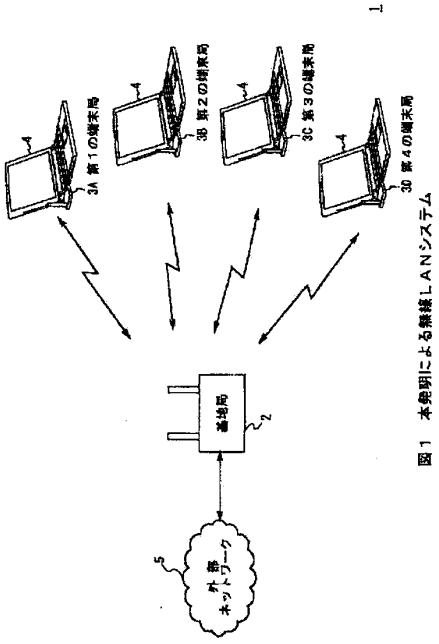


図１　本発明による無線ＬＡＮシステム

【図２】

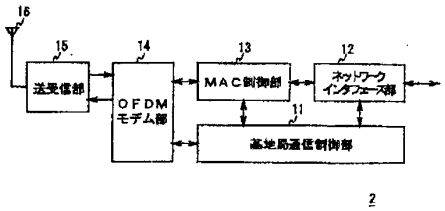


図２　基地局の回路構成

【図３】

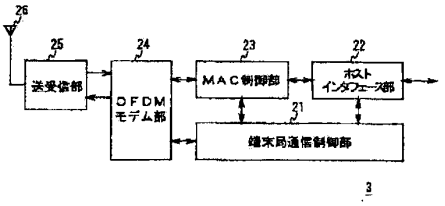


図３　端末局の回路構成

【図４】

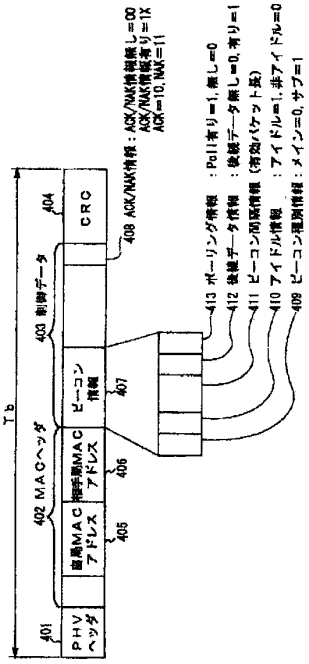


図４　ビーコンのフレームフォーマット

【図５】

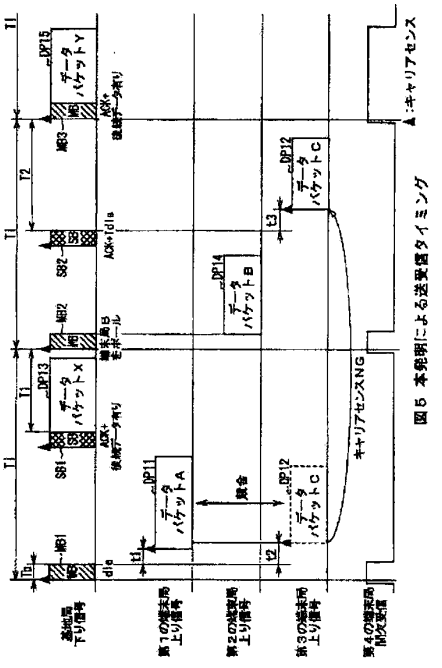


図５　本発明による送受信タイミング

【図６】

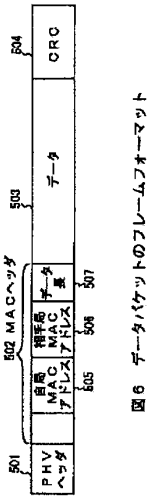


図６ データパケットのフレームフォーマット

【図７】

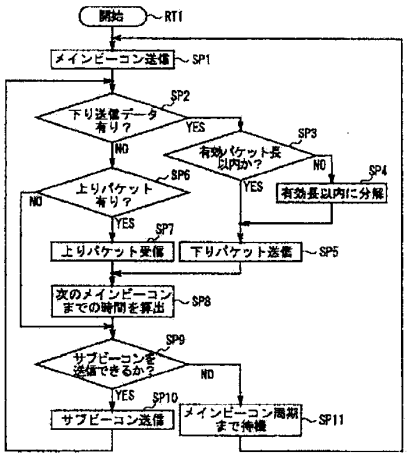


図７ 基地局の送受信処理手順

【図８】

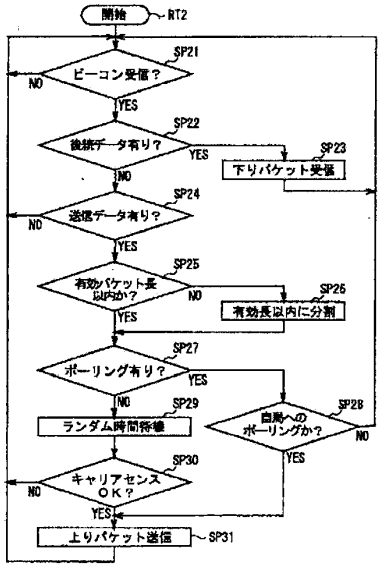


図８ 端末局の送受信処理手順

【図９】

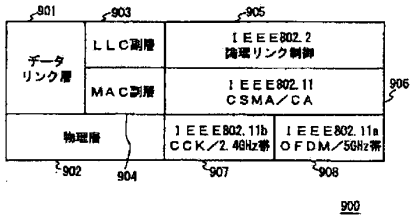


図９ 無線ＬＡＮシステムのプロトコルスタック

【図１０】

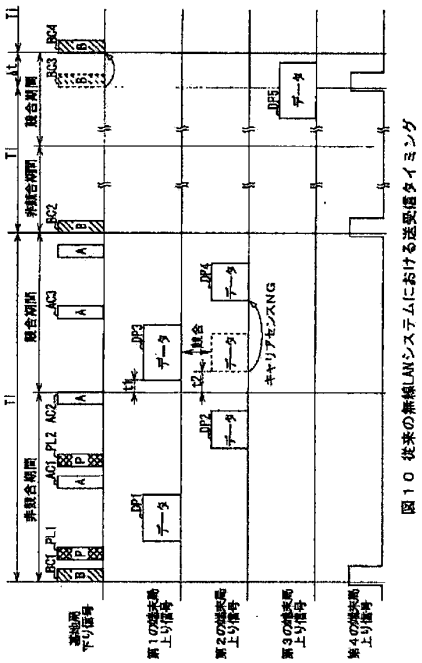


図１０ 従来の無線LANシステムにおける送受信タイミング

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant: Menzo Wentink

Title: TRANSMIT ANNOUNCEMENT INDICATION

Appl. No.: 11/627,181

Filing Date: 1/25/2007

Examiner: Abdulla A. Riyami

Art Unit: 2474

Confirmation Number: 1464

SUPPLEMENTAL INFORMATION DISCLOSURE STATEMENT UNDER 37 CFR §1.56

Mail Stop Amendment
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

Submitted herewith on Form PTO/SB/08 is a listing of documents known to Applicant in order to comply with Applicant's duty of disclosure pursuant to 37 CFR §1.56.

A copy of each non-U.S. patent document and each non-patent document is being submitted to comply with the provisions of 37 CFR §1.97 and §1.98.

The submission of any document herewith, which is not a statutory bar, is not intended as an admission that such document constitutes prior art against the claims of the present application or that such document is considered material to patentability as defined in 37 CFR §1.56(b). Applicant does not waive any rights to take any action which would be appropriate to

antedate or otherwise remove as a competent reference any document which is determined to be a *prima facie* art reference against the claims of the present application.

TIMING OF THE DISCLOSURE

The listed documents are being submitted in compliance with 37 CFR §1.97(c), before the mailing date of any of a final action under 37 CFR §1.113, a notice of allowance under 37 CFR §1.311, or an action that otherwise closes prosecution in the application.

RELEVANCE OF EACH DOCUMENT

Any document listed on the attached PTO/SB/08 was cited as being relevant during the prosecution of the corresponding Japanese application. A copy of the Japanese Office Action is attached. An English-language counterpart of the foreign-language documents has been provided where readily available. The absence of a translation or an English-language counterpart document does not relieve the PTO from its duty to consider any submitted document (37 CFR §1.98 and MPEP§609).

Applicant respectfully requests that each listed document be considered by the Examiner and be made of record in the present application and that an initialed copy of Form PTO/SB/08 be returned in accordance with MPEP §609.

STATEMENT

The undersigned hereby states in accordance with 37 CFR §1.97(e)(1) that each item of information contained in this supplemental information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three (3) months prior to filing of this Statement.

Although Applicant believes that no fee is required, the Commissioner is hereby authorized to charge any additional fees which may be due to Deposit Account No. 19-0741.

Respectfully submitted,

Date October 27, 2011

By _____

Eric N. Huston
Attorney for Applicant
Registration No. 65,684

FOLEY & LARDNER LLP
Customer Number: 23524
Telephone: (608) 258-4205
Facsimile: (608) 258-4258

POWER OF ATTORNEY and CORRESPONDENCE ADDRESS INDICATION FORM

Application Number	11/627,181
Filing Date	1/25/2007
First Named Inventor	Menzo Wentink
Title	TRANSMIT ANNOUNCEMENT INDICATION
Art Unit	2474
Examiner Name	Abdulla A. Riyami
Attorney Docket Number	088245-2616

I hereby revoke all previous powers of attorney given in the above-identified application.

I hereby appoint:

☒ Practitioners associated with the Customer Number: 23524

OR

☐ Practitioner(s) named below:

Name	Registration Number

as my/our attorney(s) or agent(s) to prosecute the application identified above, and to transact all business in the United States Patent and Trademark Office connected therewith.

Please recognize or change the correspondence address for the above-identified application to:

☐ The address associated with the above-mentioned Customer Number:

OR

☒ The address associated with Customer Number: 23524

OR

☐ Firm or Individual Name			
Address			
City		State	Zip
Country			
Telephone		Email	

I am the:

☐ Applicant/Inventor.

☒ Assignee of record of the entire interest. See 37 CFR 3.71.
Statement under 37 CFR 3.73(b) is enclosed. (Form PTO/SB/96)

SIGNATURE of Applicant or Assignee of Record

Signature	David Dutcher	Date	9/22/2011
Name	David Dutcher	Telephone	
Title and Company	Authorized person for Intellectual Ventures I LLC		

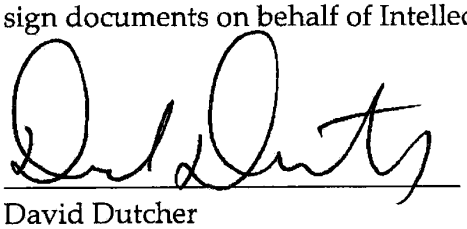
NOTE: Signatures of all the inventors or assignees of record of the entire interest or their representative(s) are required. Submit multiple forms if more than one signature is required, see below*.

☒ *Total of 1 forms are submitted.

ADI_2783643.1

DECLARATION REGARDING AUTHORITY TO SIGN
ON BEHALF OF A LEGAL ENTITY
37 C.F.R. 3.73(b)(2)(i)

I, David Dutcher (whose title is supplied below), hereby declare that I am authorized to sign documents on behalf of Intellectual Ventures I LLC.



David Dutcher
Authorized Person for Intellectual Ventures I LLC

8/16/11

Date

Electronic Acknowledgement Receipt	
EFS ID:	11106574
Application Number:	11627181
International Application Number:	
Confirmation Number:	1464
Title of Invention:	Transmit Announcement Indication
First Named Inventor/Applicant Name:	Menzo Wentink
Customer Number:	23524
Filer:	Paul S. Hunter/Charmaine Teuschler
Filer Authorized By:	Paul S. Hunter
Attorney Docket Number:	088245-2616
Receipt Date:	04-OCT-2011
Filing Date:	25-JAN-2007
Time Stamp:	13:13:56
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1		2616_373b.pdf	159094 d159299787e6de90a166cf1e4d795839a9179e5e	yes	3

	Multipart Description/PDF files in .zip description		
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	Power of Attorney	2	3
Warnings:			
Information:			
	Total Files Size (in bytes):	159094	

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111
If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371
If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office
If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

PTO/SB/96 (06-04)
Approved for use through 07/31/2006. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
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STATEMENT UNDER 37 CFR 3.73(b)

Applicant/Patent Owner:	Menzo Wentink		
Application No.:	11/627,181	Filed:	1/25/2007
Patent No.:		Issue Date:	
Docket Number:	088245-2616		
Entitled:	TRANSMIT ANNOUNCEMENT INDICATION		

INTELLECTUAL VENTURES I LLC (Name of Assignee)

LIMITED LIABILITY COMPANY (Type of Assignee, e.g., corporation, partnership, university, government agency, etc.)

states that it is:

1. ☒ the assignee of the entire right, title, and interest; or
2. ☐ an assignee of less than the entire right, title, and interest
   The extent (by percentage) of its ownership interest is %

in the patent application/patent identified above by virtue of either:

A. ☐ An assignment from the inventor(s) of the patent application/patent identified above. The assignment was recorded in the United States Patent and Trademark Office at Reel/Frame or for which a copy thereof is attached.

OR

B. ☒ A chain of title from the inventor(s), of the patent application/patent identified above, to the current assignee as shown below:

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[**NOTE**: A separate copy (i.e., a true copy of the original document(s)) must be submitted to Assignment Division in accordance with 37 CFR Part 3, if the assignment is to be recorded in the records of the USPTO. See MPEP 302.08]

The undersigned (whose title is supplied below) is authorized to act on behalf of the assignee.

Signature	Date: OCT. 4, 2004
Paul S. Hunter (Reg. No. 44,787)	(608) 258-4292
Printed or Typed Name	Telephone Number
Attorney for Applicant	
Title	

This collection of information is required by 37 CFR 3.73(b). The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND** TO: **Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

MADI_2783628.1

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant:	Menzo Wentink
Title:	TRANSMIT ANNOUNCEMENT INDICATION
Appl. No.:	11/627,181
Filing Date:	01/25/2007
Examiner:	Abdulla A. Riyami
Art Unit:	2474
Confirmation Number:	1464

AMENDMENT AND REPLY UNDER 37 CFR 1.111

Mail Stop Amendment
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

This communication is responsive to the Non-Final Office Action dated May 23, 2011, concerning the above-referenced patent application, making August 23, 2011, three months from the mailing date. Accordingly, this response is timely filed.

Amendments to the Claims are reflected in the listing of claims which begins on page 2 of this document.

Remarks/Arguments begin on page 9 of this document.

Please amend the application as follows:

Amendments to the Claims:

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

1. (Currently Amended) A method comprising:

transmitting a first communication frame from a first station to a second station; ~~and~~

~~providing, at the first station,~~ wherein the first communication frame comprises a transmit announcement indication ~~in the first communication frame, wherein the transmit announcement indication indicates~~ indicating that a second communication frame intended for the second station will follow the first communication frame and that the second communication frame will not include an address of the second station.

2. (Original) The method of claim 1, wherein the second communication frame follows after a short inter frame space (SIFS) after the first communication frame with the transmit announcement indication.

3. (Original) The method of claim 1, wherein the second communication frame follows after a short inter frame space (SIFS) after a response to the first communication frame with the transmit announcement indication.

4. (Original) The method of claim 1, wherein the transmit announcement indication comprises a zero-length frame.

5. (Currently Amended) The method of claim 1, wherein ~~providing the transmit announcement indication~~ transmitting the first communication frame comprises providing the transmit announcement indication with a request to send (RTS) frame.

6. (Original) The method of claim 5, further comprising receiving, by the first station, a clear to send (CTS) frame from the second station after the first station has transmitted the transmit announcement indication with the RTS frame.

7. (Currently Amended) The method of claim 6, further comprising transmitting the second communication frame from the first station to the second station, wherein the second communication frame does not include the address of the second station.

8. (Currently Amended) The method of claim 1, wherein ~~providing the transmit announcement indication~~ transmitting the first communication frame comprises providing the transmit announcement indication in a quality of service null (QoS-null) frame.

9. (Original) The method of claim 8, further comprising receiving, by the first station, an acknowledgement (ACK) frame from the second station after the first station has transmitted the transmit announcement indication with the QoS-null frame.

10. (Original) The method of claim 9, further comprising transmitting the second communication frame associated with the transmit announcement indication.

11. (Original) The method of claim 1, wherein providing the transmit announcement indication comprises providing the transmit announcement indication with a clear to send (CTS) frame.

12. (Original) The method of claim 11, further comprising transmitting the second communication frame associated with the transmit announcement indication.

13. (Currently Amended) ~~An article of manufacture including a~~ A non-transitory computer-readable medium having instructions stored thereon that, if executed by a computing device, cause the computing device to perform operations comprising:

transmitting a first communication frame from a first station to a second station; ~~and~~

~~providing~~ wherein the first communication frame comprises a transmit announcement indication ~~in the first communication frame, wherein the transmit announcement indication indicates~~ indicating that a second communication frame intended for the second

station will follow the first communication frame and that the second communication frame will not include an address of the second station.

14. (Currently Amended) The ~~article of manufacture~~ computer-readable medium of claim 13, wherein the transmit announcement indication comprises a zero-length frame.

15. (Currently Amended) The ~~article of manufacture~~ computer-readable medium of claim 13, wherein ~~the providing the transmit announcement indication~~ transmitting the first communication frame comprises providing the transmit announcement indication with a request to send (RTS) frame.

16. (Currently Amended) The ~~article of manufacture~~ computer-readable medium of claim 15, wherein the ~~instructions, if executed by a computing device, further cause the computing device to perform~~ operations ~~comprising~~ further comprise receiving a clear to send (CTS) frame from the second station after the first station has transmitted the transmit announcement indication with the RTS frame.

17. (Currently Amended) The ~~article of manufacture~~ computer-readable medium of claim 16, wherein the ~~instructions, if executed by a computing device, further cause the computing device to perform~~ operations ~~comprising~~ further comprise transmitting the second communication frame associated with the transmit announcement indication.

18. (Currently Amended) A system comprising:

a transmitter configured to:

transmit a first communication frame from a first station to a second station; ~~and~~

~~provide~~ wherein the first communication frame comprises a transmit announcement indication ~~in the first communication frame, wherein the transmit announcement indication indicates~~ indicating that a second communication frame intended for the second

station will follow the first communication frame and that the second communication frame will not include an address of the second station.

19. (Original) The system of claim 18, wherein the transmit announcement indication comprises a zero-length frame.

20. (Original) The system of claim 18, wherein the transmitter is further configured to provide the transmit announcement indication with a request to send (RTS) frame.

21. (Original) The system of claim 20, further comprising a receiver configured to receive, by the first station, a clear to send (CTS) frame from the second station after the first station has transmitted the transmit announcement indication with the RTS frame.

22. (Original) The system of claim 21, wherein the transmitter is further configured to transmit frame second communication frame associated with the transmit announcement indication.

23. (Original) The system of claim 18, wherein the first station comprises one of a wireless radio, desktop computer, portable computer, laptop computer, multi-media players, personal digital assistant (PDA), printer, fax machine, scanner, hub, switch, router, set-top box, and television with communication capability.

24. (Previously Presented) The method of claim 1, wherein the second communication frame comprises a physical layer (PHY) header without a media access control (MAC) portion.

25. (Previously Presented) The method of claim 1, wherein the transmit announcement indication comprises a bit inside a MAC header field.

26. (Previously Presented) The method of claim 25, wherein the bit comprises an high throughput-control field.

27. (Previously Presented) The method of claim 1, wherein the transmit announcement indication is located within one of a data frame, a management frame, or a control frame.

28. (Previously Presented) The method of claim 1, wherein the transmit announcement indication precedes a zero-length frame.

29. (Currently Amended) A method comprising:

receiving a first communication frame from a first station at a second station, wherein the first communication frame includes a transmit announcement indication that indicates that a second communication frame intended for the second station will follow the first communication frame and that the second communication frame will not include an address of the second station.

30. (Previously Presented) The method of claim 29, further comprising receiving, at the second station, the second communication frame after a short inter frame space (SIFS) that follows the first communication frame.

31. (Previously Presented) The method of claim 29, further comprising receiving, at the second station, the second communication frame after a short inter frame space (SIFS) that follows a response to the first communication frame.

32. (Previously Presented) The method of claim 29, wherein the transmit announcement indication comprises a zero-length frame.

33. (Previously Presented) The method of claim 29, wherein receiving the first communication frame comprises receiving the transmit announcement indication with a request to send (RTS) frame.

34. (Previously Presented) The method of claim 33, further comprising transmitting a clear to send (CTS) frame from the second station to the first station in response to receiving the RTS frame.

35. (Previously Presented) The method of claim 29, wherein receiving the first communication frame comprises receiving the transmit announcement indication in a quality of service null (QoS-null) frame.

36. (Previously Presented) The method of claim 35, further comprising receiving an acknowledgement (ACK) frame at the second station from the first station.

37. (Previously Presented) The method of claim 29, wherein receiving the first communication frame comprises receiving the transmit announcement indication with a clear to send (CTS) frame.

38. (Currently Amended) ~~An article of manufacture including a~~ A non-transitory computer-readable medium having instructions stored thereon that, if executed by a computing device, cause the computing device to perform operations comprising:

receiving a first communication frame from a first station, wherein the first communication frame includes a transmit announcement indication that indicates that a second communication frame will follow the first communication frame and that the second communication frame will not include an address of the second station.

39. (Currently Amended) The ~~article of manufacture~~ computer-readable medium of claim 38, wherein the transmit announcement indication comprises a zero-length frame.

40. (Currently Amended) The ~~article of manufacture~~ computer-readable medium of claim 38, wherein the receiving the first communication frame comprises receiving the transmit announcement indication with a request to send (RTS) frame.

41. (Currently Amended) The ~~article of manufacture~~ computer-readable medium of claim 40, wherein the ~~instructions, if executed by a computing device, further cause the computing device to perform~~ operations ~~comprising~~ further comprise transmitting a clear to send (CTS) frame to the first station in response to the RTS frame.

42. (Currently Amended) A system comprising:

a receiver configured to receive a first communication frame from a first station at a second station, wherein the first communication frame includes a transmit announcement indication that indicates that a second communication frame intended for the second station will follow the first communication frame and that the second communication frame will not include an address of the second station.

43. (Previously Presented) The system of claim 42, wherein the transmit announcement indication comprises a zero-length frame.

44. (Previously Presented) The system of claim 43, wherein the receiver is further configured to receive the transmit announcement indication with a request to send (RTS) frame.

45. (Previously Presented) The system of claim 44, further comprising a transmitter configured to transmit a clear to send (CTS) frame from the second station to the first station in response to the RTS frame.

46. (Currently Amended) The system of claim [[41]] 42, wherein the second station comprises one of a wireless radio, desktop computer, portable computer, laptop computer, multi-media players, personal digital assistant (PDA), printer, fax machine, scanner, hub, switch, router, set-top box, and television with communication capability.

REMARKS

Applicant respectfully requests reconsideration of the present application in view of the foregoing amendments and in view of the reasons that follow. Claims 1, 5, 7, 8, 13-18, 29, 38-42 and 46 are amended. The amendment does not add new matter and does not require a new search. Claims 1-46 are now pending in the present Application.

I. Interview Summary

Applicant thanks the Examiner for the courtesies extended in the interview conducted on July 15, 2011. The Examiner and Applicant's representative discussed the Larsson reference. The Examiner indicated that the amendment to Claim 1 may overcome the Larsson reference. No agreement as to the allowability of the claims was reached.

II. Claim Rejections Under 35 U.S.C. § 101

On page 2 of the Office Action, Claims 13-17, 38-41 and 46 were rejected under 35 U.S.C. § 101 because the claimed invention is allegedly directed to non-statutory subject matter. The Office Action notes that "[a] claim drawn to such a computer readable medium that covers both transitory and non-transitory embodiments may be amended to narrow the claims to cover only statutory embodiments to avoid a rejection under 35 U.S.C. § 101 by adding the limitation 'non-transitory' to the claims." Applicant has amended Claims 13-17 and 38-41 and 46 to clarify the claimed subject matter and to further prosecution.

Applicant has amended independent Claims 13 and 38 to recite "A non-transitory computer-readable medium having instructions stored thereon...," as per the Examiner's recommendation. Applicant submits that amended independent Claims 13 and 38 are directed to patentable subject matter under 35 U.S.C. § 101. Claims 14-17 and 39-41 depend from independent Claims 13 and 38, respectively, and include patentable subject matter for at least the same reasons. Claims 14-17 and 39-41 have been amended to clarify the preambles. Further, Claim 46 has been amended to correct its dependency, thereby rendering the rejection moot.

The use of "non-transitory" is to be understood to remove only propagating transitory signals per se from the claim scope and does not relinquish rights to all standard computer-readable media that are not only propagating transitory signals per se. In other words, the meaning of "non-transitory computer-readable medium" should be construed to exclude only those types of transitory computer - readable media which were found in Nuijten to fall outside the scope of patentable subject matter under 35 U.S.C. §101.

For at least these reasons, Applicant submits that Claims 13-17 and 38-41 and 46 are directed to patentable subject matter under 35 U.S.C. § 101. Accordingly, the rejection of Claims 13-17 and 38-41 and 46 under 35 U.S.C. § 101 should, be withdrawn.

III. Claim Rejections Under 35 U.S.C. § 102

On page 3 of the Office Action, Claims 1-3, 5-13, 15-18, 20-27, 29-31, 33-38, 40-42, and 46 were rejected under 35 U.S.C. § 102(e) as being anticipated by U.S. Publication No. 2008/0298306 to Larsson ("Larsson"). Applicant respectfully disagrees. In order to further prosecution, Applicant has amended the claims rendering the rejection moot. Larsson does not disclose at least the features "a transmit announcement indication indicating that a second communication frame intended for the second station will follow the first communication frame and that the second communication frame will not include an address of the second station," as recited by amended Claim 1. Independent Claims 13, 18, 29, 38 and 42 include similar features.

Larsson discloses "improved support for link adaptation in wireless networks." (Para. [0012]). In particular, paragraph [0018] of Larsson, cited by the Examiner, discloses (with underlining added):

> More particularly, a designated originating node sends a first message, including an indication of a current transmit duration, sometimes also referred to as a tentative transmit duration, for transfer of a predetermined amount of information, to at least a designated receiving node. The current transmit duration corresponds to a currently assumed data link rate, sometimes also

> referred to as a tentative link rate. The designated receiving node selects a desired data link rate for subsequent communication from the originating node, and then determines an updated transmit duration according to the selected data link rate. The receiving node sends a second message, including an indication of the updated transmit duration, to at least the designated originating node, and the originating node then determines an updated data link rate in response to the updated transmit duration.

Further, describing the frame types of FIG. 3 of Larsson, paragraph [0082] of Larsson, discloses (with underlining added):

> The frame format used in IEEE 802.11 is illustrated in FIG. 3. The RTS frame comprises a frame control field, a duration field, a Receiver Address (RA) field, a Transmitter Address (TA) field and a Frame Check Sequence (FCS). The CTS and ACK frames, likewise, each comprises frame control, duration, RA and FCS fields. Finally, the payload frame contains the frame control field, duration field, address fields, a sequence control field, a frame body and a FCS field.

Thus, Larsson merely discloses a scheme for establishing a data transmission rate. Further, Larsson discloses that each frame transmitted from the transmitter includes an address field.

In contrast, amended Claim 1 recites "a transmit announcement indication indicating that a second communication frame intended for the second station will follow the first communication frame and that the second communication frame will not include an address of the second station." A scheme for establishing a data transmission rate, as in Larsson, is not equivalent to "a transmit announcement indication indicating that a second communication frame intended for the second station will follow the first communication frame," as recited in Claim 1. The indicator in Larsson merely establishes the transmission rate (i.e., duration). Further, since each frame of Larsson has an address field, Larsson cannot teach "a transmit announcement indication indicating ... that the second communication frame will not include an address of the second station," as recited in Claim 1.

An anticipation rejection cannot be properly maintained where the reference cited does not disclose each and every claim element. For at least these reasons, Claim 1 is patentable over Larsson. Independent Claims 13, 18, 29, 38 and 42 include similar features and are patentable over Larsson for at least the same reasons. Claims 2-3, 5-12, 15-17, 20-27, 30-31, 33-37, 40-41, and 46 depend from one of independent Claims 1, 13, 18, 29, 38 and 42. Therefore, Applicant respectfully requests withdrawal of the rejection of Claims 1-3, 5-13, 15-18, 20-27, 29-31, 33-38, 40-42, and 46 under 35 U.S.C. § 102(e).

IV. Claim Rejections Under 35 U.S.C. § 103

On page 2 of the Office Action, Claims 4, 19, 28, 32, 39, and 43-45 were rejected under 35 U.S.C. 103(a) as being unpatentable over Larsson in view of U.S. Publication No. 2005/0265393 to Fischer *et al.* ("Fischer"). Applicant respectfully disagrees. In order to further prosecution, Applicant has amended the claims rendering the rejection moot. Larsson and Fischer, alone or in combination, do not disclose or suggest at least the features "a transmit announcement indication indicating that a second communication frame intended for the second station will follow the first communication frame and that the second communication frame will not include an address of the second station," as recited by amended Claim 1. Independent Claims 13, 18, 29, 38 and 42 include similar features.

As discussed above in **Section III.**, Larsson does not disclose at least the features "a transmit announcement indication indicating that a second communication frame intended for the second station will follow the first communication frame and that the second communication frame will not include an address of the second station," as recited by amended Claim 1.

Fischer discloses "canceling and/or trimming a medium reservation in a communication system that employs a protocol that supports a reservation of a shared communication medium." (Para. [0009]). In particular, paragraph [0040] of Fischer, cited by the Examiner, discloses:

> In some embodiments according to some aspects of the present invention, at the end of a sequence of frame transmissions and/or

> frame exchanges sent during a period of reservation of the communication medium, a portion of a complete frame, which may be used as a Signaling frame, may be sent by the holder of the reservation that may include, for example, one or more items (e.g., one of two items). A first item may include, for example, a physical layer preamble, a physical layer header and no MAC fields. The physical layer header may indicate, for example, that the MAC portion of the frame is NULL or ZERO length. A second item may include, for example, a physical layer header only in which the physical layer header indicates that the MAC portion of the frame is NULL or ZERO length. The NULL- or ZERO-length-indicated MAC frame may signal to the node which sent the reservation confirmation message that the sending node may now send a reservation cancellation message. In some embodiments according to some aspects of the present invention, the physical layer header might not include, for example, MAC layer addressing information. The addressing may be implicit or inferred. For example, the sending node, which sent the original reservation confirmation message that is implicitly addressed by the NULL physical layer header, may send the explicit reservation cancellation frame.

Further, paragraph [0046] of Fischer, cited by the Examiner, discloses:

> Some embodiments according to some aspects of the present invention provide an option such that receivers that receive the ZERO-value reservation request frame (e.g., an RTS frame as set forth in IEEE 802.11) may cancel any remaining reservation.

However, Fischer does not disclose at least the features "a transmit announcement indication indicating that a second communication frame intended for the second station will follow the first communication frame and that the second communication frame will not include an address of the second station," as recited by amended Claim 1.

An obviousness rejection cannot be properly maintained where the references cited do not disclose each and every claim element. For at least these reasons, Claim 1 is patentable over Larsson and Fischer, alone or in combination. Independent Claims 13, 18, 29, 38 and 42 include similar features and are patentable over Larsson and Fischer for at least the same reasons.

Claims 4, 19, 28, 32, 39, and 43-45 depend from one of independent Claims 1, 13, 18, 29, 38 and 42. Therefore, Applicant respectfully requests withdrawal of the rejection of Claims 4, 19, 28, 32, 39, and 43-45 under 35 U.S.C. § 103.

* * *

Applicant believes that the present application is now in condition for allowance. Favorable reconsideration of the application as amended is respectfully requested.

The Examiner is invited to contact the undersigned by telephone if it is felt that a telephone interview would advance the prosecution of the present application.

The Commissioner is hereby authorized to charge any additional fees which may be required regarding this application under 37 C.F.R. §§ 1.16-1.17, or credit any overpayment, to Deposit Account No. 19-0741. Should no proper payment be enclosed herewith, as by the credit card payment instructions in EFS-Web being incorrect or absent, resulting in a rejected or incorrect credit card transaction, the Commissioner is authorized to charge the unpaid amount to Deposit Account No. 19-0741. If any extensions of time are needed for timely acceptance of papers submitted herewith, Applicant hereby petitions for such extension under 37 C.F.R. §1.136 and authorizes payment of any such extensions fees to Deposit Account No. 19-0741.

Respectfully submitted,

Date August 23, 2011

By */Eric N. Huston/*

FOLEY & LARDNER LLP
Customer Number: 23524
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Eric N. Huston
Attorney for Applicant
Registration No. 65,684

Electronic Acknowledgement Receipt

EFS ID:	10793519
Application Number:	11627181
International Application Number:	
Confirmation Number:	1464
Title of Invention:	Transmit Announcement Indication
First Named Inventor/Applicant Name:	Menzo Wentink
Customer Number:	23524
Filer:	Eric N. Huston/mary schuster
Filer Authorized By:	Eric N. Huston
Attorney Docket Number:	088245-2616
Receipt Date:	23-AUG-2011
Filing Date:	25-JAN-2007
Time Stamp:	15:01:38
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1		R2NFOA.pdf	703722 1d9072b757b9e88795655e1878267bf6b3d08e15	yes	16

	Multipart Description/PDF files in .zip description		
	Document Description	**Start**	**End**
	Miscellaneous Incoming Letter	1	2
	Amendment/Req. Reconsideration-After Non-Final Reject	3	16
Warnings:			
Information:			
	Total Files Size (in bytes):	703722	

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111
If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371
If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office
If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

Atty. Dkt. No. 088245-2616

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant: Menzo Wentink

Title: TRANSMIT ANNOUNCEMENT INDICATION

Appl. No.: 11/627,181

Filing Date: 01/25/2007

Examiner: Abdulla A. Riyami

Art Unit: 2474

Confirmation Number: 1464

AMENDMENT TRANSMITTAL

Mail Stop Amendment
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

Transmitted herewith is an amendment in the above-identified application.

[**X**] The fee required for additional claims is calculated below:

	Claims As Amended		Previously Paid For		Extra Claims Present		Rate		Additional Claims Fee
Total Claims:	46	-	46	=	0	x	$52.00	=	$0.00
Independent Claims:	6	-	6	=	0	x	$220.00	=	$0.00
First presentation of any Multiple Dependent Claims:						+	$390.00	=	$0.00
							CLAIMS FEE TOTAL	=	$0.00

[ ] Applicant hereby petitions for an extension of time under 37 C.F.R. §1.136(a) for the total number of months checked below:

[ ]	Extension for response filed within the first month:	$130.00	$0.00
[ ]	Extension for response filed within the second month:	$490.00	$0.00
[ ]	Extension for response filed within the third month:	$1,110.00	$0.00
[ ]	Extension for response filed within the fourth month:	$1,730.00	$0.00
[ ]	Extension for response filed within the fifth month:	$2,350.00	$0.00
		EXTENSION FEE TOTAL:	$0.00
[ ]	Statutory Disclaimer Fee under 37 C.F.R. 1.20(d):	$140.00	$0.00
		CLAIMS, EXTENSION AND DISCLAIMER FEE TOTAL:	$0.00
[ ]		Small Entity Fees Apply (subtract ½ of above):	$0.00
		Extension Fees Previously Paid:	$0.00
		TOTAL FEE:	$0.00

If any extensions of time are needed for timely acceptance of papers submitted herewith, applicant hereby petitions for such extension under 37 C.F.R. §1.136 and authorizes payment of any such extensions fees to Deposit Account No. 19-0741.

Please direct all correspondence to the undersigned attorney or agent at the address indicated below.

Respectfully submitted,

Date August 23, 2011

By _____

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Eric N. Huston
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PTO/SB/06 (07-06)
Approved for use through 1/31/2007. OMB 0651-0032
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PATENT APPLICATION FEE DETERMINATION RECORD

Substitute for Form PTO-875

Application or Docket Number	Filing Date	☐ To be Mailed
11/627,181	01/25/2007	

APPLICATION AS FILED – PART I

	(Column 1)	(Column 2)	SMALL ENTITY ☐		OR	OTHER THAN SMALL ENTITY	
FOR	NUMBER FILED	NUMBER EXTRA	RATE ($)	FEE ($)		RATE ($)	FEE ($)
☐ BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A	N/A			N/A	
☐ SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A	N/A			N/A	
☐ EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A			N/A	
TOTAL CLAIMS (37 CFR 1.16(i))	minus 20 =	*	X $ =		OR	X $ =	
INDEPENDENT CLAIMS (37 CFR 1.16(h))	minus 3 =	*	X $ =			X $ =	
☐ APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is $250 ($125 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).						
☐ MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))							
* If the difference in column 1 is less than zero, enter "0" in column 2.			TOTAL			TOTAL	

APPLICATION AS AMENDED – PART II

AMENDMENT 08/23/2011	(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	SMALL ENTITY RATE ($)	ADDITIONAL FEE ($)	OR	OTHER THAN SMALL ENTITY RATE ($)	ADDITIONAL FEE ($)
Total (37 CFR 1.16(i))	* 46	Minus	** 46	= 0	X $ =		OR	X $52=	0
Independent (37 CFR 1.16(h))	* 6	Minus	***6	= 0	X $ =		OR	X $220=	0
☐ Application Size Fee (37 CFR 1.16(s))									
☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
					TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE	0

AMENDMENT	(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	RATE ($)	ADDITIONAL FEE ($)		RATE ($)	ADDITIONAL FEE ($)
Total (37 CFR 1.16(i))	*	Minus	**	=	X $ =		OR	X $ =	
Independent (37 CFR 1.16(h))	*	Minus	***	=	X $ =		OR	X $ =	
☐ Application Size Fee (37 CFR 1.16(s))									
☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
					TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE	

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.

** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".

*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".

The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1.

Legal Instrument Examiner:
/JERMAINE MINOR/

This collection of information is required by 37 CFR 1.16. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
11/627,181	01/25/2007	Menzo Wentink	088245-2616	1464

23524 7590 05/23/2011

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EXAMINER	
RIYAMI, ABDULLA A	
ART UNIT	PAPER NUMBER
2474	
MAIL DATE	DELIVERY MODE
05/23/2011	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	11/627,181	WENTINK, MENZO	
	Examiner	Art Unit	
	ABDULLAH RIYAMI	2474	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *21 July 2010*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-46* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-46* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *01/25/2007* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 101

1. 35 U.S.C. 101 reads as follows:

> Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

2. **Claims 13-17 and 38-41 and 46** are rejected under 35 U.S.C. 101 because the claimed invention is directed to non-statutory subject matter.

In particular, the limitation in line 2 of claim 13, recites a computer-readable medium having instructions stored. However, in the specification on paragraph 43, lines 6-11, it is indicated that a computer-readable medium can contain, store, communicate, propagate, or transport the program, an electronic, magnetic, optical, infrared, electromagnetic, or propagation medium. Since propagation mediums are signals and signals being a non-statutory subject matter make the invention claimed in claims 13-17 to be non-statutory. Similar problem also exists in claim 38.

Claims 14-17 are rejected since they depend from claim 13 and claims 39-41 and 46 are rejected since they depend from claim 38.

It is suggested to change “computer-readable storage medium” to “non-transitory computer-readable medium”.

A claim drawn to such a computer readable medium that covers both transitory and non-transitory embodiments may be amended to narrow the claim to cover only statutory embodiments to avoid a rejection under 35 U.S.C. § 101 by adding the limitation “non-transitory” to the claim. *Cf. Animals – Patentability*, 1077 *Off. Gaz. Pat.*

Office 24 (April 21, 1987) (suggesting that applicants add the limitation "non-human" to a claim covering a multi-cellular organism to avoid a rejection under 35 U.S.C. § 101). Such an amendment would typically not raise the issue of new matter, even when the specification is silent because the broadest reasonable interpretation relies on the ordinary and customary meaning that includes signals *per se*. The limited situations in which such an amendment could raise issues of new matter occur, for example, when the specification does not support a non-transitory embodiment because a signal *per se* is the only viable embodiment such that the amended claim is impermissibly broadened beyond the supporting disclosure. *See, e.g., Gentry Gallery, Inc. v. Berkline Corp.*, 134 F.3d 1473 (Fed. Cir. 1998).

Claim Rejections - 35 USC § 102

3. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

4. Claim 1-3, 5-13, 15-18, 20-27, 29-31, 33-38, 40-42, and 46 are rejected under 35 U.S.C. 102(e) as being anticipated by Larsson (US 2008/0298306 A1).

As per claim 1, Larsson discloses a method (see figure 3, RTS frame and CTS frame) comprising:

transmitting a first communication frame from a first station to a second station (see figure 3, RTS frame, see paragraph 18, lines 1-10, originating node sends a first message including transmit duration); and providing at the first station a transmit announcement indication in the first communication frame (see paragraph 18, lines 1-10, originating node sends a first message including transmit duration), wherein the transmit announcement indication indicates that a second communication frame intended for the second station will follow the first communication frame (see paragraph 28, lines 1-9, transmit duration information may be conveyed in different messages, such as, RTS-CTS message exchanges, see figure 5, RTS sent from source to destination, followed by data fragments).

As per claim 2, Larsson discloses wherein the second communication frame follows after a short inter frame space (SIFS) after the first communication frame with the transmit announcement indication (see figure 5, RTS sent from source to destination, followed by data fragments after SIFS, see paragraph 85, lines 5-9, SIFS is a time period used for separating transmissions).

As per claim 3, Larsson discloses wherein the second communication frame follows after a short inter frame space (SIFS) after a response to the first communication frame with the transmit announcement indication (see figure 5, RTS sent from source to destination, followed by data fragments after SIFS, see paragraph 85, lines 5-9, SIFS is a time period used for separating transmissions).

As per claim 5, Larsson discloses wherein providing the transmit announcement indication comprises providing the transmit announcement indication with a request to

send (RTS) frame (see paragraph 28, lines 1-9, transmit duration information may be conveyed in different messages, such as, RTS-CTS message exchanges).

As per claim 6, Larsson discloses receiving by the first station, a clear to send (CTS) frame from the second station after the first station has transmitted the transmit announcement indication with the RTS frame (see figure 5, RTS sent from source to destination, CTS received, followed by data fragments after SIFS).

As per claim 7, Larsson discloses transmitting the second communication frame (see figure 5, RTS sent from source to destination, followed by data fragments).

As per claim 8, Larsson discloses wherein providing the transmit announcement indication comprises providing the transmit announcement indication in a quality of service null (QoS-null) frame (see figure 3, RTS frame, see paragraph 18, lines 1-10, originating node sends a first message including transmit duration or see paragraph 110, dummy control frame without address, with frame control and duration, where the duration field is the highest rate).

As per claim 9, Larsson discloses receiving by the first station an acknowledgement (ACK) frame from the second station after the first station has transmitted the transmit announcement indication with the QoS-null frame (see paragraph 124, end of data transmission is responded with an ACK).

As per claim 10, Larsson discloses transmitting the second communication frame associated with the transmit announcement indication (see figure 3, RTS frame, see paragraph 18, lines 1-10, originating node sends a first message including transmit duration)

As per claim 11, Larsson discloses wherein providing the transmit announcement indication comprises providing the transmit announcement indication with a clear to send (CTS) frame (see figure 5, RTS sent from source to destination, CTS received, followed by data fragments after SIFS)

As per claim 12, Larsson discloses further comprising transmitting the second communication frame associated with the transmit announcement indication (see figure 5, RTS sent from source to destination, CTS received, followed by data fragments after SIFS).

As per claim 13, Larsson discloses an article of manufacture including a computer-readable medium having instructions stored thereon that if executed by a computing device cause the computing device to perform operations (see figure 2a, transmitter T, see figure 3, RTS frame and CTS frame) comprising:

transmitting a first communication frame from a first station to a second station (see figure 3, RTS frame, see paragraph 18, lines 1-10, originating node sends a first message including transmit duration); and

providing a transmit announcement indication in the first communication frame (see paragraph 18, lines 1-10, originating node sends a first message including transmit duration), wherein the transmit announcement indication indicates that a second communication frame intended for the second station will follow the first communication frame (see paragraph 28, lines 1-9, transmit duration information may be conveyed in different messages, such as, RTS-CTS message exchanges, see figure 5, RTS sent from source to destination, followed by data fragments).

As per claim 15, Larsson discloses wherein the providing the transmit announcement indication comprises providing the transmit announcement indication with a request to send (RTS) frame (see paragraph 28, lines 1-9, transmit duration information may be conveyed in different messages, such as, RTS-CTS message exchanges).

As per claim 16, Larsson discloses the article of manufacture wherein the instructions, if executed by a computing device, further cause the computing device to perform operations comprising receiving a clear to send (CTS) frame from the second station after the first station has transmitted the transmit announcement indication with the RTS frame (see figure 5, RTS sent from source to destination, CTS received, followed by data fragments after SIFS).

As per claim 17, Larsson discloses the article of manufacture wherein the instructions, if executed by a computing device further cause the computing device to perform operations comprising transmitting the second communication frame associated with the transmit announcement indication (see figure 5, RTS sent from source to destination, CTS received, followed by data fragments after SIFS).

As per claim 18, Larsson discloses a system (see figure 3, RTS frame and CTS frame) comprising: a transmitter configured to (see figure 2a, transmitter T): transmit a first communication frame from a first station to a second station (see figure 3, RTS frame, see paragraph 18, lines 1-10, originating node sends a first message including transmit duration); and provide a transmit announcement indication in the first communication frame (see paragraph 18, lines 1-10, originating node sends a first

message including transmit duration), wherein the transmit announcement indication indicates that a second communication frame intended for the second station will follow the first communication frame (see paragraph 28, lines 1-9, transmit duration information may be conveyed in different messages, such as, RTS-CTS message exchanges, see figure 5, RTS sent from source to destination, followed by data fragments).

As per claim 20, Larsson discloses wherein the transmitter is further configured to provide the transmit announcement indication with a request to send (RTS) frame (see paragraph 28, lines 1-9, transmit duration information may be conveyed in different messages, such as, RTS-CTS message exchanges).

As per claim 21, Larsson discloses a receiver configured to receive by the first station a clear to send (CTS) frame from the second station after the first station has transmitted the transmit announcement indication with the RTS frame (see paragraph 28, lines 1-9, transmit duration information may be conveyed in different messages, such as, RTS-CTS message exchanges).

As per claim 22, Larsson discloses wherein the transmitter is further configured to transmit frame second communication frame associated with the transmit announcement indication (see paragraph 28, lines 1-9, transmit duration information may be conveyed in different messages, such as, RTS-CTS message exchanges, see figure 5, RTS sent from source to destination, followed by data fragments).

As per claim 23, Larsson discloses wherein the first station comprises one of a wireless radio, desktop computer, portable computer, laptop computer, multi-media

players, personal digital assistant (PDA), printer, fax machine, scanner, hub, switch, router, set-top box, and television with communication capability (see paragraph 26, line 4, IEEE 802.11 type networks).

As per claim 24, Larsson discloses wherein the second communication frame comprises a physical layer (PHY) header without a media access control (MAC) portion (see paragraph 110, lines 5-15, dummy control frame without any address fields, see also figure 3, address 4 does not exist).

As per claim 25, Larsson discloses wherein the transmit announcement indication comprises a bit inside a MAC header field (see figure 3, MAC header in RTS/CTS frame with duration field).

As per claim 26, Larsson discloses wherein the bit comprises an high throughput-control field (see figure 3, MAC header in RTS/CTS frame with duration field).

As per claim 27, Larsson discloses wherein the transmit announcement indication is located within one of a data frame (see paragraph 71, lines 5-10, transmit duration information indicated in data fragment), a management frame (see figure 3, management frame), or a control frame (see paragraph 28, lines 1-9, transmit duration information may be conveyed in different messages, such as, RTS-CTS message exchanges).

As per claim 29, Larsson discloses a method (see figure 3, RTS frame and CTS frame) comprising: receiving a first communication frame from a first station at a second station (see figure 3, RTS frame, see paragraph 18, lines 1-10, originating node sends a first message including transmit duration), wherein the first communication frame

includes a transmit announcement indication that indicates that a second communication frame intended for the second station will follow the first communication frame (see paragraph 28, lines 1-9, transmit duration information may be conveyed in different messages, such as, RTS-CTS message exchanges, see figure 5, RTS sent from source to destination, followed by data fragments).

As per claim 30, Larsson discloses receiving, at the second station, the second communication frame after a short inter frame space (SIFS) that follows the first communication frame (see paragraph 28, lines 1-9, transmit duration information may be conveyed in different messages, such as, RTS-CTS message exchanges, see figure 5, RTS sent from source to destination, followed by data fragments, after SIFS period).

As per claim 31, Larsson discloses receiving at the second station, the second communication frame after a short inter frame space (SIFS) that follows a response to the first communication frame (see paragraph 28, lines 1-9, transmit duration information may be conveyed in different messages, such as, RTS-CTS message exchanges, see figure 5, RTS sent from source to destination, followed by data fragments, after SIFS period).

As per claim 33, Larsson discloses wherein receiving the first communication frame comprises receiving the transmit announcement indication with a request to send (RTS) frame (see paragraph 28, lines 1-9, transmit duration information may be conveyed in different messages, such as, RTS-CTS message exchanges, see figure 5, RTS sent from source to destination).

As per claim 34, Larsson discloses transmitting a clear to send (CTS) frame from the second station to the first station in response to receiving the RTS frame(see paragraph 28, lines 1-9, transmit duration information may be conveyed in different messages, such as, RTS-CTS message exchanges, see figure 5, RTS sent from source to destination and CTS viceversa).

As per claim 35, Larsson discloses wherein receiving the first communication frame comprises receiving the transmit announcement indication in a quality of service null (QoS-null) frame (see figure 3, RTS frame, see paragraph 18, lines 1-10, originating node sends a first message including transmit duration or see paragraph 110, dummy control frame without address, with frame control and duration, where the duration field is the highest rate).

As per claim 36, Larsson discloses receiving an acknowledgement (ACK) frame at the second station from the first station (see paragraph 124, end of data transmission is responded with an ACK).

As per claim 37, Larsson discloses wherein receiving the first communication frame comprises receiving the transmit announcement indication with a clear to send (CTS) frame (see paragraph 96, lines 10-20, broadcast CTS with duration field to hidden terminals, see paragraph 124, transmit duration indicated in duration field of message such as CTS or ACK)

As per claim 38, Larsson discloses an article of manufacture including a computer-readable medium having instructions stored thereon that if executed by a computing device cause the computing device to perform operations (see figure 2a,

transmitter T, see figure 3, RTS frame and CTS frame) comprising, receiving a first communication frame from a first station (see figure 3, RTS frame, see paragraph 18, lines 1-10, originating node sends a first message including transmit duration),

wherein the first communication frame includes a transmit announcement indication that indicates that a second communication frame will follow the first communication frame (see paragraph 28, lines 1-9, transmit duration information may be conveyed in different messages, such as, RTS-CTS message exchanges, see figure 5, RTS sent from source to destination, followed by data fragments).

As per claim 40, Larsson discloses wherein the receiving the first communication frame comprises receiving the transmit announcement indication with a request to send (RTS) frame (see paragraph 28, lines 1-9, transmit duration information may be conveyed in different messages, such as, RTS-CTS message exchanges, see figure 5, RTS sent from source to destination, followed by data fragments).

As per claim 41, Larsson discloses wherein the instructions, if executed by a computing device, further cause the computing device to perform operations comprising transmitting a clear to send (CTS) frame to the first station in response to the RTS frame (see paragraph 28, lines 1-9, transmit duration information may be conveyed in different messages, such as, RTS-CTS message exchanges, see figure 5, RTS sent from source to destination, followed by data fragments).

As per claim 42, Larsson discloses a system (see figure 3, RTS frame and CTS frame) comprising, a receiver configured to receive a first communication frame from a first station at a second station (see figure 3, RTS frame, see paragraph 18, lines 1-10,

originating node sends a first message including transmit duration), wherein the first communication frame includes a transmit announcement indication that indicates that a second communication frame intended for the second station will follow the first communication frame (see paragraph 28, lines 1-9, transmit duration information may be conveyed in different messages, such as, RTS-CTS message exchanges, see figure 5, RTS sent from source to destination, followed by data fragments).

As per claim 46, Larsson discloses wherein the second station comprises one of a wireless radio (see paragraph 26, line 4, IEEE 802.11 type networks), desktop computer, portable computer (see paragraph 26, line 4, IEEE 802.11 type networks), laptop computer (see paragraph 26, line 4, IEEE 802.11 type networks), multi-media players, personal digital assistant (PDA) (see paragraph 26, line 4, IEEE 802.11 type networks), printer, fax machine, scanner, hub, switch (see paragraph 26, line 4, IEEE 802.11 type networks), router (see paragraph 26, line 4, IEEE 802.11 type networks), set-top box, and television with communication capability (see paragraph 26, line 4, IEEE 802.11 type networks).

Claim Rejections - 35 USC § 103

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

6. The factual inquiries set forth in *Graham* v. *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

7. Claims 4, 19, 28, 32, 39, and 43-45 are rejected under 35 U.S.C. 103(a) as being unpatentable over Larsson (US 2008/0298306 A1) in view of Fischer et al. (US 2005/0265393 A1).

As per claim 4, Larsson disclose the transmit announcement indication (see paragraph 28, lines 1-9, transmit duration information may be conveyed in different messages, such as, RTS-CTS message exchanges).

Larsson does not expressly disclose wherein the transmit announcement indication comprises a zero-length frame.

However the teaching wherein the transmit announcement indication comprises a zero-length frame, is well known in the art as evidenced by Fischer.

Fischer discloses the transmit announcement indication comprises a zero-length frame (see paragraph 40, lines 1-10, physical layer preamble indicating that MAC portion is zero or null, see paragraph 46, lines 1-4, zero value reservation request frame such as an RTS frame as set forth in 802.11, see frame format in figure 2).

At the time of the invention, it would have been obvious to one of ordinary skill in the art to use Fischer's teaching wherein the transmit announcement indication

comprises a zero-length frame (see paragraph 40, lines 1-10, physical layer preamble indicating that MAC portion is zero or null, see paragraph 46, lines 1-4, zero value reservation request frame such as an RTS frame as set forth in 802.11, see frame format in figure 2) as a modification in Larsson's method and system of using the transmit announcement indication (see paragraph 28, lines 1-9, transmit duration information may be conveyed in different messages, such as, RTS-CTS message exchanges). The motivation to combine would have been to have a method and system for cancelling or trimming a medium reservation in a communication system that employs a protocol that supports a reservation of a shared communication medium, thereby improving efficiency in the use of the communication medium (see paragraph 6 and 19, Fischer).

As per claim 19, Larsson disclose the transmit announcement indication (see paragraph 28, lines 1-9, transmit duration information may be conveyed in different messages, such as, RTS-CTS message exchanges).

Larsson does not expressly disclose wherein the transmit announcement indication comprises a zero-length frame.

However the teaching wherein the transmit announcement indication comprises a zero-length frame, is well known in the art as evidenced by Fischer.

Fischer discloses the transmit announcement indication comprises a zero-length frame (see paragraph 40, lines 1-10, physical layer preamble indicating that MAC portion is zero or null, see paragraph 46, lines 1-4, zero value reservation request frame such as an RTS frame as set forth in 802.11, see frame format in figure 2).

At the time of the invention, it would have been obvious to one of ordinary skill in the art to use Fischer's teaching wherein the transmit announcement indication comprises a zero-length frame (see paragraph 40, lines 1-10, physical layer preamble indicating that MAC portion is zero or null, see paragraph 46, lines 1-4, zero value reservation request frame such as an RTS frame as set forth in 802.11, see frame format in figure 2) as a modification in Larsson's method and system of using the transmit announcement indication (see paragraph 28, lines 1-9, transmit duration information may be conveyed in different messages, such as, RTS-CTS message exchanges). The motivation to combine would have been to have a method and system for cancelling or trimming a medium reservation in a communication system that employs a protocol that supports a reservation of a shared communication medium, thereby improving efficiency in the use of the communication medium (see paragraph 6 and 19, Fischer).

As per claim 28, Larsson disclose the transmit announcement indication (see paragraph 28, lines 1-9, transmit duration information may be conveyed in different messages, such as, RTS-CTS message exchanges).

Larsson does not expressly disclose wherein the transmit announcement indication precedes a zero-length frame.

However the teaching wherein the transmit announcement indication precedes a zero-length frame, is well known in the art as evidenced by Fischer.

Fischer discloses the transmit announcement indication comprises a zero-length frame (see paragraph 40, lines 1-10, physical layer preamble indicating that MAC

portion is zero or null, see paragraph 46, lines 1-4, zero value reservation request frame such as an RTS frame as set forth in 802.11, see frame format in figure 2).

At the time of the invention, it would have been obvious to one of ordinary skill in the art to use Fischer's teaching wherein the transmit announcement indication precedes a zero-length frame (see paragraph 40, lines 1-10, physical layer preamble indicating that MAC portion is zero or null, see paragraph 46, lines 1-4, zero value reservation request frame such as an RTS frame as set forth in 802.11, see frame format in figure 2) as a modification in Larsson's method and system of using the transmit announcement indication (see paragraph 28, lines 1-9, transmit duration information may be conveyed in different messages, such as, RTS-CTS message exchanges). The motivation to combine would have been to have a method and system for cancelling or trimming a medium reservation in a communication system that employs a protocol that supports a reservation of a shared communication medium, thereby improving efficiency in the use of the communication medium (see paragraph 6 and 19, Fischer).

As per claim 32, Larsson disclose the transmit announcement indication (see paragraph 28, lines 1-9, transmit duration information may be conveyed in different messages, such as, RTS-CTS message exchanges).

Larsson does not expressly disclose wherein the transmit announcement indication comprises a zero-length frame.

However the teaching wherein the transmit announcement indication comprises a zero-length frame, is well known in the art as evidenced by Fischer.

Fischer discloses the transmit announcement indication comprises a zero-length frame (see paragraph 40, lines 1-10, physical layer preamble indicating that MAC portion is zero or null, see paragraph 46, lines 1-4, zero value reservation request frame such as an RTS frame as set forth in 802.11, see frame format in figure 2).

At the time of the invention, it would have been obvious to one of ordinary skill in the art to use Fischer's teaching wherein the transmit announcement indication comprises a zero-length frame (see paragraph 40, lines 1-10, physical layer preamble indicating that MAC portion is zero or null, see paragraph 46, lines 1-4, zero value reservation request frame such as an RTS frame as set forth in 802.11, see frame format in figure 2) as a modification in Larsson's method and system of using the transmit announcement indication (see paragraph 28, lines 1-9, transmit duration information may be conveyed in different messages, such as, RTS-CTS message exchanges). The motivation to combine would have been to have a method and system for cancelling or trimming a medium reservation in a communication system that employs a protocol that supports a reservation of a shared communication medium, thereby improving efficiency in the use of the communication medium (see paragraph 6 and 19, Fischer).

As per claim 39, Larsson disclose the transmit announcement indication (see paragraph 28, lines 1-9, transmit duration information may be conveyed in different messages, such as, RTS-CTS message exchanges).

Larsson does not expressly disclose wherein the transmit announcement indication comprises a zero-length frame.

However the teaching wherein the transmit announcement indication comprises a zero-length frame, is well known in the art as evidenced by Fischer.

Fischer discloses the transmit announcement indication comprises a zero-length frame (see paragraph 40, lines 1-10, physical layer preamble indicating that MAC portion is zero or null, see paragraph 46, lines 1-4, zero value reservation request frame such as an RTS frame as set forth in 802.11, see frame format in figure 2).

At the time of the invention, it would have been obvious to one of ordinary skill in the art to use Fischer's teaching wherein the transmit announcement indication comprises a zero-length frame (see paragraph 40, lines 1-10, physical layer preamble indicating that MAC portion is zero or null, see paragraph 46, lines 1-4, zero value reservation request frame such as an RTS frame as set forth in 802.11, see frame format in figure 2) as a modification in Larsson's method and system of using the transmit announcement indication (see paragraph 28, lines 1-9, transmit duration information may be conveyed in different messages, such as, RTS-CTS message exchanges). The motivation to combine would have been to have a method and system for cancelling or trimming a medium reservation in a communication system that employs a protocol that supports a reservation of a shared communication medium, thereby improving efficiency in the use of the communication medium (see paragraph 6 and 19, Fischer).

As per claim 43, Larsson disclose the transmit announcement indication (see paragraph 28, lines 1-9, transmit duration information may be conveyed in different messages, such as, RTS-CTS message exchanges).

Larsson does not expressly disclose wherein the transmit announcement indication comprises a zero-length frame.

However the teaching wherein the transmit announcement indication comprises a zero-length frame, is well known in the art as evidenced by Fischer.

Fischer discloses the transmit announcement indication comprises a zero-length frame (see paragraph 40, lines 1-10, physical layer preamble indicating that MAC portion is zero or null, see paragraph 46, lines 1-4, zero value reservation request frame such as an RTS frame as set forth in 802.11, see frame format in figure 2).

At the time of the invention, it would have been obvious to one of ordinary skill in the art to use Fischer's teaching wherein the transmit announcement indication comprises a zero-length frame (see paragraph 40, lines 1-10, physical layer preamble indicating that MAC portion is zero or null, see paragraph 46, lines 1-4, zero value reservation request frame such as an RTS frame as set forth in 802.11, see frame format in figure 2) as a modification in Larsson's method and system of using the transmit announcement indication (see paragraph 28, lines 1-9, transmit duration information may be conveyed in different messages, such as, RTS-CTS message exchanges). The motivation to combine would have been to have a method and system for cancelling or trimming a medium reservation in a communication system that employs a protocol that supports a reservation of a shared communication medium, thereby improving efficiency in the use of the communication medium (see paragraph 6 and 19, Fischer).

As per claim 44, Larsson discloses wherein the receiver is further configured to receive the transmit announcement indication with a request to send (RTS) frame (see paragraph 28, lines 1-9, transmit duration information may be conveyed in different messages, such as, RTS-CTS message exchanges, see figure 5, RTS sent from source to destination, followed by data fragments).

As per claim 45, Larsson discloses a transmitter configured to transmit a clear to send (CTS) frame from the second station to the first station in response to the RTS frame (see paragraph 28, lines 1-9, transmit duration information may be conveyed in different messages, such as, RTS-CTS message exchanges, see figure 5, RTS sent from source to destination, followed by data fragments).

Conclusion

8. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. See form 892.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to ABDULLAH RIYAMI whose telephone number is (571)270-3119. The examiner can normally be reached on Monday through Thursday 9am-5pm EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Aung Moe can be reached on (571) 272-7314. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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/AUNG S. MOE/
Supervisory Patent Examiner, Art Unit 2474

/Abdullah Riyami/
Examiner, Art Unit 2474

Notice of References Cited	Application/Control No. 11/627,181	Applicant(s)/Patent Under Reexamination WENTINK, MENZO	
	Examiner ABDULLAH RIYAMI	Art Unit 2474	Page 1 of 1

U.S. PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	Classification
*	A	US-2005/0147115 A1	07-2005	Li et al.	370/449
*	B	US-2005/0208956 A1	09-2005	Takagi et al.	455/464
*	C	US-2005/0243781 A1	11-2005	Vesuna et al.	370/338
*	D	US-2005/0265393 A1	12-2005	Fischer et al.	370/474
*	E	US-2006/0116076 A1	06-2006	Li et al.	455/041.2
*	F	US-2006/0187964 A1	08-2006	Li et al.	370/474
*	G	US-2007/0025388 A1	02-2007	Abhishek et al.	370/447
*	H	US-2007/0080781 A1	04-2007	Ginzburg et al.	340/007.21
*	I	US-2008/0039046 A1	02-2008	Vilzmann et al.	455/296
*	J	US-2008/0298306 A1	12-2008	Larsson, Peter	370/328
*	K	US-2010/0142493 A1	06-2010	SAKODA et al.	370/336
	L	US-			
	M	US-			

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*A copy of this reference is not being furnished with this Office action. (See MPEP § 707.05(a).)
Dates in MM-YYYY format are publication dates. Classifications may be US or foreign.

Index of Claims	Application/Control No.	Applicant(s)/Patent Under Reexamination
	11627181	WENTINK, MENZO
	Examiner	Art Unit
	ABDULLAH RIYAMI	2474

✓	Rejected	-	Cancelled	N	Non-Elected	A	Appeal
=	Allowed	÷	Restricted	I	Interference	O	Objected

☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47

CLAIM		DATE								
Final	Original	05/18/2011								
	1	✓								
	2	✓								
	3	✓								
	4	✓								
	5	✓								
	6	✓								
	7	✓								
	8	✓								
	9	✓								
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	35	✓								
	36	✓								

Index of Claims	Application/Control No.	Applicant(s)/Patent Under Reexamination
	11627181	WENTINK, MENZO
	Examiner	**Art Unit**
	ABDULLAH RIYAMI	2474

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☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47

CLAIM		DATE								
Final	Original	05/18/2011								
	37	✓								
	38	✓								
	39	✓								
	40	✓								
	41	✓								
	42	✓								
	43	✓								
	44	✓								
	45	✓								
	46	✓								

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	11627181	WENTINK, MENZO
	Examiner	Art Unit
	ABDULLAH RIYAMI	2474

SEARCHED			
Class	Subclass	Date	Examiner
370	328,336,338,310,310.2,350,431,443,444,433,448,445,465,474,447	5/18/2011	AR
455	41.2,69,91,296	5/18/2011	AR

SEARCH NOTES		
Search Notes	Date	Examiner
Conducted East search (limited text search in class/subclass listed above)	5/18/2011	AR
Read IEEE documents related to subjectmatter	5/18/2011	AR

INTERFERENCE SEARCH			
Class	Subclass	Date	Examiner

/ABDULLAH RIYAMI/ Examiner.Art Unit 2474	

EAST Search History

EAST Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
L1	38541	370/328,336,338,310,310.2,350,431,443,444,433,448,445,465,474,447.ccls. or 455/41.2,69,91,296.ccls.	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2011/05/18 18:39
L2	54777	transmi$9 near1 indicat$7	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2011/05/18 18:40
L3	1382	(short$2 inter$frame$2 or short$2 inter$frame$3 or short inter frame$3)	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2011/05/18 18:40
L4	280	L2 and L3	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2011/05/18 18:40
L5	132	l1 and l4	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2011/05/18 18:40
S1	29	transmi$9 near1 announc$10 near1 indicat$7	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2011/05/09 10:23
S2	54628	transmi$9 near1 indicat$7	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2011/05/09 10:43

S3	275	S2 same rts	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2011/05/09 10:44
S4	202	S3 and cts	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2011/05/09 10:44
S5	1371	(short$2 inter$frame$2 or short$2 inter$frame$3 or short inter frame$3)	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2011/05/09 10:45
S6	37	S3 and S5	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2011/05/09 10:46
S7	10434	(zero$length$2 or zero length$2 or zerolength$2 or zlf or null$data or null data)	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2011/05/09 11:26
S8	29	S7 same rts	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2011/05/09 11:26
S9	3	S7 same (without near1 mac)	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2011/05/09 12:04

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	Application Number	11627181
	Filing Date	2007-01-25
	First Named Inventor	Menzo Wentink
	Art Unit	2614
	Examiner Name	
	Attorney Docket Number	050337-1570

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	1	6842460		2005-01-11	Olkkonen et al.	
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	1	20050124294		2005-06-09	Wentink	
	2	20050243849		2005-11-03	Wentink	
	3	20030231608		2003-12-18	Wentink	
	4	20050059347		2005-03-17	Haartsen	
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	Application Number	11627181
	Filing Date	2007-01-25
	First Named Inventor	Menzo Wentink
	Art Unit	2614
	Examiner Name	
	Attorney Docket Number	050337-1570

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	1	International Search Report and Written Opinion	☐

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Substitute for form 1449/PTO				*Complete if Known*	
INFORMATION DISCLOSURE STATEMENT BY APPLICANT				**Application Number**	11/627,181
				Filing Date	1/25/2020
Date Submitted: July 21, 2010				**First Named Inventor**	Menzo Wentink
				Art Unit	2614
(use as many sheets as necessary)				Examiner Name	Curtis A. Kuntz
Sheet	1	of	1	Attorney Docket Number	088245-2616

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		2004/0196871	10-07-2004	TERRY, JOHN	
		5,844,905	12-01-1998	MCKAY ET AL.	

FOREIGN PATENT DOCUMENTS

Examiner Initials*	Cite No.[1]	Foreign Patent Document Country Code[3]-Number[4]-Kind Code[5] *(if known)*	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Documents	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear	T[6]

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		International Preliminary Report on Patentability for PCT/US2007/61058, completed December 18, 2009.	

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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant: Menzo Wentink

Title: TRANSMIT ANNOUNCEMENT INDICATION

Appl. No.: 11/627,181

Filing Date: 01/25/2007

Examiner: Curtis A. Kuntz

Art Unit: 2614

Conf. No.: 1464

PRELIMINARY AMENDMENT UNDER 37 CFR § 1.115

Mail Stop Amendment
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Prior to examination of the present application, Applicants respectfully request that the application be amended as follows:

Amendments to the Claims are reflected in the listing of claims which begins on page 2 of this document.

Remarks begin on page 9 of this document.

Please amend the application as follows:

Amendments to the Claims:

This listing of claims will replace all prior versions and listings of claims in the application:

Listing of Claims:

1. (Currently Amended) A method comprising:

transmitting a first communication frame from a first station to a second station; and

providing, at the first station, a transmit announcement indication in the first communication frame, wherein the transmit announcement indication indicates that ~~indicating whether~~ a second communication frame intended for [[to]] the second station will follow the first communication frame.

2. (Original) The method of claim 1, wherein the second communication frame follows after a short inter frame space (SIFS) after the first communication frame with the transmit announcement indication.

3. (Original) The method of claim 1, wherein the second communication frame follows after a short inter frame space (SIFS) after a response to the first communication frame with the transmit announcement indication.

4. (Original) The method of claim 1, wherein the transmit announcement indication comprises a zero-length frame.

5. (Original) The method of claim 1, wherein providing the transmit announcement indication comprises providing the transmit announcement indication with a request to send (RTS) frame.

6. (Original) The method of claim 5, further comprising receiving, by the first station, a clear to send (CTS) frame from the second station after the first station has transmitted the transmit announcement indication with the RTS frame.

7. (Currently Amended) The method of claim 6, further comprising transmitting [[a]] the second communication frame ~~associated with the transmit announcement indication~~.

8. (Original) The method of claim 1, wherein providing the transmit announcement indication comprises providing the transmit announcement indication in a quality of service null (QoS-null) frame.

9. (Original) The method of claim 8, further comprising receiving, by the first station, an acknowledgement (ACK) frame from the second station after the first station has transmitted the transmit announcement indication with the QoS-null frame.

10. (Original) The method of claim 9, further comprising transmitting the second communication frame associated with the transmit announcement indication.

11. (Original) The method of claim 1, wherein providing the transmit announcement indication comprises providing the transmit announcement indication with a clear to send (CTS) frame.

12. (Original) The method of claim 11, further comprising transmitting the second communication frame associated with the transmit announcement indication.

13. (Currently Amended) ~~A computer readable storage medium~~ An article of manufacture including a computer-readable medium having instructions stored thereon that, if executed by a computing device, cause the computing device to perform operations comprising:

~~logic configured to transmit~~ transmitting a first communication frame from a first station to a second station; and

~~logic configured to provide~~ providing a transmit announcement indication in the first communication frame, wherein the transmit announcement indication indicates that ~~indicating whether~~ a second communication frame intended for [[to]] the second station will follow the first communication frame.

14. (Currently Amended) The article of manufacture ~~computer readable storage medium~~ of claim 13, wherein the transmit announcement indication comprises a zero-length frame.

15. (Currently Amended) The article of manufacture ~~computer readable storage medium~~ of claim 13, wherein the providing ~~logic configured to provide~~ the transmit announcement indication comprises providing ~~logic configured to provide~~ the transmit announcement indication with a request to send (RTS) frame.

16. (Currently Amended) The article of manufacture ~~computer readable storage medium~~ of claim 15, wherein the instructions, if executed by a computing device, further cause the computing device to perform operations ~~further~~ comprising receiving ~~logic configured to receive, by the first station,~~ a clear to send (CTS) frame from the second station after the first station has transmitted the transmit announcement indication with the RTS frame.

17. (Currently Amended) The article of manufacture ~~computer readable storage medium~~ of claim 16, wherein the instructions, if executed by a computing device, further cause the computing device to perform operations ~~further~~ comprising transmitting ~~logic configured to transmit~~ the second communication frame associated with the transmit announcement indication.

18. (Currently Amended) A system comprising:

a transmitter configured to:

transmit a first communication frame from a first station to a second station; and

provide a transmit announcement indication in the first communication frame, wherein the transmit announcement indication indicates that ~~indicating whether~~ a second communication frame intended for [[to]] the second station will follow the first communication frame.

19. (Original) The system of claim 18, wherein the transmit announcement indication comprises a zero-length frame.

20. (Original) The system of claim 18, wherein the transmitter is further configured to provide the transmit announcement indication with a request to send (RTS) frame.

21. (Original) The system of claim 20, further comprising a receiver configured to receive, by the first station, a clear to send (CTS) frame from the second station after the first station has transmitted the transmit announcement indication with the RTS frame.

22. (Original) The system of claim 21, wherein the transmitter is further configured to transmit frame second communication frame associated with the transmit announcement indication.

23. (Original) The system of claim 18, wherein the first station comprises one of a wireless radio, desktop computer, portable computer, laptop computer, multi-media players, personal digital assistant (PDA), printer, fax machine, scanner, hub, switch, router, set-top box, and television with communication capability.

24. (New) The method of claim 1, wherein the second communication frame comprises a physical layer (PHY) header without a media access control (MAC) portion.

25. (New) The method of claim 1, wherein the transmit announcement indication comprises a bit inside a MAC header field.

26. (New) The method of claim 25, wherein the bit comprises an high throughput-control field.

27. (New) The method of claim 1, wherein the transmit announcement indication is located within one of a data frame, a management frame, or a control frame.

28. (New) The method of claim 1, wherein the transmit announcement indication precedes a zero-length frame.

29. (New) A method comprising receiving a first communication frame from a first station at a second station, wherein the first communication frame includes a transmit

announcement indication that indicates that a second communication frame intended for the second station will follow the first communication frame.

30. (New) The method of claim 29, further comprising receiving, at the second station, the second communication frame after a short inter frame space (SIFS) that follows the first communication frame.

31. (New) The method of claim 29, further comprising receiving, at the second station, the second communication frame after a short inter frame space (SIFS) that follows a response to the first communication frame.

32. (New) The method of claim 29, wherein the transmit announcement indication comprises a zero-length frame.

33. (New) The method of claim 29, wherein receiving the first communication frame comprises receiving the transmit announcement indication with a request to send (RTS) frame.

34. (New) The method of claim 33, further comprising transmitting a clear to send (CTS) frame from the second station to the first station in response to receiving the RTS frame.

35. (New) The method of claim 29, wherein receiving the first communication frame comprises receiving the transmit announcement indication in a quality of service null (QoS-null) frame.

36. (New) The method of claim 35, further comprising receiving an acknowledgement (ACK) frame at the second station from the first station.

37. (New) The method of claim 29, wherein receiving the first communication frame comprises receiving the transmit announcement indication with a clear to send (CTS) frame.

38. (New) An article of manufacture including a computer-readable medium having instructions stored thereon that, if executed by a computing device, cause the computing device to perform operations comprising receiving a first communication frame from a first station,

wherein the first communication frame includes a transmit announcement indication that indicates that a second communication frame will follow the first communication frame.

39. (New) The article of manufacture of claim 38, wherein the transmit announcement indication comprises a zero-length frame.

40. (New) The article of manufacture of claim 38, wherein the receiving the first communication frame comprises receiving the transmit announcement indication with a request to send (RTS) frame.

41. (New) The article of manufacture of claim 40, wherein the instructions, if executed by a computing device, further cause the computing device to perform operations comprising transmitting a clear to send (CTS) frame to the first station in response to the RTS frame.

42. (New) A system comprising a receiver configured to receive a first communication frame from a first station at a second station, wherein the first communication frame includes a transmit announcement indication that indicates that a second communication frame intended for the second station will follow the first communication frame.

43. (New) The system of claim 42, wherein the transmit announcement indication comprises a zero-length frame.

44. (New) The system of claim 43, wherein the receiver is further configured to receive the transmit announcement indication with a request to send (RTS) frame.

45. (New) The system of claim 44, further comprising a transmitter configured to transmit a clear to send (CTS) frame from the second station to the first station in response to the RTS frame.

46. (New) The system of claim 41, wherein the second station comprises one of a wireless radio, desktop computer, portable computer, laptop computer, multi-media players,

personal digital assistant (PDA), printer, fax machine, scanner, hub, switch, router, set-top box, and television with communication capability.

REMARKS

Applicants respectfully request that the foregoing amendments be entered prior to examination of the present application. Claims 1, 7, and 13-18 have been amended, and new Claims 24-46 have been added. Applicants respectfully submit that no new matter has been added. Support for Claims 24-46 can be found throughout the specification and original claims, for example, in paragraphs [0028]-[0043] of the published specification. Claims 1-46 are now pending in this application.

Favorable consideration of the application as amended is respectfully requested.

The Examiner is invited to contact the undersigned by telephone if it is felt that a telephone interview would advance the prosecution of the present application.

The Commissioner is hereby authorized to charge any additional fees which may be required regarding this application under 37 C.F.R. §§ 1.16-1.17, or credit any overpayment, to Deposit Account No. 19-0741. Should no proper payment be enclosed herewith, as by the credit card payment instructions in EFS-Web being incorrect or absent, resulting in a rejected or incorrect credit card transaction, the Commissioner is authorized to charge the unpaid amount to Deposit Account No. 19-0741. If any extension of time is needed for timely acceptance of papers submitted herewith, Applicants hereby petition for such extension under 37 C.F.R. §1.136 and authorizes payment of any extension fee to Deposit Account No. 19-0741.

Respectfully submitted,

Date July 21, 2010

By _____

FOLEY & LARDNER LLP
Customer Number: 23524
Telephone: (608) 258-4292
Facsimile: (608) 28-4258

Paul S. Hunter
Attorney for Applicant
Registration No. 44,787

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant: Menzo Wentink

Title: TRANSMIT ANNOUNCEMENT INDICATION

Appl. No.: 11/627,181

Filing Date: 1/25/2020

Examiner: Curtis A. Kuntz

Art Unit: 2614

Confirmation Number: 1464

SUPPLEMENTAL INFORMATION DISCLOSURE STATEMENT UNDER 37 CFR §1.56

Mail Stop Amendment
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

Submitted herewith on Form PTO/SB/08 is a listing of documents known to Applicant in order to comply with Applicant's duty of disclosure pursuant to 37 CFR §1.56.

A copy of each non-U.S. patent document and each non-patent document is being submitted to comply with the provisions of 37 CFR §1.97 and §1.98.

The submission of any document herewith, which is not a statutory bar, is not intended as an admission that such document constitutes prior art against the claims of the present application or that such document is considered material to patentability as defined in 37 CFR §1.56(b). Applicant does not waive any rights to take any action which would be appropriate to

antedate or otherwise remove as a competent reference any document which is determined to be a *prima facie* art reference against the claims of the present application.

TIMING OF THE DISCLOSURE

The listed documents are being submitted in compliance with 37 CFR §1.97(b), before the mailing date of the first Office Action on the merits.

RELEVANCE OF EACH DOCUMENT

All of the documents are in English.

Applicant respectfully requests that each listed document be considered by the Examiner and be made of record in the present application and that an initialed copy of Form PTO/SB/08 be returned in accordance with MPEP §609.

Although Applicant believes that no fee is required, the Commissioner is hereby authorized to charge any additional fees which may be due to Deposit Account No. 19-0741.

Respectfully submitted,

Date July 21, 2010

By _____

FOLEY & LARDNER LLP
Customer Number: 23524
Telephone: (608) 258-4292
Facsimile: (608) 258-4258

Paul S. Hunter
Attorney for Applicant
Registration No. 44,787

PTO/SB/08 (09-06)
Approved for use through 03/31/2007. OMB 0651-0031
U.S. Patent and Trademark Office: U.S. DEPARTMENT OF COMMERCE

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

Substitute for form 1449/PTO				*Complete if Known*	
INFORMATION DISCLOSURE STATEMENT BY APPLICANT				**Application Number**	11/627,181
				Filing Date	1/25/2020
Date Submitted: July 21, 2010				**First Named Inventor**	Menzo Wentink
				Art Unit	2614
(use as many sheets as necessary)				Examiner Name	Curtis A. Kuntz
Sheet	1	of	1	Attorney Docket Number	088245-2616

U.S. PATENT DOCUMENTS

Examiner Initials*	Cite No.[1]	Document Number Number-Kind Code[2] *(if known)*	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
		2004/0196871	10-07-2004	TERRY, JOHN	
		5,844,905	12-01-1998	MCKAY ET AL.	

FOREIGN PATENT DOCUMENTS

Examiner Initials*	Cite No.[1]	Foreign Patent Document Country Code[3] Number[4] Kind Code[5] *(if known)*	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Documents	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear	T[6]

NON PATENT LITERATURE DOCUMENTS

Examiner Initials*	Cite No.[1]	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.) date, page(s), volume-issue number(s), publisher, city and/or country where published.	T[6]
		International Preliminary Report on Patentability for PCT/US2007/61058, completed December 18, 2009.	

Examiner Signature		Date Considered	

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant. 1 Applicant's unique citation designation number (optional). 2 See Kinds Codes of USPTO Patent Documents at www.uspto.gov or MPEP 901.04. 3 Enter Office that issued the document, by the two-letter code (WIPO Standard ST.3). 4 For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. 5 Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. 6 Applicant is to place a check mark here if English language Translation is attached. This collection of information is required by 37 CFR 1.97 and 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 2 hours to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 (1-800-786-9199) and select option 2.

MADI_2360640.1

PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

(Chapter II of the Patent Cooperation Treaty)

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference 050337-2220	FOR FURTHER ACTION	See Form PCT/IPEA/416
International application No. PCT/US07/61058	International filing date *(day/month/year)* 25 January 2007 (25.01.2007)	Priority date *(day/month/year)* 25 January 2006 (25.01.2006)
International Patent Classification (IPC) or national classification and IPC IPC: **H04L 12/413**(2006.01) USPC: 370/328,443,448,450;709/227-237		
Applicant CONEXANT SYSTEMS, INC		

1. This report is the international preliminary examination report, established by this International Preliminary Examining Authority under Article 35 and transmitted to the applicant according to Article 36.
2. This REPORT consists of a total of 4 sheets, including this cover sheet.
3. This report is also accompanied by ANNEXES, comprising:
   a. ☐ *(sent to the applicant and to the International Bureau)* a total of 0 sheets, as follows:
      ☐ sheets of the description, claims and/or drawings which have been amended and are the basis of this report and/or sheets containing rectifications authorized by this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions).
      ☐ sheets which supersede earlier sheets, but which this Authority considers contain an amendment that goes beyond the disclosure in the international application as filed, as indicated in item 4 of Box No. I and the Supplemental Box.
   b. ☐ *(sent to the International Bureau only)* a total of (indicate type and number of electronic carrier(s)) _____ , containing a sequence listing and/or tables related thereto, in electronic form only, as indicated in the Supplemental Box Relating to Sequence Listing (see Section 802 of the Administrative Instructions).
4. This report contains indications relating to the following items:
   - ☒ Box No. I Basis of the report
   - ☐ Box No. II Priority
   - ☐ Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
   - ☐ Box No. IV Lack of unity of invention
   - ☒ Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
   - ☐ Box No. VI Certain documents cited
   - ☐ Box No. VII Certain defects in the international application
   - ☐ Box No. VIII Certain observations on the international application

Date of submission of the demand	Date of completion of this report
27 February 2007 (27.02.2007)	18 December 2009 (18.12.2009)
Name and mailing address of the IPEA/ US Mail Stop PCT, Attn: IPEA/US Commissioner for Patents P.O. Box 1450 Alexandria, Virginia 22313-1450 Facsimile No. (571) 273-3201	Authorized officer Dmitry H. Levitan Telephone No. 571-272-3050

Form PCT/IPEA/409 (cover sheet)(April 2007)

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

International application No.
PCT/US07/61058

Box No. I Basis of the report

1. With regard to the **language**, this report is based on:

☒ the international application in the language in which it was filed.

☐ a translation of the international application into English, which is the language of a translation furnished for the purposes of:

☐ international search (under Rules 12.3(a) and 23.1(b))

☐ publication of the international application (under Rule 12.4(a))

☐ international preliminary examination (under Rules 55.2(a) and/or 55.3(a))

2. With regard to the **elements** of the international application, this report is based on *(replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report)*:

☒ the international application as originally filed/furnished

☒ the description:
pages 1-19 as originally filed/furnished
pages* NONE received by this Authority on _____
pages* NONE received by this Authority on _____

☒ the claims:
pages 20-22 as originally filed/furnished
pages* NONE as amended (together with any statement) under Article 19
pages* NONE received by this Authority on _____
pages* NONE received by this Authority on _____

☒ the drawings:
pages 1/10-10/10 as originally filed/furnished
pages* NONE received by this Authority on _____
pages* NONE received by this Authority on _____

☐ a sequence listing and/or any related table(s) - see Supplemental Box Relating to Sequence Listing.

3. ☒ The amendments have resulted in the cancellation of:

☒ the description, pages NONE
☒ the claims, Nos. NONE
☒ the drawings, sheets/figs NONE
☐ the sequence listing (*specify*): _____
☐ any table(s) related to the sequence listing (*specify*): _____

4. ☐ This report has been established as if (some of) the amendments annexed to this report and listed below had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).

☐ the description, pages _____
☐ the claims, Nos. _____
☐ the drawings, sheets/figs _____
☐ the sequence listing (*specify*): _____
☐ any table(s) related to the sequence listing (*specify*): _____

5. ☐ This report has been established taking into account the **rectification of an obvious mistake** authorized by or notified to this Authority under Rule 91 (Rule 70.2(e)).

** If item 4 applies, some or all of those sheets may be marked "superseded."*

Form PCT/IPEA/409 (Box No. I) (April 2007)

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

International application No.
PCT/US07/61058

Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Claims 2 and 3	YES
	Claims 1 and 4-10	NO
Inventive Step (IS)	Claims None	YES
	Claims 2 and 3	NO
Industrial Applicability (IA)	Claims 1-10	YES
	Claims NONE	NO

2. Citations and Explanations (Rule 70.7)

---------- NEW CITATIONS ----------

US 5,844,905 (MCKay et al) 1 December 1998, see column 1 lines 10-30.
US PUB 2004/0196871 A1 (Terry) 7 October 2004, page 3.

Claims 1 and 4-10 lack novelty, as unticipated by McKay (US 5,844,905).
Regarding claims 1 and 10 McKay teaches transmitting a first communication frame, RTS, from station A to station B, providing transmit announcement, RTS, to reserve transmit medium for transmission of more frames from station A, as described on 1:10-30.
Regarding claims 4-9, McKay teaches using RTS request and CTS reply for organizing transmission of multiple frames from station A, including use of receiving ACK at station A; as shown on Fig. 1.

Claims 2 and 3 lack an inventive step under PCT Article 33(3) as being obvious over McKay (US 5,844,905) in view of Terry (US Pub 2004/0196871.
McKay substantially teaches the limitations of parent claims (see claim 1 rejection above).
McKay does not teach using SIFS interval to separate the messages.
Terry teaches using SIFS interval, according to 802.11 standard for separation of the frames/messages on page 3.
It would be obvious to one of ordinary skills in the art to include using SIFS interval to separate messages/frames of McKay to make the system compatible with 802.11 standard.

Form PCT/IPEA/409 (Box No. V) (April 2007)

Electronic Patent Application Fee Transmittal

Application Number:	11627181
Filing Date:	25-Jan-2007
Title of Invention:	Transmit Announcement Indication
First Named Inventor/Applicant Name:	Menzo Wentink
Filer:	Paul S. Hunter
Attorney Docket Number:	088245-2616

Filed as Large Entity

Utility under 35 USC 111(a) Filing Fees

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
Pages:				
Claims:				
Claims in excess of 20	1202	23	52	1196
Independent claims in excess of 3	1201	3	220	660
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Extension-of-Time:				
Miscellaneous:				
		Total in USD ($)		**1856**

Electronic Acknowledgement Receipt

EFS ID:	8058546
Application Number:	11627181
International Application Number:	
Confirmation Number:	1464
Title of Invention:	Transmit Announcement Indication
First Named Inventor/Applicant Name:	Menzo Wentink
Customer Number:	23524
Filer:	Paul S. Hunter
Filer Authorized By:	
Attorney Docket Number:	088245-2616
Receipt Date:	21-JUL-2010
Filing Date:	25-JAN-2007
Time Stamp:	15:15:07
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	Credit Card
Payment was successfully received in RAM	$1856
RAM confirmation Number	1435
Deposit Account	
Authorized User	

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)

1	Miscellaneous Incoming Letter	2616Transmittal.pdf	39242 ec871d4eb5ea425ee2f70dbb5925beb40b427159	no	3
Warnings:					
Information:					
2	Preliminary Amendment	2616PreAmend.pdf	105639 3f6256a67a1885aa33396797a4ac9a50061f0bee	no	9
Warnings:					
Information:					
3		2616IDS.pdf	138541 19783884cf1b1a71d7091c36bf21d3d760470d12	yes	6

Multipart Description/PDF files in .zip description		
Document Description	**Start**	**End**
Transmittal Letter	1	2
Information Disclosure Statement (IDS) Filed (SB/08)	3	3
NPL Documents	4	6

Warnings:					
Information:					
4	Fee Worksheet (PTO-875)	fee-info.pdf	31518 a7f9abdd78e30da171c79fb90c5edf45b924e30a	no	2
Warnings:					
Information:					
			Total Files Size (in bytes):	314940	

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111
If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371
If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office
If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

Atty. Dkt. No. 088245-2616

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant: Menzo Wentink

Title: Transmit Announcement Indication

Appl. No.: 11/627,181

Filing Date: 1/25/2007

Examiner: Curtis A. Kuntz

Art Unit: 2614

Confirmation Number: 1464

AMENDMENT TRANSMITTAL

Mail Stop Amendment
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

Transmitted herewith is an amendment in the above-identified application.

[**X**] The fee required for additional claims is calculated below:

	Claims As Amended		Previously Paid For		Extra Claims Present		Rate		Additional Claims Fee
Total Claims:	46	-	23	=	23	x	$52.00	=	$1196.00
Independent Claims:	6	-	3	=	3	x	$220.00	=	$660.00
First presentation of any Multiple Dependent Claims:						+	$390.00	=	$0.00

	CLAIMS FEE TOTAL =	$1856.00

[ ] Applicant hereby petitions for an extension of time under 37 C.F.R. §1.136(a) for the total number of months checked below:

[ ]	Extension for response filed within the first month:	$130.00	$0.00
[ ]	Extension for response filed within the second month:	$490.00	$0.00
[ ]	Extension for response filed within the third month:	$1,110.00	$0.00
[ ]	Extension for response filed within the fourth month:	$1,730.00	$0.00
[ ]	Extension for response filed within the fifth month:	$2,350.00	$0.00
	EXTENSION FEE TOTAL:		$0.00
[ ]	Statutory Disclaimer Fee under 37 C.F.R. 1.20(d):	$140.00	$0.00
	CLAIMS, EXTENSION AND DISCLAIMER FEE TOTAL:		$1856.00
[ ]	Small Entity Fees Apply (subtract ½ of above):		$0.00
	Extension Fees Previously Paid:		$0.00
	TOTAL FEE:		$1856.00

The above-identified fees of $1856.00 are being paid by credit card via EFS-Web.

The Commissioner is hereby authorized to charge any additional fees which may be required regarding this application under 37 C.F.R. §§ 1.16-1.17, or credit any overpayment, to Deposit Account No. 19-0741. Should no proper payment be enclosed herewith, as by the credit card payment instructions in EFS-Web being incorrect or absent, resulting in a rejected or incorrect credit card transaction, the Commissioner is authorized to charge the unpaid amount to Deposit Account No. 19-0741.

If any extensions of time are needed for timely acceptance of papers submitted herewith, applicant hereby petitions for such extension under 37 C.F.R. §1.136 and authorizes payment of any such extensions fees to Deposit Account No. 19-0741.

Please direct all correspondence to the undersigned attorney or agent indicated below.

Respectfully submitted,

Date July 21, 2010

By _____

FOLEY & LARDNER LLP
Customer Number: 23524
Telephone: (608) 258-4292
Facsimile: (608) 258-4258

Paul S. Hunter
Attorney for Applicant
Registration No. 44,787

PTO/SB/06 (07-06)
Approved for use through 1/31/2007. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875	Application or Docket Number 11/627,181	Filing Date 01/25/2007	☐ To be Mailed

APPLICATION AS FILED – PART I

	(Column 1)	(Column 2)	SMALL ENTITY ☐		OR	OTHER THAN SMALL ENTITY	
FOR	NUMBER FILED	NUMBER EXTRA	RATE ($)	FEE ($)		RATE ($)	FEE ($)
☒ BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A	N/A			N/A	**300**
☒ SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A	N/A			N/A	**500**
☒ EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A			N/A	**200**
TOTAL CLAIMS (37 CFR 1.16(i))	23 minus 20 =	* 3	X $ =		OR	X $50 =	**150**
INDEPENDENT CLAIMS (37 CFR 1.16(h))	3 minus 3 =	* 0	X $ =			X $200 =	**0**
☐ APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is $250 ($125 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).						
☐ MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))							
* If the difference in column 1 is less than zero, enter "0" in column 2.			TOTAL			TOTAL	**1150**

APPLICATION AS AMENDED – PART II

AMENDMENT	07/21/2010	(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	SMALL ENTITY RATE ($)	ADDITIONAL FEE ($)	OR	OTHER THAN SMALL ENTITY RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	* 46	Minus	** 23	= 23	X $ =		OR	X $52=	1196
	Independent (37 CFR 1.16(h))	* 6	Minus	***3	= 3	X $ =		OR	X $220=	660
	☐ Application Size Fee (37 CFR 1.16(s))									
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
						TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE	**1856**

AMENDMENT		(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	RATE ($)	ADDITIONAL FEE ($)		RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	*	Minus	**	=	X $ =		OR	X $ =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=	X $ =		OR	X $ =	
	☐ Application Size Fee (37 CFR 1.16(s))									
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
						TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE	

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.
** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".
*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".
The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1.

Legal Instrument Examiner:
/ADRIANE S. WINSTON/

This collection of information is required by 37 CFR 1.16. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
11/627,181	01/25/2007	Menzo Wentink	088245-2616

CONFIRMATION NO. 1464

23524
FOLEY & LARDNER LLP
150 EAST GILMAN STREET
P.O. BOX 1497
MADISON, WI 53701-1497

POA ACCEPTANCE LETTER

OC000000042121779

Date Mailed: 06/17/2010

NOTICE OF ACCEPTANCE OF POWER OF ATTORNEY

This is in response to the Power of Attorney filed 06/09/2010.

The Power of Attorney in this application is accepted. Correspondence in this application will be mailed to the above address as provided by 37 CFR 1.33.

/skiflemariam/

Office of Data Management, Application Assistance Unit (571) 272-4000, or (571) 272-4200, or 1-888-786-0101

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
11/627,181	01/25/2007	Menzo Wentink	50337-1570

CONFIRMATION NO. 1464

20306
MCDONNELL BOEHNEN HULBERT & BERGHOFF LLP
300 S. WACKER DRIVE
32ND FLOOR
CHICAGO, IL 60606

POWER OF ATTORNEY NOTICE

OC000000042121753

Date Mailed: 06/17/2010

NOTICE REGARDING CHANGE OF POWER OF ATTORNEY

This is in response to the Power of Attorney filed 06/09/2010.

- The Power of Attorney to you in this application has been revoked by the assignee who has intervened as provided by 37 CFR 3.71. Future correspondence will be mailed to the new address of record(37 CFR 1.33).

/skiflemariam/

Office of Data Management, Application Assistance Unit (571) 272-4000, or (571) 272-4200, or 1-888-786-0101

PTO/SB/80 (01-06)
Approved for use through 12-31-2008. OMB 0651-0035
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POWER OF ATTORNEY TO PROSECUTE APPLICATIONS BEFORE THE USPTO

I hereby revoke all previous powers of attorney given in the application identified in the attached statement under 37 CFR 3.73(b).

I hereby appoint:

[X] Practitioners associated with the Customer Number: **23524**

OR

[ ] Practitioner(s) named below (if more than ten patent practitioners are to be named, then a customer number must be used):

Name	Registration Number	Name	Registration Number

as attorney(s) or agent(s) to represent the undersigned before the United States Patent and Trademark Office (USPTO) in connection with any and all patent applications assigned only to the undersigned according to the USPTO assignment records or assignment documents attached to this form in accordance with 37 CFR 3.73(b).

Please change the correspondence address for the application identified in the attached statement under 37 CFR 3.73(b) to:

[X] The address associated with Customer Number: **23524**

OR

[ ] Firm or Individual Name					
Address					
City		State		Zip	
Country		Telephone		Email	

Assignee Name and Address:

XOCYST TRANSFER AG L.L.C.
2711 Centerville Road
Suite 400
Wilmington, DE 19808
USA

A copy of this form, together with a statement under 37 CFR 3.73(b) (Form PTO/SB/96 or equivalent) is required to be filed in each application in which this form is used. The statement under 37 CFR 3.73(b) may be completed by one of the practitioners appointed in this form if the appointed practitioner is authorized to act on behalf of the assignee, and must identify the application in which this Power of Attorney is to be filed.

SIGNATURE of Assignee of Record

The individual whose signature and title is supplied below is authorized to act on behalf of the assignee

Signature	M Melissa Coleman	Date	May 24, 2010
Name	Melissa Coleman	Telephone	
Title	Authorized Person for Xocyst Transfer AG L.L.C.		

This collection of information is required by 37 CFR 1.31, 1.32 and 1.33. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 3 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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MAD(_2290389.1

DECLARATION REGARDING AUTHORITY TO SIGN ON BEHALF OF A LEGAL ENTITY
(37 C.F.R. 3.73(b)(2)(i))

I, Melissa Coleman (whose title is supplied below), hereby declare that I am authorized to sign on behalf of Xocyst Transfer AG L.L.C.

Melissa Coleman
Authorized Person for Xocyst Transfer AG L.L.C.

May 24, 2010
[date]

MADI_2290375.1

Electronic Acknowledgement Receipt

EFS ID:	7758921
Application Number:	11627181
International Application Number:	
Confirmation Number:	1464
Title of Invention:	Transmit Announcement Indication
First Named Inventor/Applicant Name:	Menzo Wentink
Customer Number:	20306
Filer:	Paul S. Hunter/Drew Lawson
Filer Authorized By:	Paul S. Hunter
Attorney Docket Number:	50337-1570
Receipt Date:	09-JUN-2010
Filing Date:	25-JAN-2007
Time Stamp:	14:00:06
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1		2616_POA.pdf	87309 be6148b948840a9013b6d6c2032d6bbe927e2b63	yes	3

	Multipart Description/PDF files in .zip description		
	Document Description	**Start**	**End**
	Assignee showing of ownership per 37 CFR 3.73(b).	1	1
	Power of Attorney	2	3
Warnings:			
Information:			
	Total Files Size (in bytes):	87309	

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111
If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371
If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office
If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

PTO/SB/96 (07-09)
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STATEMENT UNDER 37 CFR 3.73(b)

Applicant/Patent Owner:	Menzo WENTINK		
Application No./Patent No.:	11/627,181	Filed/Issue Date:	1/25/2007
Attorney Docket Number:	088245-2616		
Entitled:	Transmit announcement indication		

XOCYST TRANSFER AG L.L.C. (Name of Assignee)

LLC (Type of Assignee, e.g., corporation, partnership, university, government agency, etc.)

states that it is:

1. ☒ the assignee of the entire right, title, and interest;
2. ☐ an assignee of less than the entire right, title, and interest (The extent (by percentage) of its ownership interest is %); or
3. ☐ the assignee of an undivided interest in the entirety of (a complete assignment from one of the joint inventors was made)

in the patent application/patent identified above by virtue of either:

A. ☐ An assignment from the inventor(s) of the patent application/patent identified above. The assignment was recorded in the United States Patent and Trademark Office at Reel/Frame _____ or for which a copy thereof is attached.

OR

B. ☒ A chain of title from the inventor(s), of the patent application/patent identified above, to the current assignee as follows:

1. From: Menzo WENTINK To: CONEXANT SYSTEMS, INC.
   The document was recorded in the United States Patent and Trademark Office at Reel 020630, Frame 0654, or for which a copy thereof is attached.

2. From: CONEXANT SYSTEMS, INC. To: XOCYST TRANSFER AG L.L.C.
   The document was recorded in the United States Patent and Trademark Office at Reel 022043, Frame 0607, or for which a copy thereof is attached.

3. From: To:
   The document was recorded in the United States Patent and Trademark Office at Reel ___, Frame ___, or for which a copy thereof is attached.

☐ Additional documents in the chain of title are listed on a supplemental sheet.

☐ As required by 37 CFR 3.73(b)(1)(i), the documentary evidence of the chain of title from the original owner to the assignee was, or concurrently is being, submitted for recordation pursuant to 37 CFR 3.11.

[NOTE: A separate copy (i.e., a true copy of the original document(s)) must be submitted to Assignment Division in accordance with 37 CFR Part 3, if the assignment is to be recorded in the records of the USPTO. See MPEP 302.08]

The undersigned (whose title is supplied below) is authorized to act on behalf of the assignee.

Signature	June 7, 2010 Date
Paul S. Hunter (Reg. No. 44,787) Printed or Typed Name	(608) 258-4292 Telephone Number
Attorney for Applicant Title	

This collection of information is required by 37 CFR 3.73(b). The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.

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MADI_2303024.1

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United States Patent and Trademark Office
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www.uspto.gov

APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
11/627,181	01/25/2007	Menzo Wentink	50337-1570

CONFIRMATION NO. 1464

20306
MCDONNELL BOEHNEN HULBERT & BERGHOFF LLP
300 S. WACKER DRIVE
32ND FLOOR
CHICAGO, IL 60606

POA ACCEPTANCE LETTER

OC000000034889502

Date Mailed: 03/11/2009

NOTICE OF ACCEPTANCE OF POWER OF ATTORNEY

This is in response to the Power of Attorney filed 03/03/2009.

The Power of Attorney in this application is accepted. Correspondence in this application will be mailed to the above address as provided by 37 CFR 1.33.

/hgray/

Office of Data Management, Application Assistance Unit (571) 272-4000, or (571) 272-4200, or 1-888-786-0101

UNITED STATES PATENT AND TRADEMARK OFFICE

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United States Patent and Trademark Office
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APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
11/627,181	01/25/2007	Menzo Wentink	50337-1570

CONFIRMATION NO. 1464

24504
THOMAS, KAYDEN, HORSTEMEYER & RISLEY, LLP
600 GALLERIA PARKWAY, S.E.
STE 1500
ATLANTA, GA 30339-5994

POWER OF ATTORNEY NOTICE

OC000000034889470

Date Mailed: 03/11/2009

NOTICE REGARDING CHANGE OF POWER OF ATTORNEY

This is in response to the Power of Attorney filed 03/03/2009.

- The Power of Attorney to you in this application has been revoked by the assignee who has intervened as provided by 37 CFR 3.71. Future correspondence will be mailed to the new address of record(37 CFR 1.33).

/hgray/

Office of Data Management, Application Assistance Unit (571) 272-4000, or (571) 272-4200, or 1-888-786-0101

PTO/SB/80 (01-06)
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U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
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POWER OF ATTORNEY TO PROSECUTE APPLICATIONS BEFORE THE USPTO

I hereby revoke all previous powers of attorney given in the application identified in the attached statement under 37 CFR 3.73(b).

I hereby appoint:

☒ Practitioners associated with the Customer Number: 20306

OR

☐ Practitioner(s) named below (If more than ten patent practitioners are to be named, then a customer number must be used):

Name	Registration Number	Name	Registration Number

as attorney(s) or agent(s) to represent the undersigned before the United States Patent and Trademark Office (USPTO) in connection with any and all patent applications assigned only to the undersigned according to the USPTO assignment records or assignment documents attached to this form in accordance with 37 CFR 3.73(b).

Please change the correspondence address for the application identified in the attached statement under 37 CFR 3.73(b) to:

☒ The address associated with Customer Number: 20306

OR

☐ Firm or Individual Name			
Address			
City		State	Zip
Country			
Telephone		Email	

Assignee Name and Address:
Xocyst Transfer AG L.L.C.
2711 Centerville Road, Suite 400
Wilmington, DE 19808

A copy of this form, together with a statement under 37 CFR 3.73(b) (Form PTO/SB/96 or equivalent) is required to be filed in each application in which this form is used. The statement under 37 CFR 3.73(b) may be completed by one of the practitioners appointed in this form if the appointed practitioner is authorized to act on behalf of the assignee, and must identify the application in which this Power of Attorney is to be filed.

SIGNATURE of Assignee of Record

The individual whose signature and title is supplied below is authorized to act on behalf of the assignee

Signature	Melissa Coleman	Date	12.9.08
Name	Melissa Coleman	Telephone	
Title	Authorized Person for Xocyst Transfer AG L.L.C.		

This collection of information is required by 37 CFR 1.31, 1.32 and 1.33. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 3 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

American LegalNet, Inc.
www.USCourtForms.com

APPENDIX

Issued Patents

Line No.	Patent Number	Title	Issue Date	Recordation Information
1.	5,828,692	BASEBAND DEMODULATOR FOR POLAR OR RECTANGULAR MODULATED SIGNAL IN A CORDLESS SPREAD SPECTRUM TELEPHONE	10/27/1998	Reel/Frame: 007898/0071 Assignors: WALLEY, JOHN S. Assignee: ROCKWELL INTERNATIONAL CORPORATION Reel/Frame: 018847/0871 Assignors: ROCKWELL INTERNATIONAL CORPORATION Assignee: ROCKWELL SCIENCE CENTER, INC. Reel/Frame: 010415/0761 Assignors: ROCKWELL SCIENCE CENTER, LLC Assignee: CONEXANT SYSTEMS, INC. Reel/Frame: 022043/0607 Assignors: CONEXANT SYSTEMS, INC. Assignee: XOCYST TRANSFER AG L.L.C.
2.	6,353,413	MULTI-FUNCTION UNIVERSAL CONTROLLER AND LOCATOR SYSTEMS	03/05/2002	Reel/Frame: 020031/0952 Assignors: WHITE, STANLEY A., ET AL. Assignee: ROCKWELL SCIENCE CENTER, INC. Reel/Frame: 020035/0018 Assignors: ROCKWELL SCIENCE CENTER, LLC Assignee: CONEXANT SYSTEMS, INC. Reel/Frame: 022043/0607 Assignors: CONEXANT SYSTEMS, INC. Assignee: XOCYST TRANSFER AG L.L.C.
3.	7,174,138	POWER-BASED HARDWARE DIVERSITY	02/06/2007	Reel/Frame: 016013/0386 Assignors: WEBSTER, MARK A., ET AL. Assignee: CONEXANT SYSTEMS, INC. Reel/Frame: 022043/0607 Assignors: CONEXANT SYSTEMS, INC. Assignee: XOCYST TRANSFER AG L.L.C.
4.	7,447,261	ADAPTIVE FREQUENCY EQUALIZER	11/04/2008	Reel/Frame: 015990/0117 Assignors: SHEARER, DANIEL D., ET AL. Assignee: CONEXANT SYSTEMS, INC. Reel/Frame: 022043/0607 Assignors: CONEXANT SYSTEMS, INC. Assignee: XOCYST TRANSFER AG L.L.C.
5.	7,398,408	SYSTEMS AND METHODS FOR WAKING UP WIRELESS LAN DEVICES	07/08/2008	Reel/Frame: 016028/0948 Assignors: PALJUG, MICHAEL, ET AL. Assignee: CONEXANT SYSTEMS, INC.

				Reel/Frame: 022043/0607 Assignors: CONEXANT SYSTEMS, INC. Assignee: XOCYST TRANSFER AG L.L.C.
6.	7,272,109	MODIFIED OFDM SUBCARRIER PROFILE	09/18/2007	Reel/Frame: 016208/0511 Assignors: WEBSTER, MARK A., ET AL. Assignee: CONEXANT SYSTEMS, INC. Reel/Frame: 022043/0607 Assignors: CONEXANT SYSTEMS, INC. Assignee: XOCYST TRANSFER AG L.L.C.

APPENDIX

Pending Applications

Line No.	Application Number	Title	Filing Date	Recordation Information
7.	10/977,469	INDEPENDENT DIRECT LINK PROTOCOL	11/01/2004	Reel/Frame: 016329/0091 Assignors: WENTINK, MENZO, ET AL. Assignee: CONEXANT SYSTEMS, INC. Reel/Frame: 022043/0607 Assignors: CONEXANT SYSTEMS, INC. Assignee: XOCYST TRANSFER AG L.L.C.
8.	10/977,470	AUTOMATIC PEER DISCOVERY	11/01/2004	Reel/Frame: 016329/0098 Assignors: WENTINK, MENZO, ET AL. Assignee: CONEXANT SYSTEMS, INC. Reel/Frame: 022043/0607 Assignors: CONEXANT SYSTEMS, INC. Assignee: XOCYST TRANSFER AG L.L.C.
9.	10/977,490	LOCATION AWARENESS IN WIRELESS NETWORKS	11/01/2004	Reel/Frame: 016276/0300 Assignors: GODFREY, TIMOTHY Assignee: CONEXANT SYSTEMS, INC. Reel/Frame: 022043/0607 Assignors: CONEXANT SYSTEMS, INC. Assignee: XOCYST TRANSFER AG L.L.C.
10.	11/035,065	POWER MANAGEMENT FOR WIRELESS DIRECT LINK	01/14/2005	Reel/Frame: 016176/0192 Assignors: WENTINK, MENZO, ET AL. Assignee: CONEXANT SYSTEMS, INC. Reel/Frame: 022043/0607 Assignors: CONEXANT SYSTEMS, INC. Assignee: XOCYST TRANSFER AG L.L.C.
11.	11/839,152	METHOD FOR MITIGATING ADVERSE PROCESSOR LOADING IN A PERSONAL COMPUTER IMPLEMENTATION OF A WIRELESS LOCAL AREA NETWORK ADAPTER	08/15/2007	Reel/Frame: 021340/0829 Assignors: SCHULTZ, RICHARD DOUGLAS, ET AL. Assignee: CONEXANT SYSTEMS, INC. Reel/Frame: 022043/0607 Assignors: CONEXANT SYSTEMS, INC. Assignee: XOCYST TRANSFER AG L.L.C.
12.	10/830,570	SIGNALING EXTENDED FUNCTIONALITY AND MANAGEMENT INFORMATION IN A NETWORK	04/23/2004	Reel/Frame: 014759/0610 Assignors: FISCHER, MICHAEL ANDREW, ET AL. Assignee: CONEXANT SYSTEMS, INC. Reel/Frame: 022043/0607 Assignors: CONEXANT SYSTEMS, INC. Assignee: XOCYST TRANSFER AG L.L.C.
13.	10/830,575	MANAGING COEXISTENCE OF SEPARATE PROTOCOLS SHARING THE SAME COMMUNICATIONS CHANNEL	04/23/2004	Reel/Frame: 014874/0546 Assignors: FISCHER, MICHAEL ANDREW, ET AL. Assignee: CONEXANT SYSTEMS, INC.

				Reel/Frame: 022043/0607 Assignors: CONEXANT SYSTEMS, INC. Assignee: XOCYST TRANSFER AG L.L.C.
14.	10/861,064	MANAGING AN ACCESS POINT IN THE PRESENCE OF SEPARATE PROTOCOLS THAT SHARE THE SAME COMMUNICATIONS CHANNEL	06/04/2004	Reel/Frame: 014874/0569 Assignors: GODFREY, TIMOTHY GORDON, ET AL. Assignee: CONEXANT SYSTEMS, INC. Reel/Frame: 022043/0607 Assignors: CONEXANT SYSTEMS, INC. Assignee: XOCYST TRANSFER AG L.L.C.
15.	10/861,065	INTELLIGENT DOWNSTREAM TRAFFIC DELIVERY TO MULTI-PROTOCOL STATIONS	06/04/2004	Reel/Frame: 014874/0569 Assignors: GODFREY, TIMOTHY GORDON, ET AL. Assignee: CONEXANT SYSTEMS, INC. Reel/Frame: 022043/0607 Assignors: CONEXANT SYSTEMS, INC. Assignee: XOCYST TRANSFER AG L.L.C.
16.	10/861,066	METHOD AND APPARATUS FOR VEHICLE TRACKING AND CONTROL	06/04/2004	Reel/Frame: 015434/0482 Assignors: GODFREY, TIMOTHY GORDON, ET AL. Assignee: CONEXANT SYSTEMS, INC. Reel/Frame: 022043/0607 Assignors: CONEXANT SYSTEMS, INC. Assignee: XOCYST TRANSFER AG L.L.C.
17.	12/168,706	SYSTEMS AND METHODS FOR WAKE-ON-LAN FOR WIRELESS LAN DEVICES	07/07/2008	Reel/Frame: 021443/0717 Assignors: PALJUG, MICHAEL Assignee: CONEXANT SYSTEMS, INC. Reel/Frame: 022043/0607 Assignors: CONEXANT SYSTEMS, INC. Assignee: XOCYST TRANSFER AG L.L.C.
18.	11/033,524	METHOD AND SYSTEM FOR HIGH DATA RATE MULTI-CHANNEL WLAN ARCHITECTURE	01/12/2005	Reel/Frame: 016506/0056 Assignors: WEBSTER, MARK A., ET AL. Assignee: CONEXANT SYSTEMS, INC. Reel/Frame: 022043/0607 Assignors: CONEXANT SYSTEMS, INC. Assignee: XOCYST TRANSFER AG L.L.C.
19.	11/083,080	MULTICHANNEL MAC DATA STREAM FOR WIRELESS COMMUNICATION	03/18/2005	Reel/Frame: 018862/0395 Assignors: WENTINK, MENZO Assignee: CONEXANT SYSTEMS, INC. Reel/Frame: 022043/0607 Assignors: CONEXANT SYSTEMS, INC. Assignee: XOCYST TRANSFER AG L.L.C.
20.	11/105,909	DUAL MODE COMMUNICATION SYSTEMS AND METHODS	04/13/2005	Reel/Frame: 016654/0241 Assignors: SEALS, MICHAEL J., ET AL. Assignee: CONEXANT SYSTEMS, INC. Reel/Frame: 022043/0607

				Assignors: CONEXANT SYSTEMS, INC. Assignee: XOCYST TRANSFER AG L.L.C.
21.	11/106,915	PACKET GENERATION SYSTEMS AND METHODS	04/15/2005	Reel/Frame: 016200/0420 Assignors: WEBSTER, MARK A., ET AL. Assignee: CONEXANT SYSTEMS, INC. Reel/Frame: 022043/0607 Assignors: CONEXANT SYSTEMS, INC. Assignee: XOCYST TRANSFER AG L.L.C.
22.	11/121,661	CYCLIC DIVERSITY SYSTEMS AND METHODS	05/04/2005	Reel/Frame: 016541/0490 Assignors: WEBSTER, MARK A., ET AL. Assignee: CONEXANT SYSTEMS, INC. Reel/Frame: 022043/0607 Assignors: CONEXANT SYSTEMS, INC. Assignee: XOCYST TRANSFER AG L.L.C.
23.	11/159,812	LEGACY COMPATIBLE SPATIAL MULTIPLEXING SYSTEMS AND METHODS	06/22/2005	Reel/Frame: 016639/0012 Assignors: WEBSTER, MARK A., ET AL. Assignee: CONEXANT SYSTEMS, INC. Reel/Frame: 022043/0607 Assignors: CONEXANT SYSTEMS, INC. Assignee: XOCYST TRANSFER AG L.L.C.
24.	11/186,260	PACKET PROCESSING SYSTEMS AND METHODS	07/21/2005	Reel/Frame: 016678/0134 Assignors: WEBSTER, MARK A., ET AL. Assignee: CONEXANT SYSTEMS, INC. Reel/Frame: 022043/0607 Assignors: CONEXANT SYSTEMS, INC. Assignee: XOCYST TRANSFER AG L.L.C.
25.	11/185,665	PACKET GENERATION SYSTEMS AND METHODS	07/20/2005	Reel/Frame: 016643/0802 Assignors: WEBSTER, MARK A., ET AL. Assignee: CONEXANT SYSTEMS, INC. Reel/Frame: 022043/0607 Assignors: CONEXANT SYSTEMS, INC. Assignee: XOCYST TRANSFER AG L.L.C.
26.	11/203,617	SYSTEMS AND METHODS FOR DECREASING LATENCY IN A DIGITAL TRANSMISSION SYSTEM	08/12/2005	Reel/Frame: 018804/0373 Assignors: HEDBERG, DAVID, ET AL. Assignee: CONEXANT SYSTEMS, INC. Reel/Frame: 022043/0607 Assignors: CONEXANT SYSTEMS, INC. Assignee: XOCYST TRANSFER AG L.L.C.
27.	11/433,599	CODING SYSTEMS AND METHODS	05/12/2006	Reel/Frame: 017865/0305 Assignors: HEDBERG, DAVID Assignee: CONEXANT SYSTEMS, INC. Reel/Frame: 022043/0607 Assignors: CONEXANT SYSTEMS, INC. Assignee: XOCYST TRANSFER AG L.L.C.
28.	11/314,143	SYSTEMS AND METHODS FOR THE CONNECTION AND REMOTE CONFIGURATION	12/21/2005	Reel/Frame: 017404/0053 Assignors: WENTINK, MENZO, ET AL.

		OF WIRELESS CLIENTS		Assignee: CONEXANT SYSTEMS, INC. Reel/Frame: 022043/0607 Assignors: CONEXANT SYSTEMS, INC. Assignee: XOCYST TRANSFER AG L.L.C.
29.	11/314,149	SYSTEMS AND METHODS FOR DEVICE DISCOVERY	12/21/2005	Reel/Frame: 017416/0241 Assignors: WEBSTER, MARK A., ET AL. Assignee: CONEXANT SYSTEMS, INC. Reel/Frame: 022043/0607 Assignors: CONEXANT SYSTEMS, INC. Assignee: XOCYST TRANSFER AG L.L.C.
30.	11/410,707	BEAMFORMING SYSTEMS AND METHODS	04/25/2006	Reel/Frame: 018043/0355 Assignors: WEBSTER, MARK A., ET AL. Assignee: CONEXANT SYSTEMS, INC. Reel/Frame: 022043/0607 Assignors: CONEXANT SYSTEMS, INC. Assignee: XOCYST TRANSFER AG L.L.C.
31.	11/411,619	SYSTEMS AND METHODS FOR TRANSMITTER DIVERSITY EXPANSION	04/26/2006	Reel/Frame: 018043/0463 Assignors: WEBSTER, MARK A., ET AL. Assignee: CONEXANT SYSTEMS, INC. Reel/Frame: 022043/0607 Assignors: CONEXANT SYSTEMS, INC. Assignee: XOCYST TRANSFER AG L.L.C.
32.	11/448,603	METHOD OF CODING DATA	06/06/2006	Reel/Frame: 018176/0506 Assignors: MITTELSTEADT, CIMARRON, ET AL. Assignee: CONEXANT SYSTEMS, INC. Reel/Frame: 022043/0607 Assignors: CONEXANT SYSTEMS, INC. Assignee: XOCYST TRANSFER AG L.L.C.
33.	11/549,438	MAC PROTECTION	10/13/2006	Reel/Frame: 018389/0627 Assignors: WENTINK, MENZO, ET AL. Assignee: CONEXANT SYSTEMS, INC. Reel/Frame: 022043/0607 Assignors: CONEXANT SYSTEMS, INC. Assignee: XOCYST TRANSFER AG L.L.C.
34.	11/556,916	SYSTEMS AND METHODS FOR FACILITATING COMMUNICATION BETWEEN COMMUNICATION DEVICES	11/06/2006	REEL/FRAME: 018789/0982 ASSIGNORS: WENTINK, MENZO, ET AL. ASSIGNEE: CONEXANT SYSTEMS, INC. REEL/FRAME: 022134/0518 ASSIGNORS: CONEXANT SYSTEMS, INC. ASSIGNEE: XOCYST TRANSFER AG L.L.C.
35.	11/557,516	COLLISION AVOIDANCE SYSTEMS AND METHODS	11/08/2006	Reel/Frame: 018493/0986 Assignors: WENTINK, MENZO Assignee: CONEXANT SYSTEMS, INC. Reel/Frame: 022043/0607

				Assignors: CONEXANT SYSTEMS, INC. Assignee: XOCYST TRANSFER AG L.L.C.
36.	11/651,879	SYMMETRIC TRANSMIT OPPORTUNITY (TXOP) TRUNCATION	01/10/2007	Reel/Frame: 018782/0584 Assignors: WENTINK, MENZO Assignee: CONEXANT SYSTEMS, INC. Reel/Frame: 022043/0607 Assignors: CONEXANT SYSTEMS, INC. Assignee: XOCYST TRANSFER AG L.L.C.
37.	11/613,020	MORE POWER SAVE MULTI-POLL INDICATION	12/19/2006	Reel/Frame: 018995/0126 Assignors: WENTINK, MENZO Assignee: CONEXANT SYSTEMS, INC. Reel/Frame: 022043/0607 Assignors: CONEXANT SYSTEMS, INC. Assignee: XOCYST TRANSFER AG L.L.C.
38.	11/627,181	TRANSMIT ANNOUNCEMENT INDICATION	01/25/2007	Reel/Frame: 020630/0654 Assignors: WENTINK, MENZO Assignee: CONEXANT SYSTEMS, INC. Reel/Frame: 022043/0607 Assignors: CONEXANT SYSTEMS, INC. Assignee: XOCYST TRANSFER AG L.L.C.
39.	11/638,157	DUAL CTS PROTECTION SYSTEMS AND METHODS	12/13/2006	Reel/Frame: 018680/0742 Assignors: WENTINK, MENZO Assignee: CONEXANT SYSTEMS, INC. Reel/Frame: 022043/0607 Assignors: CONEXANT SYSTEMS, INC. Assignee: XOCYST TRANSFER AG L.L.C.
40.	11/680,612	METHODS AND SYSTEMS FOR LDPC CODING	02/28/2007	Reel/Frame: 019555/0669 Assignors: KOSE, CENK Assignee: CONEXANT SYSTEMS, INC. Reel/Frame: 022043/0607 Assignors: CONEXANT SYSTEMS, INC. Assignee: XOCYST TRANSFER AG L.L.C.
41.	11/683,526	TRANSMISSION USING A PLURALITY OF PROTOCOLS	03/08/2007	Reel/Frame: 018980/0592 Assignors: CARTER, TRENT, ET AL. Assignee: CONEXANT SYSTEMS, INC. Reel/Frame: 022043/0607 Assignors: CONEXANT SYSTEMS, INC. Assignee: XOCYST TRANSFER AG L.L.C.
42.	11/686,147	POWER SAVE IMPROVEMENT	03/14/2007	Reel/Frame: 019011/0698 Assignors: WENTINK, MENZO Assignee: CONEXANT SYSTEMS, INC. Reel/Frame: 022043/0607 Assignors: CONEXANT SYSTEMS, INC. Assignee: XOCYST TRANSFER AG L.L.C.
43.	11/688,274	SLEEP MODE SYSTEMS AND METHODS	03/20/2007	Reel/Frame: 019033/0419 Assignors: CARTER, TRENT R.

				Assignee: CONEXANT SYSTEMS, INC. Reel/Frame: 022043/0607 Assignors: CONEXANT SYSTEMS, INC. Assignee: XOCYST TRANSFER AG L.L.C.
44.	11/750,684	ACCESS POINT POLLING SYSTEMS AND METHODS	05/18/2007	Reel/Frame: 019374/0776 Assignors: WENTINK, MENZO Assignee: CONEXANT SYSTEMS, INC. Reel/Frame: 022043/0607 Assignors: CONEXANT SYSTEMS, INC. Assignee: XOCYST TRANSFER AG L.L.C.
45.	11/750,693	COMMUNICATION ROAMING SYSTEMS AND METHODS	05/18/2007	Reel/Frame: 019315/0231 Assignors: WENTINK, MENZO Assignee: CONEXANT SYSTEMS, INC. Reel/Frame: 022043/0607 Assignors: CONEXANT SYSTEMS, INC. Assignee: XOCYST TRANSFER AG L.L.C.
46.	10/460,684	METHOD FOR MINIMIZING RECEIVE PACKAGE PROCESSING FOR A PERSONAL COMPUTER IMPLEMENTATION OF A WIRELESS LOCAL AREA NETWORK ADAPTER	06/12/2003	REEL/FRAME: 018000/0476 ASSIGNORS: SCHULTZ, RICHARD DOUGLAS ET AL. ASSIGNEE: CONEXANT SYSTEMS, INC. REEL/FRAME: 022043/0607 ASSIGNORS: CONEXANT SYSTEMS, INC. ASSIGNEE: XOCYST TRANSFER AG L.L.C.
47.	10/625,799	METHOD FOR MITIGATING ADVERSE PROCESSOR LOADING IN A PERSONAL COMPUTER IMPLEMENTATION OF A WIRELESS LOCAL AREA NETWORK ADAPTER	07/23/2003	REEL/FRAME: 018000/ 0130 ASSIGNORS: SCHULTZ, RICHARD, ET AL. ASSIGNEE: CONEXANT SYSTEMS, INC. REEL/FRAME: 022043/0607 ASSIGNORS: CONEXANT SYSTEMS, INC. ASSIGNEE: XOCYST TRANSFER AG L.L.C.
48.	12/246,219	ADAPTIVE FREQUENCY EQUALIZER	10/06/2008	REEL/FRAME: 015990/0117 ASSIGNORS: SHEARER, DANIEL D., ET AL. ASSIGNEE: CONEXANT SYSTEMS, INC. REEL/FRAME: 022043/0607 ASSIGNORS: CONEXANT SYSTEMS, INC. ASSIGNEE: XOCYST TRANSFER AG L.L.C.
49.	11/239,657	SYSTEM AND METHOD FOR NON-INTERFERING SIGNALING AND RECEPTION OF OVERLAPPING SINGLE CARRIER TRANSMISSIONS OVER DELAY SPREAD CHANNELS	09/28/2005	REEL/FRAME: 018307/0337 ASSIGNORS: EIDSON, DONALD BRIAN ASSIGNEE: CONEXANT SYSTEMS, INC. REEL/FRAME: 022043/0607 ASSIGNORS: CONEXANT SYSTEMS, INC. ASSIGNEE: XOCYST TRANSFER AG L.L.C.

Electronic Acknowledgement Receipt

EFS ID:	4864916
Application Number:	11627181
International Application Number:	
Confirmation Number:	1464
Title of Invention:	Transmit Announcement Indication
First Named Inventor/Applicant Name:	Menzo Wentink
Customer Number:	24504
Filer:	Robert Johnson Irvine
Filer Authorized By:	
Attorney Docket Number:	50337-1570
Receipt Date:	03-MAR-2009
Filing Date:	25-JAN-2007
Time Stamp:	19:22:45
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Assignee showing of ownership per 37 CFR 3.73(b).	08-1387-US-Statement.pdf	74500 b44703d9b5ca019b6599c792d0fb4f86ef2211a0	no	1

Warnings:	
Information:	

2	Power of Attorney	POA.pdf	43382 3df8a49bb4ba5c215c99eed21e056b57eedb4020	no	1
Warnings:					
Information:					
3	Miscellaneous Incoming Letter	Appendix_2.pdf	84656 66c9c76f39b0ee727bff7744f7497fdf8b682c22	no	8
Warnings:					
Information:					
			Total Files Size (in bytes):	202538	

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111
If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371
If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office
If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

PTO/SB/96 (01-08)
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STATEMENT UNDER 37 CFR 3.73(b)

Applicant/Patent Owner: XOCYST TRANSFER AG L.L.C.

Application No./Patent No.: 11/627,181 Filed/Issue Date: 01/25/2007

Entitled: TRANSMIT ANNOUNCEMENT INDICATION

XOCYST TRANSFER AG L.L.C., a corporation
(Name of Assignee) (Type of Assignee, e.g., corporation, partnership, university, government agency, etc.)

states that it is:

1. ☒ the assignee of the entire right, title, and interest; or

2. ☐ an assignee of less than the entire right, title and interest
(The extent (by percentage) of its ownership interest is _____%)

in the patent application/patent identified above by virtue of either:

A. ☐ An assignment from the inventor(s) of the patent application/patent identified above. The assignment was recorded in the United States Patent and Trademark Office at Reel _____, Frame _____, or for which a copy thereof is attached.

OR

B. ☒ A chain of title from the inventor(s), of the patent application/patent identified above, to the current assignee as follows:

1. From: See attached Appendix, line 38 To: _____
The document was recorded in the United States Patent and Trademark Office at
Reel _____, Frame _____, or for which a copy thereof is attached.

2. From: _____ To: _____
The document was recorded in the United States Patent and Trademark Office at
Reel _____, Frame _____, or for which a copy thereof is attached.

3. From: _____ To: _____
The document was recorded in the United States Patent and Trademark Office at
Reel _____, Frame _____, or for which a copy thereof is attached.

☒ Additional documents in the chain of title are listed on a supplemental sheet.

☒ As required by 37 CFR 3.73(b)(1)(i), the documentary evidence of the chain of title from the original owner to the assignee was, or concurrently is being, submitted for recordation pursuant to 37 CFR 3.11.

[NOTE: A separate copy *(i.e.,* a true copy of the original assignment document(s)) must be submitted to Assignment Division in accordance with 37 CFR Part 3, to record the assignment in the records of the USPTO. See MPEP 302.08]

The undersigned (whose title is supplied below) is authorized to act on behalf of the assignee.

/Robert J. Irvine III/	February 24, 2009
Signature	Date
Robert J. Irvine III	312-913-0001
Printed or Typed Name	Telephone Number
Attorney of Record	
Title	

This collection of information is required by 37 CFR 3.73(b). The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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American LegalNet, Inc.
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PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In Re Application of:

Menzo Wentlink

Serial No.: **11/627,181**

Filed: **01/25/2007**

For: **Transmit Announcement Indication**

Confirmation No.: **1464**

Group Art Unit: **2614**

Examiner:

Docket No. **050337-1570**

INFORMATION DISCLOSURE STATEMENT

Mail Stop Amendment
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450

Sir:

This information disclosure statement is filed in accordance with 37 C.F.R. §§ 1.56, 1.97, and 1.98, and specifically:

☒ under 37 CFR 1.97(b), or
(within Three months of filing national application; or date of entry of international application; or before mailing date of first office action on the merits; whichever occurs last)

☐ under 37 CFR 1.97(c) together with either a:
- ☐ Statement Under 37 C.F.R. 1.97(e), or
- ☐ a $180.00 fee under 37 CFR 1.17(p), or

(After the CFR 1.97(b) time period, but before the final office action or notice of allowance, whichever occurs first)

☐ under 37 CFR 1.97(d) together with a:
- ☐ Statement under 37 CFR 1.97(e), and
- ☐ a $180.00 petition fee set forth in 37 CFR 1.17(p).

(Filed after final office action or notice of allowance, whichever occurs first, but before payment of the issue fee)

☐ Enclosed is a check in the amount of $.

☐ Payment by credit card.

☐ Please charge $ to deposit account .

☒ At any time during the pendency of this application, please charge any fees required to Deposit Account 20-0778 pursuant to 37 CFR 1.25. The Commissioner is hereby requested to credit any overpayment to Deposit Account No. 20-0778.

☒ Applicant(s) submit herewith *Form PTO SB/08A-08B-08a - Information Disclosure Statement by Applicant* together with copies (where required) of patents, publications or other information of which applicant(s) are aware, which applicant(s) believe(s) may or may not be material to the examination of this application and for which there may be a duty to disclose in accordance with 37 CFR 1.56. As required by 37 C.F.R. §1.98(a), a legible copy of each document is provided.

☐ A concise explanation of the relevance of foreign language patents, foreign language publications and other foreign language information listed on PTO Form SB/08A-08B-08a, as presently understood by the individual(s) designated in 37 CFR 1.56(c) most knowledgeable about the content is given on the attached sheet, or where a foreign language patent is cited in a search report or other action by a foreign patent office in a counterpart foreign application, an English language version of the search report or action which indicates the degree of relevance found by the foreign office is listed on the form PTO SB/08A-08B-08a and is enclosed herewith.

The following rights are reserved by the Applicant(s): the right to establish the patentability of the claimed invention over any of the listed documents should they be applied as reference, and/or the right to prove that some of these documents may not be prior art, and/or the right to prove that some of these documents may not be enabling for the teachings they purport to offer.

This statement should not be construed as a representation that an exhaustive search has been made, or that information more material to the examination of the present application does not exist. Any statements or identifications regarding the relevance of any portion(s) of cited references should not be construed as a representation that the most relevant portion(s) have been identified, and the absence of such statements or identifications should not be construed as representations that there are no relevant portion(s). The Examiner is specifically requested not to rely solely on the materials submitted herewith. The Examiner is requested to conduct an independent and thorough review of the documents, and to form independent opinions as to their significance.

It is requested that the information disclosed herein be made of record in this application and that the Examiner initial and return a copy of the enclosed PTO SB/08A-08B-08a to indicate the documents have been considered.

Respectfully Submitted,

THOMAS, KAYDEN, HORSTEMEYER & RISLEY, L.L.P.

By: _____/BAB/_____
Benjie Balser, Reg. No. 58,169

600 Galleria Parkway, S.E.
Suite 1500
Atlanta, Georgia 30339-5994
Phone: (770) 933-9500
Fax: (770) 951-0933

PTO/SB/08a (05-07)
Approved for use through 11/30/2007. OMB 0651-0031
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INFORMATION DISCLOSURE STATEMENT BY APPLICANT (**Not for submission under 37 CFR 1.99)**		
	Application Number	11627181
	Filing Date	2007-01-25
	First Named Inventor	Menzo Wentink
	Art Unit	2614
	Examiner Name	
	Attorney Docket Number	050337-1570

U.S.PATENTS						Remove
Examiner Initial*	Cite No	Patent Number	Kind Code[1]	Issue Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
	1	6842460		2005-01-11	Olkkonen et al.	
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	1	20050124294		2005-06-09	Wentink	
	2	20050243849		2005-11-03	Wentink	
	3	20030231608		2003-12-18	Wentink	
	4	20050059347		2005-03-17	Haartsen	
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INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	11627181
	Filing Date	2007-01-25
	First Named Inventor	Menzo Wentink
	Art Unit	2614
	Examiner Name	
	Attorney Docket Number	050337-1570

	1							☐

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NON-PATENT LITERATURE DOCUMENTS Remove

Examiner Initials*	Cite No	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc), date, pages(s), volume-issue number(s), publisher, city and/or country where published.	T[5]
	1	International Search Report and Written Opinion	☐

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EXAMINER SIGNATURE

Examiner Signature		Date Considered	

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through a citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

[1] See Kind Codes of USPTO Patent Documents at www.USPTO.GOV or MPEP 901.04. [2] Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). [3] For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. [4] Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. [5] Applicant is to place a check mark here if English language translation is attached.

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	11627181
	Filing Date	2007-01-25
	First Named Inventor	Menzo Wentink
	Art Unit	2614
	Examiner Name	
	Attorney Docket Number	050337-1570

CERTIFICATION STATEMENT

Please see 37 CFR 1.97 and 1.98 to make the appropriate selection(s):

☒ That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).

OR

☐ That no item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the information disclosure statement was known to any individual designated in 37 CFR 1.56(c) more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(2).

☐ See attached certification statement.

☐ Fee set forth in 37 CFR 1.17 (p) has been submitted herewith.

☐ None

SIGNATURE

A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

Signature	/BAB/	Date (YYYY-MM-DD)	2008-01-18
Name/Print	Benjie Balser	Registration Number	58,169

This collection of information is required by 37 CFR 1.97 and 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 1 hour to complete, including gathering, preparing and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

Privacy Act Statement

The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether the Freedom of Information Act requires disclosure of these record s.

2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.

3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.

4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).

5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.

6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).

7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.

8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspections or an issued patent.

9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

From the INTERNATIONAL SEARCHING AUTHORITY

To:
SCOTT A. HORSTEMEYER
THOMAS, KAYDEN, HORSTEMEYER & RISLEY,
LLP
100 GALLERIA PARKWAY, N.W.
SUITE 1750
ATLANTA, GEORGIA 30339

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NOTIFICATION OF TRANSMITTAL OF THE INTERNATIONAL SEARCH REPORT AND THE WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY, OR THE DECLARATION

(PCT Rule 44.1)

	Date of mailing *(day/month/year)*
Applicant's or agent's file reference 50337-2220	**FOR FURTHER ACTION** See paragraphs 1 and 4 below
International application No. PCT/US07/61058	International filing date *(day/month/year)* 25 January 2007
Applicant CONEXANT SYSTEMS, INC.	

1. ☒ The applicant is hereby notified that the international search report and the written opinion of the International Searching Authority have been established and are transmitted herewith.

   Filing of amendments and statement under Article 19:
   The applicant is entitled, if he so wishes, to amend the claims of the international application (see Rule 46):

   When? The time limit for filing such amendments is normally two months from the date of transmittal of the international search report.

   Where? Directly to the International Bureau of WIPO, 34 chemin des Colombettes 1211 Geneva 20, Switzerland, Facsimile No.: +41 22 740 14 35

   For more detailed instructions, see the notes on the accompanying sheet.

2. ☐ The applicant is hereby notified that no international search report will be established and that the declaration under Article 17(2)(a) to that effect and the written opinion of the International Searching Authority are transmitted herewith.

3. ☐ **With regard to the protest** against payment of (an) additional fee(s) under Rule 40.2, the applicant is notified that:

   ☐ the protest together with the decision thereon has been transmitted to the International Bureau together with the applicant's request to forward the texts of both the protest and the decision thereon to the designated Offices.

   ☐ no decision has been made yet on the protest; the applicant will be notified as soon as a decision is made.

4. **Reminders**

   Shortly after the expiration of **18 months** from the priority date, the international application will be published by the International Bureau. If the applicant wishes to avoid or postpone publication, a notice of withdrawal of the international application, or of the priority claim, must reach the International Bureau as provided in Rules 90*bis*.1 and 90*bis*.3, respectively, before the completion of the technical preparations for international publication.

   The applicant may submit comments on an informal basis on the written opinion of the International Searching Authority to the International Bureau. The International Bureau will send a copy of such comments to all designated Offices unless an international preliminary examination report has been or is to be established. These comments would also be made available to the public but not before the expiration of 30 months from the priority date.

   Within **19 months** from the priority date, but only in respect of some designated Offices, a demand for international preliminary examination must be filed if the applicant wishes to postpone the entry into the national phase **until 30 months** from the priority date (in some Offices even later); otherwise, the applicant must, **within 20 months** from the priority date, perform the prescribed acts for entry into the national phase before those designated Offices.

   In respect of other designated Offices, the time limit of **30 months** (or later) will apply even if no demand is filed within 19 months.

   See the Annex to Form PCT/IB/301 and, for details about the applicable time limits, Office by Office, see the *PCT Applicant's Guide*, Volume II, National Chapters and the WIPO Internet site.

Name and mailing address of the ISA/US Mail Stop PCT, Attn: ISA/US Commissioner for Patents P.O. Box 1450, Alexandria, Virginia 22313-1450 Facsimile No. 571-273-3201	Authorized officer: Blaine R. Copenheaver Telephone No. 571-272-7774

Form PCT/ISA/220 (January 2004) *(See notes on accompanying sheet)*

From the INTERNATIONAL SEARCHING AUTHORITY

To:
SCOTT A. HORSTEMEYER
THOMAS, KAYDEN, HORSTEMEYER & RISLEY,
LLP
100 GALLERIA PARKWAY, N.W.
SUITE 1750
ATLANTA, GEORGIA 30339

PCT

NOTIFICATION OF TRANSMITTAL OF THE INTERNATIONAL SEARCH REPORT AND THE WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY, OR THE DECLARATION

(PCT Rule 44.1)

	Date of mailing *(day/month/year)* 01 NOV 2007
Applicant's or agent's file reference 50337-2220	**FOR FURTHER ACTION** See paragraphs 1 and 4 below
International application No. PCT/US07/61058	International filing date *(day/month/year)* 25 January 2007
Applicant CONEXANT SYSTEMS, INC.	

1. ☒ The applicant is hereby notified that the international search report and the written opinion of the International Searching Authority have been established and are transmitted herewith.

   Filing of amendments and statement under Article 19:
   The applicant is entitled, if he so wishes, to amend the claims of the international application (see Rule 46):

   When? The time limit for filing such amendments is normally two months from the date of transmittal of the international search report.

   Where? Directly to the International Bureau of WIPO, 34 chemin des Colombettes 1211 Geneva 20, Switzerland, Facsimile No.: +41 22 740 14 35

   For more detailed instructions, see the notes on the accompanying sheet.

2. ☐ The applicant is hereby notified that no international search report will be established and that the declaration under Article 17(2)(a) to that effect and the written opinion of the International Searching Authority are transmitted herewith.

3. ☐ **With regard to the protest** against payment of (an) additional fee(s) under Rule 40.2, the applicant is notified that:

   ☐ the protest together with the decision thereon has been transmitted to the International Bureau together with the applicant's request to forward the texts of both the protest and the decision thereon to the designated Offices.

   ☐ no decision has been made yet on the protest; the applicant will be notified as soon as a decision is made.

4. **Reminders**

   Shortly after the expiration of **18 months** from the priority date, the international application will be published by the International Bureau. If the applicant wishes to avoid or postpone publication, a notice of withdrawal of the international application, or of the priority claim, must reach the International Bureau as provided in Rules 90*bis*.1 and 90*bis*.3, respectively, before the completion of the technical preparations for international publication.

   The applicant may submit comments on an informal basis on the written opinion of the International Searching Authority to the International Bureau. The International Bureau will send a copy of such comments to all designated Offices unless an international preliminary examination report has been or is to be established. These comments would also be made available to the public but not before the expiration of 30 months from the priority date.

   Within **19 months** from the priority date, but only in respect of some designated Offices, a demand for international preliminary examination must be filed if the applicant wishes to postpone the entry into the national phase **until 30 months** from the priority date (in some Offices even later); otherwise, the applicant must, **within 20 months** from the priority date, perform the prescribed acts for entry into the national phase before those designated Offices.

   In respect of other designated Offices, the time limit of **30 months** (or later) will apply even if no demand is filed within 19 months.

   See the Annex to Form PCT/IB/301 and, for details about the applicable time limits, Office by Office, see the *PCT Applicant's Guide*, Volume II, National Chapters and the WIPO Internet site.

Name and mailing address of the ISA/US Mail Stop PCT, Attn: ISA/US Commissioner for Patents P.O. Box 1450, Alexandria, Virginia 22313-1450 Facsimile No. 571-273-3201	Authorized officer: Blaine R. Copenheaver Telephone No. 571-272-7774

Form PCT/ISA/220 (January 2004) *(See notes on accompanying sheet)*

PATENT COOPERATION TREATY

PCT

INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference 50337-2220	**FOR FURTHER ACTION**	see Form PCT/ISA/220 as well as, where applicable, item 5 below.
International application No. PCT/US07/61058	International filing date *(day/month/year)* 25 January 2007	(Earliest) Priority Date *(day/month/year)* 25 January 2006
Applicant CONEXANT SYSTEMS, INC.		

This international search report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This international search report consists of a total of 2 sheets.

☐ It is also accompanied by a copy of each prior art document cited in this report.

1. **Basis of the report**

   a. With regard to the **language**, the international search was carried out on the basis of:

   ☒ the international application in the language in which it was filed.

   ☐ a translation of the international application into _____ which is the language of a translation furnished for the purposes of international search (Rules 12.3(a) and 23.1(b)).

   b. ☐ This international search report has been established taking into account the **rectification of an obvious mistake** authorized by or notified to this Authority under Rule 91 (Rule 43.6*bis*(a)).

   c. ☐ With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, see Box No. I.

2. ☐ **Certain claims were found unsearchable** (see Box No. II).

3. ☐ **Unity of invention is lacking** (see Box No. III).

4. With regard to the **title**,

   ☒ the text is approved as submitted by the applicant.

   ☐ the text has been established by this Authority to read as follows:

5. With regard to the **abstract**,

   ☒ the text is approved as submitted by the applicant.

   ☐ the text has been established, according to Rule 38.2(b), by this Authority as it appears in Box No. IV. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority.

6. With regard to the **drawings**,

   a. the figure of the **drawings** to be published with the abstract is Figure No. 2

   ☐ as suggested by the applicant.

   ☒ as selected by this Authority, because the applicant failed to suggest a figure.

   ☐ as selected by this Authority, because this figure better characterizes the invention.

   b. ☐ none of the figures is to be published with the abstract.

Form PCT/ISA/210 (first sheet) (April 2007)

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US07/61058

A. CLASSIFICATION OF SUBJECT MATTER
IPC(8) - H04Q 7/00 (2007.01)
USPC - 370/328
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC(8) - H04Q 7/00 (2007.01)
USPC - 370/328, 465, 338; 379/142.01; 455/41.2

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

PatBase: ft=((short*~ near inter*~) near fram*~) or sifs*~ pn=us6842460; MicroPatent (Databases-USG USA EPA EPB WO JP DEG DEA DET DEU GBA FRA): Patent/Publication No. US2005243849 US2005124294 US2003231608

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X --- Y	US 6,842,460 B1 (OLKKONEN et al) 11 January 2005 (11.01.2005) entire document	1, 4, 7-10 --- 2, 3, 5, 6
Y	US 2005/0124294 A1 (WENTINK) 09 June 2005 (09.06.2005) entire document	2, 3, 5, 6
A	US 2005/0243849 A1 (WENTINK) 03 November 2005 (03.11.2005) entire document	1-10
A	US 2003/0231608 A1 (WENTINK) 18 December 2003 (18.12.2003) entire document	1-10
A	US 2005/0059347 A1 (HAARTSEN) 17 March 2005 (17.03.2005) entire document	1-10

☐ Further documents are listed in the continuation of Box C. ☐

* Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevance
"E" earlier application or patent but published on or after the international filing date
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
"O" document referring to an oral disclosure, use, exhibition or other means
"P" document published prior to the international filing date but later than the priority date claimed
"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
11 September 2007	01 NOV 2007
Name and mailing address of the ISA/US Mail Stop PCT, Attn: ISA/US, Commissioner for Patents P.O. Box 1450, Alexandria, Virginia 22313-1450 Facsimile No. 571-273-3201	Authorized officer: Blaine R. Copenheaver PCT Helpdesk: 571-272-4300 PCT OSP: 571-272-7774

Form PCT/ISA/210 (second sheet) (April 2007)

PATENT COOPERATION TREATY

From the
INTERNATIONAL SEARCHING AUTHORITY

To:
SCOTT A. HORSTEMEYER
THOMAS, KAYDEN, HORSTEMEYER & RISLEY,
LLP
100 GALLERIA PARKWAY, N.W.
SUITE 1750
ATLANTA, GEORGIA 30339

PCT

WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY

(PCT Rule 43*bis*.1)

Date of mailing *(day/month/year)*	01 NOV 2007

Applicant's or agent's file reference	FOR FURTHER ACTION
50337-2220	See paragraph 2 below

International application No.	International filing date *(day/month/year)*	Priority date *(day/month/year)*
PCT/US07/61058	25 January 2007	25 January 2006

International Patent Classification (IPC) or both national classification and IPC
IPC(8) - H04Q 7/00 (2007.01)
USPC - 370/328

Applicant CONEXANT SYSTEMS, INC.

1. This opinion contains indications relating to the following items:

- ☒ Box No. I Basis of the opinion
- ☐ Box No. II Priority
- ☐ Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- ☐ Box No. IV Lack of unity of invention
- ☒ Box No. V Reasoned statement under Rule 43*bis*.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- ☐ Box No. VI Certain documents cited
- ☐ Box No. VII Certain defects in the international application
- ☐ Box No. VIII Certain observations on the international application

2. **FURTHER ACTION**

If a demand for international preliminary examination is made, this opinion will be considered to be a written opinion of the International Preliminary Examining Authority ("IPEA") except that this does not apply where the applicant chooses an Authority other than this one to be the IPEA and the chosen IPEA has notified the International Bureau under Rule 66.1*bis*(b) that written opinions of this International Searching Authority will not be so considered.

If this opinion is, as provided above, considered to be a written opinion of the IPEA, the applicant is invited to submit to the IPEA a written reply together, where appropriate, with amendments, before the expiration of 3 months from the date of mailing of Form PCT/ISA/220 or before the expiration of 22 months from the priority date, whichever expires later.

For further options, see Form PCT/ISA/220.

3. For further details, see notes to Form PCT/ISA/220.

Name and mailing address of the ISA/US	Date of completion of this opinion	Authorized officer:
Mail Stop PCT, Attn: ISA/US Commissioner for Patents P.O. Box 1450, Alexandria, Virginia 22313-1450 Facsimile No. 571-273-3201	11 September 2007	Blaine Copenheaver PCT Helpdesk: 571-272-4300 PCT OSP: 571-272-7774

Form PCT/ISA/237 (cover sheet) (April 2007)

WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY

International application No.
PCT/US07/61058

Box No. I Basis of this opinion

1. With regard to the **language**, this opinion has been established on the basis of:

   ☒ the international application in the language in which it was filed.

   ☐ a translation of the international application into _____ which is the language of a translation furnished for the purposes of international search (Rules 12.3(a) and 23.1(b)).

2. ☐ This opinion has been established taking into account the **rectification of an obvious mistake** authorized by or notified to this Authority under Rule 91 (Rule 43*bis*.1(a))

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, this opinion has been established on the basis of:

   a. type of material

      ☐ a sequence listing

      ☐ table(s) related to the sequence listing

   b. format of material

      ☐ on paper

      ☐ in electronic form

   c. time of filing/furnishing

      ☐ contained in the international application as filed

      ☐ filed together with the international application in electronic form

      ☐ furnished subsequently to this Authority for the purposes of search

4. ☐ In addition, in the case that more than one version or copy of a sequence listing and/or table(s) relating thereto has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that in the application as filed or does not go beyond the application as filed, as appropriate, were furnished.

5. Additional comments:

Form PCT/ISA/237 (Box No. I) (April 2007)

Supplemental Box

In case **the space in any of the preceding boxes is not sufficient.**
Continuation of:
Box No. V
2. Citations and explanations:

Regarding claim 3, Olkkonen et al discloses the claimed invention features as discussed in the lack of novelty of claim 1, but lacks the teaching of wherein the second communication frame follows after a short inter frame space (SIFS) after a response to the first communication frame with the transmit announcement indication. However, Wentink teaches wherein the second communication frame follows after a short inter frame space (SIFS) after a response to the first communication frame with the transmit announcement indication (fig. 7 "BSS B CTS", item 402 "Beacon", item 414 "Beacon", item 422 "CTS", "Beacon NAV B"; paragraph 43 "The CTS frame and the beacon are separated by a SIFS inter-frame period"; Abstract "a Transmission Indication occurs simultaneously with a Beacon Transmission"). Wentink further shows that this is relevant for transmitting each of the first and second frames (paragraph 14 "transmitting each"). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate wherein the second communication frame follows after a short inter frame space (SIFS) after a response to the first communication frame with the transmit announcement indication into the invention of Olkkonen et al as taught by Wentink in order to provide a transmission for each of the first and second frames (paragraph 14 "transmitting each").

Regarding claim 5, Olkkonen et al discloses the claimed invention features as discussed in the lack of novelty of claim 4, but lacks the teaching of receiving, by the first station, a clear to send (CTS) frame from the second station after the first station has transmitted the transmit announcement indication with the RTS frame. However, Wentink teaches receiving, by the first station, a clear to send (CTS) frame from the second station after the first station has transmitted the transmit announcement indication with the RTS frame (paragraphs 27-31 "stations receiving the indication may request to transmit a CTS-to-self"). Wentink further shows that this is relevant for transmitting each of the first and second frames (paragraph 14 "transmitting each"). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate receiving, by the first station, a clear to send (CTS) frame from the second station after the first station has transmitted the transmit announcement indication with the RTS frame into the invention of Olkkonen et al as taught by Wentink in order to provide a transmission for each of the first and second frames (paragraph 14 "transmitting each").

Regarding claim 6, Olkkonen et al discloses the claimed invention features as discussed in the lack of inventive step of claim 5, but lacks the teaching of transmitting a second communication frame associated with the transmit announcement indication. However, Wentink teaches transmitting a second communication frame associated with the transmit announcement indication (paragraphs 27-32 "stations receiving the indication may request to transmit a CTS-to-self associated with a beacon"; Abstract "a Transmission Indication occurs simultaneously with a Beacon Transmission"). Wentink further shows that this is relevant for transmitting each of the first and second frames (paragraph 14 "transmitting each"). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate transmitting a second communication frame associated with the transmit announcement indication into the invention of Olkkonen et al as taught by Wentink in order to provide a transmission for each of the first and second frames (paragraph 14 "transmitting each").

Claims 1-10 meet the criteria set out in PCT Article 33(4), and thus have industrial applicability because the subject matter claimed can be made or used in industry.

The letter must indicate the differences between the claims as filed and the claims as amended. It must, in particular, indicate, in connection with each claim appearing in the international application (it being understood that identical indications concerning several claims may be grouped), whether

(i) the claim is unchanged;
(ii) the claim is cancelled;
(iii) the claim is new;
(iv) the claim replaces one or more claims as filed;
(v) the claim is the result of the division of a claim as filed.

The following examples illustrate the manner in which amendments must be explained in the accompanying letter:

1. [Where originally there were 48 claims and after amendment of some claims there are 51]:
"Claims 1 to 29, 31, 32, 34, 35, 37 to 48 replaced by amended claims bearing the same numbers, claims 30, 33 and 36 unchanged; new claims 49 to 51 added."
2. [Where originally there were 15 claims and after amendment of all claims there are 11]:
"Claims 1 to 15 replaced by amended claims 1 to 11."
3. [Where originally there were 14 claims and the amendments consist in cancelling some claims and in adding new claims]:
"Claims 1 to 6 and 14 unchanged; claims 7 to 13 cancelled; new claims 15, 16 and 17 added." or
"Claims 7 to 13 cancelled; new claims 15, 16 and 17 added; all other claims unchanged."
4. [Where various kinds of amendments are made]:
"Claims 1-10 unchanged; claims 11 to 13, 18 and 19 cancelled; claims 14, 15 and 16 replaced by amended claim 14; claim 17 subdivided into amended claims 15, 16 and 17; new claims 20 and 21 added."

"Statement under Article 19(1)" (Rule 46.4)

The amendments may be accompanied by a statement explaining the amendments and indicating any impact that such amendments might have on the description and the drawings (which cannot be amended under Article 19(1)).

The statement will be published with the international application and the amended claims.

It must be in the language in which the international application is to be published.

It must be brief, not exceeding 500 words if in English or if translated into English.

It should not be confused with and does not replace the letter indicating the differences between the claims as filed and as amended. It must be filed on a separate sheet and must be identified as such by a heading, preferably by using the words "Statement under Article 19(1)."

It may not contain any disparaging comments on the international search report or the relevance of citations contained in that report. Reference to citations, relevant to a given claim, contained in the international search report may be made only in connection with an amendment of that claim.

Consequence if a demand for international preliminary examination has already been filed

If, at the time of filing any amendments and any accompanying statement, under Article 19, a demand for international preliminary examination has already been submitted, the applicant must preferably, at the time of filing the amendments (and any statement) with the International Bureau, also file with the International Preliminary Examining Authority a copy of such amendments (and of any statement) and, where required, a translation of such amendments for the procedure before that Authority (see Rules 55.3(a) and 62.2, first sentence). For further information, see the Notes to the demand form (PCT/IPEA/401).

If a demand for international preliminary examination is made, the written opinion of the International Searching Authority will, except in certain cases where the International Preliminary Examining Authority did not act as International Searching Authority and where it has notified the International Bureau under Rule 66.1*bis*(b), be considered to be a written opinion of the International Preliminary Examining Authority. If a demand is made, the applicant may submit to the International Preliminary Examining Authority a reply to the written opinion together, where appropriate, with amendments before the expiration of 3 months from the date of mailing of Form PCT/ISA/220 or before the expiration of 22 months from the priority date, whichever expires later (Rule 43*bis*.1(c)).

Consequence with regard to translation of the international application for entry into the national phase

The applicant's attention is drawn to the fact that, upon entry into the national phase, a translation of the claims as amended under Article 19 may have to be furnished to the designated/elected Offices, instead of, or in addition to, the translation of the claims as filed.

For further details on the requirements of each designated/elected Office, see the *PCT Applicant's Guide*, Volume II.

Electronic Acknowledgement Receipt

EFS ID:	2737240
Application Number:	11627181
International Application Number:	
Confirmation Number:	1464
Title of Invention:	Transmit Announcement Indication
First Named Inventor/Applicant Name:	Menzo Wentink
Customer Number:	24504
Filer:	Benjamin Balser/Coco Bailey
Filer Authorized By:	Benjamin Balser
Attorney Docket Number:	50337-1570
Receipt Date:	18-JAN-2008
Filing Date:	25-JAN-2007
Time Stamp:	13:32:50
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes) /Message Digest	Multi Part /.zip	Pages (if appl.)
1	Information Disclosure Statement Letter	00643882.pdf	96639 ba3e621b2a1660ee0bb2d131c00d50937bd5297d	no	2
Warnings:					
Information:					

2	Information Disclosure Statement (IDS) Filed	00643731.pdf	775117 238369765a2eb0bbc72901507db338da3f8502b8	no	4
Warnings:					
Information:					
3	NPL Documents	00643751.pdf	478735 7470b5dc846fe94ba219d0c9150551e2ee459864	no	8
Warnings:					
Information:					
			Total Files Size (in bytes):	1350491	

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111
If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371
If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office
If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NUMBER	FILING OR 371(c) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
11/627,181	01/25/2007	Menzo Wentink	50337-1570

CONFIRMATION NO. 1464

24504
THOMAS, KAYDEN, HORSTEMEYER & RISLEY, LLP
100 GALLERIA PARKWAY, NW
STE 1750
ATLANTA, GA30339-5948

Title: Transmit Announcement Indication

Publication No. US-2007-0190942-A1
Publication Date: 08/16/2007

NOTICE OF PUBLICATION OF APPLICATION

The above-identified application will be electronically published as a patent application publication pursuant to 37 CFR 1.211, et seq. The patent application publication number and publication date are set forth above.

The publication may be accessed through the USPTO's publically available Searchable Databases via the Internet at www.uspto.gov. The direct link to access the publication is currently http://www.uspto.gov/patft/.

The publication process established by the Office does not provide for mailing a copy of the publication to applicant. A copy of the publication may be obtained from the Office upon payment of the appropriate fee set forth in 37 CFR 1.19(a)(1). Orders for copies of patent application publications are handled by the USPTO's Office of Public Records. The Office of Public Records can be reached by telephone at (703) 308-9726 or (800) 972-6382, by facsimile at (703) 305-8759, by mail addressed to the United States Patent and Trademark Office, Office of Public Records, Alexandria, VA 22313-1450 or via the Internet.

In addition, information on the status of the application, including the mailing date of Office actions and the dates of receipt of correspondence filed in the Office, may also be accessed via the Internet through the Patent Electronic Business Center at www.uspto.gov using the public side of the Patent Application Information and Retrieval (PAIR) system. The direct link to access this status information is currently http://pair.uspto.gov/. Prior to publication, such status information is confidential and may only be obtained by applicant using the private side of PAIR.

Further assistance in electronically accessing the publication, or about PAIR, is available by calling the Patent Electronic Business Center at 1-866-217-9197.

Pre-Grant Publication Division, 703-605-4283

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NUMBER	FILING or 371(c) DATE	GRP ART UNIT	FIL FEE REC'D	ATTY.DOCKET.NO	DRAWINGS	TOT CLAIMS	IND CLAIMS
11/627,181	01/25/2007	2614	1150	50337-1570	10	23	3

CONFIRMATION NO. 1464

24504
THOMAS, KAYDEN, HORSTEMEYER & RISLEY, LLP
100 GALLERIA PARKWAY, NW
STE 1750
ATLANTA, GA30339-5948

FILING RECEIPT

Date Mailed: 02/20/2007

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Applicant(s)

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Domestic Priority data as claimed by applicant

This appln claims benefit of 60/762,425 01/25/2006

Foreign Applications

If Required, Foreign Filing License Granted: 02/16/2007

The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is **US11/627,181**

Projected Publication Date: 07/26/2007

Non-Publication Request: No

Early Publication Request: No

Title

Transmit Announcement Indication

Preliminary Class

379

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TRANSMIT ANNOUNCEMENT INDICATION

CROSS-REFERENCE TO RELATED APPLICATION

[0001] This application claims priority to copending U.S. provisional application entitled, "Tx Announcement," having ser. no. **60/762,425,** filed January 25, 2006, which is entirely incorporated herein by reference.

TECHNICAL FIELD

[0002] The present disclosure is generally related to communications and, more particularly, is related to systems and methods for wireless network communications.

BACKGROUND

[0003] Communication networks come in a variety of forms. Notable networks include wireline and wireless. Wireline networks include local area networks (LANs), DSL networks, and cable networks, among others. Wireless networks include cellular telephone networks, classic land mobile radio networks and satellite transmission networks, among others. These wireless networks are typically characterized as wide area networks. More recently, wireless local area networks and wireless home networks have been proposed, and standards, such as Bluetooth and IEEE 802.11, have been introduced to govern the development of wireless equipment for such localized networks.

[0004] A wireless local area network (WLAN) typically uses infrared (IR) or radio frequency (RF) communications channels to communicate between portable or mobile computer terminals and stationary access points or base stations. These access points are, in turn, connected by a wired or wireless communications channel to a network infrastructure which connects groups of access points together to form the LAN, including, optionally, one or more host computer systems.

[0005] Wireless protocols such as Bluetooth and IEEE 802.11 support the logical interconnections of such portable roaming terminals having a variety of types of communication capabilities to host computers. The logical interconnections are based upon an infrastructure in which at least some of the terminals are capable of communicating with at least two of the access points when located within a predetermined range, each terminal being normally associated, and in communication, with a single one of the access points. Based on the overall spatial layout, response time, and loading requirements of the network, different networking schemes and communication protocols have been designed so as to most efficiently regulate the communications.

[0006] IEEE Standard 802.11 ("802.11") is set out in "Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) Specifications" and is available from the IEEE Standards Department, Piscataway, N.J. 802.11 permits either IR or RF communications at 1 Mbps, 2 Mbps and higher data rates, a medium access technique similar to carrier sense multiple access/collision avoidance (CSMA/CA), a power-save mode for battery-operated mobile stations, seamless roaming in a full cellular network, high

throughput operation, diverse antenna systems designed to eliminate "dead spots," and an easy interface to existing network infrastructures.

[0007] As communication devices become smaller, while providing increasing functionality, increasing transmission speed without dramatically affecting overhead raises significant design challenges. Thus, a heretofore unaddressed need exists in the industry to address the aforementioned deficiencies and inadequacies.

SUMMARY

[0008] Embodiments of the present disclosure provide a system of transmission announcement indication. Briefly described, in architecture, one embodiment of the system, among others, can be implemented as a transmitter configured to transmit a first communication frame from a first station to a second station; and provide a transmit announcement indication in the communications frame, the transmit announcement indication indicating whether a second communication frame to the second station will follow the first communication frame.

[0009] Embodiments of the present disclosure can also be viewed as providing methods for transmission announcement indication. In this regard, one embodiment of such a method, among others, can be broadly summarized by the following steps: transmitting a first communication frame from a first station to a second station; providing a transmit announcement indication in the communications frame, the transmit announcement indication indicating whether a second communication frame to the second station will follow the first communication frame.

[0010] Other systems, methods, features, and advantages of the present disclosure will be or become apparent to one with skill in the art upon examination of the following drawings and detailed description. It is intended that all such additional systems, methods, features, and advantages be included within this description, be within the scope of the present disclosure, and be protected by the accompanying claims.

BRIEF DESCRIPTION OF THE DRAWINGS

[0011] Many aspects of the disclosure can be better understood with reference to the following drawings. The components in the drawings are not necessarily to scale, emphasis instead being placed upon clearly illustrating the principles of the present disclosure. Moreover, in the drawings, like reference numerals designate corresponding parts throughout the several views.

[0012] FIG. 1 is a block diagram of an open system interconnection (OSI) layered model for data transmission.

[0013] FIG. 2 is a diagram of an exemplary embodiment of a communication system comprising two stations using the OSI model of FIG. 1

[0014] FIG. 3 is a block diagram of an exemplary embodiment of a system of transmission announcement indication with RTS and CTS frames using the communication system of FIG. 2.

[0015] FIG. 4 is a block diagram of an exemplary embodiment of a system of transmission announcement indication with QoS-null and ACK frames using the communication system of FIG. 2.

[0016] FIG. 5 is a block diagram of an exemplary embodiment of a system of transmission announcement indication with CTS frames using the communication system of FIG. 2.

[0017] FIG. 6 is a block diagram of an exemplary embodiment of a system of transmission announcement indication with QoS-null and NoACK using the communication system of FIG. 2.

[0018] FIG. 7 is a block diagram of an exemplary embodiment of a control word for use in an exemplary embodiment of a system of transmission announcement indication using the communication system of FIG. 2.

[0019] FIG. 8 is a flow chart of a method embodiment comprising transmission announcement indication of the communication system of FIG. 2.

[0020] FIG. 9 is a flow chart of a method embodiment comprising transmission announcement indication of the communication system of FIG. 2.

[0021] FIG. 10 is a flow chart of a method embodiment comprising transmission announcement indication of the communication system of FIG. 2.

DETAILED DESCRIPTION

[0022] Disclosed herein are various communication system and method embodiments. Such communication systems comprise, in one exemplary embodiment, an access point and one or more client devices that enable an exchange of transmission announcement indications. To increase data rates on portable wireless local area network (WLAN) clients, the 802.11

specification provides for transmission announcement operations on client devices. Transmission announcement operations may be performed in any type of processor such as a MAC layer processor, though not limited to a MAC layer processor, including, but not limited to, a digital signal processor (DSP), a microprocessor unit (MCU), a general purpose processor, and an application specific integrated circuit (ASIC), among others. Because certain embodiments of communication systems that provide for the exchange of transmission announcement indication are described herein in the context of an 802.11n system, a brief description of 802.11 and layers in a wireless LAN (WLAN) follows with the understanding that the disclosed systems and methods may similarly apply to other communications systems.

[0023] IEEE 802.11n (the "802.11n proposal") is a high data rate extension of the 802.11a standard at 5 gigahertz (GHz) and 802.11g at 2.4 GHz. Both of these standards use orthogonal frequency division multiplexing (OFDM), which is a signaling scheme which uses multiple, parallel tones to carry the information. These tones are commonly called subcarriers. It is noted that, at the present time, the 802.11n proposal is only a proposal and is not yet a completely defined standard. Other applicable standards include Bluetooth, xDSL, WiMAX, other sections of 802.11, etc. To increase the data rate, 802.11n is considering using a transmission announcement indication.

[0024] IEEE 802.11 is directed to wireless LANs, and in particular specifies the MAC and the PHY layers. These layers are intended to correspond closely to the two lowest layers of a system based on the ISO Basic Reference Model of OSI, i.e., the data link layer and the physical layer. FIG. 1 shows a diagrammatic representation of an open systems interconnection

(OSI) layered model 100 developed by the International Organization for Standards (ISO) for describing the exchange of information between layers in communication networks. The OSI layered model 100 is particularly useful for separating the technological functions of each layer, and thereby facilitating the modification or update of a given layer without detrimentally impacting on the functions of neighboring layers.

[0025] At a lower most layer, the OSI model 100 has a physical layer or PHY layer 102 that is responsible for encoding and decoding data into signals that are transmitted across a particular medium. Above the PHY layer 102, a data link layer 104 is defined for providing reliable transmission of data over a network while performing appropriate interfacing with the PHY layer 102 and a network layer 106. The network layer 106 is responsible for routing data between nodes in a network, and for initiating, maintaining and terminating a communication link between users connected to the nodes. A transport layer 108 is responsible for performing data transfers within a particular level of service quality. A session layer 110 is generally concerned with controlling when users are able to transmit and receive data. A presentation layer 112 is responsible for translating, converting, compressing and decompressing data being transmitted across a medium. Finally, an application layer 114 provides users with suitable interfaces for accessing and connecting to a network.

[0026] This OSI model 100 can be useful for transmissions between, for example, two stations, 120, 130 as shown in FIG. 2 and an access point (AP). An embodiment of a communication system 200 is shown that provides for transmission announcement indication, and, in one embodiment, is configured as a wireless ad hoc network (IBSS). An IBSS is a group of

802.11 stations such as stations 120, 130 communicating with one another. Stations 120, 130 of communication system 200 may comprise transceivers for transmitting and receiving data streams between stations 120, 130, and may include multiple antennas for receiving and/or transmitting. Stations 120, 130 may comprise two client stations or a client station and an AP. Stations 120, 130 do not necessarily have the same number of antennas. Stations 120, 130 may transmit using, as non-limiting examples, a time division multiple access (TDMA) protocol or a Carrier Sense Multiple Access with Collision Avoidance (CSMA/CA) protocol, or a combination of the same and/or other protocols. Although only two stations are provided in this example, the disclosed principles of transmission announcement indication are also applicable to larger networks with more devices. Certain embodiments of the transmission announcement indication systems and methods may also be implemented as a basic service set (BSS). A BSS is a group of 802.11 stations with a central access point (AP). An AP may be the central access point for a plurality of stations in a BSS.

[0027] In some embodiments, each station 120, 130 comprises a PHY signal processor configured to implement communications operations, in addition to performing transmission announcement indication. That is, each PHY signal processor, alone, or in combination with other logic or components, implements the functionality of the various embodiments. Functionality of transmission announcement indication systems and methods may be embodied in a wireless radio, or other communication device. Such a communication device may include many wireless communication devices, including computers (desktop, portable, laptop, etc.), consumer electronic

devices (e.g., multi-media players), compatible telecommunication devices, personal digital assistants (PDAs), or any other type of network devices, such as printers, fax machines, scanners, hubs, switches, routers, set-top boxes, televisions with communication capability, etc.

[0028] A transmission announcement (TxA) comprises an indication in a transmission frame transmitted from station 120, for example, which is addressed to a certain destination, station 130, for example, that another transmission for that same destination, station 130, will follow. The indicated transmission does not need to include a MAC destination address because the transmission announcement indication was set on the preceding transmission to that station.

[0029] The transmission indicated by the TxA indication could be a PHY header without MAC portion, which may also be referred to as a zero-length frame (ZLF) or Null Data Packet (NDP). A ZLF may be transmitted to sound the channel between sender station 120 and responder station 130. The transmission indicated by the TxA indication may start after the receiver sends a possible response frame to the frame where the TxA indication is included. The transmission indicated by the TxA indication may also start after the frame where the TxA indication is included, before the receiver sends a possible response frame. The indicated transmission may start after a short inter frame space (SIFS), but there is no strict requirement on the timing. SIFS is used to separate transmissions belonging to a single dialog (e.g., fragment-acknowledge), and is the minimum inter frame space, and there is at most one single station to transmit at this given time, hence having priority over all other stations.

[0030] SIFS is a fixed value designated in the PHY and is calculated in such a way that the transmitting station is able to switch back to receive mode and is capable of decoding the incoming packet. However, if the interval is longer than SIFS (or point coordination inter frame space (PIFS)), there is a risk that a transmission from another node will get interspersed, in which case this frame then falsely gets interpreted as the indicated transmission. The transmission announcement can be a bit inside a MAC header field, such as the HT-control field.

[0031] System 300 embodying a TxA indication is illustrated in FIG. 3. A ready to send (RTS) (herein also referred to as an RTS frame) with a TxA indication is transmitted from station 120 to station 130. The RTS and TxA indication may be followed by a clear to send (CTS) (herein also referred to as an CTS frame) response from station 130 to station 120, after which the announced transmission from station 120 to station 130 follows. Station 120 sends an RTS with TxA 310 to station 130. Station 130 sends CTS 320 in response to the RTS+TxA 310. Station 130 receives the next transmission 330 as announced by the TxA indication portion of RTS+TxA 310. In this exemplary embodiment, the announced transmission occurs when station 120 gains control over the medium.

[0032] FIG. 4 provides an alternative embodiment of systems and methods of TxA indication. A QoS-null with TxA indication is followed by an acknowledgement (ACK) response, after which the announced transmission follows. QoS-Null is a quality of service (QoS) Null frame with a QoS subheader as part of the MAC header. The QoS subheader (called QoS control field) contains bits which can be used to signal no-ACK policy. Station

120 sends a QOS-null with a TxA indication to station 130. Station 130 sends an ACK in response to the QOS-null. Station 130 receives the next transmission 430 as announced by the TxA indication. Similar to the exemplary embodiment of FIG. 3, the announced transmission occurs when station 120 gains control over the medium.

[0033] FIG. 5 provides an illustration of the TxA indication. The announced transmission follows after the CTS. Station 120 sends a CTS with TxA 510 to station 130. Station 130 receives the next transmission 520as announced by the TxA indication. In this exemplary embodiment, station 130 may gain control over the medium after the transmission announced in the CTS, even when the existing frame exchange sequence would dictate otherwise. This embodiment may be applied to other frame types as well, in which case the announced transmission follows substantially immediately (i.e., SIFS) after the frame which announces it, with the effect of postponing a potential SIFS response until after the announced transmission. In the exemplary embodiments as provided in FIG. 3 and FIG. 4, the transmission announced in the CTS may follow SIFS after a possible transmission by the receiver of the CTS.

[0034] FIG. 6 provides an exemplary embodiment of a TxA indication. The announced transmission follows after the QOS-null with no ACK policy, because there is no response frame to a frame with no ACK policy. Station 120 sends a QOS-null frame with a TxA indication 610 to station 130, indicating no ACK policy. Station 130 receives the next transmission 620 as announced by the TxA indication.

[0035] Besides these examples, a TxA indication could be present in other frames as well, such as data frames, null frames, management frames, control frames, QoS frames, etc. A response may be interspersed between the frame carrying the TxA indication and the announced transmission. The announced transmission itself may or may not provoke an acknowledgement.

[0036] In one exemplary embodiment, a TxA indication bit is located at bit 24 of a high throughput (HT)-control field as illustrated in FIG. 7. FIG. 7 provides the 32-bit HT-control field with TxA bit. Bits 0-15 comprise link adaptation control 710. Bits 16-17 comprise calibration position 720. Bits 18-19 comprise calibration sequence 730. Bits 20-21 comprise feedback request 740. Bits 22-23 comprise CSI/steering 750. Bit 24 is TxA 760. Bits 25-29 comprise reserved bits 770. Bit 30 comprises AC constraint 780. Bit 31 comprises RDG/More PPDU 790.

[0037] In an exemplary embodiment, a TxA announcement frame precedes the ZLF. For instance, a QoS-null with HT-control field, where bit 24 of the HT-control field is used to indicate that this is a TxA announcement (bit 24 is currently reserved) indicates that this is a TxA. The ZLF follows within an SIFS for no ACK or SIFS after the ACK for immediate ACK. In another exemplary embodiment a management action frame may be utilized.

[0038] FIG. 8 provides flowchart 800 for an exemplary embodiment of a method of transmission announcement indication. In block 810, a first communication frame is transmitted from a first station to a second station. In block 820, a transmission announcement indication is provided with an RTS. In block 830, a CTS is received after transmitting the transmission

announcement indication. In block 840, a second communication frame associated with the transmit announcement indication is transmitted.

[0039] FIG. 9 provides flowchart 900 for an exemplary embodiment of a method of transmission announcement indication. In block 910, a first communication frame is transmitted from a first station to a second station. In block 920, a transmission announcement indication is provided with a QoS-null frame. In block 930, an acknowledge frame is received after transmitting the transmission announcement indication. In block 940, a second communication frame associated with the transmit announcement indication is transmitted.

[0040] FIG. 10 provides flowchart 1000 for an exemplary embodiment of a method of transmission announcement indication. In block 1010, a first communication frame is transmitted from a first station to a second station. In block 1020, a transmission announcement indication is provided with a CTS. In block 1030, a second communication frame associated with the transmit announcement indication is transmitted.

[0041] Embodiments of the present disclosure can be implemented in hardware, software, firmware, or a combination thereof. In the embodiment(s), the TxA indication is implemented in software or firmware that is stored in a memory and that is executed by a suitable instruction execution system. If implemented in hardware, as in an alternative embodiment, the TxA indication can be implemented with any or a combination of the following technologies, which are all well known in the art: a discrete logic circuit(s) having logic gates for implementing logic functions upon data signals, an application specific integrated circuit (ASIC) having

appropriate combinational logic gates, a programmable gate array(s) (PGA), a field programmable gate array (FPGA), *etc.*

[0042] Any process descriptions or blocks in flow charts should be understood as representing modules, segments, or portions of code which include one or more executable instructions for implementing specific logical functions or steps in the process, and alternate implementations are included within the scope of the preferred embodiment of the present disclosure in which functions may be executed out of order from that shown or discussed, including substantially concurrently or in reverse order, depending on the functionality involved, as would be understood by those reasonably skilled in the art of the present disclosure.

[0043] The TxA indication program, which comprises an ordered listing of executable instructions for implementing logical functions, can be embodied in any computer-readable medium for use by or in connection with an instruction execution system, apparatus, or device, such as a computer-based system, processor-containing system, or other system that can fetch the instructions from the instruction execution system, apparatus, or device and execute the instructions. In the context of this document, a "computer-readable medium" can be any means that can contain, store, communicate, propagate, or transport the program for use by or in connection with the instruction execution system, apparatus, or device. The computer readable medium can be, for example but not limited to, an electronic, magnetic, optical, electromagnetic, infrared, or semiconductor system, apparatus, device, or propagation medium. More specific examples (a nonexhaustive list) of the computer-readable medium would include the following: an

electrical connection (electronic) having one or more wires, a portable computer diskette (magnetic), a random access memory (RAM) (electronic), a read-only memory (ROM) (electronic), an erasable programmable read-only memory (EPROM or Flash memory) (electronic), an optical fiber (optical), and a portable compact disc read-only memory (CDROM) (optical). Note that the computer-readable medium could even be paper or another suitable medium upon which the program is printed, as the program can be electronically captured, via, for instance, optical scanning of the paper or other medium, then compiled, interpreted or otherwise processed in a suitable manner if necessary, and then stored in a computer memory. In addition, the scope of the present disclosure includes embodying the functionality of the preferred embodiments of the present disclosure in logic embodied in hardware or software-configured mediums.

[0044] It should be emphasized that the above-described embodiments of the present disclosure, particularly, any "preferred" embodiments, are merely possible examples of implementations, merely set forth for a clear understanding of the principles of the disclosure. Many variations and modifications may be made to the above-described embodiment(s) of the disclosure without departing substantially from the spirit and principles of the disclosure. All such modifications and variations are intended to be included herein within the scope of this disclosure and the present disclosure and protected by the following claims.

CLAIMS

Therefore, at least the following is claimed:

1. A method comprising:

transmitting a first communication frame from a first station to a second station; and

providing a transmit announcement indication in the first communication frame, the transmit announcement indication indicating whether a second communication frame to the second station will follow the first communication frame.

2. The method of claim 1, wherein the second communication frame follows after a short inter frame space (SIFS) after the first communication frame with the transmit announcement indication.

3. The method of claim 1, wherein the second communication frame follows after a short inter frame space (SIFS) after a response to the first communication frame with the transmit announcement indication.

4. The method of claim 1, wherein the transmit announcement indication comprises a zero-length frame.

5. The method of claim 1, wherein providing the transmit announcement indication comprises providing the transmit announcement indication with a request to send (RTS) frame.

6. The method of claim 5, further comprising receiving, by the first station, a clear to send (CTS) frame from the second station after the first station has transmitted the transmit announcement indication with the RTS frame.

7. The method of claim 6, further comprising transmitting a second communication frame associated with the transmit announcement indication.

8. The method of claim 1, wherein providing the transmit announcement indication comprises providing the transmit announcement indication in a quality of service null (QoS-null) frame.

9. The method of claim 8, further comprising receiving, by the first station, an acknowledgement (ACK) frame from the second station after the first station has transmitted the transmit announcement indication with the QoS-null frame.

10. The method of claim 9, further comprising transmitting the second communication frame associated with the transmit announcement indication.

11. The method of claim 1, wherein providing the transmit announcement indication comprises providing the transmit announcement indication with a clear to send (CTS) frame.

12. The method of claim 11, further comprising transmitting the second communication frame associated with the transmit announcement indication.

13. A computer readable storage medium comprising:

logic configured to transmit a first communication frame from a first station to a second station; and

logic configured to provide a transmit announcement indication in the first communication frame, the transmit announcement indication indicating whether a second communication frame to the second station will follow the first communication frame.

14. The computer readable storage medium of claim 13, wherein the transmit announcement indication comprises a zero-length frame.

15. The computer readable storage medium of claim 13, wherein the logic configured to provide the transmit announcement indication comprises logic configured to provide the transmit announcement indication with a request to send (RTS) frame.

16. The computer readable storage medium of claim 15, further comprising logic configured to receive, by the first station, a clear to send (CTS) frame from the second station after the first station has transmitted the transmit announcement indication with the RTS frame.

17. The computer readable storage medium of claim 16, further comprising logic configured to transmit the second communication frame associated with the transmit announcement indication.

18. A system comprising:

a transmitter configured to:

transmit a first communication frame from a first station to a second station; and

provide a transmit announcement indication in the first communication frame, the transmit announcement indication indicating whether a second communication frame to the second station will follow the first communication frame.

19. The system of claim 18, wherein the transmit announcement indication comprises a zero-length frame.

20. The system of claim 18, wherein the transmitter is further configured to provide the transmit announcement indication with a request to send (RTS) frame.

21. The system of claim 20, further comprising a receiver configured to receive, by the first station, a clear to send (CTS) frame from the second station after the first station has transmitted the transmit announcement indication with the RTS frame.

22. The system of claim 21, wherein the transmitter is further configured to transmit frame second communication frame associated with the transmit announcement indication.

23. The system of claim 18, wherein the first station comprises one of a wireless radio, desktop computer, portable computer, laptop computer, multi-media players, personal digital assistant (PDA), printer, fax machine, scanner, hub, switch, router, set-top box, and television with communication capability.

ABSTRACT OF THE DISCLOSURE

Systems and methods for transmission announcement indication are disclosed. A transmission announcement indication is provided for use inside a communications frame addressed to a destination as an indication that another transmission for that same destination will follow.

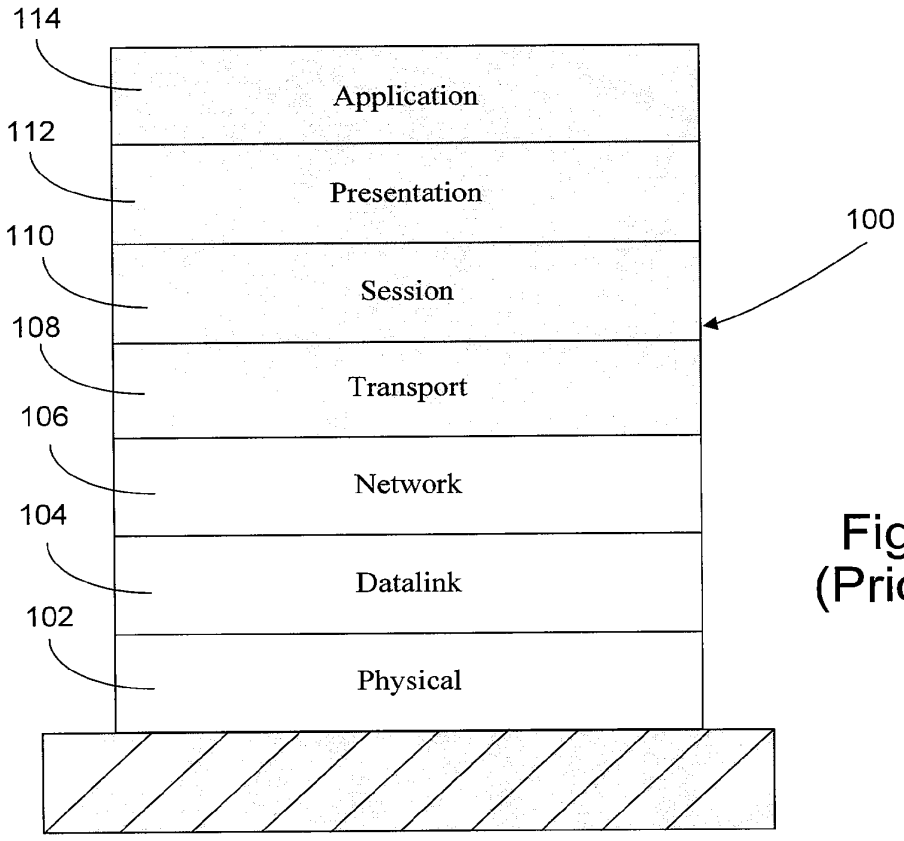


Figure 1
(Prior Art)

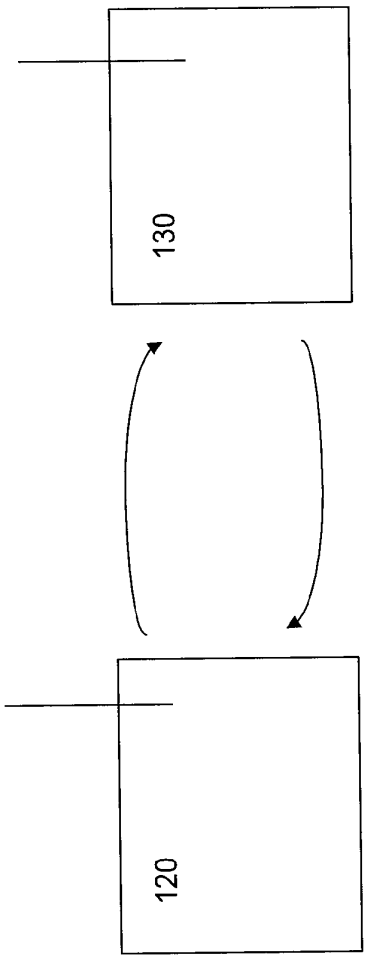


FIGURE 2

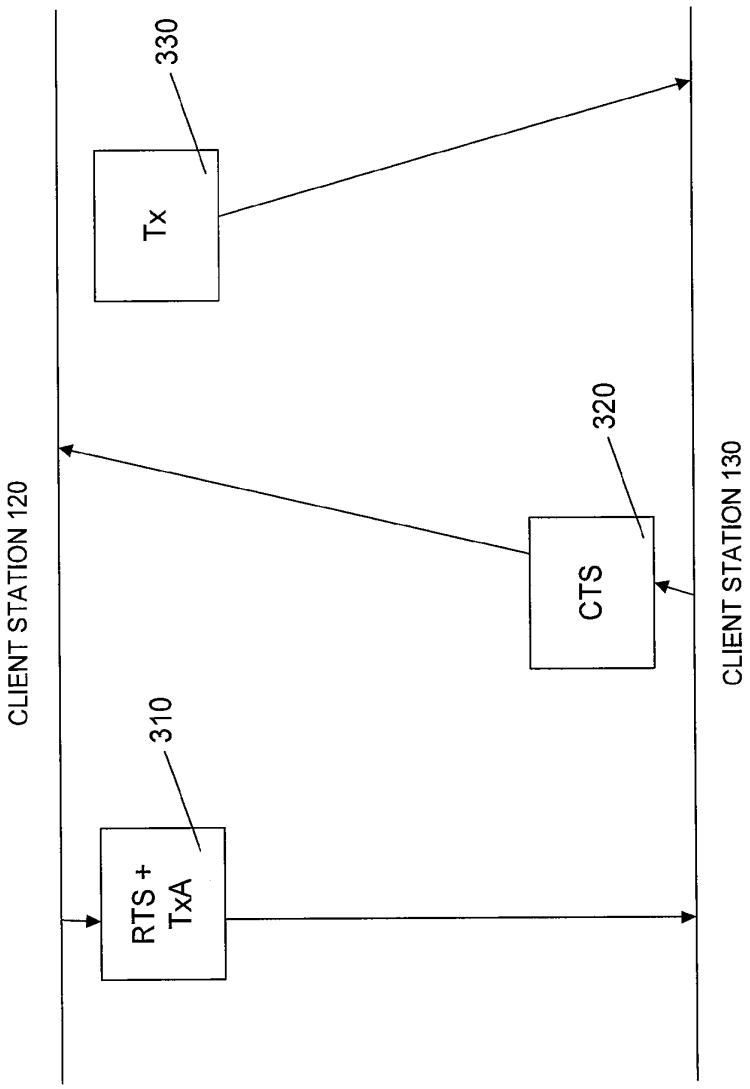

CLIENT STATION 120
CLIENT STATION 130
RTS + TxA
310
CTS
320
Tx
330
300

FIGURE 3

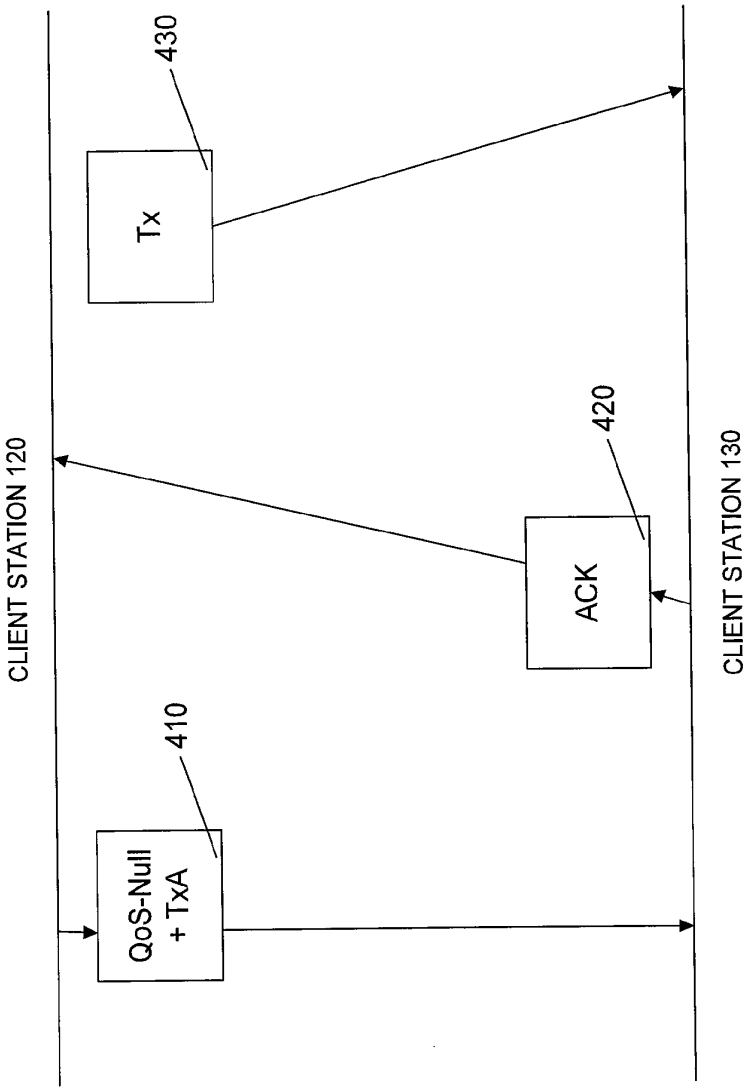

CLIENT STATION 120
CLIENT STATION 130
QoS-Null + TxA
410
ACK
420
Tx
430
400

FIGURE 4

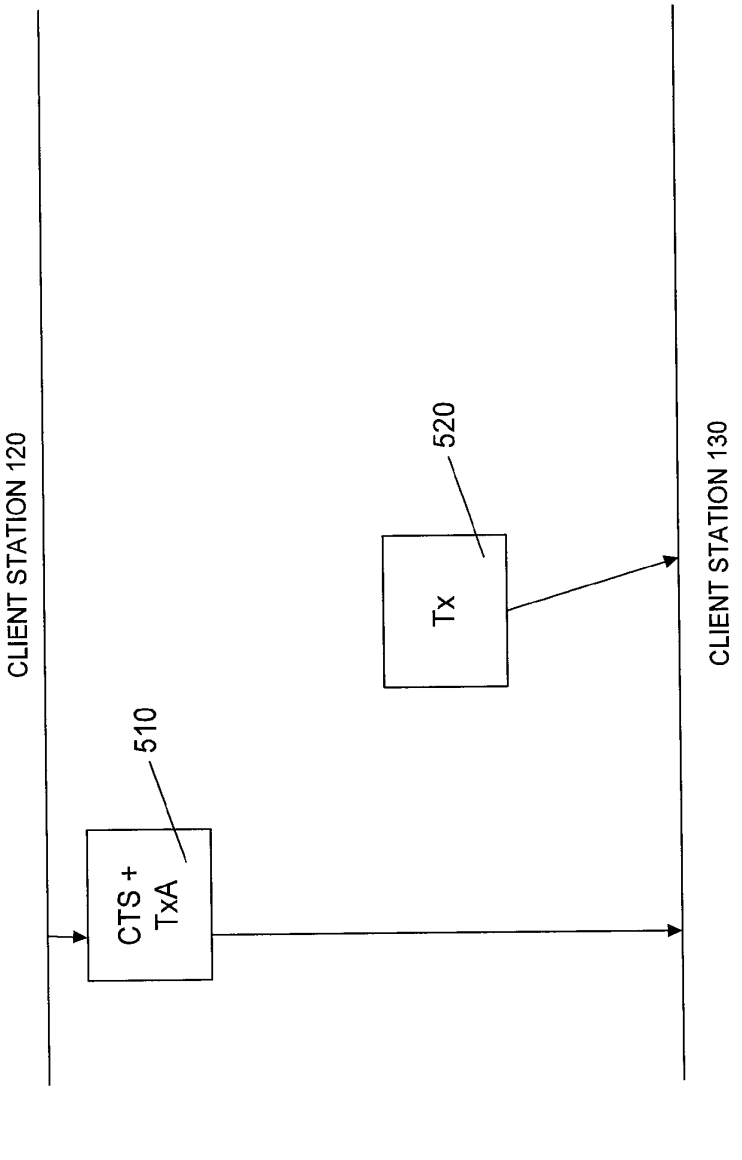


FIGURE 5

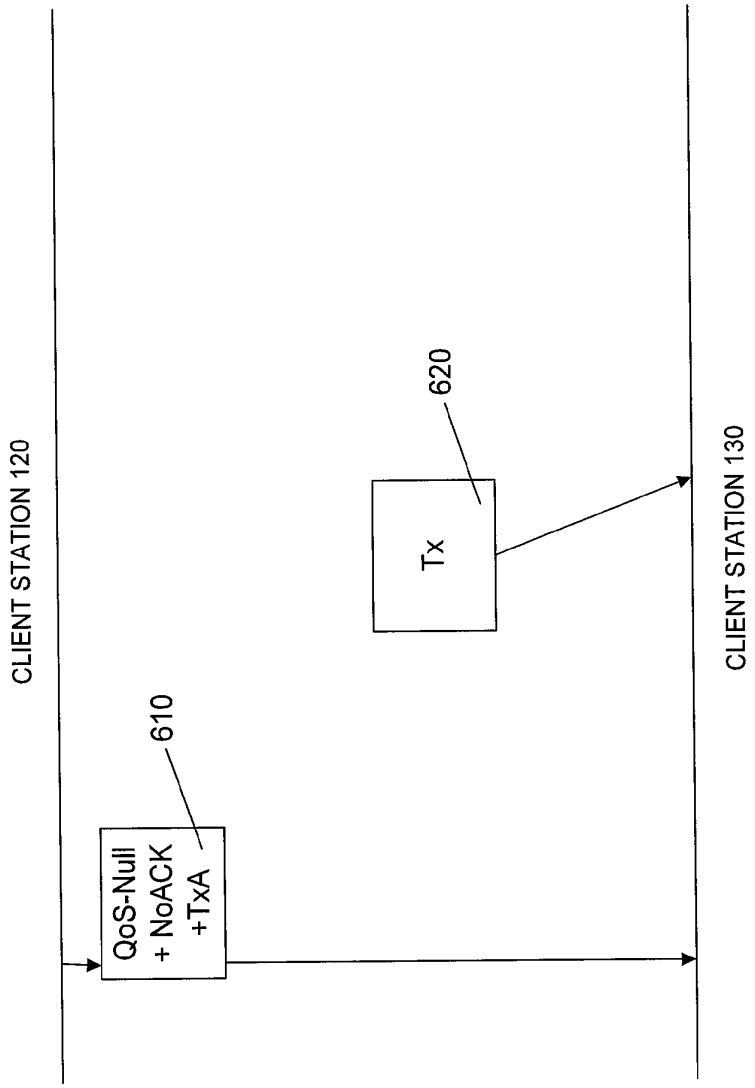

CLIENT STATION 120
CLIENT STATION 130
610
QoS-Null
+ NoACK
+TxA
620
Tx
600

FIGURE 6

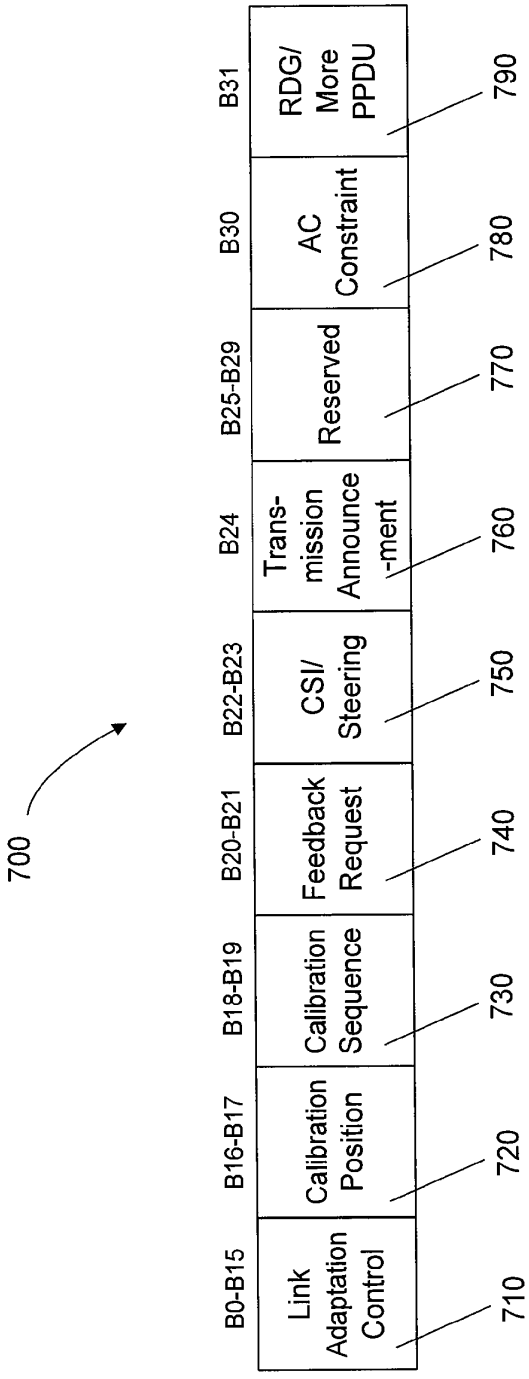

700
B0-B15
B16-B17
B18-B19
B20-B21
B22-B23
B24
B25-B29
B30
B31
Link Adaptation Control
Calibration Position
Calibration Sequence
Feedback Request
CSI/ Steering
Trans-mission Announce-ment
Reserved
AC Constraint
RDG/ More PPDU
710
720
730
740
750
760
770
780
790

FIGURE 7

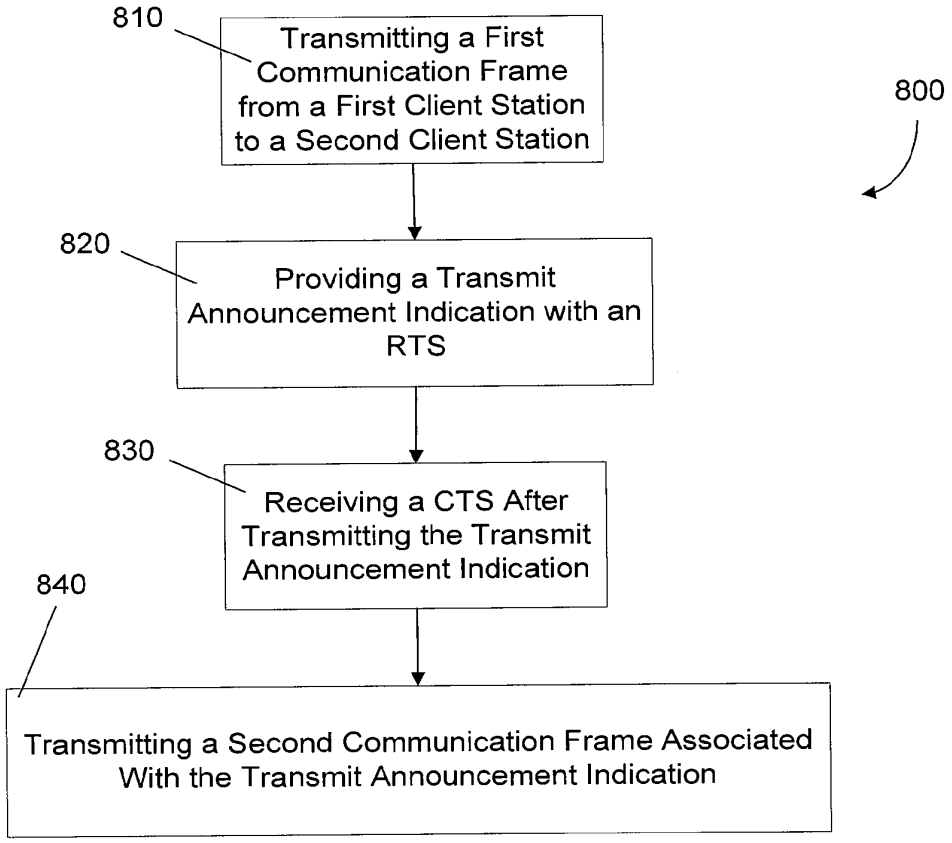

810
Transmitting a First Communication Frame from a First Client Station to a Second Client Station
800
820
Providing a Transmit Announcement Indication with an RTS
830
Receiving a CTS After Transmitting the Transmit Announcement Indication
840
Transmitting a Second Communication Frame Associated With the Transmit Announcement Indication

FIGURE 8

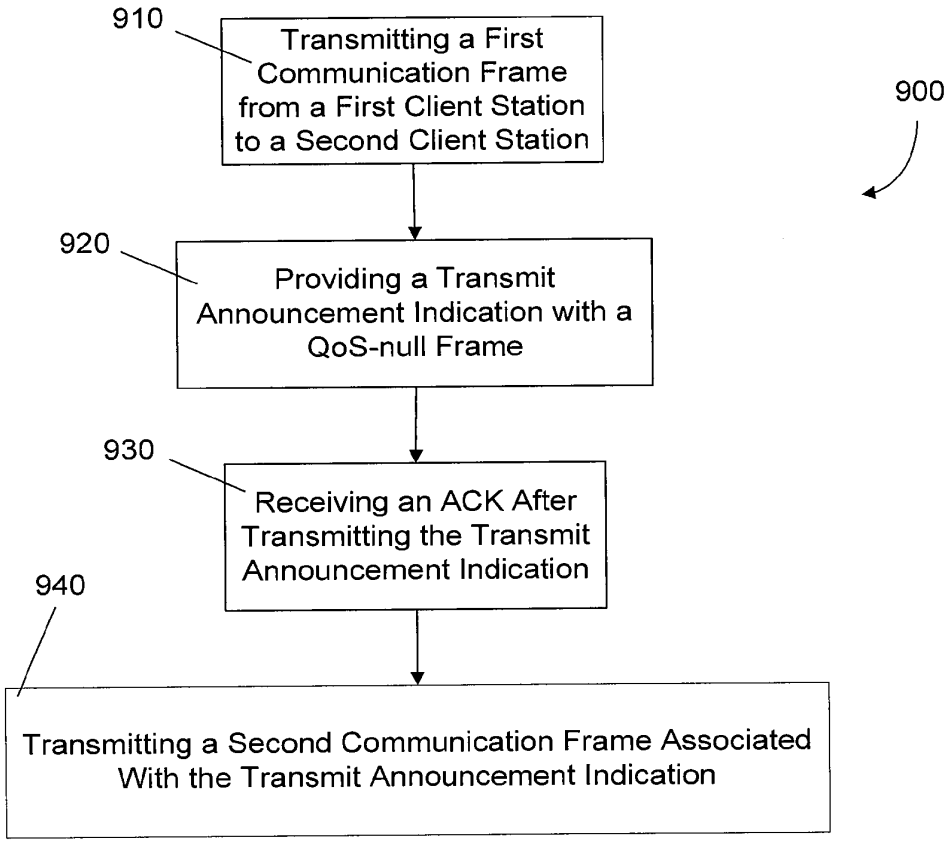

910
Transmitting a First Communication Frame from a First Client Station to a Second Client Station
900
920
Providing a Transmit Announcement Indication with a QoS-null Frame
930
Receiving an ACK After Transmitting the Transmit Announcement Indication
940
Transmitting a Second Communication Frame Associated With the Transmit Announcement Indication

FIGURE 9

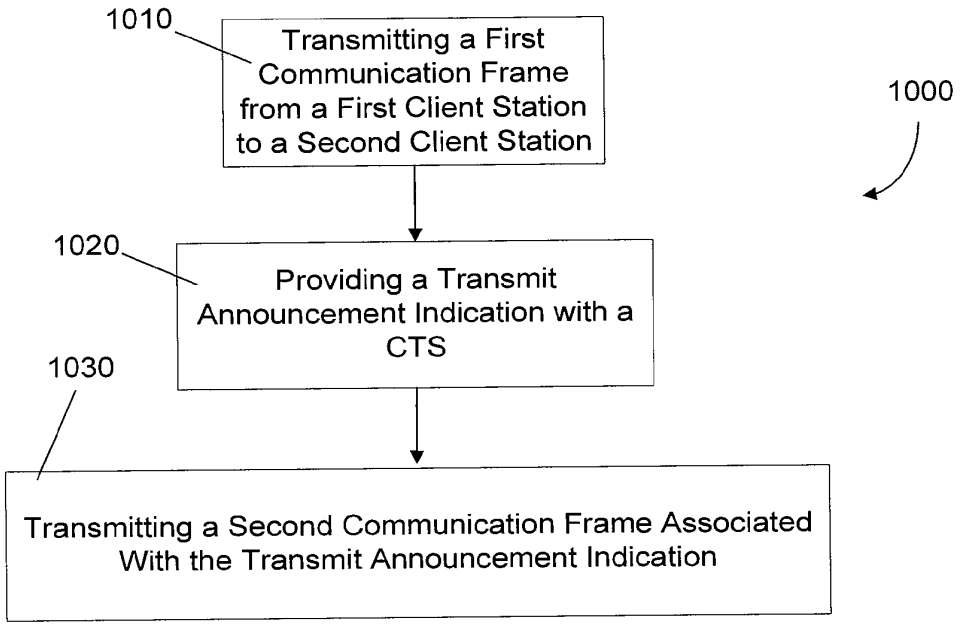

1010
Transmitting a First Communication Frame from a First Client Station to a Second Client Station
1000
1020
Providing a Transmit Announcement Indication with a CTS
1030
Transmitting a Second Communication Frame Associated With the Transmit Announcement Indication

FIGURE 10

DECLARATION FOR PATENT APPLICATION

Attorney Docket No: 50337-1570

As the below named inventor, I hereby declare that:

My residence, post office address and citizenship are as stated below next to my name.

I believe I am an original, first and sole inventor of the subject matter which is claimed and for which a patent is sought on the invention entitled "**TRANSMIT ANNOUNCEMENT INDICATION**", the specification of which:

☒ is attached hereto.
☐ was filed on as Application Serial No. .

I hereby state that I have reviewed and understand the contents of the above-identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose information which is material to the examination of this application in accordance with Title 37, Code of Federal Regulations, §1.56.

I hereby claim foreign priority benefits under Title 35, United States Code, 119(a)-(d) or (f), or 365(b) of any foreign application(s) for patent, inventor's or plant breeder's rights certificate(s), or 365(a) of any PCT international application which designated at least one country other than the United States of America listed below and have also identified below any foreign application for patent, inventor's or plant breeder's rights certificate(s), or any PCT international application having a filing date before that of the application on which priority is claimed: **NOT APPLICABLE.**

I hereby appoint all attorneys and agents of Thomas, Kayden, Horstemeyer & Risley, LLP, who are listed under the USPTO Customer Number shown below as my attorneys and agents to prosecute this application and to transact all business in the United States Patent and Trademark Office connected therewith, recognizing that the specific attorneys agents listed under that Customer Number may be changed from time to time at the sole discretion of Thomas, Kayden, Horstemeyer & Risley, LLP, and request that all correspondence be addressed to the address associated with the same USPTO Customer Number.

24504

I hereby declare under penalty of perjury under the laws of the United States of America that all statements made herein of my own knowledge are true and correct and that all statements made on information and belief are believed to be true and correct; and further that these statements were made with the knowledge that willful false statement and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

Inventor's Signature: _____ Date: 01-25-07

Full Name of Inventor: **Menzo Wentink**
Residence: **3511AB Utrecht**
The Netherlands Citizenship: **Dutch**
Post Office Address: 3511AB Utrecht
The Netherlands

PTO/SB/14 (08-05)
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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	50337-1570
	Application Number	
Title of Invention	Transmit Announcement Indication	

The application data sheet is part of the provisional or nonprovisional application for which it is being submitted. The following form contains the bibliographic data arranged in a format specified by the United States Patent and Trademark Office as outlined in 37 CFR 1.76.
This document may be completed electronically and submitted to the Office in electronic format using the Electronic Filing System (EFS) or the document may be printed and included in a paper filed application.

Secrecy Order 37 CFR 5.2

☐ Portions or all of the application associated with this Application Data Sheet may fall under a Secrecy Order pursuant to 37 CFR 5.2 (Paper filers only. Applications that fall under Secrecy Order may not be filed electronically.)

Applicant Information:

Applicant 1 Remove

Applicant Authority ◉ Inventor ○ Legal Representative under 35 U.S.C. 117 ○ Party of Interest under 35 U.S.C. 118

Prefix	Given Name	Middle Name	Family Name	Suffix
	Menzo		Wentink	

Residence Information (Select One) ○ US Residency ◉ Non US Residency ○ Active US Military Service

City		Country Of Residence[i]	NL
Citizenship under 37 CFR 1.41(b) [i]	NL		

Mailing Address of Applicant:

Address 1	3511AB Utrecht		
Address 2			
City		State/Province	
Postal Code		Country[i]	NL

All Inventors Must Be Listed - Additional Inventor Information blocks may be generated within this form by selecting the **Add** button. Add

Correspondence Information:

Enter either Customer Number or complete the Correspondence Information section below.
For further information see 37 CFR 1.33(a).

☐ **An Address is being provided for the correspondence Information of this application.**

Customer Number	24504		
Email Address	scott.horstemeyer@tkhr.com	Add Email	Remove Email

Application Information:

Title of the Invention	Transmit Announcement Indication		
Attorney Docket Number	50337-1570	Small Entity Status Claimed	☐
Application Type	Nonprovisional		
Subject Matter	Utility		
Suggested Class (if any)		Sub Class (if any)	
Suggested Technology Center (if any)			
Total Number of Drawing Sheets (if any)	10	Suggested Figure for Publication (if any)	

PTO/SB/14 (08-05)
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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	50337-1570
	Application Number	
Title of Invention	Transmit Announcement Indication	

Publication Information:
☐ Request Early Publication (Fee required at time of Request 37 CFR 1.219)
☐ Request Not to Publish. I hereby request that the attached application not be published under 35 U.S.C. 122(b) and certify that the invention disclosed in the attached application has not been and will not be the subject of an application filed in another country, or under a multilateral agreement, that requires publication at eighteen months after filing.

Representative Information:

Representative information should be provided for all practitioners having a power of attorney in the application. Providing this information in the Application Data Sheet does not constitute a power of attorney in the application (see 37 CFR 1.32).
Enter either Customer Number or complete the Representative Name section below. If both sections are completed the Customer Number will be used for the Representative Information during processing.

Please Select One:	◉ Customer Number	○ US Patent Practitioner	○ US Representative (37 CFR 11.9)
Customer Number	24504		

Domestic Priority Information:

This section allows for the applicant to claim benefit under 35 U.S.C. 119(e), 120, 121, or 365(c). Providing this information in the application data sheet constitutes the specific reference required by 35 U.S.C. 119(e) or 120, and 37 CFR 1.78(a)(2) or CFR 1.78(a)(4), and need not otherwise be made part of the specification.

Prior Application Status	Pending		Remove
Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)
	non provisional of	60762425	2006-01-25

Additional Domestic Priority Data may be generated within this form by selecting the **Add** button. Add

Foreign Priority Information:

This section allows for the applicant to claim benefit of foreign priority and to identify any prior foreign application for which priority is not claimed. Providing this information in the application data sheet constitutes the claim for priority as required by 35 U.S.C. 119(b) and 37 CFR 1.55(a).

Remove

Application Number	Country [i]	Parent Filing Date (YYYY-MM-DD)	Priority Claimed
			◉ Yes ○ No

Additional Foreign Priority Data may be generated within this form by selecting the **Add** button. Add

Assignee Information:

Providing this information in the application data sheet does not substitute for compliance with any requirement of part 3 of Title 37 of the CFR to have an assignment recorded in the Office.

Assignee 1 Remove

If the Assignee is an Organization check here. ☐

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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	50337-1570
	Application Number	
Title of Invention	Transmit Announcement Indication	

Prefix	**Given Name**	Middle Name	**Family Name**	Suffix

Mailing Address Information:			
Address 1			
Address 2			
City		**State/Province**	
Country [i]		Postal Code	
Phone Number		Fax Number	
Email Address			
Additional Assignee Data may be generated within this form by selecting the **Add** button.		Add	

Signature:

A signature of the applicant or representative is required in accordance with 37 CFR 1.33 and 10.18. Please see 37 CFR 1.4(d) for the form of the signature.					
Signature	/BAB/			Date (YYYY-MM-DD)	2007-01-25
First Name	Benjamin	Last Name	Balser	Registration Number	58169

This collection of information is required by 37 CFR 1.76. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 23 minutes to complete, including gathering, preparing, and submitting the completed application data sheet form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether the Freedom of Information Act requires disclosure of these records.

2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.

3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.

4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).

5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.

6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).

7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.

8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspections or an issued patent.

9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

Electronic Patent Application Fee Transmittal

Application Number:	
Filing Date:	
Title of Invention:	Transmit Announcement Indication
First Named Inventor/Applicant Name:	Menzo Wentink
Filer:	Benjamin Balser/Brooke French
Attorney Docket Number:	50337-1570

Filed as Large Entity

Utility Filing Fees

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
Utility application filing	1011	1	300	300
Utility Search Fee	1111	1	500	500
Utility Examination Fee	1311	1	200	200
Pages:				
Claims:				
Claims in excess of 20	1202	3	50	150
Miscellaneous-Filing:				
Petition:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				
Miscellaneous:				
		Total in USD ($)		**1150**

Electronic Acknowledgement Receipt

EFS ID:	1465920
Application Number:	11627181
International Application Number:	
Confirmation Number:	1464
Title of Invention:	Transmit Announcement Indication
First Named Inventor/Applicant Name:	Menzo Wentink
Customer Number:	24504
Filer:	Benjamin Balser/Brooke French
Filer Authorized By:	Benjamin Balser
Attorney Docket Number:	50337-1570
Receipt Date:	25-JAN-2007
Filing Date:	
Time Stamp:	16:40:37
Application Type:	Utility

Payment information:

Submitted with Payment	yes
Payment was successfully received in RAM	$1150
RAM confirmation Number	511
Deposit Account	

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)	Multi Part /.zip	Pages (if appl.)

1		00476262.pdf	709143	yes	21
	Multipart Description/PDF files in .zip description				
	Document Description		**Start**	**End**	
	Specification		1	15	
	Claims		16	20	
	Abstract		21	21	
Warnings:					
Information:					
2	Drawings	00476261.pdf	108235	no	10
Warnings:					
Information:					
3	Oath or Declaration filed	00476263.pdf	77540	no	1
Warnings:					
Information:					
4	Application Data Sheet	00476268.pdf	1240825	no	4
Warnings:					
Information:					
5	Fee Worksheet (PTO-06)	fee-info.pdf	8448	no	2
Warnings:					
Information:					
		Total Files Size (in bytes):	2144191		

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New Applications Under 35 U.S.C. 111
If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

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If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

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PATENT APPLICATION FEE DETERMINATION RECORD
Substitute for Form PTO-875

Application or Docket Number: 11,627,181

APPLICATION AS FILED – PART I

FOR	(Column 1) NUMBER FILED	(Column 2) NUMBER EXTRA	SMALL ENTITY RATE ($)	SMALL ENTITY FEE ($)	OR	OTHER THAN SMALL ENTITY RATE ($)	OTHER THAN SMALL ENTITY FEE ($)
BASIC FEE (37 CFR 1.16(a), (b), or (c))				75			300
SEARCH FEE (37 CFR 1.16(k), (i), or (m))				250			500
EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))				100			200
TOTAL CLAIMS (37 CFR 1.16(i))	23	3	X$ 25		OR	X$50	150
INDEPENDENT CLAIMS (37 CFR 1.16(h))	3		X$100			X$200	
APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is $250 ($125 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR						
MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))			180			360	
* If the difference in column 1 is less than zero, enter "0" in column 2.			TOTAL			TOTAL	1150

APPLICATION AS AMENDED – PART II

		(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	SMALL ENTITY RATE ($)	SMALL ENTITY ADDITIONAL FEE ($)	OR	OTHER THAN SMALL ENTITY RATE ($)	OTHER THAN SMALL ENTITY ADDITIONAL FEE ($)
AMENDMENT A	Total (37 CFR 1.16(i))	*	Minus	**	=	X =		OR	X =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=	X =		OR	X =	
	Application Size Fee (37 CFR 1.16(s))									
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))					180		OR	360	
						TOTAL ADD'T FEE		OR	TOTAL ADD'T FEE	

		(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	RATE ($)	ADDITIONAL FEE ($)	OR	RATE ($)	ADDITIONAL FEE ($)
AMENDMENT B	Total (37 CFR 1.16(i))	*	Minus	**	=	X =		OR	X =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=	X =		OR	X =	
	Application Size Fee (37 CFR 1.16(s))									
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))					N/A		OR	N/A	
						TOTAL ADD'T FEE		OR	TOTAL ADD'T FEE	

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.
** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".
*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".
The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1.

This collection of information is required by 37 CFR 1.16. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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