

PETITION TO ACCEPT UNINTENTIONALLY DELAYED PAYMENT OF MAINTENANCE FEE IN AN EXPIRED PATENT (37 CFR 1.378(b))				
Patent Number	Issue Date	Application Number	Filing Date	Docket Number (if applicable)
7420952	02-Sep-2008	10434948	08-May-2003	
CAUTION: Maintenance fee (and surcharge, if any) payment must correctly identify: (1) the patent number and (2) the application number of the actual U.S. application leading to issuance of that patent to ensure the fee(s) is/are associated with the correct patent. 37 CFR 1.366(c) and (d).				
Applicants claims the following fee status:				
☒ Small Entity				
☐ Micro Entity				
☐ Regular Undiscounted				
Applicants selects the following :				
☐ 3 1/2		☐ 7 1/2		☒ 11 1/2
PETITION FEE The petition fee required by 37 CFR 1.17(m) (Fee Code 1558/2558) must be paid as a condition of accepting unintentionally delayed payment of the maintenance fee.				
MAINTENANCE FEE (37 CFR 1.20(e)-(g)) The appropriate maintenance fee must be submitted with this petition.				
STATEMENT The delay in payment of the maintenance fee for this patent was unintentional. Petitioner is reminded that a delay resulting from a deliberately chosen course of action or a change in circumstance is not an unintentional delay. Petitioner is further reminded that a person seeking reinstatement of an expired patent should not make a statement that the delay in payment of the maintenance fee was unintentional unless the entire delay was unintentional, including the period from discovery that the maintenance fee was not timely paid until payment of the maintenance fee. For example, a statement that the delay in payment of the maintenance fee was unintentional would not be proper when the patentee becomes aware of an unintentional failure to timely pay the maintenance fee and then intentionally delays filing a petition for reinstatement of the patent under 37 CFR 1.378. See MPEP 2590. NOTE: Where the petition under 37 CFR 1.378 is filed more than two years after the date the patent expired for nonpayment of the maintenance fee, the United States Patent and Trademark Office requires an additional explanation of the circumstances surrounding the delay that establishes the entire delay was unintentional. This requirement is in addition to the requirement to provide a statement that the entire delay was unintentional. See <i>Clarification of the Practice for Requiring Additional Information in Petitions Filed in Patent Applications and Patents Based on Unintentional Delay</i> , 85 FR 12222 (March 2, 2020). See MPEP 711.03(c)(II)(C)-(F) for additional guidance on the information required to establish that the entire delay was unintentional.				
PETITIONER(S) REQUEST THAT THE DELAYED PAYMENT OF THE MAINTENANCE FEE BE ACCEPTED AND THE PATENT REINSTATED				
THIS PORTION MUST BE COMPLETED BY THE SIGNATORY OR SIGNATORIES 37 CFR 1.378(c) states: "Any petition under this section must be signed in compliance with 37 CFR 1.33(b)."				
I certify, in accordance with 37 CFR 1.4(d)(4) that I am				

- ☒ An attorney or agent registered to practice before the Patent and Trademark Office who has been given power of attorney in this application.
- ☐ An attorney or agent registered to practice before the Patent and Trademark Office
- ☐ A sole patentee
- ☐ A joint patentee; I certify that I am authorized to sign this submission on behalf of all the other patentees as evidenced by the power of attorney in the application
- ☐ A joint patentee; all of whom are signing this e-petition
- ☐ The assignee of record of the entire interest that qualifies as an authorized party under 37 CFR 1.33(b)

Attorney

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	/Szymon M. Gurda/		
Name	Szymon Gurda	Registration Number	58451

Electronic Patent Application Fee Transmittal				
Application Number:		10434948		
Filing Date:		08-May-2003		
Title of Invention:		HIGH PERFORMANCE WIRELESS NETWORKS USING DISTRIBUTED CONTROL		
First Named Inventor/Applicant Name:		Francis da Costa		
Filer:		Szymon Maciej Gurda		
Attorney Docket Number:		0357-02201		
Filed as Small Entity				
Filing Fees for Utility under 35 USC 111(a)				
Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Basic Filing:				
MAINTENANCE FEE DUE AT 11.5 YEARS	2553	1	3850	3850
PET. DELAY PYMT MAINTAIN PATENT IN FORCE	2558	1	1050	1050
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				
Miscellaneous:				
Total in USD (\$)				4900



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

In re Patent No. 7420952 :
Issue Date: September 2, 2008 :
Application No. 10434948 :DECISION GRANTING PETITION
Filed: May 8, 2003 :UNDER 37 CFR 1.378(b)
Attorney Docket No. 0357-02201 :

This is a decision on the electronic petition, filed March 2, 2022, under 37 CFR 1.378(b) to accept the unintentionally delayed payment of the 11.5 year maintenance fee for the above-identified patent.

The petition is **GRANTED**.

The maintenance fee is accepted, and the above-identified patent reinstated as of March 2, 2022. This decision also constitutes notice that the fee has been accepted. An electronic copy of the petition and this decision has been created as an entry in the Image File Wrapper. Nevertheless, petitioner should print and retain an independent copy.

Telephone inquiries related to this electronic decision should be directed to the Electronic Business Center at 1-866-217-9197.

Electronic Acknowledgement Receipt	
EFS ID:	45131060
Application Number:	10434948
Patent Number:	7420952
Confirmation Number:	7871
Petition Issued Date:	March 2,2022
Title of Invention:	HIGH PERFORMANCE WIRELESS NETWORKS USING DISTRIBUTED CONTROL
First Named Inventor/Applicant Name:	Francis da Costa
Customer Number:	27197
Filer:	Szymon Maciej Gurda
Filer Authorized By:	
Attorney Docket Number:	0357-02201
Receipt Date:	02-MAR-2022
Filing Date:	08-MAY-2003
Time Stamp:	19:02:42
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	CARD
Payment was successfully received in RAM	\$4900
RAM confirmation Number	E202232J02363797
Deposit Account	
Authorized User	
The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:	

File Listing:					
Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	ePetition Request Form	petition-request.pdf	47927	no	2
			d0fa67bcd9dc067ca6344263a860149531e3a27b		
Warnings:					
Information:					
2	Fee Worksheet (SB06)	fee-info.pdf	40239	no	2
			a0bef0d5a4905f34405eac494a4775a5123edad		
Warnings:					
Information:					
Total Files Size (in bytes):			88166		
<p>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.</p> <p><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.</p> <p><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.</p> <p><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.</p>					

"FEE ADDRESS" INDICATION FORM

Address to:
Mail Stop M Correspondence
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Fax to:
571-273-6500

- OR -

INSTRUCTIONS: The issue fee must have been paid for application(s) listed on this form. In addition, only an address represented by a Customer Number can be established as the fee address for maintenance fee purposes (hereafter, fee address). A fee address should be established when correspondence related to maintenance fees should be mailed to a different address than the correspondence address for the application. **When to check the first box below:** If you have a Customer Number to represent the fee address. **When to check the second box below:** If you have no Customer Number representing the desired fee address, in which case a completed Request for Customer Number (PTO/SB/125) must be attached to this form. For more information on Customer Numbers, see the Manual of Patent Examining Procedure (MPEP) § 403.

For the following listed application(s), please recognize as the "Fee Address" under the provisions of 37 CFR 1.363 the address associated with:



Customer Number:

27197

OR



The attached Request for Customer Number (PTO/SB/125) form.

PATENT NUMBER (if known)	APPLICATION NUMBER
7,420,952	10/434,948

Completed by (check one):



Applicant/Inventor

/Szymon M. Gurda/

Signature



Attorney or Agent of record 58451

(Reg. No.)

Szymon M. Gurda

Typed or printed name



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)

312-621-1330

Requester's telephone number



Assignee recorded at Reel _____ Frame _____

October 25, 2011

Date

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 _____ forms are submitted.

This collection of information is required by 37 CFR 1.363. 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 5 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 COMPLETE FORMS TO THIS ADDRESS.
SEND TO: Mail Stop M Correspondence, 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.

Electronic Acknowledgement Receipt	
EFS ID:	11259033
Application Number:	10434948
International Application Number:	
Confirmation Number:	7871
Title of Invention:	HIGH PERFORMANCE WIRELESS NETWORKS USING DISTRIBUTED CONTROL
First Named Inventor/Applicant Name:	Francis da Costa
Customer Number:	27197
Filer:	Szymon Maciej Gurda
Filer Authorized By:	
Attorney Docket Number:	0357-02201
Receipt Date:	25-OCT-2011
Filing Date:	08-MAY-2003
Time Stamp:	13:44:04
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	Change of Address	SB47.pdf	311993 2685c7bd7ef6af90d6752b79bb9c5703ce16dd3a	no	2
Warnings:					
Information:					

Total Files Size (in bytes):	311993
<p>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.</p> <p><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.</p> <p><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.</p> <p><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.</p>	



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
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APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
10/434,948	05/08/2003	Francis da Costa	0357-02201

CONFIRMATION NO. 7871

POA ACCEPTANCE LETTER



0C000000032990190*

27197
CHERSKOV & FLAYNIK
THE CIVIC OPERA BUILDING
20 NORTH WACKER DRIVE, SUITE 1447
CHICAGO, IL 60606

Date Mailed: 11/13/2008

NOTICE OF ACCEPTANCE OF POWER OF ATTORNEY

This is in response to the Power of Attorney filed 11/01/2008.

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.

/nmohammed/

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
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Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
10/434,948	05/08/2003	Francis da Costa	MESHPO01

21912
VAN PELT, YI & JAMES LLP
10050 N. FOOTHILL BLVD #200
CUPERTINO, CA 95014

CONFIRMATION NO. 7871
POWER OF ATTORNEY NOTICE



0C000000032990188*

Date Mailed: 11/13/2008

NOTICE REGARDING CHANGE OF POWER OF ATTORNEY

This is in response to the Power of Attorney filed 11/01/2008.

- 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).

/nmohammed/

Office of Data Management, Application Assistance Unit (571) 272-4000, or (571) 272-4200, or 1-888-786-0101

Print Form

PTO/SB/81 (07-08)

Approved for use through 12/31/2008. OMB 0651-0035

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.

POWER OF ATTORNEY OR REVOCATION OF POWER OF ATTORNEY WITH A NEW POWER OF ATTORNEY AND CHANGE OF CORRESPONDENCE ADDRESS	Application Number	10/434,948
	Filing Date	May 8, 2003
	First Named Inventor	Francis daCosta
	Title	High Performance Wireless Networks Using Distributed
	Art Unit	2617
	Examiner Name	Stephen M. D'Agosta
	Attorney Docket Number	0357-02201

I hereby revoke all previous powers of attorney given in the above-identified application.

☐ A Power of Attorney is submitted herewith.

OR

☒ I hereby appoint Practitioner(s) associated with the following Customer 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:

27197

OR

☐ I hereby appoint Practitioner(s) named below 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:

Practitioner(s) Name	Registration Number

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:

27197

OR

☐ Firm or Individual Name			
Address			
City		State	
Country			
Telephone		Email	

I am the:

☐ Applicant/Inventor.

OR

☒ Assignee of record of the entire interest. See 37 CFR 3.71.
Statement under 37 CFR 3.73(b) (Form PTO/SB/96) submitted herewith or filed on _____.

SIGNATURE of Applicant or Assignee of Record

Signature	<i>Francis daCosta</i>	Date	October 31, 2008
Name	Francis daCosta	Telephone	+1 (408) 373-7700
Title and Company	President, MESH DYNAMICS INC.		

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.

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.

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.

STATEMENT UNDER 37 CFR 3.73(b)

Applicant/Patent Owner: DACOSTA ET AL.

Application No./Patent No.: 10/434,948 Filed/Issue Date: 05/08/2003

Entitled: HIGH PERFORMANCE WIRELESS NETWORKS USING DISTRIBUTED CONTROL

MESH DYNAMICS INC.

(Name of Assignee)

, a corporation

(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 019345, Frame 0124, or for which a copy therefore 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: _____ 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.

/Szymon M. Gurda/

Signature

Oct. 31, 2008

Date

Szymon M. Gurda

Printed or Typed Name

312-621-1330

Telephone Number

Attorney

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.**

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

Electronic Acknowledgement Receipt	
EFS ID:	4218010
Application Number:	10434948
International Application Number:	
Confirmation Number:	7871
Title of Invention:	HIGH PERFORMANCE WIRELESS NETWORKS USING DISTRIBUTED CONTROL
First Named Inventor/Applicant Name:	Francis da Costa
Customer Number:	21912
Filer:	Szymon Maciej Gurda
Filer Authorized By:	
Attorney Docket Number:	MESHP001
Receipt Date:	01-NOV-2008
Filing Date:	08-MAY-2003
Time Stamp:	16:58:16
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	Power of Attorney	2201PoA.pdf	194267 <small>27crlbe068067d86cb016dd74b87a543ae4 c73822</small>	no	2
Warnings:					
Information:					

Total Files Size (in bytes):	194267
<p>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.</p> <p><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.</p> <p><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.</p> <p><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.</p>	



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Alexandria, Virginia 22313-1450
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APPLICATION NO.	ISSUE DATE	PATENT NO.	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/434,948	09/02/2008	7420952	MESHP001	7871
21912	7590	08/13/2008		
VAN PELT, YI & JAMES LLP 10050 N. FOOTHILL BLVD #200 CUPERTINO, CA 95014				

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 744 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 Customer Service Center of the Office of Patent Publication at (571)-272-4200.

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

Francis da Costa, San Jose, CA;
Sriram Dayanandan, San Jose, CA;



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United States Patent and Trademark Office
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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/434,948	05/08/2003	Francis da Costa	MESHPO01	7871
21912 7590 08/06/2008 VAN PELT, YI & JAMES LLP 10050 N. FOOTHILL BLVD #200 CUPERTINO, CA 95014			EXAMINER D AGOSTA, STEPHEN M	
			ART UNIT 2617	PAPER NUMBER
			MAIL DATE 08/06/2008	DELIVERY MODE 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'S AMENDMENT

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 Diana Fu on 7-24-2008.

1. Please delete pages 47-62 from the specification.

This amendment serves to remove the figures contained in the specification (which is improper).

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Stephen M. D'Agosta whose telephone number is 571-272-7862. The examiner can normally be reached on M-F, 8am to 5pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Dwayne Bost can be reached on 571-272-7023. 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.

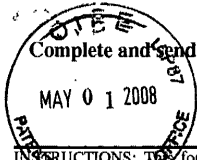
/Stephen M. D'Agosta/
Primary Examiner, Art Unit 2617

IDS 08/25/2005 U.S. Department of Commerce, Patent and Trademark Office		Application No.:	10/434,948
		Filing Date:	May 8, 2003
		First Named Inventor:	Francis daCosta
		Group Art Unit:	2661
INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Use several sheets if necessary)		Examiner Name:	na
		Confirmation No.:	na
		Attorney Docket No.:	MESHPO01

U.S. Patent Documents							
*Examiner Initials		Document Number	Date	Name	Class	Subclass	Filing Date if Appropriate
SD	1.	20040137924	7-15-2004	Herscovich, Bernard ; et al.	455	500	1-10-2003
	2.	20040001442	1-1-2004	Rayment, Stephen G. ; et al.	370	238	6-28-2002
	3.	6,704,301	3-9-2004	Chari, et al.	370	351	12-29-2000
	4.	6,904,275	June 7, 2005	Stanforth; Peter	455	343.1	May 18, 2001
	5.	6,892,068	May 10, 2005	Karabinis, et al.	455	429	Aug 1, 2001
	6.	20030114204	June 19, 2003	Allen, Vernon Anthony ; et al.	455	574	Dec 13, 2001
	7.	20030012176	Jan 16, 2003	Kondylis, George ; et al.	370	348	Nov 9, 2001
	8.	20050122925	June 9, 2005	Chitre; Dattakumar M et al.	370	310	Nov 19, 1999
	9.	6,865,170	June 19, 1998	Zendle	370	338	Mar 8, 2005
	10.	6,859,652	Feb 22, 2005	Karabinis, et al.	455	427	Dec 4, 2001
	11.	5,166,929	Nov 24, 1992	Lo	370	448	June 18, 1990
	12.	6,831,921	Dec 14, 2004	Higgins	370	401	Mar 27, 2002
	13.	6,026,303	Feb 15, 2000	Minamisawa	455	446	Nov 6, 1997
Foreign Patent Documents							
							Translation
		Document	Date	Country	Class	Subclass	Yes No
Other Art (Including Author, Title, Date, Pertinent Pages, Etc.)							

Examiner:	/Stephen D Agosta/	Date Considered:	11/08/2006
* Examiner: Initial if reference is 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 your communication with applicant.			

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21912 7590 03/25/2008

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 CUPERTINO, CA 95014

05/01/2008 REFERENCE 00000033 10434948

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 300.00 OP
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Elaine Nguyen	(Depositor's name)
<i>Elaine Nguyen</i>	(Signature)
4/25/2008	(Date)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/434,948	05/08/2003	Francis da Costa	MESHP001	7871

TITLE OF INVENTION: HIGH PERFORMANCE WIRELESS NETWORKS USING DISTRIBUTED CONTROL

APPLN. TYPE	SMALL ENTITY	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	YES	\$720	\$300	\$0	\$1020	06/25/2008

EXAMINER	ART UNIT	CLASS-SUBCLASS
D AGOSTA, STEPHEN M	2617	370-338000

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 Van Pelt, Yi & James LLP

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

Mesh Dynamics, Inc.

(B) RESIDENCE: (CITY and STATE OR COUNTRY)

Santa Clara, CA

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 4

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 50-0685 (enclose an extra copy of this form).

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

- ☐ a. Applicant claims SMALL ENTITY status. See 37 CFR 1.27. ☐ b. Applicant is no longer claiming SMALL ENTITY status. See 37 CFR 1.27(g)(2).

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 *Diana Y. Fu*
 Typed or printed name Diana Y. Fu

Date 4/25/08
 Registration No. 52,924

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.

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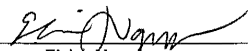
IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Inventor:	DACOSTA et al.	Examiner:	Stephen M. D Agosta
Application No.:	10/434,948	Art Unit:	2617
Filed:	May 8, 2003	Docket No.:	MESHP001
Title:	HIGH PERFORMANCE WIRELESS NETWORKS USING DISTRIBUTED CONTROL		

CERTIFICATE OF MAILING

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4/25, 2008.


Elaine Nguyen

REPLACEMENT DRAWING(S)

MAIL STOP – ISSUE FEE

Commissioner for Patents

P.O. Box 1450

Alexandria, VA 22313-1450

Sir:

The attached sheet(s) of drawing(s) includes changes to Figure(s) 1-18. This(ese) sheet(s), which includes Figure(s) 1-18, replace(s) the original sheet(s) including Figure(s) 1-18.

Attachment: Replacement Sheet

Respectfully submitted,

Dated: 4/25/08



Diana Y. Fu
Registration No. 52,924
V 408-973-2593
F 408-973-2595

VAN PELT AND YI, LLP
10050 N. Foothill Blvd., Suite 200
Cupertino, CA 95014



1/18

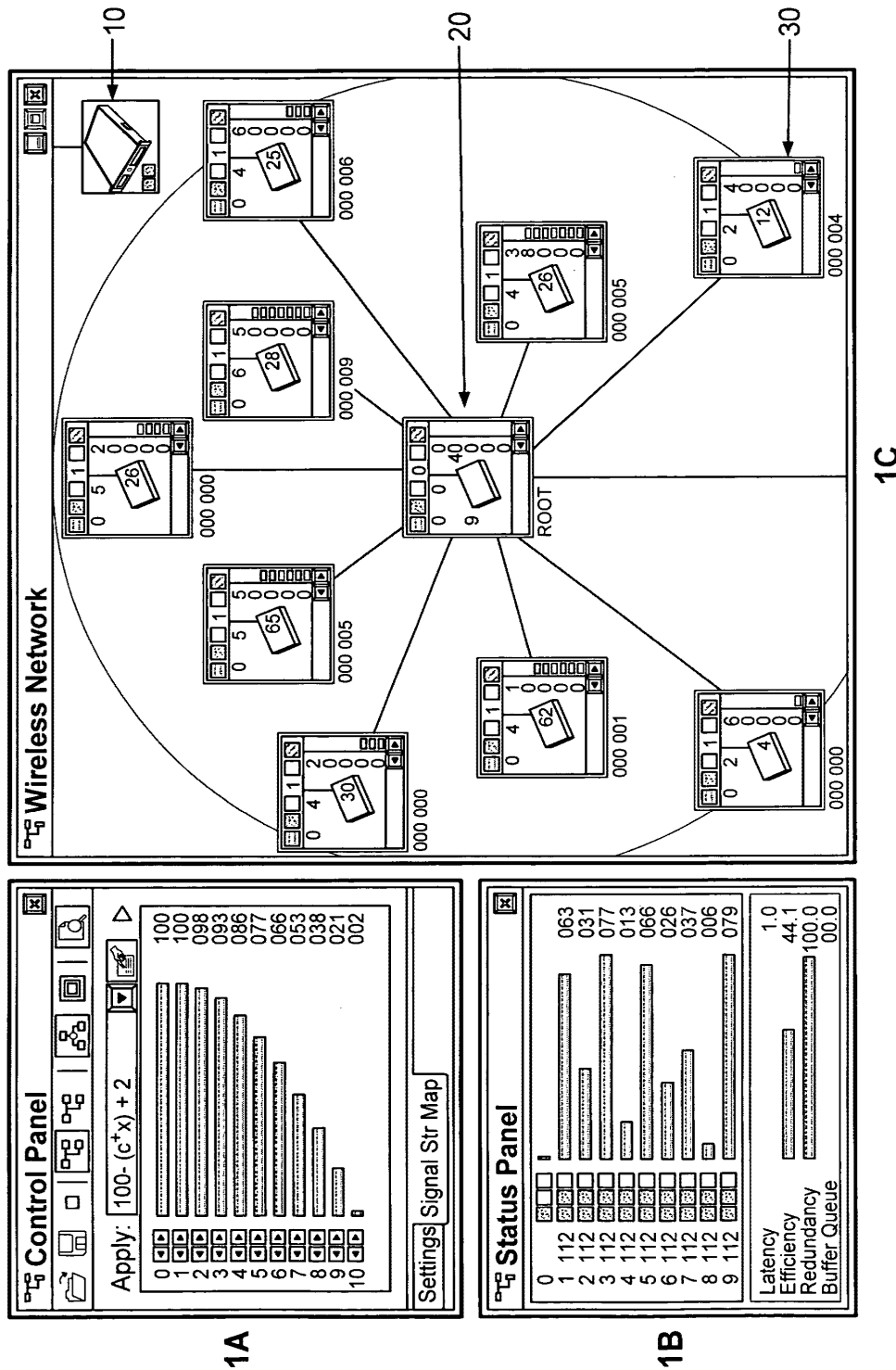
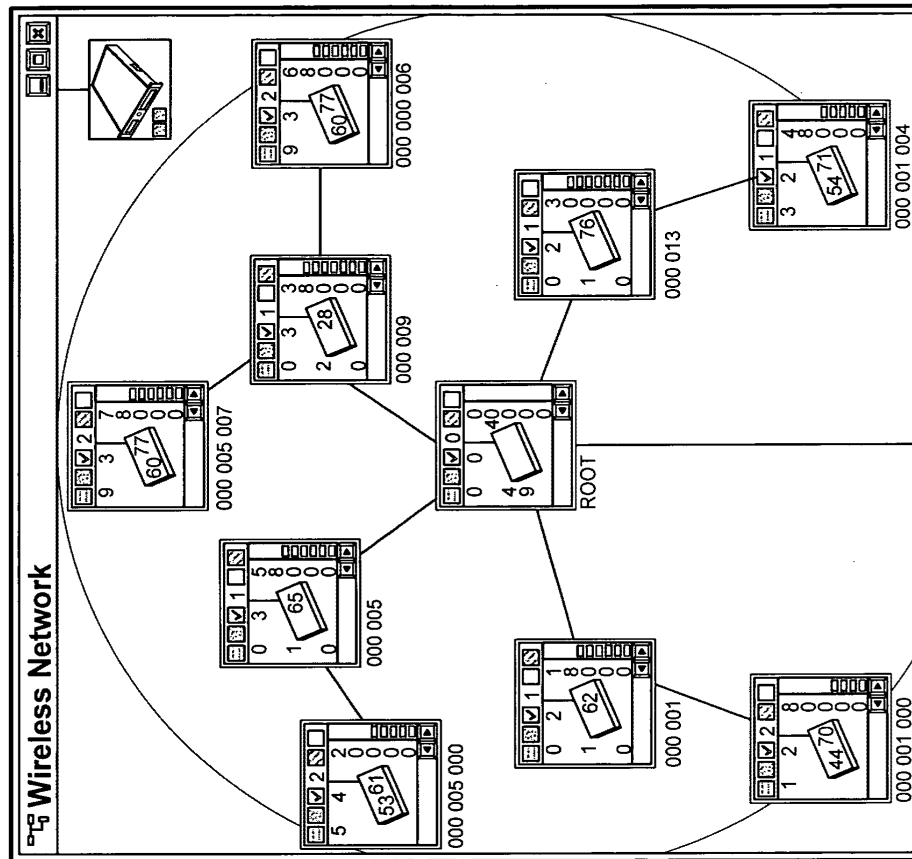


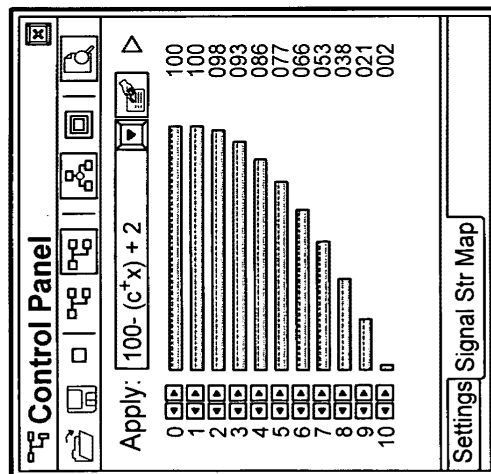
FIG. 1

2/18

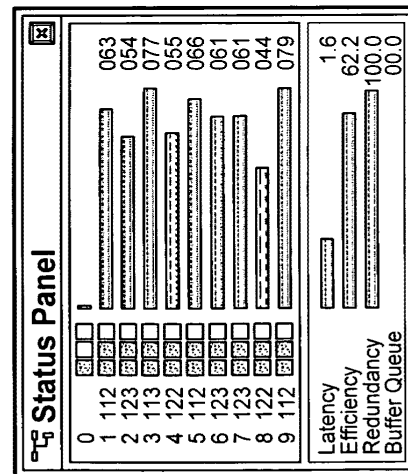


2C

FIG. 2



2A



2B



FIG. 3

3A

3B

5/18

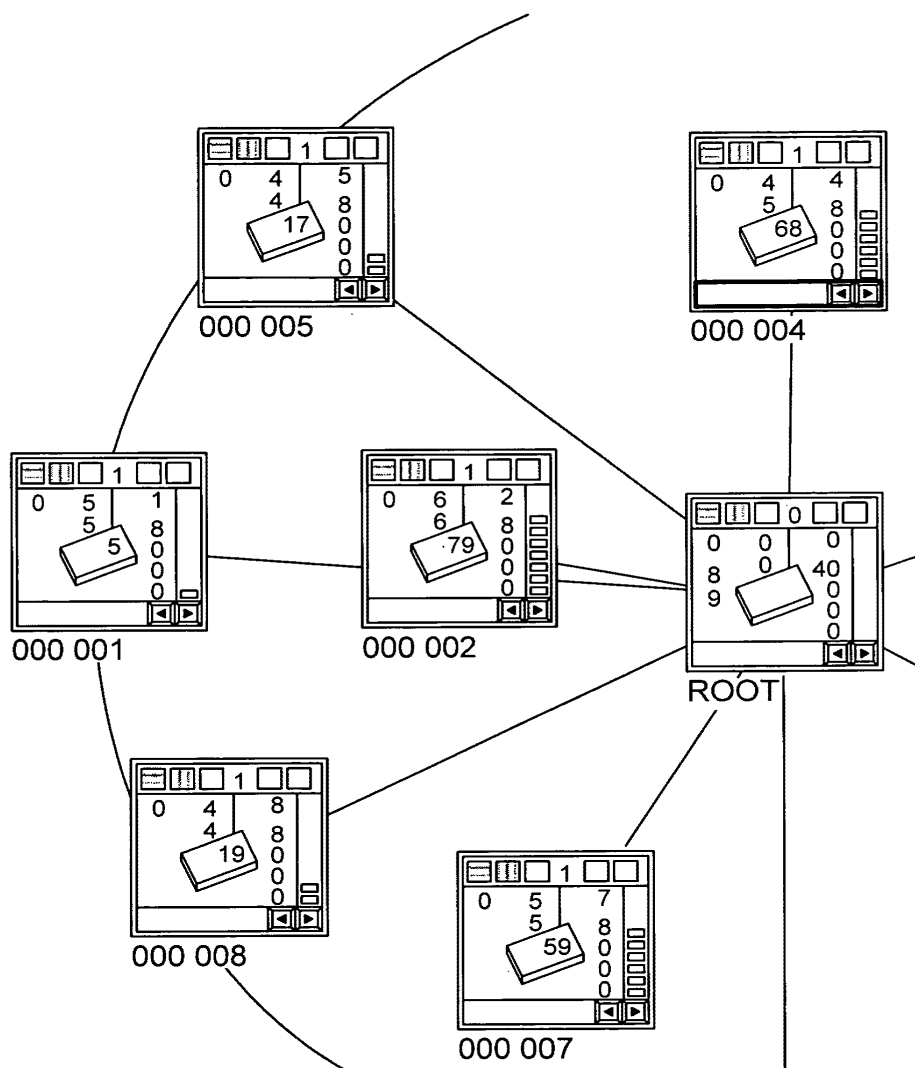


FIG. 5

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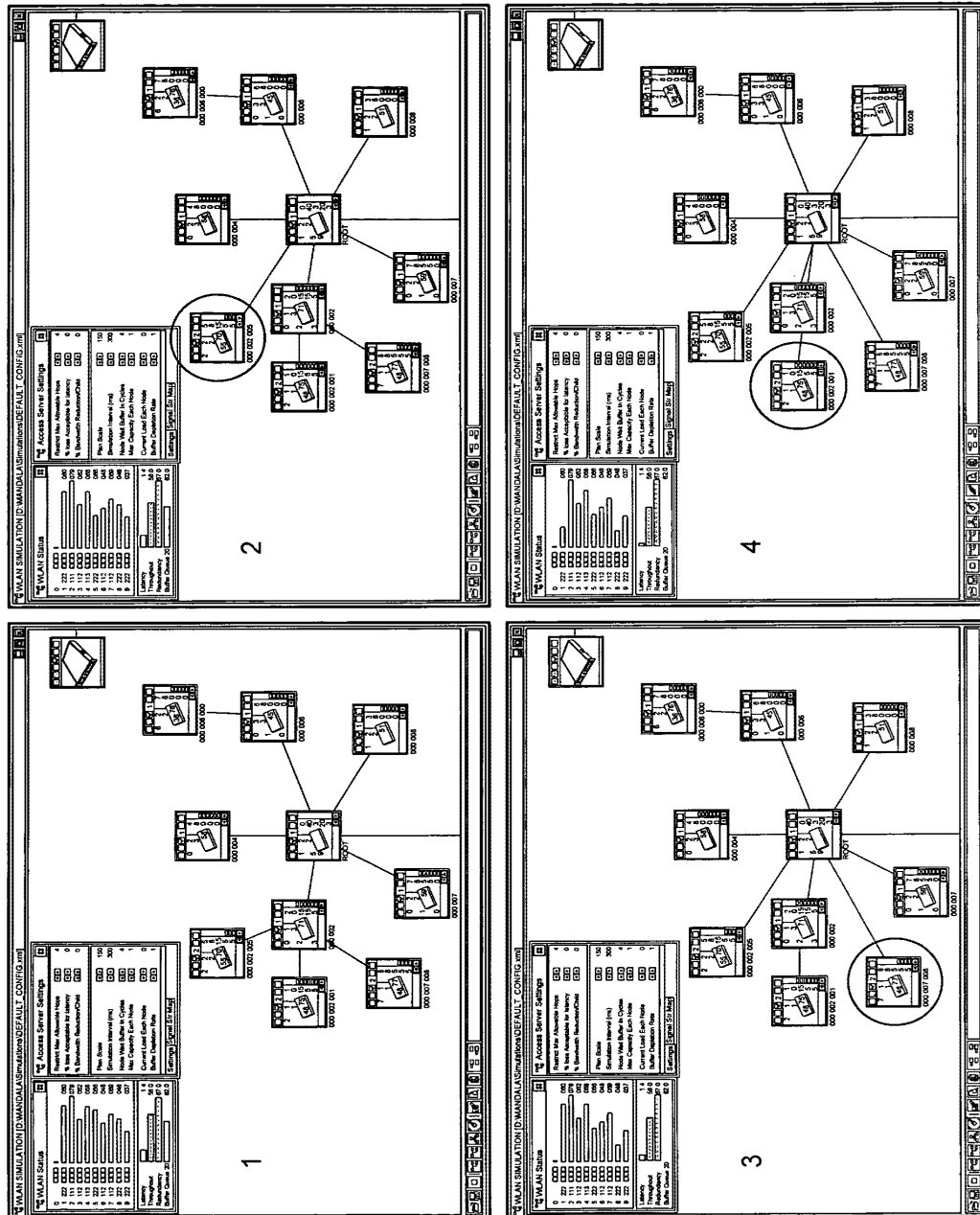


FIG. 6

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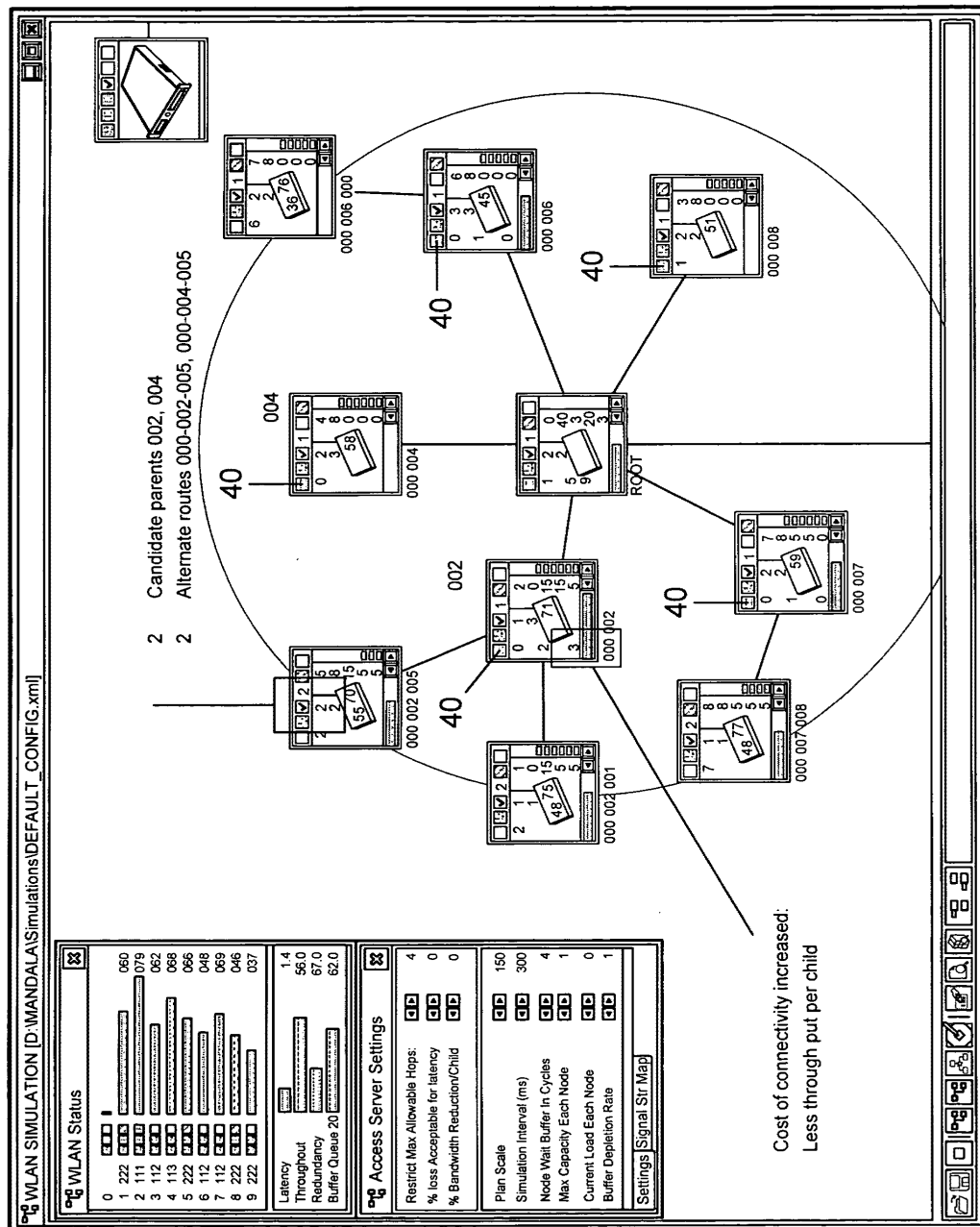


FIG. 7

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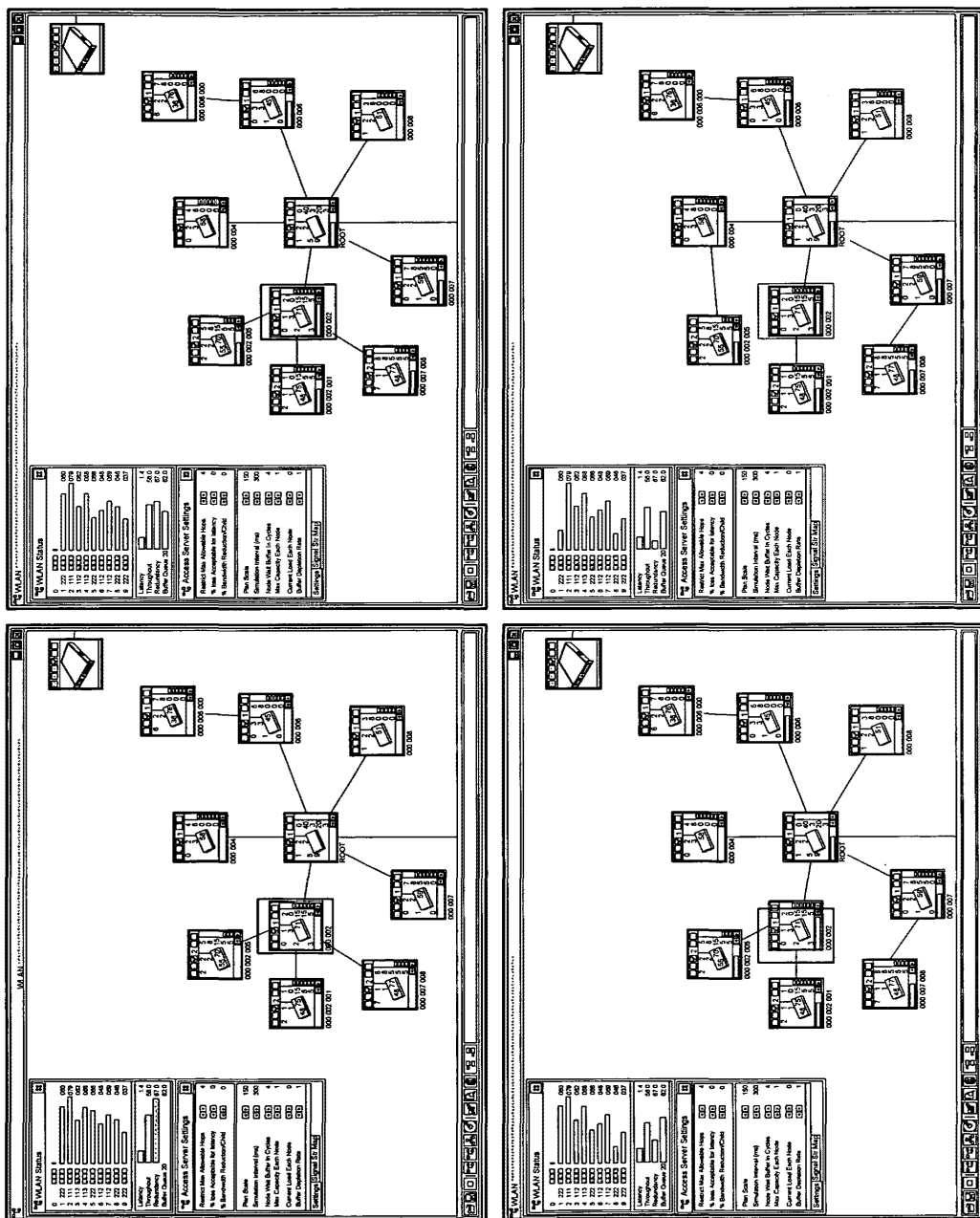


FIG. 8

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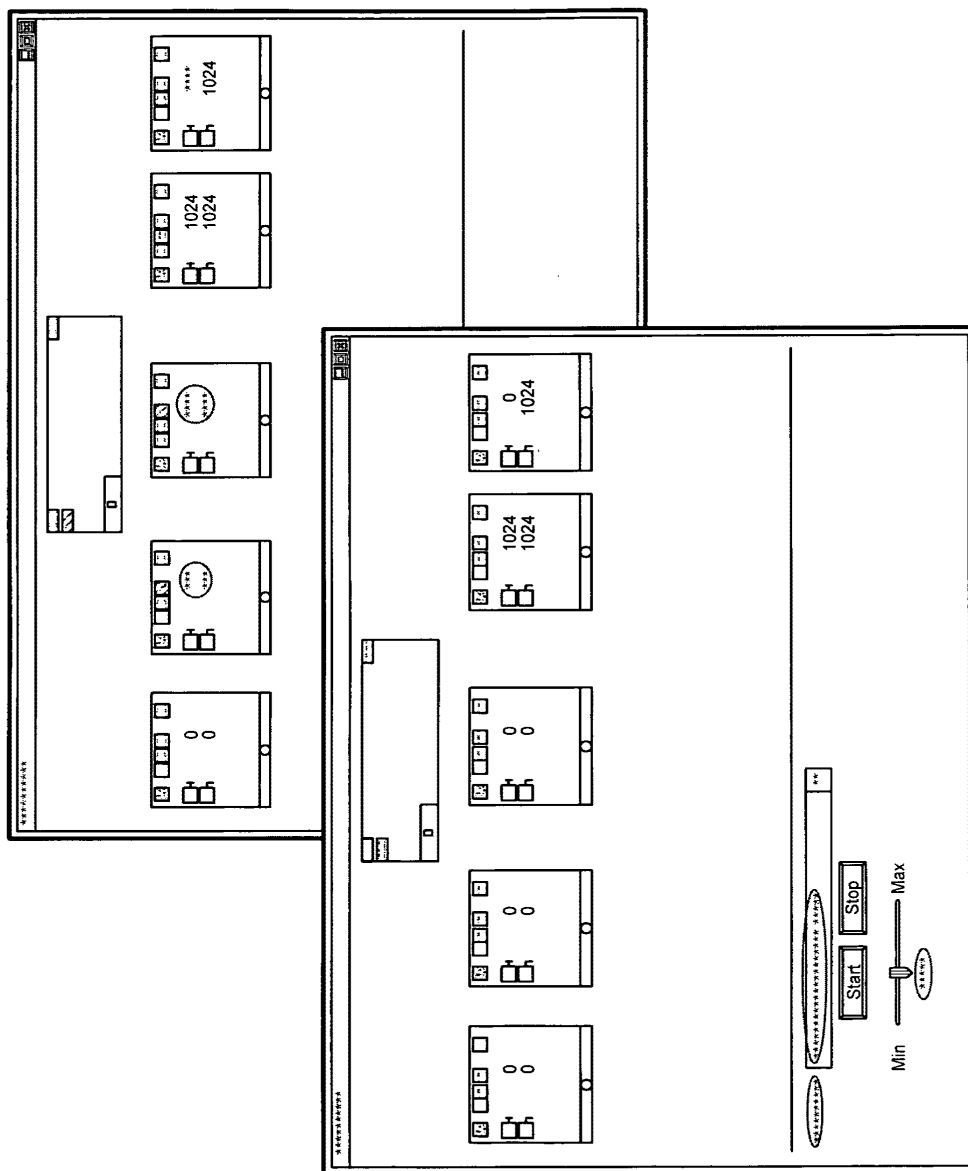
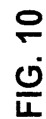


FIG. 9



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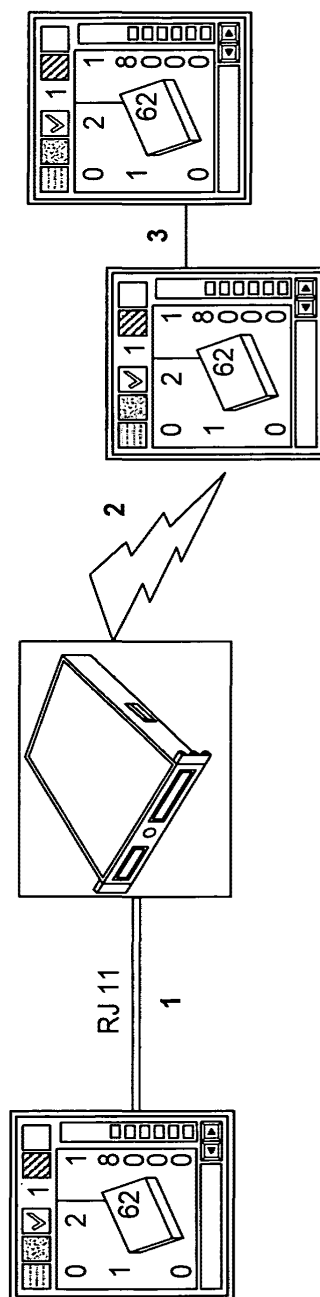


FIG. 11

12/18

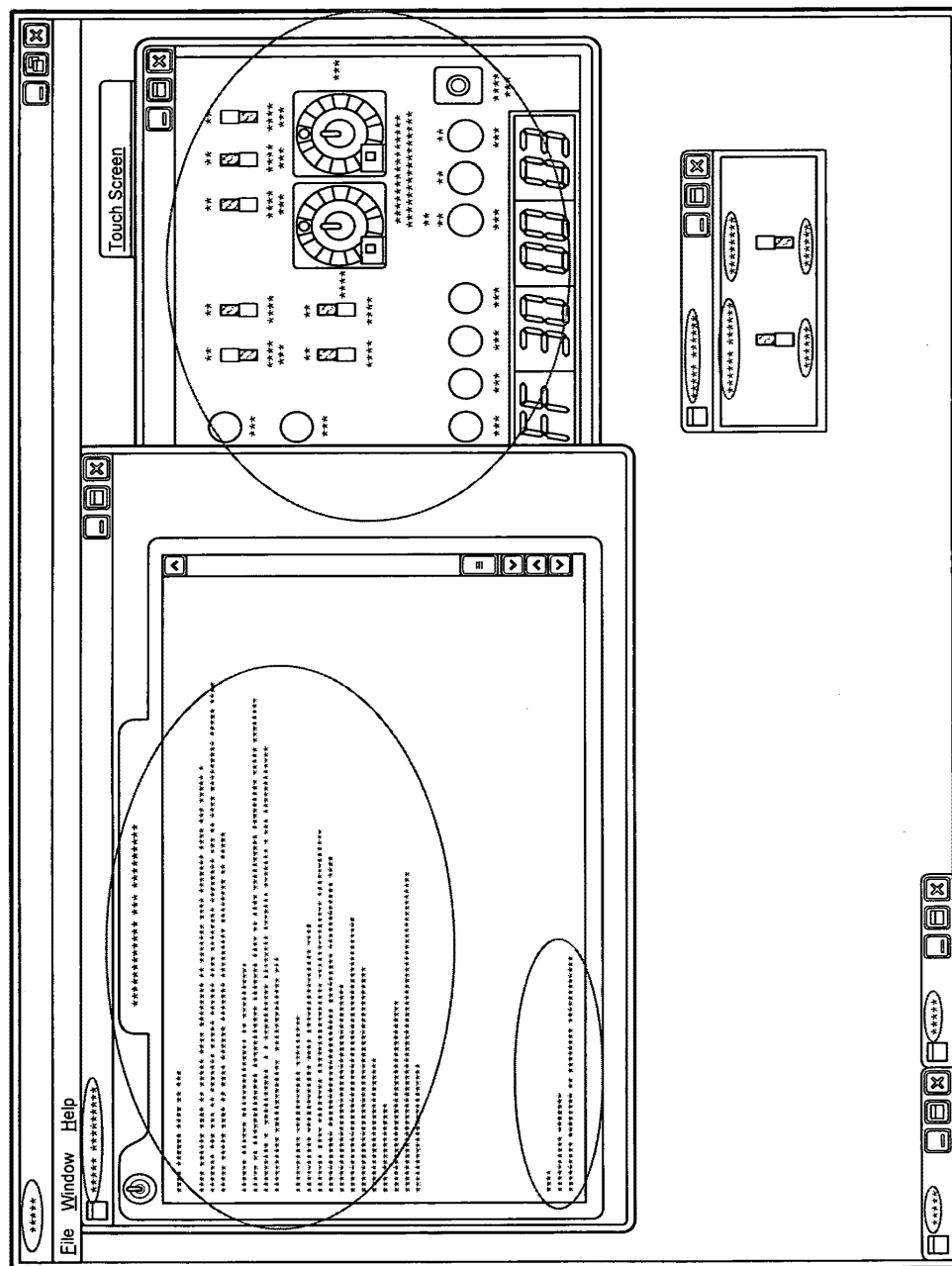


FIG. 12

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Objective: Low Foot Print for Low Cost Embedded System Applications
 Key Idea: Remove Overhead of OS/Virtual Machine from the Equation

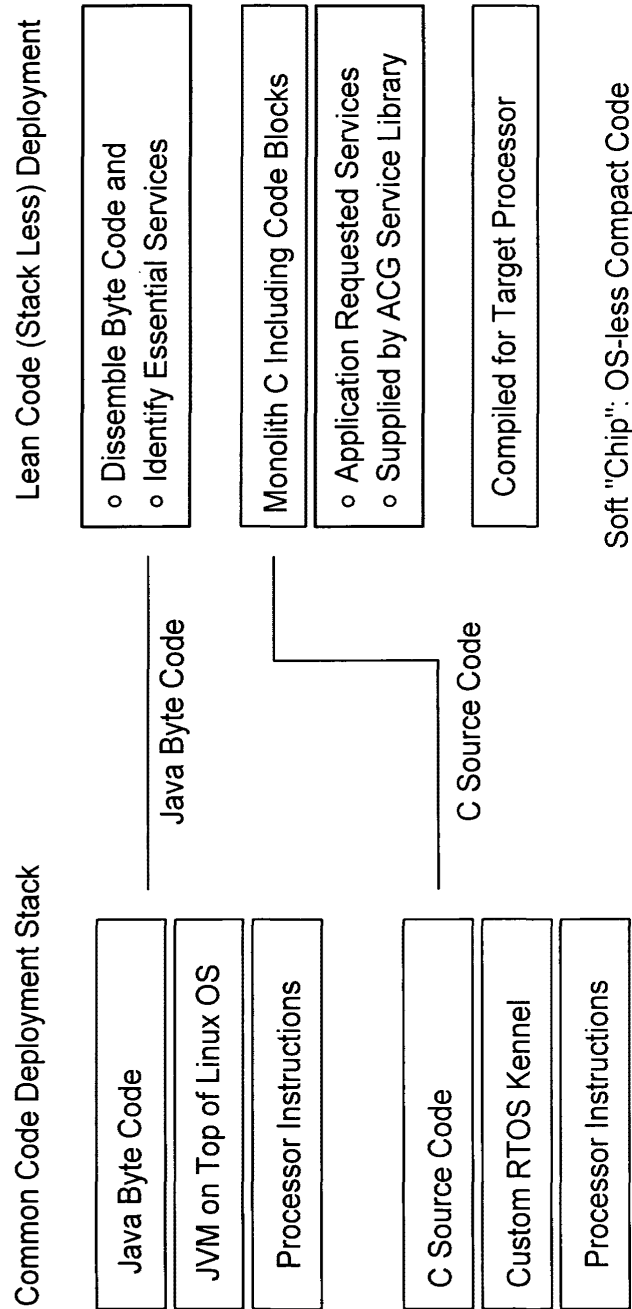
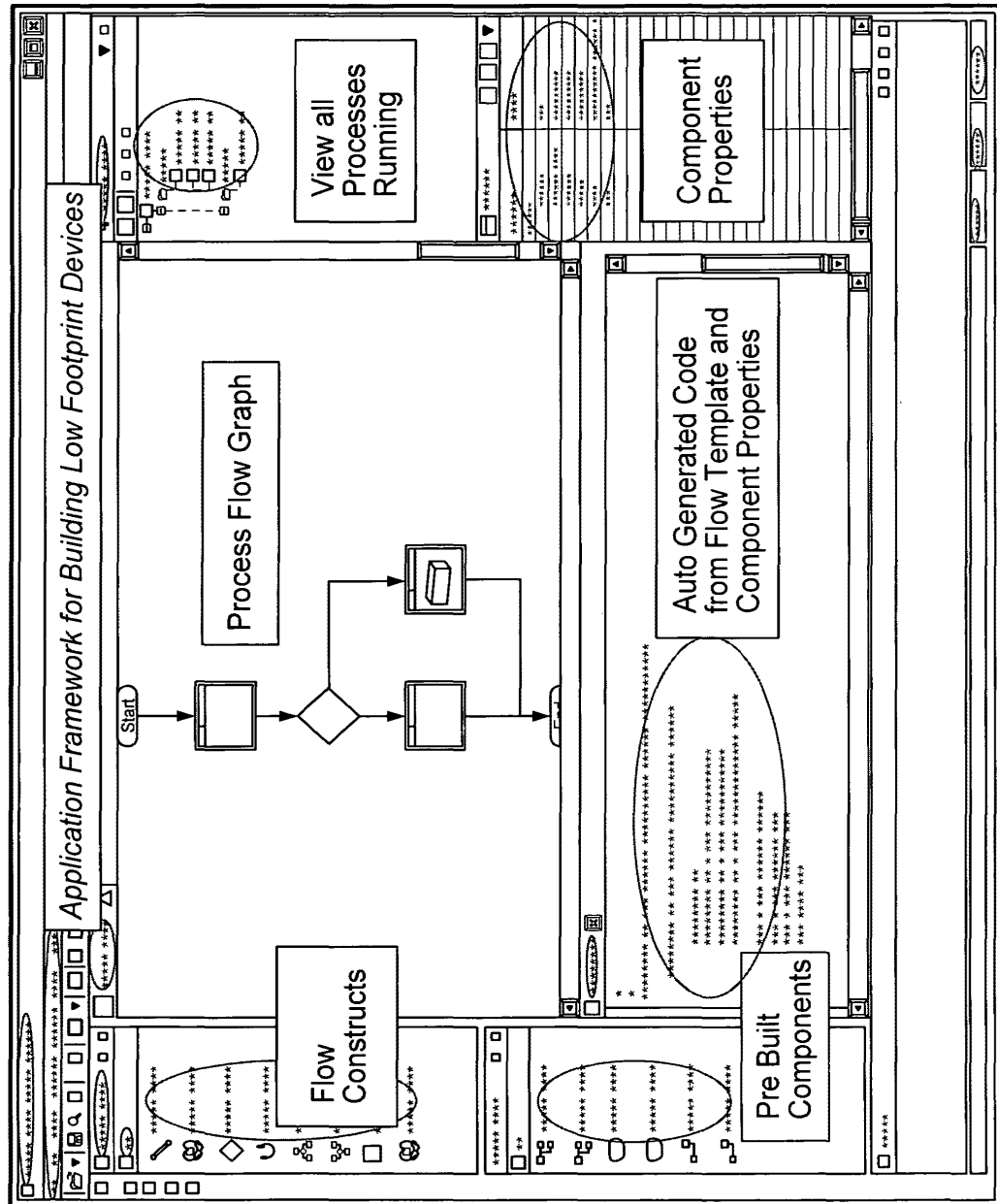


FIG. 13

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FIG. 14



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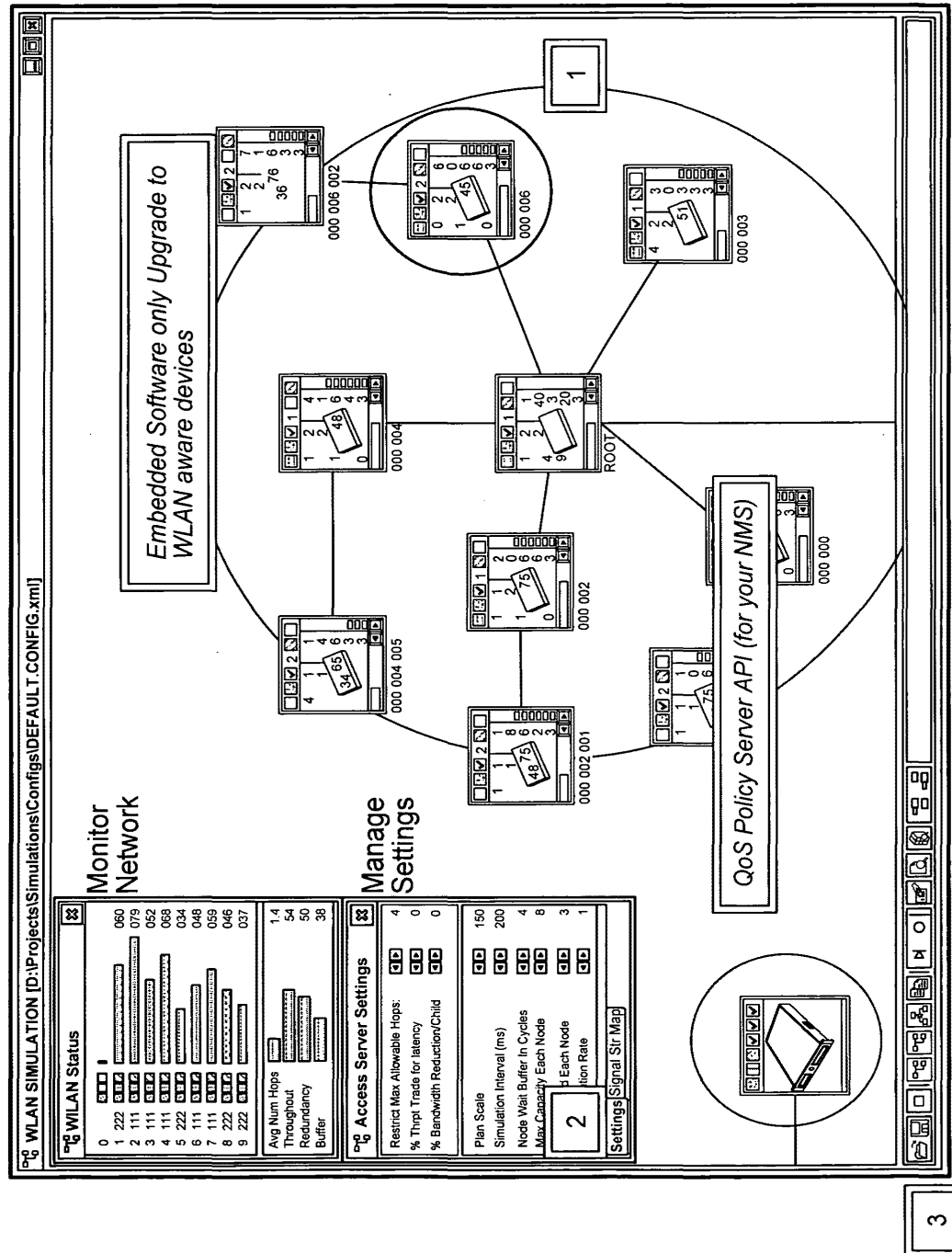


FIG. 15

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☒ Dynamic Channel Allocation

0		05.	1								
1		02 07 08.	2								
2		01 07.	1								
3		06 07.	1								
4		.	1								
5		04.	2								
6		03.	2								
7		01 08.	3								
8		01 07.	1								
9		03 07	2								

Topology

Channels

Distance Map

Power

FIG. 16

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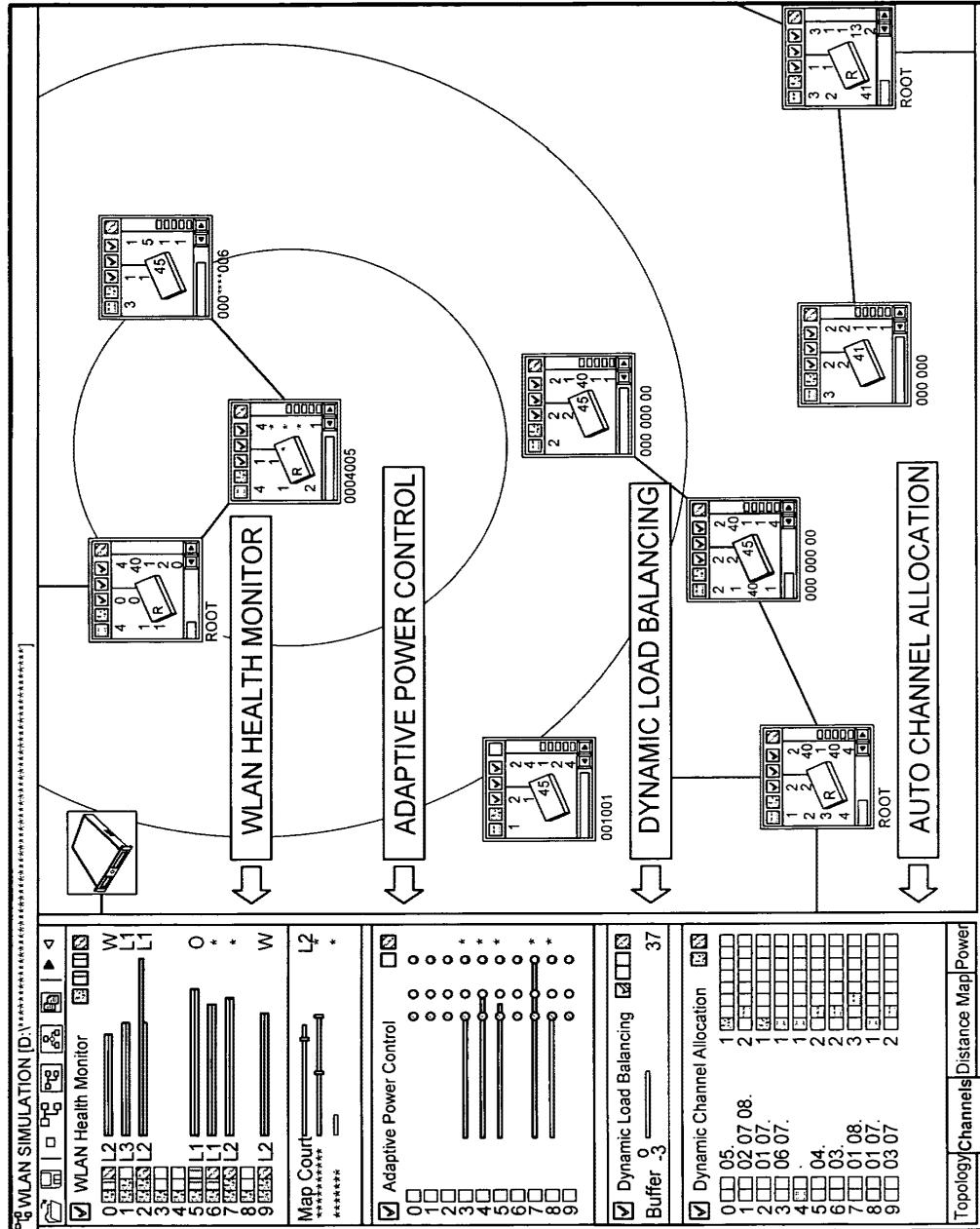


FIG. 17

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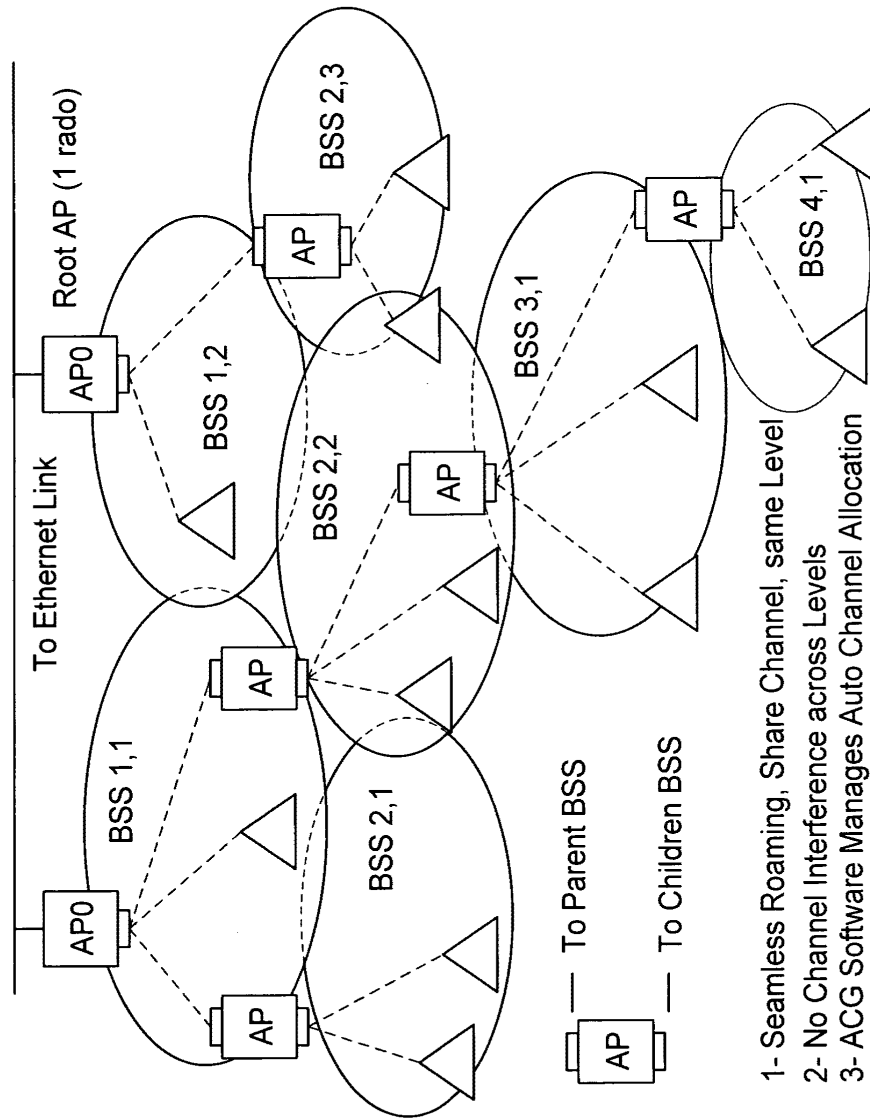


FIG. 18



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CUPERTINO, CA 95014

EXAMINER

D AGOSTA, STEPHEN M

ART UNIT

PAPER NUMBER

2617

DATE MAILED: 03/25/2008

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/434,948	05/08/2003	Francis da Costa	MESHP001	7871

TITLE OF INVENTION: HIGH PERFORMANCE WIRELESS NETWORKS USING DISTRIBUTED CONTROL

APPLN. TYPE	SMALL ENTITY	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	YES	\$720	\$300	\$0	\$1020	06/25/2008

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.

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

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/434,948	05/08/2003	Francis da Costa	MESHPO01	7871

TITLE OF INVENTION: HIGH PERFORMANCE WIRELESS NETWORKS USING DISTRIBUTED CONTROL

APPLN. TYPE	SMALL ENTITY	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	YES	\$720	\$300	\$0	\$1020	06/25/2008

EXAMINER	ART UNIT	CLASS-SUBCLASS
D AGOSTA, STEPHEN M	2617	370-338000

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

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(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. 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:

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- ☐ 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)

- ☐ a. Applicant claims SMALL ENTITY status. See 37 CFR 1.27. ☐ b. Applicant is no longer claiming SMALL ENTITY status. See 37 CFR 1.27(g)(2).

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.

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UNITED STATES PATENT AND TRADEMARK OFFICE

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United States Patent and Trademark Office
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www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/434,948	05/08/2003	Francis da Costa	MESHP001	7871
21912	7590	03/25/2008		
VAN PELT, YI & JAMES LLP 10050 N. FOOTHILL BLVD #200 CUPERTINO, CA 95014				
			EXAMINER	
			D AGOSTA, STEPHEN M	
			ART UNIT	PAPER NUMBER
			2617	

DATE MAILED: 03/25/2008

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 841 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 841 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.

Notice of Allowability	Application No.	Applicant(s)	
	10/434,948	DA COSTA ET AL.	
	Examiner	Art Unit	
	Stephen M. D'Agosta	2617	

-- 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 the amendment received 3-3-08.

2. ☒ The allowed claim(s) is/are 23-25, 28-35, 49-51 and 54-60.

3. ☐ 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 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.

4. ☐ A SUBSTITUTE OATH OR DECLARATION must be submitted. Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL PATENT APPLICATION (PTO-152) which gives reason(s) why the oath or declaration is deficient.

5. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
(a) ☐ including changes required by the Notice of Draftsperson's Patent Drawing Review (PTO-948) attached
1) ☐ hereto or 2) ☐ to Paper No./Mail Date _____.
(b) ☐ 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. ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948) 3. ☐ Information Disclosure Statements (PTO/SB/08), Paper No./Mail Date _____ 4. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material	5. ☐ Notice of Informal Patent Application 6. ☐ Interview Summary (PTO-413), Paper No./Mail Date _____ 7. ☐ Examiner's Amendment/Comment 8. ☒ Examiner's Statement of Reasons for Allowance 9. ☐ Other _____.
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DETAILED ACTION

Response to Amendment

The applicant's amendment, received 3-3-08, overcomes the examiner's prior art rejection. Hence claims 23-25, 28-35, 49-51 and 54-60 are allowed while claims 1-22, 26-27, 36-48 and 52-53 are cancelled.

Allowable Subject Matter

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

The applicant has amended as per the recommendations of the examiner.
Hence he believes the claims to be novel over 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."

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Stephen M. D'Agosta whose telephone number is 571-272-7862. The examiner can normally be reached on M-F, 8am to 5pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Bill Trost can be reached on 571-272-7872. 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.

/Stephen M. D'Agosta/
Primary Examiner, Art Unit 2617



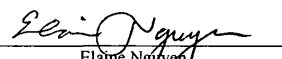
IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Inventor:	DACOSTA et al.	Examiner:	Stephen M. D'Agosta
Application No.:	10/434,948	Art Unit:	2617
Filed:	May 8, 2003	Docket No.:	MESHP001
Title:	HIGH PERFORMANCE WIRELESS NETWORKS USING DISTRIBUTED CONTROL		

CERTIFICATE OF MAILING

I hereby certify that this correspondence is being deposited with the United States Postal Service as First Class Mail in a prepaid envelope addressed to: Mail Stop AF, Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450 on:

2/26, 2008.


Elaine Nguyen

AMENDMENT E

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

Dear Sir:

This is in response to the Office Action mailed January 7, 2008. The following amendments and remarks are respectfully submitted.

OK TO ENTER: /SD/

Application Serial No. 10/434,948
Attorney Docket No. MESHP001

1

Index of Claims 	Application/Control No. 10434948	Applicant(s)/Patent Under Reexamination DA COSTA ET AL.
	Examiner Stephen M D'Agosta	Art Unit 2617

✓	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	03/12/2008													
	1														
	2														
	3														
	4														
	5														
	6														
	7														
	8														
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6	30	=													
7	31	=													
8	32	=													
9	33	=													
10	34	=													
11	35	=													
	36														

Index of Claims 	Application/Control No. 10434948	Applicant(s)/Patent Under Reexamination DA COSTA ET AL.
	Examiner Stephen M D'Agosta	Art Unit 2617

✓	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	03/12/2008											
	37												
	38												
	39												
	40												
	41												
	42												
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17	56	=											
18	57	=											
19	58	=											
20	59	=											
21	60	=											

Search Notes 	Application/Control No. 10434948	Applicant(s)/Patent Under Reexamination DA COSTA ET AL.
	Examiner Stephen M D'Agosta	Art Unit 2617

SEARCHED			
Class	Subclass	Date	Examiner
370	338, 319, 321, 328, 336, 442, 445	3/12/08	SMD
455	41.2, 41.3, 450, 502, 507		

SEARCH NOTES		
Search Notes	Date	Examiner

INTERFERENCE SEARCH			
Class	Subclass	Date	Examiner
	ABOVE and Text/Claims	3/12/08	SMD

EAST Search History

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
L1	0	"wireless mesh network" and (relay near node \$2) and (child near node\$2) and "parent relay node" and (channel near select\$4) and (parent near child near relationship) and (sibling near node\$2) and (performance near requirement\$2)	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2008/03/12 07:45
L2	0	"mesh network" and (relay near node\$2) and (child near node\$2) and "parent relay node" and (channel near select\$4) and (parent near child near relationship) and (sibling near node\$2) and (performance near requirement\$2)	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2008/03/12 07:45
L3	0	"mesh network" and (relay near node\$2) and (child near node\$2) and "parent relay node" and (parent near child near relationship) and (sibling near node \$2) and (performance near requirement\$2)	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2008/03/12 07:46

L4	0	"mesh network" and (relay near node\$2) and (child near node\$2) and "parent relay node" and (parent near child near relationship) and (sibling near node \$2)	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2008/03/12 07:46
L5	0	"mesh network" and (relay near node\$2) and (child near node\$2) and "parent relay node" and (parent near child near relation\$5) and (sibling near node \$2)	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2008/03/12 07:46
L6	0	"mesh network" and (child near node\$2) and "parent relay node" and (parent near child near relation\$5) and (sibling near node \$2)	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2008/03/12 07:46
L7	0	"mesh network" and (child near node\$2) and "parent relay node" and (parent near child) and (sibling near node \$2)	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2008/03/12 07:46
L8	0	mesh and (child near node\$2) and "parent relay node" and (parent near child) and (sibling near node \$2)	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2008/03/12 07:46

EAST Search History

L9	8	mesh and (child near node\$2) and "parent node" and (parent near child) and (sibling near node\$2)	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2008/03/12 07:47
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3/ 12/ 08 7:50:26 AM

C:\ Documents and Settings\ SDagosta\ My Documents\ EAST\ Workspaces\ 10_434948. wsp



15w AF

PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Inventor:	DACOSTA et al.	Examiner:	Stephen M. D'Agosta
Application No.:	10/434,948	Art Unit:	2617
Filed:	May 8, 2003	Docket No.	MESHP001
Title:	HIGH PERFORMANCE WIRELESS NETWORKS USING DISTRIBUTED CONTROL		

CERTIFICATE OF MAILING

I hereby certify that this correspondence is being deposited with the United States Postal Service as First Class Mail in a prepaid envelope addressed to: Mail Stop AF, Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450 on:

2/26, 2008.

Elaine Nguyen
Elaine Nguyen

TRANSMITTAL OF AMENDMENT E

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

Sir:

Transmitted herewith is Amendment E in response to Office Action mailed January 7, 2008 in the above-identified application.

The fee has been calculated as shown below.

CLAIMS	After Amd.	HP*	Extra	Small Entity			Large Entity	
				Rate	Fee		Rate	Fee
Total	21	31	-0-	x \$25 = \$		OR	x \$50 = \$	
Independent	2	3	-0-	x \$105 = \$		OR	x \$210 = \$	
Multiple Dependent Claims				x \$185 = \$		OR	x \$370 = \$	
*HP = Highest previously paid				TOTAL FEE \$		OR	TOTAL FEE \$	-0-

☐ Applicant(s) hereby petition for following extension of time in which to respond to the outstanding Office Action.

	SMALL ENTITY			LARGE ENTITY	
	Rate	Add'l Fee		Rate	Add'l Fee
☐ Extension for Response within FIRST month	x \$60 = \$		OR	x \$120 = \$	
☐ Extension for Response within SECOND month	x \$230 = \$		OR	x \$460 = \$	
☐ Extension for Response within THIRD month	x \$525 = \$		OR	x \$1050 = \$	
☐ Extension for Response within FOURTH month	x \$820 = \$		OR	x \$1640 = \$	
☐ Extension for Response within FIFTH month	x \$1115 = \$		OR	x \$2230 = \$	

Attorney Docket No.: MESHP001
Application No.: 10/434,948

1 of 2

☒ Applicant(s) believe that no (additional) Extension of Time is required; however, if it is determined that such an extension is required, Applicant(s) hereby petition that such an extension be granted and authorize the Commissioner to charge the required fees for an Extension of Time under 37 CFR 1.136 to Deposit Account No. 50-0685. (MESH001).

☐ Enclosed is our Check No. ___ in the amount of \$_____ to cover the additional claim fee and/or extension of time fees.

☐ Enclosed is Applicant Initiated Interview Request Form, PTOL-413A.

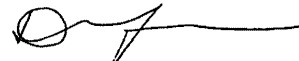
☐ Enclosed are _____ sheets replacement drawings.

☐ Please charge Deposit Account No. 50-0685 (MESH001) in the amount of \$_____ to cover the additional claim fee and/or extension of time fees.

☒ If the required fees are missing or any additional fees are required during the pendency of the subject application, please charge such fees or credit any overpayment to Deposit Account No. 50-0685 (MESH001).

☐ OTHER:

Respectfully submitted,
VAN PELT, YI & JAMES LLP



Diana Y. Fu
Registration No. 52,924

10050 N. Foothill Blvd., Suite 200
Cupertino, CA 95014
Telephone: 408-973-2585



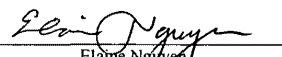
IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Inventor:	DACOSTA et al.	Examiner:	Stephen M. D'Agosta
Application No.:	10/434,948	Art Unit:	2617
Filed:	May 8, 2003	Docket No.:	MESHP001
Title:	HIGH PERFORMANCE WIRELESS NETWORKS USING DISTRIBUTED CONTROL		

CERTIFICATE OF MAILING

I hereby certify that this correspondence is being deposited with the United States Postal Service as First Class Mail in a prepaid envelope addressed to: Mail Stop AF, Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450 on:

2/26, 2008.


Elaine Nguyen

AMENDMENT E

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

Dear Sir:

This is in response to the Office Action mailed January 7, 2008. The following amendments and remarks are respectfully submitted.

Application Serial No. 10/434,948
Attorney Docket No. MESHP001

IN THE CLAIMS

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

Claims 1-22 (Canceled)

23. (Previously Presented) A method of controlling a wireless mesh network, comprising:
- a) configuring the wireless mesh network with a first configuration, the wireless mesh network comprising a plurality of relay nodes, each of the relay nodes being capable of relaying traffic from a child node associated with the relay node, each of the relay nodes including a first radio interface configurable to relay traffic to a parent relay node and a second dual purpose radio interface configurable to both relay traffic from the child relay node and to communicate with a client node that is not a relay node, and at least one of the relay nodes is configured in the first configuration to relay traffic from a child relay node to a parent relay node;
 - b) determining that a first one of the plurality of relay nodes in the wireless mesh network requires a channel selection change;
 - c) dynamically selecting a second one of the plurality of relay nodes in the wireless mesh network to form a parent-child relationship with the first relay node; and
 - d) making a channel selection change;
- wherein prior to being dynamically selected, the second relay node was a sibling node of the first relay node; and
- making a channel selection includes making a channel selection change to meet a performance requirement.
24. (Previously Presented) A method as recited in Claim 23, wherein the second node is selected to be a parent node of the first node.
25. (Previously Presented) A method as recited in Claim 23, wherein the second node is selected to be a child node of the first node.

26. (Cancelled)
27. (Cancelled)
28. (Previously Presented) A method as recited in Claim 23, wherein making a channel selection includes making a channel selection change to meet a latency requirement.
29. (Previously Presented) A method as recited in Claim 23, wherein making a channel selection includes making a channel selection change to meet a throughput requirement.
30. (Previously Presented) A method as recited in Claim 23, wherein determining that the first node requires a channel selection change includes determining that the channel selection change is required due to a performance requirement change.
31. (Previously Presented) A method as recited in Claim 23, wherein determining that the first node requires a channel selection change includes determining that the channel selection change is required due to congestion.
32. (Previously Presented) A method as recited in Claim 23, wherein the channel selection change is made to avoid channel interference.
33. (Previously Presented) A method as recited in Claim 23, wherein the channel selection change is made based on a change to network topology.
34. (Previously Presented) A method as recited in Claim 23, further comprising repeating b)-d).
35. (Previously Presented) A method as recited in Claim 23, further comprising receiving a monitoring signal that includes information about available nodes from which the second node is selected.
36. (Cancelled)
37. (Cancelled)
38. (Cancelled)

39. (Cancelled)

40. (Cancelled)

41. (Cancelled)

42. (Cancelled)

43. (Cancelled)

44. (Cancelled)

45. (Cancelled)

46. (Cancelled)

47. (Cancelled)

48. (Cancelled)

49. (Previously Presented) A computer program product for controlling a wireless mesh network, the computer program product being embodied in a computer readable medium and comprising computer instructions for:

a) configuring the wireless mesh network with a first configuration, the wireless mesh network comprising a plurality of relay nodes, each of the relay nodes being capable of relaying traffic from a child node associated with the relay node, each of the relay nodes including a first radio interface configurable to relay traffic to a parent relay node and a second dual purpose radio interface configurable to both relay traffic from the child relay node and to communicate with a client node that is not a relay node, and at least one of the relay nodes is configured in the first configuration to relay traffic from a child relay node to a parent relay node;

b) determining that a first one of the plurality of relay nodes in the wireless mesh network requires a channel selection change;

c) dynamically selecting a second one of the plurality of relay nodes in the wireless mesh network to form a parent-child relationship with the first relay node; and

d) making a channel selection change;

wherein prior to being dynamically selected, the second relay node was a sibling node of the first relay node; and

making a channel selection includes making a channel selection change to meet a performance requirement.

50. (Previously Presented) A computer program product as recited in Claim 49, wherein the second node is selected to be a parent node of the first node.

51. (Previously Presented) A computer program product as recited in Claim 49, wherein the second node is selected to be a child node of the first node.

52. (Cancelled)

53. (Cancelled)

54. (Previously Presented) A computer program product as recited in Claim 49, wherein making a channel selection includes making a channel selection change to meet a latency requirement.

55. (Previously Presented) A computer program product as recited in Claim 49, wherein making a channel selection includes making a channel selection change to meet a throughput requirement.

56. (Previously Presented) A computer program product as recited in Claim 49, wherein determining that the first node requires a channel selection change includes determining that the channel selection change is required due to a performance requirement change.

57. (Previously Presented) A computer program product as recited in Claim 49, wherein determining that the first node requires a channel selection change includes determining that the channel selection change is required due to congestion.

58. (Previously Presented) A computer program product as recited in Claim 49, wherein the channel selection change is made based on network topology.

59. (Previously Presented) A computer program product as recited in Claim 49, the computer program product further comprising computer instructions for repeating b)-d).

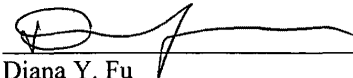
60. (Previously Presented) A computer program product as recited in Claim 49, the computer program product further comprising computer instructions for receiving a monitoring signal that includes information about available nodes from which the second node is selected.

REMARKS

Claims 23-25, 28-35, 49-51 and 54-60 are allowed. Claims 36-38 and 41-47 have been cancelled. Claims 23-25, 28-35, 49-51 and 54-60 are pending. It is believed that the claims are now in condition for allowance. If at any time the Examiner believes that an interview would be helpful, please contact the undersigned.

Respectfully submitted,

Dated: 2/26/2008



Diana Y. Fu
Registration No. 52,924
V 408-973-2593
F 408-973-2595

VAN PELT, YI & JAMES LLP
10050 N. Foothill Blvd., Suite 200
Cupertino, CA 95014

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 10/434,948		Filing Date 05/08/2003		☐ To be Mailed	
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APPLICATION AS FILED – PART I						OTHER THAN SMALL ENTITY			
(Column 1)		(Column 2)		SMALL ENTITY ☒		OR		SMALL ENTITY	
FOR	NUMBER FILED	NUMBER EXTRA	RATE (\$)	FEE (\$)	RATE (\$)	FEE (\$)	RATE (\$)	FEE (\$)	
☐ BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A	N/A		N/A		N/A		
☐ SEARCH FEE (37 CFR 1.16(k), (l), or (m))	N/A	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		N/A		
TOTAL CLAIMS (37 CFR 1.16(j))	minus 20 =	*	X \$ =		OR	X \$ =			
INDEPENDENT CLAIMS (37 CFR 1.16(h))	minus 3 =	*	X \$ =		OR	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						OTHER THAN SMALL ENTITY					
(Column 1)		(Column 2)		(Column 3)		SMALL ENTITY		OR		SMALL ENTITY	
AMENDMENT	03/03/2008	CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA	RATE (\$)	ADDITIONAL FEE (\$)	RATE (\$)	ADDITIONAL FEE (\$)		
	Total (37 CFR 1.16(i))	* 21	Minus	** 37	= 0	X \$25 =	0	OR	X \$ =		
	Independent (37 CFR 1.16(h))	* 2	Minus	*** 3	= 0	X \$105 =	0	OR	X \$ =		
	☐ Application Size Fee (37 CFR 1.16(s))							OR			
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR			
						TOTAL ADD'L FEE	0	OR	TOTAL ADD'L FEE		

(Column 1)		(Column 2)		(Column 3)		SMALL ENTITY		OR		SMALL ENTITY	
AMENDMENT		CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	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))							OR			
	☐ 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:
/JASON B. EADDY/

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.
10/434,948	05/08/2003	Francis da Costa	MESHP001	7871
21912 7590 01/07/2008 VAN PELT, YI & JAMES LLP 10050 N. FOOTHILL BLVD #200 CUPERTINO, CA 95014			EXAMINER D AGOSTA, STEPHEN M	
			ART UNIT 2617	PAPER NUMBER
			MAIL DATE 01/07/2008	DELIVERY MODE 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)	
	10/434,948		DA COSTA ET AL.	
	Examiner		Art Unit	
	Stephen M. D'Agosta		2617	

-- 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 10 December 2007.

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) 23-25, 28-38, 41-47, 49-51 and 54-60 is/are pending in the application.

 4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5) ☒ Claim(s) 23-25, 28-35, 49-51 and 54-60 is/are allowed.

6) ☒ Claim(s) 36-38 and 41-47 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 _____ 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: _____
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DETAILED ACTION

Response to Arguments

Applicant's arguments with respect to claims 36-38 and 41-47 have been considered but are moot in view of the new ground(s) of rejection.

1. All other claims are in condition for allowance.

2. The examiner notes that independent claim 36 does not contain the requisite level of detail that is found in the other (allowed) independent claims. The applicant can either amend claim 36 and/or cancel it (along with its dependent claims). The missing "detail" is from Letter "a" in the allowed independent claims:

"..a) configuring the wireless mesh network with a first configuration, the wireless mesh network comprising a plurality of relay nodes, each of the relay nodes being capable of relaying traffic from a child node associated with the relay node, each of the relay nodes including a first radio interface configurable to relay traffic to a parent relay node and a second dual purpose radio interface configurable to both relay traffic from the child relay node and to communicate with a client node that is not a relay node, and at least one of the relay nodes is configured in the first configuration to relay traffic from a child relay node to a parent relay node".

3. A more favorable outcome may occur if the applicant amends claim 36 as discussed in #2 above and/or as follows:

Claim 36 + (claim 37 or 38) + (any other one claim from 41 thru 47)

Claim Rejections - 35 USC § 103

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 negated by the manner in which the invention was made.

Claims 36-37 and 41-47 23-24, 26-37, 39-50 and 52-60—rejected under 35 U.S.C. 103(a) as being unpatentable over Crosbie US 2002/0085719 and further in view of Forstadius et al. US 7,200,130 and Meirer et al US 6,046,992.

As per **claims 23, 36 and 49**, Crosbie teaches a method of controlling a wireless “mesh” network, comprising:

- a) configuring the wireless mesh network with a first configuration (figure 3, top of page shows mobile device/slave #26-2 connected to Initial Master #24-4);
- b) determining that a first one of the plurality in the wireless mesh network requires a channel selection change (Para #6 teaches handing-off due to various reasons:

This feature, known as “hand-offs” is required for many functions such as load balancing, improving radio link performance, and moving the mobile device inside a building without losing the network connection.

- c) dynamically selecting a second one of the plurality to form a parent-child relationship with the first node **AND** d) making a channel selection change (figure 3 shows device/slave #26-2 moving from the Initial Master to the Target Master #24-5 which reads on selecting a second “node” and forming a parent-child/master-slave relationship on a different channel. Also see figure 6).

The examiner notes that all claims presented are interpreted in the broadest reasonable manner, hence the claims do not limit:

- i) how the terms “first and second node” must be interpreted, eg. what network(s) they are associated with.

ii) how the new channel connection is made (eg. is the second node part of the first wireless mesh and/or from a different mesh).

iii) Applicant's figure 1 shows each node with only one connection to a master which is similar to Crosbie's figure (eg. a true mesh requires that each node have a direct connection to every other node, which is not shown in applicant's drawings);

but is silent on the wireless mesh network comprising a plurality of relay nodes, each of the relay nodes being capable of relaying traffic from a child node associated with the relay node, and at least one of the relay nodes is configured in the first configuration to relay traffic from a child relay node to a parent relay node AND each of the relay nodes including a first radio interface configurable to relay traffic to a parent relay node and a second dual purpose radio interface configurable to both relay traffic from the child relay node and to communicate with a client node that is not a relay node (in a wireless mesh network) AND wherein prior to being dynamically selected, the second relay node was a sibling node of the first relay node and making a channel selection includes making a channel selection change to meet a performance requirement.

Forstadius teaches a short range RF network whereby Bluetooth transceivers act as relay nodes to a Master/Parent and between themselves while also supporting communications to a mobile/node user, which reads on the claim (see figure 2 which shows relays (100-x) which can communicate to the Master/Parent, to other relays or to mobile/cellular devices).

Meier teaches a network which uses relays/bridges that can talk to other bridges as well as individual RF devices (see figure 1 where Bridge/Relay #32 connects to Bridge #48 as well as RF Devices #108/#110. The RF frequency can be either the same and/or different depending upon which transceivers are used. The examiner also notes that dual-transceiver mobile devices and access points are well known, hence the Bridge-to-Bridge frequency could be different than the Bridge-to-mobile frequency).

The examiner notes that multi-mode/dual-band mobile devices are known in the art and can **inherently** connect to several networks (eg. cellular, Bluetooth, WLAN, etc.). the manner in which devices roam and connect/reconnect in the hierarchy is **not inherently constrained** and therefore any node can change/become a first/second/etc. node if when it was a sibling/etc. of the first/second/etc. node. Meaning, one skilled would ensure that any/all combinations of reconnections between/among the devices is possible since one cannot know beforehand how the mesh will configure itself and also in which direction(s) the devices will roam and reconnect.

Furthermore, (Para #6 teaches performance:

This feature, known as " hand-offs" is required for many functions such as load balancing, improving radio link performance, and moving the mobile device inside a building without losing the network connection).

Also see Para #9 which teaches QoS and giving a user more bandwidth.

It would have been obvious to one skilled in the art at the time of the invention to modify Crosbie, such that the wireless mesh network comprising a plurality of relay nodes, each of the relay nodes being capable of relaying traffic from a child node associated with the relay node, and at least one of the relay nodes is configured in the first configuration to relay traffic from a child relay node to a parent relay node AND each of the relay nodes including a first radio interface configurable to relay traffic to a parent relay node and a second dual purpose radio interface configurable to both relay traffic from the child relay node and to communicate with a client node ~~that is not a relay node~~ (in a wireless mesh network) between various first/second nodes and channel selection is based on performance, to provide means for the mesh routing tables to be controlled in a parent/child relationship (eg. routing updates occurs via a hierarchy) between the relay nodes, user devices and parent nodes to support various mesh connections and performance requirements.

As per **claims 24, 37 and 50**, Crosbie teaches claim 23/36/49, wherein the second node is selected to be a parent node of the first node (figure 3 shows the "second node" as being the master/parent to the mobile which has handed off).

As per **claims 28-29, 41-42 and 54-55**, Crosbie teaches claim 23/36/49, wherein making a channel selection includes making a channel selection change to meet a latency requirement AND/OR wherein making a channel selection includes making a channel selection change to meet a throughput requirement (Para #6 teaches latency/throughput which reads on load-balancing, since it would reduce throughput problems by using multiple links/paths:

This feature, known as "hand-offs" is required for many functions such as load balancing, improving radio link performance, and moving the mobile device inside a building without losing the network connection).

Also see Para #9 which teaches QoS.

As per **claims 30, 43 and 56**, Crosbie teaches claim 23/36/49, wherein determining that the first node requires a channel selection change includes determining that the channel selection change is required due to a performance requirement change (Para #6 teaches handing off due to performance problems, eg. latency/throughput is occurring and the mobile desires better performance/throughput:

This feature, known as "hand-offs" is required for many functions such as load balancing, improving radio link performance, and moving the mobile device inside a building without losing the network connection). Also see Para #9 which teaches QoS.

The examiner notes that the claim does not specify whether it is the mobile or the network that perceives the "performance requirement change".

As per **claims 31, 44 and 57**, Crosbie teaches claim 23/36/49, wherein determining that the first node requires a channel selection change includes determining that the channel selection change is required due to congestion (Para #6 teaches latency/throughput which reads on congestion, since it would reduce throughput problems by using multiple links/paths:

This feature, known as "hand-offs" is required for many functions such as load balancing, improving radio link performance, and moving the mobile device inside a building without losing the network connection).

Also see Para #9 which teaches QoS.

As per **claims 33, 45 and 58**, Crosbie teaches claim 23/36/49, wherein the channel selection change is made based on a change to network topology (Para #6 teaches moving inside a building which would prompt a change to the network topology, eg. connection, since a handoff would occur to a new master located within the building:

This feature, known as "hand-offs" is required for many functions such as load balancing, improving radio link performance, and moving the mobile device inside a building without losing the network connection).

The claim does not specify from what perspective the network topology is being driven by/from (eg. network or user?). As a second point, a poor communication link can be perceived as a dropped link, which would also be viewed as a topology change and hence spawn a handoff).

Also see Para #9 which teaches QoS and giving the user it's own channel which is viewed as a network topology change.

As per **claims 23, 46 and 50**, Crosbie teaches 34/36/49, further comprising repeating "b" thru "d" (Para #6 teaches a hand off "process" which will be performed until a handoff is successful, eg. steps b thru d will be repeated until a new channel/link is found to handoff to:

This feature, known as "hand-offs" is required for many functions such as load balancing, improving radio link performance, and moving the mobile device inside a building without losing the network connection.

As per **claims 35, 47 and 60**, Crosbie teaches claim 23/36/49, further comprising receiving a monitoring signal that includes information about available nodes from which the second node is selected (Para #6 teaches handing off from one master to another and the examiner takes Official Notice that it is well known in the art of handoffs for the mobile to be able to receive the second BTS's/master's signal/beacon in order for it to determine if it is a handoff candidate, which reads on "receiving a monitoring signal that includes information about available nodes from which the second node is selected").

Claims 25, 38 and 51 rejected under 35 U.S.C. 103(a) as being unpatentable over Crosbie/Forstadius/Meirer and further in view of Joon-Boi et al. US 2002/0055978.

As per **claims 25, 38 and 51**, Crosbie teaches claim 23/36, **but is silent on** wherein the second node is selected to be a child node of the first node.

Joon-Boi teaches a parent/master leaving/changing status and a new parent/master is selected from the proximate children/slaves. Hence a first node would either stay as a child/slave (eg. the second node becomes a parent/master) or said first node becomes the new parent/master and said second node becomes the child/slave:

"...A method for managing a network in which Bluetooth equipped devices are linked together when the network master cannot

serve as a master.....When power of the network master is exhausted, or when the network master leaves the network operating region, a new master is selected from the remaining slaves according to the backup master rank information, thereby reconfiguring a network around the new network master. The method enables proper designation of a new master when a preexisting network master leaves the network operating region, thereby increasing a probability of holding connection throughout the network.." (Abstract)

It would have been obvious to one skilled in the art at the time of the invention to modify Crosbie, such that the second node is selected to be a child node of the first node, to provide means for a flexible network reconfiguration to occur whereby the most optimal node is chosen to become the new parent/master (thus leaving the other devices to stay as children/slaves and then connect to the new master).

Allowable Subject Matter

Claims 23-25, 28-35, 49-51 and 54-60 allowed.

The examiner believes the claim amendments make the claims novel over the prior art of record.

Application/Control Number:
10/434,948
Art Unit: 2617

Page 10

Conclusion

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 Stephen M. D'Agosta whose telephone number is 571-272-7862. The examiner can normally be reached on M-F, 8am to 5pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Bill Trost can be reached on 571-272-7872. 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.

STEVE M. D'AGOSTA
PRIMARY EXAMINER


12-27-07

Search Notes		Application/Control No.	Applicant(s)/Patent under Reexamination	
		10/434,948	DA COSTA ET AL.	
		Examiner	Art Unit	
		Stephen M. D'Agosta	2617	

SEARCHED			
Class	Subclass	Date	Examiner

INTERFERENCE SEARCHED			
Class	Subclass	Date	Examiner

SEARCH NOTES (INCLUDING SEARCH STRATEGY)		
	DATE	EXMR
INVENTOR SEARCH	11-7-04	no
LOS ART		
EAST DO'S		
TEXT SEARCH		
UPDATED SEARCH	3-30-07	no
" "	8-17-07	no
" "	12-27-07	no

Index of Claims 		Application/Control No. 10/434,948 Examiner Stephen M. D'Agosta		Applicant(s)/Patent under Reexamination DA COSTA ET AL. Art Unit 2617	
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✓ Rejected = Allowed	- (Through numeral) Cancelled ÷ Restricted	N Non-Elected I Interference	A Appeal O Objected
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15W 2617

PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Inventor:	DACOSTA et al.	Examiner:	Stephen M. D'Agosta
Application No.:	10/434,948	Art Unit:	2617
Filed:	May 8, 2003	Docket No.	MESHPO01
Title:	HIGH PERFORMANCE WIRELESS NETWORKS USING DISTRIBUTED CONTROL		

CERTIFICATE OF MAILING

I hereby certify that this correspondence is being deposited with the United States Postal Service as First Class Mail in a prepaid envelope addressed to: Mail Stop Amendment, Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450 on:

12/4, 2007.

Elaine Nguyen
Elaine Nguyen

TRANSMITTAL OF AMENDMENT D

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

Sir:

Transmitted herewith is Amendment D in response to Office Action mailed September 17, 2007 in the above-identified application.

The fee has been calculated as shown below.

CLAIMS	After Amd.	HP*	Extra	Small Entity			Large Entity	
				Rate	Fee		Rate	Fee
Total	31	38	-0-	x \$25 = \$		OR	x \$50 = \$	
Independent	3	3	-0-	x \$105 = \$		OR	x \$210 = \$	
Multiple Dependent Claims				x \$185 = \$		OR	x \$370 = \$	
*HP = Highest previously paid				TOTAL FEE \$		OR	TOTAL FEE \$	-0-

☐ Applicant(s) hereby petition for following extension of time in which to respond to the outstanding Office Action.

	SMALL ENTITY			LARGE ENTITY	
	Rate	Add'l Fee		Rate	Add'l Fee
☐ Extension for Response within FIRST month	x \$60 = \$		OR	x \$120 = \$	
☐ Extension for Response within SECOND month	x \$230 = \$		OR	x \$460 = \$	
☐ Extension for Response within THIRD month	x \$525 = \$		OR	x \$1050 = \$	
☐ Extension for Response within FOURTH month	x \$820 = \$		OR	x \$1640 = \$	
☐ Extension for Response within FIFTH month	x \$1115 = \$		OR	x \$2230 = \$	

Attorney Docket No.: MESHPO01
Application No.: 10/434,948

1 of 2

☒ Applicant(s) believe that no (additional) Extension of Time is required; however, if it is determined that such an extension is required, Applicant(s) hereby petition that such an extension be granted and authorize the Commissioner to charge the required fees for an Extension of Time under 37 CFR 1.136 to Deposit Account No. 50-0685. (MESHP001).

☐ Enclosed is our Check No. ___ in the amount of \$_____ to cover the additional claim fee and/or extension of time fees.

☐ Enclosed is Applicant Initiated Interview Request Form, PTOL-413A.

☐ Enclosed are _____ sheets replacement drawings.

☐ Please charge Deposit Account No. 50-0685 (MESHP001) in the amount of \$_____ to cover the additional claim fee and/or extension of time fees.

☒ If the required fees are missing or any additional fees are required during the pendency of the subject application, please charge such fees or credit any overpayment to Deposit Account No. 50-0685 (MESHP001).

☐ OTHER:

Respectfully submitted,
VAN PELT, YI & JAMES LLP



Diana Y. Fu
Registration No. 52,924

10050 N. Foothill Blvd., Suite 200
Cupertino, CA 95014
Telephone: 408-973-2585



IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Inventor:	DACOSTA et al.	Examiner:	Stephen M. D'Agosta
Application No.:	10/434,948	Art Unit:	2617
Filed:	May 8, 2003	Docket No.:	MESHP001
Title:	HIGH PERFORMANCE WIRELESS NETWORKS USING DISTRIBUTED CONTROL		

CERTIFICATE OF MAILING

I hereby certify that this correspondence is being deposited with the United States Postal Service as First Class Mail in a prepaid envelope addressed to: Mail Stop Amendment, Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450 on:

10/4, 2007.

Elaine Nguyen
Elaine Nguyen

AMENDMENT D

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

Dear Sir:

This is in response to the Office Action mailed September 17, 2007. The following amendments and remarks are respectfully submitted.

Application Serial No. 10/434,948
Attorney Docket No. MESHP001

IN THE CLAIMS

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

Claims 1-22 (Canceled)

23. (Currently Amended) A method of controlling a wireless mesh network, comprising:

a) configuring the wireless mesh network with a first configuration, the wireless mesh network comprising a plurality of relay nodes, each of the relay nodes being capable of relaying traffic from a child node associated with the relay node, each of the relay nodes including a first radio interface configurable to relay traffic to a parent relay node and a second dual purpose radio interface configurable to both relay traffic from the child relay node and to communicate with a client node that is not a relay node, and at least one of the relay nodes is configured in the first configuration to relay traffic from a child relay node to a parent relay node;

b) determining that a first one of the plurality of relay nodes in the wireless mesh network requires a channel selection change;

c) dynamically selecting a second one of the plurality of relay nodes in the wireless mesh network to form a parent-child relationship with the first relay node; and

d) making a channel selection change;

wherein prior to being dynamically selected, the second relay node was a sibling node of the first relay node; and

making a channel selection includes making a channel selection change to meet a performance requirement.

24. (Previously Presented) A method as recited in Claim 23, wherein the second node is selected to be a parent node of the first node.

25. (Previously Presented) A method as recited in Claim 23, wherein the second node is selected to be a child node of the first node.

26. (Cancelled)
27. (Cancelled)
28. (Previously Presented) A method as recited in Claim 23, wherein making a channel selection includes making a channel selection change to meet a latency requirement.
29. (Previously Presented) A method as recited in Claim 23, wherein making a channel selection includes making a channel selection change to meet a throughput requirement.
30. (Previously Presented) A method as recited in Claim 23, wherein determining that the first node requires a channel selection change includes determining that the channel selection change is required due to a performance requirement change.
31. (Previously Presented) A method as recited in Claim 23, wherein determining that the first node requires a channel selection change includes determining that the channel selection change is required due to congestion.
32. (Previously Presented) A method as recited in Claim 23, wherein the channel selection change is made to avoid channel interference.
33. (Previously Presented) A method as recited in Claim 23, wherein the channel selection change is made based on a change to network topology.
34. (Previously Presented) A method as recited in Claim 23, further comprising repeating b)-d).
35. (Previously Presented) A method as recited in Claim 23, further comprising receiving a monitoring signal that includes information about available nodes from which the second node is selected.
36. (Currently Amended) A relay node system in a wireless mesh network that includes a plurality of relay nodes, comprising:
a first radio interface configurable to relay traffic to a parent relay node;
a second dual purpose radio interface configurable to both relay traffic from a child relay node and to communicate with a client node that is not a relay node;

a processor configured to:

- a) configure the relay node system in a first configuration to relay traffic from a child relay node to a parent relay node;
 - b) determine that the relay node system is a first relay node in the wireless mesh network that requires a channel selection change;
 - c) dynamically select a second relay node from the plurality of relay nodes in the wireless mesh network to form a parent-child relationship with the first relay node; and
 - d) make a channel selection change; and
- a memory coupled to the processor, configured to provide the processor with instructions;

wherein prior to being dynamically selected, the second relay node was a sibling node of the first relay node; and
making a channel selection includes making a channel selection change to meet a performance requirement.

- 37. (Previously Presented) A system as recited in Claim 36, wherein the second node is selected to be a parent node of the first node.
- 38. (Previously Presented) A system as recited in Claim 36, wherein the second node is selected to be a child node of the first node.
- 39. (Cancelled)
- 40. (Cancelled)
- 41. (Previously Presented) A system as recited in Claim 36, wherein the processor is further configured to make a channel selection change to meet a latency requirement.
- 42. (Previously Presented) A system as recited in Claim 36, wherein the processor is further configured to make a channel selection change to meet a throughput requirement.
- 43. (Previously Presented) A system as recited in Claim 36, wherein the processor is configured to determine that the channel selection change is required due to a performance requirement change.

44. (Previously Presented) A system as recited in Claim 36, wherein the processor is configured to determine that the channel selection change is required due to congestion.
45. (Previously Presented) A system as recited in Claim 36, wherein the processor is configured to determine the channel selection change based on network topology.
46. (Previously Presented) A system as recited in Claim 36, wherein the processor is further configured to repeat b)-d).
47. (Previously Presented) A system as recited in Claim 36, wherein the processor is further configured to receive a monitoring signal that includes information about available nodes from which the second node is selected.
48. (Cancelled)
49. (Currently Amended) A computer program product for controlling a wireless mesh network, the computer program product being embodied in a computer readable medium and comprising computer instructions for:
- a) configuring the wireless mesh network with a first configuration, the wireless mesh network comprising a plurality of relay nodes, each of the relay nodes being capable of relaying traffic from a child node associated with the relay node, each of the relay nodes including a first radio interface configurable to relay traffic to a parent relay node and a second dual purpose radio interface configurable to both relay traffic from the child relay node and to communicate with a client node that is not a relay node, and at least one of the relay nodes is configured in the first configuration to relay traffic from a child relay node to a parent relay node;
 - b) determining that a first one of the plurality of relay nodes in the wireless mesh network requires a channel selection change;
 - c) dynamically selecting a second one of the plurality of relay nodes in the wireless mesh network to form a parent-child relationship with the first relay node; and
 - d) making a channel selection change;
- wherein prior to being dynamically selected, the second relay node was a sibling node of the first relay node; and

making a channel selection includes making a channel selection change to meet a performance requirement.

- 50. (Previously Presented) A computer program product as recited in Claim 49, wherein the second node is selected to be a parent node of the first node.
- 51. (Previously Presented) A computer program product as recited in Claim 49, wherein the second node is selected to be a child node of the first node.
- 52. (Cancelled)
- 53. (Cancelled)
- 54. (Previously Presented) A computer program product as recited in Claim 49, wherein making a channel selection includes making a channel selection change to meet a latency requirement.
- 55. (Previously Presented) A computer program product as recited in Claim 49, wherein making a channel selection includes making a channel selection change to meet a throughput requirement.
- 56. (Previously Presented) A computer program product as recited in Claim 49, wherein determining that the first node requires a channel selection change includes determining that the channel selection change is required due to a performance requirement change.
- 57. (Previously Presented) A computer program product as recited in Claim 49, wherein determining that the first node requires a channel selection change includes determining that the channel selection change is required due to congestion.
- 58. (Previously Presented) A computer program product as recited in Claim 49, wherein the channel selection change is made based on network topology.
- 59. (Previously Presented) A computer program product as recited in Claim 49, the computer program product further comprising computer instructions for repeating b)-d).

60. (Previously Presented) A computer program product as recited in Claim 49, the computer program product further comprising computer instructions for receiving a monitoring signal that includes information about available nodes from which the second node is selected.

REMARKS

Claims 26-27, 39-40, 52-53 have been cancelled. Claims 23, 36, 49, have been amended to clarify the subject matter regarded as the invention. Claims 23-25, 28-38, 41-47, 49-51, 54-60 are pending.

The Examiner has indicated that a more favorable outcome may occur if claim 23, 26, and any one claim from 27 through 35 were combined. Amended claim 23 is intended to include all of the limitations of claims 23, 26, and 27.

35 USC §103 Rejections

Claims 23-24, 26-37, 39-50, and 52-60 stand rejected under 35 U.S.C. 103(a) as being unpatentable over Crosbie and further in view of Forstadius and Meirer. Claims 25, 38, and 51 are under 35 U.S.C. 103(a) as being unpatentable over Crosbie/Forstadius/Meier further in view of Joon-Boi.

The rejection is respectfully traversed. With respect to claim 23, since neither Crosbie, nor Forstadius, nor Meirer, either singly or in combination, teaches a method of controlling a wireless mesh network wherein prior to being dynamically selected, the second relay node was a sibling node of the first relay node, and making a channel selection includes making a channel selection change to meet a performance requirement.

Claims 24-25 and 28-35 depend from claim 23 and are believed to be allowable for the same reasons described above.

Claim 36 recites a system for carrying out the method of claims 23. Therefore, it is believed that claim 36 is also allowable.

Claims 37-38 and 41-47 depend from claim 36 and are believed to be allowable for the same reasons described above.

Claim 49 recites program code for carrying out the method of claim 23. Therefore, it is believed that claim 49 is also allowable.

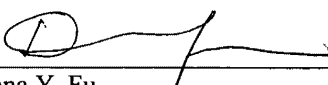
Claims 50-51 and 54-60 depend from claim 49 and are believed to be allowable for the same reasons described above.

The foregoing amendments are not to be taken as an admission of unpatentability of any of the claims prior to the amendments.

Reconsideration of the application and allowance of all claims are respectfully requested based on the preceding remarks. If at any time the Examiner believes that an interview would be helpful, please contact the undersigned.

Respectfully submitted,

Dated: 12/3/07



Diana Y. Fu
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F 408-973-2595

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PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875					Application or Docket Number 10/434,948		Filing Date 05/08/2003		☐ To be Mailed	
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APPLICATION AS FILED – PART I						OTHER THAN SMALL ENTITY			
(Column 1)		(Column 2)		SMALL ENTITY ☒		OR		SMALL ENTITY	
FOR	NUMBER FILED	NUMBER EXTRA	RATE (\$)	FEE (\$)	RATE (\$)	FEE (\$)	RATE (\$)	FEE (\$)	
☐ BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A	N/A		N/A		N/A		
☐ SEARCH FEE (37 CFR 1.16(k), (l), or (m))	N/A	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		N/A		
TOTAL CLAIMS (37 CFR 1.16(j))	minus 20 =	*	X \$ =		OR	X \$ =			
INDEPENDENT CLAIMS (37 CFR 1.16(h))	minus 3 =	*	X \$ =		OR	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))									
			TOTAL			TOTAL			

* If the difference in column 1 is less than zero, enter "0" in column 2.

APPLICATION AS AMENDED – PART II						OTHER THAN SMALL ENTITY					
(Column 1)		(Column 2)		(Column 3)		SMALL ENTITY		OR		SMALL ENTITY	
AMENDMENT	12/10/2007	CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA	RATE (\$)	ADDITIONAL FEE (\$)	RATE (\$)	ADDITIONAL FEE (\$)		
	Total (37 CFR 1.16(i))	* 31	Minus	** 37	= 0	X \$25 =	0	OR	X \$ =		
	Independent (37 CFR 1.16(h))	* 3	Minus	***3	= 0	X \$105 =	0	OR	X \$ =		
	☐ Application Size Fee (37 CFR 1.16(s))							OR			
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR			
						TOTAL ADD'L FEE	0	OR	TOTAL ADD'L FEE		

(Column 1)		(Column 2)		(Column 3)		SMALL ENTITY		OR		SMALL ENTITY	
AMENDMENT		CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	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))							OR			
	☐ 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:
dante r. smith

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.
10/434,948	05/08/2003	Francis da Costa	MESHP001	7871
21912 7590 09/17/2007 VAN PELT, YI & JAMES LLP 10050 N. FOOTHILL BLVD #200 CUPERTINO, CA 95014			EXAMINER D AGOSTA, STEPHEN M	
			ART UNIT 2617	PAPER NUMBER
			MAIL DATE 09/17/2007	DELIVERY MODE 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)	
	10/434,948		DA COSTA ET AL.	
	Examiner		Art Unit	
	Stephen M. D'Agosta		2617	

-- 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 14 August 2007.

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) 23-60 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) 23-60 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 _____ 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

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 8-14-2007 has been entered.

- New art has been added to address the claim amendments.
- After further consideration, the examiner believes a **more favorable outcome may occur** if they amend claim 23 as follows:
 - Claim 23 + claim 26 + any one claim from 27 thru 35 (3 claims total)

Claim Rejections - 35 USC § 103

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 negated by the manner in which the invention was made.

Claims 23-24, 26-37, 39-50 and 52-60 rejected under 35 U.S.C. 103(a) as being unpatentable over Crosbie US 2002/0085719 and further in view of Forstadius et al. US 7,200,130 and Meirer et al US 6,046,992.

As per **claims 23, 36 and 49**, Crosbie teaches a method of controlling a wireless "mesh" network, comprising:

- a) configuring the wireless mesh network with a first configuration (figure 3, top of page shows mobile device/slave #26-2 connected to Initial Master #24-4);
- b) determining that a first one of the plurality in the wireless mesh network requires a channel selection change (Para #6 teaches handing-off due to various reasons:

This feature, known as "hand-offs" is required for many functions such as load balancing, improving radio link performance, and moving the mobile device inside a building without losing the network connection.

- c) dynamically selecting a second one of the plurality to form a parent-child relationship with the first node **AND** d) making a channel selection change (figure 3 shows device/slave #26-2 moving from the Initial Master to the Target Master #24-5 which reads on selecting a second "node" and forming a parent-child/master-slave relationship on a different channel. Also see figure 6).

The examiner notes that all claims presented are interpreted in the broadest reasonable manner, hence the claims do not limit:

i) how the terms "first and second node" must be interpreted, eg. what network(s) they are associated with.

ii) how the new channel connection is made (eg. is the second node part of the first wireless mesh and/or from a different mesh).

iii) Applicant's figure 1 shows each node with only one connection to a master which is similar to Crosbie's figure (eg. a true mesh requires that each node have a direct connection to every other node, which is not shown in applicant's drawings);

but is silent on the wireless mesh network comprising a plurality of relay nodes, each of the relay nodes being capable of relaying traffic from a child node associated with the relay node, and at least one of the relay nodes is configured in the first configuration to relay traffic from a child relay node to a parent relay node AND each of the relay nodes including a first radio interface configurable to relay traffic to a parent relay node and a second dual purpose radio interface configurable to both relay traffic from the child relay node and to communicate with a client node that is not a relay node (in a wireless mesh network).

Forstadius teaches a short range RF network whereby Bluetooth transceivers act as relay nodes to a Master/Parent and between themselves while also supporting communications to a mobile/node user, which reads on the claim (see figure 2 which shows relays (100-x) which can communicate to the Master/Parent, to other relays or to mobile/cellular devices).

Meier teaches a network which uses relays/bridges that can talk to other bridges as well as individual RF devices (see figure 1 where Bridge/Relay #32 connects to Bridge #48 as well as RF Devices #108/#110. The RF frequency can be either the same and/or different depending upon which transceivers are used. The examiner also notes that dual-transceiver mobile devices and access points are well known, hence the Bridge-to-Bridge frequency could be different than the Bridge-to-mobile frequency).

It would have been obvious to one skilled in the art at the time of the invention to modify Crosbie, such that the wireless mesh network comprising a plurality of relay nodes, each of the relay nodes being capable of relaying traffic from a child node associated with the relay node, and at least one of the relay nodes is configured in the

first configuration to relay traffic from a child relay node to a parent relay node AND each of the relay nodes including a first radio interface configurable to relay traffic to a parent relay node and a second dual purpose radio interface configurable to both relay traffic from the child relay node and to communicate with a client node that is not a relay node (in a wireless mesh network), to provide means for the mesh routing tables to be controlled in a parent/child relationship (eg. routing updates occurs via a hierarchy) between the relay nodes, user devices and parent nodes.

As per **claims 23, 46 and 59**, Crosbie teaches 34/36/49, further comprising repeating "b" thru "d" (Para #6 teaches a hand off "process" which will be performed until a handoff is successful, eg. steps b thru d will be repeated until a new channel/link is found to handoff to:

This feature, known as "hand-offs" is required for many functions such as load balancing, improving radio link performance, and moving the mobile device inside a building without losing the network connection.

As per **claims 24, 37 and 50**, Crosbie teaches claim 23/36/49, wherein the second node is selected to be a parent node of the first node (figure 3 shows the "second node" as being the master/parent to the mobile which has handed off).

As per **claims 26, 39 and 52**, Crosbie teaches Claim 23/36/49, **but is silent on** wherein the first node includes a plurality of radios wherein prior to being dynamically selected, the second relay node was a sibling node of the first relay node.

The examiner takes official notice that multi-mode/dual-band mobile devices are known in the art and can connect to several networks (eg. cellular, Bluetooth, WLAN, etc.). the manner in which devices roam and connect/reconnect in the hierarchy is not constrained and therefore any node can change/become a first/second/etc. node if when it was a sibling/etc. of the first/second/etc. node. Meaning, one skilled would ensure that any/all combinations of reconnections between/among the devices is

possible since one cannot know beforehand how the mesh will configure itself and also in which direction(s) the devices will roam and reconnect.

It would have been obvious to one skilled in the art at the time of the invention to modify Crosbie, such that the first node includes a plurality of radios, to provide means for the device to connect to different networks as it roams.

As per **claims 27, 40 and 53**, Crosbie teaches claim 23/36/49, wherein making a channel selection includes making a channel selection change to meet a performance requirement (Para #6 teaches performance:

This feature, known as "hand-offs" is required for many functions such as load balancing, improving radio link performance, and moving the mobile device inside a building without losing the network connection).

Also see Para #9 which teaches QoS and giving a user more bandwidth.

As per **claims 28-29, 41-42 and 54-55**, Crosbie teaches claim 23/36/49, wherein making a channel selection includes making a channel selection change to meet a latency requirement AND/OR wherein making a channel selection includes making a channel selection change to meet a throughput requirement (Para #6 teaches latency/throughput which reads on load-balancing, since it would reduce throughput problems by using multiple links/paths:

This feature, known as "hand-offs" is required for many functions such as load balancing, improving radio link performance, and moving the mobile device inside a building without losing the network connection).

Also see Para #9 which teaches QoS.

As per **claims 30, 43 and 56**, Crosbie teaches claim 23/36/49, wherein determining that the first node requires a channel selection change includes determining that the channel selection change is required due to a performance requirement change (Para #6 teaches handing off due to performance problems, eg. latency/throughput is occurring and the mobile desires better performance/throughput:

This feature, known as "hand-offs" is required for many functions such as load balancing, improving radio link performance, and moving the mobile device inside a building without losing the network connection). Also see Para #9 which teaches QoS.

The examiner notes that the claim does not specify whether it is the mobile or the network that perceives the "performance requirement change".

As per **claims 31, 44 and 57**, Crosbie teaches claim 23/36/49, wherein determining that the first node requires a channel selection change includes determining that the channel selection change is required due to congestion (Para #6 teaches latency/throughput which reads on congestion, since it would reduce throughput problems buy using multiple links/paths:

This feature, known as "hand-offs" is required for many functions such as load balancing, improving radio link performance, and moving the mobile device inside a building without losing the network connection).

Also see Para #9 which teaches QoS.

As per **claim 32**, Crosbie teaches claim 23, wherein the channel selection change is made to avoid channel interference (Para #6 teaches improving radio link performance which reads on avoiding channel interference, since it would reduce interference by moving to a new link:

This feature, known as "hand-offs" is required for many functions such as load balancing, improving radio link performance, and moving the mobile device inside a building without losing the network connection).

As per **claims 33, 45 and 58**, Crosbie teaches claim 23/36/49, wherein the channel selection change is made based on a change to network topology (Para #6 teaches moving inside a building which would prompt a change to the network topology, eg. connection, since a handoff would occur to a new master located within the building:

This feature, known as "hand-offs" is required for many functions such as load balancing, improving radio link performance, and moving the mobile device inside a building without losing the network connection).

The claim does not specify from what perspective the network topology is being driven by/from (eg. network or user?). As a second point, a poor communication link can be perceived as a dropped link, which would also be viewed as a topology change and hence spawn a handoff).

Also see Para #9 which teaches QoS and giving the user it's own channel which is viewed as a network topology change.

As per **claims 35, 47 and 60**, Crosbie teaches claim 23/36/49, further comprising receiving a monitoring signal that includes information about available nodes from which the second node is selected (Para #6 teaches handing off from one master to another and the examiner takes Official Notice that it is well known in the art of handoffs for the mobile to be able to receive the second BTS's/master's signal/beacon in order for it to determine if it is a handoff candidate, which reads on "receiving a monitoring signal that includes information about available nodes from which the second node is selected").

Claims 25, 38 and 51 rejected under 35 U.S.C. 103(a) as being unpatentable over Crosbie/Forstadius/Meirer and further in view of Joon-Boi et al. US 2002/0055978.

As per **claims 25, 38 and 51**, Crosbie teaches claim 23/36, **but is silent on** wherein the second node is selected to be a child node of the first node.

Joon-Boi teaches a parent/master leaving/changing status and a new parent/master is selected from the proximate children/slaves. Hence a first node would

either stay as a child/slave (eg. the second node becomes a parent/master) or said first node becomes the new parent/master and said second node becomes the child/slave:

"..A method for managing a network in which Bluetooth equipped devices are linked together when the network master cannot serve as a master.....When power of the network master is exhausted, or when the network master leaves the network operating region, a new master is selected from the remaining slaves according to the backup master rank information, thereby reconfiguring a network around the new network master. The method enables proper designation of a new master when a preexisting network master leaves the network operating region, thereby increasing a probability of holding connection throughout the network.." (Abstract)

It would have been obvious to one skilled in the art at the time of the invention to modify Crosbie, such that the second node is selected to be a child node of the first node, to provide means for a flexible network reconfiguration to occur whereby the most optimal node is chosen to become the new parent/master (thus leaving the other devices to stay as children/slaves and then connect to the new master).

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

1. Tuomela et al. US 7,190,690
2. Lee et al. US 6,909,705
3. Johansson et al. US 7,058,050
4. Lee US 6,913,373

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Stephen M. D'Agosta whose telephone number is 571-272-7862. The examiner can normally be reached on M-F, 8am to 5pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Bill Trost can be reached on 571-272-7872. 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.

STEVE M. D'AGOSTA
PRIMARY EXAMINER

8-17-07

Notice of References Cited	Application/Control No. 10/434,948	Applicant(s)/Patent Under Reexamination DA COSTA ET AL.	
	Examiner Stephen M. D'Agosta	Art Unit 2617	Page 1 of 1

U.S. PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	Classification
*	A	US-6,046,992	04-2000	Meier et al.	370/338
*	B	US-7,058,050	06-2006	Johansson et al.	370/386
*	C	US-6,912,373	06-2005	Lee, Hee Dong	455/41.2
*	D	US-7,190,690	03-2007	Tuomela et al.	370/347
*	E	US-6,909,705	06-2005	Lee et al.	370/338
*	F	US-7,200,130	04-2007	Forstadius et al.	370/338
	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
	N					
	O					
	P					
	Q					
	R					
	S					
	T					

NON-PATENT DOCUMENTS

*		Include as applicable: Author, Title Date, Publisher, Edition or Volume, Pertinent Pages)
	U	
	V	
	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. 10/434,948 Examiner Stephen M. D'Agosta	Applicant(s)/Patent under Reexamination DA COSTA ET AL. Art Unit 2617
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√ Rejected = Allowed	- (Through numeral) Cancelled ÷ Restricted	N Non-Elected I Interference	A Appeal O Objected
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Claim	Date
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Search Notes		Application/Control No.	Applicant(s)/Patent under Reexamination	
		10/434,948	DA COSTA ET AL.	
		Examiner	Art Unit	
		Stephen M. D'Agosta	2617	

SEARCHED			
Class	Subclass	Date	Examiner

INTERFERENCE SEARCHED			
Class	Subclass	Date	Examiner

SEARCH NOTES (INCLUDING SEARCH STRATEGY)		
	DATE	EXMR
INVENTOR SEARCH	11-7-04	no
IOS ART		
EAST DO'S		
TEXT SEARCH		
UPDATED SEARCH	3-30-07	no
" "	8-17-07	no



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
10/434,948	05/08/2003	Francis da Costa	MESHP001

21912
 VAN PELT, YI & JAMES LLP
 10050 N. FOOTHILL BLVD #200
 CUPERTINO, CA 95014

CONFIRMATION NO. 7871
 OC000000025441992
 OC000000025441992

Date Mailed: 08/17/2007

NOTICE OF ACCEPTANCE OF POWER OF ATTORNEY

This is in response to the Power of Attorney filed 08/07/2007.

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.

8138

Office of Initial Patent Examination (571) 272-4000, or 1-800-PTO-9199
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 Alexandria, Virginia 22313-1450
 www.uspto.gov

APPLICATION NUMBER	FILING OR 371 (c) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
10/434,948	05/08/2003	Francis da Costa	DACOSTAF.PT1

24943
 INTELLECTUAL PROPERTY LAW GROUP LLP
 12 SOUTH FIRST STREET
 SUITE 1205
 SAN JOSE, CA 95113

CONFIRMATION NO. 7871
OC000000025441952
 OC000000025441952

Date Mailed: 08/17/2007

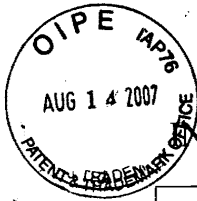
NOTICE REGARDING CHANGE OF POWER OF ATTORNEY

This is in response to the Power of Attorney filed 08/07/2007.

- 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).

E138

Office of Initial Patent Examination (571) 272-4000, or 1-800-PTO-9199
 OFFICE COPY



RCE\$
IFU

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Inventor:	DACOSTA	Examiner:	Stephen M. D'Agosta
Application No.:	10/434,948	Art Unit:	2617
Filed:	May 8, 2003	Docket No.:	MESHP001
Title:	HIGH PERFORMANCE WIRELESS NETWORKS USING DISTRIBUTED CONTROL		

CERTIFICATE OF MAILING

I hereby certify that this correspondence is being deposited with the United States Postal Service as First Class Mail in a prepaid envelope addressed to:
Commissioner for Patents, Mail Stop RCE, P.O. Box 1450, Alexandria, VA 22313-1450

8/9, 2007.

Elaine Nguyen
Elaine Nguyen

**REQUEST FOR CONTINUED EXAMINATION (RCE) TRANSMITTAL
FILED WITH AMENDMENT C**

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

This is a Request for Continued Examination (RCE) under 37 CFR §1.114 of the above-identified application.

1. Submission required under 37 CFR §1.114

a. ☐ Previously submitted:

☐ Consider the amendment(s)/reply under 37 CFR §1.116 previously
filed on _____

☐ Consider the arguments in the Appeal Brief or Reply Brief previously
filed on _____

☐ Other _____

b. ☒ Enclosed:

☒ Amendment/Reply

☐ Affidavit(s)/Declaration(s)

☒ Information Disclosure Statement (IDS)

☐ Other

ATTORNEY DOCKET NO. MESHP001
Application No.: 10/434,948

Page 1 of 2

08/15/2007 HU0061 00000070 10434948 790.00 UP
01 FC:1801

c. Fee Calculation: The fee for excess claims, if applicable, has been calculated as shown below.

				Small Entity			Large Entity	
				Rate	Fee		Rate	Fee
RCE FILING FEE				x \$395 = \$		OR	x \$790 = \$	790.00
CLAIMS	After RCE	*HP	Extra					
Total	37	38		x \$25 = \$		OR	x \$50 = \$	
Independent	3	3		x \$100 = \$		OR	x \$200 = \$	
Multiple Dependent Claims			-0-	x \$180 = \$		OR	x \$360 = \$	
*HP = Highest previously paid				TOTAL FEES \$			TOTAL FEES \$	
							790.00	

2. Miscellaneous:

- a. ☐ Suspension of action on the above-identified application is requested under 37 CFR §1.103(c) for a period of _____ months.
- b. ☐ Other _____

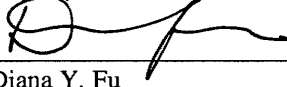
3. ☒ Applicant hereby petitions for an extension of time as follows:

	SMALL ENTITY			LARGE ENTITY	
	Rate	Add'l Fee		Rate	Add'l Fee
☒ Extension for Response within FIRST month	x \$60 = \$		OR	x \$120 = \$	120.00
☐ Extension for Response within SECOND month	x \$225 = \$		OR	x \$450 = \$	
☐ Extension for Response within THIRD month	x \$510 = \$		OR	x \$1020 = \$	
☐ Extension for Response within FOURTH month	x \$795 = \$		OR	x \$1590 = \$	
☐ Extension for Response within FIFTH month	x \$1080 = \$		OR	x \$2160 = \$	

4. ☒ Applicant(s) hereby petition that any additional required extension of time be granted.
5. ☒ Enclosed is our Check No. 3145 in the amount of \$910.00 to cover the RCE Fee required under 37 CFR §1.17 (e), the additional claim fee, if any, and/or extension of time fees.
6. ☐ Please charge Deposit Account No. 50-0685 (MESHP001) in the amount of \$_____ to cover the additional claim fee and/or extension of time fees.
7. ☒ If the required fees are missing or any additional fees are required during the pendency of the subject application, please charge such fees or credit any overpayment to Deposit Account No. 50-0685 (MESHP001).
8. ☐ Applicant Initiated Interview Request Form.
9. ☒ Please continue to send correspondence to the following address:

CUSTOMER NO. 21912
VAN PELT, YI & JAMES LLP
 10050 N. Foothill Blvd., Ste. 200
 Cupertino, CA 95014
 Tel (408) 973-2585 Fax (408) 973-2595

Date: 8/9/07


 Diana Y. Fu
 Reg. No. 52,924



IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Inventor:	DACOSTA et al.	Examiner:	Stephen M. D'Agosta
Application No.:	10/434,948	Art Unit:	2617
Filed:	May 8, 2003	Docket No.:	MESHP001
Title:	HIGH PERFORMANCE WIRELESS NETWORKS USING DISTRIBUTED CONTROL		

CERTIFICATE OF MAILING

I hereby certify that this correspondence is being deposited with the United States Postal Service as First Class Mail in a prepaid envelope addressed to: Mail Stop RCE, Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450 on:

8/9, 2007.


Elaine Nguyen

AMENDMENT C

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

Dear Sir:

This is in response to the Office Action mailed April 16, 2007. The following amendments and remarks are respectfully submitted.

08/15/2007 HVUONG1 00000070 10434948

02 FC:1251

120.00 OP

Application Serial No. 10/434,948
Attorney Docket No. MESHP001

IN THE CLAIMS

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

Claims 1-22 (Canceled)

23. (Currently Amended) A method of controlling a wireless mesh network, comprising:
- a) configuring the wireless mesh network with a first configuration, the wireless mesh network comprising a plurality of relay nodes, each of the relay nodes being capable of relaying traffic from a child node associated with the relay node, each of the relay nodes including a first radio interface configurable to relay traffic to a parent relay node and a second dual purpose radio interface configurable to both relay traffic from the child relay node and to communicate with a client node that is not a relay node, and at least one of the relay nodes is configured in the first configuration to relay traffic from a child relay node to a parent relay node;
 - b) determining that a first one of the plurality of relay nodes in the wireless mesh network requires a channel selection change;
 - c) dynamically selecting a second one of the plurality of relay nodes in the wireless mesh network to form a parent-child relationship with the first relay node; and
 - d) making a channel selection change.
24. (Previously Presented) A method as recited in Claim 23, wherein the second node is selected to be a parent node of the first node.
25. (Previously Presented) A method as recited in Claim 23, wherein the second node is selected to be a child node of the first node.
26. (Currently Amended) A method as recited in Claim 23, wherein ~~the first node includes a plurality of radios~~ prior to being dynamically selected, the second relay node was a sibling node of the first relay node.

27. (Previously Presented) A method as recited in Claim 23, wherein making a channel selection includes making a channel selection change to meet a performance requirement.
28. (Previously Presented) A method as recited in Claim 23, wherein making a channel selection includes making a channel selection change to meet a latency requirement.
29. (Previously Presented) A method as recited in Claim 23, wherein making a channel selection includes making a channel selection change to meet a throughput requirement.
30. (Previously Presented) A method as recited in Claim 23, wherein determining that the first node requires a channel selection change includes determining that the channel selection change is required due to a performance requirement change.
31. (Previously Presented) A method as recited in Claim 23, wherein determining that the first node requires a channel selection change includes determining that the channel selection change is required due to congestion.
32. (Previously Presented) A method as recited in Claim 23, wherein the channel selection change is made to avoid channel interference.
33. (Previously Presented) A method as recited in Claim 23, wherein the channel selection change is made based on a change to network topology.
34. (Previously Presented) A method as recited in Claim 23, further comprising repeating b)-d).
35. (Previously Presented) A method as recited in Claim 23, further comprising receiving a monitoring signal that includes information about available nodes from which the second node is selected.
36. (Currently Amended) A relay node system in a wireless mesh network that includes a plurality of relay nodes, comprising:
 a first radio interface configurable to relay traffic to a parent relay node;
 a second dual purpose radio interface configurable to both relay traffic from a child relay node and to communicate with a client node that is not a relay node;
 a processor configured to:

a) ~~configure a first relay node in a first configuration, the first relay node being one of the plurality of relay nodes included in the wireless mesh network, the first relay node being configured in the~~ the relay node system in a first configuration to relay traffic from a child relay node to a parent relay node;

b) determine that the ~~first relay node system~~ is a first relay node in the wireless mesh network ~~that~~ requires a channel selection change;

c) dynamically select a second relay node from the plurality of relay nodes in the wireless mesh network to form a parent-child relationship with the first relay node; and

d) make a channel selection change; and
a memory coupled to the processor, configured to provide the processor with instructions.

37. (Previously Presented) A system as recited in Claim 36, wherein the second node is selected to be a parent node of the first node.

38. (Previously Presented) A system as recited in Claim 36, wherein the second node is selected to be a child node of the first node.

39. (Currently Amended) A system as recited in Claim 36, ~~further comprising a plurality of radios wherein prior to being dynamically selected, the second relay node was a sibling node of the first relay node.~~

40. (Previously Presented) A system as recited in Claim 36, wherein the processor is further configured to make a channel selection change to meet a performance requirement.

41. (Previously Presented) A system as recited in Claim 36, wherein the processor is further configured to make a channel selection change to meet a latency requirement.

42. (Previously Presented) A system as recited in Claim 36, wherein the processor is further configured to make a channel selection change to meet a throughput requirement.

43. (Previously Presented) A system as recited in Claim 36, wherein the processor is configured to determine that the channel selection change is required due to a performance requirement change.

44. (Previously Presented) A system as recited in Claim 36, wherein the processor is configured to determine that the channel selection change is required due to congestion.
45. (Previously Presented) A system as recited in Claim 36, wherein the processor is configured to determine the channel selection change based on network topology.
46. (Previously Presented) A system as recited in Claim 36, wherein the processor is further configured to repeat b)-d).
47. (Previously Presented) A system as recited in Claim 36, wherein the processor is further configured to receive a monitoring signal that includes information about available nodes from which the second node is selected.
48. (Cancelled)
49. (Currently Amended) A computer program product for controlling a wireless mesh network, the computer program product being embodied in a computer readable medium and comprising computer instructions for:
- a) configuring the wireless mesh network with a first configuration, the wireless mesh network comprising a plurality of relay nodes, each of the relay nodes being capable of relaying traffic from a child node associated with the relay node, each of the relay nodes including a first radio interface configurable to relay traffic to a parent relay node and a second dual purpose radio interface configurable to both relay traffic from the child relay node and to communicate with a client node that is not a relay node, and at least one of the relay nodes is configured in the first configuration to relay traffic from a child relay node to a parent relay node;
 - b) determining that a first one of the plurality of relay nodes in the wireless mesh network requires a channel selection change;
 - c) dynamically selecting a second one of the plurality of relay nodes in the wireless mesh network to form a parent-child relationship with the first relay node; and
 - d) making a channel selection change.
50. (Previously Presented) A computer program product as recited in Claim 49, wherein the second node is selected to be a parent node of the first node.

51. (Previously Presented) A computer program product as recited in Claim 49, wherein the second node is selected to be a child node of the first node.

52. (Currently Amended) A computer program product as recited in Claim 49, wherein ~~the first node includes a plurality of radios. prior to being dynamically selected, the second relay node was a sibling node of the first relay node.~~

53. (Previously Presented) A computer program product as recited in Claim 49, wherein making a channel selection includes making a channel selection change to meet a performance requirement.

54. (Previously Presented) A computer program product as recited in Claim 49, wherein making a channel selection includes making a channel selection change to meet a latency requirement.

55. (Previously Presented) A computer program product as recited in Claim 49, wherein making a channel selection includes making a channel selection change to meet a throughput requirement.

56. (Previously Presented) A computer program product as recited in Claim 49, wherein determining that the first node requires a channel selection change includes determining that the channel selection change is required due to a performance requirement change.

57. (Previously Presented) A computer program product as recited in Claim 49, wherein determining that the first node requires a channel selection change includes determining that the channel selection change is required due to congestion.

58. (Previously Presented) A computer program product as recited in Claim 49, wherein the channel selection change is made based on network topology.

59. (Previously Presented) A computer program product as recited in Claim 49, the computer program product further comprising computer instructions for repeating b)-d).

60. (Previously Presented) A computer program product as recited in Claim 49, the computer program product further comprising computer instructions for receiving a monitoring signal that includes information about available nodes from which the second node is selected.

REMARKS

Claims 23, 26, 36, 39, 49, 52 have been amended to clarify the subject matter regarded as the invention. Claims 23-47, 49-60 are pending.

Claims 23-24, 26-37, 39-50 and 52-60 stand rejected under 35 U.S.C. 103(a) as being unpatentable over Crosbie (US 2002/0085719) and further in view of Wolf et al. (US 2002/0159409) and Novaes (US 2003/0012193).

The rejection is respectfully traversed. With respect to claim 23, neither Crosbie, nor Wolfe, nor Novaes, either singly or in combination, teaches a “wireless mesh network comprising a plurality of relay nodes, each of the relay nodes being capable of relaying traffic from a child node associated with the relay node, each of the relay nodes including a first radio interface configurable to relay traffic to a parent relay node and a second dual purpose radio interface configurable to both relay traffic from the child relay node and to communicate with a client node that is not a relay node, and at least one of the relay nodes is configured in the first configuration to relay traffic from a child relay node to a parent relay node.” Support for the amended claim may be found, as an example and without limitation, at [0043], [0100], [0101], and FIG. 18 of the specification.

Crosbie does not teach relay nodes, and therefore does not teach a relay node with two radio interfaces. Wolfe teaches a radio base station (RBS) with a backhaul interface and a mobile interface (FIG. 2). The backhaul interface provides the communication link for carrying packet data into and out of the RBS 16. The mobile interface’s function is to communicate with one or more mobile terminals. ([0020]-[0021]). Thus, Wolfe only teaches that the RBS has two interfaces each dedicated to a particular purpose. Wolfe does not, however, teach a dual purpose radio interface configurable to both relay traffic from the child relay node and to communicate with a client node that is not a relay node configured to both relay traffic from the child relay node and to communicate with a client node that is not a relay node. Novaes teaches methods and apparatus for updating Subsource Addressing Multicast (SAM) routing records, but does not teach a first radio interface configurable to relay traffic to a parent relay node and a second dual purpose radio interface configurable to both relay traffic from the child relay node and to communicate with a client node that is not a relay node, and at least one of the relay nodes is

configured in the first configuration to relay traffic from a child relay node to a parent relay node. As such, claim 23 is believed to be allowable.

Claims 24-35 depend from claim 23 and are believed to be allowable for the same reasons described above.

With respect to claim 36, neither Crosbie, nor Wolfe, nor Novaes, either singly or in combination, teaches a relay node system comprising a first radio interface configurable to relay traffic to a parent relay node, and a second dual purpose radio interface configurable to both relay traffic from a child relay node and to communicate with a client node that is not a relay node. As such, claim 36 is believed to be allowable.

Claims 37-47 depend from claim 36 and are believed to be allowable for the same reasons described above.

With respect to claim 49, neither Crosbie, nor Wolfe, nor Novaes, either singly or in combination, teaches a computer program product comprising computer instructions for configuring the wireless mesh network with a first configuration, the wireless mesh network comprising a plurality of relay nodes, each of the relay nodes being capable of relaying traffic from a child node associated with the relay node, each of the relay nodes including a first radio interface configurable to relay traffic to a parent relay node and a second dual purpose radio interface configurable to both relay traffic from the child relay node and to communicate with a client node that is not a relay node, and at least one of the relay nodes is configured in the first configuration to relay traffic from a child relay node to a parent relay node. As such, claim 49 is believed to be allowable.

Claims 50-60 depend from claim 49 and are believed to be allowable for the same reasons described above.

The foregoing amendments are not to be taken as an admission of unpatentability of any of the claims prior to the amendments.

Reconsideration of the application and allowance of all claims are respectfully requested based on the preceding remarks. If at any time the Examiner believes that an interview would be helpful, please contact the undersigned.

Respectfully submitted,

Dated: 8/9/07



Diana Y. Fu
Registration No. 52,924
V 408-973-2593
F 408-973-2595

VAN PELT, YI & JAMES LLP
10050 N. Foothill Blvd., Suite 200
Cupertino, CA 95014

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 10/434948			
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 (\$)	FEE (\$)		
BASIC FEE (37 CFR 1.16(a), (b), or (c))									
SEARCH FEE (37 CFR 1.16(k), (j), or (m))									
EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))									
TOTAL CLAIMS (37 CFR 1.16(j))	minus 20 =	*	X	=	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))									
			TOTAL		TOTAL				
* If the difference in column 1 is less than zero, enter "0" in column 2.									
APPLICATION AS AMENDED – PART II									
(Column 1)		(Column 2)		(Column 3)		SMALL ENTITY		OR OTHER THAN SMALL ENTITY	
AMENDMENT A	CLAIMS REMAINING AFTER AMENDMENT	HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA	RATE (\$)	ADDITIONAL FEE (\$)	RATE (\$)	ADDITIONAL FEE (\$)	RATE (\$)	ADDITIONAL FEE (\$)
Total (37 CFR 1.16(j))	* 37	Minus	** 37	X	=	X	=	X	=
Independent (37 CFR 1.16(h))	* 3	Minus	*** 3	X	=	X	=	X	=
Application Size Fee (37 CFR 1.16(s))									
FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))									
			TOTAL ADD'L FEE		TOTAL ADD'L FEE			TOTAL ADD'L FEE	
(Column 1)		(Column 2)		(Column 3)		SMALL ENTITY		OR OTHER THAN SMALL ENTITY	
AMENDMENT B	CLAIMS REMAINING AFTER AMENDMENT	HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA	RATE (\$)	ADDITIONAL FEE (\$)	RATE (\$)	ADDITIONAL FEE (\$)	RATE (\$)	ADDITIONAL FEE (\$)
Total (37 CFR 1.16(j))	*	Minus	**	X	=	X	=	X	=
Independent (37 CFR 1.16(h))	*	Minus	***	X	=	X	=	X	=
Application Size Fee (37 CFR 1.16(s))									
FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))									
			TOTAL ADD'L FEE		TOTAL ADD'L FEE			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.									

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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VAN PELT, YI & JAMES LLP
10050 N. Foothill Blvd.
Suite 200
Cupertino, California 95014
Tel: 408-973-2585
Fax: 408-973-2595

Date: August 7, 2007

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TO: Official Fax Filing
COMPANY: U.S. Patent & Trademark Office
FAX NO.: 571-273-8300

FROM: Diana Y. Fu
RE: Revocation of Power of Attorney with New Power of Attorney and
Change of Correspondence Address
REF. NO.: MESHPO01
PATENT APPLICATION NO.: 10/434,948
NO. PAGES: 3 pages total

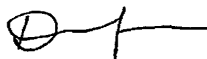
MESSAGE:

Dear Official Fax Filing:

Please accept the enclosed Power of Attorney to Prosecute and 37 CFR §3.73(b) Statement, for the above-referenced application.

If you have any questions please do not hesitate to contact me.

Best Regards,



Diana Y. Fu

3 OF 12

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PTO/SB/02 (04-05)
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U.S. Patent and Trademark Office, U.S. DEPARTMENT OF COMMERCE
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REVOCATION OF POWER OF ATTORNEY WITH NEW POWER OF ATTORNEY AND CHANGE OF CORRESPONDENCE ADDRESS	Application Number	10/434,848
	Filing Date	May 8, 2003
	First Named Inventor	Francis daCosta
	Art Unit	2817
	Examiner Name	Stephen M. D'Agosta
	Attorney Docket Number	MESH001

I hereby revoke all previous powers of attorney given in the above-identified application.

☐ A Power of Attorney is submitted herewith.

OR

☒ I hereby appoint the practitioners associated with the Customer Number:

21912

☒ Please change the correspondence address for the above-identified application to:

☐ The address associated with
Customer Number:

21912

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/06)

SIGNATURE of Applicant or Assignee of Record

Signature

Name

Francis daCosta

Date

Aug - 3 - 2007

Telephone

408-973-7700

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.

This collection of information is required by 37 CFR 1.38. 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 22313-3450. 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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STATEMENT UNDER 37 CFR 3.73(b)

Applicant/Patent Owner: DACOSTA et al.

Application No./Patent No.: 10/434,948 Filed/Issue Date: May 8, 2003

Entitled: HIGH PERFORMANCE WIRELESS NETWORKS USING DISTRIBUTED CONTROL

Mesh Dynamics, Inc., 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 019345, Frame 0124, 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: _____ 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.

Signature

Diana Y. Fu

Printed or Typed Name

Reg. No. 52,824

Title

Date

8/7/07
408-973-2595

Telephone Number

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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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/434,948	05/08/2003	Francis da Costa	DACOSTAF.PT1	7871
24943 7590 04/16/2007 INTELLECTUAL PROPERTY LAW GROUP LLP 12 SOUTH FIRST STREET SUITE 1205 SAN JOSE, CA 95113			EXAMINER D AGOSTA, STEPHEN M	
			ART UNIT	PAPER NUMBER
			2617	
SHORTENED STATUTORY PERIOD OF RESPONSE		MAIL DATE	DELIVERY MODE	
3 MONTHS		04/16/2007	PAPER	

Please find below and/or attached an Office communication concerning this application or proceeding.

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

Office Action Summary	Application No. 10/434,948		Applicant(s) DA COSTA ET AL.	
	Examiner Stephen M. D'Agosta		Art Unit 2617	
	-- 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 3-16-2007.

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) 23-47 and 49-60 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) 23-47 and 49-60 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 _____ 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

Response to Arguments

Applicant's arguments with respect to the claims have been considered but are moot in view of the new ground(s) of rejection.

Claim Rejections - 35 USC § 103

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 negated by the manner in which the invention was made.

Claims 23-24, 26-37, 39-50 and 52-60 rejected under 35 U.S.C. 103(a) as being unpatentable over Crosbie US 2002/0085719 and further in view of Wolf et al. 2002/0159409 and Novaes 2003/0012193.

As per **claims 23, 36 and 49**, Crosbie teaches a method of controlling a wireless "mesh" network, comprising:

- a) configuring the wireless mesh network with a first configuration (figure 3, top of page shows mobile device/slave #26-2 connected to Initial Master #24-4);
- b) determining that a first one of the plurality in the wireless mesh network requires a channel selection change (Para #6 teaches handing-off due to various reasons:

This feature, known as "hand-offs" is required for many functions such as load balancing, improving radio link performance, and moving the mobile device inside a building without losing the network connection.

c) dynamically selecting a second one of the plurality to form a parent-child relationship with the first node **AND** d) making a channel selection change (figure 3 shows device/slave #26-2 moving from the Initial Master to the Target Master #24-5 which reads on selecting a second "node" and forming a parent-child/master-slave relationship on a different channel. Also see figure 6).

The examiner notes that all claims presented are interpreted in the broadest reasonable manner, hence the claims do not limit:

i) how the terms "first and second node" must be interpreted, eg. what network(s) they are associated with.

ii) how the new channel connection is made (eg. is the second node part of the first wireless mesh and/or from a different mesh).

iii) Applicant's figure 1 shows each node with only one connection to a master which is similar to Crosbie's figure (eg. a true mesh requires that each node have a direct connection to every other node, which is not shown in applicant's drawings);

but is silent on the wireless mesh network comprising a plurality of relay nodes, each of the relay nodes being capable of relaying traffic from a child node associated with the relay node, and at least one of the relay nodes is configured in the first configuration to relay traffic from a child relay node to a parent relay node.

Wolfe teaches a mesh network whereby access points relay data from themselves to another node in order to route user traffic:

[0014] FIG. 1 illustrates a radio access network (RAN) generally referred to by the numeral 10. The network 10 comprises a base station controller (BSC) 12, a network manager 14, one or more radio base stations (RBSs) 15 of a first type, a plurality of RBSs 16 of a second type forming a mesh network 18, and one or more mesh attachment points (MAPs) 20. The RAN 10 permits users of mobile terminals 22 to communicate with other mobile terminal users, and with users of communication devices or services associated with a Public Switched Data Network (PSDN) 24, such as the Internet, PSTN, or some combination thereof, which is accessible to the RAN 10 through a mobile switching center (MSC) 26.

Novaes teaches a routed network which discloses the concept of child-parent relationships in said routed network:

[0108] FIG. 13 illustrates a decision process that each SAM router node may preferably perform in receiving a SAM subscription message. Particularly, at step 202, a subscription message S is received from a direct descendant node, or "child node" (i.e., a descendant node that is adjacent). (Other pertinent terminology: an "indirect descendant node" would be a descendant node that is not a child node; a "parent" node would be a direct, or adjacent, ancestor node; and an "indirect ancestor node" would be an ancestor node which is not a parent.) At 204, A is assigned as the address listed in the subscription, and B is assigned as the address of this node. At step 206, the address A of the subscription is looked up in a SAM routing table.

It would have been obvious to one skilled in the art at the time of the invention to modify Crosbie, such that the wireless mesh network comprising a plurality of relay nodes, each of the relay nodes being capable of relaying traffic from a child node associated with the relay node, and at least one of the relay nodes is configured in the first configuration to relay traffic from a child relay node to a parent relay node, to provide means for the mesh routing tables to be controlled in a parent/child relationship (eg. routing updates occurs via a hierarchy).

As per **claims 23, 46 and 59**, Crosbie teaches 34/36/49, further comprising repeating "b" thru "d" (Para #6 teaches a hand off "process" which will be performed until a handoff is successful, eg. steps b thru d will be repeated until a new channel/link is found to handoff to:

This feature, known as "hand-offs" is required for many functions such as load balancing, improving radio link performance, and moving the mobile device inside a building without losing the network connection.

As per **claims 24, 37 and 50**, Crosbie teaches claim 23/36/49, wherein the second node is selected to be a parent node of the first node (figure 3 shows the "second node" as being the master/parent to the mobile which has handed off).

As per **claims 26, 39 and 52**, Crosbie teaches Claim 23/36/49, **but is silent on** wherein the first node includes a plurality of radios.

The examiner takes official notice that multi-mode/dual-band mobile devices are known in the art and can connect to several networks (eg. cellular, Bluetooth, WLAN, etc.).

It would have been obvious to one skilled in the art at the time of the invention to modify Crosbie, such that the first node includes a plurality of radios, to provide means for the device to connect to different networks as it roams.

As per **claims 27, 40 and 53**, Crosbie teaches claim 23/36/49, wherein making a channel selection includes making a channel selection change to meet a performance requirement (Para #6 teaches performance:

This feature, known as "hand-offs" is required for many functions such as load balancing, improving radio link performance, and moving the mobile device inside a building without losing the network connection).

Also see Para #9 which teaches QoS and giving a user more bandwidth.

As per **claims 28-29, 41-42 and 54-55**, Crosbie teaches claim 23/36/49, wherein making a channel selection includes making a channel selection change to meet a latency requirement AND/OR wherein making a channel selection includes making a channel selection change to meet a throughput requirement (Para #6 teaches latency/throughput which reads on load-balancing, since it would reduce throughput problems by using multiple links/paths:

This feature, known as "hand-offs" is required for many functions such as load balancing, improving radio link performance, and moving the mobile device inside a building without losing the network connection).

Also see Para #9 which teaches QoS.

As per **claims 30, 43 and 56**, Crosbie teaches claim 23/36/49, wherein determining that the first node requires a channel selection change includes determining that the channel selection change is required due to a performance requirement change (Para #6 teaches handing off due to performance problems, eg. latency/throughput is occurring and the mobile desires better performance/throughput:

This feature, known as "hand-offs" is required for many functions such as load balancing, improving radio link performance, and moving the mobile device inside a building without losing the network connection). Also see Para #9 which teaches QoS.

The examiner notes that the claim does not specify whether it is the mobile or the network that perceives the "performance requirement change".

As per **claims 31, 44 and 57**, Crosbie teaches claim 23/36/49, wherein determining that the first node requires a channel selection change includes determining that the channel selection change is required due to congestion (Para #6 teaches latency/throughput which reads on congestion, since it would reduce throughput problems by using multiple links/paths:

This feature, known as "hand-offs" is required for many functions such as load balancing, improving radio link performance, and moving the mobile device inside a building without losing the network connection).

Also see Para #9 which teaches QoS.

As per **claim 32**, Crosbie teaches claim 23, wherein the channel selection change is made to avoid channel interference (Para #6 teaches improving radio link performance which reads on avoiding channel interference, since it would reduce interference by moving to a new link:

This feature, known as "hand-offs" is required for many functions such as load balancing, improving radio link performance, and moving the mobile device inside a building without losing the network connection).

As per **claims 33, 45 and 58**, Crosbie teaches claim 23/36/49, wherein the channel selection change is made based on a change to network topology (Para #6 teaches moving inside a building which would prompt a change to the network topology, eg. connection, since a handoff would occur to a new master located within the building:

This feature, known as "hand-offs" is required for many functions such as load balancing, improving radio link performance, and moving the mobile device inside a building without losing the network connection).

The claim does not specify from what perspective the network topology is being driven by/from (eg. network or user?). As a second point, a poor communication link can be perceived as a dropped link, which would also be viewed as a topology change and hence spawn a handoff).

Also see Para #9 which teaches QoS and giving the user it's own channel which is viewed as a network topology change.

As per **claims 35, 47 and 60**, Crosbie teaches claim 23/36/49, further comprising receiving a monitoring signal that includes information about available nodes from which the second node is selected (Para #6 teaches handing off from one master to another and the examiner takes Official Notice that it is well known in the art of handoffs for the mobile to be able to receive the second BTS's/master's signal/beacon in order for it to determine if it is a handoff candidate, which reads on "receiving a monitoring signal that includes information about available nodes from which the second node is selected").

Claims 25, 38 and 51 rejected under 35 U.S.C. 103(a) as being unpatentable over Crosbie/Wolf/Novaes and further in view of Joon-Boi et al. US 2002/0055978.

As per **claims 25, 38 and 51**, Crosbie teaches claim 23/36, **but is silent on** wherein the second node is selected to be a child node of the first node.

Joon-Boi teaches a parent/master leaving/changing status and a new parent/master is selected from the proximate children/slaves. Hence a first node would

either stay as a child/slave (eg. the second node becomes a parent/master) or said first node becomes the new parent/master and said second node becomes the child/slave:

"...A method for managing a network in which Bluetooth equipped devices are linked together when the network master cannot serve as a master.....When power of the network master is exhausted, or when the network master leaves the network operating region, a new master is selected from the remaining slaves according to the backup master rank information, thereby reconfiguring a network around the new network master. The method enables proper designation of a new master when a preexisting network master leaves the network operating region, thereby increasing a probability of holding connection throughout the network.." (Abstract)

It would have been obvious to one skilled in the art at the time of the invention to modify Crosbie, such that the second node is selected to be a child node of the first node, to provide means for a flexible network reconfiguration to occur whereby the most optimal node is chosen to become the new parent/master (thus leaving the other devices to stay as children/slaves and then connect to the new master).

Conclusion

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).

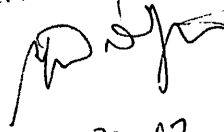
A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened 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 Stephen M. D'Agosta whose telephone number is 571-272-7862. The examiner can normally be reached on M-F, 8am to 5pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Bill Trost can be reached on 571-272-7872. 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.

STEVE M. D'AGOSTA
PRIMARY EXAMINER



3-30-07

Notice of References Cited	Application/Control No. 10/434,948	Applicant(s)/Patent Under Reexamination DA COSTA ET AL.	
	Examiner Stephen M. D'Agosta	Art Unit 2617	Page 1 of 1

U.S. PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	Classification
*	A	US-2003/0012193	01-2003	Novaes, Marcos N.	370/390
*	B	US-2002/0159409	10-2002	Wolfe et al.	370/329
	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
	N					
	O					
	P					
	Q					
	R					
	S					
	T					

NON-PATENT DOCUMENTS

*		Include as applicable: Author, Title Date, Publisher, Edition or Volume, Pertinent Pages)
	U	
	V	
	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.

U.S. Patent and Trademark Office
PTO-892 (Rev. 01-2001)

Notice of References Cited

Part of Paper No. 20070330



PTO/SB/08 (08-03)

Substitute for form 1449/PTO		Complete if Known			
Information Disclosure Statement By Applicant (Use as many sheets as necessary)		Application No.:	10/434,948		
		Filing Date	May 8, 2003		
		First Named Inventor	Francis da Costa		
		Art Unit	2617		
		Examiner Name	Stephen M. D'Agosta		
Sheet	1	of	1	Atty Docket No.	MESHP001

U.S. Patent Documents					
Examiner Initials	Cite No.	Document Number Number-Kind Code (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
/SD/	A.	7,164,667 B2	01-16-2007	RAYMENT et al.	
	B.				
	C.				
	D.				
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	G.				
	H.				
	I.				
	J.				
	K.				
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FOREIGN PATENT DOCUMENTS					
Examiner Initials	Cite No.	Foreign Patent Document	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
		Country Code-Number-Kind Code (if known)			
	Q.				
	R.				
	S.				

NON PATENT LITERATURE DOCUMENTS				T ²
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, page(s), volume-issue number(s), publisher, city and/or country where published		
	T.			
	U.			
	V.			
	W.			
	X.			
	Y.			
	Z.			

Examiner	/Stephen D Agosta/	Date Considered	03/30/2007
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Examiner: Initial citation considered. Draw line through citation if not in conformance and not considered.
Include copy of this form with next communication to applicant.

T² = Applicant is to place a check mark here if English language Translation is attached

Index of Claims 	Application/Control No. 10/434,948 Examiner Stephen M. D'Agosta	Applicant(s)/Patent under Reexamination DA COSTA ET AL. Art Unit 2617
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✓ Rejected = Allowed	- (Through numeral) Cancelled ÷ Restricted	N Non-Elected I Interference	A Appeal O Objected
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Claim	Final	Original	Date
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Claim	Final	Original	Date
51		✓	
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Claim	Final	Original	Date
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Search Notes		Application/Control No.	Applicant(s)/Patent under Reexamination	
		10/434,948	DA COSTA ET AL.	
		Examiner	Art Unit	
		Stephen M. D'Agosta	2617	

SEARCHED			
Class	Subclass	Date	Examiner

INTERFERENCE SEARCHED			
Class	Subclass	Date	Examiner

SEARCH NOTES (INCLUDING SEARCH STRATEGY)		
	DATE	EXMR
INVENTOR SEARCH	11-7-04	mo
I/Os ART		
EAST DO's		
TEXT SEARCH		
J/PATENT SEARCH	3-30-07	mo

10-434-948

PATENT APPLICATION FEE DETERMINATION RECORD Effective January 1, 2003				Application or Docket Number 10439948	
CLAIMS AS FILED - PART I					
		(Column 1)	(Column 2)		
TOTAL CLAIMS		22			
FOR		NUMBER FILED	NUMBER EXTRA		
TOTAL CHARGEABLE CLAIMS		22 minus 20 =	* 2		
INDEPENDENT CLAIMS		3 minus 3 =	*		
MULTIPLE DEPENDENT CLAIM PRESENT		☐			
<p>* If the difference in column 1 is less than zero, enter "0" in column 2</p>					
CLAIMS AS AMENDED - PART II					
		(Column 1)	(Column 2)	(Column 3)	
AMENDMENT A		CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA
	Total	* 37	Minus	98	=
	Independent	*	Minus	***	=
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM ☐				
	1,6 22				
		(Column 1)	(Column 2)	(Column 3)	
AMENDMENT B		CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA
	Total	*	Minus	**	=
	Independent	*	Minus	***	=
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM ☐				
		(Column 1)	(Column 2)	(Column 3)	
AMENDMENT C		CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA
	Total	*	Minus	**	=
	Independent	*	Minus	***	=
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM ☐				
<p>* 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.</p>					

SMALL ENTITY TYPE ☐ **OR** **OTHER THAN SMALL ENTITY**

RATE	FEE		RATE	FEE
BASIC FEE	375.00	OR	BASIC FEE	750.00
X\$ 9=	18	OR	X\$18=	
X42=		OR	X84=	
+140=		OR	+280=	
TOTAL	393	OR	TOTAL	

SMALL ENTITY ☐ **OR** **OTHER THAN SMALL ENTITY**

RATE	ADDITIONAL FEE		RATE	ADDITIONAL FEE
X\$ 9=		OR	X\$18=	
X42=		OR	X84=	
+140=		OR	+280=	
TOTAL ADDIT. FEE		OR	TOTAL ADDIT. FEE	



THE UNITED STATES PATENT AND TRADEMARK OFFICE

Inventor:	DA COSTA et al.	Examiner:	Stephen M. D'Agosta
Application No.:	10/434,948	Art Unit:	2617
Filed:	May 8, 2003	Docket No.:	MESHP001
Title:	HIGH PERFORMANCE WIRELESS NETWORKS USING DISTRIBUTED CONTROL		

CERTIFICATE OF MAILING

I hereby certify that this correspondence is being deposited with the United States Postal Service as First Class Mail in a prepaid envelope addressed to: Mail Stop Amendment, Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450 on:

3/13, 2007.

Elaine Nguyen
Elaine Nguyen

AMENDMENT B

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

Dear Sir:

This is in response to the Office Action mailed November 20, 2006. The following amendments and remarks are respectfully submitted.

Application Serial No. 10/434,948
Attorney Docket No. MESHP001

IN THE CLAIMS

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

Claims 1-22 (Canceled)

23. (Currently Amended) A method of controlling a wireless mesh network, comprising:
- a) configuring the wireless mesh network with a first configuration, the wireless mesh network comprising a plurality of relay nodes, each of the relay nodes being capable of relaying traffic from a child node associated with the relay node, and at least one of the relay nodes is configured in the first configuration to relay traffic from a child relay node to a parent relay node;
 - b) determining that a first ~~node~~ one of the plurality of relay nodes in the wireless mesh network requires a channel selection change;
 - c) dynamically selecting a second ~~node~~ one of the plurality of relay nodes to form a parent-child relationship with the first relay node; and
 - d) making a channel selection change.
24. (Previously Presented) A method as recited in Claim 23, wherein the second node is selected to be a parent node of the first node.
25. (Previously Presented) A method as recited in Claim 23, wherein the second node is selected to be a child node of the first node.
26. (Previously Presented) A method as recited in Claim 23, wherein the first node includes a plurality of radios.
27. (Previously Presented) A method as recited in Claim 23, wherein making a channel selection includes making a channel selection change to meet a performance requirement.
28. (Previously Presented) A method as recited in Claim 23, wherein making a channel selection includes making a channel selection change to meet a latency requirement.

29. (Previously Presented) A method as recited in Claim 23, wherein making a channel selection includes making a channel selection change to meet a throughput requirement.
30. (Previously Presented) A method as recited in Claim 23, wherein determining that the first node requires a channel selection change includes determining that the channel selection change is required due to a performance requirement change.
31. (Previously Presented) A method as recited in Claim 23, wherein determining that the first node requires a channel selection change includes determining that the channel selection change is required due to congestion.
32. (Previously Presented) A method as recited in Claim 23, wherein the channel selection change is made to avoid channel interference.
33. (Previously Presented) A method as recited in Claim 23, wherein the channel selection change is made based on a change to network topology.
34. (Previously Presented) A method as recited in Claim 23, further comprising repeating b)-d).
35. (Previously Presented) A method as recited in Claim 23, further comprising receiving a monitoring signal that includes information about available nodes from which the second node is selected.
36. (Previously Presented) A system in a wireless mesh network, comprising:
a processor configured to:
 configure a first relay node in a first configuration, the first relay node being one of the plurality of relay nodes included in the wireless mesh network, the first relay node being configured in the first configuration to relay traffic from a child relay node to a parent relay node;
 determine that the first relay node in the wireless mesh network requires a channel selection change;
 dynamically select a second relay node from the plurality of relay nodes to form a parent-child relationship with the first relay node; and
 make a channel selection change; and

a memory coupled to the processor, configured to provide the processor with instructions.

- 37. (Previously Presented) A system as recited in Claim 36, wherein the second node is selected to be a parent node of the first node.
- 38. (Previously Presented) A system as recited in Claim 36, wherein the second node is selected to be a child node of the first node.
- 39. (Previously Presented) A system as recited in Claim 36, further comprising a plurality of radios.
- 40. (Previously Presented) A system as recited in Claim 36, wherein the processor is further configured to make a channel selection change to meet a performance requirement.
- 41. (Previously Presented) A system as recited in Claim 36, wherein the processor is further configured to make a channel selection change to meet a latency requirement.
- 42. (Previously Presented) A system as recited in Claim 36, wherein the processor is further configured to make a channel selection change to meet a throughput requirement.
- 43. (Previously Presented) A system as recited in Claim 36, wherein the processor is configured to determine that the channel selection change is required due to a performance requirement change.
- 44. (Previously Presented) A system as recited in Claim 36, wherein the processor is configured to determine that the channel selection change is required due to congestion.
- 45. (Previously Presented) A system as recited in Claim 36, wherein the processor is configured to determine the channel selection change based on network topology.
- 46. (Previously Presented) A system as recited in Claim 36, wherein the processor is further configured to repeat b)-d).
- 47. (Previously Presented) A system as recited in Claim 36, wherein the processor is further configured to receive a monitoring signal that includes information about available nodes from which the second node is selected.

48. (Cancelled)

49. (Previously Presented) A computer program product for controlling a wireless mesh network, the computer program product being embodied in a computer readable medium and comprising computer instructions for:

a) configuring the wireless mesh network with a first configuration, the wireless mesh network comprising a plurality of relay nodes, each of the relay nodes being capable of relaying traffic from a child node associated with the relay node, and at least one of the relay nodes is configured in the first configuration to relay traffic from a child relay node to a parent relay node;

b) determining that a first ~~node~~ one of the plurality of relay nodes in the wireless mesh network requires a channel selection change;

c) dynamically selecting a second ~~node~~ one of the plurality of relay nodes to form a parent-child relationship with the first relay node; and

d) making a channel selection change.

50. (Previously Presented) A computer program product as recited in Claim 49, wherein the second node is selected to be a parent node of the first node.

51. (Previously Presented) A computer program product as recited in Claim 49, wherein the second node is selected to be a child node of the first node.

52. (Previously Presented) A computer program product as recited in Claim 49, wherein the first node includes a plurality of radios.

53. (Previously Presented) A computer program product as recited in Claim 49, wherein making a channel selection includes making a channel selection change to meet a performance requirement.

54. (Previously Presented) A computer program product as recited in Claim 49, wherein making a channel selection includes making a channel selection change to meet a latency requirement.

55. (Previously Presented) A computer program product as recited in Claim 49, wherein making a channel selection includes making a channel selection change to meet a throughput requirement.
56. (Previously Presented) A computer program product as recited in Claim 49, wherein determining that the first node requires a channel selection change includes determining that the channel selection change is required due to a performance requirement change.
57. (Previously Presented) A computer program product as recited in Claim 49, wherein determining that the first node requires a channel selection change includes determining that the channel selection change is required due to congestion.
58. (Previously Presented) A computer program product as recited in Claim 49, wherein the channel selection change is made based on network topology.
59. (Previously Presented) A computer program product as recited in Claim 49, the computer program product further comprising computer instructions for repeating b)-d).
60. (Previously Presented) A computer program product as recited in Claim 49, the computer program product further comprising computer instructions for receiving a monitoring signal that includes information about available nodes from which the second node is selected.

REMARKS

Claims 23, 36, and 49 have been amended to clarify the subject matter regarded as the invention. Claim 48 has been cancelled. Claims 23-47, and 49-60 are pending.

The Examiner has rejected claims 23-24, 27-37, 40-50, and 53-60 under 35 U.S.C. 102(e) as being anticipated by Crosbie (US 2002/0085719).

The rejection is respectfully traversed. With respect to Claim 23, Crosbie teaches teaches “hand-offs” for mobile devices to change its point of connection to the LAN (Crosbie, [0006]). Specifically, Crosbie teaches the transfer of a mobile device from one Access Point (AP) to another (Crosbie, [0009]). The mobile devices of Crosbie, such as mobile telephones, laptop computers, headsets, and PDA’s, are not relay nodes capable of relaying traffic from its child node. Further, Crosbie’s networks such as ones shown in FIGS. 1 and 3 are not wireless networks “comprising a plurality of relay nodes, each of the relay nodes being capable of relaying traffic from a child node associated with the relay node, and at least one of the relay nodes is configured in the first configuration to relay traffic from a child relay node to a parent relay node.” Nor does Crosbie teach “determining that a first one of the plurality of relay nodes in the wireless mesh network requires a channel selection change”, or “dynamically selecting a second one of the plurality of relay nodes to form a parent-child relationship with the first relay node.” As such, Claim 23 is believed to be allowable.

Claims 24-35 depend from Claim 23 and are believed to be allowable for the same reasons described above.

Similarly, with respect to Claims 36 and 49, Crosbie does not teach a system in a wireless mesh network comprising a processor configured to “configure a first relay node in a first configuration, the first relay node being one of the plurality of relay nodes included in the wireless mesh network, the first relay node being configured in the first configuration to relay traffic from a child relay node to a parent relay node,” or a computer program product comprising computer instructions for “configuring the wireless mesh network with a first configuration, the wireless mesh network comprising a plurality of relay nodes, each of the relay nodes being capable of relaying traffic from a child node associated with the relay node, and at

least one of the relay nodes is configured in the first configuration to relay traffic from a child relay node to a parent relay node.”

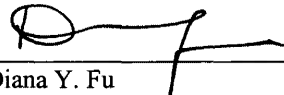
Claims 37-47 depend from Claim 36, and Claims 50-60 depend from Claim 49. They are believed to be allowable for the same reasons described above.

Consideration of the application and allowance of all claims are respectfully requested. If at any time the Examiner believes that an interview would be helpful, please contact the undersigned.

Respectfully submitted,

Dated: _____

3/9/07



Diana Y. Fu
Registration No. 52,924
V 408-973-2593
F 408-973-2595

VAN PELT, YI & JAMES LLP
10050 N. Foothill Blvd., Suite 200
Cupertino, CA 95014



2617

PATENT

THE UNITED STATES PATENT AND TRADEMARK OFFICE

Inventor:	DA COSTA et al.	Examiner:	Stephen M. D'Agosta
Application No.:	10/434,948	Art Unit:	2617
Filed:	May 8, 2003	Docket No.:	MESHP001
Title:	HIGH PERFORMANCE WIRELESS NETWORKS USING DISTRIBUTED CONTROL		

CERTIFICATE OF MAILING

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3/13, 2007.

Elaine Nguyen

TRANSMITTAL OF AMENDMENT B

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

03/19/2007 CCHAU1 00000007 10434948
01 FC:1251 120.00 DP

Sir:

Transmitted herewith is Amendment B in response to Office Action mailed November 20, 2007 in the above-identified application.

The fee has been calculated as shown below.

CLAIMS	After Amd.	HP*	Extra	Small Entity			Large Entity	
				Rate	Fee		Rate	Fee
Total	37	38	-0-	x \$25 = \$		OR	x \$50 = \$	
Independent	3	3	-0-	x \$100 = \$		OR	x \$200 = \$	
Multiple Dependent Claims				x \$180 = \$		OR	x \$360 = \$	
*HP = Highest previously paid				TOTAL FEE \$		OR	TOTAL FEE \$	-0-

☒ Applicant(s) hereby petition for following extension of time in which to respond to the outstanding Office Action.

	SMALL ENTITY			LARGE ENTITY	
	Rate	Add'l Fee		Rate	Add'l Fee
☒ Extension for Response within FIRST month	x \$60 = \$		OR	x \$120 = \$	120.00
☐ Extension for Response within SECOND month	x \$225 = \$		OR	x \$450 = \$	
☐ Extension for Response within THIRD month	x \$510 = \$		OR	x \$1020 = \$	
☐ Extension for Response within FOURTH month	x \$795 = \$		OR	x \$1590 = \$	
☐ Extension for Response within FIFTH month	x \$1080 = \$		OR	x \$2160 = \$	

Attorney Docket No.: MESHP001
Application No.: 10/434,948

1 of 2

☒ Applicant(s) believe that no (additional) Extension of Time is required; however, if it is determined that such an extension is required, Applicant(s) hereby petition that such an extension be granted and authorize the Commissioner to charge the required fees for an Extension of Time under 37 CFR 1.136 to Deposit Account No. 50-0685. (MESH001).

☒ Enclosed is our Check No. 2864 in the amount of \$300.00 to cover the additional claim fee and/or extension of time fees and information disclosure statement fee.

☐ Enclosed is Applicant Initiated Interview Request Form, PTOL-413A.

☐ Enclosed are _____ sheets replacement drawings.

☐ Please charge Deposit Account No. 50-0685 (MESH001) in the amount of \$_____ to cover the additional claim fee and/or extension of time fees.

☒ If the required fees are missing or any additional fees are required during the pendency of the subject application, please charge such fees or credit any overpayment to Deposit Account No. 50-0685 (MESH001).

☒ OTHER: Information Disclosure Statement with Form PTO/SB/08

Respectfully submitted,
VAN PELT, YI & JAMES LLP


Diana Y. Fu
Registration No. 52,924

10050 N. Foothill Blvd., Suite 200
Cupertino, CA 95014
Telephone: 408-973-2585



PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Inventor:	DA COSTA et al.	Examiner:	Stephen M. D'Agosta
Application No.:	10/434,948	Art Unit:	2617
Filed:	May 8, 2003	Docket No.:	MESHP001
Title:	HIGH PERFORMANCE WIRELESS NETWORKS USING DISTRIBUTED CONTROL		

CERTIFICATE OF MAILING

I hereby certify that this correspondence is being deposited with the United States Postal Service as First Class Mail in a prepaid envelope addressed to: Mail Stop Amendment, Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450 on:

3/13, 2007.

Elaine Nguyen
Elaine Nguyen

INFORMATION DISCLOSURE STATEMENT
BEFORE MAILING DATE OF EITHER A FINAL ACTION OR
NOTICE OF ALLOWANCE (37 CFR 1.97(c))

Mail Stop Amendment
Commissioner for Patents
PO Box 1450
Alexandria, VA 22313

Dear Sir:

The references listed in the attached PTO SB/08, may be material to examination of the above-identified patent application. Applicants disclose these references in compliance with their duty of disclosure pursuant to 37 CFR §§1.56 and 1.97. The Examiner is requested to make these references of official record in this application. Copies of the cited references are provided to the extent required by 37 CFR §1.98 and any applicable waivers.

This Information Disclosure Statement is not to be construed as a representation that a search has been made, that additional information material to the examination of this application does not exist, or that these references indeed constitute prior art.

03/19/2007 CCHAUI 00000007 10434948

02 FC:1806

180.00 OP

Atty Docket No. MESHP001
Application No.: 10/434,948

1 of 2

This Information Disclosure Statement is being filed after the mailing date of the first Office Action on the merits, or after three months of the filing date of this national application or the date of entry of the national stage as set forth in §1.491 in an international application, whichever event occurred last, but it is believed, before the mailing date of either (1) a final action under §1.113 or (2) a notice of allowance under §1.311, whichever occurs first.

Accompanying this Information Disclosure Statement is the fee set forth in 37 CFR 1.17(p) for submission of an information disclosure statement under §1.97(c). (\$180.00). If it is determined that any additional fees are due, the Commissioner is hereby authorized to charge such fees to Deposit Account 50-0685 (Order No. MESHP001).

Respectfully submitted,
VAN PELT, YI & JAMES LLP

A handwritten signature in black ink, appearing to be 'Diana Y. Fu', with a stylized flourish at the end.

Diana Y. Fu
Registration No. 52,924

10050 N. Foothill Blvd. Ste 200
Cupertino, CA 95014
Telephone: (408) 973-8525



PTO/SB/08 (08-03)

Substitute for form 1449/PTO		<i>Complete if Known</i>			
Information Disclosure Statement By Applicant (Use as many sheets as necessary)		Application No.:	10/434,948		
		Filing Date	May 8, 2003		
		First Named Inventor	Francis da Costa		
		Art Unit	2617		
		Examiner Name	Stephen M. D'Agosta		
Sheet	1	of	1	Atty Docket No.	MESHP001

U.S. Patent Documents					
Examiner Initials	Cite No.	Document Number Number-Kind Code (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
	A.	7,164,667 B2	01-16-2007	RAYMENT et al.	
	B.				
	C.				
	D.				
	E.				
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FOREIGN PATENT DOCUMENTS					
Examiner Initials	Cite No.	Foreign Patent Document Country Code-Number-Kind Code (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
	Q.				
	R.				
	S.				

NON PATENT LITERATURE DOCUMENTS			
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, page(s), volume-issue number(s), publisher, city and/or country where published	T ²
	T.		
	U.		
	V.		
	W.		
	X.		
	Y.		
	Z.		

Examiner	Date Considered
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Examiner: Initial citation considered. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

T² = Applicant is to place a check mark here if English language Translation is attached

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.

**REQUEST FOR WITHDRAWAL
AS ATTORNEY OR AGENT
AND CHANGE OF
CORRESPONDENCE ADDRESS**

Application Number	10/434,948
Filing Date	05-08-2003
First Named Inventor	Francis da Costa
Art Unit	2617
Examiner Name	D AGOSTA, STEPHEN M
Attorney Docket Number	DACOSTAF,PT1

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

Please withdraw me as attorney or agent for the above identified patent application, and

- ☒ all the attorneys/agents of record.
- ☐ the attorneys/agents (with registration numbers) listed on the attached paper(s), or
- ☐ the attorneys/agents associated with Customer Number

NOTE: This box can only be checked when the power of attorney of record in the application is to all the practitioners associated with a customer number.

The reasons for this request are: The practitioners have been discharged by the client.

CORRESPONDENCE ADDRESS

1. ☐ The correspondence address is NOT affected by this withdrawal.
2. ☒ Change the correspondence address and direct all future correspondence to:

☐ The address associated with Customer Number:

OR

☒ Firm or Individual Name	Lee Van Pelt, Esq.		
Address	Van Pelt, Yi & James LLP 10050 N. Foothill Blvd., Suite 200		
City	Cupertino	State	CA
Country	USA		
Telephone	408-973-2585	Email	
Signature	/Juneko Jackson/		
Name	Juneko Jackson	Registration No.	48,670
Date	03/08/2007	Telephone No.	408-286-8933

NOTE: Withdrawal is effective when approved rather than when received. Unless there are at least 30 days between approval of withdrawal and the expiration date of a time period for response or possible extension period, the request to withdraw is normally disapproved.

This collection of information is required by 37 CFR 1.36. 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.

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

Electronic Acknowledgement Receipt	
EFS ID:	1595852
Application Number:	10434948
International Application Number:	
Confirmation Number:	7871
Title of Invention:	High performance wireless networks using distributed control
First Named Inventor/Applicant Name:	Francis da Costa
Customer Number:	24943
Filer:	Otto O. Lee/Kathleen Mok
Filer Authorized By:	Otto O. Lee
Attorney Docket Number:	DACOSTAF.PT1
Receipt Date:	15-MAR-2007
Filing Date:	08-MAY-2003
Time Stamp:	15:56:30
Application Type:	Utility

Payment information:

Submitted with Payment	no
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File Listing:

Document Number	Document Description	File Name	File Size(Bytes)	Multi Part /.zip	Pages (if appl.)
1	CHII - Request to withdraw as attorney - IA	withdrawal_PT1.pdf	326005	no	1

Warnings:

Information:	
Total Files Size (in bytes):	326005
<p>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.</p> <p><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.</p> <p><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.</p> <p><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.</p>	



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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/434,948	05/08/2003	Francis da Costa	DACOSTAF.PT1	7871
24943	7590	11/20/2006	EXAMINER	
INTELLECTUAL PROPERTY LAW GROUP LLP 12 SOUTH FIRST STREET SUITE 1205 SAN JOSE, CA 95113			D'AGOSTA, STEPHEN M	
			ART UNIT	PAPER NUMBER
			2617	

DATE MAILED: 11/20/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No. 10/434,948		Applicant(s) DA COSTA ET AL.	
	Examiner Stephen M. D'Agosta		Art Unit 2617	
	-- 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 25 August 2005.

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) 23-60 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) 23-60 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 08 May 2003 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: _____.
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DETAILED ACTION

Preliminary Amendment

The preliminary amendment canceled claims 1-22 and added claims 23-60.

Claim Objections

Claim 48 objected to under 37 CFR 1.75(c), as being of improper dependent form for failing to further limit the subject matter of a previous claim. Applicant is required to cancel the claim(s), or amend the claim(s) to place the claim(s) in proper dependent form, or rewrite the claim(s) in independent form.

- Claim 48 is an exact copy of claim 47, hence one should be canceled.

Claim Rejections - 35 USC § 102

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.

Claims 23-24, 27-37, 40-50 and 53-60 rejected under 35 U.S.C. 102(e) as being anticipated by Crosbie US 2002/0085719.

As per **claims 23, 36 and 49**, Crosbie teaches a method of controlling a wireless “mesh” network, comprising:

a) configuring the wireless mesh network with a first configuration (figure 3, top of page shows mobile device/slave #26-2 connected to Initial Master #24-4);

b) determining that a first node in the wireless mesh network requires a channel selection change (Para #6 teaches handing-off due to various reasons:

This feature, known as "hand-offs" is required for many functions such as load balancing, improving radio link performance, and moving the mobile device inside a building without losing the network connection.

c) dynamically selecting a second node to form a parent-child relationship with the first node **AND** d) making a channel selection change (figure 3 shows device/slave #26-2 moving from the Initial Master to the Target Master #24-5 which reads on selecting a second "node" and forming a parent-child/master-slave relationship on a different channel. Also see figure 6).

The examiner notes that all claims presented are interpreted in the broadest reasonable manner, hence the claims do not limit:

i) how the terms "first and second node" must be interpreted, eg. what network(s) they are associated with.

ii) how the new channel connection is made (eg. is the second node part of the first wireless mesh and/or from a different mesh).

iii) Applicant's figure 1 shows each node with only one connection to a master which is similar to Crosbie's figure (eg. a true mesh requires that each node have a direct connection to every other node, which is not shown in applicant's drawings).

As per **claims 24, 37 and 50**, Crosbie teaches claim 23/36/49, wherein the second node is selected to be a parent node of the first node (figure 3 shows the "second node" as being the master/parent to the mobile which has handed off).

As per **claims 27, 40 and 53**, Crosbie teaches claim 23/36/49, wherein making a channel selection includes making a channel selection change to meet a performance requirement (Para #6 teaches performance:

This feature, known as "hand-offs" is required for many functions such as load balancing, improving radio link performance, and moving the mobile device inside a building without losing the network connection).

Also see Para #9 which teaches QoS and giving a user more bandwidth.

As per **claims 28-29, 41-42 and 54-55**, Crosbie teaches claim 23/36/49, wherein making a channel selection includes making a channel selection change to meet a latency requirement AND/OR wherein making a channel selection includes making a channel selection change to meet a throughput requirement (Para #6 teaches latency/throughput which reads on load-balancing, since it would reduce throughput problems by using multiple links/paths:

This feature, known as "hand-offs" is required for many functions such as load balancing, improving radio link performance, and moving the mobile device inside a building without losing the network connection).

Also see Para #9 which teaches QoS.

As per **claims 30, 43 and 56**, Crosbie teaches claim 23/36/49, wherein determining that the first node requires a channel selection change includes determining that the channel selection change is required due to a performance requirement change (Para #6 teaches handing off due to performance problems, eg. latency/throughput is occurring and the mobile desires better performance/throughput:

This feature, known as "hand-offs" is required for many functions such as load balancing, improving radio link performance, and moving the mobile device inside a building

without losing the network connection). Also see Para #9 which teaches QoS.

The examiner notes that the claim does not specify whether it is the mobile or the network that perceives the "performance requirement change".

As per **claims 31, 44 and 57**, Crosbie teaches claim 23/36/49, wherein determining that the first node requires a channel selection change includes determining that the channel selection change is required due to congestion (Para #6 teaches latency/throughput which reads on congestion, since it would reduce throughput problems by using multiple links/paths:

This feature, known as "hand-offs" is required for many functions such as load balancing, improving radio link performance, and moving the mobile device inside a building without losing the network connection).

Also see Para #9 which teaches QoS.

As per **claim 32**, Crosbie teaches claim 23, wherein the channel selection change is made to avoid channel interference (Para #6 teaches improving radio link performance which reads on avoiding channel interference, since it would reduce interference by moving to a new link:

This feature, known as "hand-offs" is required for many functions such as load balancing, improving radio link performance, and moving the mobile device inside a building without losing the network connection).

As per **claims 33, 45 and 58**, Crosbie teaches claim 23/36/49, wherein the channel selection change is made based on a change to network topology (Para #6 teaches moving inside a building which would prompt a change to the network topology, eg. connection, since a handoff would occur to a new master located within the building:

This feature, known as "hand-offs" is required for many functions such as load balancing, improving radio link performance, and moving the mobile device inside a building without losing the network connection).

The claim does not specify from what perspective the network topology is being driven by/from (eg. network or user?). As a second point, a poor communication link can be perceived as a dropped link, which would also be viewed as a topology change and hence spawn a handoff).

Also see Para #9 which teaches QoS and giving the user it's own channel which is viewed as a network topology change.

As per **claims 23, 46 and 59**, Crosbie teaches 34/36/49, further comprising repeating "b" thru "d" (Para #6 teaches a hand off "process" which will be performed until a handoff is successful, eg. steps b thru d will be repeated until a new channel/link is found to handoff to:

This feature, known as "hand-offs" is required for many functions such as load balancing, improving radio link performance, and moving the mobile device inside a building without losing the network connection.

As per **claims 35, 47 and 60**, Crosbie teaches claim 23/36/49, further comprising receiving a monitoring signal that includes information about available nodes from which the second node is selected (Para #6 teaches handing off from one master to another and the examiner takes Official Notice that it is well known in the art of handoffs for the mobile to be able to receive the second BTS's/master's signal/beacon in order for it to determine if it is a handoff candidate, which reads on "receiving a monitoring signal that includes information about available nodes from which the second node is selected").

Claim Rejections - 35 USC § 103

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 negated by the manner in which the invention was made.

Claims 25, 38 and 51 rejected under 35 U.S.C. 103(a) as being unpatentable over Crosbie and further in view of Joon-Boi et al. US 2002/0055978.

As per **claims 25, 38 and 51**, Crosbie teaches claim 23/36, **but is silent on** wherein the second node is selected to be a child node of the first node.

Joon-Boi teaches a parent/master leaving/changing status and a new parent/master is selected from the proximate children/slaves. Hence a first node would either stay as a child/slave (eg. the second node becomes a parent/master) or said first node becomes the new parent/master and said second node becomes the child/slave:

"..A method for managing a network in which Bluetooth equipped devices are linked together when the network master cannot serve as a master.....When power of the network master is exhausted, or when the network master leaves the network operating region, a new master is selected from the remaining slaves according to the backup master rank information, thereby reconfiguring a network around the new network master. The method enables proper designation of a new master when a preexisting network master leaves the network operating region, thereby increasing a probability of holding connection throughout the network.." (Abstract)

It would have been obvious to one skilled in the art at the time of the invention to modify Crosbie, such that the second node is selected to be a child node of the first node, to provide means for a flexible network reconfiguration to occur whereby the most optimal node is chosen to become the new parent/master (thus leaving the other devices to stay as children/slaves and then connect to the new master).

Claims 26, 39 and 52 rejected under 35 U.S.C. 103(a) as being unpatentable over Crosbie.

As per **claims 26, 39 and 52**, Crosbie teaches Claim 23/36/49, **but is silent on** wherein the first node includes a plurality of radios.

The examiner takes official notice that multi-mode/dual-band mobile devices are known in the art and can connect to several networks (eg. cellular, Bluetooth, WLAN, etc.).

It would have been obvious to one skilled in the art at the time of the invention to modify Crosbie, such that the first node includes a plurality of radios, to provide means for the device to connect to different networks as it roams.

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

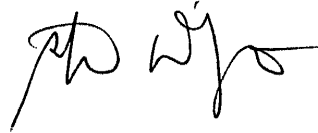
1. Boger US 2002/0159401
2. Aggarwal et al. US 6,876,643
3. Treister et al. US 2002/0097681
4. Kaku US 2001/0021639
5. Dabak et al. US 2005/0181725

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Stephen M. D'Agosta whose telephone number is 571-272-7862. The examiner can normally be reached on M-F, 8am to 5pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Bill Trost can be reached on 571-272-7872. 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.

STEVE M. D'AGOSTA
PRIMARY EXAMINER

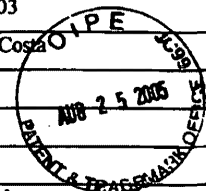
A handwritten signature in black ink, appearing to read 'Steve M. D'Agosta', written over the printed name.

11-7-04

IDS 08/25/2005

Sheet 1 of 3

U.S. Department of Commerce, Patent and Trademark Office INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Use several sheets if necessary)	Application No.:	10/434,948
	Filing Date:	May 8, 2003
	First Named Inventor:	Francis daCosta
	Group Art Unit:	2661
	Examiner Name:	na
	Confirmation No.:	na
	Attorney Docket No.:	MESHP001



U.S. Patent Documents							
*Examiner Initials		Document Number	Date	Name	Class	Subclass	Filing Date if Appropriate
SD	1.	20040137924	7-15-2004	Herscovich, Bernard ; et al.	455	500	1-10-2003
	2.	20040001442	1-1-2004	Rayment, Stephen G. ; et al.	370	238	6-28-2002
	3.	6,704,301	3-9-2004	Chari, et al.	370	351	12-29-2000
	4.	6,904,275	June 7, 2005	Stanforth; Peter	455	343.1	May 18, 2001
	5.	6,892,068	May 10, 2005	Karabinis, et al.	455	429	Aug 1, 2001
	6.	20030114204	June 19, 2003	Allen, Vernon Anthony ; et al.	455	574	Dec 13, 2001
	7.	20030012176	Jan 16, 2003	Kondylis, George ; et al.	370	348	Nov 9, 2001
	8.	20050122925	June 9, 2005	Chitre; Dattakumar M et al.	370	310	Nov 19, 1999
	9.	6,865,170	June 19, 1998	Zendle	370	338	Mar 8, 2005
	10.	6,859,652	Feb 22, 2005	Karabinis, et al.	455	427	Dec 4, 2001
	11.	5,166,929	Nov 24, 1992	Lo	370	448	June 18, 1990
	12.	6,831,921	Dec 14, 2004	Higgins	370	401	Mar 27, 2002
✓	13.	6,026,303	Feb 15, 2000	Minamisawa	455	446	Nov 6, 1997
Foreign Patent Documents							
							Translation
		Document	Date	Country	Class	Subclass	Yes No
Other Art (Including Author, Title, Date, Pertinent Pages, Etc.)							

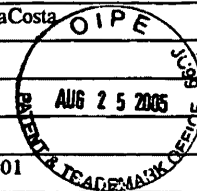
Examiner:	/Stephen D Agosta/	Date Considered:	11/08/2006
* Examiner: Initial if reference is considered, whether or not citation is in conformance with MPEP 609; Draw line through citation if not in conformance and not considered. Include copy of this form with your communication with applicant.			

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	First Named Inventor:	Francis daCosta
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	Examiner Name:	na
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	Attorney Docket No.:	MESHP001

U.S. Patent Documents							
*Examiner Initials		Document Number	Date	Name	Class	Subclass	Filing Date if Appropriate
SD	14.	6,597,919	July 22, 2003	Kumar, et al.	455	510	June 23, 2000
	15	6,426,814	July 30, 2002	Berger, et al.	398	45	Nov 3, 1999
	16	6,363,062	March 26, 2002	Aaronson, et al.	370	348	June 8, 1999
	17	6,683,865	Jan 27, 2004	Garcia-Luna-Aceves, et al.	370	349	Oct 15, 1999
	18	6,665,536	Dec 16, 2003	Mahany	455	434	July 20, 1999
	19	20030002442	Jan 2, 2003	Flammer, George H. III, et al.	370	230	June 27, 2001
	20	6,298,053	Oct 2, 2001	Flamner, III, et al.	370	349	Jan 14, 2000
	21	20040014491	Jan 22, 2004	Weigand, Gilbert G.	455	552.1	April 15, 2003
	22	20020181427	Dec 5, 2002	Sparr, Robert H.; et al.	370	338	April 15, 2002
	23	20020176390	Nov 28, 2002	Sparr, Robert H.; et al.	370	338	April 15, 2002
	24	20020097696	July 25, 2002	Kossi, Jouni; et al.	370	330	Jan 19, 2001
	25	20030185169	Oct 2, 2003	Higgins, James A.	370	329	Mar 27, 2002
↓	26	20030026356	Feb 6, 2003	Brommer, Karl D.	375	324	April 18, 2002
Foreign Patent Documents							
							Translation
		Document	Date	Country	Class	Subclass	Yes No
Other Art (Including Author, Title, Date, Pertinent Pages, Etc.)							

Examiner:	/Stephen D Agosta/	Date Considered:	11/08/2006
* Examiner: Initial if reference is 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 your communication with applicant.			

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U.S. Patent Documents							
*Examiner Initials		Document Number	Date	Name	Class	Subclass	Filing Date if Appropriate
SD	27.	6,850,502	Feb 1, 2005	Kagan, et al.	370	330	Oct 30, 2000
	28						
	29						
	30						

Foreign Patent Documents							Translation	
		Document	Date	Country	Class	Subclass	Yes	No
SD		WO 2004/017568 PCT/EP2003/009062	26 Feb 2004	Germany			x	

Other Art (Including Author, Title, Date, Pertinent Pages, Etc.)		

Examiner:	/Stephen D Agosta/	Date Considered:	11/08/2006
* Examiner: Initial if reference is 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 your communication with applicant.			

Notice of References Cited	Application/Control No. 10/434,948	Applicant(s)/Patent Under Reexamination DA COSTA ET AL.	
	Examiner Stephen M. D'Agosta	Art Unit 2617	Page 1 of 1

U.S. PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	Classification
*	A	US-2002/0085719	07-2002	Crosbie, David B.	380/248
*	B	US-2002/0055978	05-2002	Joon-Bo et al.	709/209
*	C	US-2005/0181725	08-2005	Dabak et al.	455/041.2
*	D	US-2001/0021639	09-2001	Kaku, Takashi	455/41
*	E	US-2002/0097681	07-2002	Treister et al.	370/238
*	F	US-6,876,643	04-2005	Aggarwal et al.	370/338
*	G	US-2002/0159401	10-2002	Boger, Yoel	370/294
	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
	N					
	O					
	P					
	Q					
	R					
	S					
	T					

NON-PATENT DOCUMENTS

*		Include as applicable: Author, Title Date, Publisher, Edition or Volume, Pertinent Pages)
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	V	
	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.

Search Notes 	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%;">Application/Control No.</td> <td colspan="2">Applicant(s)/Patent under Reexamination</td> </tr> <tr> <td>10/434,948</td> <td colspan="2">DA COSTA ET AL.</td> </tr> <tr> <td>Examiner</td> <td>Art Unit</td> <td></td> </tr> <tr> <td>Stephen M. D'Agosta</td> <td>2617</td> <td></td> </tr> </table>	Application/Control No.	Applicant(s)/Patent under Reexamination		10/434,948	DA COSTA ET AL.		Examiner	Art Unit		Stephen M. D'Agosta	2617	
Application/Control No.	Applicant(s)/Patent under Reexamination												
10/434,948	DA COSTA ET AL.												
Examiner	Art Unit												
Stephen M. D'Agosta	2617												

SEARCHED			
Class	Subclass	Date	Examiner

INTERFERENCE SEARCHED			
Class	Subclass	Date	Examiner

SEARCH NOTES (INCLUDING SEARCH STRATEGY)		
	DATE	EXMR
INVENTOR SEARCH	11-7-04	mo
I/Os ART		
EAST DO'S		
TEXT SEARCH		

Index of Claims 		Application/Control No. 10/434,948 Examiner Stephen M. D'Agosta		Applicant(s)/Patent under Reexamination DA COSTA ET AL. Art Unit 2617	
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✓ Rejected = Allowed	— (Through numeral) Cancelled ÷ Restricted	N Non-Elected I Interference	A Appeal O Objected
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Claim	Date
Final Original	
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Claim	Date
Final Original	
51	✓
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UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
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Bib Data Sheet

CONFIRMATION NO. 7871

SERIAL NUMBER 10/434,948	FILING OR 371(c) DATE 05/08/2003 RULE	CLASS 370	GROUP ART UNIT 2617	ATTORNEY DOCKET NO. DACOSTAF.PT1
APPLICANTS Francis da Costa, San Jose, CA; Sriram Dayanandan, San Jose, CA; <i>OR NP</i> MESH DYNAMICS CO.				
** CONTINUING DATA ***** This appln claims benefit of 60/421,930 10/28/2002				
** FOREIGN APPLICATIONS ***** <i>None</i>				
IF REQUIRED, FOREIGN FILING LICENSE GRANTED** SMALL ENTITY ** ** 06/30/2003				
Foreign Priority claimed ☐ yes ☒ no 35 USC 119 (a-d) conditions met ☐ yes ☒ no ☐ Met after Allowance		STATE OR COUNTRY CA	SHEETS DRAWING 14	TOTAL CLAIMS 22
Verified and Acknowledged <i>[Signature]</i> Examiner's Signature Initials				INDEPENDENT CLAIMS 3
ADDRESS 24943				
TITLE High performance wireless networks using distributed control				
FILING FEE RECEIVED 393	FEES: Authority has been given in Paper No. _____ to charge/credit DEPOSIT ACCOUNT No. _____ for following:		☐ All Fees ☐ 1.16 Fees (Filing) ☐ 1.17 Fees (Processing Ext. of time) ☐ 1.18 Fees (Issue) ☐ Other _____ ☐ Credit	

<http://neo:8000/PrexServlet/PrexAction?serviceName=BibDataSheet&Action=display&brow...> 11/8/06

EAST Search History

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
L1	189	"20040137924" "20040001442" "6,704,301" "6,904,275" "6,892,068" "20030114204" "20030012176" "20050122925" "6,865,170" "6,859,652" "5,166,929" "6,831,921" "6,026,303"	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2006/11/08 07:51
L2	15	US-6704301-\$.DID. OR US-6904275-\$.DID. OR US-6892068-\$.DID. OR US-6865170-\$.DID. OR US-6859652-\$.DID. OR US-5166929-\$.DID. OR US-6831921-\$.DID. OR US-6026303-\$.DID.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2006/11/08 07:52
L3	12	US-6597919-\$.DID. OR US-6426814-\$.DID. OR US-6363062-\$.DID. OR US-6683865-\$.DID. OR US-6665536-\$.DID. OR US-6298053-\$.DID.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2006/11/08 08:27
L8	6	dacosta.in. and dayanandan.in.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2006/11/08 08:18
L9	13	"20030002442".pn. or "20040014491".pn. or "20020181427".pn. or "20020176390".pn. or "20020097696".pn. or "20030185169".pn. or "20030026356".pn.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2006/11/08 08:30
L10	10	"20040137924".pn. or "20040001442".pn. or "20030114204".pn. or "20030012176".pn. or "20050122925".pn.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2006/11/08 08:32
L11	286	mesh and (parent near child)	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2006/11/08 08:32
L12	35	mesh same (parent near child)	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2006/11/08 08:32

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Page 1

EAST Search History

L14	0	(bluetooth or blue-tooth) and adhoc and (parent same child\$4) and @ad<"20020508"	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2006/11/08 08:34
L15	306	(bluetooth or blue-tooth) and (parent same child\$4) and @ad<"20020508"	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2006/11/08 08:34
L16	11	(bluetooth or blue-tooth) same (parent same child\$4) and @ad<"20020508"	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2006/11/08 08:54
L17	23	((bluetooth or blue-tooth) same (first near network) same (second near network)) and @ad<"20020508"	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2006/11/08 08:50
L24	0	reconfig\$6 near bluetooth	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2006/11/08 08:53
L25	133	reconfig\$6 same bluetooth	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2006/11/08 08:53
L27	613	(bluetooth or blue-tooth) same ((parent same child\$4) or (master same slave\$2)) and @ad<"20020508"	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2006/11/08 08:55
L28	613	((bluetooth or blue-tooth) same ((parent same child\$4) or (master same slave\$2))) and @ad<"20020508"	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2006/11/08 08:55

EAST Search History

L29	0	((bluetooth or blue-tooth) same ((parent same child\$4) or (master same slave\$2)) same spawn\$4) and @ad<"20020508"	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2006/11/08 08:55
L30	6	((bluetooth or blue-tooth) same ((parent same child\$4) or (master same slave\$2)) same reconfig\$6) and @ad<"20020508"	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2006/11/08 11:03
L31	77	((bluetooth or blue-tooth) same ((parent same child\$4) or (master same slave\$2)) and (slave near slave)) and @ad<"20020508"	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2006/11/08 09:21
L32	52	((bluetooth or blue-tooth) same ((parent same child\$4) or (master same slave\$2)) and (channel near select\$5)) and @ad<"20020508"	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2006/11/08 09:24
L33	92	((bluetooth or blue-tooth) and ((parent same child\$4) or (master same slave\$2)) and (channel near select\$5)) and @ad<"20020508"	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2006/11/08 09:24
L34	110	((bluetooth or blue-tooth) and ((parent\$2 same child\$4) or (master\$2 same slave\$2))) and split\$5 and @ad<"20020508"	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2006/11/08 09:26
L35	0	((bluetooth or blue-tooth) and ((parent\$2 same child\$4) or (master\$2 same slave\$2))) and (split\$5 near network\$2) and @ad<"20020508"	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2006/11/08 09:25
L36	7	((bluetooth or blue-tooth) and (select\$5 near new near (parent\$2 or master\$2))) and @ad<"20020508"	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2006/11/08 09:29

EAST Search History

L37	169	((bluetooth or blue-tooth) and (new near (parent\$2 or master\$2))) and @ad<"20020508"	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2006/11/08 09:29
L38	16	((bluetooth or blue-tooth) same (new near (parent\$2 or master\$2))) and @ad<"20020508"	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2006/11/08 09:31
L39	12	((bluetooth or blue-tooth) same (second near (parent\$2 or master\$2))) and @ad<"20020508"	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2006/11/08 09:46
L40	43	((bluetooth or blue-tooth) same (hand\$4 near (off\$2 or over\$2))) and @ad<"20020508"	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2006/11/08 10:45
L41	2	((bluetooth or blue-tooth) same mesh) and @ad<"20020508"	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2006/11/08 10:45
L42	82	((bluetooth or blue-tooth) and mesh) and @ad<"20020508"	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2006/11/08 10:45
L43	3148	choi.in. and kang.in.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2006/11/08 11:03
L44	3	choi.in. and kang.in. and (master near disappears)	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2006/11/08 11:04

11/8/06 11:40:19 AM

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PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:	Francis da Costa & Sriram Dayanandan	Attorney Docket:	DACOSTAF.PT1
Serial No.:	10/434,948	Art Unit:	2616
Filed:	May 8, 2003	Examiner:	Wellington Chin
Title:	HIGH PERFORMANCE WIRELESS NETWORKS USING DISTRIBUTED CONTROL	Confirmation No.:	7871

STATUS INQUIRY

Commissioner for Patents
United States Patent and Trademark Office
Director of the U.S. Patent and Trademark Office
P.O. Box 1450
Alexandria, VA 22313-1450

Attn: Wellington Chin

Dear Sir:

According to our records, the above-identified application was filed in the United States Patent and Trademark Office on May 8, 2003.

The undersigned attorney respectfully requests that the Office advise her of the status of this application as soon as possible in order to determine whether further action by applicant(s) is required at this time.

Respectfully submitted,

Date 8/16/2006


Juneko Jackson
Reg. No. 48,870

Intellectual Property Law Group LLP
Old Bank of America Building
12 South First Street, 12th Floor
San Jose, CA 95113
(408) 286-8933
Attorneys for Applicant(s)

Electronic Acknowledgement Receipt	
EFS ID:	1158117
Application Number:	10434948
Confirmation Number:	7871
Title of Invention:	High performance wireless networks using distributed control
First Named Inventor:	Francis da Costa
Customer Number:	24943
Filer:	Otto O. Lee/Kathleen Mok
Filer Authorized By:	Otto O. Lee
Attorney Docket Number:	DACOSTAF.PT1
Receipt Date:	16-AUG-2006
Filing Date:	08-MAY-2003
Time Stamp:	21:05:04
Application Type:	Utility
International Application Number:	

Payment information:

Submitted with Payment	no
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File Listing:

Document Number	Document Description	File Name	File Size(Bytes)	Multi Part	Pages
1	Request for status of Application	STATUS_INQUIRY_DACOS TAFPT1.pdf	36740	no	1

Warnings:	
Information:	
Total Files Size (in bytes):	36740
<p>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.</p> <p><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.</p> <p><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.</p>	



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INTELLECTUAL PROPERTY LAW GROUP LLP
12 SOUTH FIRST STREET
SUITE 1205
SAN JOSE CA 95113

MAIL

SEP 12 2005

DIRECTOR OFFICE
TECHNOLOGY CENTER 2600

In re Application of:
Francis Da Costa, et al.
Application No.: 10/434,948
Filed: May 8, 2003
For:

**HIGH PERFORMANCE WIRELESS
NETWORKS USING DISTRIBUTED
CONTROL**

DECISION ON PETITION
TO MAKE SPECIAL

This is a decision on the petition, filed August 25, 2005 under 37 C.F.R. §102(d) and M.P.E.P. §708.02(XI): Inventions For Countering Terrorism, to make the above-identified application special.

M.P.E.P. §708.02 (XI), which sets out the prerequisites for a grantable petition for Inventions For Countering Terrorism under 37 C.F.R. § 102(d), states in relevant part:

International terrorism as defined in 18 U.S.C. 2331 includes "activities that - (A) involve violent acts or acts dangerous to human life that are a violation of the criminal laws of the United States or of any State, or that would be a criminal violation if committed within the jurisdiction of the United States or of any State; [and] (B) appear to be intended - (i) to intimidate or coerce a civilian population; (ii) to influence the policy of a government by intimidation or coercion; or (iii) to affect the conduct of a government by assassination or kidnapping..." The types of technology for countering terrorism could include, but are not limited to, systems for detecting/identifying explosives, aircraft sensors/security systems, and vehicular barricades/disabling systems.

Applicants who desire that an application relating to inventions for countering terrorism be made special should file a petition with the petition fee under 37 CFR 1.17(h) requesting the Patent and Trademark Office to make the application special. The petition for special status should be accompanied by a statement explaining how the invention contributes to countering terrorism.

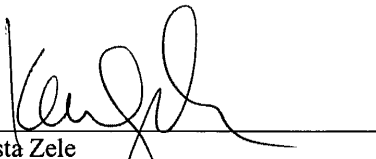
Petitioner's submission fails to meet the criteria set out with respect to countering terrorism in M.P.E.P. §708.02(XI). The specification and claims as originally filed provide no indication of an intention to counter terrorism by contributing to systems for anti-terrorist video surveillance. The reason supporting the petition describes a system that will counter terrorism by enabling wide area video surveillance by way of a unique wireless mesh network architecture. However, the claimed invention fails to indicate countering terrorism. Further steps would be required to actually offset or nullify terrorism, yet no suggestion of "countering terrorism" is found in the

Application Serial No.: 10/434,948
Decision on Petition

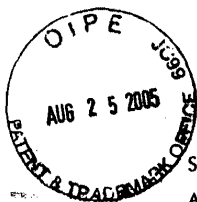
disclosure. As a result, no advancement in the technology of countering terrorism has been persuasively shown.

Accordingly, the petition is **DENIED**. The application file is being forwarded to Central Files to await examination in its proper turn based on its effective filing date. Any request for reconsideration must be filed within two months of the mailing date of this decision.

It is suggested that applicant review M.P.E.P. § 708.02 regarding other grounds available for filing a petition to make special. In particular, note M.P.E.P. § 708.02(VIII): Accelerated Examination, which does not place limitations on the subject matter of the application.



Krista Zele
Special Program Examiner
Technology Center 2600



In the United States Patent and Trademark Office

Serial Number: 10/434,948
Appn. Filed: MAY 8, 2003
Applicant(s): FRANCIS D'ACOSTA AND SPIRAM DAYANANDAN
Appn. Title: HIGH PERFORMANCE WIRELESS NETWORKS USING DISTRIBUTED CONTROL
Examiner/GAU: UNKNOWN / 2661
Mailed: 8-25-05
At: SANTA CLARA, CA

Petition to Make Special

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

Sir:

Applicant hereby respectfully petitions that the above application be made special under MPEP Sec. 708.02 for the following reason; attached is a declaration in support thereof:

- | | |
|---|---|
| I. ☐ Manufacturer Available;* | VII. ☐ Recombinant DNA Is Involved;* |
| II. ☐ Infringement Exists;* | VIII. ☐ Special Procedure: Search Was Made;* |
| III. ☐ Applicant's Health Is Poor; | IX. ☐ Superconductivity Is Advanced; |
| IV. ☐ Applicant's Age Is 65 or Greater; | X. ☐ Relates to HIV/AIDS or Cancer;* |
| V. ☐ Environmental Quality Will Be Enhanced; | XI. ☒ Counters Terrorism.* |
| VI. ☐ Energy Savings Will Result; | |

* ☒ Also attached, since reason I, II, VII, VIII, X, or XI has been checked, is the \$ 130 Petition Fee pursuant to Rules 102 and 17(i).

Very respectfully,

Applicant(s):

Francis D'Acosta

08/30/2005 EFLORES 00000042 10434948

01 FC:1464

130.00 0P

Attachment(s): Fee if indicated and supporting Declaration

Applicant(s):

FRANCIS D'ACOSTA
SPIRAM DAYANANDAN

c/o: MESH Dynamics Inc
2953 BUNKER HILL LA, SUITE 400
SANTA CLARA, CA 95054
Telephone: 408-373-7700

Certificate of Mailing

I certify that this correspondence will be deposited with the United States Postal Service as Express first class mail with proper postage affixed in an envelope addressed to: "Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450" on the date below.

Date: 2005, August 25

Francis D'Acosta

Applicant





8-29-05

2661\$

IFW

Approved for use through 07/31/2007. 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 displays a valid OMB control number.

PETITION FEE Under 37 CFR 1.17(f), (g) & (h) TRANSMITTAL (Fees are subject to annual revision) Send completed form to: Commissioner for Patents P.O. Box 1450, Alexandria, VA 22313-1450	Application Number	10/434,948
	Filing Date	MAY 8, 2003
	First Named Inventor	FRANCIS D'ACOSTA
	Art Unit	2661
	Examiner Name	UNKNOWN
	Attorney Docket Number	MESHPOQ1

Enclosed is a petition filed under 37 CFR 1.17(h) that requires a processing fee (37 CFR 1.17(f), (g), or (h)). Payment of \$ 130 is enclosed.

This form should be included with the above-mentioned petition and faxed or mailed to the Office using the appropriate Mail Stop (e.g., Mail Stop Petition), if applicable. For transmittal of processing fees under 37 CFR 1.17(i), see form PTO/SB/17i.

Payment of Fees (small entity amounts are NOT available for the petition fees)

☐ The Commissioner is hereby authorized to charge the following fees to Deposit Account No. _____:

☐ petition fee under 37 CFR 1.17(f), (g) or (h) ☐ any deficiency of fees and credit of any overpayments

Enclose a duplicative copy of this form for fee processing.

☒ Check in the amount of \$ 130 is enclosed.

☐ Payment by credit card (Form PTO-2038 or equivalent enclosed). Do not provide credit card information on this form.

Petition Fees under 37 CFR 1.17(f): Fee \$400 Fee Code 1462

For petitions filed under:

- § 1.53(e) - to accord a filing date.
- § 1.57(a) - to accord a filing date.
- § 1.182 - for decision on a question not specifically provided for.
- § 1.183 - to suspend the rules.
- § 1.378(e) - for reconsideration of decision on petition refusing to accept delayed payment of maintenance fee in an expired patent.
- § 1.741(b) - to accord a filing date to an application under § 1.740 for extension of a patent term.

Petition Fees under 37 CFR 1.17(g): Fee \$200 Fee Code 1463

For petitions filed under:

- § 1.12 - for access to an assignment record.
- § 1.14 - for access to an application.
- § 1.47 - for filing by other than all the inventors or a person not the inventor.
- § 1.59 - for expungement of information.
- § 1.103(a) - to suspend action in an application.
- § 1.136(b) - for review of a request for extension of time when the provisions of section 1.136(a) are not available.
- § 1.295 - for review of refusal to publish a statutory invention registration.
- § 1.296 - to withdraw a request for publication of a statutory invention registration filed on or after the date the notice of intent to publish issued.
- § 1.377 - for review of decision refusing to accept and record payment of a maintenance fee filed prior to expiration of a patent.
- § 1.550(c) - for patent owner requests for extension of time in *ex parte* reexamination proceedings.
- § 1.956 - for patent owner requests for extension of time in *inter partes* reexamination proceedings.
- § 5.12 - for expedited handling of a foreign filing license.
- § 5.15 - for changing the scope of a license.
- § 5.25 - for retroactive license.

Petition Fees under 37 CFR 1.17(h): Fee \$130 Fee Code 1464

For petitions filed under:

- § 1.19(g) - to request documents in a form other than that provided in this part.
- § 1.84 - for accepting color drawings or photographs.
- § 1.91 - for entry of a model or exhibit.
- § 1.102(d) - to make an application special.
- § 1.138(c) - to expressly abandon an application to avoid publication.
- § 1.313 - to withdraw an application from issue.
- § 1.314 - to defer issuance of a patent.

Francis D'Acosta
Signature
FRANCIS D'ACOSTA
Typed or printed name

8-25-05
Date

Registration No., if applicable

This collection of information is required by 37 CFR 1.17. 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 5 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.



IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Inventor:	DA COSTA et al.	Examiner:	Unknown
Application No.:	10/434,948	Art Unit:	2661
Filed:	May 8, 2003	Docket No.:	MESHP001
Title:	HIGH PERFORMANCE WIRELESS NETWORKS USING DISTRIBUTED CONTROL		

DECLARATION IN SUPPORT OF ACCOMPANYING PETITION TO MAKE

SPECIAL

REASON XI -- COUNTERS TERRORISM

In support of the accompanying Petition to Make Special, applicant declares as follows:

1. I am the applicant in the above identified patent application.
2. The invention of the above application will materially enhance systems for countering terrorism by enabling wide area video surveillance by way of a unique wireless mesh network architecture as described below.
3. Mesh networks provide long range wireless connectivity by relaying packets from one mesh router to another (each relay called a "hop"), like a bucket brigade. With conventional mesh technology, one radio (and one frequency channel) is typically used to do this, and as a result, the performance (bandwidth, latency and jitter) degrades substantially after each additional hop. Video surveillance requires high bandwidth with low latency and jitter through the mesh over many hops and thus, applicant's mesh architecture with multi-radio and multi-channel relay capability will support the high bandwidth required for critical video surveillance applications.
4. Applicant's assignee company, Advanced Cybernetics Group/MeshDynamics, has already sold its mesh products to the USAF BattleLab (for force protection), the Department of the Navy (for border surveillance), and the Canadian Government

Application Serial No. 10/434,948

Attorney Docket No. MESHP001

(DRDC - Alberta) for use in robot video surveillance vehicles. Applicant's company was also recently visited by representatives of the UK Ministry of Defense where they are interested in using this technology specifically for anti-terrorist video surveillance.

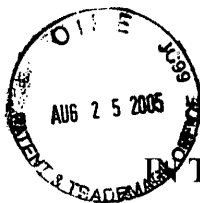
5. I further declare that all statements made herein of my own knowledge are true and that all statements made upon information and belief are believed to be true, and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine 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 and any patent issuing therefrom.

Very Respectfully,



Francis daCosta
c/o MeshDynamics, Inc.
2953 Bunker Hill La, Suite 400
Santa Clara, CA 95054
408-373-7700

August 25, 2005



THE UNITED STATES PATENT AND TRADEMARK OFFICE

Inventor:	DA COSTA et al.	Examiner:	Unknown
Application No.:	10/434,948	Art Unit:	2661
Filed:	May 8, 2003	Docket No.:	MESHP001
Title:	HIGH PERFORMANCE WIRELESS NETWORKS USING DISTRIBUTED CONTROL		

CERTIFICATE OF MAILING

I hereby certify that this correspondence is being deposited with the United States Postal Service as Express Mail in a prepaid envelope addressed to:
Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450 on:

8-25-05, 2005.

ED 841795951US

PRELIMINARY AMENDMENT A

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

Dear Sir:

Prior to the examination of the application on the merits, please amend the application as follows:

Application Serial No. 10/434,948
Attorney Docket No. MESHP001

IN THE CLAIMS

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

Claims 1-22 (Canceled)

23. (New) A method of controlling a wireless mesh network, comprising:
- a) configuring the wireless mesh network with a first configuration;
 - b) determining that a first node in the wireless mesh network requires a channel selection change;
 - c) dynamically selecting a second node to form a parent-child relationship with the first node; and
 - d) making a channel selection change.
24. (New) A method as recited in Claim 23, wherein the second node is selected to be a parent node of the first node.
25. (New) A method as recited in Claim 23, wherein the second node is selected to be a child node of the first node.
26. (New) A method as recited in Claim 23, wherein the first node includes a plurality of radios.
27. (New) A method as recited in Claim 23, wherein making a channel selection includes making a channel selection change to meet a performance requirement.
28. (New) A method as recited in Claim 23, wherein making a channel selection includes making a channel selection change to meet a latency requirement.
29. (New) A method as recited in Claim 23, wherein making a channel selection includes making a channel selection change to meet a throughput requirement.

30. (New) A method as recited in Claim 23, wherein determining that the first node requires a channel selection change includes determining that the channel selection change is required due to a performance requirement change.
31. (New) A method as recited in Claim 23, wherein determining that the first node requires a channel selection change includes determining that the channel selection change is required due to congestion.
32. (New) A method as recited in Claim 23, wherein the channel selection change is made to avoid channel interference.
33. (New) A method as recited in Claim 23, wherein the channel selection change is made based on a change to network topology.
34. (New) A method as recited in Claim 23, further comprising repeating b)-d).
35. (New) A method as recited in Claim 23, further comprising receiving a monitoring signal that includes information about available nodes from which the second node is selected.
36. (New) A system in a wireless mesh network, comprising:
a processor configured to:
 configure a first node in a first configuration;
 determine that the first node in the wireless mesh network requires a
channel selection change;
 dynamically select a second node to form a parent-child relationship with
the first node; and
 make a channel selection change; and
a memory coupled to the processor, configured to provide the processor with
instructions.
37. (New) A system as recited in Claim 36, wherein the second node is selected to be a parent node of the first node.
38. (New) A system as recited in Claim 36, wherein the second node is selected to be a child node of the first node.

39. (New) A system as recited in Claim 36, further comprising a plurality of radios.
40. (New) A system as recited in Claim 36, wherein the processor is further configured to make a channel selection change to meet a performance requirement.
41. (New) A system as recited in Claim 36, wherein the processor is further configured to make a channel selection change to meet a latency requirement.
42. (New) A system as recited in Claim 36, wherein the processor is further configured to make a channel selection change to meet a throughput requirement.
43. (New) A system as recited in Claim 36, wherein the processor is configured to determine that the channel selection change is required due to a performance requirement change.
44. (New) A system as recited in Claim 36, wherein the processor is configured to determine that the channel selection change is required due to congestion.
45. (New) A system as recited in Claim 36, wherein the processor is configured to determine the channel selection change based on network topology.
46. (New) A system as recited in Claim 36, wherein the processor is further configured to repeat b)-d).
47. (New) A system as recited in Claim 36, wherein the processor is further configured to receive a monitoring signal that includes information about available nodes from which the second node is selected.
48. (New) A system as recited in Claim 36, wherein the processor is further configured to receive a monitoring signal that includes information about available nodes from which the second node is selected.
49. (New) A computer program product for controlling a wireless mesh network, the computer program product being embodied in a computer readable medium and comprising computer instructions for:
- a) configuring the wireless mesh network with a first configuration;

- b) determining that a first node in the wireless mesh network requires a channel selection change;
- c) dynamically selecting a second node to form a parent-child relationship with the first node; and
- d) making a channel selection change.

50. (New) A computer program product as recited in Claim 49, wherein the second node is selected to be a parent node of the first node.

51. (New) A computer program product as recited in Claim 49, wherein the second node is selected to be a child node of the first node.

52. (New) A computer program product as recited in Claim 49, wherein the first node includes a plurality of radios.

53. (New) A computer program product as recited in Claim 49, wherein making a channel selection includes making a channel selection change to meet a performance requirement.

54. (New) A computer program product as recited in Claim 49, wherein making a channel selection includes making a channel selection change to meet a latency requirement.

55. (New) A computer program product as recited in Claim 49, wherein making a channel selection includes making a channel selection change to meet a throughput requirement.

56. (New) A computer program product as recited in Claim 49, wherein determining that the first node requires a channel selection change includes determining that the channel selection change is required due to a performance requirement change.

57. (New) A computer program product as recited in Claim 49, wherein determining that the first node requires a channel selection change includes determining that the channel selection change is required due to congestion.

58. (New) A computer program product as recited in Claim 49, wherein the channel selection change is made based on network topology.

59. (New) A computer program product as recited in Claim 49, the computer program product further comprising computer instructions for repeating b)-d).

60. (New) A computer program product as recited in Claim 49, the computer program product further comprising computer instructions for receiving a monitoring signal that includes information about available nodes from which the second node is selected.

REMARKS

Claims 1-22 have been cancelled. New claims 23-60 have been added. No new matter has been added.

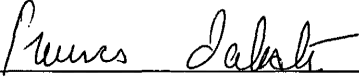
An IDS has been attached along with a copy of each foreign reference.

A Petition to Make Special has also been attached along with the appropriate transmittal form and fee (\$130), and a declaration in support of the petition.

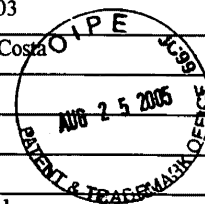
Consideration of the application and allowance of all claims are respectfully requested. If at any time the Examiner believes that an interview would be helpful, please contact the undersigned.

Respectfully submitted,

Dated: 8-25-05


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408-373-7700

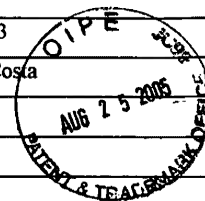
U.S. Department of Commerce, Patent and Trademark Office INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Use several sheets if necessary)	Application No.:	10/434,948
	Filing Date:	May 8, 2003
	First Named Inventor:	Francis da Costa
	Group Art Unit:	2661
	Examiner Name:	na
	Confirmation No.:	na
	Attorney Docket No.:	MESHP001



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*Examiner Initials		Document Number	Date	Name	Class	Subclass	Filing Date if Appropriate
	1.	20040137924	7-15-2004	Herscovich, Bernard ; et al.	455	500	1-10-2003
	2.	20040001442	1-1-2004	Rayment, Stephen G. ; et al.	370	238	6-28-2002
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	13	6,026,303	Feb 15, 2000	Minamisawa	455	446	Nov 6, 1997
Foreign Patent Documents							
							Translation
		Document	Date	Country	Class	Subclass	Yes No
Other Art (Including Author, Title, Date, Pertinent Pages, Etc.)							

Examiner:	Date Considered:
* Examiner: Initial if reference is 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 your communication with applicant.	

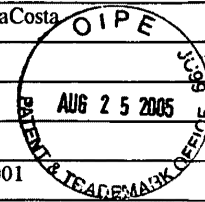
U.S. Department of Commerce, Patent and Trademark Office INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Use several sheets if necessary)	Application No.:	10/434,948
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	Attorney Docket No.:	MESHP001



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*Examiner Initials		Document Number	Date	Name	Class	Subclass	Filing Date if Appropriate	
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	15	6,426,814	July 30, 2002	Berger , et al.	398	45	Nov 3, 1999	
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	26	20030026356	Feb 6, 2003	Brommer, Karl D.	375	324	April 18, 2002	
Foreign Patent Documents								
							Translation	
		Document	Date	Country	Class	Subclass	Yes	No
Other Art (Including Author, Title, Date, Pertinent Pages, Etc.)								

Examiner:	Date Considered:
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U.S. Department of Commerce, Patent and Trademark Office INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Use several sheets if necessary)	Application No.:	10/434,948
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*Examiner Initials		Document Number	Date	Name	Class	Subclass	Filing Date if Appropriate
	27.	6,850,502	Feb 1, 2005	Kagan, et al.	370	330	Oct 30, 2000
	28						
	29						
	30						

Foreign Patent Documents							Translation	
		Document	Date	Country	Class	Subclass	Yes	No
		WO 2004/017568 PCT/EP2003/009062	26 Feb 2004	Germany			x	

Other Art (Including Author, Title, Date, Pertinent Pages, Etc.)		

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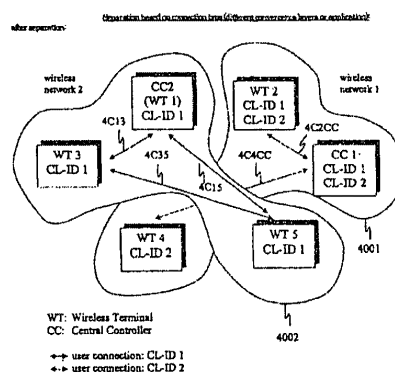
Published:
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(72) Inventors; and

(75) Inventors/Applicants (for US only): STADELMEIER,

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: BANDWIDTH ORIENTED RECONFIGURATION OF WIRELESS AD HOC NETWORKS



(57) Abstract: A first wireless ad hoc network with a certain available amount of bandwidth comprises a plurality of wireless terminals communicating via wireless connections with each other. Each wireless connection requires a certain amount of the available amount of bandwidth. A problem occurs, if a wireless terminal wants to set up a new wireless connection requiring bandwidth or requires more bandwidth for an existing wireless connection and the required amount of bandwidth exceeds the left amount of the available amount of bandwidth of the first wireless ad hoc network. In a state of the art wireless ad hoc network the requested bandwidth cannot be provided and a user application may not be possible. According to the invention, however, the required amount of bandwidth can be provided by splitting the first wireless ad hoc network such that a second wireless ad hoc network is spawned which operates in a different communication channel and thus provides additional bandwidth. The second wireless ad hoc network comprises wireless terminals of the first wireless ad hoc network and/or new wireless terminals.

WO 2004/017568 A1

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5 The invention is related to wireless ad hoc networks which comprise a central controller and a set of wireless terminals (also referred to as wireless devices). In particular, the invention is related to a method and means for providing additional bandwidth for a wireless ad hoc network if the available bandwidth is not sufficient.

10 A wireless ad hoc network is a collection of autonomous nodes or wireless terminals that communicate with each other by forming a radio network and maintaining connectivity in a decentralized manner. Since the nodes communicate over wireless connections, they have to contend with the effects of radio communication, such as noise, fading, and interference. In
15 addition, the connections typically have less bandwidth than in a wired network. The network topology is in general dynamic, because the connectivity among the nodes may vary with time due to node departures, new node arrivals, and the possibility of having mobile nodes.

20 For a variety of home multimedia applications and business applications, it is important to establish networks, preferably wireless networks, for exchanging data and messages between different devices that are part of the network. In a typical business application scenario, a mobile terminal gets services over a fixed corporate or public infrastructure. In an exemplary
25 home application scenario, a low-cost and flexible networking is supported to interconnect wireless digital consumer devices. Such devices can for example be multimedia devices which typically require high bit rates and are therefore using a lot of the available amount of bandwidth of a wireless ad hoc network.

The ETSI (European Telecommunications Standards Institute) Project BRAN (Broadband Radio Access Networks) has defined the standard HIPERLAN/2 (High Performance Radio Local Area Network), which provides high-speed multimedia communications between different broadband core networks and wireless (mobile) terminals. HIPERLAN/2 provides a flexible platform for a variety of business and home applications that can support a set of bit rates up to 54 Mbit/s. The HIPERLAN/2 standard is an example how

- 2 -

1 data can be transmitted between different devices in a wireless ad hoc network. Another standardization body for wireless ad hoc networks is IEEE 802.11. The invention is not limited to wireless networks according to the HIPERLAN/2 and IEEE 802.11 standard, though.

5 A problem occurs within a state of the art wireless ad hoc network, if a wireless terminal requests more bandwidth than the left amount of bandwidth of the wireless ad hoc network. The terminal may request more bandwidth e.g. because it wants to setup a new wireless connection or requires
10 more bandwidth for an existing wireless connection with another wireless terminal of the network. More bandwidth may also be required if a new wireless terminal wants to join the wireless ad hoc network and wants to set up wireless connections. In such a case, if the wireless ad hoc network runs according to the above mentioned HIPERLAN/2 standard or IEEE
15 802.11 standard, a wireless terminal may not be provided with the requested amount of bandwidth. Therefore, a certain user application may not be possible.

20 Fig. 1 shows a state of the art wireless ad hoc network 100 comprising three wireless terminal-devices, i.e. a first wireless terminal-device WT10, a second wireless terminal-device WT20, and a third wireless terminal-device WT30, and a terminal-device central controller CC100 that controls the wireless terminal-devices. Further, there are three wireless device-connections, a first wireless device-connection C23 between the second wireless terminal-device WT20 and the third wireless terminal-device WT30, a second
25 wireless device-connection C31 between the first wireless terminal-device WT10 and the third wireless terminal-device WT30 and a third device-connection C1CC between the first wireless terminal-device WT10 and the terminal-device central controller CC100. The wireless device-connections require a certain amount of the available bandwidth of the wireless ad hoc
30 network 100. In the example the first wireless device-terminal WT10 wants to establish a new wireless device-connection C21 with the second wireless terminal-device WT20. However, the required bandwidth for this new wireless device-connection C21 exceeds the left amount of bandwidth of the total available bandwidth of the wireless ad hoc network. Therefore, in the
35 state of the art wireless ad hoc network 100, if the network is operated according to HIPERLAN/2 standard, the setup of the new wireless device-con-

- 3 -

1 nection C21 fails, or, if the network is operated according to IEEE 802.11
standard, an application on the new wireless device-connection C21 is not
possible. A similar situation would occur if more bandwidth would be re-
quired for an existing wireless device-connection and the required amount
5 of bandwidth exceeds the left available bandwidth of the wireless ad hoc
network. If for example the second wireless terminal-device WT20 requires
more bandwidth for the first wireless device-connection C23 and the requi-
red amount of bandwidth exceeds the left amount of the total available
bandwidth, an application may not be possible. Moreover, data packets
10 transmitted within the wireless ad hoc network may get lost.

Therefore, it is an object of the invention to provide a method and means
for providing additional bandwidth for a wireless ad hoc network in case
the amount of bandwidth of the wireless ad hoc network is not sufficient to
15 establish new wireless connections or to provide more bandwidth for exi-
sting wireless connections.

The object of the invention is solved by a method for providing additional
bandwidth for a wireless ad hoc network according to claim 1, by a wireless
20 terminal according to claim 7, by a central controller according to claim 9,
and by a wireless ad hoc network according to claim 11. Preferred embodi-
ments thereof are respectively defined in the respective following
subclaims.

25 The method to provide additional bandwidth for a wireless ad hoc network
comprising a plurality of wireless terminals operating in a certain commu-
nication channel (e.g. a RF channel at a certain frequency, an IR or optic
channel) with a certain amount of available bandwidth according to the
present invention comprises a step of splitting said wireless ad hoc network
30 such that at least one new wireless ad hoc network is spawned, if more
bandwidth than said certain amount of available bandwidth is required by
said plurality of wireless terminals, wherein after the split of said wireless
ad hoc network at least one wireless terminal of said wireless ad hoc net-
work and/or one or more new wireless terminals belong(s) to said at least
35 one new wireless ad hoc network, and said at least one new wireless ad hoc
network is operating in a respective different communication channel.

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1 In other words, if a first wireless ad hoc network requires more bandwidth,
a second (new) wireless ad hoc network is spawned (generated). This se-
cond wireless ad hoc network is operated in a different communication
5 channel than the first wireless ad hoc network, therefore providing additio-
nal bandwidth. Wireless terminals of the first wireless ad hoc network or
new wireless terminals may be moved to the second wireless ad hoc net-
work. It may also be possible, that new wireless terminals are moved to the
first wireless ad hoc network and wireless terminals of the first wireless ad
hoc network are moved to the second wireless ad hoc network. The splitting
10 of a wireless ad hoc network (spawning of a new wireless ad hoc network)
can also be seen as a bandwidth oriented reconfiguration of a wireless ad
hoc network.

The wireless terminal of a wireless ad hoc network controlled by a central
15 controller of said wireless ad hoc network according to the present inventi-
on comprises a receiving means adapted to receive a requesting command
(SPAWN_NETWORK) from the central controller of the wireless ad hoc net-
work, i.e. the first wireless ad hoc network, indicating certain operating
conditions for the wireless terminal, a condition checking means to check if
20 the wireless terminal can be operated under said certain conditions, and a
sending means that sends out a confirmation command (SPAWN_NET-
WORK_ACK), if the condition checking means determines that the wireless
terminal can be operated under said certain conditions, i.e. in the new (se-
cond) wireless ad hoc network.

25 The central controller of a (first) wireless ad hoc network comprising a plu-
rality of wireless terminals according to the present invention comprises a
splitting means that controls the splitting of said (first) wireless ad hoc net-
work, wherein a new (second) wireless ad hoc network is spawned that
30 comprises at least one of said plurality of wireless terminals and/or one or
more new wireless terminals.

The wireless ad hoc network according to the present invention comprises a
plurality of wireless terminals according to the present invention and a
35 central controller according to the present invention.

Preferably, said (first) wireless ad hoc network and the splitting of said wi-

- 5 -

1 wireless ad hoc network are controlled by a central controller of said (first)
wireless ad hoc network that decides which wireless terminals of said (first)
wireless ad hoc network and/or which new wireless terminals are moved to
5 said at least one new wireless ad hoc network (second wireless ad hoc net-
work), wherein the decision is based on certain separation criteria, and
said central controller determines a new central controller for said at least
one new wireless ad hoc network (second wireless ad hoc network).

Further, said (first) wireless ad hoc network and said at least one new wire-
10 less ad hoc network (second wireless ad hoc network) might be operated ac-
cording to the IEEE802.11 or ETSI BRAN HIPERLAN/2 standard.

It is further advantageous, if said certain separation criteria assure that
wireless terminals that have the same convergence layers, and/or are of the
15 same application layer, and/or have the same connection, and/or provide
the same or corresponding functions are not separated into different wire-
less ad hoc networks.

Preferably, said certain separation criteria further assure that wireless ter-
20 minals with certain connections that should not be interrupted are not mo-
ved to said at least one new wireless ad hoc network.

Further, the invention provides advantageous new commands in order to
spawn said at least one new wireless ad hoc network (second wireless ad
25 hoc network), i.e. a requesting command (SPAWN_NETWORK) that is sent
to a request wireless terminal to ask this request wireless terminal to move
to said at least one new ad hoc wireless network (second wireless ad hoc
network), and a confirmation command (SPAWN_NETWORK_ACK) that is
used by a request wireless terminal to signal that it can move to said at
30 least one new ad hoc wireless network (second wireless ad hoc network).

Preferably, said certain conditions define if said request wireless terminal
can operate as a central controller of a wireless ad hoc network, if said re-
quest wireless terminal can operate in a certain communication channel,
35 and a moment in time at which said request wireless terminal should op-
erate in said certain communication channel.

- 6 -

- 1 Further, advantageously a wireless terminal stops using its entire wireless
connections (radio link control - RLC) the moment it sent out said confir-
mation command (SPAWN_NETWORK_ACK), moves to one of said at least
one new wireless ad hoc network, waits until it receives a start command
5 (RLC_CC_START_OPERATION) sent out by a central controller, and then
starts using its wireless connections according to the information (e.g. time
stamp) provided by said start command (RLC_CC_START_OPERATION). It
may also be possible that within said requesting command (SPAWN_NET-
WORK) a time stamp is transmitted and a wireless terminal stops its entire
10 connections at the moment in time indicated by this time stamp. Thus, all
wireless terminals that are moved to said at least one new wireless ad hoc
network (second ad hoc wireless network) stop their radio link control at
the same time.
- 15 The invention and advantageous details thereof will be explained by way of
an exemplary embodiment thereof in the following with reference to the ac-
companying drawings in which
- 20 **Fig. 1** shows an example of a state of the art wireless ad hoc network
where the setup of a new connection fails because there is not
enough available bandwidth to establish the connection;
- 25 **Fig. 2A** shows an example of a wireless ad hoc network with different
user connections wherein a wireless terminal requires more
bandwidth and a wireless terminal wants to join the network;
- 30 **Fig. 2B** shows the splitting based on application level of the wireless
ad hoc network of Fig. 2A according to the invention to provide
more bandwidth;
- Fig. 3** shows a flow chart illustrating the process of splitting a wire-
less ad hoc network;
- 35 **Fig. 4A** shows an example of a wireless ad hoc network with wireless
connections with different convergence layers, i.e. different
connection types, wherein a wireless terminal requires more
bandwidth to set up a new wireless connection;

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- 1 **Fig. 4B** shows the splitting based on connection type of the wireless ad hoc network of Fig. 4A according to the invention to provide more band width; and
- 5 **Fig. 5** shows a message sequence chart (MSC) for the ETSI BRAN HIPERLAN/2 standard that describes the process of splitting the wireless ad hoc network of Fig. 4A and 4B, wherein new commands according to the invention are used.
- 10 **Figs. 2A and 2B** show an example of a wireless ad hoc network according to the invention. In Fig. 2A, the first original wireless network 200 comprises four wireless terminals, i.e. a first wireless terminal WT1, a second wireless terminal WT2, a third wireless terminal WT3, and a fourth wireless terminal WT4, and a central controller CC. There are three wireless connections (user connections), i.e. a first wireless connection 2C13 (connecting the first wireless terminal WT1 and the third wireless terminal WT3), a second wireless connection 2C12 (connecting the first wireless terminal WT1 and the second wireless terminal WT2), and a third wireless connection 2C4CC (connecting the fourth wireless terminal WT4 and the central controller CC). In the example, the second wireless terminal WT2 requests the setup of a fourth wireless connection 2C23 with the third wireless terminal WT3 requiring a certain amount of bandwidth. Further, a fifth wireless terminal WT5 wants to join the first original wireless network 200 requesting a fifth wireless connection 2C35 with the third wireless terminal WT3 requiring a certain amount bandwidth. The central controller CC therefore checks, if all conditions for establishing the new connections, i.e. the fourth wireless connection 2C23 and the fifth wireless connection 2C35, are met, i.e. especially the central controller CC checks, if there is enough bandwidth available. In the example, there is not enough bandwidth available to establish the new connections. If the network would run according to state of the art HIPERLAN/2 standard the required connections could not be established, or if the network would run according to IEEE 802.11 standard a desired user application would not be possible.
- 35 As can be seen in Fig. 2B, according to the invention, the first original wireless ad hoc network 200 is split up into two wireless ad hoc networks such that a first new wireless ad hoc network is spawned. In Fig. 2B, wire-

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1 less ad hoc network 2001 corresponds to the first original wireless ad hoc
network 200 of Fig. 2A, further, a first new wireless ad hoc network 2002
can be seen. Each wireless ad hoc network operates in a different RF chan-
nel. It should be mentioned, that the invention is not limited to RF chan-
5 nels. It may be used for a variety of different communication channels, e.g.
IR or other optic channels. If the RF channels of the wireless ad hoc net-
work 2001 and the first new wireless ad hoc network 2002 have the same
available amount of bandwidth, the total amount of bandwidth available for
the wireless terminals is doubled in comparison to the first original wire-
10 less ad hoc network 200 of Fig. 2A. Here, the wireless ad hoc network 2001
operates in the same RF channel as the wireless ad hoc network 200.
However, it is also possible, that the RF channel of wireless ad hoc network
2001 is changed, wherein the channel is different from that of the first new
wireless ad hoc network 2002.

15 As can be seen in Fig. 2B, each wireless ad hoc network, i.e. wireless net-
work 2001 and the first new wireless ad hoc network 2002, has a central
controller. Wireless ad hoc network 2001 has a first central controller CC1
and wireless ad hoc network 2002 has a second central controller CC2. The
20 first central controller CC1 is the original central controller CC of the first
original wireless ad hoc network 200 of Fig. 2A. The second central control-
ler CC2 is the original second wireless terminal WT2 of Fig. 2A, i.e. the se-
cond wireless terminal WT2 now has additional controlling functions to
function as the second central controller CC2 of the first new wireless ad
25 hoc network 2002.

A wireless terminal can function as a central controller. In this case the wi-
reless terminal performs additional controlling functions. That means, a
central controller can be seen as a wireless terminal with additional con-
30 trolling functions. Controlling functions include the management of the
network and its connections, for example the association of new wireless
terminals. However, there may also be some wireless terminals that are not
capable of performing addition controlling functions, i.e. they cannot be
used as central controllers. If a network is split up the new central control-
35 ler of the new wireless ad hoc network can therefore only be a wireless ter-
minal with additional controlling functions. The original central controller
can assign the new central controller, since the capabilities of the different

1 wireless terminals with respect to the controlling functions are exchanged during the association process, i.e. the log-in of a wireless terminal to a network.

5 In Fig. 2B wireless ad hoc network 2001 comprises the fourth wireless terminal WT4 and the second central controller CC2. The second central controller CC2 is the central controller CC of the first original wireless ad hoc network 200 of Fig. 2A. Further, the wireless network 2001 comprises the third wireless connection 2C4CC between the fourth wireless terminal WT4
10 and the second central controller CC2.

In the following description, if the reference symbol of a wireless terminal, central controller, and/or a connection changes due to a split of a network, the corresponding reference symbol before the split will be given in parenthesis, e.g. the second central controller CC2 in Fig. 2B will be written as
15 second central controller CC2 (CC).

In Fig. 2B the first new wireless ad hoc network 2002 comprises the first wireless terminal WT1, the third wireless terminal WT3, the fifth wireless terminal WT5 and the second central controller CC2 (WT2), which is the second wireless terminal WT2 of the first original wireless network 200 of Fig. 2A now functioning as a central controller. Further, the first new wireless network 2002 comprises the first wireless connection 2C13, the second wireless connection 2C12, the fourth wireless connection 2C23, and the fifth
20 wireless connection 2C35. The fifth wireless connection 2C35 between the third wireless terminal WT3 and the fifth WT5 and the fourth wireless connection 2C23 between the second wireless terminal WT2 and the third wireless terminal WT3 are the requested connections that can now be established because there is now enough bandwidth available due to the splitting of the first original wireless network 200 of Fig. 2A.
25
30

In the example of Fig. 2B the criteria used for separating (splitting), i.e. the decision which wireless terminals are placed in which wireless network, is based on the functionality of the different wireless terminals (functional or
35 application level based separation). Examples for different functionalities of wireless terminals are video communication and audio communication on the one hand, and data transfer (PC to PC data communication) on the

- 10 -

1 other hand. In the example of Figs. 2A and 2B, the first wireless terminal
WT1, the second wireless terminal WT2, the third wireless terminal WT3
and the fifth wireless terminal WT5 are PC-type devices. The fourth wireless
terminal WT4 and the first central controller CC1 are video and audio devi-
5 ces (VCR, TV, loudspeaker, ...). Therefore, the video and audio devices, i.e.
the fourth wireless terminal WT4 and the first central controller CC1 are
left in wireless ad hoc network 2001 and the PC-type devices, i.e. the first
wireless terminal WT1, the second wireless terminal WT2, the third wireless
terminal WT3 and the fifth wireless terminal WT5 are put into the first new
10 wireless ad hoc network 2002. There is no connection between wireless ad
hoc network 2001 and the first new wireless ad hoc network 2002.

There may be other criteria according to which wireless terminals should
be separated during the splitting process. Examples for such criteria are:

15

- Connection type (supported convergence layers). In HIPERLAN/2 it
is possible to have multiple convergence layers (e.g. Ethernet, IEEE
1394) in parallel on top of one wireless connection. It may be im-
portant not to separate wireless terminals connected by a wireless
20 connection with the same convergence layer.

20

- Application layer specific criteria. In IEEE 802.11 and HIPERLAN/2
standard, an application layer may have specific requirements, e.g.
communication on specific port numbers, applications, or protocols.
25 These may be criteria to perform network separation, e.g. wireless ter-
minals with application layers communicating on the same port num-
ber should not be separated.

25

- Communication on the same connection. It may be important not to
separate wireless terminals that are communicating on the same con-
30 nection(s).

30

- Functionality of devices (e.g. in IEEE 1394: Video devices, Audio de-
vices,...). It may be important that devices that can potentially com-
35 municate with each other are not separated. For example a video out-
putting device should maybe not be separated from a video reproducing
device (cf. example of Fig. 2B).

35

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1 Another separation criterion may be the interruption of connections. During the move of a wireless terminal to a new (spawned) wireless ad hoc network, the transfer of data may not be possible for a short moment. If the wireless terminal has an application requiring a certain quality of service,
5 e.g. for a real time application, it should therefore eventually not be moved to the new wireless ad hoc network. If such a wireless terminal stays in the original wireless ad hoc network, the data transfer may not be interrupted, i.e. the quality of service can be assured even during a split of a network.

10 Fig. 3 shows a flow chart illustrating the process of splitting a wireless ad hoc network. In the original state S301 a wireless ad hoc network is established. In a following step S302 a wireless device (wireless terminal, WT) wants to set up a new connection. The wireless device therefore informs the central controller of the wireless ad hoc network about this desire to set up
15 a new connection.

In the next step S303 the wireless terminal that wants to set up a new connection gets the feedback from the central controller that the left amount of bandwidth is insufficient to establish the new connection. The central controller therefore checks thereafter in step S304 if another channel is
20 available. If this is not the case, the first final state S311 is reached which indicates that the application is not possible.

If another channel is available, in step S305, the central controller checks
25 if a network split is possible. Therefore, it is checked which devices of the network need to remain in the same wireless ad hoc network and which can be moved to the new wireless network. This means the above mentioned criteria are checked and two sets of wireless terminals are formed such that wireless terminals that cannot be separated according to the respective
30 criteria are kept within the same set, i.e. the same wireless network. It is then determined which wireless terminals are separated from the wireless ad hoc network to form a new wireless ad hoc network. (In the following these wireless terminals are referred to as splitting wireless terminals). If a network split is not possible, the first final state S311 is reached, i.e. the
35 application is not possible. If, however, in step S305, the central controller determines that a network split is possible, in step 306, all splitting wireless terminals are informed about the split. The splitting wireless terminals

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1 are provided with the following information:

5 - Each splitting wireless terminal is informed whether its role in the new wireless ad hoc network is the role of a regular wireless terminal or the role of the central controller of the new network.

- The splitting devices are also informed about the splitting time, i.e. the moment in time at which the split of the network will be performed.

10

- Further, the RF frequency of the new wireless ad hoc network is transmitted to the splitting device such that a splitting device may restart its wireless connections after the split at the indicated frequency.

15

In a following step S307 the radio link control (RLC) of all affected devices, i.e. all splitting devices, is stopped.

20 Thereafter, in step S308 the central controller then transfers all connection information to the central controller of the new wireless ad hoc network, and the new central controller of the new wireless ad hoc network activates the RLC of all devices in the new network at the splitting time in step S309. In a second final state S310 there then exists a new wireless ad hoc network under control of the new central controller. In parallel there exists a wireless network (original wireless ad hoc network) that comprises all wireless terminals that have not been moved to the new wireless ad hoc network and the original central controller. It may also comprise new wireless terminals.

30 Fig. 4A and 4B show another example of a wireless ad hoc network that is split up according to the invention. Here, the separation of wireless terminals is based on the connection type of the different wireless terminals, i.e. wireless terminals with the same connection type are preferably not separated into different ad hoc networks. In the example here, a connection type refers to a convergence layer in the sense of the HIPERLAN/2 standard. This means, wireless terminals with the same convergence layers are not separated. As mentioned above in HIPERLAN/2 networks, it is possible to

35

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1 have different convergence layers (CL) on top of the data link control (DLC)
layers and physical (PHY) layers. Specific convergence layers can be for ex-
ample Ethernet, IEEE1394, IP, ATM, or UMTS. This makes HIPERLAN/2 a
multi-network air interface. There may be exceptions, i.e. it may be possi-
5 ble that wireless terminals with the same connection type are admitted to
be separated. An exception is made, if the wireless terminals are not com-
municating with each other, i.e. they have no connections with each other.

Fig. 4A shows a second original wireless ad hoc network 400 before the se-
10 paration according to the invention. It comprises the first wireless terminal
WT1, the second wireless terminal WT2, the third wireless terminal WT3,
the fourth wireless terminal WT4, and the fifth wireless terminal WT5, and
the central controller CC. Further, it comprise a sixth wireless connection
4C13, a seventh wireless connection 4C2CC, an eighth wireless connection
15 4C35, and a ninth wireless connection 4C4CC. The first wireless terminal
WT1, the third wireless terminal WT3, and the fifth wireless terminal WT5
have wireless connections with the same first convergence layer CL-ID1, i.e.
the sixth wireless connection 4C13 and the eighth wireless connection
4C35 have the first convergence layer CL-ID1. The fourth wireless terminal
20 WT4 has a wireless connection with a different convergence layer, i.e. a se-
cond convergence layer CL-ID2. The second wireless terminal WT2 and the
central controller CC have the seventh wireless connection 4C2CC with
both convergence layers, i.e. the first convergence layer CL-ID1 and the se-
cond convergence layer CL-ID2. Now, the first wireless terminal WT1 wants
25 to setup a tenth wireless connection 4C15 with the first convergence layer
CL-ID1 with the fifth wireless terminal WT5 requiring a certain amount of
bandwidth. However, the left amount of bandwidth within the wireless net-
work is not sufficient. Therefore, according to the invention, the network is
split up, i.e. a new wireless ad hoc network is spawned. It should be men-
30 tioned again, that if the network would run according to state of the art
HIPERLAN/2 standard the setup of the tenth wireless connection 4C15
would fail, or if the network would run according to IEEE802.11 standard,
an application would not be possible...

35 The central controller CC now determines, which wireless terminals are
moved to the second new wireless ad hoc network and which remain in the
second original network. The two separated wireless networks can be seen

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1 in Fig. 4B. The wireless ad hoc network 4001 in Fig. 4B corresponds to the
second original wireless ad hoc network 400 of Fig. 4A, further a second
new wireless ad hoc network 4002 is spawned during the splitting process.
As mentioned above, in the example of Fig. 4A and 4B, the separation of wi-
5 reless terminals is based on connection type, i.e. on the respective conver-
gence layers. Since the first wireless terminal WT1, the third wireless ter-
minal WT3, and the fifth wireless terminal WT5 are communicating over wi-
reless connections with the same first convergence layer CL-ID1, these wi-
reless terminals are not separated. Further, the second wireless terminal
10 WT2, the fourth wireless terminal WT4 and the central controller CC have
connections with each other with the second convergence layer CL-ID2 and
are therefore not separated. As mentioned above, the second wireless termi-
nal WT2 and the central controller CC additionally have the second conver-
gence layer CL-ID1 on top of the seventh wireless connection 4C2CC.
15 However, they have no connection with the first wireless terminal WT1, the
third wireless terminal WT3, and the fifth wireless terminal WT5, and can
therefore be separated from these wireless terminals.

As can be seen in Fig. 4B, the tenth wireless connection 4C15 between the
20 fifth wireless terminal WT5 and the second new central controller CC2
(WT1) could now be established because of the split of the network there is
now enough bandwidth available. The second new central controller CC2 is
the original first wireless terminal WT1 of the second original wireless net-
work in Fig. 4A.

25 Fig. 5 shows a message sequence chart (MSC) for the ETSI BRAN HIPER-
LAN/2 standard for the separation (splitting) process according to the in-
vention. The MSC in Fig. 5 describes the separation process of the wireless
ad hoc network in Figs. 4A and 4B. The MSC in Fig. 5 shows the first wire-
less terminal WT1, the second wireless terminal WT2, the third wireless
30 terminal WT3, the fourth wireless terminal WT4, the fifth wireless terminal
WT5, and the central controller CC of the second original wireless ad hoc
network 400 of Fig. 4A.

35 In the initial state S501 the first wireless terminal WT1, the second wire-
less terminal WT2, the third wireless terminal WT3, the fourth wireless ter-
minal WT4, and the fifth wireless terminal WT5 are associated to the cen-

- 15 -

1 tral controller CC as shown in Fig. 4A. As mentioned above the first wire-
 less terminal WT1 now requires more bandwidth to set up the tenth wire-
 less connection 4C15 with the fifth wireless terminal WT5. Therefore, in
 step S502, the first wireless terminal WT1 sends the standard HIPERLAN/2
 5 message "RLC_Setup" to the central controller CC indicating the required
 setup of the new connection requiring more bandwidth. In the following
 step S503, the central controller CC sends back the HIPERLAN/2 standard
 command "RLC_Release: lack of resources" to the first wireless terminal
 WT1 indicating that no bandwidth is available to set up a new connection
 10 with the required amount of bandwidth. The lack of bandwidth causes the
 central controller CC to check if parts of the network can be separated to a
 new network. This means the above mentioned criteria are checked. In the
 present example the criteria for the separation are the convergence layers
 of the wireless terminals associated to the central controller CC. As ex-
 15 plained above with reference to the Figs. 4A and 4B, the first wireless ter-
 minal WT1, the third wireless terminal WT3, and the fifth wireless terminal
 WT5 have the same convergence layers and are therefore not separated and
 the second wireless terminal WT2, the fourth wireless terminal WT4, and
 the central controller CC are not separated.

20 Once, the central controller CC has determined that a split is possible and
 which wireless terminals are moved to the new wireless ad hoc networks
 (splitting wireless terminals), the central controller CC sends a command
 "Spawn_Network" to the splitting wireless terminals, here, the first wireless
 25 terminal WT1, the third wireless terminal WT3, and the fifth wireless termi-
 nal WT5. The command "Spwan_Network " is defined as follows:

SPAWN_NETWORK

30 functionality: a central controller (CC) informs wireless terminals (WTs) to
 change to a new wireless network

parameters:

channel	center frequency of the new network defines
CC_or_MT	role of the device in the new network (wireless terminal or new central controller)
35 start_mac_frame	defines point of time when devices belong to new network and are controlled by the new central controller CC.

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1 A wireless terminal that receives a command "Spawn_Network" from a central controller sends back a command "Spawn_Network_ack" to the central controller indicating whether it can change to the new network or not. The command "Spawn_Network_ack" is defined as follows:

5

SPAWN_NETWORK_ACK

functionality: wireless terminals acknowledge SPAWN_NETWORK command parameters:

10 ACCEPT_ACTION indicates if the wireless terminal can change to the new network or rejects the separation. The rejection lets the central controller look for new separation possibilities or cancel the separation process.

15 As soon as a command "Spawn_Network_ack" is sent out by a wireless terminal indicating that the wireless terminal can change to a new network (the parameter ACCEPT_ACTION is set accordingly), the wireless terminal stops its radio link control (RLC). When the time indicated by the command "start_mac_frame" arrives, the wireless terminal moves to the new network,
20 i.e. it sets all its parameters (e.g. frequency) according to the values indicated by the command "SPAWN_NETWORK". It then waits for a wake-up command "RLC_CC_START_OPERATION" sent out by the new central controller of the new wireless ad hoc network to actually start its RLC.

25 Now, in the example of Fig. 5, in step S504, the command "Spawn_Network" is sent to the first wireless terminal WT1. Since the first wireless terminal WT1 will become the second new central controller CC2, it is the designated central controller CC-CAND (central controller candidate) of the new wireless ad hoc network. Therefore, the parameter "CC_or_MT" of the command "Spawn_Network" indicates that the first wireless terminal WT1 becomes a central controller. In the following step S505 the first wireless terminal WT1 sends back the command "Spawn_Network_ack" to the central controller CC indicating that it can change to the new network and can be the central controller of the new network. Then, in step S506, the central controller sends the command "Spawn_Network" to the third wireless terminal WT3. Within this Spawn_Network command the parameter "CC_or_MT" indicates that the third wireless terminal WT3 remains a wireless terminal,
35

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1 i.e. does not become a central controller. Then, in step S507, the third wireless terminal WT3 sends back a command "Spawn_Network_ack" to the central controller CC indicating that it can change to the new network. In the following step, i.e. step S508, the central controller CC sends the command "Spawn_Network" to the fifth wireless terminal WT5. The parameter "CC_or_MT" again indicates that the fifth wireless terminal WT5 remains a wireless terminal in the new network. The fifth wireless terminal WT5 sends back the command "Spawn_Network_ack" in step S509 to the central controller CC indicating that it can change to the new network.

10

As mentioned above, when a wireless terminal sends out a command "Spawn_Network_ack" it stops its RLC. Therefore, in the respective steps S505, S507, and S509 the first wireless terminal WT1, the third wireless terminal WT3, and the fifth wireless terminal WT5 stopped their RLC. Therefore, in the internal state S510 the RLC of the affected devices, i.e. the first wireless terminal WT1, the third wireless terminal WT3, and the fifth wireless terminal WT5 are stopped.

15

Thereafter, in step S511, the central controller CC sends out the HIPERLAN/2 standard command "RLC_TRANS_CC_DATA" to the central controller candidate CC-CAND of the second new wireless ad hoc network (the first wireless terminal WT1). With this command the central controller CC transmits all connection-relevant data to the first wireless terminal WT1 (central controller candidate CC-CAND of the second new network). It is therefore possible to maintain all direct link connections that shall be moved to the new network without the need of a new setup procedure. After the central controller candidate CC-CAND of the new network, here the first wireless terminal WT1, is aware of all network-relevant data it sends the standard HIPERLAN/2 command "RLC_CC_START_OPERATION" to all wireless terminals of the new network. Besides other information within the command "RLC_CC_START_OPERATION" also a time stamp is transmitted indicating at which time the wireless terminal that receives the command may start its RLC. This way, all wireless terminals of the new network start their RLC at the same moment in time.

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In the next step, i.e. in step S512, the central controller candidate CC-CAND (WT1) sends a command "RLC_TRANS_DATA_ACK" of the HIPERLAN/

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1 2 standard to the central controller to acknowledge the reception of the
command "RLC_TRANS_CC_DATA".

5 In the following step S513, the central controller candidate CC_CAND (WT1)
sends the HIPERLAN/2 standard command "RLC_CC_START_OPERATION"
to the third wireless terminal WT3. In step S514 the central controller can-
didate CC_CAND (WT1) then sends the HIPERLAN/2 standard command
"RLC_CC_START_OPERATION" to the fifth wireless terminal WT5.

10 In step S515, when the time indicated by the time stamps of the commands
"RLC_CC_START_OPERATION" transmitted to the third wireless terminal
WT3 and the fifth wireless terminal WT5 in steps S513 and S514 arrives,
the RLC of the third wireless terminal WT3 and the fifth wireless terminal
WT5 and the RLC of the second new central controller CC2, i.e. CC-CAND
15 (WT1), are enabled.

In the final state S516 the separation process is finished and the second
new wireless ad hoc network is running as shown in Fig. 4B.

20 In the following the invention is summarized:
A first wireless ad hoc network with a certain available amount of band-
width comprises a plurality of wireless terminals communicating via wire-
less connections with each other. Each wireless connection requires a cer-
tain amount of the available amount of bandwidth. A problem occurs, if a
25 wireless terminal wants to set up a new wireless connection requiring
bandwidth or requires more bandwidth for an existing wireless connection
and the required amount of bandwidth exceeds the left amount of the
available amount of bandwidth of the first wireless ad hoc network. In a
state of the art wireless ad hoc network the requested bandwidth cannot be
30 provided and a user application may not be possible. According to the in-
vention, however, the required amount of bandwidth can be provided by
splitting the first wireless ad hoc network such that a second wireless ad
hoc network is spawned which operates in a different communication chan-
nel and thus provides additional bandwidth. The second wireless ad hoc
35 network comprises wireless terminals of the first wireless ad hoc network
and/or new wireless terminals.

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1

Claims

1. A method to provide additional bandwidth for a wireless ad hoc network operating in a certain communication channel with a certain amount of available bandwidth comprising a plurality of wireless terminals, **characterized in that**
- 5 - said wireless ad hoc network is split up such that at least one new wireless ad hoc network is spawned, if more bandwidth than said certain amount of available bandwidth is required by said plurality of wireless terminals,
- 10 - wherein after the split of said wireless ad hoc network at least one wireless terminal of said wireless ad hoc network and/or one or more new wireless terminals belong(s) to said at least one new wireless ad hoc network, and
- 15 - said at least one new wireless ad hoc network is operating in a respective different communication channel,
- wherein the decision which of said wireless terminals of said wireless ad hoc network and/or which of said at least one wireless terminal are moved to said at least one new wireless ad hoc network is based on certain
- 20 separation criteria,
- which certain separation criteria assure that wireless terminals that
- have the same convergence layers, and/or
 - are of the same application layer, and/or
 - have the same connection, and/or
 - provide the same or corresponding functions
- 25 are not separated into different wireless ad hoc networks.
2. The method according to claim 1, **characterized in that**
- said wireless ad hoc network and the splitting of said wireless ad hoc network are controlled by a central controller of said wireless ad hoc network that decides which wireless terminals of said wireless ad hoc network and/or which new wireless terminals are moved to said at least one new wireless ad hoc network,
- 30 wherein the decision is based on said certain separation criteria, and
- 35 said central controller determines a new central controller for said at least one new wireless ad hoc network.

- 20 -

1 3. The method according to claim 1 or 2, **characterized in that**
 said wireless ad hoc network and said at least one new wireless ad
 hoc network are operated according to the IEEE802.11 or ETSI BRAN HI-
 PERLAN/2 standard.

5 4. The method according to anyone of the preceding claims, **characterized in that**

 said certain separation criteria assure that wireless terminals with
 certain connections that should not be interrupted are not moved to said
10 at least one new wireless ad hoc network.

5. The method according to anyone of the preceding claims, **characterized by**

 providing new commands in order to spawn said at least one new wi-
15 reless ad hoc network,

 wherein a requesting command (SPAWN_NETWORK) is sent to a re-
 quest wireless terminal to ask this request wireless terminal to move to
 said at least one new ad hoc wireless network,

 and a confirmation command (SPAWN_NETWORK_ACK) is used by a
20 request wireless terminal to signal that it can move to said at least one
 new ad hoc wireless network.

6. The method according to claim 5, **characterized in that**

 a wireless terminal stops using its entire wireless connections the
25 moment it sent out said confirmation command (SPAWN_NETWORK_ACK),

 moves to one of said at least one new wireless ad hoc network,

 waits until it receives a start command (RLC_CC_START_OPERA-
 TION) sent out by a central controller, and

 then starts using its wireless connections according to the informa-
30 tion provided by said start command (RLC_CC_START_OPERATION).

7. A wireless terminal of a wireless ad hoc network controlled by a cen-
 tral controller of said wireless ad hoc network **characterized by**

 a receiving means adapted to receive a requesting command
35 (SPAWN_NETWORK) from the central controller indicating certain opera-
 ting conditions for the wireless terminal,

 a condition checking means to check if the wireless terminal can be

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- 1 operated under said certain conditions, and
a sending means that sends out a confirmation command
(SPAWN_NETWORK_ACK), if the condition checking means determines
that the wireless terminal can be operated under said certain conditions.
- 5
8. The wireless terminal according to claim 7, **characterized in that**
said certain conditions define
if said wireless terminal can operate as a central controller of a wire-
less ad hoc network,
10 a certain communication channel at which said wireless terminal is
able to operate, and/or
a moment in time at which said wireless terminal shall operate in
said certain communication channel and at which it may be controlled by
a different central controller.
- 15
9. A central controller of a wireless ad hoc network comprising a plura-
lity of wireless terminals, **characterized by**
a splitting means that controls the splitting of said wireless ad hoc
network, wherein a new wireless ad hoc network is spawned that compri-
20 ses at least one of said plurality of wireless terminals and/or one or more
new wireless terminals.
10. The central controller according to claim 10, **characterized in that**
the splitting means comprises
25 a sending means that sends out requesting commands (SPAW-
N_NETWORK) to wireless terminals,
a receiving means that receives confirmation commands
(SPAWN_NETWORK_ACK), and
an operating means that decides which of said plurality of wireless
30 terminals and/or of said new wireless terminals may be moved to said new
wireless ad hoc network and determines a wireless terminal of said plura-
lity of wireless terminals and/or of said new wireless terminals that beco-
mes the central controller of said new wireless ad hoc network.
- 35
11. A wireless ad hoc network comprising
a plurality of wireless terminals according to claim 7 or 8, and
a central controller according to claim 9 or 10.

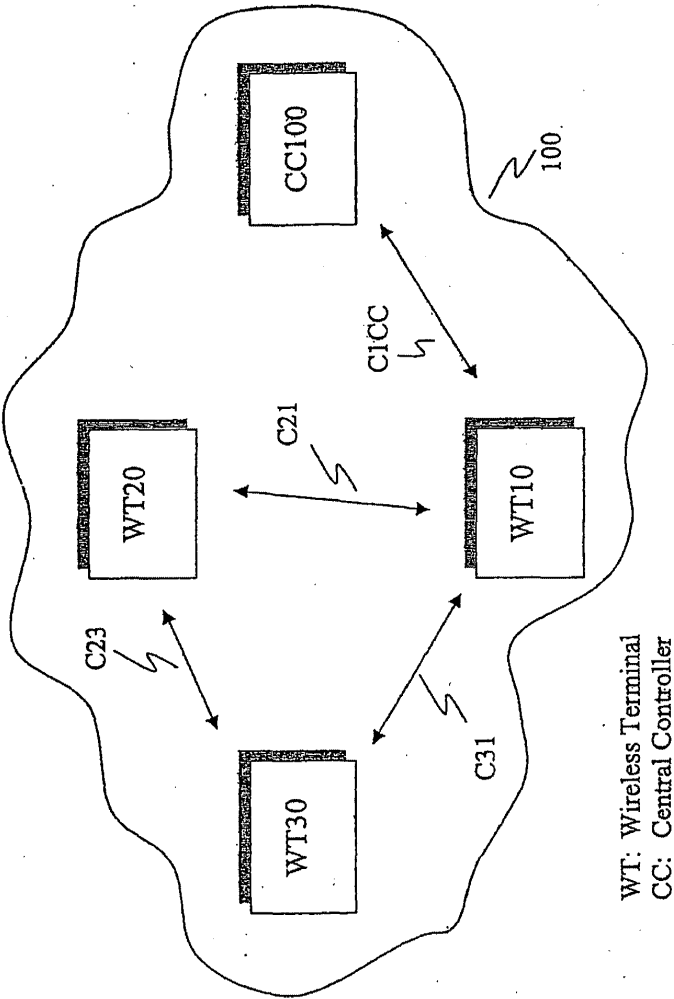


Figure 1

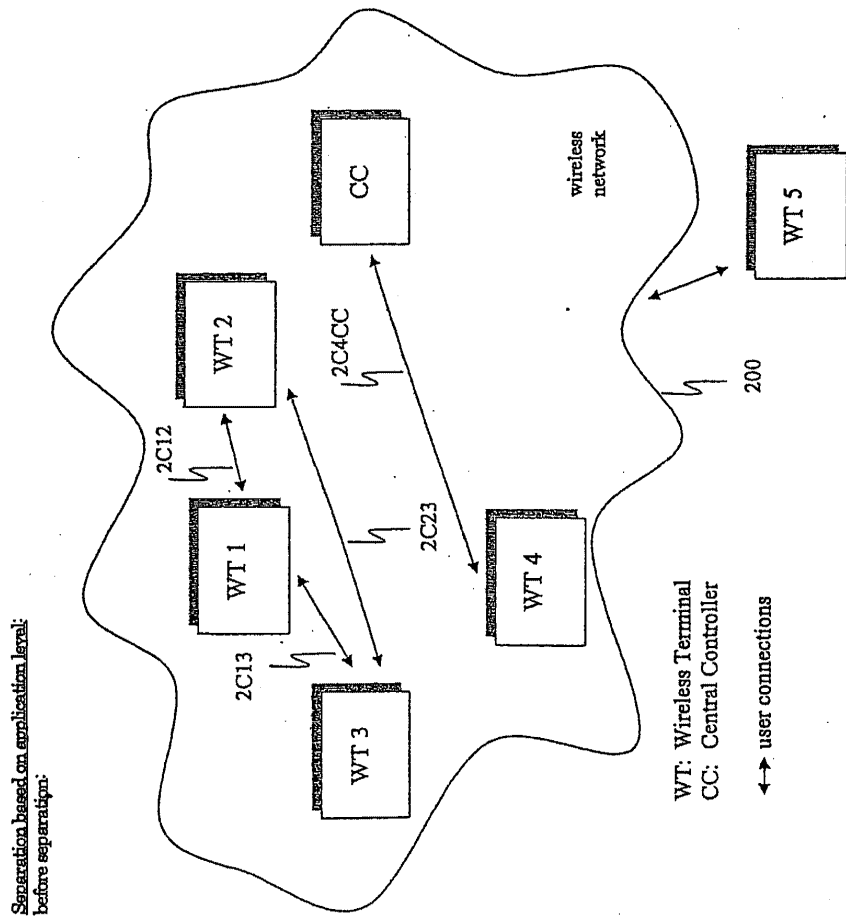


Figure 2A

3/7

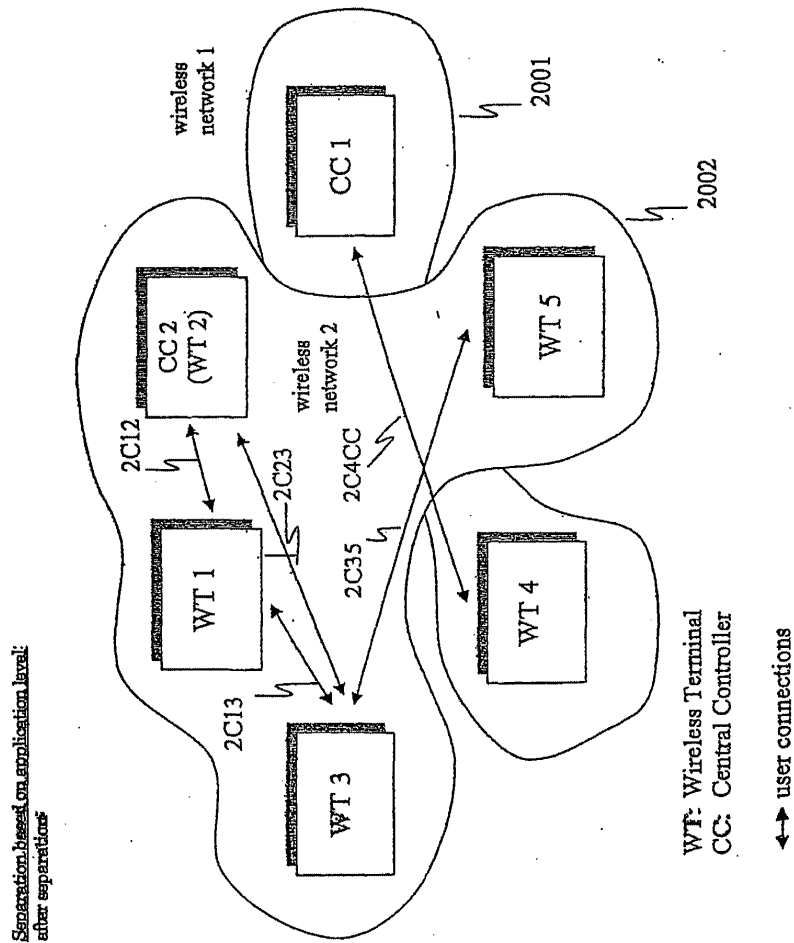


Figure 2B

4/7

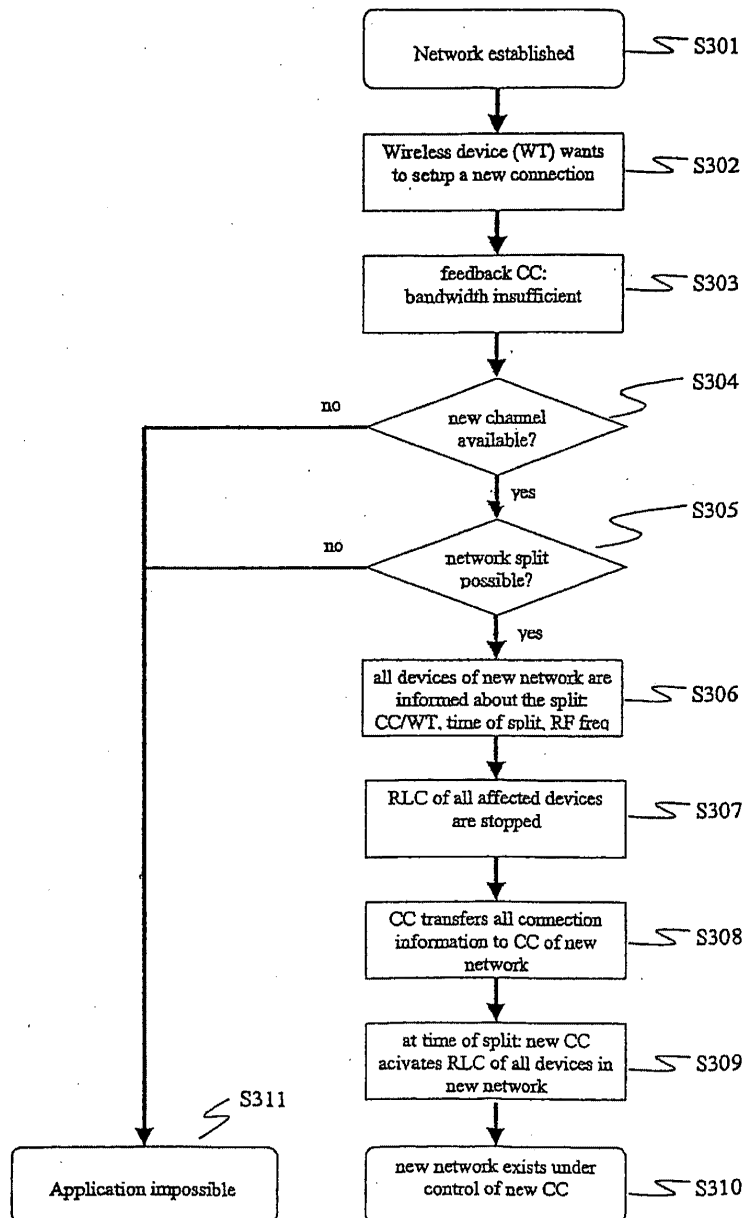


Figure 3

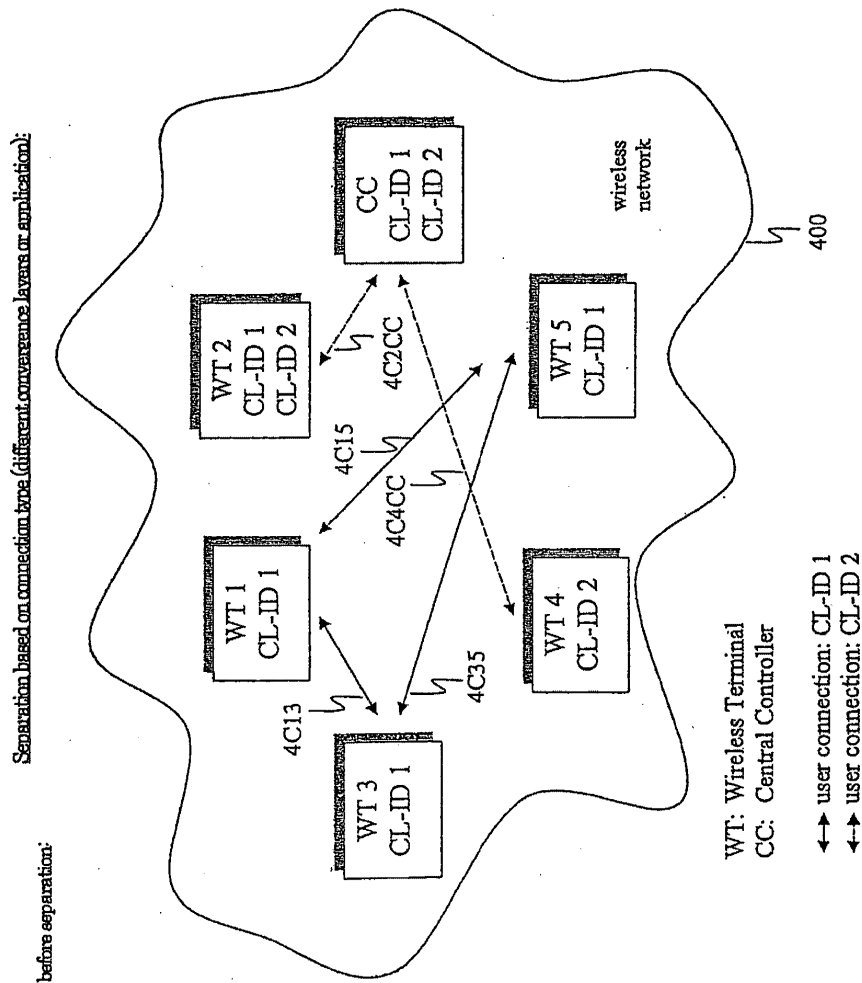


Figure 4A

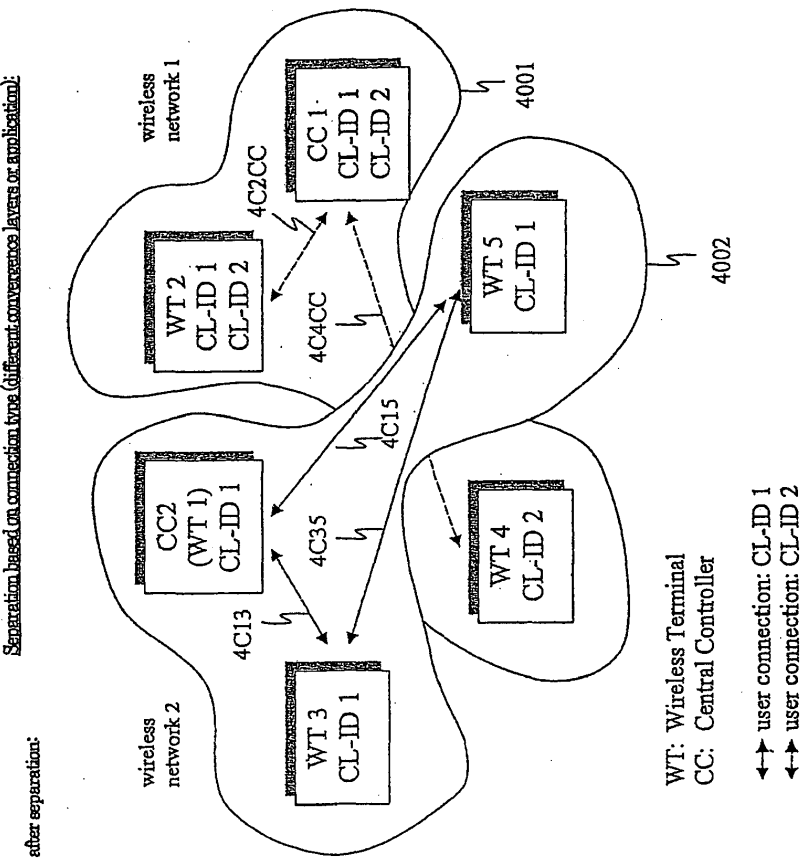
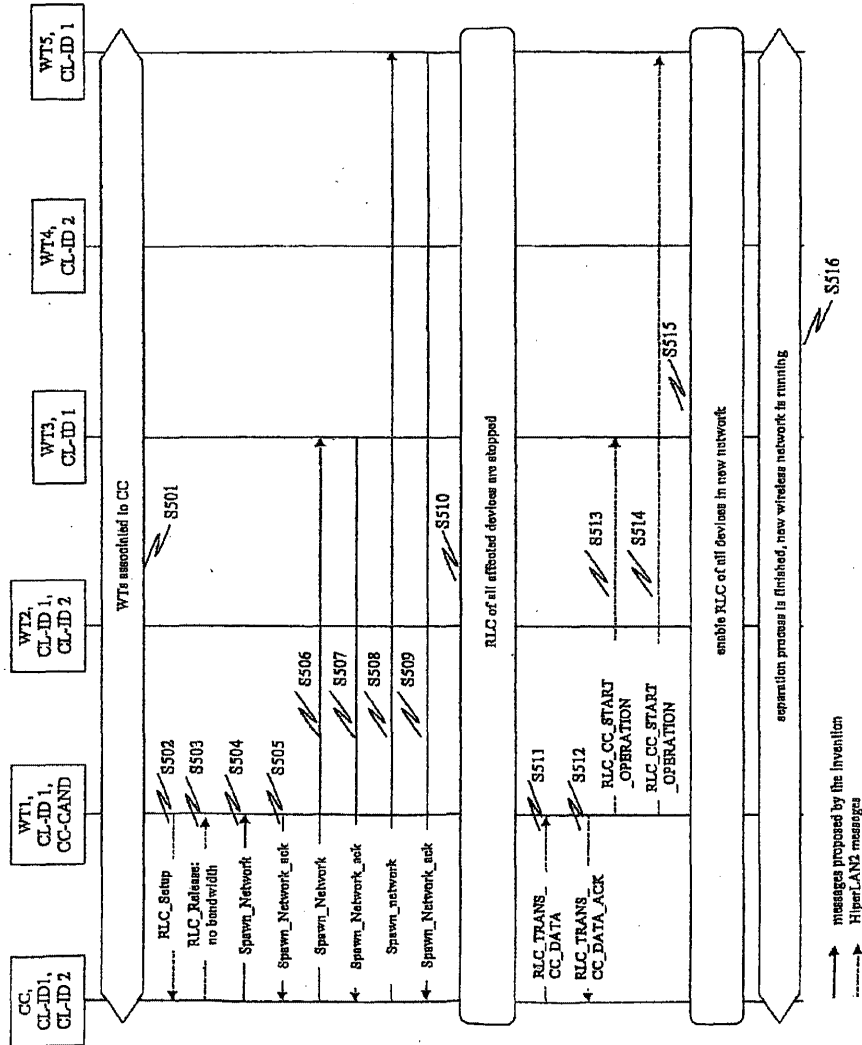


Figure 4B

7/7

Figure 5



INTERNATIONAL SEARCH REPORT

International Application No.

PCT/EP 03/09062

A. CLASSIFICATION OF SUBJECT MATTER

IPC 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)

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

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X A	DE 100 53 809 A (PHILIPS CORP INTELLECTUAL PTY) 8 May 2002 (2002-05-08) column 1, line 1 - line 37 column 2, line 55 - line 67 column 3, line 9 - line 65 column 4, line 5 - line 60 column 7, line 5 - line 39	1-4,7-11 5,6
X A	WO 99 14897 A (ERICSSON TELEFON AB L M) 25 March 1999 (1999-03-25) page 1, line 1 - line 18 page 3, line 3 - line 22 page 5, line 13 -page 6, line 5 page 15, line 14 -page 16, line 5 page 23, line 6 - line 23	1-4,7-11 5,6
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☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

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Date of the actual completion of the international search

17 November 2003

Date of mailing of the international search report

25/11/2003

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INTERNATIONAL SEARCH REPORT

International Application No.

PCT/EP 03/09062

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	<p>VILLELA D ET AL: "Virtuosity: Programmable resource management for spawning networks" COMPUTER NETWORKS, ELSEVIER SCIENCE PUBLISHERS B.V., AMSTERDAM, NL, vol. 36, no. 1, June 2001 (2001-06), pages 49-73, XP004304884 ISSN: 1389-1286 abstract page 49, left-hand column, line 1 -page 52, left-hand column, line 30 page 55, right-hand column, line 34 -page 56, left-hand column, line 36 page 58, left-hand column, line 1 -page 61, left-hand column, line 30</p>	1-11
A	<p>CAMPBELL A T ET AL: "SPAWNING NETWORKS" IEEE NETWORK, IEEE INC. NEW YORK, US, July 1999 (1999-07), pages 16-29, XP000875025 ISSN: 0890-8044 abstract page 16, right-hand column, line 19 -page 17, right-hand column, line 34 page 18, right-hand column, line 53 -page 19, right-hand column, line 34 page 20, right-hand column, line 36 -page 21, left-hand column, line 40 page 24, right-hand column, line 12 -page 26, left-hand column, line 36 page 27, left-hand column, line 56 -right-hand column, line 2</p>	1-11
A	<p>US 2002/018448 A1 (AMIS ALAN DEWAYNE ET AL) 14 February 2002 (2002-02-14) page 1, paragraphs 2,4 page 3, paragraph 44 page 6, paragraph 108</p>	1-11

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INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No.

PCT/EP 03/09062

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
DE 10053809	A	08-05-2002	DE 10053809 A1	08-05-2002
			AU 1057202 A	15-05-2002
			CN 1394419 T	29-01-2003
			WO 0237770 A2	10-05-2002
			EP 1249106 A2	16-10-2002
			US 2002194384 A1	19-12-2002
WO 9914897	A	25-03-1999	US 6590928 B1	08-07-2003
			AU 756518 B2	16-01-2003
			AU 9099498 A	05-04-1999
			BR 9812226 A	18-07-2000
			CA 2304189 A1	25-03-1999
			CN 1278974 T	03-01-2001
			EE 200000166 A	16-04-2001
			EP 1016241 A2	05-07-2000
			JP 2001517021 T	02-10-2001
			NO 20001378 A	12-05-2000
			RU 2201034 C2	20-03-2003
			WO 9914897 A2	25-03-1999
US 2002018448	A1	14-02-2002	NONE	

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UTILITY PATENT APPLICATION TRANSMITTAL <small>(Only for new nonprovisional applications under 37 CFR 1.53(b))</small>	Attorney Docket No.	DACOSTAF.PT1
	First Inventor	Francis daCosta
	Title	High Performance Wireless Networks Using ...
	Express Mail Label No.	EL046701720US

APPLICATION ELEMENTS <small>See MPEP chapter 600 concerning utility patent application contents.</small>	ADDRESS TO: Assistant Commissioner for Patents Box Patent Application Washington, DC 20231
<p>1. ☒ Fee Transmittal Form (e.g., PTO/SB/17) <small>(Submit an original and a duplicate for fee processing)</small></p> <p>2. ☒ Applicant claims small entity status. See 37 CFR 1.27.</p> <p>3. ☒ Specification <small>[Total Pages 67]</small> <small>(preferred arrangement set forth below)</small></p> <ul style="list-style-type: none">- Descriptive title of the invention- Cross Reference to Related Applications- Statement Regarding Fed sponsored R & D- Reference to sequence listing, a table, or a computer program listing appendix- Background of the Invention- Brief Summary of the Invention- Brief Description of the Drawings (if filed)- Detailed Description- Claim(s)- Abstract of the Disclosure <p>4. ☒ Drawing(s) (35 U.S.C. 113) <small>[Total Sheets 14]</small></p> <p>5. Oath or Declaration <small>[Total Pages 4]</small></p> <p>a. ☒ Newly executed (original or copy)</p> <p>b. ☐ Copy from a prior application (37 CFR 1.63 (d)) <small>(for continuation/divisional with Box 18 completed)</small></p> <p>i. ☐ DELETION OF INVENTOR(S) <small>Signed statement attached deleting inventor(s) named in the prior application, see 37 CFR 1.63(d)(2) and 1.33(b).</small></p> <p>6. ☐ Application Data Sheet. See 37 CFR 1.76</p> <p>7. ☐ CD-ROM or CD-R in duplicate, large table or Computer Program (Appendix)</p> <p>8. Nucleotide and/or Amino Acid Sequence Submission (if applicable, all necessary)</p> <p>a. ☐ Computer Readable Form (CRF)</p> <p>b. Specification Sequence Listing on:</p> <p>i. ☐ CD-ROM or CD-R (2 copies); or</p> <p>ii. ☐ paper</p> <p>c. ☐ Statements verifying identity of above copies</p>	
ACCOMPANYING APPLICATION PARTS	
<p>9. ☐ Assignment Papers (cover sheet & document(s))</p> <p>10. ☐ 37 CFR 3.73(b) Statement ☒ Power of Attorney <small>(when there is an assignee)</small></p> <p>11. ☐ English Translation Document (if applicable)</p> <p>12. ☐ Information Disclosure Statement (IDS)/PTO-1449 ☐ Copies of IDS Citations</p> <p>13. ☐ Preliminary Amendment</p> <p>14. ☒ Return Receipt Postcard (MPEP 503) <small>(Should be specifically itemized)</small></p> <p>15. ☐ Certified Copy of Priority Document(s) <small>(if foreign priority is claimed)</small></p> <p>16. ☐ Nonpublication Request under 35 U.S.C. 122 (b)(2)(B)(i). Applicant must attach form PTO/SB/35 or its equivalent.</p> <p>17. ☐ Other: _____</p>	

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Prior application information:

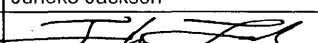
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FEE TRANSMITTAL
for FY 2003

Effective 01/01/2003. Patent fees are subject to annual revision.

☒ Applicant claims small entity status. See 37 CFR 1.27

TOTAL AMOUNT OF PAYMENT (\$ 393

Complete if KnownApplication Number
Filing Date
First Named Inventor Francis daCosta
Examiner Name
Art Unit
Attorney Docket No. DACOSTAF.PT1**METHOD OF PAYMENT** (check all that apply)☒ Check ☐ Credit card ☐ Money Order ☐ Other ☐ None☒ Deposit Account:

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1001 750	2001 375	Utility filing fee	375.00
1002 330	2002 165	Design filing fee	
1003 520	2003 260	Plant filing fee	
1004 750	2004 375	Reissue filing fee	
1005 160	2005 80	Provisional filing fee	

SUBTOTAL (1) (\$ 375.00

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Total Claims	Extra Claims	Fee from below	Fee Paid
22	-20** = 2	X 9	= 18
3	-3** = 0	X	=
Multiple Dependent			= 18

Large Entity Fee Code (\$)	Small Entity Fee Code (\$)	Fee Description
1202 18	2202 9	Claims in excess of 20
1201 84	2201 42	Independent claims in excess of 3
1203 280	2203 140	Multiple dependent claim, if not paid
1204 84	2204 42	** Reissue independent claims over original patent
1205 18	2205 9	** Reissue claims in excess of 20 and over original patent

SUBTOTAL (2) (\$ 18.00

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FEE CALCULATION (continued)**3. ADDITIONAL FEES**

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1052 50	2052 25	Surcharge - late provisional filing fee or cover sheet	
1053 130	1053 130	Non-English specification	
1812 2,520	1812 2,520	For filing a request for <i>ex parte</i> reexamination	
1804 920*	1804 920*	Requesting publication of SIR prior to Examiner action	
1805 1,840*	1805 1,840*	Requesting publication of SIR after Examiner action	
1251 110	2251 55	Extension for reply within first month	
1252 410	2252 205	Extension for reply within second month	
1253 930	2253 465	Extension for reply within third month	
1254 1,450	2254 725	Extension for reply within fourth month	
1255 1,970	2255 985	Extension for reply within fifth month	
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1402 320	2402 160	Filing a brief in support of an appeal	
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1451 1,510	1451 1,510	Petition to institute a public use proceeding	
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1453 1,300	2453 650	Petition to revive - unintentional	
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1503 630	2503 315	Plant issue fee	
1460 130	1460 130	Petitions to the Commissioner	
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1806 180	1806 180	Submission of Information Disclosure Stmt	
8021 40	8021 40	Recording each patent assignment per property (times number of properties)	
1809 750	2809 375	Filing a submission after final rejection (37 CFR 1.129(a))	
1810 750	2810 375	For each additional invention to be examined (37 CFR 1.129(b))	
1801 750	2801 375	Request for Continued Examination (RCE)	
1802 900	1802 900	Request for expedited examination of a design application	

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SUBMITTED BY

Name (Print/Type) Juneko Jackson

Registration No. (Attorney/Agent)

48,870

(Complete if applicable)

Telephone 408-286-8933

Signature

Date

May 8, 2003

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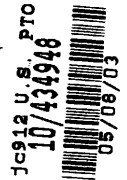
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May 8, 2003

VIA EXPRESS MAIL
EL046701720US

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

Re: NEW UTILITY NON-PROVISIONAL PATENT APPLICATION
Title: "High Performance Wireless Networks Using Distributed Control"
Inventors: Francis daCosta and Sriram Dayanandan
Priority Serial no.: 60/421,930
Priority filing date: 10/28/2002
Our File No.: DACOSTAF.PT1

Dear Sir:

Transmitted herewith is the utility non-provisional patent application of inventors, Francis daCosta and Sriram Dayanandan, for the above-entitled invention.

Please find enclosed the following:

1. a cover letter;
2. a utility transmittal letter;
3. a fee transmittal;
4. an application of a total of 67 pages: including a written description (30 pages), a set of claims (4 pages), an abstract (1 page), an Appendix A (12 pages), an Appendix B (20 pages);
5. a set of drawings (14 sheets);
6. a signed joint declaration/power of attorney by the inventor;
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**HIGH PERFORMANCE WIRELESS NETWORKS
USING DISTRIBUTED CONTROL**

Inventors: Francis daCosta and Sriram Dayanandan

5 CROSS-REFERENCE

[0001] This application claims the benefit of priority from U.S. Provisional Application No. 60/421,930, filed October 28, 2002, which is herein incorporated by reference. This application also incorporates by reference, applicant's invention disclosure document no. 527186.

10

FIELD OF THE INVENTION

[0002] The present invention describes an adaptive software layer for a distributed set of wireless communication devices that communicate with each other in a wireless network. The software control layer addresses low latency requirements (for applications such as

15 voice) and high throughput requirements (for applications involving data transfer). One embodiment of the present invention provides the software control for wireless (devices, such as, but not limited to Access Points, employed in a convergent enterprise network supporting voice, video and data. A topical application of the software control layer is a home or personal networking environment (PAN) using Ultra Wide Band or Wi-Fi as the

20 communications medium. Another topical application of the adaptive software control layer is extending wireless communication range using mesh networks for Metropolitan Area Networks (MAN). Lastly, the software control layer is also relevant to both home and enterprise Wireless Local Area Networks (WLANS),

25 BACKGROUND OF THE INVENTION

[0003] There is increasing demand within the enterprise, the home and within cities to employ one wireless network to support both voice, video and data traffic. Currently, the "voice" network, e.g. the telephone system, is separate from the "data" network e.g. Internet connectivity and access to enterprise data over a Local Area Network (LAN). Convergence

is, as the name implies, the ability to converge these two networks into one network, centrally managed by one access server servicing a network of relay and leaf nodes.

[0004] The challenge lies in providing - within the same wireless network - the ability to address potentially conflicting latency and throughput needs of diverse applications. For example, voice needs to be transmitted with low delay (latency). Occasionally lost voice packets, while undesirable, is not fatal for voice transmissions. Conversely, data transmissions mandate delivery of all packets and while low latency is desirable it is not essential. In essence transmission across the wireless network should ideally be driven by the needs of the application. The table below lists some types of applications and their latency requirements.

<u>Delivery Type</u>	<u>Description</u>
Asynchronous	No constraints on delivery time ("elastic"): e.g. email
Synchronous	Data is time-sensitive, but requirements flexible in terms of delays
Interactive	Delays noticeable but not adversely affecting usability or functionality
Isochronous	Time-sensitive: delays adversely affect usability. E.g. voice/video
Mission critical	Data delivery delays disables functionality

[0005] A wireless network provides service to a diverse set of applications, with varied latency requirements. One approach to make dumb wireless devices, that are nodes of the network, more application aware by implementing QoS (Quality of Service) reservation schemes dictated by the application server.

[0006] Changing the rate the queue is serviced can also be accomplished by specialized communications between wireless communication devices such as Access Point (AP) nodes and the access server to ensure that voice and data, for example, are serviced at different time intervals. Unfortunately, this adversely affects scalability and redundancy of the system: the access server is now micromanaging the network and has become a single point of failure. A paramount concern of any network is distributed control, especially a network handling voice, video and data.

[0007] Another shortcoming of a centralized approach – central control and central execution - is the cost of maintaining a central control point with all intelligence and control at one location and dumb communication devices distributed in the enterprise. The cost of the central control point is high, , and the dumb access points are not any less expensive than smart access points – since the smarts is in the software. Thus a distributed approach is far less expensive –. In addition to being more cost effective a distributed approach is more fault tolerant and has built in fail-safe redundancy. The only way to get redundancy out of centralized approaches is to buy multiple central control points – an expensive approach.

[0008] Building a reliable wireless network comes with other constraints specific to wireless. Some routing paths may be best for voice and video, others for data. In Ethernet applications separate routing paths is easily accomplished. But in a wireless network, operating over radio, the cost of associating and disassociating with a relay node - to switch to new routing paths - is prohibitive. Multiple radios, supporting separate voice and data channels is possible but expensive. It is preferable, therefore, if each AP node can support both voice and data transmissions with a one “channel”.

[0009] Furthermore, mesh networks have been around for years now, the Internet being an excellent example. Routers exchange information about each other and build up their routing tables, and use the entries in the routing table to make routing decisions. Although they work, these algorithms are sub-optimal at best and are more oriented towards wired or wire-like interfaces, which are exclusive “non-shared” communication mediums. Wireless Personal Area Networks (WPANs) pose an entirely different set of challenges for AD-HOC networks because of the following reasons: shared non exclusive medium with finite communication channels; dynamically changing environment; shorter distances; used by resource constrained low power devices. There is therefore a need for an approach to solving these sets of challenges, using a low footprint distributed adaptive control layer that is aware of the above set of problems.

SUMMARY OF THE INVENTION

[0010] Accordingly, there is a need for, and an objective of the present invention, to develop an adaptive wireless network, based on “smart” communication devices such as Access Points (AP) that provide embedded intelligence at the edge of the network, are application aware and provide cost effective distributed sensing and control of the network. An additional objective of this invention is to allow the characteristics of the network to be set by a centralized access server, which can thus “tune” the character of the network to be anything between the two extremes of low latency to high throughput, based on the needs of applications running in the enterprise. The invention also supports the possibility of running multiple types of networks supporting anything between the two extremes of low latency and high throughput, using multiple radios at each node for each distinct type of network.

[0011] As an illustration of central control but distributed intelligence, consider **Fig. 1**, where the star network depicted has low latency (See **Fig. 1B** for the latency in the status panel). However, since the signal strength varies inversely with the distance from the Access Point, as shown in **Fig. 1A** in the look up table (control panel) on the top left corner, the price is poor throughput. If all devices are required to connect directly to the root node as shown, regardless of their distance from the root node, then the overall throughput of the network can be low.

[0012] Since the signal strength varies inversely with the distance, it may be advantageous, from the perspective of better signal strength and overall better throughput for some AP nodes to connect to an intermediate AP rather than to the root, as shown in **Fig. 2C**. In **Fig. 2**, the throughput of the network has increased, see **Fig. 2B**, because two nodes are connecting to other nodes (relays) with an overall increased throughput from 44.1 to 62.2. (See **Figs. 1B and 2B**).

[0013] The number 44.1 is a measure of the throughput computed based on the look up table shown in **Figs. 1 and 2** where distance from the root causes a rapid decrease in throughput. The throughput is expressed as a percentage, where a connection to the root at zero distance would be the maximum possible throughput: 100%.

[0014] While the throughput increased to 62.2, the tradeoff is more hops, resulting in a loss of latency for higher throughput. In **Fig. 2**, the latency has increased as a measure of the number of hops from an Access Point (AP) to the root node. It is 1.6, since some nodes
5 now are 2 hops away from the root node.

[0015] The objective of this invention is to allow the Access Server to set some latency/throughput constraints that causes each AP node to change their relationships to each other and consequently the character of the network. Control parameters, set by an access
10 server can then tune the wireless network to provide a mix between the two extremes of max throughput and low latency. As shown in **Fig. 3**, parameters set by the access server cause the network to self configure providing an average latency to 1.3 from 1.6. (See **Figs. 3B and 2B**). Even though the throughput has reduced from 62.2 to 57.0%, it is still better than 44.1, the case in **Fig. 1**.

[0016] The approach taken to modify the network is completely decentralized - the changes in the network take place with algorithms running in each AP node. The Access Server does not change the characteristics of each node, it simply sets the parameters governing the characteristic of the network – and let the AP nodes reconfigure their
20 relationships to meet the objectives set by the Access Server. Thus the Access Server can control the behavior of the network without necessarily controlling the behavior of each node of the network. Benefits of this approach include a highly scaleable, redundant wireless network. Some other benefits include:

1. Installs out of the box. No site survey or installation involved, since system self
25 configures
2. Network is redundant. Mesh network formalism is supported, ensuring multiple paths.
3. Load balancing supported: Network nodes reroute data to avoid load-congested nodes.
4. No single point of failure. If a node “dies”, another optimal routing path is selected
5. Decentralized execution: Algorithms controlling the network nodes resident in every
30 node.
6. Central control: Setting system level “tuning” parameters changes network configuration

7. Network application aware: latency/throughput profiles defined in the access server
8. Application awareness: Based on the application profile in the access server, the network configures itself to satisfy all application requirements as best as possible.
9. Network is very scaleable – since execution is completely decentralized

5

[0017] Uses of a self configuring application aware wireless network range from providing voice/data access to warehouses, factory floors, communications with process control equipment to home networking applications involving voice/data/video streaming. Some applications under consideration include:

- 10 • Monitoring process control equipment with a Publish/Subscribe Stream server built on top of the wireless network. Examples include chemical plants, medical devices, industrial controls.
- Voice over IP (VOIP) based low cost communication devices for mobility within enterprises
- 15 • Video streaming over wireless for remote surveillance.

- [0018]** Furthermore, another object of the embodiment of the present invention, is to solve the problems associated with ad-hoc wireless personal area networks by using a low footprint distributed adaptive control layer with algorithm that is aware of such problems
- 20 (e.g. shared non exclusive medium with finite communication channels; dynamically changing environment; shorter distances; used by resource constrained low power devices).

- [0019]** These and other embodiments of the present invention are further made apparent, in the remainder of the present document, to those of ordinary skill in the art.

25

BRIEF DESCRIPTION OF DRAWINGS

- [0020]** In order to more fully describe embodiments of the present invention, reference is made to the accompanying drawings. These drawings are not to be considered limitations in the scope of the invention, but are merely illustrative.

30

[0021] FIG. 1 illustrates a wireless network in star configuration, with low latency but poor throughput according to an embodiment of the present invention; Fig. 1A illustrates the control panel; Fig. 1B illustrates the status panel and Fig. 1C illustrates the wireless network.

5

[0022] FIG. 2 illustrates a wireless network with improved throughput but poor latency according to an embodiment of the present invention; Fig. 2A illustrates the control panel; Fig. 2B illustrates the status panel and Fig. 2C illustrates the wireless network.

10 **[0023]** FIG. 3 shows the result of how wireless network self configures to meet Access Server requirements according to an embodiment of the present invention; Fig. 3A illustrates the control panel; Fig. 3B illustrates the status panel and Fig. 3C illustrates the wireless network.

15 **[0024]** FIG. 4A indicates terminology for variables used by parent selection and load balancing algorithms according to an embodiment of the present invention.

[0025] FIG. 4B illustrates Routing paths selected for maximizing throughput according to an embodiment of the present invention.

20

[0026] FIG. 5 illustrates Routing paths selected for low latency according to an embodiment of the present invention.

25 **[0027]** FIG. 6 illustrates how progressively changing the latency cost factor affects the network configuration according to an embodiment of the present invention.

[0028] FIG. 7 illustrates how node increases its Cost of connectivity from 0 to 3 to reduce congestion according to an embodiment of the present invention.

30 **[0029]** FIG. 8 illustrates how progressively increasing the cost of connectivity causes children to seek other routes according to an embodiment of the present invention.

[0030] FIG. 9 shows the modeling of both the DCF and PCF algorithms described, based on 802.11X specifications according to an embodiment of the present invention.

5 [0031] FIG. 10 illustrates how the worst timing constraint for an Isochronous PCF mode would be 5T according to an embodiment of the present invention.

[0032] FIG. 11 shows the Key distribution for AES symmetric private key distribution under PKI for distribution according to an embodiment of the present invention.

10 [0033] FIG. 12 illustrates ACG RTOS running algorithms in Intel PXA250 emulation environment according to an embodiment of the present invention.

[0034] FIG. 13 illustrates the process for low footprint code generation from Java or
15 C, with ACG RTOS library components according to an embodiment of the present invention.

[0035] FIG. 14 illustrates the implementation of a method to generate low footprint code from Java according to an embodiment of the present invention.

20 [0036] FIG. 15 illustrates an implementation of a complete system including three components of one product offering, according to an embodiment of the present invention.

[0037] FIG. 16 illustrates an implementation of a Dynamic Channel Allocation
25 Scheme to ensure non-interfering radio channel selection (enlargement) according to an embodiment of the present invention.

[0038] FIG. 17 illustrates an implementation of a Dynamic Channel Allocation
Scheme to ensure non-interfering radio channel selection according to an embodiment of the
30 present invention.

5 [0039] FIG. 18 illustrates an implementation of a Dynamic Channel Allocation Scheme to ensure seamless roaming in a multi hop mesh network according to an embodiment of the present invention.

DETAILED DESCRIPTION OF SPECIFIC EMBODIMENTS

10 [0040] The description above and below and the drawings of the present document focus on one or more currently preferred embodiments of the present invention and also describe some exemplary optional features and/or alternative embodiments. The description and drawings are for the purpose of illustration and not limitation. Those of ordinary skill in the art would recognize variations, modifications, and alternatives. Such variations, modifications, and alternatives are also within the scope of the present invention. Section titles are terse and are for convenience only.

- 15 [0041] The object of this invention is a new type of wireless AP nodes that:
- Configure them selves based on considerations, set by the access server for the network.
 - Support automatic load balancing: AP nodes avoid data congestion hot spots.
 - Support fail over: if one node dies, nodes connected to it automatically switch to another.
 - Is fully functional when powered up: no installation procedure or site survey required.
 - 20 • Support software upgrades to them selves through a communications interface
 - Support both isochronous and asynchronous application requirements in the same network
 - Support the wireless equivalent of switches
 - Supports centralized control and is application aware based on settings provided by the
 - 25 access server.

[0042] Each AP Node is implemented as a self-contained embedded system, with all algorithms resident in its operating system. The normal day-to-day functioning of the AP node is based entirely on resident control algorithms. Upgrades are possible through a

30 communications interface described later.

Description of system components

[0043] There are three typical components of the system proposed. In **Fig. 1**:

1. The Access server **(10)** “manages” the network, by setting control parameters for the network
2. The “Root” Node **(20)**, is connected to the Access Server through an Ethernet link
3. Wireless communication Devices such as AP nodes **(30)** that connect to the Root or other AP nodes devices to form a communications path terminating at an Ethernet link.

To enable voice and data types of requirements to be serviced satisfactorily within the same network configuration, the access server **(10)** maintains a list of applications and their latency and throughput requirements. Based on those application “profiles”, the access server **(10)** sets the Network “profile” that each wireless communication device **(30)** in the network strives towards.

[0044] In one implementation of the invention, the root node **(20)** acts as the interface between the wireless communication devices **(30)** and the Ethernet. All wireless devices **(30)** communicate to the Ethernet through a root node **(20)**, which is has a radio interface and an Ethernet link.

[0045] In that implementation of the invention, other wireless communications devices or AP nodes **(30)** have two radios: one to communicate with its clients which includes wireless devices such as laptops, VOIP wireless phones etc. Clients to one AP node **(30)** also include other AP nodes **(30)** connecting to it. In **Fig. 4B**, for example, Node 002 has nodes 005 connected to it. In addition all nodes **(30)** may have local clients – laptops etc. – connected to them directly. Each node, therefore, is dual purpose: It acts as a relay node – relaying traffic from a (child) node and also acts as an Access Point to local devices. In this implementation of the invention, redundancy is assured because of the mesh characteristic of the network.

[0046] In an alternate implementation of the invention, all Wireless AP Nodes are roots- they are all wired. In this case the network is not a mesh network and redundancy is dependant on having a large number of nearby AP nodes. However there is still communication between the nodes so load balancing and wireless switching, as described later, is supported.

Description of Variables used by Algorithm

[0047] Figs. 4A, 4B, describe the variables used by the algorithms. With reference to Fig. 4A, some relevant variables are:

- 10 • NI: Node Index: the unique Identifier for each wireless communication node
- PN: Parent Node Index: Node Index for a node connects to in order to transmit data, For example, In Fig. 4B, the parent of Node 005 is 002.
- RP: Route Path. In Fig. 4B, the route path for 005 is 000 002 005, its connection route.
- 15 • NP: Number of parents available: Each Node has choices regarding which parent it selects to connect to, based on latency/throughput requirements. In Fig. 4B, Node 005 can connect to 004, 001, 002, and 000 (the root), all of whom are within the wireless range.
- NR: Number of unique paths some of the parents may be children of another node in the list of NP. NR is therefore the list of unique roots the node has. In Fig. 4B, 001 is a child of 005. The number of unique roots is therefore 3.
- 20 • AC: Number of Active children. This is the number of immediate children a node has: In Fig. 4B, Node 005 has 3 children: 005, 001, 008
- ND: Number of Descendants: Child nodes may also have their own children. ND is the total number of descendants that are connected, directly or indirectly to the parent node.
- 25 • CO: Cost to connect. When a node is congested it raises the cost of connectivity for a prospective child, thereby dissuading new connections till the congestion is alleviated. The cost to connect is a number transmitted to the child node. It is related to the level of congestion
- LR: Load on Route, is the total communications traffic (load) from all children and their descendants that a Node sees. Thus in Fig. 4B, the LR for Root Node 000 will be all
- 30

nodes connected to it, directly or indirectly. This information is needed to determine if a particular parent can support the communication needs (load) of a new child node

- CC Load Capacity is the amount of communication traffic or load that the node is capable of handling. It will be driven by the buffer size of the node – since data from a node's children is typically buffered before being retransmitted to the node's parent.
- LC Load from Children: This is the sum total of all traffic being passed on from children to their parent for retransmission to the parent's parent. In **Fig. 4B** Node 002 has load from children 005, 001, 008. Each of those nodes may have children with their loads.
- LL Local Load: In addition to servicing children, each node may also be servicing individual clients that comprise their local load. For example, Node 002 services three child nodes. But in addition, there could be laptops in its vicinity that connect to it directly. They constitute a local load.
- LS Local Signal Strength: is related to signal strength that a node sees from its parent. It is actually the throughput expected based on the actual signal strength seen by the radio and is computed based on a look up table as shown in **Figs. 1 and 2**.
- GT Global Throughput: This is the product of all throughputs each node along the route provides. Nodes connected to the root have a throughput related to LS. Thus the throughput of Node 002 in **Fig. 4B** is 79%, based on the throughput table shown in **Figs. 1 and 2** and its distance from the root.

The Global Throughput of Node 005 is (LS to Node 002)* (GT of Node 002) = .79*70= .55

Description of Parent Selection Algorithm

[0048] Since there is no central point of control in a distributed system, the same algorithms, running in every node, must determine what is best, based on the information it received from the Access Server and other nearby nodes. Much of this relates to selecting correct "route" or path to the root node. As an illustration, in **Fig. 4B** the route for Node 005 is 000-002-005. The Node 002 is the parent for Node 005 while Node 000 is the parent for 002.

[0049] Assuming for the present, that the Access Server wishes the network to have the maximum throughput. Then, if each node independently makes the best selection of its parent – to maximize throughput - then a question arises of whether one can be assured that the network as a whole is running as “best” as possible.

5

[0050] To answer this, consider the network in **Fig. 4B**. If the parameter set by the Access Server is to maximize throughput. Node 002 would examine all nodes it can connect to and choose a parent that ensures the highest global throughput (GT).

10

[0051] Since GT is product function of the LS times the GT of the potential node. Node 005 would have examined all potential parent nodes before selecting node 002. Similarly Node 002 has chosen Node 000. Other nodes would yield a lower GT. Thus, since each node is making a parent selection based on the “best” throughput, the throughput of the network as a whole is also maximized.

15

[0052] Thus, each node, starting from those closest to the root and spreading outwards maximizes its GT based on products related to the GT at each previous node, the overall throughput of the system is the sum of all individual throughputs, which have been maximized by the selection algorithm.

20

[0053] The implementation steps taken by the selection algorithm are:

1. Seek out and list all active nearby nodes.
2. Remove descendants: nodes that are connected to it, or children of nodes connected to it.
3. Order the list: push nodes closer to the route (shorter routing paths) up in the list.
- 25 4. Compute total throughput for each routing in the list of connection nodes
5. Select the node that provides the best latency or max throughput or combination of both.
6. Repeat steps 1,5 on a periodic basis.

To compute throughput, Nodes receive the following pieces of information from all nearby nodes:

- 1) The current routing path of the node. This is a list of nodes that the AP node has to connect to, in order to reach a root node. In **Fig. 4B**, Node 005 has a routing path of 000-002-005.
- 2) The current throughput of that node. The signal strength of that node's parent as seen by the node, is correlated to a look up table that maps the signal strength to throughput. For Node 002 (**Fig. 4B**), that is shown as 79.

[0054] Based on these two pieces of information, collected for all nearby AP nodes, the node selects one parent node that satisfies the requirements of low latency or high throughput. If low latency is the issue then a short routing path is desirable: In **Fig. 5** Node 005 chooses the root node 000. Note that the overall throughput for Node 005 is low – 17% because of the large distance away from the root node, resulting in poor signal strength. Conversely, if high throughput were required, Node 005 would connect to Node 002. The overall throughput for that connection is:

$$\begin{array}{rcl} \text{Throughput (Node 002 – Node 000)} & * & \text{Throughput (Node 005 – Node 002):} \\ 0.79 & * & 0.70 = .55. \end{array}$$

[0055] At the end of step 4, the global throughput – computed as a product of the local signal strength to that potential parent node and the GT of the potential parent node – is computed and compared for each potential parent in the list of nearby nodes. The one with the highest throughput wins.

Controlling Network latency/throughput

[0056] The section on the selection of the parent assumed that only maximizing throughput was the sole objective. Often there is a tradeoff between low latency and high throughput as evidenced in **Figs. 1, 2, and 3**. Since each AP node is in all likelihood supporting multiple applications with diverse needs, the access server setting is probably not either extreme but something between low latency and max throughput.

[0057] The aforementioned describes the algorithm for maximized throughput. For lowest latency, the choice of parent is restricted to the parent with the highest throughput

with an upper bound on the number of hops the parent is away from the root. There are two ways in which the Access Server can control the latency of the network:

1. Place an upper bound on the number of hops admissible for any node – this forces nodes on the fringe of the network to choose shorter path routes. This approach acts a cut off: it forces nodes at the fringe of the network towards selecting low latency routes, regardless of the loss in throughput. In terms of the routing algorithm, this translates to computing the throughput for selecting a parent with the highest throughput that fall in a group with latency better or equal to the upper bound.
2. Define a latency loss threshold whereby selecting a longer route path requires throughput gain to more than offset the loss of latency:

$$\text{Throughput (Longer Route)} + \text{Latency_loss_threshold} > \text{Throughput (Shorter route)}$$

[0058] If the latency loss threshold is set high, the choices a node in selecting its parent is restricted, to nodes closer to the root, with shorter route paths. In contrast to the cutoff approach this approach is more forgiving: Selecting a longer path is allowed if throughput gains in choosing a longer routing path offset increased latency. In terms of the routing algorithm, this translates to computing the throughput for all nearby nodes.

[0059] Reference is now made to re-examining the parent selection process with latency restrictions in place. With reference to **Fig. 4B**, if the latency restriction of the first type is enforced, and the maximum number of hops allowed for any node is set to 1, then the list of accessible nodes is reduced to node 000. Alternatively, or in conjunction with this restriction, if the latency threshold is set high, then even if other nodes are acceptable potential parents, the latency threshold will reduce their attractiveness and again Node 000 could be selected.

[0060] Combinations of both restrictions, based on the parameters set, result in networks that address both latency and throughput requirements. This was shown in **Fig. 3**, where the overall network configuration was somewhat mid way the two extremes. It is further evidenced in **Fig. 6**, where increasing the latency loss threshold results in progressively lower latency network configurations. Nodes circled in each snap shot of the

simulation show movement towards shorter routing paths as the latency cost factor is progressively increased.

Automatic Load Balancing

5 **[0061]** Described thus far is how the parent selection process takes into account latency/throughput criteria set by the access server. However, one must also take into account how the system behaves under load, when the load increases at one node, causing congestion.

10 **[0062]** Since this is a distributed system, each node is responsible for selecting a parent that can service it satisfactorily – it is not part of a congested route. During the selection process, the connect cost associated with selecting a new parent is supplied by the parent. Thus a congested route will have a higher connect cost than a less congested route – and a lower throughput. The routing algorithm selects the parent with the highest
15 throughput. As its connect cost increases a congested parent is increasing less attractive.

[0063] In Fig. 7, the cost of connectivity is raised from 0 to 3, resulting in one node “leaving” in favor of a better route. As the cost of connectivity is progressively increased, more nodes select alternate paths as evidenced in Fig. 8.

20

[0064] Increasing the cost of connectivity acts as an incentive for nodes to find other routes, but does not prevent a child node from continuing its association. This ensures that all child nodes are serviced always. Additionally, the cost of connectivity is increased only until all child nodes that have the option to leave have left- for example, in Fig. 7, the cost in
25 increased only while child nodes that have multiple alternate route are still attached to a congested parent node. In other words, there is no reason to increase the connectivity cost for child nodes that have no alternate route and are “stuck” with the current congested parent node.

30 **[0065]** As the load is balanced, the congestion is reduced and the cost of connectivity is gradually reduced, enabling the child nodes that left to return. If this is not done, then

nodes leaving one parent would contribute to congestion elsewhere, resulting in increased cost of connectivity elsewhere and system instability.

[0066] One characteristic of a mesh network is the ability for nodes to select alternate routes, in case one node fails or becomes congested. As shown in **Fig. 7**, each node, when computing the throughput of nearby nodes, also infers from the routing path for those nodes, how many alternate paths are available to it. This is done by examining the routing paths of each nearby node and classifying them based on the node that connects to the root.

5 [0067] In **Fig. 7**, Nodes 002 and 004 connect to the root - as do other nodes shown in one embodiment with a color indicated square on their top left corner (**40**), for instance this may be a blue square. Node 005, therefore, can have two routing paths: 000-002-005 and 000-004-005. Other nodes may also have multiple paths, but may not find a parent that, if it accepts them as child, has the capacity to service them, based on their current load. Hence,
10 some of the nodes show one parent and one route, in another color indicator, for instance red (**50**).
15

[0068] It is desirable to configure the network to ensure all nodes have alternate paths. This is achieved by increasing the number of nodes connecting to the root. The access server can force this by increasing the latency cost factor, resulting in nodes that can connect to the root directly to do so rather than through another node closer to them to the root. This was described earlier as depicted in **Figs. 4, 5, and 6**. It can also force some nodes to work in either low latency or high throughput modes- in **Fig. 7**, the check box for each node (checked in each case) depicts that each node is currently in high throughput mode,
20 working within the constraints set by the access server.
25

[0069] By controlling the latency cost factor, or the upper bound of the max hops, the access server can change the configuration of the network resulting in a higher redundancy of the system and less likelihood of load congestion hot spots.

30

Real World Constraints to Load Balancing Algorithm

[0070] Implementation of the load balancing algorithm on the wireless devices,
5 required modifications to the connect cost algorithms based on real world constraints.
Wireless devices communicating with devices running the load balancing software may not
all be running the same software. As an example, consider the case where the load balancing
software is loaded on wireless Access Points but not on laptops communicating with the
access points. Clearly, the laptop has no way of knowing that the connect cost has increased
10 and therefore will continue to “stick” to the access point.

[0071] The load balancing algorithm has therefore been modified to work where
there is no communication regarding connect cost by the following approach: When the load
exceeds a cut off threshold, the Access Point (or other wireless device performing load
15 balancing) will drop its signal strength to the lowest possible – thereby dissuading clients
such as laptops from associating with it and encouraging them to seek another association
with a higher signal strength access point.

[0072] Since the laptops seek the access point with the highest signal strength, this is
20 a necessary but not sufficient cause for a re-association: some laptops may continue to
“stick” to the access point, due to proximity or a sticky algorithm. The Access Point must
therefore forcibly disassociate the laptop.

[0073] After disassociating all the stations that it needed to, in order to shed load, the
25 access point can gradually increase its signal strength to attract back some the stations that it
disassociated. Those that did not find other associations, will return, almost immediately after
association, and the access point takes them back because despite the lowered signal strength,
these devices have no place to go.

30 [0074] This load balancing algorithm has been implemented and demonstrated to

shed load by moving one laptop from one root node to another when overloaded by two laptops on the same root node.

Monitoring the Health of the Network

5 [0075] By controlling the latency cost factor, or the upper bound of the max hops, the access server can change the configuration of the network resulting in a higher redundancy of the system and less likelihood of load congestion hot spots. In Fig 7, Node 002 is shown congested and available "parents" that will accept it are reduced to 1 (shown in red (50)). As a result the redundancy and fail safe nature of the wireless network has been adversely
10 affected.

[0076] Congestion in Fig 7 is being caused by the fact that there is only one root node transporting all wireless traffic to the wired network. Clearly, another root node would improve the fail safe nature of the network.

15

[0077] Algorithms have been implemented that reside in the device and periodically check to see what potential associations are possible. If the number is reduced to one then a warning (shown in red) is forwarded to the Network Management System. The system administrator is then advised to add another root node to preserve the fail safe nature of the
20 network. Note that this type of warning is coming from the edge device to the management system and without the algorithm in place, the management system would not know that a problem existed

Dynamic Channel Allocation and RF Interference Control

25 [0078] Managing the throughput of voice, video and data traffic in a wireless network is complicated by the nature of the wireless medium. Since wireless is a shared medium, all traffic can potentially interfere with other traffic on the same radio channel- at any point in time only one device can be active on any one given channel. This limits the bandwidth in cases where high bandwidth traffic (e.g. video) needs to be transported or when there are
30 many devices on the network.

[0079] One solution is to allocate different channels to devices communicating on different portions of the network. For example, in **Fig. 10**, each of the 3 sub networks shown in Red (70), Black (80) and Blue (90) circles can communicate on one channel internally and
5 another channel externally through the parent – that is part of the other BSS.

[0080] An algorithm to define what the best channel allocations should be between devices and their parents has been devised and shown in **Fig. 16** and in **Fig. 17**. The algorithm sends out a beacon on all channels to inform all neighboring devices that it is
10 intending to select a channel. All neighboring devices – that can hear the beacon – respond over the wired network with the channel numbers they are using. The algorithm then takes care to select a channel, from a list of available channels that does not conflict with channels selected by neighboring devices

15 **Dynamic Channel Allocation and Seamless Roaming Requirements**

[0081] A situation can occur when, as shown in **Fig. 18**, some overlap between neighboring channels is called for. One reason for this is seamless roaming where a laptop leaves one wireless area and enters another adjoining area. If the signal strengths are managed, so that the overlap between adjoining areas is minimized, then adjoining areas can
20 share the same RF channel and yet cause a reduction in bandwidth. Further, devices moving from one region to another will do so without having to change channels, which is time consuming and hence disruptive.

[0082] The algorithm implemented addresses the case where siblings of a multi
25 layered wireless network are to be assigned the same channels. In **Fig. 18** BSS [1,1] and [1,2] share the same channel for access by their client stations. Also BSS [2,1], [2,2],[2,3] also share the same channels for seamless roaming by their client stations. The implementation of the algorithm therefore requires that when one sibling makes a channel assignment, ALL adjoining siblings have to make the same channel assignment. The channel
30 selection process therefore requires a list of all neighboring nodes for all siblings and their RF channels. This extension has been incorporated into the channel allocation algorithm.

[0083] Protocols for sharing this information have been implemented and tested. Appendix A hereto describes the 802.11 Infrastructure Control Layer Protocol version 2.0. In addition, Appendix B hereto describes in another embodiment of the present invention, a distributed adaptive control algorithm for ad-hoc wireless personal area networks.

[0084] Note that seamless roaming requires that the Wireless AP shown in Fig. 18 have incorporated the features needed for switching – that is auto discovery of new clients in its BSS. Else messages being sent to a new client (previously connected to another BSS) will not be forwarded to the client, now part of the another BSS. The wireless equivalent of a wired switch has been implemented and is covered in a subsequent section.

Asynchronous Application Data Flow

[0085] Algorithms that show how data from nodes will flow to the root node have been modeled for both high throughput and for low latency requirements. High throughput data flow requirements are discussed first.

[0086] To service asynchronous applications each node services its children in a round robin manner, ensuring that all children are serviced in sequence. But to ensure that all children receive at least one service request, each recently serviced child must wait for at least another child to be serviced before it can be serviced again. Additionally, some child nodes servicing applications with higher priority will be serviced before others.

[0087] In one implementation of this algorithm, related to this invention, the priorities may be stored in the Access server and different applications fall into different priority buckets. By changing the priorities in the Access Server, applications with higher priority are serviced before other competing applications with a lower priority. Also with a priority bucket, applications with more data to transfer are serviced first.

[0088] In another implementation, the determination regarding which child to service next is based on which child needs servicing the most. This is determined by examining the load of each child, each time; the node services its children. It is done each time because:

- Child nodes may have made other connections, if load balancing is also active
- 5 • Child nodes data may have changed – data with short time to live, will have been removed

[0089] The node then makes the decision to service the child with the highest need, in a priority bucket, provided it has not serviced that same child most recently. This is simply to
10 avoid any one child from “hogging” all the attention.

[0090] This proprietary PCF (Point Control Function) implementation worked well for asynchronous applications, when compared to 802.11a standard DCF (Distributed Control Function) approach that was also implemented for benchmarking reasons as shown
15 in Fig. 9. The PCF protocol implemented per the approach described above was approximately twice as fast, largely because nodes did not have to deal with delays caused by collision avoidance contention window delays required for wireless transmissions in a DCF mode.

20 **Isochronous Application Data Flow**

[0091] Isochronous applications require more deterministic service intervals that are less sensitive to variations of load. The algorithm described above is not suitable when:

- Each child must be serviced by the parent in a regular and predictable time interval
- The amount of data transferred is relatively fixed – else it will affect the time interval.

25

[0092] The algorithm to service Isochronous Application has also been implemented. In Fig. 10, there are two service cycles. One service cycle (70) services 3 children, the other one (80) 5 children, one of which is the parent node of the three children in the first service cycle (70). In each service cycle, each child is visited at a regular interval defined by 1) the

time interval between each switching from one child to another and 2) the number of children in each service cycle.

5 [0093] Thus if the parent of the red service cycle (70) spends 10ms with each child, it will revisit each child every $3 * 10 = 30$ ms. Data from each child cannot then be retrieved at a rate faster than once every 30 ms.

[0094] Having retrieved the data, it will sit at the buffer of the parent, until the parent is serviced (the black (80) circle). Since there are 5 children in that service cycle, the service
10 period is $5 * 10 = 50$ ms.

[0095] Since both service cycles are running independently of each other with no synchronization, it is impossible to predict when the parent in either service cycle will service its children. It can be stated, however that each child in service cycle marked red (70)
15 (005, 001, 008) will have data transferred to the root at best every 30ms and at worst every 50ms. In other words, in the isochronous network, the worst time interval is the maximum time period of all service cycles.

[0096] If it is assumed that, to ensure multiple routing paths, there are more nodes
20 connected to the root, then the service cycle will be driven by the number of 1 hop nodes, in this case 5. Note that the network configuration is set for high throughput. In this configuration the worst service cycle is 5T. Ironically, the network configuration for a "low latency". Isochronous network would have been 9T, will all nodes connected to the root. In other words, in the case of isochronous networks, the algorithm proposed provides a better
25 service cycle and a better throughput. In general, splitting the number of nodes into two or more service cycles will improve the service cycle. The high throughput mode setting for the routing algorithm makes that happen naturally.

Internal Traffic Flow/ Wireless equivalent of Switching

30 [0097] Referring again to Fig. 10, Nodes 005, 001, 008 are children of Node 002. The red oval (70) indicates that these form a "family". In the technical parlance of 802.11,

they are a “Basic Service Set” (BSS). Likewise the nodes in the black circle (80) form another family or BSS.

5 [0098] Traffic from Node 005 to Node 001 would logically travel to Parent 002 and then from 002 to 001. This affects the throughput of the entire system because the traffic is buffered in 002 and then retransmitted. If node 005 was aware of its siblings, within its wireless range, then Node 005 and Node 001 could communicate directly over wireless. In effect this would be a wireless equivalent of Ethernet switches.

10 [0099] This direct communication link between siblings (within range) increases throughput 100%. This is so because 2 transfers of data (Source node to parent and then Parent to destination node) are now reduced to 1 transfer (Source node to destination node).

15 [0100] In this embodiment, the algorithm has been implemented whereby traffic intended for a destination node is automatically sent to the destination node if it is within the family/BSS and within range. When the routing algorithm runs, the routing paths of each nearby node is recorded to determine the number of hops it is away from the root. From the routing paths, the list of siblings within range can be inferred – they all share the same parent in their routing paths. If data intended for these siblings is received, it will automatically be
20 sent to the sibling, without involving the parent.

[0101] If the destination node is not in the list of nearby siblings, then the data has to be sent onwards to the parent node. At that point the parent node, which “knows” its siblings, can route traffic to one if its siblings. Thus the switching algorithm ensures that traffic is
25 routed only as far as a parent whose child is a destination node.

Extensions with Multiple Radios

[0102] As shown in Fig. 10, there are at least two families or BSS in the network. Node 002 belongs to both – as a parent of one (the red oval BSS) (70) and as a child to another (the black circle BSS) (80). To communicate with its children, Node 002 has one
30 radio, and another to communicate with its parent. There is preferably therefore, at the

minimum, two radios in each node for the system to work- One radio to support the inward interface (the children, red oval (70)) and one to support the outward interface (the parent, black circle(80)).

- 5 [0103] Adding more radios to the outward interface increases throughput but also enables more freedom in making choices related to latency/throughput tradeoffs. For example, suppose that some traffic requires high throughput and other traffic low latency. If the compromise approach described in this invention is unacceptable because the range of requirements are too high, then two radios for the outward interface can reduce the range of
- 10 requirements: One radio will address more of the low latency traffic with a low latency traffic route while the other will address the high throughput needs with a different high throughput traffic route. The wireless node now begins to resemble a wireless equivalent of network routers.
- 15 [0104] The algorithms described in this invention are still applicable: only the range of applicability has changed. The embodiment of the present invention is also relevant for wireless routers.

Security of the Network

- 20 [0105] Wireless transmissions are inherently insecure. While the technology to encrypt/decrypt secure data exists, the problem is communication of the keys over wireless to the nodes, from the access server. This common key distribution problem is addressed by the following embodiment of the system.
- 25 [0106] The wireless communication devices will have, as part of the algorithms resident in their operating system, the ability to generate a public and private key based on the RSA algorithm. These keys will be based on some unique identifier in the AP node—the processor Chip Serial Number as an example.
- 30 [0107] When the Wireless device is first deployed, it will be connected via Ethernet cable to the access server and the node's public key will be transmitted to the Access Server.

This public key will be used by the Access Server to transmit a common private key (using the symmetric AES encryption algorithm) to all nodes. Since only the Access Server knows the public key for each node, only the access server will be able to transmit this private key. Further, since the common private key for all nodes was transmitted in encrypted form to all nodes, it is impossible to decipher the common private key without knowing the public key for the node it was intended for. In addition, even if that public key for that node is known, it is useless since the private key for that node was never exchanged. The transmission of the common Private Key is thus secure.

10 [0108] Secure data transmitted by one AP node will then be encrypted with the common private key and be decrypted only at a destination AP node. By the same token, all data from the Ethernet to an AP node will be encrypted with the same private key for onward transmission.

15 [0109] The enterprise Access Server can be used to generate a new private key at regular intervals and transmit it to all Wireless AP Nodes in the system. The system is thus doubly secure.

Implementation of algorithm in Firmware

20 [0110] The control algorithms described above require significant resources – CPU. Memory – resulting in large footprint applications. Wireless devices and other network aware communication devices are typically embedded systems with low foot print requirements. A challenge that must be addressed – if this technology is to have practical applications is how to reduce the footprint of the software control layer to fit into embedded devices with 64KB or 128KB RAM.

[0111] A self-standing executable containing some of the algorithms and support functions has been produced within a footprint of less than 100KB running on an Intel PXA250 Processor. Additionally in an embodiment of the present invention, the mesh and load balancing algorithms have been successfully ported to run on the hardware depicted in Fig. 15, with a footprint of 64KB.

[0112] The reason for the small footprint is that the approach of the embodiment of the present invention to building software is to include only the portions of an operating system needed by the programs. Thus, only functional blocks needed by the algorithms are added to the make file needed by the compiler to create the executable. If string functions are not required by any procedures in the program, then the string function library is not included when the executable is made. In contrast, a typical embedded operating system is more general purpose, requiring a larger footprint and possibly more CPU resources.

10 [0113] The language in which the algorithms are written is currently Java, and will may also include Microsoft TM .NET languages. In the embodiment of the present invention, a Java Class file converter has been built that takes Java Byte Code and disassembles it to produce what is referred to internally as R (for Real) classes. R classes are the C code equivalent of the Java Op codes, used by a Java Virtual Machine (JVM) to run the Java program. The R classes map to C code which is produced after examining the functional libraries needed and adding them to the list of support libraries needed to make an executable self standing. Once that is completed a self-standing executable is made for the processor.

[0114] An extensible service library of software components needed to build a complete Operating system (OS) is implemented through the embodiment of the present invention. This component based approach to building an Operating system from scratch enables one to select only the essential services needed by an application when it is ported from high level languages to small footprint embedded devices. Since only the essential services and not an entire general purpose OS is included, the footprint is compact. Additionally, there is a significant (3X-6X) performance improvement because layers of software needed to run code written in high level languages like Java or .NET languages are no longer needed.

[0115] Fig. 13 depicts how the approach of the embodiment of the present invention to lean code generation differs from more traditional approaches. On the left of the figure are the layers or stacks needed to run Java (JVM on top of linux) or C (on top of a custom RTOS

OS like VxWorks). On the right is an embodiment where Java code is examined at the Byte code level to identify essential services. These services are added when the Java Byte code is converted to C – by mapping Java Op codes intended for a JVM to code blocks from a library of C equivalent code blocks. For C code, this means simply adding the OS service code blocks needed for the C program to run without an RTOS below it. In both cases, as depicted in **Fig. 13**, A monolith block C code is produced, much like a compiler would, except that all the services are statically bound at development time and no dynamic bindings are required at run time, as is the case with the layered approach on the left.

10 [0116] Thus there is a clear migration strategy in place from high level code generation to low level object code that includes all the functionality provided by an operating system to ensure that the object code is self contained.

15 [0117] There is implemented one version of this migration strategy where one begins with high level code written and tested in a development environment and can swiftly migrate it to a low footprint executable. **Fig. 14**, depicts an extension to IBM's open extensible framework for development, called Eclipse (www.eclipse.org). As shown, there is built a framework on top of eclipse that enables one to model processes as a flow graph, where at each node of the flow graph one can insert code that needs to be tested. The framework is also used to do a performance analysis of code blocks at each node to determine where the bottlenecks are. At the end of the debug and analysis cycle, Java Byte Code is passed on to the Byte code converter (shown in **Fig. 13**) for low footprint code generation.

25 [0118] Since there is no OS, there is no easy way to tamper with the system. This approach –internally referred to as Application Specific Embedded OS software - thereby protects the security of the algorithms and enables the algorithms to run on low power (and less expensive) processors and with lower (and less expensive) memory requirements.

30 [0119] The simulations depicted are running the same code in each node shown in the figures. The code running in each node has been compiled to object code for the Intel™

PX250 processor as a proof of concept (**Fig. 12**). It has also been compiled to run on a embedded system development platform shown in **Fig. 15**.

Upgrade Path for new algorithms

5 **[0120]** A distributed network poses problems related to upgrading the software at each node. If the software is cast in concrete – as in an ASIC implementation – then there is no upgrade path available. Since the wireless standards are evolving, this is not a practical approach.

10 **[0121]** In the description of the embodiment of the modular approach to generating a self standing executable, it becomes apparent that there is no migration path available to the system to upgrade the executable easy.

15 **[0122]** This is resolved by providing a simple communication protocol for uploading new object code into the system. This has also been implemented as is internally called Simple Upgrade Protocol (SUP).

20 **[0123]** When the executable is made, a simple communication protocol is added, which, with proper authentication, using the public key of the node, can be used upload object code into the Flash memory of the device. A very thin boot kernel with the AP Node and the rest of the code is remotely installed. The boot kernel contains the simple communications protocol to upload object code and the security to ensure that only the Access Server can access the device. By building security at the boot level, one ensures that all code loaded into the system has to be authorized- since the security code cannot be
25 overwritten.

30 **[0124]** Throughout the description and drawings, example embodiments are given with reference to specific configurations. It will be appreciated by those of ordinary skill in the art that the present invention can be embodied in other specific forms. Those of ordinary skill in the art would be able to practice such other embodiments without undue experimentation. The scope of the present invention, for the purpose of the present patent

document, is not limited merely to the specific example embodiments of the foregoing description, but rather is indicated by the appended claims. All changes that come within the meaning and range of equivalents within the claims are intended to be considered as being embraced within the spirit and scope of the claims.

5



APPENDIX A**EXEMPLARY 802.11 INFRASTRUCTURE CONTROL LAYER PROTOCOL
VERSION 2.0****5. DESIGN CONSIDERATIONS****Size Limitation**

Since an Ethernet packet can only be a maximum of 1500 bytes the maximum length of a UDP datagram so as to not cause IP fragmentation is 1472 (1500 - 20 byte IP header - 8 byte UDP header). Every SNIP packet consists of a 8 byte SNIP header followed by parameters. Since all IMCP functions use only 1 SNIP parameter the maximum length of the parameter value is therefore 1462 (1472 - 8 byte SNIP header - 2 byte param length).

Packet Destination

All SNIP packets (either from Access Manager or from A/P) are sent via UDP to either the limited broadcast (FF: FF: FF: FF: FF: FF) or a chosen multicast address (01:00:5E:XX:XX:XX). This method ensures that all A/P's get the message and also obviates the need for assigning I/P addresses to every A/P.

DEFINITIONS**20. Network Health Monitoring****Health Index**

The number of unique Root paths determines the Health Index of an Access Point. In an "All-Root" network the Health Index determines the degree of redundancy of the Access Point's location. In an infrastructure mesh network for Relay nodes the Health Index determines the number of unique paths to the "wire".

Heartbeat Interval

This attribute specifies the interval at which Access Points send in a "heartbeat" signal, that specifies the conditions of their operations.

Location Awareness Scan Interval

This attribute specifies the interval, at which Access Points scan the “airspace” to know about other Access Points in their vicinity, to determine their Health Index and for Dynamic Load Balancing purposes.

5

Dynamic Load Balancing

This Boolean attribute, determines whether an Access Point enables the adaptive dynamic load balancing functionality during its operation. If enabled the Kick-in Threshold and Delta T attributes determines the way this functionality is put to use.

10

Connect Cost

The Connect Cost is a value in the range [0,3] where 0 being the minimum Connect Cost. The Access Point increases its cost of connectivity during Dynamic Load Balancing, after it determines that the load has stayed beyond the Kick-in Threshold for a period of Delta T units. The Connect Cost is adaptively reduced according to the load.

15

Delta T

This attribute determines the duration of sampling for the Access Point to determine that the load was higher or lower than the Kick-in threshold for Dynamic Load Balancing purposes.

Kick-in Threshold

20

This attribute is a percentage of the total capacity of the Access Point. This is used in conjunction with Delta T for Dynamic Load Balancing purposes.

Dynamic Channel Allocation**Channel Number**

25

When Dynamic Channel Allocation is disabled, this attribute specifies the channel of operation for the Access Point.

Topology**Latency Throughput Control**

30

When zero, this instructs the Access Point to always choose a Parent, whose hop count is lowest. When non-zero, the Access Point may choose to “tradeoff” latency for

throughput provided the difference in throughput is more than Latency/Throughput Trade-Off attribute.

Max Allowable Hops

- This attribute controls the topology of the wireless network so that, any Access Point
5 is never more than Max Allowable Hops away from the “wire”.

Latency/Throughput Trade-off

This attribute determines, the difference threshold for an Access Point to choose a parent with more number of hops in exchange for lower latency.

10 **PACKET INFORMATION**

STA Association Notification

Direction	<i>AP to Broadcast/Multicast</i>
When Sent	<i>Upon STA association</i>
SNIP FUNCTION ID	3
Purpose	Topology Updating

Param 0 Value Format

15	-----+-----+-----+-----+ 'I' 'M' 'C' 'P'	4 byte signature
	-----+-----+-----+-----+-----+-----+ DS MAC ADDRESS	6 bytes
	-----+-----+-----+-----+-----+-----+ WM MAC ADDRESS	6 bytes
20	-----+-----+-----+-----+-----+-----+ STA MAC ADDRESS	6 bytes
	-----+-----+-----+-----+-----+-----+	
	Total Size	
	22 Octets	

25

STA Disassociation Notification

Direction	<i>AP to Broadcast/Multicast</i>
When Sent	<i>Upon STA disassociation</i>
SNIP FUNCTION ID	4
Purpose	Topology Updating

Param 0 Value Format

	+-----+	
5	'I' 'M' 'C' 'P'	4 byte signature
	+-----+	
	DS MAC ADDRESS	6 bytes
	+-----+	
	WM MAC ADDRESS	6 bytes
10	+-----+	
	STA MAC ADDRESS	6 bytes
	+-----+	
	REASON	2 bytes
	+-----+	
15	Total Size	
	24 Octets	

20

25

Access Point IMCP Synchronization

Direction *AP to AP*
When Sent *When an AP starts up or during scanning*
SNIP FUNCTION ID 11
Purpose Identification, Health, Topology

Param 0 Value Format

```

+---+---+---+---+
| 'I' | 'M' | 'C' | 'P' | 4 byte signature
5 +---+---+---+---+
|          BSSID          | 6 bytes
+---+---+---+---+

```

Total Size
10 Octets

Access Point IMCP Acknowledgement

Direction *AP to AP*
When Sent *Upon receipt of IMCP Sync*
SNIP FUNCTION ID 12
Purpose Identification, Health, Topology

Param 0 Value Format

```

+---+---+---+---+
15 | 'I' | 'M' | 'C' | 'P' | 4 byte signature
+---+---+---+---+
|          BSSID          | 6 bytes
+---+---+---+---+
|        ROOT BSSID        | 6 bytes
20 +---+---+---+---+

```

Total Size
16 Octets

Seek Best Parent Request

Direction *AP to Access Server*
When Sent *Upon startup and frequently*
SNIP FUNCTION ID 13
Purpose *Topology Formation, Operation*

Param 0 Value Format

```

+-----+-----+-----+
| 'I' | 'M' | 'C' | 'P' | 4 byte signature
+-----+-----+-----+
5 |          DS MAC ADDRESS          | 6 bytes
+-----+-----+-----+
|          WM MAC ADDRESS          | 6 bytes
+-----+-----+-----+
                                     } AP Identifier
10 | CC | PC | FR | HI | CH | 5 bytes
+-----+-----+-----+
|          BSSID[0]                | 6 bytes
+-----+-----+-----+
| S[0] | N[0] | 2 bytes
15 +-----+-----+-----+
|          BSSID[1]                | 6 bytes
+-----+-----+-----+
| S[1] | N[1] | 2 bytes
+-----+-----+-----+
20 :                               :
   :                               :
+-----+-----+-----+
|          BSSID[X]                | 6 bytes
+-----+-----+-----+
25 | S[X] | N[X] | 2 bytes
+-----+-----+-----+

```

X = PC - 1
CC = CONNECT COST (0,1,2,3 with 0 being minimum)
HI = HEALTH INDEX (NUMBER OF UNIQUE ROOT PATHS)
FR = FORCE REPLY
5 **CH** = CHANNEL
PC = PARENT COUNT (ROOT NODES SET PC TO 0)
S[i] = Signal strength from Parent i
N[i] = Noise from Parent i
BSSID[i] = BSSID of Parent I

10 **Total Size**

21 + 8 * PC (MIN 21, MAX 1461)

Seek Best Parent Response

Direction	<i>Access Server to AP</i>
When Sent	<i>Upon receipt of SEEK request</i>
SNIP FUNCTION ID	14
Purpose	Topology Formation, Operation

15 **Param 0 Value Format**

	+-----+-----+-----+-----+		
	'I' 'M' 'C' 'P'	4	byte signature
	+-----+-----+-----+-----+		
	DS MAC ADDRESS	6	bytes
20	+-----+-----+-----+-----+		
	WM MAC ADDRESS	6	bytes
	+-----+-----+-----+-----+		
	BSSID	6	bytes
	+-----+-----+-----+-----+		
25	ENC AUT LTC DLB DCA CH	6	bytes
	+-----+-----+-----+-----+		
	DT MAH LAS ESL KI KTH	6	bytes

} AP Identifier

```

+-----+-----+-----+-----+-----+
| TO | SKL | NASL | HBI |           4   bytes
+-----+-----+-----+-----+-----+
| PRIMARY RADIUS | AUTPRT | 6   bytes
5 +-----+-----+-----+-----+-----+
| SEC RADIUS | ACCPRT | 6   bytes
+-----+-----+-----+-----+-----+
| WEP KEY 1 | 13   bytes
+-----+-----+-----+-----+-----+
10 | WEP KEY 2 | 13   bytes
+-----+-----+-----+-----+-----+
| WEP KEY 3 | 13   bytes
+-----+-----+-----+-----+-----+
| WEP KEY 4 | 13   bytes
15 +-----+-----+-----+-----+-----+
| ESSID | ESL bytes
+-----+-----+-----+-----+-----+
| SHARED KEY | SKL bytes
+-----+-----+-----+-----+-----+
20 | NAS NAME | NASL bytes
+-----+-----+-----+-----+-----+

```

ENC = ENCRYPTION TYPE

AUT = AUTHENTICATION TYPE

25 ESL = ESSID LENGTH

KI = WEP KEY INDEX

SKL = SHARED KEY LENGTH

NASL = NAS ID LENGTH

PRIMARY RADIUS = PRIMARY 802.1X RADIUS SERVER IP ADDRESS

30 AUTPRT = AUTHENTICATION PORT

SECONDARY RADIUS = SECONDARY 802.1X RADIUS SERVER IP ADDRESS

ACCPRT = ACCOUNTING PORT

DLB = DYNAMIC LOAD BALANCING

DCA = DYNAMIC CHANNEL ALLOCATION

5 LTC = LATENCY THROUGHPUT CONTROL (0 for Lowest Latency, 1 for Tradeoff)

MAH = MAX ALLOWABLE HOPS

HBI = HEARTBEAT INTERVAL

LAS = LOCATION AWARENESS SCAN INTERVAL

10 CH = CHANNEL NUMBER

DT = DELTA T

KTH = DYNAMIC LOAD BALANCING KICKIN THRESHOLD

TO = LATENCY/THROUGHPUT TRADEOFF

15 Channel Scan Lock Request

Direction	AP to Access Server
When Sent	Before scanning
SNIP FUNCTION ID	15
Purpose	Health

Param 0 Value Format

20	<pre> +---+---+---+---+ 'I' 'M' 'C' 'P' +---+---+---+---+ </pre>	4 byte signature	
	<pre> +---+---+---+---+---+---+ DS MAC ADDRESS +---+---+---+---+---+---+ </pre>	6 bytes	} AP Identifier
	<pre> +---+---+---+---+---+---+ WM MAC ADDRESS +---+---+---+---+---+---+ </pre>	6 bytes	

25 Total Size

16 Octets

Channel Scan Lock Response

Direction	<i>Access Server to AP</i>
When Sent	<i>When Access Server determines</i>
SNIP FUNCTION ID	16
Purpose	Health

Param 0 Value Format

5	'I' 'M' 'C' 'P'	4 byte signature	

	DS MAC ADDRESS	6 bytes	} AP Identifier

	WM MAC ADDRESS	6 bytes	
10	-----		
	Total Size		
	16 Octets		

Channel Scan Release Lock Request

Direction	<i>AP to Access Server</i>
When Sent	<i>After finishing scanning</i>
SNIP FUNCTION ID	17
Purpose	Health

15

Param 0 Value Format

	'I' 'M' 'C' 'P'	4 byte signature	

20	DS MAC ADDRESS	6 bytes	} AP Identifier

	WM MAC ADDRESS	6 bytes	

Total Size

16 Octets

Channel Scan Release Lock Response**Direction***Access Server to AP***When Sent***Upon receipt of Lock Release Request***SNIP FUNCTION ID****18****Purpose****Health**

5

Param 0 Value Format

+---+---+---+---+

| 'I' | 'M' | 'C' | 'P' |

4 byte signature

+---+---+---+---+

10

| DS MAC ADDRESS |

6 bytes

+---+---+---+---+

| WM MAC ADDRESS |

6 bytes} **AP Identifier**

+---+---+---+---+

Total Size

15

16 Octets

Access Point Reset

Direction	<i>Access Server to AP</i>
When Sent	<i>When settings change</i>
SNIP FUNCTION ID	19
Purpose	Operation

Param 0 Value Format

5	+---+---+---+---+		
	'I' 'M' 'C' 'P'	4 byte signature	
	+---+---+---+---+		
	DS MAC ADDRESS	6 bytes	} AP Identifier
	+---+---+---+---+		
10	WM MAC ADDRESS	6 bytes	
	+---+---+---+---+		

Total Size

16 Octets

15 **References**

1. Simple Network Information Protocol SNIP, Sriram Dayanandan, January 2003.

APPENDIX B**DISTRIBUTED ADAPTIVE CONTROL ALGORITHM FOR AD-HOC WIRELESS
PERSONAL AREA NETWORKS** © 1992-2003 Advanced Cybernetics Group, Inc.

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5

TECHNOLOGY DESCRIPTION**CONVENTIONAL ROUTING PROTOCOLS****Distance-Vector Routing (DV)**

10 Each node maintains a table of approximate distances of nodes. Nodes send the table out to nearest neighbors. The receiving nodes update their tables and recalculate routes using a shortest path algorithm. Thus routing decisions are made using sub-global approximations and are not optimal especially in a dynamically changing environment like WPANs.

15 Link State Routing (LS)

Each node maintains a view of the entire network and broadcasts the state of the link to its nearest neighbors. The receiving nodes update their tables and recalculate routes using a shortest path algorithm. Pros include: widely used and commercialized; well tested; well documented. Cons include: well suited for static environments, not for dynamic
20 environments; infrastructure oriented (dedicated hosts are organized for routing); not suited for resource constrained, low power devices

STANDARD AD-HOC ROUTING ALGORITHMS

The IETF Mobile Ad-Hoc Networking Standard (MANET) has proposed the
25 following AD-HOC routing algorithms.

Destination Sequenced Distance Vector Routing (DSDV)

- A version of DV adjusted for AD-HOC networks.
- Power management is not considered
- Does not have dynamic adaptive load balancing
- 30 • Convergence times can be large
- No support for QOS

- No zonal/multi-channel support

AD-HOC On Demand Distance Vector Routing (AODV)

- Reactive as opposed to pro-active
- Uses L3, hence is shielded from the MAC and PHY layers
- 5 • Supports only one route per destination
- Does not have dynamic adaptive load balancing
 - Power management is not considered
- Does not support unidirectional links
- No support for QOS
- 10 • No zonal/multi-channel support

Dynamic Source Routing (DS)

- Reactive as opposed to pro-active. Routes are learnt on-demand and hence can slow down the performance
- Does not have dynamic adaptive load balancing
- 15 • Power management is not considered
- Needs support from either the MAC layer or the network layer for including the route information
- No support for QOS
- No zonal/multi-channel support

20 Zone Routing Protocol (ZRP)

- Divides the network into zones
- Intra-zone routing is left to the implementer
- Inter-zone routing uses a reactive as opposed to pro-active protocol
- Does not have dynamic adaptive load balancing
- 25 • Power management is not considered
- No support for QOS

ALGORITHM DESIGN CONSIDERATIONS**No Central Control**

AD-HOC WPAN's typically work in environments where there cannot be any level of central intelligence as far as routing and parametric decisions are concerned. This requires
5 the algorithm to be truly distributed and every device must be able to make decisions by itself.

Self-configuring

AD-HOC WPAN's by definition need to be self-configuring without having the need for any network plan.

10 Self-healing/Fault Tolerant

AD-HOC WPAN's need to be self-corrective and fault tolerant. Devices must be able to change their routing decisions in real-time as soon as a path gets clogged or closes down.

Dynamic Adaptive Load Balancing

15 The load on the network must be balanced fairly across all possible paths, and this decision must happen dynamically in an adaptive manner.

Pro-active Routing

The routing decisions need to be made on a pro-active as opposed to an on-demand basis. This ensures that the task of routing does not interfere with the device's primary
20 responsibility, which is to accomplish its own functionality.

Varied Bandwidth/QOS/Power requirements

Devices have varied bandwidth requirements, some need isochronous performance (fixed latency), and some need bounded latency, and some might be power constrained and must use very low power for their transmissions.

25 Low memory footprint

The design of the algorithm must consider the fact that WPAN would typically consist of low footprint resource constrained devices.

Multi-Zone/Multi-Channel Support

The design of the algorithm must consider the support for routing between multiple
30 Pico-cells or multiple network zones.

Network layer independent

The algorithm must not depend on the existence of a network layer protocol like IP.

The algorithm must directly use the services provided by the MAC sub-layer.

5 **Efficient Topology Lookup and Modification**

Every device in an AD-HOC WPAN plays dual roles:

- Accomplish its own functionality, which could involve sending packets either directly or via another device. (Primary Role)
- Forward packets of other devices. (Secondary Role)

10 The design of the algorithm must consider the fact that, the primary role of every device on the network is to accomplish its own functionality, and routing of packets of other devices is secondary (unless the device is a special node that is just present for forwarding) and must not affect the performance of its primary role.

15 For the primary role, this means whenever the device has to send out its own data packet, to another device the routing decision must be very fast.

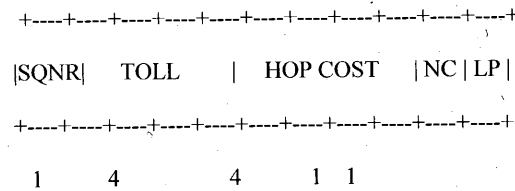
For the secondary role, this means whenever a device receives from another source destined to another device, it must be able to readily reference the routing decisions made by the source according to its Bandwidth/QOS/Power requirements.

20 When a device goes down, the topology and the routing decisions need to be modified in real-time so that network performance levels are maintained.

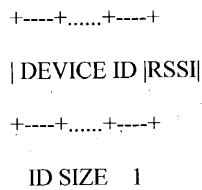
TECHNOLOGY IMPLEMENTATION

The Algorithm uses control systems approach wherein every device sends out a broadcast heartbeat packet into the medium, at a specified frequency.

5 Header



10 Payload



15 SQNR = 1 BYTE SEQUENCE NUMBER (0-255)

TOLL = 4 BYTE DEVICE TOLL COST

HOP COST = 4 BYTE DEVICE HOP COST

NC = 1 BYTE NEIGHBOUR COUNT (0-255)

LP = 1 BYTE LOW POWER/HIGH THROUGHPUT FLAG

20 DEVICE ID = DEVICE IDENTIFICATION SEQUENCE (e.g. MAC ADDRESS)

RSSI = 1 BYTE RELATIVE SIGNAL STRENGTH INDEX

$$\begin{aligned} \text{TOTAL SIZE OF HEARBEAT PACKET} &= \text{HEADER SIZE} + \text{NC} * \text{PAYLOAD SIZE} \\ &= 11 + \text{NC} * (\text{ID SIZE} + 1) \end{aligned}$$

Sequence Number

Sequence Number is a one-byte counter incremented upon the transmission of a heartbeat packet. This counter will wrap to 0 after it reaches a value of 255.

Whenever a device receives a heartbeat packet, it updates the sequence number for the source in its own tables. The device then retransmits the heartbeat packet so that other devices distant from the source can also receive it. If a device receives a heartbeat packet with a sequence number less than or equal to the noted sequence number for the source, the packet is discarded.

The sequence number is significant because of the shared nature of the wireless medium. Lets consider Figure 1 and a scenario where node "2" has just come up.

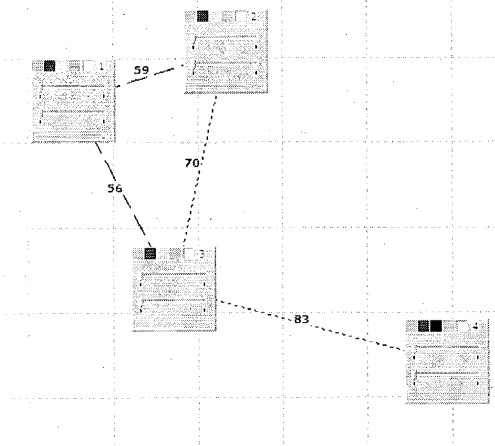


Figure 1

When the node labeled "2" sends out its heartbeat with sequence number "1" node "1" and "3" will hear the packet and update the entry corresponding to node "2" with the value "1". Since both "1" and "3" have heard "2" for the first time, they both will retransmit the packet so that distant devices and new devices which have just come up can receive the heartbeat. Lets assume that node "1" relays the heartbeat first. Nodes "2" and "3" would hear the packet again. "2" would discard it because the original sender is itself, whereas "3" would discard it as its tables already indicate sequence number "1" for node "2".

Now "3" relays the packet and "4" receives it and updates its tables before retransmitting it. For a network with N nodes every heartbeat packet is transmitted N times for the first time. Thus the sequence number helps prevent broadcast flooding for heartbeat packets. This mechanism is only used for the first heartbeat packet. For broadcast/multicast data packets and subsequent heartbeat packets, an optimized technique is used which is discussed below.

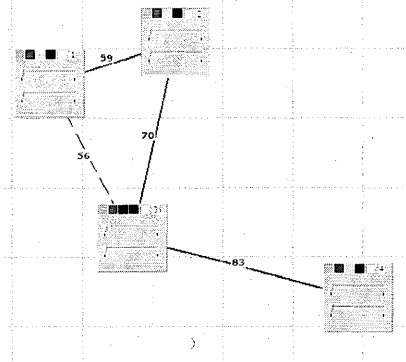


Figure 2

When the node "2" sends out the heartbeat packet with sequence number "2", both 1 and 3 hear the heartbeat and update the table entries corresponding to node "2". Both "1" and "3" would then refer to the Single Source Shortest Path (SSSP) tree corresponding to node "2" as shown by the solid blue lines in Figure 2 above. According to the tree "1" does not have any "child" and hence will not forward the packet further. "3" on the other hand has "4" as its child and hence will forward the packet to "4".

Hence subsequent heartbeat packets are sent $M \leq N$ times, where M is the number of levels in the SSSP tree for the source node, and N is the number of devices on the network. If in the mean time another node comes up and hears the heartbeat for the first time, it will retransmit the packet, but the sequence number will help other nodes discard the packet.

Multi-zone/Multi-channel support is explained later in the document for the purposes of brevity.

Device Toll Cost (Dtc)

5 The Device Toll Cost is the value charged by the device for forwarding a packet to one of its neighbors. This value is used in determining the optimal routes. This value helps in the dynamic adaptive load balancing of the network.

Device Hop Cost (Dhc)

The Device Hop Cost is the expense incurred every time a packet needs to be sent via another device. This value helps in the determining QOS requirements of the node.

10

Low Power/High Throughput Flag (Lp)

This flag is set to "1" for devices that use a routing table optimized for low power consumption/high throughput.

15 ALGORITHM DATA-STRUCTURES

Network Representation

The algorithm uses a Directed Weighted Graph (DWG) for representing the networks, which may have unidirectional links and Un-Directed Weighted Graph (UWG) for networks having bidirectional links only. The devices on the network form the set of vertices for the graph. Based on the information in the heartbeat packet, edges are added to the graph with
20 an initial weight that is inversely proportional to the RSSI.

Graph Representation

Traditionally graphs have been represented using either adjacency matrices or
25 adjacency lists. Adjacency matrices offer fast $O(1)$ edge lookup and modification, but tend to be wasteful if the number of edges in the graph is a lot less than N^2 , where N is the number of devices. The maximum number of edges is $"P_2"$ for a DWG and $"C_2"$ for a UWG.

Practically the number of edges N_e in a WPAN would be much lesser than $"P_2$ and hence much lesser than N^2 number of edges, for $N \geq 2$, $"C_2 < "P_2$, $N_e < "C_2 < N^2$.

Adjacency lists on the other hand save memory, but offer $O(M)$ worst-case edge lookup and modification, where M is the number of edges on the list, and hence tend to affect the overall routing performance. The algorithm uses a specialized representation of a graph that offers acceptable performance and has lower runtime memory requirements.

A graph object in the algorithm has the following attributes:

- A vertex hash table for fast vertex lookup and modification
- An edge hash table for fast edge lookup and modification
- A vertex list for vertex enumeration
- An edge list for edge enumeration

A vertex object exists in both the graph's vertex hash table and on the graph's vertex list. A vertex object also includes an edge list for all incident edges. In addition, a vertex object also has 2 spare link pointers through which it can exist in 2 more lists.

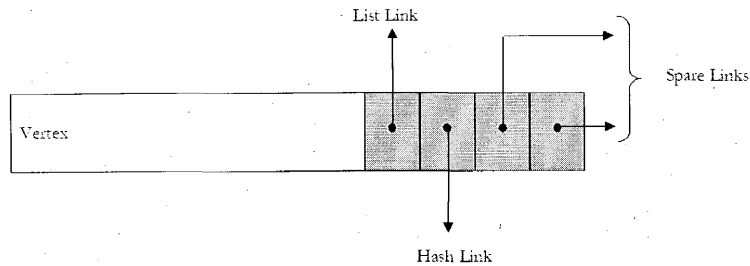
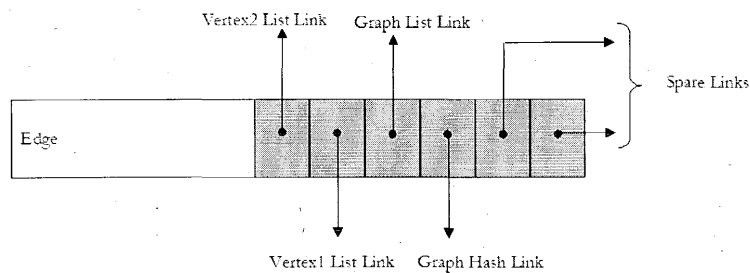
An edge object on the other hand exists not only on both the graph's edge hash table and the graph's edge list, but also exists on the following:

- If un-directed, on the edge lists of both the vertices it is incident upon
- If directed, on the edge list of the source vertex.

In addition an edge object also has 2 spare link pointers through which it can exist in 2 more lists.

The 2 spare link pointers on the vertex and edge objects are helpful for algorithms that operate on graphs for sorting purposes. These algorithms can sort vertices/edges in any manner they deem without having to allocate/free additional memory.

Graph algorithms can also save custom data pointers within the vertex and edge objects.

**Figure 3****Figure 4**

- 5 This specialized data structure helps answer the following questions regarding the graph very quickly.
- Is Vertex 'X' on the graph?
 - Is there an edge between Vertex 'X' and Vertex 'Y'? If yes what is the initial edge cost?
- 10
- What are the edges incident upon Vertex 'Z'?
 - Enumeration of all the edges on the graph
 - Enumeration of all the vertices on the graph

The edge and vertex lookup times are dependant on the bucket size of the hash tables used. The value of the bucket size can be changed as required.

ALGORITHM OPERATION**Direct Heartbeat Reception**

Upon receipt of a direct heartbeat (from a source we can directly hear), the algorithm takes the following steps:

- 5 1. Lookup vertex for the source. If the vertex is not present, create a new vertex for the source and initialize its corresponding custom vertex data.
2. Lookup edge between the source and us. If an edge is not present, create a new edge between the source and us and initialize its corresponding custom edge data.
3. If the sequence number of the heartbeat is less than or equal to the sequence number noted in the custom vertex data, discard the packet. End.
- 10 4. Update the RSSI information and the last known good time in the custom edge data.
5. Update the sequence number, toll cost, hop cost, and low power flag in the custom vertex data.
6. If the source was heard for the first time (an edge was just created), then forward the packet by re-transmitting it, and go to step 8.
- 15 7. Lookup our position on the source's SSSP tree. If we have nodes below us on the tree forward the packet by re-transmitting it.
8. For every payload entry
 - a. Lookup vertex and create it if not present.
 - 20 b. Lookup an edge between the source and the vertex, and create it if not present.
 - c. Update the RSSI information and the last known good time in the custom edge data.

In-direct Heartbeat Reception

- 25 Upon receipt of an in-direct heartbeat (from a source we cannot directly hear), the algorithm takes the following steps:

1. Lookup vertex for immediate transmitter. If the vertex is not present, create a new vertex for the immediate transmitter and initialize its corresponding custom vertex data.
- 30 2. Lookup edge between the immediate transmitter and us. If the edge is not present, create a new edge and initialize its corresponding custom edge data.

3. Lookup vertex for the source. If the vertex is not present, create a new vertex for the source and initialize its corresponding custom vertex data.
4. If the sequence number of the heartbeat is less than or equal to the sequence number entered in the source vertex's custom vertex data, discard the packet. End.
5. Update the RSSI information and the last known good time in the custom edge data, for the immediate sender.
6. Update the sequence number, toll cost, hop cost, and low power flag in the custom vertex data for the source.
7. If the source was heard for the first time (an edge was just created), then forward the packet by re-transmitting it, and go to step 9.
8. Lookup our position on the source's SSSP tree. If we have nodes below us on the tree forward the packet by re-transmitting it.
9. For every payload entry
 - a. Lookup vertex and create it if not present.
 - b. Lookup an edge between the source and the vertex, and create it if not present.
 - c. Update the RSSI information and the last known good time in the custom edge data.

Heartbeat Transmission

Before transmitting the heartbeat packet, the algorithm takes the following steps:

1. Check the last known good timestamp for every edge, and delete edges whose last known good times are greater than $K * U$, where $K \geq 2$ is a chosen constant, and U is the heartbeat update interval chosen for the network.
2. Calculate our own Redundancy Index RI for health indication purposes. This is done as follows:
 - a. Initialize Good Nodes Count GNC to 0
 - b. For every vertex we can reach, using an edge incident upon us, mark the edge as closed, and try to reach the vertex using any other path. If the vertex can be reached, increment GNC .
 - c. Good Nodes Ratio $GNR = (GNC / TOTAL_INCIDENT_EDGES)$
 - d. Incidence Ratio $IR =$

$$TOTAL_INCIDENT_EDGES / (TOTAL_VERTEX_COUNT - 1)$$

$$e. RI = (GNR * 0.6 + IR * 0.4) * 100$$

3. For every vertex compute the SSSP tree for this vertex, using the SSSP algorithm described below.
4. Add every edge incident upon us to the heartbeat packet and send out the heartbeat packet, with our *DTC*, *DHC* and sequence numbers.
5. Increment sequence number.

Single Source Shortest Path (SSSP) algorithm

The SSSP algorithm used here is a modified version of Dijkstra's SSSP algorithm.

- 10 The original Dijkstra SSSP algorithm uses pre-computed edge costs, where as in this modified algorithm instead of using the edge costs, we compute the Destination Vertex Cost *DVC* from the RSSI information, dynamically as we proceed in the algorithm.

The modified algorithm makes use of the spare links provided by the vertex and edge objects.

1. Initialize the Vertex Cost *VC* to ∞ , and the Vertex Edge *VE* to *NULL* for all vertices, other than the source. For the source vertex, set *VC* to 0 and *VE* to *NULL*.
2. We use the two spare links provided in the vertex object, to form a doubly linked list of vertices, without having to allocate or free any additional memory. Set the source vertex as the head of this doubly linked list, set the Hop Count *HC* for the source vertex to be 0.
- 20 3. For every vertex in the doubly linked list
 - a. We use the two spare links provided in the edge object, to form a doubly linked list of edges, without having to allocate or free any additional memory. For every edge incident on the vertex, compute the Final Edge Cost *FEC* using the equation given below.

$$FEC = (100 - RSSI) + HC * DHC + TC$$

$$TC = 0 \text{ if } HC = 0, DTC \text{ if } HC \neq 0$$
 Use insertion sort to insert the edge onto the doubly linked list sorted in ascending order of *FEC*. We call the vertex in context the *Control Vertex*, and the edge destination the *Destination Vertex*.
 - 25 $FEC = (100 - RSSI) + HC * DHC + TC$
 - 30 $TC = 0 \text{ if } HC = 0, DTC \text{ if } HC \neq 0$

- i. Compute *DVC* using the equation given below.
 For Low Power Consumption:

$$DVC = MAX (VC \text{ of Control Vertex}, FEC)$$
 Otherwise:

$$DVC = VC \text{ of Control Vertex} + FEC$$
 - ii. If *VC* for *Destination Vertex* = ∞ then, set *VC* for *Destination Vertex* to *DVC*, *VE* for *Destination Vertex* to the current edge, *HC* for *Destination Vertex* to *HC* of *Control Vertex* + 1. Go to Step iv.
 - iii. If *VC* for *Destination Vertex* > *DVC* then, set *VC* for *Destination Vertex* to *DVC*, *VE* for *Destination Vertex* to current edge, *HC* for *Destination Vertex* to *HC* of *Control Vertex* + 1. Remove *Destination Vertex* from doubly linked list.
 - iv. Use insertion sort, to insert *Destination Vertex* into doubly linked list.
4. Create a new graph object for the SSSP tree.
 5. Add every vertex in the original graph, to the SSSP tree and every vertex's *VE* to the SSSP tree.

TECHNOLOGY EVALUATION

No Central Control

The implementation of the algorithm makes it clear that it is truly distributed without the need for any central control. The implementer has to choose appropriate values for *K* and *U* depending on the physical characteristics of the network.

Self-Configuring

Any device can join the network instantly. Devices already present on the network can discover the new device after the heartbeat packet transmitted by it is propagated through the network. The device itself can report its health using the value of *RI*. This information can help the user choose an appropriate location for the device.

Self-Healing/Fault Tolerant

The heartbeat packets sent by the devices, make sure that the system can recover from route and device failures.

Dynamic Adaptive Load Balancing

- 5 The devices can adaptively increase or decrease the value of their *DTC*, so as to trigger changes in the SSSP trees of other devices. E.g. when a device detects that a lot of devices are using it for forwarding packets, it could adaptively increase its *DTC* so that the traffic then flows through other devices on the network. Similarly when the device detects that the traffic load through it has decreased, it could adaptively decrease its *DTC*.

10 **Pro-Active Routing**

The computation of the SSSP tree by every vertex, for every vertex makes the algorithm very pro-active. This means route planning times are minimized at the time of packet sending and forwarding.

Varied Bandwidth/Qos/Power Requirements

- 15 The *DHC* value of a device changes the way in which its SSSP tree is computed. Low latency driven devices can set *DHC* to a high value to make sure their SSSP trees are computed with minimum number of hops. Low Power Flag chooses edges so as to minimize the transmit power for the devices.

Low Memory Footprint

- 20 The specialized data structures used by the algorithm provided acceptable performance and use reasonably low memory. For a network with very large number of devices e.g. 10,000, the network could be divided into multiple zones, so as to provide acceptable performance using low memory. Multi-Zoning is explained in the next section.

Multi-Zone/Multi-Channel Support

- 25 A WPAN can be divided into 2 or more Pico-nets using different RF channels, so as to minimize the interference between them. Two attractive approaches are explained below.

30

Common Device Approach

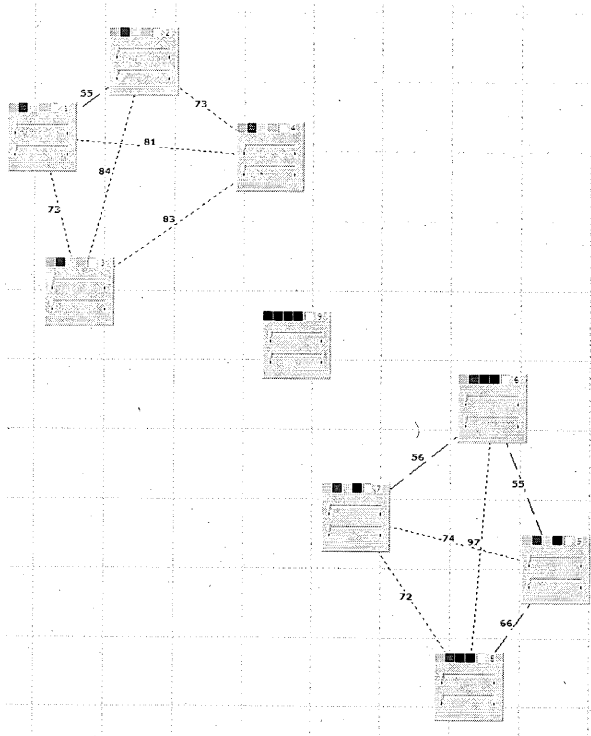


Figure 5

Figure 5 shows two Pico-nets comprising of nodes (1,2,3,4) and (5,6,7,8) respectively. Both Pico-nets are operating on different RF channels so as to not interfere with each other. Node 9 is a node having two interfaces, one listening to the RF channel for the first Pico-net and the other listening to the RF channel for the second Pico-net. Hence Node 9 is designated as the *Common Device*.

When Node 9 is turned off both Pico-nets can only operate independently.

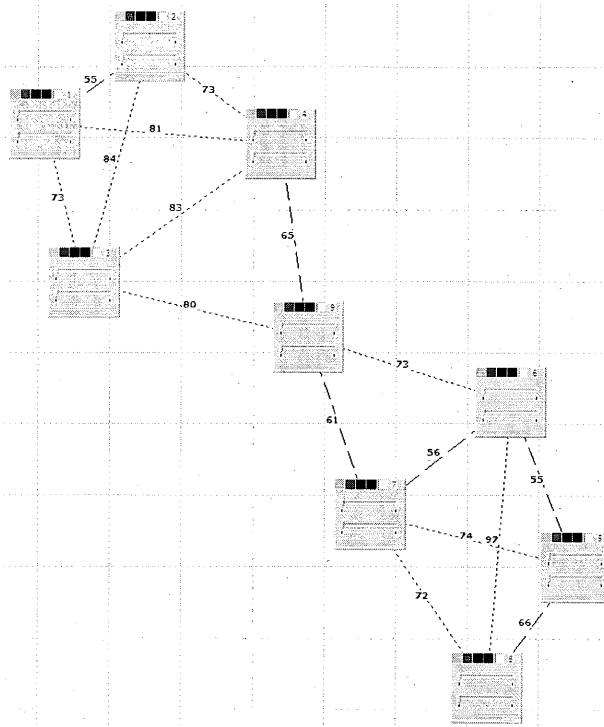


Figure 6

When Node 9 is turned on both Pico-nets can now not only work independently, but can also use Node 9 to route information between the Pico-nets. Node 9 ensures that the heartbeat packets generated in both Pico-nets are forwarded to the other Pico-net. Thus devices of both Pico-nets view the network as one combined Pico-net.

Common Router Approach

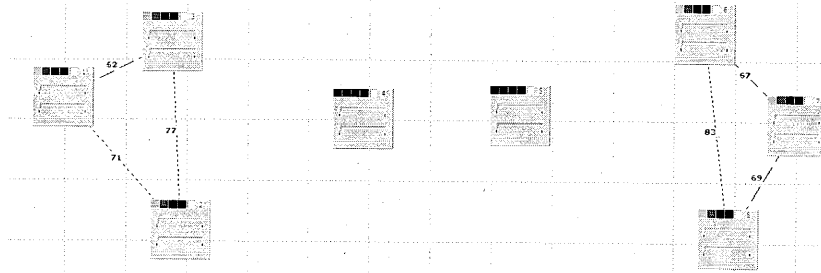


Figure 7

Figure 7 above shows two Pico-nets comprising of Nodes (1,2,3,4) and (5,6,7,8) respectively. Here the Nodes 4 and 5 have been designated as *Common Routers*. Separate RF channels are used for the Intra Pico-net and Inter Pico-net communications. When the *Common Routers* are turned off, both Pico-nets can only work independently. When the *Common Routers* are turned on, the Figures 8 and 9 below show the Intra Pico-net SSSP trees of both Pico-nets respectively, Figure 10 shows the entire topology.

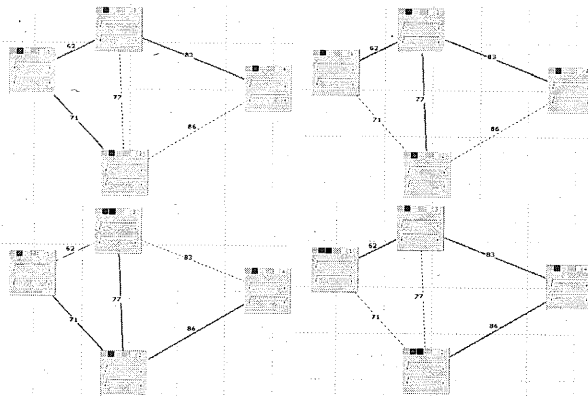


Figure 8

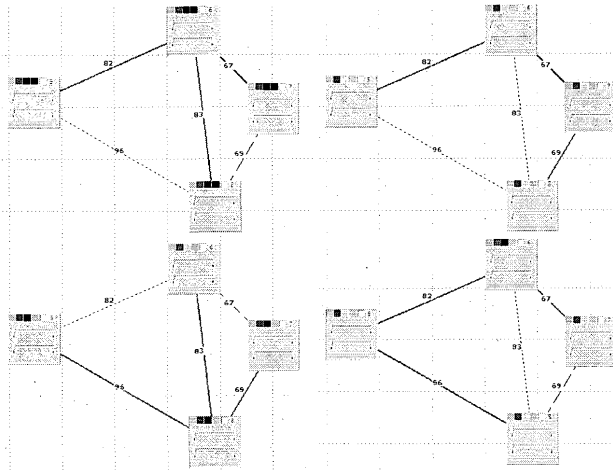


Figure 9

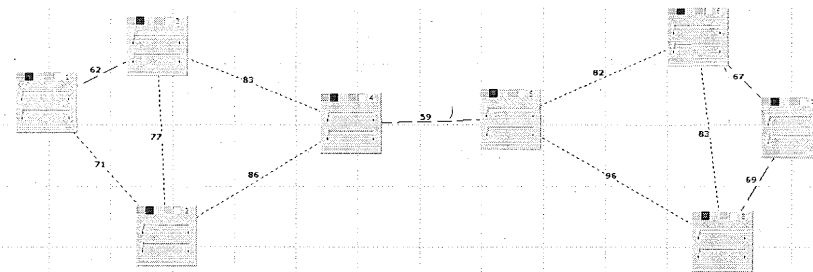


Figure 10

- 5 The heartbeat packets transmitted by the *Common Routers* are different for Inter Pico-net and Intra Pico-net communication. For Intra Pico-net communications, the *Common Routers* include only the Pico-net members they hear in their heartbeat packets. Hence for the first Pico-net, the Intra Pico-net heartbeat sent out by 4 would include entries for Nodes 1,2 and 3. Even though Node 4 can also hear Node 5, the Intra Pico-net will not have an entry for
- 10 Node 5.

5 The Inter Pico-net heartbeat transmitted by Node 4 will include entries for Nodes 1,2,3 and 5. Hence only the *Common Routers* will need to know about the entire topology, whereas individual devices will only need to know the topology of their Pico-net. Whenever a device needs to send a packet to a device that is outside its Pico-net, the packet is sent to the *Common Router* for that Pico-net.

Network Layer Independent

Clearly the algorithm described does not depend on any Network Layer protocol like IP. This algorithm is also independent of the MAC sub-layer although its use is intended to be at the MAC sub-layer.

10 Efficient Topology Lookup And Modification

The specialized graph data structures used by the algorithm are designed for efficient topology lookup, offering acceptable performance over a reasonably large number of nodes.

15

What is claimed is:

- 1 1. A dynamic wireless network comprising:
 - 2 a) an access server that controls overall operating parameters of said wireless
 - 3 network;
 - 4 b) a first set of control algorithms on said access server for establishing and
 - 5 communicating operating parameters for said wireless network;
 - 6 c) at least one root node in communication with said access server;
 - 7 d) a plurality of wireless access point devices capable of communication with
 - 8 said root node and access server;
 - 9 e) a second set of control algorithms running on at least one of said plurality of
 - 10 access point devices for operating said access point devices within the parameters defined by
 - 11 said access server, and
 - 12 wherein said plurality of access point devices alter their relationship to one another to
 - 13 function optimally within the operating parameters of the network established by said access
 - 14 server.
- 1 2. The dynamic wireless network as in claim 1 wherein said root node serves as an interface
- 2 between said access point devices and an outside link, wherein the outside link can be an
- 3 Ethernet, token ring, phone line or serial cable.
- 1 3. The dynamic wireless network as in claim 1 wherein all access point devices serve as root
- 2 nodes connected to an outside link, wherein the outside link can be an Ethernet, token ring,
- 3 phone line or serial cable.
- 1 4. The dynamic wireless network of claim 1 wherein code unnecessary for essential functions
- 2 of the control algorithm and its accompanying operating system is removed from the control
- 3 algorithm, resulting in decreased size.
- 1 5. The dynamic wireless network of claim 1 wherein the access point devices are capable of
- 2 generating encryption keys for providing a secure network.

- 1 6. A control system for managing wireless LANs comprising:
2 a) readily available information for defining characteristics of a wireless
3 network;
4 b) a set of control algorithms to use said readily available information to select a
5 best routing path of each of a node of the network;
6 c) implementation of said control algorithms in a low footprint to
7 extend capabilities of a plurality of existing low cost wireless access point nodes and a
8 plurality of other wireless enabled communication devices; and
9 d) a plurality of settings passed from a network management system (NMS) for
10 dynamically tuning the network or any node of the network,
11 wherein a self-configuring, dynamically expandable wireless network is provided.
- 1 7. The system of claim 6 wherein the control algorithms are specially designed to run
2 effectively within a small footprint embedded system.
- 1 8. The system of claim 6 implemented with a minimal footprint so as to run on a multitude
2 of wireless enabled devices, including low cost, resource limited hardware.
- 1 9. The system of claim 6, wherein the low footprint, is generated as a result of a library of
2 components of a plurality of operating system services with which a plurality of self standing
3 executables is generated to include only components of an operating system essential for an
4 operation of an application.
- 1 10. The system of claim 6, wherein the control algorithms are implemented to run on at least
2 two readily available pieces of data, comprising a signal strength of a wireless radio of
3 nearby nodes in the network and a number of hops of nearby nodes to a wired connection.
- 1 11. The system of claim 6, wherein the control algorithms run above a MAC layer of the
2 communication device and is thereby both hardware and protocol agnostic.

1 12. The system of claim 11 wherein the control algorithms are capable of being embedded in
2 wireless communication devices running on different operating systems but managed by one
3 NMS.

1 13. The system of claim 6 wherein the control algorithms common to all devices in the
2 network are instrumental in changing the network characteristics, based on a plurality of
3 settings passed to said algorithms from a NMS.

1 14. The system of claim 6 wherein the implementation of the low footprint algorithms
2 include the functionality of bridging, switching, load balancing in addition to a plurality of
3 performance characteristics of the network related to latency and signal throughput.

4 15. The system of claim 14 wherein the performance characteristics of the network is tuned
5 to be low latency, or high throughput or somewhere in between low latency and high
6 throughput.

1 16. The system of claim 6, wherein performance of the network is predicated on a plurality
2 of low footprint control layer algorithms running in wireless access point nodes.

1 17. The system of claim 16, wherein the running of the control algorithms in each device
2 results in a low footprint distributed control system approach wherein said approach is more
3 scaleable than centralized control systems, when the number of nodes of the network
4 increases.

1 18. The system of claim 17 wherein the low footprint distributed control approach comprises
2 an ability for control algorithms to be upgraded remotely using a simple upgrade protocol,
3 thereby allowing a modifiable and extensible implementation of the system.

1 19. The system of claim 6 wherein the control algorithms manage the RF Interference of
2 neighboring wireless devices by sensing and exchanging information regarding Radio
3 channels in operation in the vicinity and selecting non interfering radio channels based on a
4 algorithm described.

1 20. The system of claim 6 wherein the control algorithms manage the RF Interference of
2 neighboring wireless devices in a multi hop wireless network and maintain seamless roaming
3 for stations as they move from one BSS to an adjoining BSS.

1 21. The system of claim 6 wherein the control algorithms monitor the health of the
2 wireless network and inform the NMS if node congestion occurs or the network has not been
3 designed to be fail safe and redundant.

1 22. A method for implementing a control system for managing Wireless LANs comprising:
2 a) defining characteristics of a wireless network using readily available
3 information;
4 b) utilizing control algorithms to use said readily available information to select
5 a best routing path of each of a node of the network;
6 c) implementing said control algorithms in a low footprint to
7 extend capabilities of a plurality of existing low cost wireless access point nodes and
8 a plurality of other wireless enabled communication devices; and
9 d) dynamically tuning the network or any node of the network by a plurality of
10 settings passed from a network management system,
11 wherein a self-configuring, dynamically expandable wireless network is provided.

ABSTRACT

A design and proof of concept of a new type of WLAN, complete with simulation and results from the simulation has been described. Each AP Node is implemented as a self-contained embedded OS unit, with all algorithms resident in its Operating system. The normal day-to-day functioning of the AP node is based entirely on resident control algorithms. Upgrades are possible through a simple secure communications interface supported by the OS kernel for each AP node. Benefits provided by a wireless network, as proposed in this invention, are that: it installs out of the box; the network is self-configuring; the network is redundant in that mesh network formalism is supported, ensuring multiple paths; load balancing is supported; there is no single point of failure; allows for decentralized execution; there is a central control; it is network application aware; there is application awareness; there is automatic channel allocation to manage and curtail RF interference, maximize non interference bandwidth and enable seamless roaming between adjoining wireless sub networks (BSS) and it supports the wireless equivalent for switching – for seamless roaming requirements.

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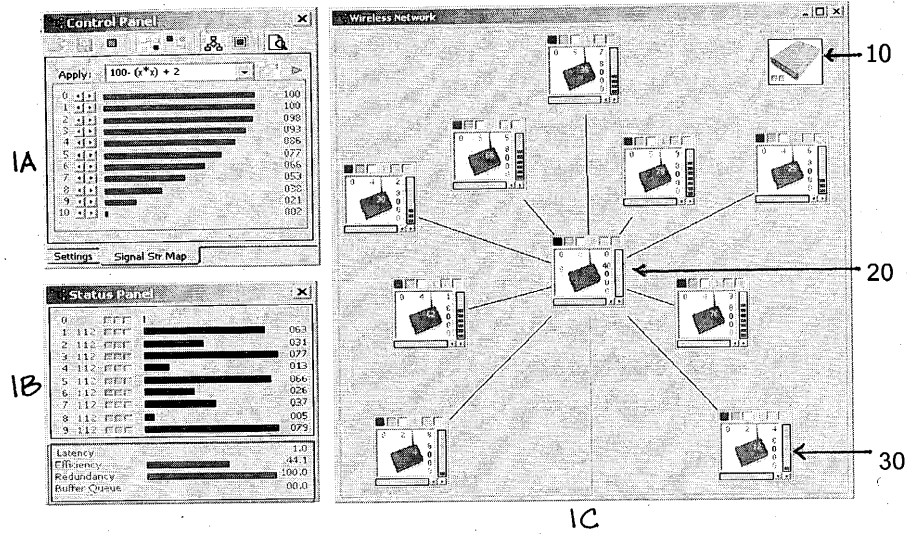


FIG. 1

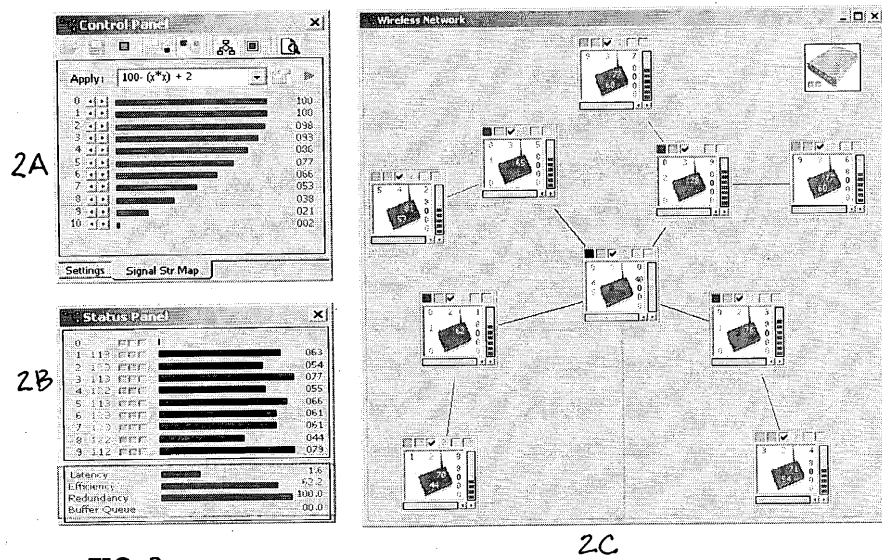
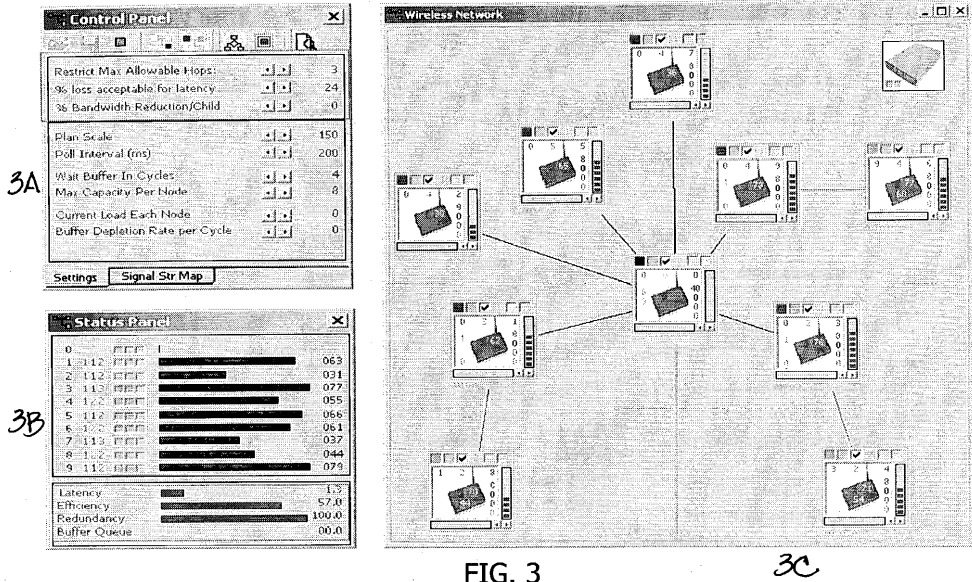
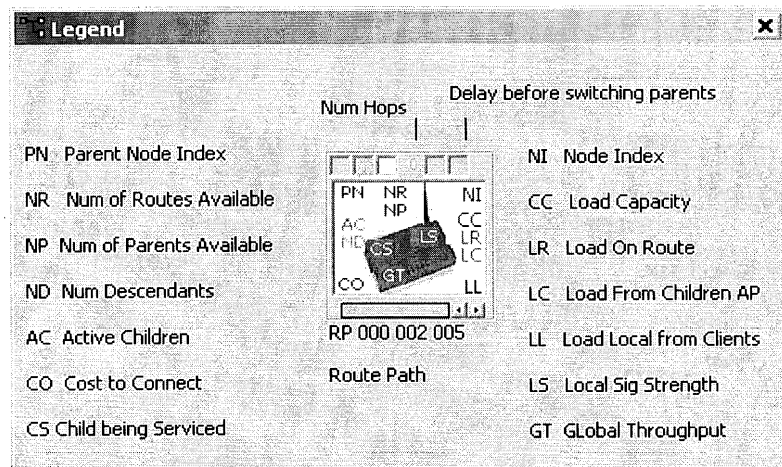


FIG. 2

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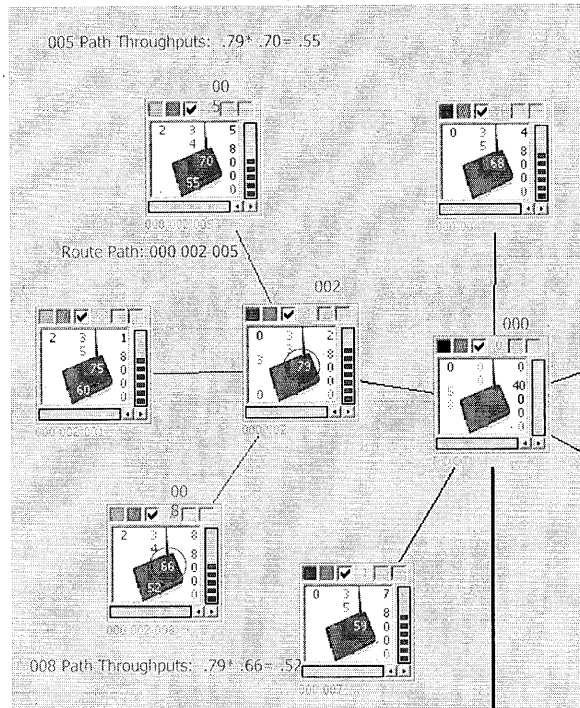


FIG. 4B

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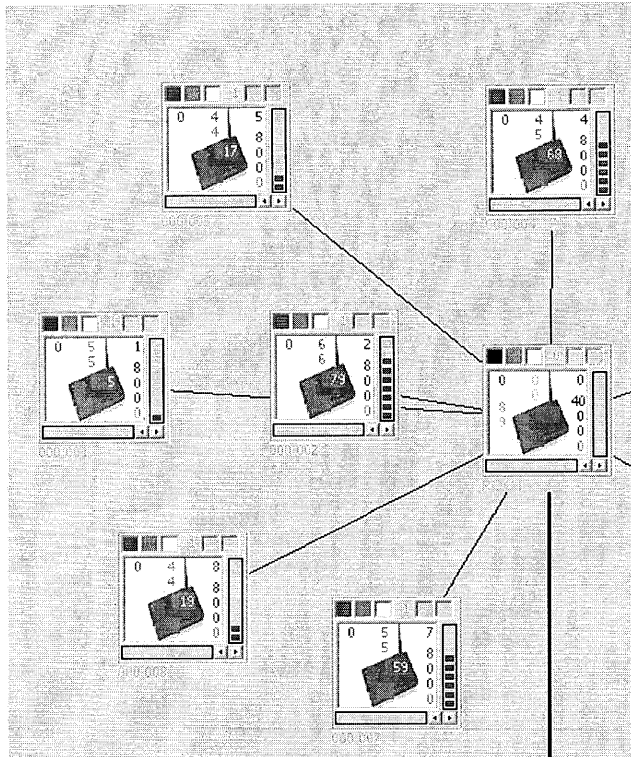


FIG. 5

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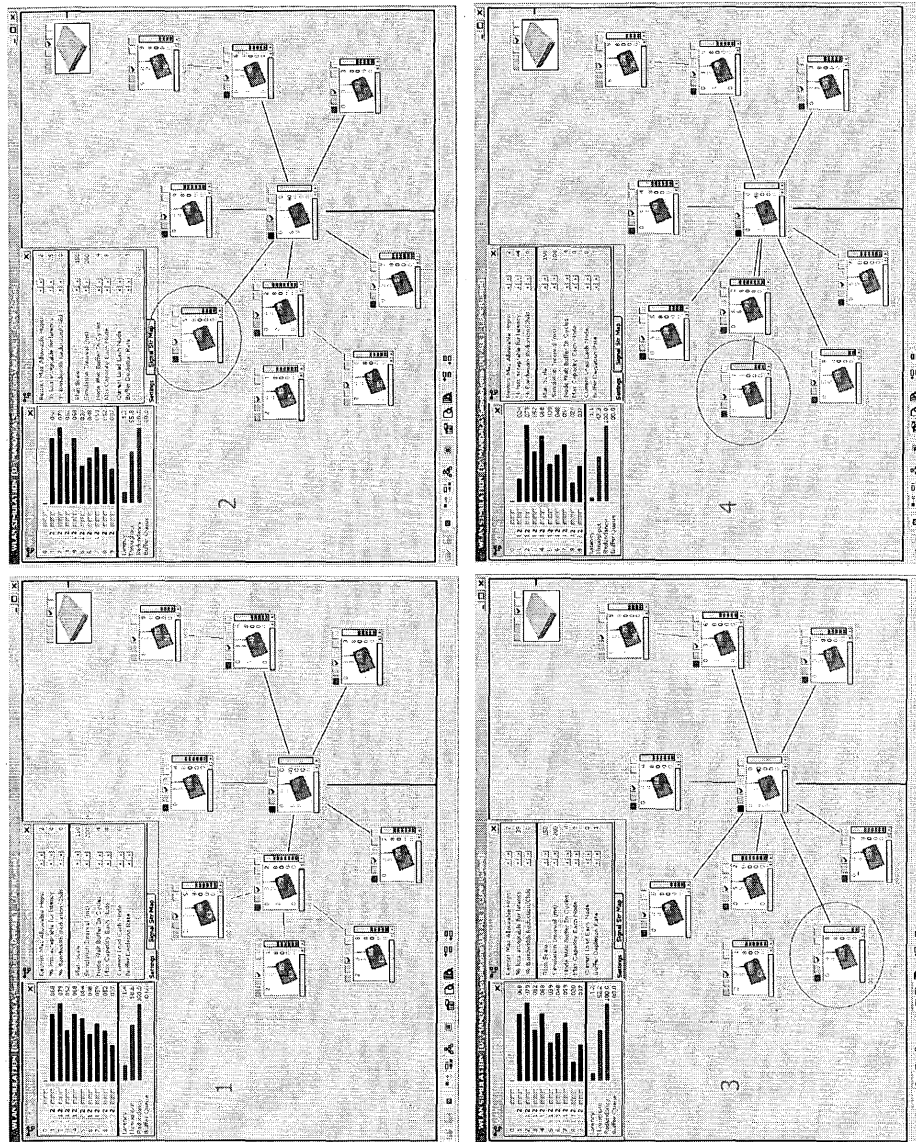


FIG. 6

10434948 : 050003

6/14

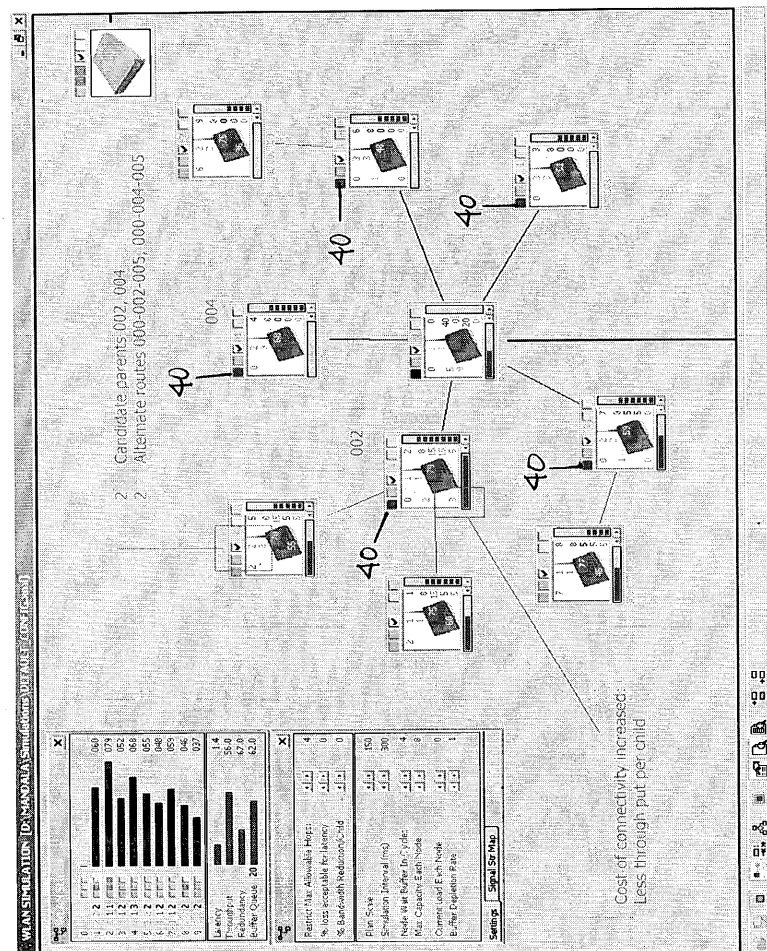


FIG. 7

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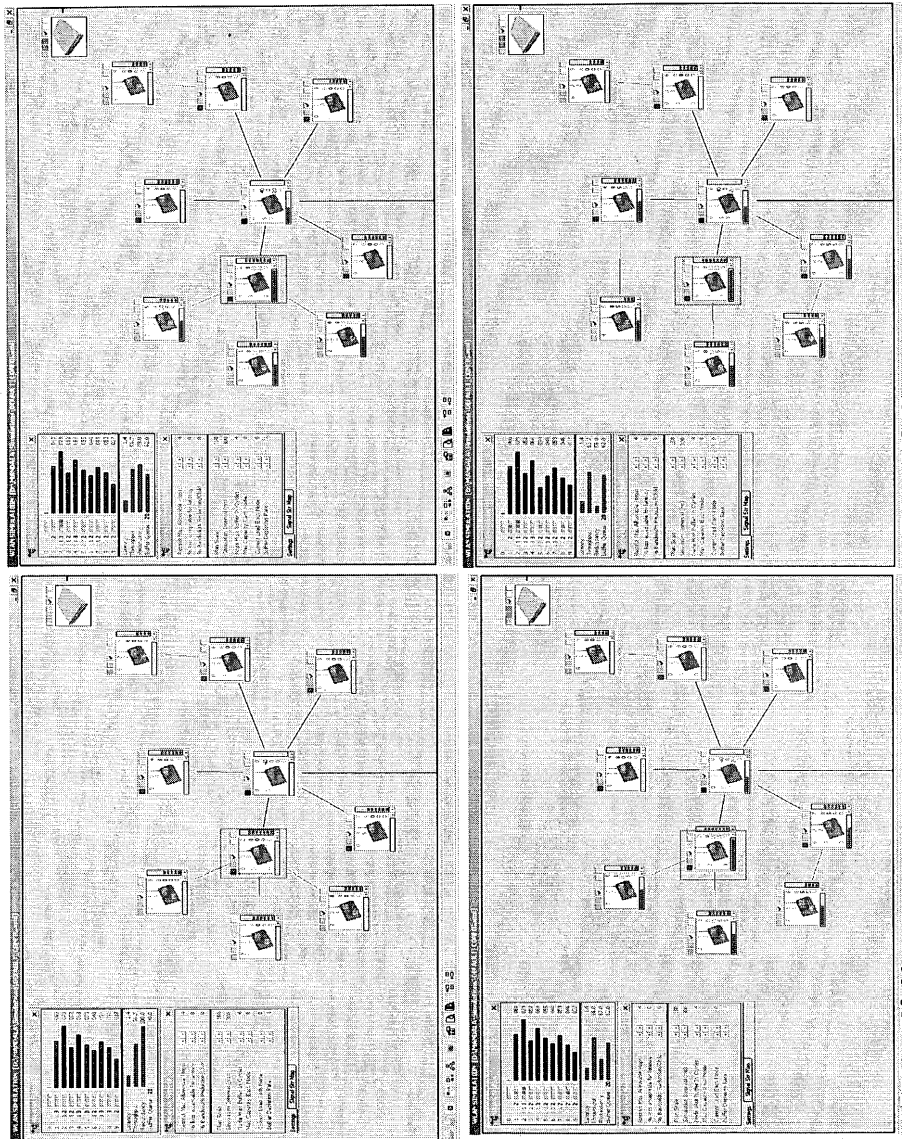


FIG. 8

10434940 : 000000

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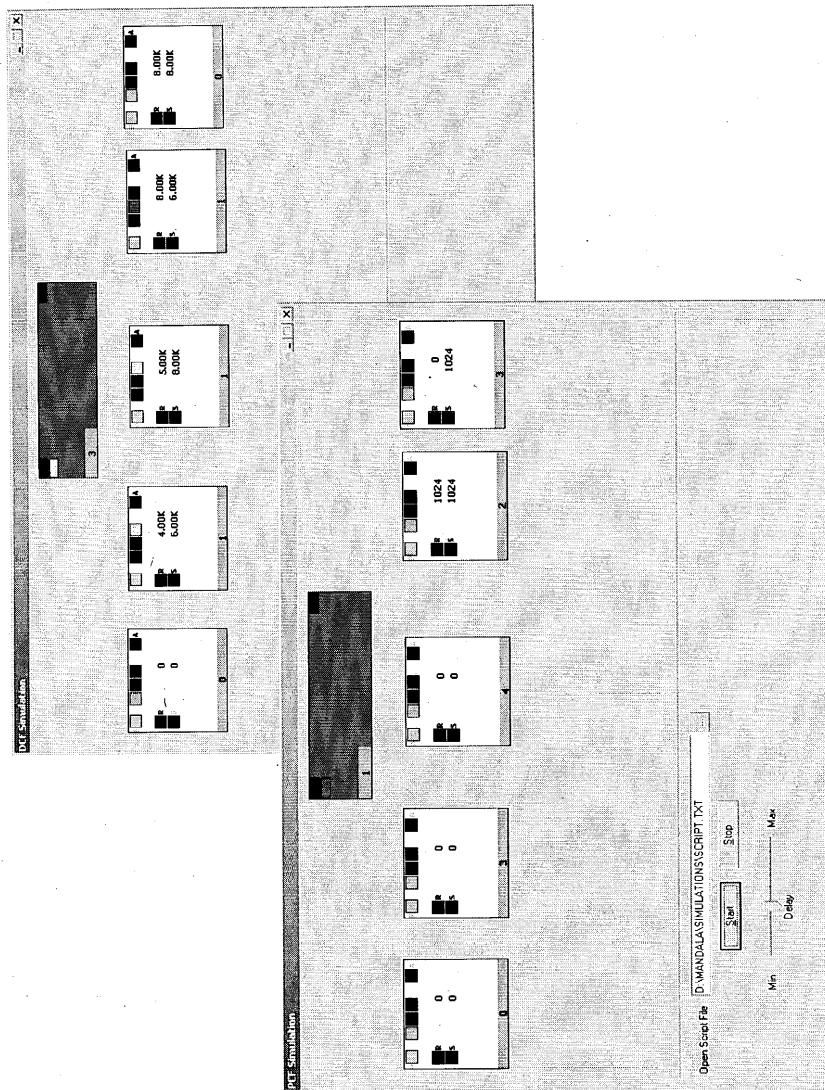


FIG. 9

10434540, 050003

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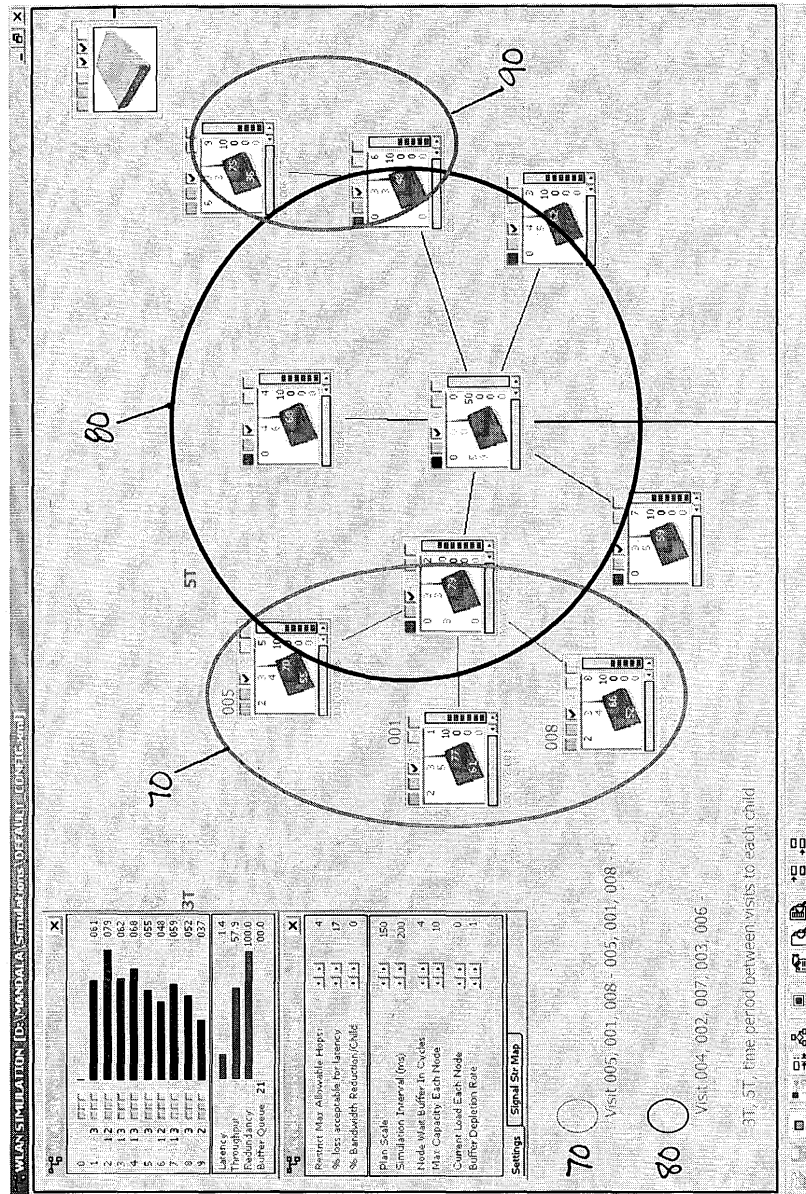


FIG. 10

10434948 . 050003

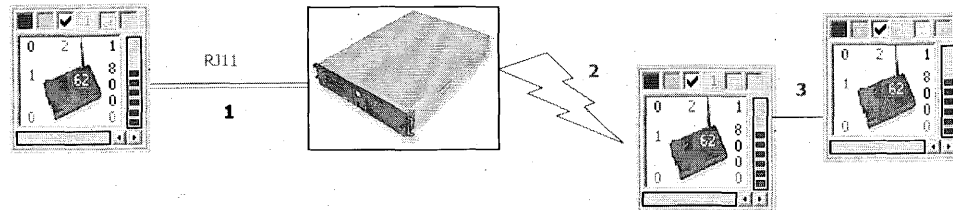


FIG. 11

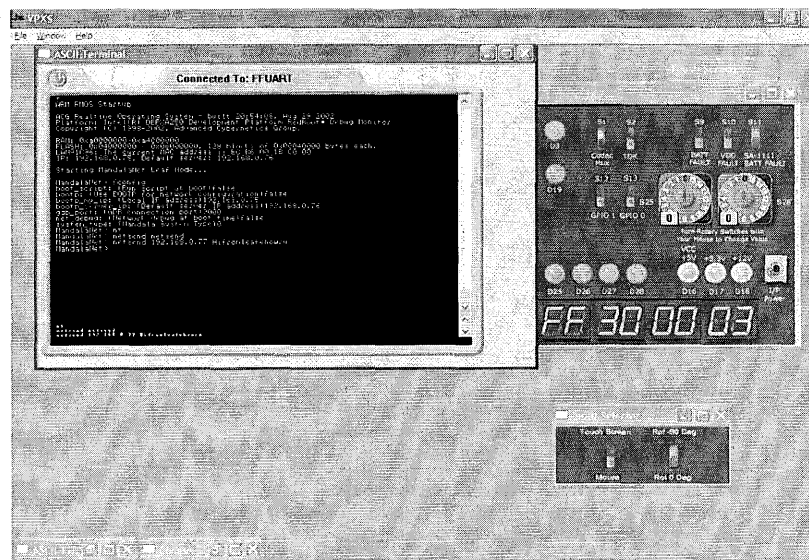


FIG. 12

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Objective: Low foot print for low cost embedded system applications
Key Idea: Remove overhead of OS/Virtual Machine from the equation

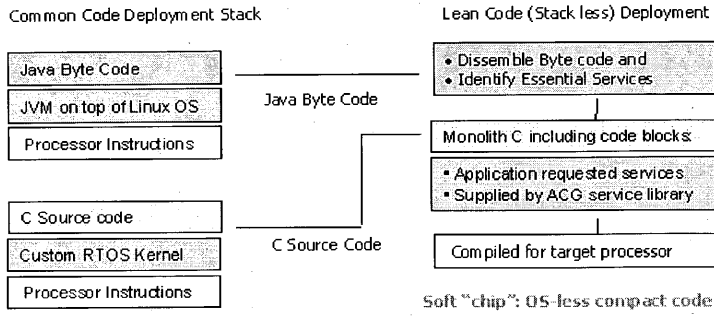


FIG. 13

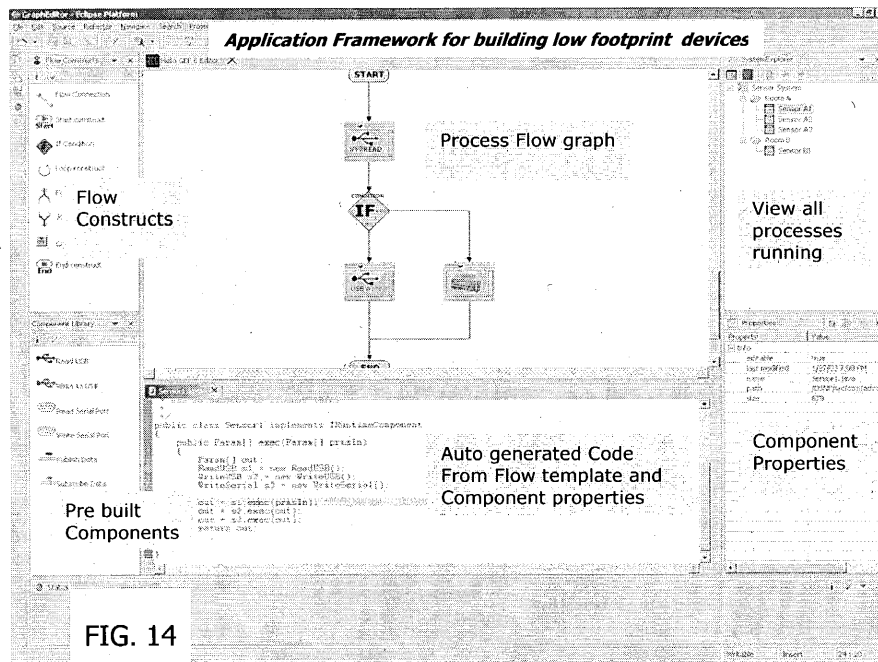


FIG. 14

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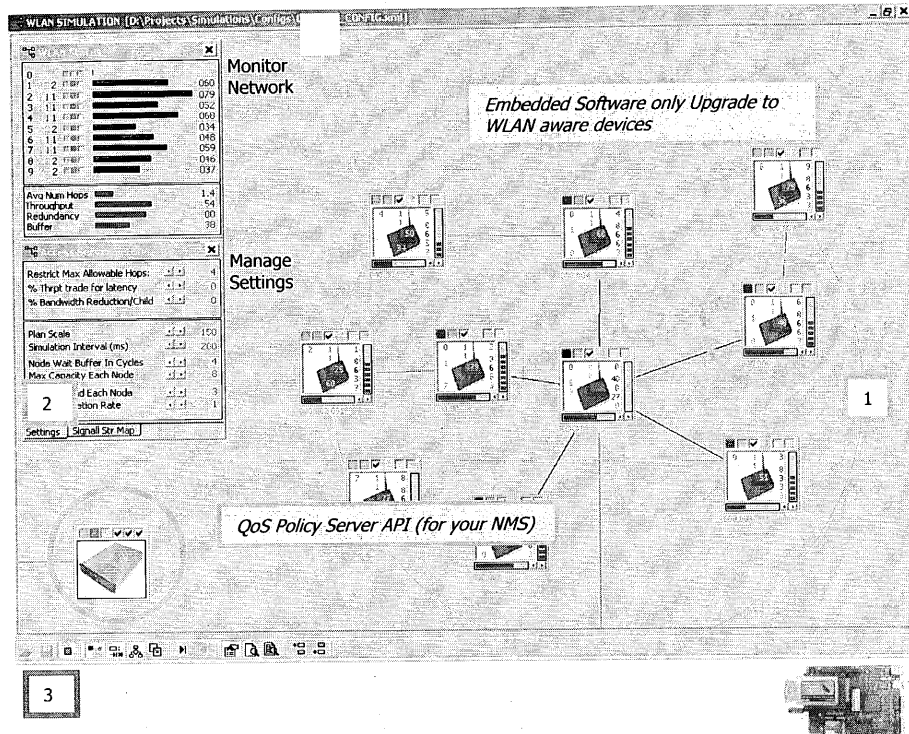


FIG. 15

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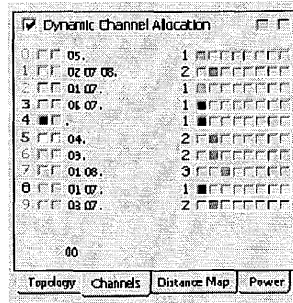


FIG. 16

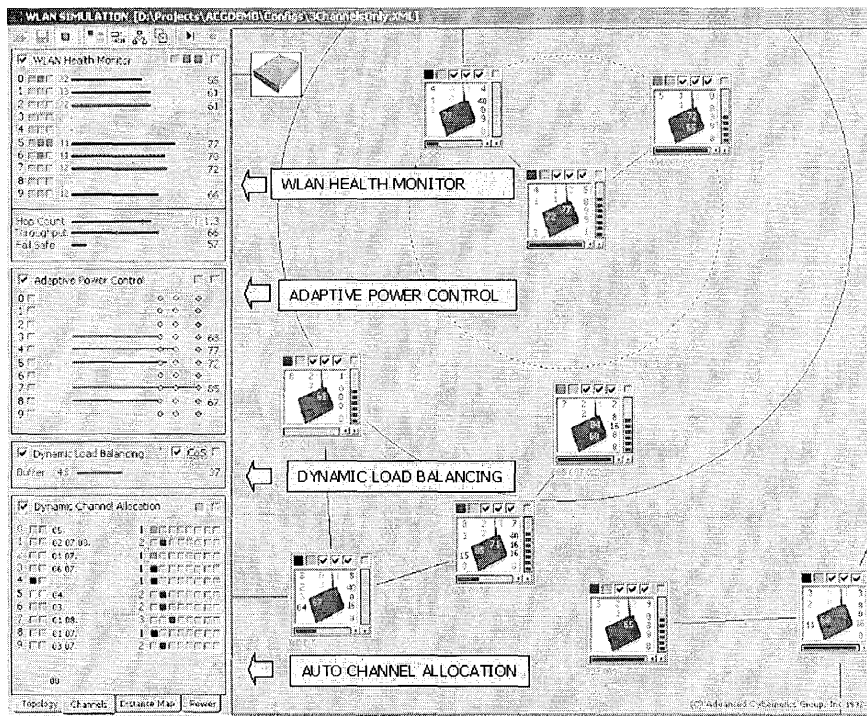


FIG. 17

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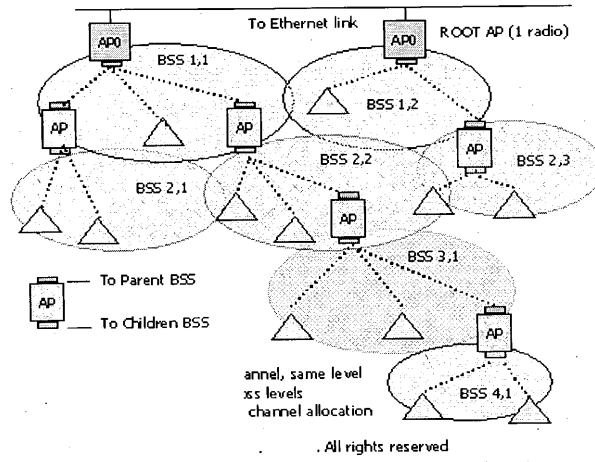


FIG. 18

DECLARATION

DACOSTA.FPT1

UTILITY APPLICATION

As a 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 the original, first, and sole inventor (if only one name is listed below) or an original, first, and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled HIGH PERFORMANCE WIRELESS NETWORKS USING DISTRIBUTED CONTROL the specification of which

CHECK ONE

☒ is attached hereto.

☐ was filed on _____ as
Application Serial No. _____
and was amended on _____
(if applicable)

I have read the applicable statutes and rules reprinted on the attached page of this declaration which I understand to describe subject matter which is material under 37 C.F.R. § 1.56(a).

I hereby state that I have reviewed and understand the contents of the above-identified specification, including the claims, as amended by any amendment(s) 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(a). I hereby claim foreign priority benefits under Title 35, United States Code, § 119 of any foreign application(s) for patent or inventor's certificate listed below and have also identified below any foreign application for patent or inventor's certificate having a filing date before that of the application on which priority is claimed.

Application Number	Country	Date of Filing	Priority Claimed	
			Yes√	No√
N/A				

I hereby claim the benefit under Title 35, United States § 119(e) of any United States provisional application(s) listed below.

Application Number	Date of Filing
60/421,930	10/28/2002

I hereby claim the benefit under Title 35, United States Code, § 120 of any United States application(s) listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States application in the manner provided by the first paragraph of Title 35, United States Code, § 112, I acknowledge the duty to disclose material information as defined in Title 37, Code of Federal Regulations, § 1.56, including for continuation-in-part applications, material information which became available between the filing date of the prior application and the national or PCT international filing date of the continuation-in-part application.

Application Number	Date of Filing	Status -Patented, Pending, or Abandoned
N/A		

APPLICABLE STATUTES & RULES

37 C.F.R. § 1.56 - DUTY OF DISCLOSURE; FRAUD; STRIKING OR REJECTION OF APPLICATIONS

(a) A duty of candor and good faith toward the Patent and Trademark Office rests on the inventor, on each attorney or agent who prepares or prosecutes the application and on every other individual who is substantively involved in the preparation or prosecution of the application and who is associated with the inventor, with the assignee or with anyone to whom there is an obligation to assign the application. All such individuals have a duty to disclose to the Office information they are aware of which is material to the examination of the application. Such information is material where there is a substantial likelihood that a reasonable examiner would consider it important in deciding whether to allow the application to issue as a patent. The duty is commensurate with the degree of involvement in the preparation or prosecution of the application.

Information relating to the following factual situations enumerated in 35 U.S.C. § 102 and § 103 should be considered material under 37 C.F.R. § 1.56(a):

A person shall be entitled to a patent unless --

- (a) The invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for patent, or
- (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of the application for patent in the United States, or
- (c) he has abandoned the invention, or
- (d) the invention was first patented or caused to be patented, or was the subject of an inventor's certificate, by the applicant or his legal representatives or assigns in a foreign country prior to the date of the application for patent in this country on an application for patent or

inventor's certificate filed more than twelve months before the filing of the application in the United States, or

(e) the invention was described in a patent granted on an application for patent by another filed in the United States before the invention thereof by the applicant for patent, or on an international application by another who has fulfilled the requirements of paragraphs (1), (2), and (4) of section 371(c) of this title before the invention thereof by the applicant for patent, or

(f) he did not himself invent the subject matter sought to be patented, or

(g) before the applicant's invention thereof the invention was made in this country by another who had not abandoned, suppressed, or concealed it. In determining priority of invention there shall be considered not only the respective dates of conception and reduction to practice of the invention, but also the reasonable diligence of one who was first to conceive and last to reduce to practice, from a time prior to conception by the other.

35 U.S.C. § 103 - CONDITIONS FOR PATENTABILITY; NON-OBVIOUS SUBJECT MATTER

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 negated by the manner in which the invention was made.

35 U.S.C. § 119 - BENEFIT OF EARLIER FILING DATE IN FOREIGN COUNTRY; RIGHT OF PRIORITY (Applicable Portion)

An application for patent for an invention filed in this country by any person who has, or whose legal representatives or assigns have, previously regularly filed an application for a patent for the same invention in a foreign country which affords similar privileges shall have the same effect as the same application would have if filed in this country on the date on which the application for patent for the same invention was first filed in such foreign country, if the application in this country is filed within twelve months from the earliest date on which such foreign application was filed; but no patent shall be granted on any application for patent for an invention which has been patented or described in a printed publication in any country more than one year before the date of the actual filing of the application in this country, or which had been in public use or on sale in this country more than one year prior to such filing.

35 U.S.C. § 120 - BENEFIT OF EARLIER FILING DATE IN THE UNITED STATES

An application for patent for an invention disclosed in the manner provided by the first paragraph of section 112 of this title in an application previously filed in the United States, or as provided by section 363 of this title, by the same invention shall have the same effect, as to such invention, as though filed on the date of the prior application, if filed before the patenting or abandonment of or termination of proceedings on the first application or on an application similarly entitled to the benefit of the filing date of the first application and if it contains or is amended to contain a specific reference to the earlier filed application.

35 U.S.C. § 112 - SPECIFICATION (Applicable Portion)

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make use the same, and shall set forth the best mode contemplated by the inventor of carrying out his invention.

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

I hereby appoint as attorneys of record with full power of substitution and revocation, to prosecute this application and transact all business in the Patent and Trademark Office connected therewith: Otto O. Lee, Reg. No. 37,871, Debbie Chun, Reg. No. 38,700, Naren Chaganti, Reg. No. 44,602, and Juneko C. Jackson, Reg. No. 48,870.

Send Correspondence to:	Intellectual Property Law Group LLP 12 South First Street, Twelfth Floor San Jose, CA 95113	Direct Telephone Calls to: <u>Otto O. Lee</u> (408) 286-8933
-------------------------	---	--

2 0 1	FULL NAME OF INVENTOR	FIRST Name Francis	Middle Initial(s)	LAST Name da Costa
	RESIDENCE & CITIZENSHIP	City San Jose	State or Foreign Country California	Country of Citizenship USA
	POST OFFICE ADDRESS	Post Office Address 1299 PARKMOOR AVE, #153	City San Jose	State or Country CA
				Zip Code 95128

2 0 2	FULL NAME OF INVENTOR	FIRST Name Sriram	Middle Initial(s)	LAST Name Dayanandan
	RESIDENCE & CITIZENSHIP	City San Jose	State or Foreign Country CA	Country of Citizenship INDIA
	POST OFFICE ADDRESS	Post Office Address 1299 PARKMOOR AVE, #153	City San Jose	State or Country CA
				Zip Code 95128

I further declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements 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 of any patent issuing thereon.

Signature of Inventor 201	<i>Francis da Costa</i>
Date	05/07/2003

Signature of Inventor 202	<i>[Signature]</i>
Date	05/07/2003

(Signatures should conform to names as presented at 201 *et seq.* above.)

05/08/03
JC839 U.S. S.T.O.

05-12-03

10434948 050003

PTO/SB/05 (03-01)

Approved for use through 10/31/2002. 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.

UTILITY PATENT APPLICATION TRANSMITTAL (Only for new nonprovisional applications under 37 CFR 1.53(b))	Attorney Docket No.	DACOSTAF.PT1
	First Inventor	Francis daCosta
	Title	High Performance Wireless Networks Using ...
	Express Mail Label No.	EL046701720US

APPLICATION ELEMENTS See MPEP chapter 600 concerning utility patent application contents.	ADDRESS TO: Assistant Commissioner for Patents Box Patent Application Washington, DC 20231
1. ☒ Fee Transmittal Form (e.g., PTO/SB/17) (Submit an original and a duplicate for fee processing)	7. ☐ CD-ROM or CD-R in duplicate, large table or Computer Program (Appendix)
2. ☒ Applicant claims small entity status. See 37 CFR 1.27.	8. Nucleotide and/or Amino Acid Sequence Submission (if applicable, all necessary)
3. ☒ Specification [Total Pages 67] (preferred arrangement set forth below) <ul style="list-style-type: none">- Descriptive title of the invention- Cross Reference to Related Applications- Statement Regarding Fed sponsored R & D- Reference to sequence listing, a table, or a computer program listing appendix- Background of the Invention- Brief Summary of the Invention- Brief Description of the Drawings (if filed)- Detailed Description- Claim(s)- Abstract of the Disclosure	a. ☐ Computer Readable Form (CRF)
4. ☒ Drawing(s) (35 U.S.C. 113) [Total Sheets 14]	b. Specification Sequence Listing on: <ul style="list-style-type: none">i. ☐ CD-ROM or CD-R (2 copies); orii. ☐ paper
5. Oath or Declaration [Total Pages 4] <ul style="list-style-type: none">a. ☒ Newly executed (original or copy)b. ☐ Copy from a prior application (37 CFR 1.63 (d)) (for continuation/divisional with Box 18 completed)i. ☐ DELETION OF INVENTOR(S) Signed statement attached deleting inventor(s) named in the prior application, see 37 CFR 1.63(d)(2) and 1.33(b).	c. ☐ Statements verifying identity of above copies
6. ☐ Application Data Sheet. See 37 CFR 1.76	ACCOMPANYING APPLICATION PARTS
	9. ☐ Assignment Papers (cover sheet & document(s))
	10. ☐ 37 CFR 3.73(b) Statement ☒ Power of Attorney (when there is an assignee)
	11. ☐ English Translation Document (if applicable)
	12. ☐ Information Disclosure Statement (IDS)/PTO-1449 ☐ Copies of IDS Citations
	13. ☐ Preliminary Amendment
	14. ☒ Return Receipt Postcard (MPEP 503) (Should be specifically itemized)
	15. ☐ Certified Copy of Priority Document(s) (if foreign priority is claimed)
	16. ☐ Nonpublication Request under 35 U.S.C. 122 (b)(2)(B)(i). Applicant must attach form PTO/SB/35 or its equivalent.
	17. ☐ Other: _____

18. If a CONTINUING APPLICATION, check appropriate box, and supply the requisite information below and in a preliminary amendment, or in an Application Data Sheet under 37 CFR 1.76:

☐ Continuation ☐ Divisional ☐ Continuation-in-part (CIP) of prior application No. _____
Prior application information: Examiner: _____ Group Art Unit: _____

For CONTINUATION OR DIVISIONAL APPS only: The entire disclosure of the prior application, from which an oath or declaration is supplied under Box 5b, is considered a part of the disclosure of the accompanying continuation or divisional application and is hereby incorporated by reference. The incorporation can only be relied upon when a portion has been inadvertently omitted from the submitted application parts.

19. CORRESPONDENCE ADDRESS					
☐ Customer Number or Bar Code Label (Insert Customer No. or Attach bar code label here) or ☒ Correspondence address below					
Name	Otto O. Lee				
Address	Intellectual Property Law Group LLP				
Address	12 South First St., Suite 1205				
City	San Jose	State	CA	Zip Code	95113
Country	U.S.A.	Telephone	408-286-8933	Fax	408-286-8932

Name (Print/Type)	Juneke Jackson	Registration No. (Attorney/Agent)	48,870
Signature		Date	05/08/2003

Burden Hour Statement: This form is estimated to take 0.2 hours to complete. Time will vary depending upon the needs of the individual case. Any comments on the amount of time you are required to complete this form should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, Washington, DC 20231. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Assistant Commissioner for Patents, Box Patent Application, Washington, DC 20231.

10434948 050803

PTO/SB/17 (01-03)

Approved for use through 04/30/2003. 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.

FEE TRANSMITTAL
for FY 2003

Effective 01/01/2003. Patent fees are subject to annual revision.

☒ Applicant claims small entity status. See 37 CFR 1.27**TOTAL AMOUNT OF PAYMENT** (\$) 393**Complete if Known**

Application Number	
Filing Date	
First Named Inventor	Francis daCosta
Examiner Name	
Art Unit	
Attorney Docket No.	DACOSTAF.PT1

METHOD OF PAYMENT (check all that apply)☒ Check ☐ Credit card ☐ Money Order ☐ Other ☐ None☒ Deposit Account:

Deposit Account Number

50-1037

Deposit Account Name
IP Law Group LLP

The Commissioner is authorized to: (check all that apply)

☒ Charge fee(s) indicated below ☒ Credit any overpayments
☒ Charge any additional fee(s) during the pendency of this application
☒ Charge fee(s) indicated below, except for the filing fee to the above-identified deposit account.**FEE CALCULATION****1. BASIC FILING FEE**

Large Entity		Small Entity		Fee Description	Fee Paid
Fee Code	Fee (\$)	Fee Code	Fee (\$)		
1001	750	2001	375	Utility filing fee	375.00
1002	330	2002	165	Design filing fee	
1003	520	2003	260	Plant filing fee	
1004	750	2004	375	Reissue filing fee	
1005	160	2005	80	Provisional filing fee	
SUBTOTAL (1)					(\$) 375.00

2. EXTRA CLAIM FEES FOR UTILITY AND REISSUE

Total Claims	22	-20** =	2	X	9	=	18
Independent Claims	3	-3** =	0	X		=	
Multiple Dependent						=	18

Large Entity		Small Entity		Fee Description	Fee Paid
Fee Code	Fee (\$)	Fee Code	Fee (\$)		
1202	18	2202	9	Claims in excess of 20	
1201	84	2201	42	Independent claims in excess of 3	
1203	280	2203	140	Multiple dependent claim, if not paid	
1204	84	2204	42	** Reissue independent claims over original patent	
1205	18	2205	9	** Reissue claims in excess of 20 and over original patent	
SUBTOTAL (2)					(\$) 18.00

**or number previously paid, if greater; For Reissues, see above

FEE CALCULATION (continued)**3. ADDITIONAL FEES**

Large Entity		Small Entity		Fee Description	Fee Paid
Fee Code	Fee (\$)	Fee Code	Fee (\$)		
1051	130	2051	65	Surcharge - late filing fee or oath	
1052	50	2052	25	Surcharge - late provisional filing fee or cover sheet	
1053	130	1053	130	Non-English specification	
1812	2,520	1812	2,520	For filing a request for <i>ex parte</i> reexamination	
1804	920*	1804	920*	Requesting publication of SIR prior to Examiner action	
1805	1,840*	1805	1,840*	Requesting publication of SIR after Examiner action	
1251	110	2251	55	Extension for reply within first month	
1252	410	2252	205	Extension for reply within second month	
1253	930	2253	465	Extension for reply within third month	
1254	1,450	2254	725	Extension for reply within fourth month	
1255	1,970	2255	985	Extension for reply within fifth month	
1401	320	2401	160	Notice of Appeal	
1402	320	2402	160	Filing a brief in support of an appeal	
1403	280	2403	140	Request for oral hearing	
1451	1,510	1451	1,510	Petition to institute a public use proceeding	
1452	110	2452	55	Petition to revive - unavoidable	
1453	1,300	2453	650	Petition to revive - unintentional	
1501	1,300	2501	650	Utility issue fee (or reissue)	
1502	470	2502	235	Design issue fee	
1503	630	2503	315	Plant issue fee	
1460	130	1460	130	Petitions to the Commissioner	
1807	50	1807	50	Processing fee under 37 CFR 1.17(q)	
1806	180	1806	180	Submission of Information Disclosure Stmt	
8021	40	8021	40	Recording each patent assignment per property (times number of properties)	
1809	750	2809	375	Filing a submission after final rejection (37 CFR 1.129(a))	
1810	750	2810	375	For each additional invention to be examined (37 CFR 1.129(b))	
1801	750	2801	375	Request for Continued Examination (RCE)	
1802	900	1802	900	Request for expedited examination of a design application	
Other fee (specify) _____					
*Reduced by Basic Filing Fee Paid					
SUBTOTAL (3)					(\$)

SUBMITTED BY

Name (Print/Type) Juneko Jackson

Registration No.

(Attorney/Agent)

48,870

(Complete if applicable)

Telephone 408-286-8933

Signature

Date

May 8, 2003

WARNING: Information on this form may become public. Credit card information should not be included on this form. Provide credit card information and authorization on PTO-2038.

This collection of information is required by 37 CFR 1.17 and 1.27. 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, Washington, DC 20231. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, Washington, DC 20231.

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SAN DIEGO
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402 West Broadway, Suite 400
San Diego, California 92101

SEATTLE
Two Union Square Center
601 Union Street, 42nd Floor
Seattle, Washington 98101



**INTELLECTUAL
PROPERTY
LAW GROUP LLP**

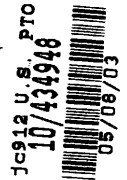
- PATENT - TRADEMARK - COPYRIGHT -

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WASHINGTON D.C.
601 Pennsylvania Avenue Center
South Building Suite 900
Washington, D.C. 20004



May 8, 2003

VIA EXPRESS MAIL
EL046701720US

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

Re: NEW UTILITY NON-PROVISIONAL PATENT APPLICATION
Title: "High Performance Wireless Networks Using Distributed Control"
Inventors: Francis daCosta and Sriram Dayanandan
Priority Serial no.: 60/421,930
Priority filing date: 10/28/2002
Our File No.: DACOSTAF.PT1

Dear Sir:

Transmitted herewith is the utility non-provisional patent application of inventors, Francis daCosta and Sriram Dayanandan, for the above-entitled invention.

Please find enclosed the following:

1. a cover letter;
2. a utility transmittal letter;
3. a fee transmittal;
4. an application of a total of 67 pages: including a written description (30 pages), a set of claims (4 pages), an abstract (1 page), an Appendix A (12 pages), an Appendix B (20 pages);
5. a set of drawings (14 sheets);
6. a signed joint declaration/power of attorney by the inventor;
7. a check of \$393.00 to cover the filing fee for the patent application (small entity) including the two extra claims fee; and
8. a return receipt postcard.

The commissioner is hereby authorized to charge any underpayment or credit any overpayment to Deposit Account Number 501037. If you should have any questions, please contact us.

Sincerely,
INTELLECTUAL PROPERTY LAW GROUP LLP

Juneko Jackson (Reg. No.: 48,870)
Enclosures

CERTIFICATE OF EXPRESS MAIL

"EXPRESS MAIL" mailing label number: EL046701720US Date of Deposit: May 8, 2003
I hereby certify that the above-identified correspondence, which is attached, is being deposited with the United States Postal Service "Express Mail Post Office to Addressee" service under 37 C.F.R. '1.10 on the date indicated above and is addressed to Mail Stop Patent Application, Commissioner for Patents, P.O. Box 1450, Alexandria, VA, 22313-1450.

Juneko Jackson
Name of Person Mailing Paper or Fee

Signature

PATENT APPLICATION SERIAL NO. _____

U.S. DEPARTMENT OF COMMERCE
PATENT AND TRADEMARK OFFICE
FEE RECORD SHEET

05/13/2003 SDIRETA1 00000035 10434948

01 FC:2001	375.00 OP
02 FC:2202	18.00 OP

PTO-1556
(5/87)

*U.S. Government Printing Office: 2002 — 489-267/69033

PATENT APPLICATION FEE DETERMINATION RECORD
Effective January 1, 2003

Application or Docket Number

10439948

CLAIMS AS FILED - PART I

	(Column 1)	(Column 2)
TOTAL CLAIMS	22	
FOR	NUMBER FILED	NUMBER EXTRA
TOTAL CHARGEABLE CLAIMS	22 minus 20 = *	2
INDEPENDENT CLAIMS	3 minus 3 = *	
MULTIPLE DEPENDENT CLAIM PRESENT ☐		

* If the difference in column 1 is less than zero, enter "0" in column 2

SMALL ENTITY TYPE ☐ OR

OTHER THAN SMALL ENTITY

RATE	FEE		RATE	FEE
BASIC FEE	375.00	OR	BASIC FEE	750.00
X\$ 9=	15	OR	X\$18=	
X42=		OR	X84=	
+140=		OR	+280=	
TOTAL	393	OR	TOTAL	

CLAIMS AS AMENDED - PART II

	(Column 1)	(Column 2)	(Column 3)
AMENDMENT A	CLAIMS REMAINING AFTER AMENDMENT	HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA
Total	*	Minus **	=
Independent	*	Minus ***	=
FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM ☐			

1,6 22

SMALL ENTITY OR

OTHER THAN SMALL ENTITY

RATE	ADDITIONAL FEE		RATE	ADDITIONAL FEE
X\$ 9=		OR	X\$18=	
X42=		OR	X84=	
+140=		OR	+280=	
TOTAL ADDIT. FEE		OR	TOTAL ADDIT. FEE	

	(Column 1)	(Column 2)	(Column 3)
AMENDMENT B	CLAIMS REMAINING AFTER AMENDMENT	HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA
Total	*	Minus **	=
Independent	*	Minus ***	=
FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM ☐			

RATE	ADDITIONAL FEE		RATE	ADDITIONAL FEE
X\$ 9=		OR	X\$18=	
X42=		OR	X84=	
+140=		OR	+280=	
TOTAL ADDIT. FEE		OR	TOTAL ADDIT. FEE	

	(Column 1)	(Column 2)	(Column 3)
AMENDMENT C	CLAIMS REMAINING AFTER AMENDMENT	HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA
Total	*	Minus **	=
Independent	*	Minus ***	=
FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM ☐			

RATE	ADDITIONAL FEE		RATE	ADDITIONAL FEE
X\$ 9=		OR	X\$18=	
X42=		OR	X84=	
+140=		OR	+280=	
TOTAL ADDIT. FEE		OR	TOTAL ADDIT. 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.

CLAIMS ONLY							SERIAL NO. 10434948	FILING DATE					
							APPLICANT(S)						
CLAIMS													
	AS FILED		AFTER 1ST AMENDMENT		AFTER 2ND AMENDMENT								
	IND	DEP	IND	DEP	IND	DEP		IND	DEP	IND	DEP	IND	DEP
1							51						
2							52						
3							53						
4							54						
5							55						
6							56						
7							57						
8							58						
9							59						
10							60						
11							61						
12							62						
13							63						
14							64						
15							65						
16							66						
17							67						
18							68						
19							69						
20							70						
21							71						
22							72						
23							73						
24							74						
25							75						
26							76						
27							77						
28							78						
29							79						
30							80						
31							81						
32							82						
33							83						
34							84						
35							85						
36							86						
37							87						
38							88						
39							89						
40							90						
41							91						
42							92						
43							93						
44							94						
45							95						
46							96						
47							97						
48							98						
49							99						
50							100						
TOTAL IND.	3						TOTAL IND.						
TOTAL DEP.	19						TOTAL DEP.						
TOTAL CLAIMS	22						TOTAL CLAIMS						

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