INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	18088450
	Filing Date	2022-12-23
	First Named Inventor	RALEIGH, GREGORY
	Art Unit	
	Examiner Name	not yet assigned
	Attorney Docket Number	RALEP038D1C1C1C1C1

/E.M.S/	273	8352630		2013-01-08	Hart, Justin Scott	
	274	8352980		2013-01-08	Howcroft, Jerald Robert	
	275	8353001		2013-01-08	Herrod, Allan	
	276	8355570	B2	2013-01-15	Karsanbhai et al.	
	277	8355696	B1	2013-01-15	Olding et al.	
	278	8356336	B2	2013-01-15	Johnston, Keith et al.	
	279	8358638	B2	2013-01-22	Scherzer, Tamir et al.	
	280	8358975	B2	2013-01-22	Bahl et al.	
	281	8363658		2013-01-29	Delker, Jason R. et al.	
	282	8363799	B2	2013-01-29	Gruchala et al.	
	283	8364089		2013-01-29	PHILLIPS, Derek	

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	Examiner Name	not yet assigned
	Attorney Docket Number	RALEP038D1C1C1C1C1

/E.M.S/	284	8364806		2013-01-29	Short, Joel E. et al.	
	285	8369274	B2	2013-02-05	Sawai, Ryo	
	286	8370477		2013-02-05	Short, Joel E. et al.	
	287	8370483	B	2013-02-05	Choong Jason et al.	
	288	8374090		2013-02-12	Morrill, Robert J. et al.	
	289	8374102	B2	2013-02-12	Luft et al.	
	290	8374592		2013-02-12	Proctor, Jr. James A. et al.	
	291	8375128	B2	2013-02-12	Tofighbakhsh et al.	
	292	8375136	B2	2013-02-12	Roman et al.	
	293	8379847		2013-02-19	Bell, Robert H. et al.	
	294	8380247	B2	2013-02-19	Engstrom	

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	Examiner Name	not yet assigned
	Attorney Docket Number	RALEP038D1C1C1C1C1

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	296	8385199	B1	2013-02-26	Coward et al.	
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	298	8385964	B2	2013-02-26	Haney, Richard D.	
	299	8385975	B2	2013-02-26	Forutanpour et al.	
	300	8386386		2013-02-26	Zhu, Kevin	

If you wish to add additional U.S. Patent citation information please click the Add button.

U.S.PATENT APPLICATION PUBLICATIONS

Examiner Initial*	Cite No	Publication Number	Kind Code[1]	Publication Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
	1					

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FOREIGN PATENT DOCUMENTS

Examiner Initial*	Cite No	Foreign Document Number[3]	Country Code[2]	Kind Code[4]	Publication Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear	T[5]

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	18088450
	Filing Date	2022-12-23
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	Art Unit	
	Examiner Name	not yet assigned
	Attorney Docket Number	RALEP038D1C1C1C1C1

	1							☐

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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, pages(s), volume-issue number(s), publisher, city and/or country where published.	T[5]
	1		☐

If you wish to add additional non-patent literature document citation information please click the Add button

EXAMINER SIGNATURE

Examiner Signature	/EL HADJI M SALL/	Date Considered	01/27/2024

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through a citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

[1] See Kind Codes of USPTO Patent Documents at www.USPTO.GOV or MPEP 901.04. [2] Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). [3] For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. [4] Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. [5] Applicant is to place a check mark here if English language translation is attached.

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	Application Number	18088450
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	Examiner Name	not yet assigned
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CERTIFICATION STATEMENT

Please see 37 CFR 1.97 and 1.98 to make the appropriate selection(s):

☐ That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).

OR

☐ That no item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the information disclosure statement was known to any individual designated in 37 CFR 1.56(c) more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(2).

☐ See attached certification statement.

☐ The fee set forth in 37 CFR 1.17 (p) has been submitted herewith.

☒ A certification statement is not submitted herewith.

SIGNATURE

A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

Signature	/Farshad Farjami/	Date (YYYY-MM-DD)	2023-05-24
Name/Print	Farshad Farjami	Registration Number	41014

This collection of information is required by 37 CFR 1.97 and 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 1 hour to complete, including gathering, preparing and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspections or an issued patent.

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PATENT AND TRADEMARK OFFICE

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www.uspto.gov

ELECTRONIC ACKNOWLEDGEMENT RECEIPT

APPLICATION #	RECEIPT DATE / TIME	ATTORNEY DOCKET #
18/088,450	**01/09/2024 06:17:23 PM Z ET**	**RALEP038D1C1C1C1C1**

Title of Invention

Communications Device with Secure Data Path Processing Agents

Application Information

APPLICATION TYPE	Utility - Nonprovisional Application under 35 USC 111(a)	PATENT #	-
CONFIRMATION #	4358	FILED BY	Evan Gunderman
PATENT CENTER #	63894289	FILING DATE	12/23/2022
CUSTOMER #	106963	FIRST NAMED INVENTOR	Gregory G. Raleigh
CORRESPONDENCE ADDRESS	-	AUTHORIZED BY	Michael Farjami

Documents

TOTAL DOCUMENTS: 2

DOCUMENT		PAGES	DESCRIPTION	SIZE (KB)
RALEP038D1C1C1C1C1_IDS_Jan_9_24.pdf		13	-	4344 KB
RALEP038D1C1C1C1C1_IDS_Jan_9_24-IDS.pdf	(1-3)	3	Information Disclosure Statement (IDS) Form (SB08)	700 KB
RALEP038D1C1C1C1C1_IDS_Jan_9_24-NPL.pdf	(4-13)	10	Non Patent Literature	3646 KB

Digest

DOCUMENT	MESSAGE DIGEST(SHA-512)

RALEP038D1C1C1C1C1_IDS_Jan_9_24.pdf	A1008A0ED52751660CB4EBCC2E4D72BCAE92C34A3E66A1DE4F4644355717B1D952B64CB9E7D4BBC6854C2BF9A034578A16F7555C38D83053E09D2B25FE1B6416
RALEP038D1C1C1C1C1_IDS_Jan_9_24-IDS.pdf	F6373D169AF58C613098A79D95FE7E75F0477DE466634ECE3C5C341E44DC3E5648F3AAADCA6947CDBE1964A8D0EA47877DCE29D07B396A8F169789B9D2637B9C
RALEP038D1C1C1C1C1_IDS_Jan_9_24-NPL.pdf	D64FFE62F051A1D9FC06312E2CD8CBC0568B890EB9C3A423E2F80EFE1B722F53C4315F256D4E12AAB9286B951D18628AAED348C529C571C9C4FFE565B686DB85

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

National Stage of an International Application under 35 U.S.C. 371

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

New International Application Filed with the USPTO as a Receiving Office

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

Doc code: IDS
Doc description: Information Disclosure Statement (IDS) Filed

PTO/SB/08a (01-22)
Approved for use through 05/31/2024. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
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	Application Number	18088450
	Filing Date	2022-12-23
	First Named Inventor	RALEIGH, GREGORY
	Art Unit	
	Examiner Name	Unknown
	Attorney Docket Number	RALEP038D1C1C1C1C1

U.S.PATENTS

Examiner Initial*	Cite No	Patent Number	Kind Code[1]	Issue Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
	1					

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U.S.PATENT APPLICATION PUBLICATIONS

Examiner Initial*	Cite No	Publication Number	Kind Code[1]	Publication Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
	1	20040224668	A1	2004-11-11	Shell, Scott R. et al.	

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FOREIGN PATENT DOCUMENTS

Examiner Initial*	Cite No	Foreign Document Number[3]	Country Code[2]	Kind Code[4]	Publication Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear	T[5]
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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, pages(s), volume-issue number(s), publisher, city and/or country where published.	T[5]

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (**Not for submission under 37 CFR 1.99)**		
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	Filing Date	2022-12-23
	First Named Inventor	RALEIGH, GREGORY
	Art Unit	
	Examiner Name	Unknown
	Attorney Docket Number	RALEP038D1C1C1C1C1

	1	Jon Inouye et al., „Dynamic Network Reconfiguration Support for Mobile Computers“, Proceedings of the 3rd annual ACM/IEEE International Conference on Mobile Computing and Networking (MobiCom ’97), published September 1997	☐

If you wish to add additional non-patent literature document citation information please click the Add button

EXAMINER SIGNATURE

Examiner Signature		Date Considered	

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through a citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

[1] See Kind Codes of USPTO Patent Documents at www.USPTO.GOV or MPEP 901.04. [2] Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). [3] For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. [4] Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. [5] Applicant is to place a check mark here if English language translation is attached.

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	Filing Date	2022-12-23
	First Named Inventor	RALEIGH, GREGORY
	Art Unit	
	Examiner Name	Unknown
	Attorney Docket Number	RALEP038D1C1C1C1C1

CERTIFICATION STATEMENT

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☐ See attached certification statement.

☐ The fee set forth in 37 CFR 1.17 (p) has been submitted herewith.

☒ A certification statement is not submitted herewith.

SIGNATURE

A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

Signature	/Farshad Farjami/	Date (YYYY-MM-DD)	2024-01-09
Name/Print	Farshad Farjami	Registration Number	41014

This collection of information is required by 37 CFR 1.97 and 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 1 hour to complete, including gathering, preparing and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

Electronic Acknowledgement Receipt	
EFS ID:	48819448
Application Number:	18088450
International Application Number:	
Confirmation Number:	4358
Title of Invention:	Communications Device with Secure Data Path Processing Agents
First Named Inventor/Applicant Name:	Gregory G. Raleigh
Customer Number:	106963
Filer:	Michael Farjami/Evan Gunderman
Filer Authorized By:	Michael Farjami
Attorney Docket Number:	RALEP038D1C1C1C1C1
Receipt Date:	10-NOV-2023
Filing Date:	23-DEC-2022
Time Stamp:	18:20:12
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		RALEP038D1C1C1C1C1_Pre_Amendment_Nov_10_23.pdf	59039 8439115f61edfa734d78180556a8352219538808	yes	7

	Multipart Description/PDF files in .zip description		
	Document Description	**Start**	**End**
	Transmittal Letter	1	1
	Preliminary Amendment	2	7
Warnings:			
Information:			
	Total Files Size (in bytes):	59039	

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New International Application Filed with the USPTO as a Receiving Office
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Mission Viejo, California 92691
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fax: (949) 282-1002

ELECTRONIC TRANSMISSION COVER SHEET

Date: November 10, 2023

To: United States Patent and Trademark Office
Examiner: Unknown; Art Unit: Unknown

Re: **Application Serial No.: 18/088,450**
Filing Date: 12/23/2022; First-Named Inventor: Raleigh
Attorney Docket No.: RALEP038D1C1C1C1C1

From: Farjami & Farjami LLP

Number of pages including the cover sheet: 7

Message:

Enclosed, please find the Preliminary Amendment.

Authorization is hereby given to the Commissioner to charge any fees associated with this communication or credit any overpayment to Deposit Account No. **50-0731**.

Thank you.

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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant(s): **Raleigh et al.** Application Serial No.: **18/088,450** Filed: **12/23/2022** Title: **Communications Device with Secure Data Path Processing Agents**	Group Art Unit: Not Assigned Examiner: Not Assigned

PRELIMINARY AMENDMENT

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

Dear Sir/Madam:

Please enter the following amendments and remarks in the above-captioned application.

In the Claims:

Claim 1 (Cancelled)

Claim 2 (New): A communications device comprising:

a wide area network port configured to connect the communications device to a wide area network;

a secure memory;

a secure execution environment configured to be inaccessible to a user application software; and

a secure data path processing agent configured to:

execute in the secure execution environment;

generate a unique identifier for communication to a network element in the wide area network;

store the unique identifier in the secure memory;

generate a data record;

associate the unique identifier with the data record; and

send the unique identifier to the network element over a trusted communication link between the secure data path processing agent and the network element.

Claim 3 (New): The communications device of claim 2, wherein the secure data path processing agent includes a device data record mailbox, wherein the device data record mailbox is configured to relay the data record to an agent outside of the secure execution environment for transmission to the network element.

Claim 4 (New): The communications device of claim 2, further comprising:

a subscriber identity module (SIM), wherein at least a portion of the SIM is within the secure execution environment.

Claim 5 (New): The communications device of claim 4, wherein the secure data path processing agent resides on the SIM.

Claim 6 (New): The communications device of claim 5, wherein the secure data path processing agent includes a data path security verifier.

Claim 7 (New): The communications device of claim 2, further comprising:

an applications processor unit within the secure execution environment.

Claim 8 (New): The communications device of claim 7, wherein the secure data path processing agent resides within the applications processor unit.

Claim 9 (New): The communications device of claim 8, wherein the secure data path processing agent includes a data path security verifier in a wireless modem chipset of the communications device.

Claim 10 (New): The communications device of claim 9, wherein the data path security verifier restricts network access to allow only monitored device data communications activity.

Claim 11 (New): A method for use by a communications device including a wide area network port configured to connect the communications device to a wide area network, and further including a secure memory, a secure execution environment configured to be inaccessible to a user application software, and a secure data path processing agent, the method comprising:

executing, by the secure data path processing agent, in the secure execution environment;

generating, by the secure data path processing agent, a unique identifier for communication to a network element in the wide area network;

storing, by the secure data path processing agent, the unique identifier in the secure memory;

generating, by the secure data path processing agent, a data record;

associating, by the secure data path processing agent, the unique identifier with the data record; and

sending, by the secure data path processing agent, the unique identifier to the network element over a trusted communication link between the secure data path processing agent and the network element.

Claim 12 (New): The method of claim 11, wherein the secure data path processing agent includes a device data record mailbox, and wherein the method further comprises:

relaying, using the device data record mailbox, the data record to an agent outside of the secure execution environment for transmission to the network element.

Claim 13 (New): The method of claim 11, the communications device further includes a subscriber identity module (SIM), and wherein at least a portion of the SIM is within the secure execution environment.

Claim 14 (New): The method of claim 13, wherein the secure data path processing agent resides on the SIM.

Claim 15 (New): The method of claim 14, wherein the secure data path processing agent includes a data path security verifier.

Claim 16 (New): The method of claim 11, wherein the communications device further includes an applications processor unit within the secure execution environment.

Claim 17 (New): The method of claim 16, wherein the secure data path processing agent resides within the applications processor unit.

Claim 18 (New): The method of claim 17, wherein the secure data path processing agent includes a data path security verifier in a wireless modem chipset of the communications device.

Claim 19 (New): The method of claim 18, further comprising:

restricting, using the data path security verifier, network access to allow only monitored device data communications activity.

Application Serial No.: 18/088,450
Attorney Docket No.: RALEP038D1C1C1C1C1

REMARKS

By this preliminary amendment, Applicant cancels claim 1, and adds new claims 2-19. After the present amendment, claim 2-19 will be pending in the present application. No new matter is added. Applicant respectfully requests allowance of claims 2-19.

Respectfully Submitted;
FARJAMI & FARJAMI LLP

/Farshad Farjami/
Farshad Farjami, Esq.
Reg. No. 41,014

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CERTIFICATE OF ELECTRONIC TRANSMISSION

I hereby certify that this correspondence is being filed via EFS in United States Patent and Trademark Office, on the date stated below.

November 10, 2023
Date

Evan C. Gunderman — */evan c. gunderman/*
Name — Signature

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PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875	Application or Docket Number 18/088,450	Filing Date 12/23/2022	☐ To be Mailed

ENTITY: ☐ LARGE ☑ SMALL ☐ MICRO

APPLICATION AS FILED - PART I

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☐ EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A		N/A	
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INDEPENDENT CLAIMS (37 CFR 1.16(h))	minus 3 =	*		x $240 =	
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AMENDMENT	11/10/2023							
	Total (37 CFR 1.16(i))	* 18	Minus	** 20	= 0		x $40 =	0
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PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875	Application or Docket Number 18/088,450	Filing Date 12/23/2022	☐ To be Mailed

ENTITY: ☐ LARGE ☑ SMALL ☐ MICRO

APPLICATION AS FILED - PART I

	(Column 1)	(Column 2)			
FOR	NUMBER FILED	NUMBER EXTRA		RATE ($)	FEE ($)
☐ BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A		N/A	
☐ SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A		N/A	
☐ EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A		N/A	
TOTAL CLAIMS (37 CFR 1.16(i))	minus 20 =	*		x $50 =	
INDEPENDENT CLAIMS (37 CFR 1.16(h))	minus 3 =	*		x $240 =	
☐ APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is $310 ($155 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).				
☐ MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))					
* If the difference in column 1 is less than zero, enter "0" in column 2.				TOTAL	

APPLICATION AS AMENDED - PART II

		(Column 1)		(Column 2)	(Column 3)			
AMENDMENT	11/10/2023	CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA		RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	* 18	Minus	** 20	= 0		x $40 =	0
	Independent (37 CFR 1.16(h))	* 2	Minus	***	=		x $192 =	
	☐ Application Size Fee (37 CFR 1.16(s))							
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							
							TOTAL ADD'L FEE	0

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

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.	LDRC
** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".	/CARMEN D WILLIAMS/
*** 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.**

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

Doc code: IDS
Doc description: Information Disclosure Statement (IDS) Filed

PTO/SB/08a (01-22)
Approved for use through 05/31/2024. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
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INFORMATION DISCLOSURE STATEMENT BY APPLICANT (**Not for submission under 37 CFR 1.99)**		
	Application Number	18088450
	Filing Date	2022-12-23
	First Named Inventor	RALEIGH, GREGORY
	Art Unit	
	Examiner Name	
	Attorney Docket Number	RALEP038D1C1C1C1C1

U.S.PATENTS

Examiner Initial*	Cite No	Patent Number	Kind Code[1]	Issue Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
	1					

If you wish to add additional U.S. Patent citation information please click the Add button.

U.S.PATENT APPLICATION PUBLICATIONS

Examiner Initial*	Cite No	Publication Number	Kind Code[1]	Publication Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
	1	20100199325	A1	2013-03-05	Raleigh	
	2	20040098610	A1	2004-05-20	Hrastar, Scott E.	

If you wish to add additional U.S. Published Application citation information please click the Add button.

FOREIGN PATENT DOCUMENTS

Examiner Initial*	Cite No	Foreign Document Number[3]	Country Code[2] i	Kind Code[4]	Publication Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear	T[5]
	1							☐

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NON-PATENT LITERATURE DOCUMENTS

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	18088450
	Filing Date	2022-12-23
	First Named Inventor	RALEIGH, GREGORY
	Art Unit	
	Examiner Name	
	Attorney Docket Number	RALEP038D1C1C1C1C1

Examiner Initials*	Cite No	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc), date, pages(s), volume-issue number(s), publisher, city and/or country where published.	T[5]
	1	Arai, Masato, et al; "A Proposal for an Effective Information Flow Control Model for Sharing and Protecting Sensitive Information", Proc. 7th Australasian Information Security Conference (AISC 2009), Wellington, New Zealand	☐

If you wish to add additional non-patent literature document citation information please click the Add button

EXAMINER SIGNATURE

Examiner Signature		Date Considered	

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through a citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

[1] See Kind Codes of USPTO Patent Documents at www.USPTO.GOV or MPEP 901.04. [2] Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). [3] For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. [4] Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. [5] Applicant is to place a check mark here if English language translation is attached.

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	18088450
	Filing Date	2022-12-23
	First Named Inventor	RALEIGH, GREGORY
	Art Unit	
	Examiner Name	
	Attorney Docket Number	RALEP038D1C1C1C1C1

CERTIFICATION STATEMENT

Please see 37 CFR 1.97 and 1.98 to make the appropriate selection(s):

☐ That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).

OR

☐ That no item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the information disclosure statement was known to any individual designated in 37 CFR 1.56(c) more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(2).

☐ See attached certification statement.

☐ The fee set forth in 37 CFR 1.17 (p) has been submitted herewith.

☒ A certification statement is not submitted herewith.

SIGNATURE

A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

Signature	/Farshad Farjami/	Date (YYYY-MM-DD)	2023-11-08
Name/Print	Farshad Farjami	Registration Number	41014

This collection of information is required by 37 CFR 1.97 and 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 1 hour to complete, including gathering, preparing and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

Electronic Acknowledgement Receipt	
EFS ID:	48812337
Application Number:	18088450
International Application Number:	
Confirmation Number:	4358
Title of Invention:	Communications Device with Secure Data Path Processing Agents
First Named Inventor/Applicant Name:	Gregory G. Raleigh
Customer Number:	106963
Filer:	Michael Farjami/Evan Gunderman
Filer Authorized By:	Michael Farjami
Attorney Docket Number:	RALEP038D1C1C1C1C1
Receipt Date:	08-NOV-2023
Filing Date:	23-DEC-2022
Time Stamp:	18:49:39
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		RALEP038D1C1C1C1C1_IDS_Nov_8_23.pdf	3378482 bcd5c61299b49c23d69bc6793617897a187028d1	yes	13

	Multipart Description/PDF files in .zip description		
	Document Description	**Start**	**End**
	Information Disclosure Statement (IDS) Form (SB08)	1	3
	Non Patent Literature	4	13
Warnings:			
Information:			
	Total Files Size (in bytes):	3378482	

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

New Applications Under 35 U.S.C. 111
If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.
National Stage of an International Application under 35 U.S.C. 371
If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.
New International Application Filed with the USPTO as a Receiving Office
If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

PTO/SB/06 (09-11)
Approved for use through 1/31/2014. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
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PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875	Application or Docket Number 18/088,450	Filing Date 12/23/2022	☐ To be Mailed

ENTITY: ☐ LARGE ☑ SMALL ☐ MICRO

APPLICATION AS FILED - PART I

FOR	(Column 1) NUMBER FILED	(Column 2) NUMBER EXTRA		RATE ($)	FEE ($)
☐ BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A		N/A	
☐ SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A		N/A	
☐ EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A		N/A	
TOTAL CLAIMS (37 CFR 1.16(i))	minus 20 =	*		x $50 =	
INDEPENDENT CLAIMS (37 CFR 1.16(h))	minus 3 =	*		x $240 =	
☐ APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is $310 ($155 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).				
☐ MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))					
* If the difference in column 1 is less than zero, enter "0" in column 2.				TOTAL	

APPLICATION AS AMENDED - PART II

		(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA		RATE ($)	ADDITIONAL FEE ($)
AMENDMENT	10/25/2023							
	Total (37 CFR 1.16(i))	* 9	Minus	** 9	= 0		x $40 =	0
	Independent (37 CFR 1.16(h))	* 3	Minus	*** 3	= 0		x $192 =	0
	☐ Application Size Fee (37 CFR 1.16(s))							
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							
							TOTAL ADD'L FEE	0

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

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.	LDRC
** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".	/CARMEN D WILLIAMS/
*** 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.**

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

Doc code: IDS
Doc description: Information Disclosure Statement (IDS) Filed

PTO/SB/08a (01-22)
Approved for use through 05/31/2024. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (**Not for submission under 37 CFR 1.99)**		
	Application Number	18088450
	Filing Date	2022-12-23
	First Named Inventor	RALEIGH, GREGORY
	Art Unit	
	Examiner Name	Unknown
	Attorney Docket Number	RALEP038D1C1C1C1C1

U.S.PATENTS

Examiner Initial*	Cite No	Patent Number	Kind Code[1]	Issue Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
	1	7821985		2010-10-26	Van Megen	
	2	7023909		2006-04-04	Adams	
	3	9408070		2006-08-02	Altbaum	

If you wish to add additional U.S. Patent citation information please click the Add button.

U.S.PATENT APPLICATION PUBLICATIONS

Examiner Initial*	Cite No	Publication Number	Kind Code[1]	Publication Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
	1	20080101293		2008-05-01	Woo	
	2	20060039364		2006-02-23	Wright	

If you wish to add additional U.S. Published Application citation information please click the Add button.

FOREIGN PATENT DOCUMENTS

Examiner Initial*	Cite No	Foreign Document Number[3]	Country Code[2]	Kind Code[4]	Publication Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear	T[5]

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	18088450
	Filing Date	2022-12-23
	First Named Inventor	RALEIGH, GREGORY
	Art Unit	
	Examiner Name	Unknown
	Attorney Docket Number	RALEP038D1C1C1C1C1

	1	2006012018	WO			Sadowsky		☐

If you wish to add additional Foreign Patent Document citation information please click the Add button

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, pages(s), volume-issue number(s), publisher, city and/or country where published.	T5
	1	A. Freier, et al., The Secure Sockets Layer (SSL) Protocol Version 3.0, Internet Engineering Task Force (IETF), Request for Comments: 6101, ISSN: 2070-1721, August 2011, available at https://datatracker.ietf.org/doc/html/rfc6101	☐
	2	M. V. Pedersen, F. H. P. Fitzek, and T. Larsen, “Implementation and Performance Evaluation of Network Coding for Cooperative Mobile Devices,” ICC Workshops - 2008 IEEE International Conference on Communications Workshops, Beijing, China: IEEE, May 2008, pp. 91–96. doi: 10.1109/ICCW.2008.22	☐
	3	W. R. Stevens, “TCP/IP Illustrated, Volume 1,” 2003, ISBN: 0-13-141155-1 (“Stevens”)	☐
	4	Bajaj, et al., IETF RFC 3198, Web Services Policy 1.2 - Framework (WS-Policy), April 25, 2006, downloaded from the internet at https://www.w3.org/Submission/WS-Policy/ on August 29, 2023	☐
	5	Sloman, et. al., "Security and management policy specification." IEEE Network, March/April 2002 pp. 10-19	☐
	6	Lu, et. al., "Comparing system level power management policies." IEEE Design & Test of Computers, March/April 2001 pp. 10-19	☐
	7	Davie, et al., IETF RFC 3246, An Expedited Forwarding PHB (Per-Hop Behavior), March 2002, downloaded from the internet at https://datatracker.ietf.org/doc/html/rfc3246 on September 5, 2023	☐
	8	Excerpts, The New Penguin Dictionary of Computing, by Dick Pountain, 2001	☐

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	Filing Date	2022-12-23
	First Named Inventor	RALEIGH, GREGORY
	Art Unit	
	Examiner Name	Unknown
	Attorney Docket Number	RALEP038D1C1C1C1C1

	9	Westerinen, et al., IETF RFC 3198, Terminology for Policy-Based Management, November 2001, downloaded from the internet at https://www.ietf.org/rfc/rfc3198.txt on August 15, 2023.	☐
	10	Yavatkar, IETF RFC 2753, A Framework for Policy-Based Admission Control, January 2000, downloaded from the internet at https://datatracker.ietf.org/doc/html/rfc2753 on September 5, 2023	☐
	11	IPR2023-01360; Petition for Inter Partes Review of United States Patent No. 9,609,544, filed on September 11, 2023	☐
	12	IPR2023-01361; Petition for Inter Partes Review of United States Patent No. 9,271,184, filed on September 8, 2023	☐
	13	IPR2023-01362; Petition for Inter Partes Review of United States Patent No. 9,271,184, filed on September 8, 2023	☐
	14	IPR2023-01336; Petition for Inter Partes Review of United States Patent No. 9,137,701, filed on August 25, 2023	☐
	15	IPR2023-01337; Petition for Inter Partes Review of United States Patent No. 9,521,578, filed on August 25, 2023	☐
	16	IPR2023-01462; Petition for Inter Partes Review of United States Patent No. 9,277,445, filed on September 28, 2023	☐
	17	D. P. Bovet, "Understanding the Linux Kernel," 2000, ISBN: 0-596-00002-2	☐

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EXAMINER SIGNATURE

Examiner Signature		Date Considered	

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through a citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

EFS Web 2.1.18

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
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	Art Unit	
	Examiner Name	Unknown
	Attorney Docket Number	RALEP038D1C1C1C1C1

[1] See Kind Codes of USPTO Patent Documents at www.USPTO.GOV or MPEP 901.04. [2] Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). [3] For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. [4] Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. [5] Applicant is to place a check mark here if English language translation is attached.

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	18088450
	Filing Date	2022-12-23
	First Named Inventor	RALEIGH, GREGORY
	Art Unit	
	Examiner Name	Unknown
	Attorney Docket Number	RALEP038D1C1C1C1C1

CERTIFICATION STATEMENT

Please see 37 CFR 1.97 and 1.98 to make the appropriate selection(s):

☐ That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).

OR

☐ That no item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the information disclosure statement was known to any individual designated in 37 CFR 1.56(c) more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(2).

☐ See attached certification statement.

☐ The fee set forth in 37 CFR 1.17 (p) has been submitted herewith.

☒ A certification statement is not submitted herewith.

SIGNATURE

A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

Signature	/Farshad Farjami/	Date (YYYY-MM-DD)	2023-10-19
Name/Print	Farshad Farjami	Registration Number	41014

This collection of information is required by 37 CFR 1.97 and 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 1 hour to complete, including gathering, preparing and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
2 February 2006 (02.02.2006)

PCT

(10) International Publication Number
WO 2006/012018 A1

(51) International Patent Classification[7]: H04L 12/28, H04Q 7/38

(21) International Application Number: PCT/US2005/021162

(22) International Filing Date: 14 June 2005 (14.06.2005)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
10/883,611 30 June 2004 (30.06.2004) US

(71) Applicant *(for all designated States except US)*: **INTEL CORPORATION** [US/US]; 2200 Mission College Boulevard, Santa Clara, CA 95052 (US).

(72) Inventors; and

(75) Inventors/Applicants *(for US only)*: **SADOWSKY, John, S.** [US/US]; 1428 West Lindner, Mesa, AZ 85202 (US). **WOODWARD, Ernest, E.** [US/US]; 2730 West Kent Drive, Chandler, AZ 85224 (US).

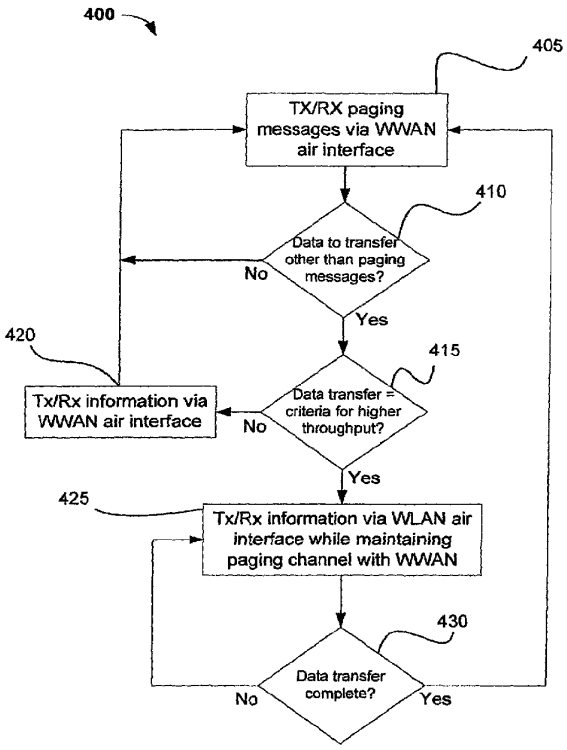
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[Continued on next page]

(54) Title: AIR INTERFACE COOPERATION BETWEEN WWAN AND WLAN



(57) Abstract: Methods and systems for communicating in a wireless network include usage based switching between two or more different types of air interfaces. In example implementations, a first air interface for wireless wide area networks (VWUAN) may be used for low bandwidth data transfers and a second interface for wireless local area networks (WLAN) or wireless metropolitan area networks (WMAN) may be used for higher bandwidth data transfers. Various specific embodiments and variations are also disclosed.

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AIR INTERFACE COOPERATION BETWEEN WWAN AND WLAN

BACKGROUND OF THE INVENTION.

[0001] Due to the increasing use of wireless networks for media applications, it is becoming more important to be able to provide service with greater efficiency while still maintaining low power consumption for mobile devices. Currently, there are several types of wireless networks each having unique aspects. For example, there are various types of air interfaces for wireless wide area networks (WWANs) and wireless local area networks (WLANs). Air interfaces for these types of networks may have various advantageous and disadvantages.

[0002] Accordingly, it would be desirable for wireless networks to utilize at least two different air interfaces in a manner to increase efficiency of wireless communications.

BRIEF DESCRIPTION OF THE DRAWING.

[0003] Aspects, features and advantages of the embodiments of the present invention will become apparent from the following description of the invention in reference to the appended drawing in which like numerals denote like elements and in which:

[0004] Fig. 1 is a block diagram of a wireless network according to one example embodiment of the present invention;

[0005] Fig. 2 is a functional block diagram showing an example wireless network communicating using a first air interface of a multiple air interface system according to one embodiment of the present invention;

[0006] Fig. 3 is a functional block diagram showing an example wireless network communicating using a first and second air interface of the multiple air interface system according to one embodiment of the present invention;

[0007] Fig. 4 is a flow diagram of an example method for content based switching of air interfaces in a wireless network according to various embodiments of the present invention; and

[0008] Fig. 5 is a functional block diagram of an example embodiment for a wireless apparatus adapted to perform one or more of the methods of the present invention.

DETAILED DESCRIPTION OF THE INVENTION.

[0009] While the following detailed description may describe example embodiments of the present invention in relation to air interfaces for wireless local area networks (WLANs) and wireless wide area networks (WWANs), the invention is not limited thereto and can be applied to other types of wireless networks or air interfaces where advantages could be obtained. Such air interfaces specifically include, but are not limited to, those associated with wireless metropolitan area networks (WMANs), such as wireless broadband solutions colloquially referred to as wireless to the max (WiMAX) air interfaces and wireless personal area networks (WPANs) and the like.

[0010] The following inventive embodiments may be used in a variety of applications including transmitters and receivers of a radio system, although the present invention is not limited in this respect. Radio systems specifically included within the scope of the present invention include, but are not limited to, network interface cards (NICs), network adaptors, mobile stations, base stations, access points (APs), gateways, bridges, hubs and radiotelephones. Further, the radio systems within the scope of the invention may include cellular radiotelephone systems, satellite systems, personal communication systems (PCS), two-way radio systems, two-way pagers, personal computers (PCs) and related peripherals, personal digital assistants (PDAs), personal computing accessories and all existing and future arising systems

which may be related in nature and to which the principles of the inventive embodiments could be suitably applied.

[0011] As used herein, WWANs may include but are not limited to packet data cellular networks such as general packet radio service (GPRS), enhanced GPRS (EGPRS), wideband code division multiple access (WCDMA), cdma2000, or other similar systems or air interfaces which may cover metropolitan-size or broader geographic areas. Certain advantages of WWANs include a relatively broad area of coverage coupled with relatively low power consumption. The low power consumption often results from using highly scheduled transmission protocols. For example, packet data services may be managed in a WWAN using a paging system. Paging channels may be scheduled for each mobile user using a low duty cycle. This allows a mobile receiver to essentially "sleep" between paging channels. When data traffic arrives, the system may move from the paging mode to an active mode to receive dedicated data packets. A disadvantage of many WWANs is a relatively low data throughput on the order of 150 kps.

[0012] By contrast, WLANs have a relatively large data throughput and can sustain bursty transmissions on the order of 11-54 Mbps. However, since many WLANs use carrier sense multiple access (CSMA) or similar traffic delivery protocols, a WLAN receiver may constantly monitor the channel and demodulate at least part of all transmissions in order to detect which transmissions are addressed specifically to the receiver. This constant monitoring may result in higher power consumption as compared with WWANs. The table below illustrates some advantages and disadvantages of these systems:

	WLAN	WWAN
Coverage	Highly limited – (home, business + hotspots). By area, WLAN coverage is insignificant in comparison to WWAN.	Metropolitan area or broader coverage.
Throughput	Extremely high. WiFi (Institute for Electrical and Electronics Engineers (IEEE) 802.11a standard for WLAN) bursts at 11 Mbps. IEEE 802.11g bursts at 54 Mbps.	Limited. In reality, one can rely on rates on the order of 144 kbps. These systems will support higher rates, but with limited coverage. Systems like high speed downlink packet access (HSDPA) will provide up to 10 Mbps burst rates, but only for limited coverage and these services are not available yet.
Scheduling	Essentially none. CSMA (carrier sense multiple access) is essentially an "Ethernet on the air."	Highly scheduled. Packet data services are managed using a paging system. Paging channels are scheduled per user with a very low duty factor. This allows the mobile receiver to "sleep" between paging systems. When data traffic arrives, the system moves from the paging mode to an active mode to receive dedicated data packets.
Power Consumption	High. CSMA requires that the receiver constantly monitor the channel and demodulate at least part of all transmission to detect which transmission are addressed to the specific user.	Very low. The paging system allows very low power sleep periods between traffic bursts. In active mode, the mobile fully demodulates only packets addressed to that mobile.

TABLE 1

[0013] Turning to Fig. 1, a wireless communication system 100 according to one embodiment of the invention may include one or more user stations 110, 112, 114, 116 and one or more network access stations 120. System 100 may be capable of facilitating two or more different types of air interfaces such as an air interface for

WLAN networks, an air interface for WWAN networks and an air interface for WMAN networks. One or more user stations 110-116 may communicate with one or more network access stations 120 via the different air interfaces based on bandwidth requirements or power efficiencies for various communications.

[0014] System 100 may further include one or more other wired or wireless network devices as desired. In certain embodiments system 100 may use an adaptive orthogonal frequency division multiplexing (OFDM) air interface although the embodiments of the invention are not limited in this respect. OFDM is the modulation currently used in many wireless applications including the Institute of Electrical and Electronic Engineers (IEEE) 802.11(a) and (g) standards for WLANs.

[0015] Peers in a wireless network such as user stations 110, 112, 114 and 116 may have varying needs for supporting traffic streams or data transfers. Accordingly in one example implementation, user stations 110-116 and network access station 120 may utilize a WWAN air interface and a WLAN air interface in combination to achieve enhanced data transfers and/or greater power efficiency. In another example implementation, the peers may utilize a WWAN air interface and a WMAN air interface in combination.

[0016] Turning to Figs. 2 and 3, an example architecture for a network 200 adapted for usage based switching of multiple air interfaces generally includes a server system 205, one or more distribution stations 220 and one or more clients 240.

[0017] Server system 205 may be any component or combination of components adapted to provide information to, and/or facilitate communications with, one or more clients (e.g., client 240; user stations 110-116, Fig. 1). In certain example implementations, server system 205 may provide functionality of an application program server 207 as well as a WWAN mobile switching center (MSC) 210, although the inventive embodiments are not limited in this respect.

[0018] Distribution station 220 may be any individual station or combination of stations adapted to support one or more air interfaces. In certain embodiments, distribution station 220 may include functionality for supporting a WLAN air interface (e.g., WLAN access point (AP) 225) and a WWAN air interface (e.g., base station 227). Distribution station 220 may be separate from or included with server system 205 as suitably desired.

[0019] Client 240 may be any mobile or stationary device or combination of devices configured to receive data from server station 205 via an air interface. Client 240 may include any radio frequency (RF), physical (PHY) link layer and/or data link layer components adapted to support multiple air interfaces. In one example embodiment, client 240 may support connection via a WWAN air interface as well as a WLAN air interface. Client 240 may include respective functional components generally depicted as WWAN modem 244 and WLAN modem 246. Client 240 may also include one or more processors 248 and/or memories (not shown) for supporting various application programs on client 240.

[0020] In one embodiment, there may be at least two modes of data transmission; for example, a WWAN mode (shown enabled in the illustrative embodiment of Fig. 2) and a WLAN mode (shown enabled in the illustrative embodiment of Fig. 3). According to one possible implementation, application server 207 may dynamically switch between WWAN mode and WLAN mode operations based on the content or amount of data to be transferred to/from client 240. Additionally or alternatively, switching between various modes may be based on a quality of service (QoS) requirement or desire so that switching between various air interfaces may be performed, for example, based on cost, link error, latency, synchronized path or isochronous path preferences.

[0021] Application server 207 and/or application processor 248 may utilize respective data paths 208, 245 to select the desired air interface (e.g., WWAN air interface 232 or WLAN air interface 332) for primary data transfers. Figs. 2 and 3 show that the logical pipe of packet communications between WWAN mode and WLAN mode may be established by holding emphasis on the WWAN modem 244 to base station 227 interface for WWAN mode (Fig. 2) and holding emphasis on the WLAN modem 246 and AP 225 interface for WLAN mode (Fig. 3). The main packet throughput may be moved between WWAN modem 244 and WLAN modem 246 based on operational desires. In preferred embodiments, regardless of which data path 208, 245 (Fig. 2; Fig. 3) or corresponding air interface 232, 332 is used for primary packet throughput, a radio control link 234 with the WWAN is maintained.

[0022] Radio control link 234 may be a paging channel used for tracking WWAN connections with base stations. WWAN paging channels are used by base stations to periodically send low bandwidth messages to generally inform mobile stations of network activity (e.g., they can wake up mobile stations or allow them to continue in a sleep mode). Mobile stations may also respond via the paging channel so that a base station may monitor which mobile stations are in its area of coverage. Accordingly, in various embodiments of the present invention, switching between WWAN mode and WLAN mode for data transfers is not a hard handoff to the WLAN AP 220 because the paging channel for the WWAN air interface is not released even when in WLAN mode.

[0023] Turning now to Fig. 4, an example method 400 for content-based or usage-based switching between an air interface (e.g. a WWAN) and a higher throughput air interface (e.g., a WLAN or WMAN) generally may include transmitting or receiving 405, 420 first information using a first air interface and transmitting or

receiving 425 second information using a second air interface different than the first interface while maintaining connection with the first air interface.

[0024] In certain embodiments, a wireless device (e.g., client 240; Figs. 2 and 3) may transmit and/or receive 405 one or more messages over a paging channel with a network station (e.g., 227; Fig. 2 and 3) via a WWAN air interface. Such interface may include, for example, an (E)GPRS, WCDMA, CDMA 2000 or other type of packet data cellular air interface. If 410 there is data to be transferred to or from the wireless device, characteristics of the data to be transferred and/or network may be evaluated 415.

[0025] One or more criteria may be used for determining which type of air interface should be used for data transfer. These criteria may include, but are not limited to: (i) whether more than one type of air interface is possible (e.g., whether the client device has access to multiple air interfaces in its present location); (ii) what type of data is to be transferred (e.g., time-sensitive or integrity sensitive data); (iii) available power for the client device; (iv) a volume and/or suitable data rate of the data to be transferred; (v) a quality of service (QoS) required or desired; or (vi) any combination of the foregoing criteria. Decisions based on the criteria may be made by the client device (e.g., application processor 245), a network management entity (e.g., application server 207) and/or a combination of both.

[0026] If 415 the predetermined criteria for using a higher throughput air interface are not met, data may be transferred 420 to or from the wireless device using the lower throughput air interface (e.g., WWAN interface). If 415 however, one or more of the criteria for using the higher throughput air interface are met, data may be transferred 425 to or from the wireless device using the higher throughput air interface (e.g., WLAN air interface or WiMAX air interface) while the paging channel with the lower throughput network is maintained.

[0027] When 430, the higher throughput data transfer is completed, the wireless device and/or network station may revert to communications via the lower throughput air interface (e.g., 405 and/or 420). The various embodiments of the present invention are ideally suited for applications which often involve bursty data transfers such as web browsing, file transfer protocol (FTP) transfers, distribution of digital images (e.g., digital camera photos), emails or similar applications.

[0028] For example, traffic flow for web applications may include lots of short messages (e.g., transfer control protocol/Internet protocol (TCP/IP) acknowledgements (ACKs), keystroke messages and the like). Consequently, with a fairly low duty factor a wireless device can transmit or receive fairly large files. However, there are likewise, many long idle periods for these types of applications which make constant monitoring, e.g., with a carrier sense multiple access (CSMA) air interface, inefficient for power consumption purposes.

[0029] In one example implementation, consider a mobile device (e.g., client 240; Figs. 2 and 3) communicating with a network via a WWAN air interface such as used by a general packet radio system (GPRS). In this example, the mobile device may be running a web browser application which needs to download a new web page. To do this, the mobile device may first initiate a GPRS transfer block flow (TBF) via the WWAN interface that sends data, which may include a web address of the desire web page, to a network server (e.g., application server 207; Fig. 2).

[0030] The mobile device and/or the network access station may determine that the requested download would be best served via a higher throughput air interface (e.g., a WLAN link). Negotiations for the higher throughput air interface may be communicated via the GPRS TBF and subsequently result in the mobile device connecting via the higher throughput air interface (e.g., the mobile device connects to the local AP via the WLAN to establish the WLAN link with the application server).

Similarly, a high bandwidth transmit might utilize the WLAN link if, for example the mobile device is attempting to upload a large file (e.g., digital image) to the network. Other varying bandwidth applications may also be possible and the embodiments of the present invention are not limited to any particular air interface or application.

[0031] Turning to Fig. 5, an example wireless network apparatus 500 which may be used to implement various embodiments of the present invention may generally include a host processing circuit 510, a WLAN or WMAN medium access controller (MAC) 530, a WWAN MAC 540 and, if desired, a baseband processor and radio frequency (RF) interface 550.

[0032] In one example embodiment, host processing circuit 510 may be any component or combination of components and/or machine readable code adapted to process application programs and control or negotiate selection of multiple air interfaces. Circuit 510 may include one or more memories and/or processors (not shown) operative to store and execute application programs 512 such as web browsers, email clients, digital photo applications, personal calendars and the like. Host circuit 510 preferably includes software or a firmware module for controlling or negotiating the data path and/or the active air interface via the respective WLAN MAC 530 or WWAN MAC 540. This functionality is depicted in Fig. 5 as a mobility connection services module 515 which may be a reconfigurable radio architecture programmed to adapt the radio interface as desired.

[0033] Baseband/RF portion 550 may include any hardware, software and/or firmware components necessary for physical (PHY) link layer processing and/or RF processing of respective receive/transmit signals for supporting the various air interfaces.

[0034] Apparatus 500 may be a wireless mobile station (STA) such as a cell phone, personal digital assistant, computer, personal entertainment device, wireless

router or other equipment and/or wireless network adaptor therefore. Accordingly, the functions and/or specific configurations of apparatus 500 could be varied as suitably desired.

[0035] The components and features of apparatus 500 may be implemented using any combination of discrete circuitry, application specific integrated circuits (ASICs), logic gates and/or single chip architectures. Further, the features of apparatus 500 may be implemented using microcontrollers, programmable logic arrays and/or microprocessors or any combination of the foregoing where suitably appropriate.

[0036] It should be appreciated that apparatus 500 shown in the block diagram of Fig. 5 is only one functionally descriptive example of many potential implementations. Accordingly, division, omission or inclusion of block functions depicted in the accompanying figures does not infer that the hardware components, circuits, software and/or elements for implementing these functions would necessarily be combined, divided, omitted, or included in embodiments of the present invention.

[0037] Embodiments of the present invention may be implemented using single input single output (SISO) systems. However, certain alternative implementations may use multiple input multiple output (MIMO) architectures having multiple antennas.

[0038] The embodiments of the present invention may result in issues of possible simultaneous radio use (i.e., paging messages transferred via the WWAN air interface while transferring data using the WLAN air interface). One option to handle potential simultaneous radio issues is to have both WLAN and WWAN radios operating simultaneously in the mobile device when in WLAN mode. However, this may be difficult due to interference and other RF implementation issues. In addition, in a reconfigurable radio, resources for both WLAN and WWAN modems (e.g., 246, 244;

Figs. 2 and 3) may not be available for use at the same time. Accordingly, it may be desirable to prevent transmission or reception via the WLAN air interface during WWAN pages.

[0039] Additionally or alternatively, when in WLAN mode, the network access station and/or mobile device could refrain from sending or receiving any WWAN traffic. Thus WWAN paging messages (e.g., wake up messages) might not be sent while the mobile device is in WLAN mode or the mobile device could temporarily ignore the WWAN paging channel.

[0040] In some instances, the radio resource control (RRC) of a WWAN may send messages to mobile devices even when there is no traffic flow on the WWAN. It is possible if these RRC messages are ignored (e.g., while the mobile device is in WLAN mode), the WWAN link could be incidentally dropped. Potential solutions to address this possibility may be to update the service provider RRC protocols to prevent dropping of the WWAN link or to send the RRC messages over the WLAN link instead. Various solutions to implementation issues may be addressed, in most instances, by updating the existing service provider software.

[0041] Unless contrary to physical possibility, the inventors envision the methods described herein: (i) may be performed in any sequence and/or in any combination; and (ii) the components of respective embodiments may be combined in any manner.

[0042] Although there have been described example embodiments of this novel invention, many variations and modifications are possible without departing from the scope of the invention. Accordingly the inventive embodiments are not limited by the specific disclosure above, but rather should be limited only by the scope of the appended claims and their legal equivalents.

CLAIMS

The invention claimed is:

1. A method of communicating with a wireless device using two air interfaces, the method comprising:

transmitting or receiving first information at the wireless device using a first air interface; and

transmitting or receiving second information at the wireless device using a second air interface different than the first interface while maintaining connection with the first air interface.

2. The method of claim 1 further comprising selecting the first or second air interface based on an amount of information to be transmitted or received.

3. The method of claim 1 wherein the first air interface comprises a wireless wide area network (WWAN) air interface and wherein the second interface comprises a wireless local area network (WLAN) air interface.

4. The method of claim 1 wherein the first information comprises one or more cellular paging messages and wherein the second information comprises a plurality of packet data units.

5. The method of claim 2 wherein the first air interface is selected for data requiring relatively low bandwidth in transmitting or receiving and wherein the second air interface is selected for data requiring a higher bandwidth in transmitting or receiving.

6. The method of claim 1 wherein the first air interface comprises a code division multiple access (CDMA) air interface and wherein the second air interface comprises an orthogonal frequency division multiplex (OFDM) air interface.

7. The method of claim 2 wherein selecting the first or second air interface is controlled, at least in part, by an application server associated with a network access station.

8. An apparatus for use in a wireless network, the apparatus comprising:

a processing circuit adapted to enable the apparatus to transmit or receive first information using a first air interface and transmit or receive second

information using a second air interface different than the first interface while maintaining connection with the first air interface.

9. The apparatus of claim 8 further comprising:

at least one radio frequency (RF) interface coupled to the processing circuit.

10. The apparatus of claim 8 wherein the apparatus comprises at least a portion of a mobile station.

11. The apparatus of claim 8 wherein the apparatus comprises at least a portion of a network access station.

12. The apparatus of claim 8 wherein the processing circuit is further adapted to select the first or second air interface based on an amount of information to be transmitted or received.

13. The apparatus of claim 8 wherein the first air interface comprises a wireless wide area network (WWAN) air interface and wherein the second interface comprises a wireless local area network (WLAN) air interface.

14. The apparatus of claim 8 wherein the first information comprises one or more cellular paging messages and wherein the second information comprises a plurality of packet data units.

15. The apparatus of claim 8 wherein the first air interface is selected for transmitting or receiving a first volume of data and wherein the second air interface is selected for transmitting or receiving a second, higher volume of data.

16. The apparatus of claim 8 wherein the first air interface comprises a spread spectrum air interface and wherein the second air interface comprises an orthogonal frequency division multiplex (OFDM) air interface.

17. The apparatus of claim 8 wherein the first or second air interface is selected based on an application server associated with a network access station.

18. The apparatus of claim 9 further comprising at least two antennas coupled to the RF interface to provide multiple input multiple output (MIMO) capability.

19. The apparatus of claim 8 further comprising a memory in communication with the processing circuit and operative to store an application program for web browsing.

20. A system comprising:

a processing circuit configured to transmit or receive first information using a first air interface and transmit or receive second information using a second air interface different than the first interface while maintaining a link through the first air interface; and

a memory in communicaton to the processing circuit, the memory storing a web browser application program adapted to use the second information for displaying or updating a web page.

21. The system of claim 20 wherein the system comprises a mobile station.

22. The system of claim 21 wherein use of the first and second air interfaces is selected by a server associated with a network access station.

23. The system of claim 22 wherein use of the first and second air interfaces is selected based on an amount of information to be transmitted or received.

24. The system of claim 20 wherein the first air interface comprises a wireless wide area network (WWAN) air interface and wherein the second interface comprises a wireless local area network (WLAN) air interface.

25. The system of claim 20 wherein the first information comprises one or more cellular paging messages and wherein the second information comprises a plurality of packet data units.

26. The system of claim 20 wherein the first air interface comprises a spread spectrum air interface and wherein the second air interface comprises an orthogonal frequency division multiplex (OFDM) air interface.

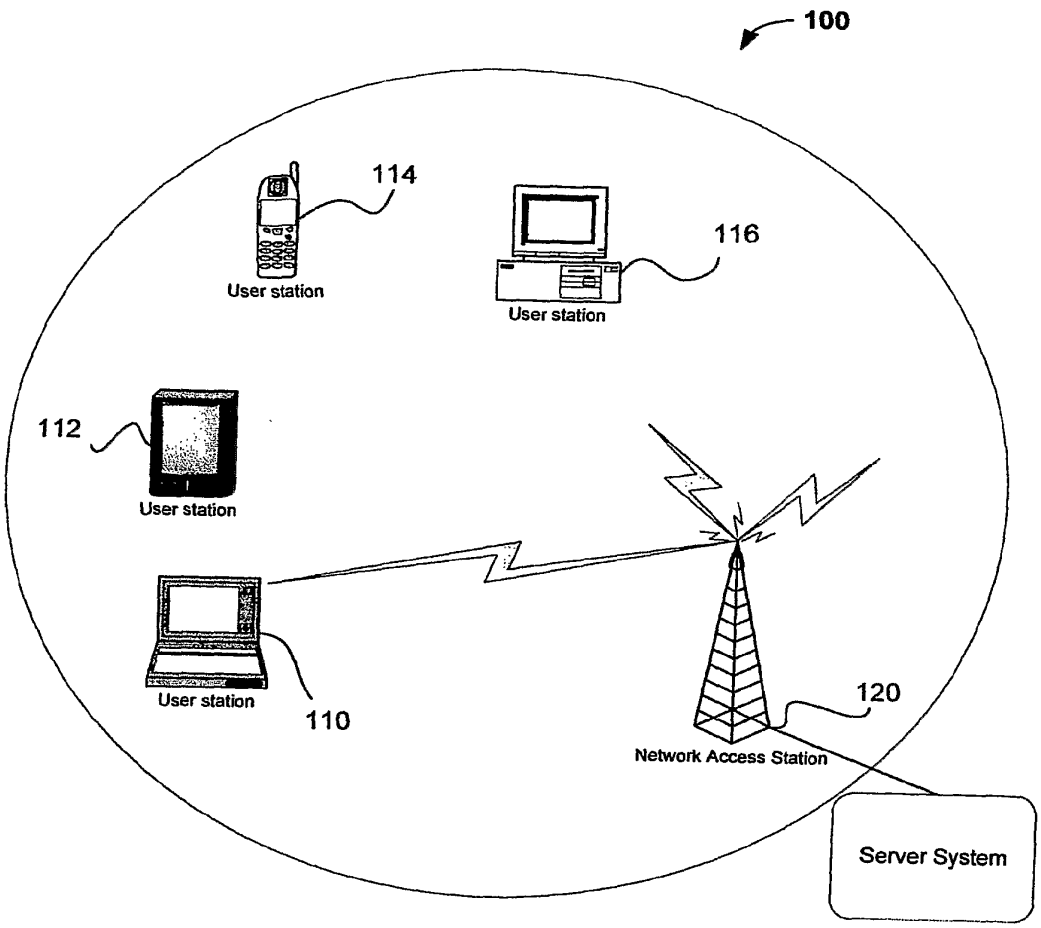

100
114
User station
116
User station
112
User station
User station
110
120
Network Access Station
Server System

Fig. 1

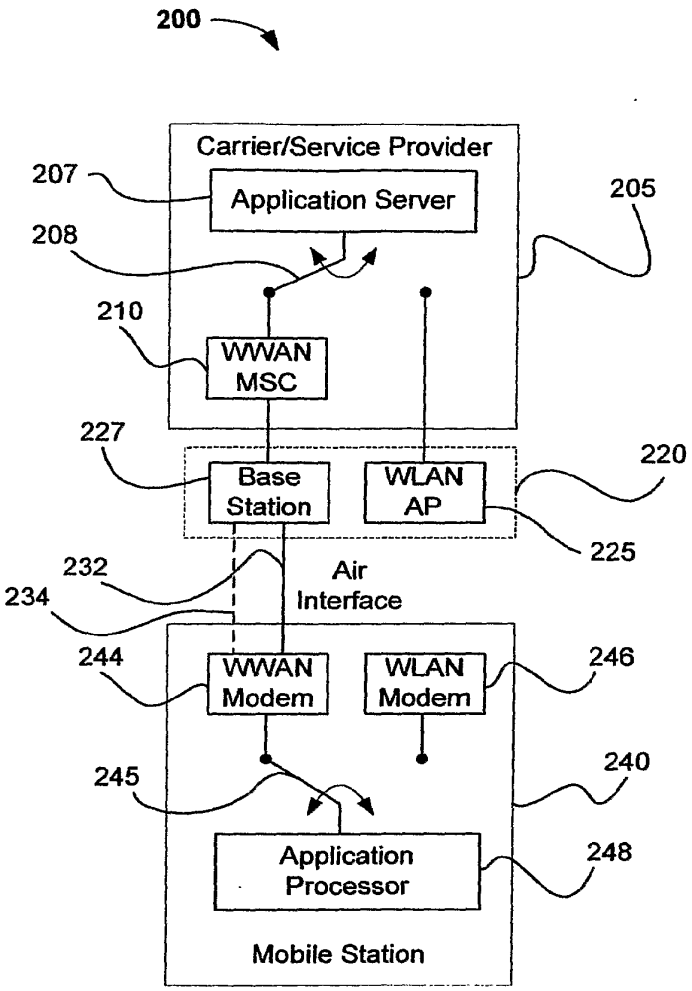

200
Carrier/Service Provider
207
Application Server
205
208
210
WWAN
MSC
227
220
Base
Station
WLAN
AP
225
232
Air
Interface
234
244
WWAN
Modem
WLAN
Modem
246
240
245
Application
Processor
248
Mobile Station

Fig. 2

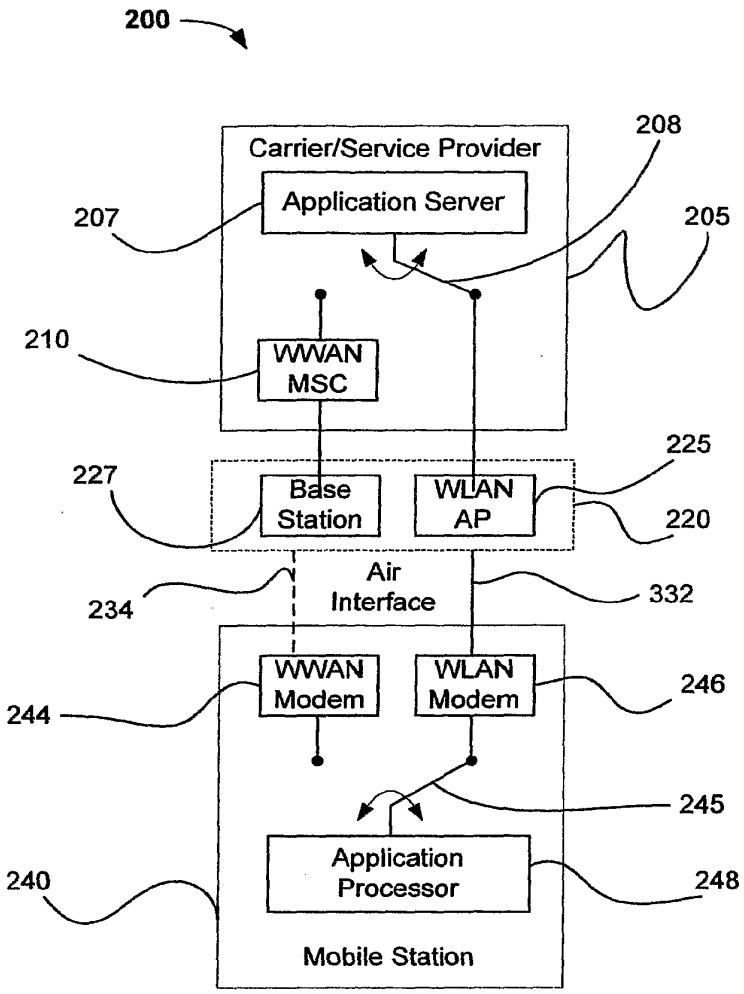

200
Carrier/Service Provider
208
Application Server
207
205
210
WWAN MSC
225
227
Base Station
WLAN AP
220
Air Interface
234
332
WWAN Modem
WLAN Modem
246
244
245
Application Processor
240
248
Mobile Station

Fig. 3

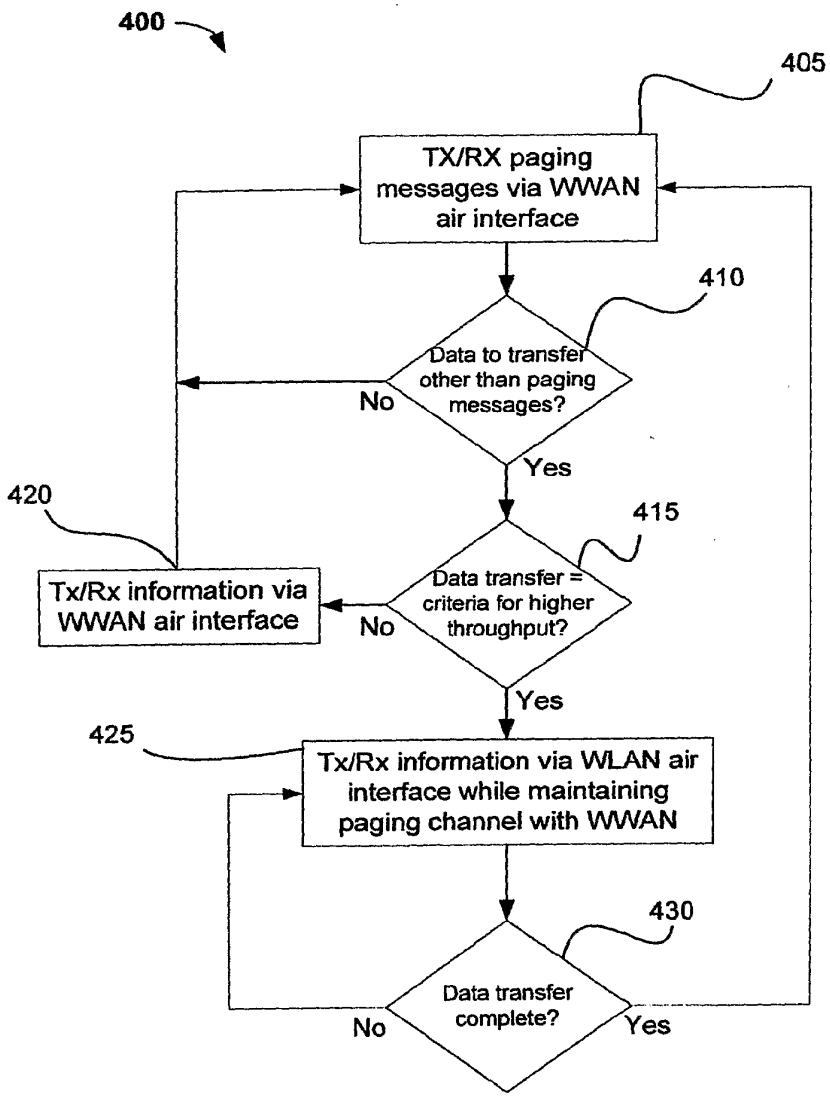

400
405
TX/RX paging messages via WWAN air interface
410
Data to transfer other than paging messages?
No
Yes
420
415
Tx/Rx information via WWAN air interface
Data transfer = criteria for higher throughput?
No
Yes
425
Tx/Rx information via WLAN air interface while maintaining paging channel with WWAN
430
Data transfer complete?
No
Yes

Fig. 4

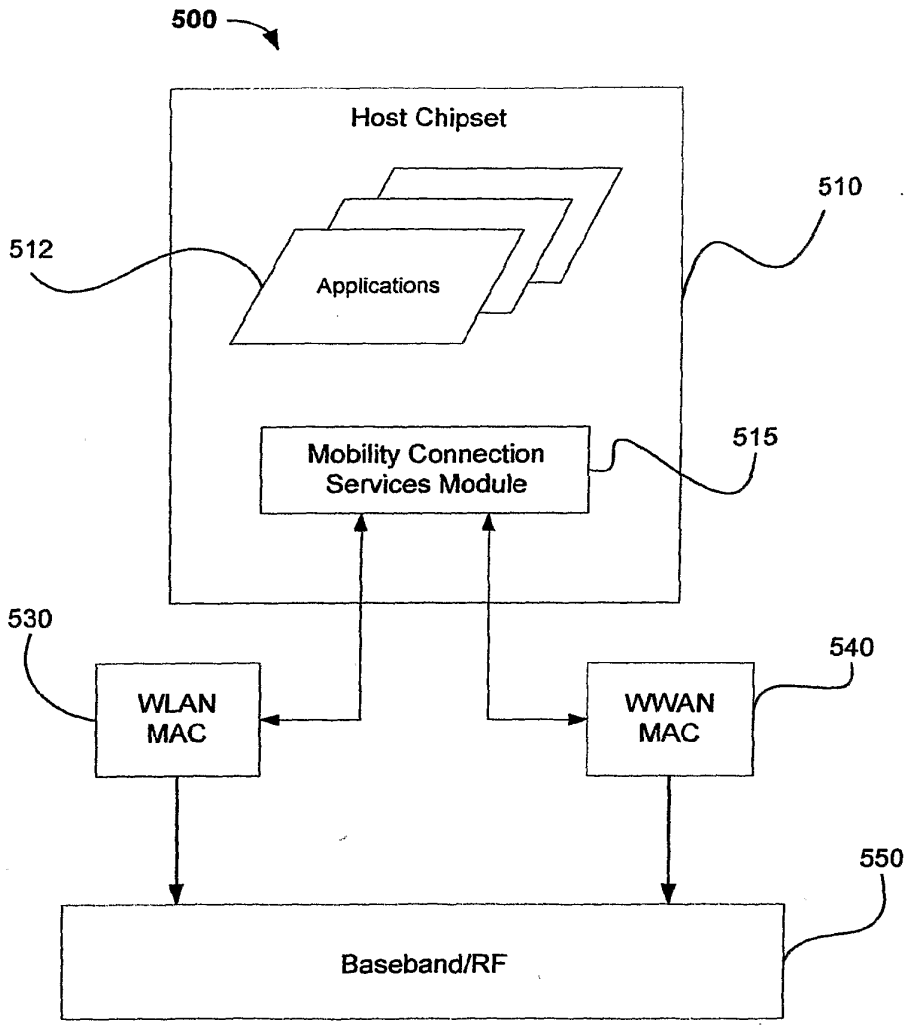

500
Host Chipset
510
512
Applications
Mobility Connection Services Module
515
530
WLAN MAC
540
WWAN MAC
550
Baseband/RF

Fig. 5

INTERNATIONAL SEARCH REPORT

International Application No
PCT/US2005/021162

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 H04L12/28 H04Q7/38

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 H04Q

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

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 6 243 581 B1 (JAWANDA JASTINDER) 5 June 2001 (2001-06-05) column 2, lines 1-9 column 2, line 42 - column 3, line 27 column 5, line 62 - column 6, line 8	1-3, 5-13, 15-17, 19-24,26
X	US 2002/039884 A1 (RAYNES DEBORAH L ET AL) 4 April 2002 (2002-04-04) paragraphs '0006! - '0010!, '0025!, '0031!	1-3, 5-13, 15-18

-/--

[X] Further documents are listed in the continuation of box C.

[X] Patent family members are listed in annex.

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

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

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

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

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Date of the actual completion of the international search	Date of mailing of the international search report
8 September 2005	16/09/2005

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

2

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page 1 of 2

INTERNATIONAL SEARCH REPORT

International Application No
PCT/US2005/021162

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 6 567 855 B1 (TUBBS GRAHAM S ET AL) 20 May 2003 (2003-05-20) column 1, line 65 - column 2, line 7 column 2, line 61 - column 3, line 10	1-5, 7-15,17, 19-26
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page 2 of 2

INTERNATIONAL SEARCH REPORT

International Application No
PCT/US2005/021162

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
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Electronic Acknowledgement Receipt	
EFS ID:	48742394
Application Number:	18088450
International Application Number:	
Confirmation Number:	4358
Title of Invention:	Communications Device with Secure Data Path Processing Agents
First Named Inventor/Applicant Name:	Gregory G. Raleigh
Customer Number:	106963
Filer:	Michael Farjami/Evan Gunderman
Filer Authorized By:	Michael Farjami
Attorney Docket Number:	RALEP038D1C1C1C1C1
Receipt Date:	19-OCT-2023
Filing Date:	23-DEC-2022
Time Stamp:	19:23:49
Application Type:	Utility under 35 USC 111(a)

Payment information:

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File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Information Disclosure Statement (IDS) Form (SB08)	RALEP038D1C1C1C1C1_IDS_Oct_19_23.pdf	1081521 eb45ed7ed2f981e37bb88636f97ebbf94c84b41c	no	5

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3	Non Patent Literature	1_Freier.pdf	2103146 59f31631754da79cd496403a3c4a939992894d6f	no	67
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4	Non Patent Literature	2_Pedersen.pdf	2054212 9ed3cf9e72ba9f0b31a256c14e67cfcc9d7cb8d9	no	6
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5	Non Patent Literature	3_Stevens_Part1.pdf	25158041 e42a3e84fff81a512199d77bc3b074aab4e1f602	no	150
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7	Non Patent Literature	3_Stevens_Part3.pdf	25164129 821494995098a711424cc1d3f14cc038d472e8c7	no	144
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8	Non Patent Literature	3_Stevens_Part4.pdf	25115819 dd97a930075434bff5514d39a98a426678906b24	no	153
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10	Non Patent Literature	4_Bajaj.pdf	1675258 87d04a981b24b5c76cae0d6bf4e53eebcf8b906c	no	19
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11	Non Patent Literature	5_Sloman.pdf	926945 d8cd35c3fda14934409929a0e3e1e883118e34b6	no	10
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17	Non Patent Literature	11_IPR2023-01360.pdf	5725107 f5514c6d9f187179e6fde1fb916a4793b8220c8f	no	98
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New International Application Filed with the USPTO as a Receiving Office

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Doc code: IDS
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Approved for use through 05/31/2024. OMB 0651-0031
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INFORMATION DISCLOSURE STATEMENT BY APPLICANT (**Not for submission under 37 CFR 1.99)**		
	Application Number	18088450
	Filing Date	2022-12-23
	First Named Inventor	RALEIGH, GREGORY
	Art Unit	
	Examiner Name	Unknown
	Attorney Docket Number	RALEP038D1C1C1C1C1

U.S.PATENTS						
Examiner Initial*	Cite No	Patent Number	Kind Code[1]	Issue Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
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	First Named Inventor	RALEIGH, GREGORY
	Art Unit	
	Examiner Name	Unknown
	Attorney Docket Number	RALEP038D1C1C1C1C1

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	Art Unit	
	Examiner Name	Unknown
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Examiner Initial*	Cite No	Foreign Document Number[3]	Country Code[2]	Kind Code[4]	Publication Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear	T[5]
	1	03100581	WO	A2	2003-12-04	Dive-Reclus et al.		☐

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Examiner Initials*	Cite No	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc), date, pages(s), volume-issue number(s), publisher, city and/or country where published.	T[5]
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	Application Number	18088450
	Filing Date	2022-12-23
	First Named Inventor	RALEIGH, GREGORY
	Art Unit	
	Examiner Name	Unknown
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INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
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	First Named Inventor	RALEIGH, GREGORY
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	Art Unit	
	Examiner Name	Unknown
	Attorney Docket Number	RALEP038D1C1C1C1C1

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	18088450
	Filing Date	2022-12-23
	First Named Inventor	RALEIGH, GREGORY
	Art Unit	
	Examiner Name	Unknown
	Attorney Docket Number	RALEP038D1C1C1C1C1

CERTIFICATION STATEMENT

Please see 37 CFR 1.97 and 1.98 to make the appropriate selection(s):

☐ That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).

OR

☐ That no item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the information disclosure statement was known to any individual designated in 37 CFR 1.56(c) more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(2).

☐ See attached certification statement.

☐ The fee set forth in 37 CFR 1.17 (p) has been submitted herewith.

☒ A certification statement is not submitted herewith.

SIGNATURE

A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

Signature	/Farshad Farjami/	Date (YYYY-MM-DD)	2023-10-06
Name/Print	Farshad Farjami	Registration Number	41014

This collection of information is required by 37 CFR 1.97 and 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 1 hour to complete, including gathering, preparing and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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

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(71) Applicant *(for all designated States except US)*: **SYMBIAN LIMITED** [GB/GB]; Sentinel House, 16 Harcourt Street, London W1H 1DS (GB).

(72) Inventors; and
(75) Inventors/Applicants *(for US only)*: **DIVE-RECLUS, Corinne** [FR/GB]; 51 Charmouth Road, St Albans, Herts AL1 4SE (GB). **HARRIS, Jonathan** [GB/GB]; 35 Caterham Road, London SE13 5AP (GB). **MAY, Dennis** [GB/GB]; 28 Woodquest Avenue, London SE24 0HD (GB).

(74) Agent: **LANGLEY, Peter, James**; Origin Limited, 52 Muswell Hill Road, London N10 3JR (GB).

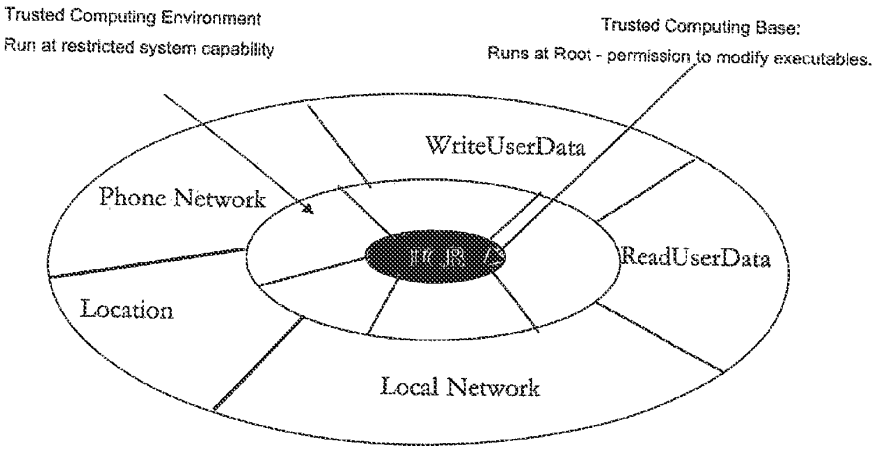
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(84) Designated States *(regional)*: ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC,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

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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: SECURE MOBILE WIRELESS DEVICE



(57) Abstract: A secure mobile wireless device in which executable code to be installed on the device is assigned a set of capabilities which define the protected resource(s) on the device which it can access. Hence, the present invention takes the idea of capabilities (known in the context of defining the capabilities or access privileges of different *users* in a multi-user system) and applies it to defining the capabilities or access privileges of different *native executable code* for secure, single-user mobile wireless devices.

WO 03/100581 A2

SECURE MOBILE WIRELESS DEVICE

FIELD OF THE INVENTION

This invention relates to a secure mobile wireless device; in particular it relates to a new approach to platform security for mobile wireless devices which protects key operating system resources from harmful access.

DESCRIPTION OF THE PRIOR ART

Platform security covers the philosophy, architecture and implementation of platform defence mechanisms against malicious or badly written code. These defence mechanisms prevent such code from causing harm. Malicious code generally has two components: a payload mechanism that does the damage and a propagation mechanism to help it spread. They are usually classified as follows:

Trojan horse: poses as a legitimate application that appears benign and attractive to the user.

Worm: can replicate and spread without further manual action by their perpetrators or users.

Virus: Infiltrates legitimate programs and alters or destroys data.

Security threats encompass (a) a potential breach of confidentiality, integrity or availability of services or data in the value chain and integrity of services and (b) compromise of service function. Threats are classified in the following categories:

1. Threats to confidentiality and integrity of data. Examples: Get user's password; corrupt files.
2. Threats to confidentiality and integrity of services. Examples: Use bandwidth from phone network subscriber without paying for it; repudiate transaction with network service provider.

3. Threats to availability of service (also called denial of service). Examples: Prevent the user from sending a text message; prevent the user from accepting a telephone call.

Hence, mobile wireless devices offer very considerable challenges to the designer of a security architecture. A conventional approach typically operates by first of all determining whether the code (e.g. an application) is sufficiently trustworthy to be installed and then subsequently protecting the platform from errant behaviour once it is installed. In terms of determining trust, third party applications can be categorised according to the degree of trust associated with their authors. Hence, it is known to allow applications to be automatically installed on a device only if they can present a valid digital certificate issued by an acceptable Certificate Authority (CA).

Digital certificates are however only just becoming widespread; prior to their adoption, a primary platform security mechanism was to grant privileges to a user rather than to an application. At run time, the code being executed by the user is granted all his privileges. At install time, only designated users could install sensitive software. This meant that potentially harmful code could be vetted by an expert administrator prior to installation. Many well known operating systems adopt this approach to platform security – e.g. Unix-based operating systems.

Platform security based on giving different users different access privileges is not relevant however for mobile wireless devices for the simple reason that this category of product is *single user*. It is a personal device, typically a 'smartphone', enhanced mobile telephone, PDA or other personal, portable computing device. Furthermore, the single user is very likely not to be expert in computing and hence cannot reliably assess the risk of installing and running code. With mobile wireless devices, the key threats that a platform security model tries to address are unauthorised access to user data and to system services, in particular the phone stack. The phone stack is especially important because it controls a permanent data connection to the phone network; mobile commerce, mobile banking etc. will be performed using the phone stack and (as noted above) losing control over it to malicious or badly written code exposes the device owner to potentially very significant financial damage.

To date, there have been no effective proposals for platform security for mobile wireless devices.

SUMMARY OF THE PRESENT INVENTION

In a first aspect of the present invention, there is a secure mobile wireless device in which native executable code to be installed on the device is assigned a set of capabilities which define the protected resource(s) on the device which it can access. Native code is composed of instructions directly executed by a CPU on a device.

In a second aspect, there is a software application adapted to run on a secure mobile wireless device and written in native code in which the application is assigned a set of capabilities which define the protected resource(s) on the device which it can access.

In a third aspect, there is an operating system adapted to run on a secure mobile wireless device in which the operating system requires executable code requiring access to sensitive resources to be assigned a set of capabilities which define the protected resource(s) which it can access.

Hence, the present invention takes the idea of capabilities (known in the context of defining the capabilities or access privileges of different *users* in a multi-user system) and applies it to defining the capabilities or access privileges of different *native executable code* for secure, single-user mobile wireless devices.

An implementation of the present invention can be thought of as firewall protection of key operating system servers through the use of capability-based access control as applied to native executable code. Each capability may grant access to a specific API (or range of APIs), a file or any other applicable resource(s). Each executable (e.g. program (EXEs), or shared, static or dynamic libraries (DLLs)) contains the capabilities it has been granted at installation time. Each executable is permanently stored in a location only accessible to the Trusted Computing Base (kernel, loader, file server and software installer; see Detailed Description section 1.1) to preserve the integrity of the capabilities assigned to the executable. Once an executable is invoked, the loader will load the executable either to create

a new process or to load the library code into an existing process. When creating a new process, the capabilities of this process are equal to the capabilities granted to the program. Based on this set of capabilities, the loader controls which libraries can be loaded into n process. For each client-server communication, the kernel will pass the client capabilities to the server. Therefore, the server can fully trust the client capabilities, as they are not passed/approved by it but by a process part of the Trusted Computing Base, e.g. the kernel. The server can decide either to process the call or to reject it.

Preferably, the capability model is deliberately limited to a small number of capabilities. *System* capabilities are mandatory and control access to the operating system kernel, file system and system data. They guarantee the integrity of the 'Trusted Computing Environment' (or TCE – see Detailed Description at 1.2). The way they are controlled cannot be modified by the user of the device and they are never exposed to them. Other kinds of capability are discretionary, as they are meaningful enough to average users to let them decide whether or not to grant some of them to code they have installed. These capabilities are categorised are follow:

Root (mandatory) "Full access to all files - Can modify capabilities associated with executables"

Used by the Trusted Computing Base only.

System capabilities (mandatory)

As examples, we may define:

WriteSystemData allows a process to modify configuration system data.

CommDD grants access to all communication and ethernet card device drivers.

User-exposed capabilities (discretionary)

As examples, we may define:

PhoneNetwork. "Can access phone network services (and potentially spend user money)"

ReadUserData. "Can read the device user's private information"

BRIEF DESCRIPTION OF THE DRAWINGS

The present inventionwill be described with reference to the accompanying drawings, in which

Figure 1 shows the Run time processes, system capability rings and user visible capability groupings for an implementation; and

Figure 2 illustrates a possible process of installation.

DETAILED DESCRIPTION

The present invention will be described with reference to the security architecture of the Symbian OS object oriented operating system, designed for single user wireless devices. The Symbian operating system has been developed for mobile wireless devices by Symbian Ltd, of London, United Kingdom.

The basic outline of the Symbian OS security architecture is analogous to a medieval castle defences. In a similar fashion it employs simple and staggered layers of security above and beyond the installation perimeter. The key threats that the model is trying to address are those that are linked with unauthorised access to user data and to system services, in particular the phone stack. The phone stack is especially important in the context of a smart phone because it will be controlling a permanent data connection to the phone network. There are two key design drivers lying behind the model:

- **Firewall protection** of key system resources through the use of **capability-based access control.**
- **Data partitioning** which creates a protected part of the file system which standard software is not able to access.

The main concept of the capability model described below is to control what a *process* can do rather than what a user can do. This approach is quite different to well-known operating systems as Windows NT and Unix. The main reasons are:

- The very nature of Symbian OS is to be mono-user.
- Symbian OS provides services through independent server processes. They always run and are not attached to a user session. As long as power is supplied, Symbian OS is always on even if no user is logged on.
- Symbian OS is aimed to be used in devices used by a large public with no technology knowledge. When installing software, the user may not have the skills to decide what permissions to grant to an application. Furthermore, with always-

connected devices, the consequences of a wrong or malevolent decision may impact a domain much larger than the device itself.

A remarkable point of this invention is that the use of cryptography has been deliberately excluded from the kernel and the loader: executables are not signed, capabilities are not stored encrypted or signed. That has been possible because data partitioning provides a secure storage area for executables. It allows the system to treat executables from ROM (built in the device) the same way as code from RAM (installed by the user) without compromising either on security or performance. Therefore any misuse or exploit of device manufacturer code is restricted to the capabilities assigned to this code.

1 Trusted Computing Platform

1.1 Trusted Computing Base

A trusted computing base (TCB) is a basic architectural requirement for robust platform security. The trusted computing base consists of a number of architectural elements that cannot be subverted and that guarantee the integrity of the device. It is important to keep this base as small as possible and to apply the principle of least privilege to ensure system servers and applications do not have to be given privileges they do not need to function. On closed devices, the TCB consists of the kernel, loader and file server; on open devices the software installer is also required. All these processes are system-wide trusted and have therefore full access to the device. This trusted core would run with a "root" capability not available to other platform code (see section 2.1).

There is one other important element to maintain the integrity of the trusted computing base that is out of the scope of this invention, namely the hardware. In particular, with devices that hold trusted computing base functionality in flash ROM, it is necessary to provide a secure boot loader to ensure that it is not possible to subvert the trusted computing base with a malicious ROM image.

1.2 Trusted Computing Environment

Beyond the core, other system components would be granted restricted orthogonal system capabilities and would constitute the Trusted Computing Environment (TCE); they would include system servers such as phone and window servers... For instance the window server would not be granted the capability of phone stack access and the phone server would not be granted the capability of direct access to keyboard events. It is strongly recommended to give as few system capabilities as possible to a software component to limit potential damage by any misuse of these privileges.

The TCB ensures the integrity of the full system as each element of the TCE ensures the integrity of one service. The TCE cannot exist without a TCB but the TCB can exist by itself to guarantee a safe "sand box" for each process.

2 Process Capabilities

A capability can be thought of as an access token that corresponds to a permission to undertake a sensitive action. The purpose of the capability model is to control access to sensitive system resources. The most important resource that requires access control is the kernel executive itself and a *system* capability (see section 2.1) is required by a client to access certain functionality through the kernel API. All other resources reside in user-side servers accessed via IPC [Inter Process Communication]. A small set of basic capabilities would be defined to police specific client actions on the servers. For example, possession of a *make calls* capability would allow a client to use the phone server. It would be the responsibility of the corresponding server to police client access to the resources that the capability represents. Capabilities would also be associated with each library (DLL) and program (EXE) and combined by the loader at run time to produce net process capabilities that would be held by the kernel. For open devices, third party software would be assigned capabilities either during software installation based on the certificate used to sign their installation packages or post software installation by the user, as detailed in section 3. The

policing of capabilities would be managed between the loader, the kernel and affected servers but would be kernel-mediated through the IPC mechanism.

The key features of the process capability model are:

- It is primarily focused around system servers and client-server IPC interactions between these entities.
- Capabilities are associated with processes and not threads. Threads in the same process share the same address space and memory access permissions. This means that any data being used by one thread can be read and modified by all other threads in the same process.
- The policing of the capabilities is managed by the loader and kernel and through capability policing at the target servers. The kernel IPC mechanism is involved in the latter.
- When the code is not running, capabilities are stored inside of libraries and programs. Capabilities stored in libraries and programs are not modifiable, as they would be stored during installation in a location that is only accessible by the Trusted Computing Base.
- Not all servers would have to handle client capabilities. Servers would be responsible for interpreting capabilities as they wish.
- The only cryptography involved in this scheme might be at the software installation stage where certificates would be checked off against a suitable root certificate (refer to sub-section 3)

2.1 System capabilities: Protecting the integrity of the device

Root. "Full access to all files - Can modify capabilities associated with executables "

"Root" capability – Used by the Trusted Computing Base only, it gives full access to all files in the device.

System capabilities

Some system servers require some specific access to the Trusted Computing Base. Because of the object-oriented implementation of Symbian OS, the kind of resources required by a system server is most of the time exclusive to it. Therefore, one system

server would be granted some system capability that would be orthogonal to those required by another. For instance, the window server would be granted access to keyboard and pen events issued by the kernel but it would not have permission to access the phone stack. In the same way, the phone server would be granted access to the phone stack but would not have permission to collect events from the kernel.

As examples, we can name:

WriteSystemData	Allows modification of configuration system data
CommDD	Grants access to all communication and Ethernet card device drivers.
DiskAdmin	Can perform administration task on the disk (reformat, rename a drive,...).

2.2 User-exposed capabilities: Mapping real-world permissions

The process of generating capabilities can be difficult. One has first to identify those accesses that require policing and then to map those requirements into something that is meaningful for a user. In addition, more capabilities means greater complexity and complexity is widely recognised as being the chief enemy of security. A solution based on capabilities should therefore seek to minimise the overall number deployed. The following capabilities map fairly broadly onto the main threats which are unauthorised access to system services (eg. the phone stack) and preserving the confidentiality/integrity of user data.

PhoneNetwork. "Can access phone network services and potentially spend user money"

"Make telephone calls"

"Send short text messages".

WriteUserData. "Can read and modify users private information"

"Add a contact".

"Delete an appointment".

ReadUserData. "Can read users private information"

"Access contacts data".

"Access agenda data".

LocalNetwork. "Can access local network"

"Send Bluetooth messages".

"Establish an IR connection"

"Establish an USB connection"

Location. " Can access the current location of the device"

"Locate the device on a map"

"Display closest restaurants and cinema"

It is necessary to make a distinction between PhoneNetwork and LocalNetwork because it is possible to transmit information across a network without spending any money (eg. Bluetooth piconet). This kind of access may be a very useful third party software enabler but nonetheless represents a local way of leaking sensitive information via a trojan horse so it must be protected with a capability, albeit LocalNetwork. PhoneNetwork, if granted by the user, would allow trojans seeking to use the phone network as their exit route; that is potentially much more damaging and hence the blunt warning in its description.

Root and system capabilities are mandatory; if not granted to an executable, the user of the device cannot decide to do it. Their strict control ensures the integrity of the Trusted Computing Platform. However the way servers check user-exposed capabilities or interpret them may be fully flexible and even user-discretionary.

Figure 1 shows the Run time processes, system capability rings and user visible capability groupings.

2.3 Assigning capabilities to a process

The association of a run-time capability with a process involves the loader. In essence, it transforms the static capability settings associated with individual libraries and programs into

a run-time capability that the kernel holds and can be queried through a kernel user library API. The loader applies the following rules:

Rule 1. When creating a process from a program, the loader assigns the same set of capabilities as its program's.

Rule 2. When loading a library within an executable, the library capability set must be *greater than or equal to* the capability set of the loading executable. If not true, the library is not loaded into the executable.

Rule 3. An executable can load a library with higher capabilities, but does not gain capabilities by doing so.

Rule 4. The loader refuses to load any executable not in the data caged part of the file system reserved to the TCB.

It has to be noted that:

- Libraries' capabilities are checked at load time only. Beyond that, all code contained in libraries is run freely and is assigned the same capability set as the program it runs into when initiating some IPC calls.
- For ROM images with execution in place, the ROM build tool resolves all symbols doing the same task as the loader at runtime. Therefore the ROM build tool must enforce the same rules as the loader when building a ROM image.

These rules

- Prevent malware from being loaded in sensitive processes, for example, a plug-in in a system server
- Encourage encapsulation of sensitive code inside processes with no possible bypass

The examples below show how these rules are applied in the cases of statically and dynamically loaded libraries respectively.

2.3.1 Examples for linked DLLs

The program P.EXE is linked to the library L1.DLL.

The library L1.DLL is linked to the library L0.DLL.

Case 1:

P.EXE holds Cap1 & Cap2

L1.DLL holds Cap1 & Cap2 & Cap3

L0.DLL holds Cap1 & Cap2.

Process P cannot be created, the loader fails it because L1.DLL cannot load L0.DLL. Since L0.DLL does not have a capability set greater than or equal to L1.DLL, Rule 2 applies.

Case 2:

P.EXE holds Cap1 & Cap2

L1.DLL holds Cap1 & Cap2 & Cap3

L0.DLL holds Cap1 & Cap2 & Cap3 & Cap4

Process P is created, the loader succeeds it and the new process is assigned Cap1 & Cap2. The capability of the new process is determined by applying Rule 1; L1.DLL cannot acquire the Cap4 capability held by L0.DLL, and P1.EXE cannot acquire the Cap3 capability held by L1.DLL as defined by Rule 3.

2.3.2 Examples for dynamically loaded DLLs

The program P.EXE dynamically loads the library L1.DLL.

The library L1.DLL then dynamically loads the library L0.DLL.

Case 1:

P.EXE holds Cap1 & Cap2

L1.DLL holds Cap1 & Cap2 & Cap3

L0.DLL holds Cap1 & Cap2

Process P is successfully created and assigned Cap1 & Cap2.

When P requests the loader to load L1.DLL & L0.DLL, the loader succeeds it because P can load L1.DLL and L0.DLL. Rule 2 does apply here the loading executable being the process P not the library L1.DLL: the IPC load request that the loader processes is sent by the process P. The fact that the call is within L1.DLL is here irrelevant. Rule 1 & 3 apply as before and P does not acquire Cap3 by loading L1.DLL

Case 2:

P.EXE holds Cap1 & Cap2

L1.DLL holds Cap1&Cap2&Cap3

L0.DLL holds Cap1&Cap2&Cap4

Process P is successfully created and assigned Cap1 & Cap2. When P requests the loader to load L1.DLL & L0.DLL, the loader succeeds it because P can load L1.DLL and L0.DLL. Once again, Rule 2 does apply with P as the loading executable rather than L1.DLL, while Rule 3 ensures P acquires neither Cap3 nor Cap4.

2.4 Protecting system servers names

To prevent impersonation of critical servers, a specific system capability ProtServ has been created. When a process is granted this capability, it can register as a 'Protected Server' to the kernel under a specific name format, for instance starting by '!'. The kernel will reject any name registration starting by '!' if the calling process does not have ProtServ. However all servers from the protected server community must be trusted not to impersonate another server of this community. It is believed this simple mechanism will achieve a good enough level of security providing that ProtServ is granted only to a small set of services. If two server domains were proven not to be enough, nothing would prevent in the future adding a new domain linked to a new capability and name format.

2.5 Firewall-ing Symbian OS system servers

2.5.1 Capability Permission lifetime

With a kernel-mediated process capability model in place, specific policy decisions are delegated to the servers themselves. Each server would have to police itself and would do so differently - some would be more paranoid than others and may decide to check client capability settings per access or may refuse to allow access at all without the requisite capability bit set. Devolving security policy to a local decision at servers represents good abstraction as it means that security policy can be interpreted locally as desired. In addition,

interpretation of the presence of the capability bit could be done in one of four ways, namely blanket permission, process permission, session permission and selective access permission.

From a user point of view, it has become more and more difficult to identify the lifetime of a process or a session. For instance, in most smart phones, when the user accesses her Agenda, she does not know if a new Agenda process has been created or if an existing one is being re-used. In the same way, she does not have any idea, when making a telephone call, if the telephone application has created a new session to the phone server or re-use the previous one. It is our belief that users can understand only two ways of granting capabilities: the blanket and the selective access permission.

In line with this, there would be two possible alternatives for interpretation of the presence of a user-exposed capability bit at capability-aware servers:

Blanket permission: Capability is granted as a one off act. If the capability is not present when the process is created, the request fails. All access requiring system capability will be policed this way.

Single action permission: Capability is checked upon each sensitive API call to the server. This means that on each access to the sensitive API call, a dialog box created by the server asks the user if they wish to grant that capability. However the capability only lasts for the duration of the corresponding sensitive API call.

The user perception of this kind of permission must not be confused with when a server will check a required capability. For instance, an application may be granted PhoneNetwork as blanket permission but the phone server will check PhoneNetwork capability at each relevant call made by this application as the kernel will send the client capability set at each IPC call anyway. But as the user will not be asked to make a decision (to grant or not to grant PhoneNetwork for this call), this security check is transparent to the user.

The advantages of this design are:

- To take immediately into account any modification of the process blanket set of permission
- To maintain the time of check as close to the time of use as possible (to avoid any TOCTOU(time of check - time of use flaws)
- To avoid the server storing capability-related information for a process.

3 Software Installer – Enhancing perimeter security

The software installer has to support the process capability model to determine what capabilities can genuinely be granted to a piece of code to be installed after manufacture time. There are many ways to do it and this invention does not mandate any. In the following sections, we explore different scenarios based on the existence of a Public Key Infrastructure to illustrate how someone may choose to do it and which issues should be considered.

The software installer may support three main scenarios:

- The [un]installation/revocation of trusted (signed) applications
- The [un]installation/revocation of untrusted (signed) applications
- The [un]installation/revocation of unsigned applications

The trust distinction here is a function of the presence of a root certificate in the signing chain that corresponds to one of the root certificates stored on the device. In the next subsections, we examine these alternatives from a user perspective.

3.1 Installation of trusted (signed) software

In this case, approved client applications would be checked by a recognised authority. Software would then be signed, along with a list of the capabilities it required, into installation packages. Capabilities that could be signed for would be system and user-exposed capabilities. The chain of certificates included with the software is terminated by a root CA known by the software installer, in which case the user can install the software safe

in the knowledge that the root CA vouches for it. At install time, the software would be installed on the device without any user feedback, though on some devices it would be possible to examine the details of the signing certificate. Note that any third party software that sought system capability would be forced to go via this route.

3.2 Installation of untrusted (signed) software

In this case, the third party software would not check out against any of the root certificates. The software is signed by an unknown root CA in which case the user would be presented with a warning but could just go ahead and install the software anyway after viewing the contents of the certificate. The software installer would throw up a user dialog at install time, which would offer the user the option of installing the application plus a list of the capabilities the application wished to request. Capabilities that could be granted via this route would be in the range of user-exposed capabilities. In other words, it would not be possible for users to grant system capability to signed software that did not check out against one of the root certificates on the device.

3.3 Installation of unsigned software

The scenario here would be similar to 3.2. Third parties would have to request capabilities with their installation package. Again, only user-exposed capabilities would be available via this route - it would not be possible for users to grant system capability to unsigned software.

Figure 2 illustrates a possible process of installation when it is wished to let the user make discretionary decisions about the policy to apply to either an unsigned application or a signed application the root-signing certificate of which didn't match against any of the device root certificates.

3.4 Control Panel for revoking capabilities

In case it is wished to let the user make discretionary security policy decisions after install time, a software installer control panel dialog would be required to provide access to the capability settings currently granted to various installed third party applications. The user would be able to view and optionally grant or revoke user-exposed capabilities for installed third party code. In addition, it would be possible to view a corresponding code signing certificate (if necessary). The following table illustrates what the control panel dialog might look like:

Installed	PhoneNetwork	ReadUserData	WriteUserData	LocalNetwork	Certificate
Good.exe	Not granted	Granted	Not granted	Granted	Checked OK – click to view root signing cert
Bad.exe	Not granted	Not granted	Not granted	Not granted	Unsigned

CLAIMS

1. A secure mobile wireless device for a single user in which native executable code to be installed on the device is assigned a set of capabilities which define the protected resource(s) on the device which it can access.

2. The device of Claim 1 in which a capability grants access to a specific API (or range of APIs), file or other operating system protected resource(s).

3. The device of Claim 1 in which the executable code contains the capabilities it has been granted at install time.

4. The device of Claim 3 in which the executable code is permanently stored in a location in memory of the device which is only accessible to the trusted computing base to preserve the integrity of the capabilities assigned to the executable code.

5. The device of Claim 4 in which the loader refuses to load executables not permanently stored in a location in memory of the device which is only accessible to the trusted computing base, to preserve the integrity of the system.

6. The device of Claim 1 in which there are system capabilities which are mandatory and control access to the operating system kernel, file system and system data.

7. The device of Claim 1 in which for each client-server communication within the device, the device kernel will pass the client capabilities to the server.

8. The device of Claim 1 in which, for each library to be loaded in an executable, the loader verifies that this library is assigned a superset of the capabilities granted to the requesting executable.

9. The device of Claim 1 in which the capability is selected from a list of capabilities which comprise root capabilities, system capabilities and user –exposed capabilities.

10. The device of Claim 9 in which the user – exposed capabilities allow the following functions:

(a) Can spend subscribers money by using the phone network

(b) Can read users private information

(c) Can modify users private information

(d) Can send information to a local network without spending subscribers money.

(e) Can know the device location.

11. A software application adapted to run on a secure mobile wireless device in which the application is assigned some capabilities which define the protected resource(s) on the device which it can access.

12. An operating system adapted to run on a secure mobile wireless device in which the operating system requires native executable code requiring access to sensitive resources to be assigned some capabilities which define the protected resource(s) which it can access.

Figure 1

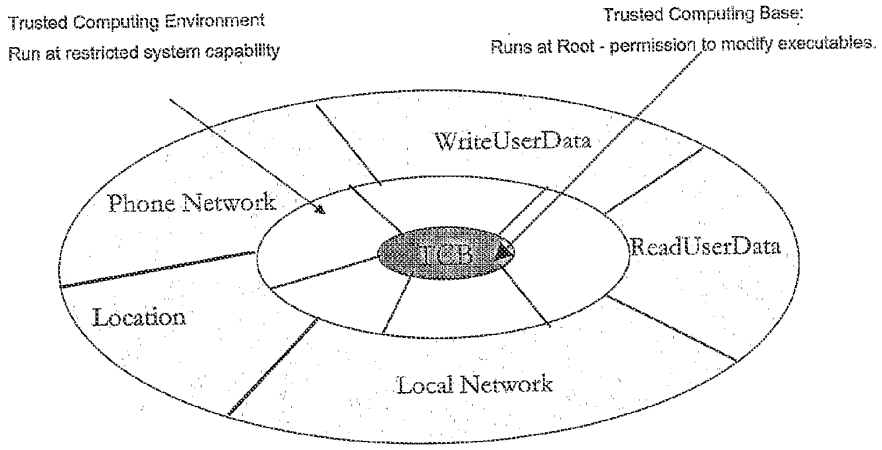
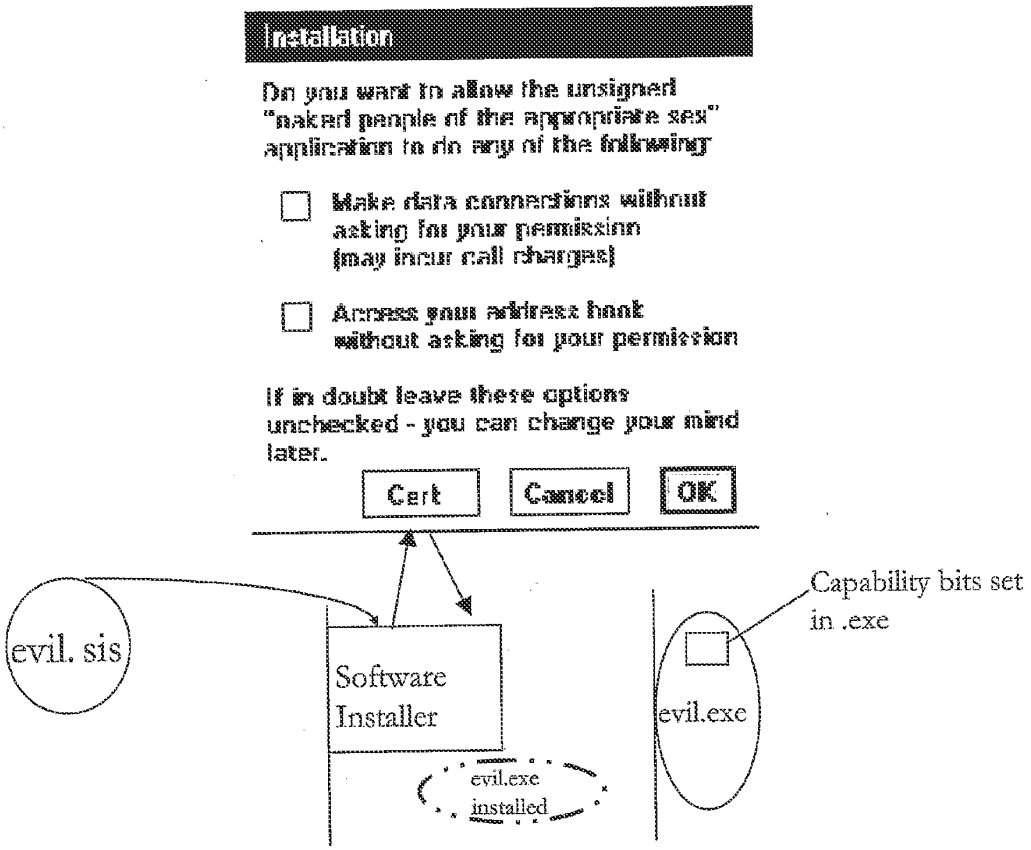

Trusted Computing Environment
Run at restricted system capability
Trusted Computing Base:
Runs at Root - permission to modify executables.
WriteUserData
Phone Network
TCB
ReadUserData
Location
Local Network

Figure 2


Installation
Do you want to allow the unsigned "naked people of the appropriate sex" application to do any of the following
Make data connections without asking for your permission (may incur call charges)
Access your address book without asking for your permission
If in doubt leave these options unchecked - you can change your mind later.
Cert
Cancel
OK
evil. sis
Software Installer
evil.exe installed
evil.exe
Capability bits set in .exe

Electronic Acknowledgement Receipt

EFS ID:	48692767
Application Number:	18088450
International Application Number:	
Confirmation Number:	4358
Title of Invention:	Communications Device with Secure Data Path Processing Agents
First Named Inventor/Applicant Name:	Gregory G. Raleigh
Customer Number:	106963
Filer:	Michael Farjami/Evan Gunderman
Filer Authorized By:	Michael Farjami
Attorney Docket Number:	RALEP038D1C1C1C1C1
Receipt Date:	06-OCT-2023
Filing Date:	23-DEC-2022
Time Stamp:	19:52:31
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Information Disclosure Statement (IDS) Form (SB08)	RALEP038D1C1C1C1C1_IDS_Oct_6_23.pdf	1567695 08473c80af1d3a757740d9c5e18fb20c1bf88976	no	7

Warnings:

Information:					
This is not an USPTO supplied IDS fillable form					
2	Foreign Reference	WO03100581.pdf	20143440 7679867c2c747a4e30d4e3579790f4ec21716054	no	24
Warnings:					
Information:					
3	Non Patent Literature	Exhibit_1037_Banchs_Distributed_weighted_fair_queuing_in_80211_wireless_LAN.pdf	4668847 2e238e5bcf5590a0684e312caf6173e8ee13b4d5	no	7
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4	Non Patent Literature	Exhibit_1024_Buxton_Integrating-the_Periphery_and_Context_A_New_Model-of-Telematics.pdf	9678282 9d7265ef9a280fbbf82c09ce55e89896d315939e	no	8
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Information:					
5	Non Patent Literature	Exhibit_1017_Carter_Contact_networking_a_localized_mobility_system_Part_1_of_2.pdf	6324877 b5d172333cb3b2c7b463265ea5b174ca7c7c2430	no	9
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10	Non Patent Literature	Exhibit_1030_Extensible_Markup-Language-XML_11-Second_Edition.pdf	3960003 9085e2c821ac54471e9700a3bbe052b06d51f1c4	no	41
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11	Non Patent Literature	Exhibit_1020_Flanagan_Java_in_a_Nutshell.pdf	705129 5bdcb20b1f32f9a00409966457ea226de02fff7e	no	4
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12	Non Patent Literature	Exhibit_1025_Hinckley_Foreground_and_background_interaction_with_sensor-enhanced_mobile-devices.pdf	1735896 92ec95753d30a5324281991efe10f4e7cce4ce37	no	22
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13	Non Patent Literature	Exhibit_1025_IETF_RFC_2475.pdf	1136006 6f1b281ade28f21544b2fccef55dddb63ac11fc0	no	36
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14	Non Patent Literature	Exhibit_1036_IETF_RFC_2748.pdf	1586094 c259bedb55172adfb911ae08e047c3827c6082c2	no	38
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15	Non Patent Literature	Exhibit_1023_IETF_RFC_3198.pdf	999731 38a53520c3938157fd343a64edd9ddd4201ba463	no	19
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16	Non Patent Literature	Exhibit_1031_IETF_RFC_4745.pdf	1099392 cb50a99428b44600a1d090253efbbe1188df4c01	no	32
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17	Non Patent Literature	Exhibit_1021_IETF_RFC_791.pdf	1487406 39f3d38959baa2525e757ce01030479d9cbf28d2	no	45
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18	Non Patent Literature	Exhibit_1029_Model-View-Controller.pdf	790377 3cfbe998dc78746e430c8966abba116482be6a81	no	9
Warnings:					
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19	Non Patent Literature	Exhibit_1032_Samsung_Stipulation_letter_regarding_IPR_grounds_in_District_court_litigation.pdf	1041906 3822b017513b8aa19b37dc4dc2429605ab24d19d	no	4
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20	Non Patent Literature	Exhibit_1016_Samsung_Stipulation_letter_regarding_IPR_grounds_in_District_court_litigation.pdf	1067083 792f6a39472041888c4f5b3e7228f03f1134c65e	no	4
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21	Non Patent Literature	Exhibit_1034_Shuler_How_Does_the_Internet_Work.pdf	912080 5ae370ec7471b5b7c2179e8f51dfb41128fa23e5	no	13
Warnings:					
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23	Non Patent Literature	Exhibit_1013_Tanenbaum_Excepts_Computer_Networks.pdf	15171077 9bd091b9554301a36d508b58637d79ca831cfb2c	no	8
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24	Non Patent Literature	Exhibit_1011_TCP_IP_Illustrated_Volume_1.pdf	7755776 0b1112b662aa55e79cdc384ca9d03230a87451f7	no	5
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Warnings:					
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26	Non Patent Literature	Exhibit_1032_Want_When_Cell_Phones_Become_Computers.pdf	4637500 4365fb109e7e559e3550a3062211c41d913496da	no	4
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27	Non Patent Literature	Exhibit_1022_Welsh_Memory_management_for_user-level_network_interfaces.pdf	927970 db8a862eec76e35aef5cf7c490030a88cf4b6b89	no	10
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	Application Number	18088450
	Filing Date	2022-12-23
	First Named Inventor	RALEIGH, GREGORY
	Art Unit	N/A
	Examiner Name	NOT YET ASSIGNED
	Attorney Docket Number	RALEP038D1C1C1C1C1

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	2	5987611	A	1999-11-16	Freund	
	3	6947723	B1	2005-09-20	Gurnani et al.	
	4	7924730	B1	2011-04-12	McAllister et al.	
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	2	20060039354	A1	2006-02-23	Rao et al.	
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	1	1484871	EP	A1	2004-12-08	Kelz et al.		☐

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	1	IPR2023-01157: Petition for Inter Partes Review of United States Patent No. 11,405,224, filed July 20, 2023.	☐
	2	IPR2023-01226: Petition for Inter Partes Review of United States Patent No. 10,237,773, filed July 21, 2023.	☐
	3	Complaint filed in Headwater Research LLC v. Samsung Electronics Co., Ltd., Samsung Electronics America, Inc., dated October 26, 2022, Case No. 2:22-cv-00422, E.D. Texas.	☐
	4	First Amended Complaint filed in Headwater Research LLC v. Samsung Electronics Co., Ltd., Samsung Electronics America, Inc., dated November 30, 2022, Case No. 2:22-cv-00422, E.D. Texas.	☐
	5	Complaint filed in Headwater Research LLC v. Samsung Electronics Co., Ltd. et al., dated December 6, 2022, Case No. 2:22-cv-00467, E.D. Texas.	☐
	6	File History of U.S. Patent No. 9,277,445 (Raleigh et al.), issued March 1, 2016	☐
	7	File History of IPR2023-01157, filed July 20, 2023.	☐
	8	File History of IPR2023-01226, filed July 21, 2023.	☐
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(54) **Apparatus, method and software program product for quality of service management in a mobile device**

(57) A controller module (19) for coordinating data flow in a mobile device is described. The mobile device comprises at least one application (mail (25), games (26), video (27), Push2Talk (28), JVM, Instant Messaging (IM) and MMS) adapted for exchanging data with at least one protocol stack (2,3); said protocol stacks being adapted for transferring data between at least one of said applications and a wireless connection. The controller module is adapted for receiving information about the respective QoS requirements of at least one of said applications, and at least one of actual parameters and predicted parameters within the mobile device that indicate at least one of an actual state and a future state of said data flow. The controller module is adapted for deriving, from said inputs, control settings for the mobile device in a way that said QoS requirements are fulfilled as far as possible.

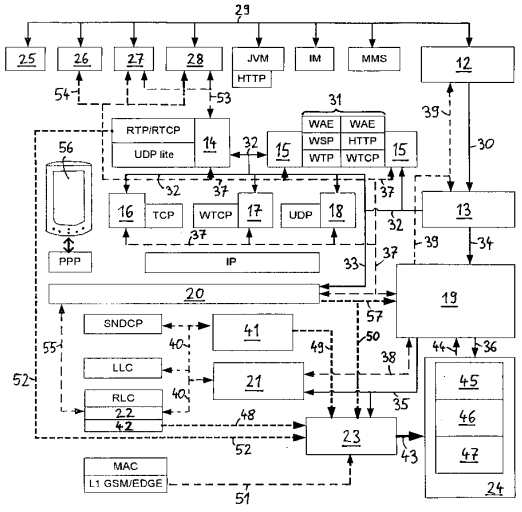


Fig. 2

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Description

BACKGROUND OF THE INVENTION

[0001] The present invention relates to a controller module for a mobile device, to a mobile device, and to a method for coordinating data flow in a mobile device.

[0002] Mobile devices, e.g. handsets or PDAs (Personal Digital Assistants), comprise a plurality of different applications that are supplied by different companies. Some of said applications include their own protocols, while others might e.g. use transport protocols such as UDP/IP or TCP/IP. Data is transferred from said transport protocol layers to the mobile device's transmission protocol stack, e.g. to a GPRS/GSM or a GPRS/EDGE stack, and then, said data is transmitted via a wireless connection. Data that has been received via the wireless connection is transferred from the transmission protocol stack to the respective transport protocol stack.

[0003] The transmission protocol stack receives data traffic from different kinds of applications and takes care of said data streams. The specific requirements of the different types of data traffic are not always considered.

SUMMARY OF THE INVENTION

[0004] It is an object of the invention to improve the data flow within a mobile device. The object of the invention is solved by the independent claims. Preferred embodiments are shown by the dependent claims.

[0005] According to the present invention, a controller module for coordinating data flow in a mobile device is provided. The mobile device comprises at least one application that is adapted for exchanging data with at least one protocol stack, whereby said protocol stacks are adapted for transferring data between at least one of said applications and a wireless connection. The controller module is adapted for receiving information about the respective quality-of-service (QoS) requirements of at least one of said applications, and at least one of actual parameters and predicted parameters within the mobile device that indicate at least one of an actual state and a future state of said data flow. The controller module is adapted for deriving, from said inputs, control settings for the mobile device in a way that said quality-of service requirements are fulfilled as far as possible.

[0006] The controller module according to embodiments of the present invention provides a link between the applications that are implemented on the mobile device and the protocol stacks, whereby said protocol stacks might e.g. comprise transport protocol stacks such as UDP/IP or TCP/IP as well as transmission protocol stacks, e.g. of the GPRS type. The controller module is informed about the needs of the applications, in particular about the quality-of-service requirements of said applications, because the quality-of-service requirements imposed by a Video data stream differ considerably from those of a background application such as e.g. mail. Besides that, the controller module is informed about the state of the data flow in the system. The controller module might e.g. receive parameters indicating the workload of the various protocol stacks, like e.g. the fill levels of buffers. The controller module might e.g. also be informed about the signal strength and the available bandwidth of the wireless connection. Alternatively or additionally, the controller module might receive predicted data indicating a future state of the system's data flow. Said predicted data might e.g. comprise information related to the timing of cell reselections.

[0007] Based on this input data, the controller module can calculate optimum setting parameters for the system. Said setting parameters might e.g. comprise setting parameters for the transport protocol stacks, for the transmission protocol stack, for the applications, for the radio resource management, etc. The controller module might e.g. select a transmission mode that is best suited for the respective traffic, it might prioritise the different data streams, postpone cell reselections, etc. The decisions of the controller module might be based on predefined rules, or on statistics, or on the validated results of a trial-and-error strategy, just to name a few examples. The controller module sets the system's arbitrary parameters in a way that the respective quality-of-service requirements of the different kinds of data traffic are fulfilled as far as possible.

[0008] The interplay between the applications, the various protocol stacks supplied by different companies and the wireless link is improved. As a result, the available resources in terms of bandwidth and transmission capacities can be exploited more efficiently. The total throughput might increase, and the properties of a respective data transmission will be better adapted to the requirements imposed by the type of the data stream that is transmitted. A smooth and efficient transmission is provided for all sorts of data traffic.

[0009] Preferably, said controller module receives said actual parameters from at least one of: the applications, the protocol stacks, the wireless connection. According to a preferred embodiment of the invention, said actual parameters comprise at least one of: workload of at least one of the protocol stacks, fill level of buffers, available bandwidth, signal strength on the wireless link. Further preferably, said control settings comprise control settings for at least one of: the protocol stacks, the applications and the wireless connection. The settings within the whole mobile device may be dynamically adapted to one another, and to the respective needs of the applications.

[0010] According to another preferred embodiment of the invention, said controller module is adapted for at least one of validating whether the derived control settings have been well-suited for fulfilling said quality-of-service requirements and whether the predicted parameters have been correct. The controller module might e.g. evaluate whether the previous control settings have improved the data flow within the mobile device. Be-

sides that, the controller module might e.g. draw up statistics in order to continuously improve the strategies for generating said control settings.

[0011] A mobile device according to the invention comprises at least one application adapted for exchanging data with at least one protocol stack, and at least one protocol stack adapted for transferring data between at least one of said applications and a wireless connection. Furthermore, the mobile device comprises a controller module adapted for coordinating data flow in the mobile device. Said controller module is adapted for receiving information about the respective quality-of-service requirements of at least one of said applications, and at least one of actual parameters and predicted parameters within the mobile device that indicate at least one of an actual state and a future state of said data flow. The controller module is adapted for deriving, from said inputs, control settings for the mobile device in a way that said quality-of-service requirements are fulfilled substantially in the best possible way.

[0012] Preferably, said protocol stacks comprise at least one transport protocol stack adapted for transferring data between at least one of said applications and a transmission control stack, and the transmission protocol stack, which is adapted for transferring data between at least one of said transport protocol stacks and the wireless connection. Usually, the various protocol stacks within the system are developed according to different standards that have been specified by different standard bodies. Furthermore, the transport protocol stacks (like e.g. UDP/IP or TCP/IP) and the transmission protocol stack (as e.g. a GPRS stack) are often supplied by different companies. Therefore, these protocol stacks are not very well adjusted to each other. To some extent, it is possible to adapt the respective protocol stacks to the needs of the user, though. The protocol stacks might comprise arbitrary parameters that can be defined by the user. By adjusting these settings, it is possible to improve the interaction between the transport protocol stacks and the transmission protocol stack, whereby the interactions induced by the controller module are not limited by the commonly used layered approach. The control exerted by the controller module might cover layers from the applications down to the physical layer.

[0013] Preferably, the transport protocols comprise at least one of the protocols WAP, TCP, WTCP, UDP, UDP lite, RTP/RTCP. According to a preferred embodiment of the invention, said transmission protocol stack is a stack for at least one of: GPRS/GSM, GPRS/EDGE, CDMA, UMTS, wireless LAN, Bluetooth. Further preferably, the transmission protocol stack comprises at least one of a SNDCP, LLC, RLC, MAC, L1 layer.

[0014] Preferably, the mobile device comprises a collector module adapted for collecting at least one of said actual parameters within the mobile device that indicate the actual state of the data flow. This module is responsible for gathering parameters from all parts of the mobile device, e.g. from the protocol stacks, from the mobility/radio resource management, from the applications, etc. In case any system components are modified, the collector module will have to be adapted as well, but all the other modules of the quality-of-service management system (e.g. the controller module) don't have to be modified, because they receive data from the collector module.

[0015] Further preferably, the mobile device comprises a state predictor module adapted for deriving, from at least one of said actual parameters, predicted parameters within the mobile device that indicate a future state of the data flow. This provides an opportunity to look ahead and anticipate the future behaviour of the system. The data flow can be smoothly adapted to the future properties. In particular, it is useful to know in advance that a cell reselection will occur.

[0016] Preferably, said state predictor module provides predictions for at least one of round trip time, throughput, coding scheme, bit error rate, and cell reselections. For different kinds of data traffic, different kinds of predictions might be used. For example, for an application such as Video, predictions related to throughput might be considered more important than predictions that relate to the bit error rate, because for this kind of traffic, the bit error rate might not be considered as being important. The controller module might therefore consider the predictions in accordance with the respective type of data traffic.

[0017] According to a preferred embodiment of the invention, the mobile device comprises at least one protocol optimiser module adapted for accessing the parameters of corresponding transport protocol stacks, preferably in accordance with control settings provided by the controller module. The transport protocol stacks might offer a possibility for adapting their configurations to the quality-of-service requirements of applications that use the respective transport protocol. The corresponding protocol optimiser module will then optimise the configuration of the transport protocol stack. There might exist arbitrary parameters of the transport protocol stack that may be modified by the protocol optimisers in accordance with the respective needs. By doing this, it is possible to optimise overall data flow and throughput.

[0018] According to another preferred embodiment of the invention, the mobile device comprises a stack manager module adapted for accessing the settings of the transmission protocol stack, preferably in accordance with control settings provided by the controller module. Transmission protocol stacks provide a variety of features that can be adapted dynamically to the requirements of the kind of data stream that is actually transmitted, in particular to the requirements related to reliability, priority, delay and required bandwidth of the data traffic. For example, the transmission protocol stack might e.g. provide different options concerning the transmission mode. For a real-time application, an unacknowledged mode might be more suitable than an ac-

knowledged mode. Besides that, the transmission protocol stack might e.g. comprise buffers that can be used for optimising the data flow. Though a transmission protocol stack of the GPRS type is used in most mobile devices today, the present application also relates to future transmission protocol stacks. Future transmission protocol stacks will most likely also comprise possibilities for adjusting the transmission properties to the quality-of-service requirements.

[0019] Preferably, said stack manager module is adapted for at least one of: modifying the timing of a cell reselection, interacting with the RLC layer of the transmission protocol stack, indicating to the transmission protocol stack that a certain quality-of-service class is required, managing PDP contexts of the transmission protocol stack in accordance with quality-of-service requirements, setting or modifying GGSN filter rules.

[0020] According to a preferred embodiment of the invention, the mobile device might comprise a quality-of-service packet processor module adapted for at least one of monitoring and modifying the data flow between said at least one transport protocol stack and the transmission protocol stack. The quality-of-service packet processor module keeps track of the different kinds of data traffic that are forwarded to the transmission protocol stack. The information obtained by monitoring the data traffic might be used for drawing up statistics, and said statistics might be helpful for determining future system settings. Besides that, the quality-of-service packet processor module might be used for actively controlling and modifying the data flow. Instead of passing all the data packets to the transmission protocol stack, the quality-of-service packet processor module might delete or buffer some of the data packets. Additionally, the quality-of-service packet processor module might e. g. fragment arriving data packets.

[0021] Preferably, said quality-of-service packet processor module is adapted for buffering data packets in order to optimise the data flow. For example, it might be advantageous to buffer data packets of a background application during the transmission of a real-time data stream. Thus, the requirements of different kinds of data traffic, and in particular the requirements of real-time traffic can be fulfilled while data packets of other applications do not necessarily get lost.

[0022] According to another preferred embodiment of the invention, the mobile device comprises a RLC manager module adapted for accessing the RLC layer. Usually, the RLC layer of a GPRS transmission stack comprises a RLC buffer adapted for buffering data packets. The fill level of said RLC buffer is an important parameter that can be used for optimising data traffic within the transmission protocol stack.

[0023] Preferably, said RLC manager module establishes a feedback channel to the quality-of-service packet processor module in order to provide the quality-of-service packet processor module with information about the RLC layer. Based on this information, the quality-of-service packet processor module can decide whether further data packets are forwarded to the transmission protocol stack, or whether said data packets have to be buffered, or even deleted. By means of said feedback channel, a kind of closed-loop control circuit for controlling the data flow is established. Congestion of the transmission protocol stack is avoided.

[0024] Preferably, the mobile device comprises an application manager module adapted for collecting information about the applications and their respective quality-of-service requirements. Said application manager module is responsible for collecting data from said applications. In case the set of applications is modified, the application manager module might have to be modified as well, but the other modules do not necessarily have to be changed.

[0025] Further preferably, the mobile device comprises a protocol manager module adapted for initialising said protocol optimisers in accordance with at least one of: the required transport protocols and the quality-of-service requirements of the applications. The protocol manager module is informed about the applications and their data traffic. In case the transmission of a new kind of data traffic is started, the protocol manager module might reinitialise the corresponding protocol optimisers.

[0026] The modules according to embodiments of the present invention can be partly or entirely embodied or supported by suitable software, which can be stored on or otherwise provided by any kind of data carrier, and which might be executed in or by any suitable data processing unit.

BRIEF DESCRIPTION OF THE DRAWINGS

[0027] Other objects and many of the attendant advantages of the present invention will be readily appreciated and become better understood by reference to the following detailed description when considering in connection with the accompanied drawings.

Fig. 1 shows the set-up of a mobile device; and

Fig. 2 depicts the set-up of a mobile device comprising a QoS management system.

DETAILED DESCRIPTION OF EMBODIMENTS OF THE INVENTION

[0028] Fig. 1 gives an overview of the data flow in a mobile device. The mobile device comprises a plurality of applications 1 that exchange data packets of different transport protocols 2 with a transmission protocol stack 3. The applications 1 might comprise applications such as mail 4, games 5, Video 6, Push2talk 7, JVM (Java Virtual Machine), IM (Instant Messaging), MMS (Multimedia Messaging Service). Applications like mail 4 or JVM generate data that has to be transmitted securely. For this kind of data, transport protocols like e.g. TCP/

IP (Transmission Control Protocol/Internet Protocol) and WTCP/IP (Wireless TCP) are well-suited. Other applications like e.g. Video 6 or Push2talk 7 generate real-time data streams according to the standards RTP (Real-Time Transport Protocol) and RTCP (Real-Time Transport Control Protocol). Games 5 might generate real-time data streams. Usually, the protocol UDP/IP (User Datagram Protocol/Internet Protocol) is employed for the transport of real-time data streams, because UDP/IP allows for a fast transmission ("Fire and Forget") that is not impaired by security features and error handling. For the transport of data that is provided by applications such as JVM, IM or MMS, the transport protocol WAP (Wireless Application Protocol) 8 is used. As can be seen from Fig. 1, the protocol WAP 8 represents a plurality of different protocols.

[0029] Data packets that have been generated by an application are provided to the transmission protocol stack 3, in order to transmit said data via a wireless connection. Data that has been received via the wireless link is routed to a corresponding transport protocol stack. In addition to the IP-based transport protocols, also the point-to-point protocol (PPP) might be utilized, e.g. for exchanging date with a PDA (Personal Digital Assistant) 9 that is connected to the mobile device.

[0030] The transmission protocol stack 3 might e.g. be a GPRS/GSM stack or a GPRS/EDGE stack. In the future, other transmission protocol stacks that relate to future transmission protocols might be employed.

[0031] In the lower part of Fig. 1, layers of a transmission protocol stack of the GPRS type are shown. The uppermost layer of said stack is the SNDCP (Sub-Network Dependent Convergence Protocol). The subsequent layer, the LLC (Logical Link Control) is responsible for segmenting IP-packets into data blocks that are forwarded to the RLC (Radio Link Control). The RLC comprises a RLC buffer 10 adapted for storing said data blocks until they are transmitted. For the transmission of the data packets via the wireless link, either an acknowledged mode or an unacknowledged mode may be used. The data packets are provided to the MAC (Medium Access Control) and to the physical layer L1, which is the lowest layer of the GPRS/GSM/EDGE stack. The physical layer L1 provides data to and receives data from a modulation unit. The physical layer L1 is connected with the Radio Resource Management 11. The Radio Resource Management 11 is responsible for monitoring and adjusting the available bandwidth of the wireless connection.

[0032] In Fig. 2, the structure of a QoS management system according to embodiments of the present invention is shown. The QoS management system is a collection of different modules and has to be seen as a basis for further architectural designs. Due to the modular approach, it can be adapted easily to different needs of various systems and/or customers. The QoS management system might e.g. fulfill the tasks of optimising the data flow within the mobile device in accordance with the QoS (Quality of Service) requirements of the applications, and in accordance with the behavior of the network and the air link, whereby dynamic methods and predictive flow control (PFC) are utilized. The QoS management system controls and coordinates the QoS related settings within the mobile device.

[0033] The QoS management system shown in Fig. 2 comprises an application manager 12, a protocol manager 13, a set of protocol optimisers 14-18, a main controller 19, a QoS packet processor 20, a stack manager 21, a RLC manager 22, a collector 23 and a state predictor 24. It has to be pointed out that a QoS management system according to an embodiment of the present invention doesn't have to comprise every single one of said modules. A QoS management system according to an embodiment of the present invention might as well comprise a subset of the above-mentioned modules. In the following, the functionality and the interplay of said modules will be described in more detail.

[0034] The application manager 12 keeps track of the various applications that are implemented on the mobile device, and of the QoS requirements of said applications. In the example of Fig. 2, the mobile device comprises the applications mail 25, games 26, Video 27, Push2talk 28, JVM, IM, and MMS. It has to be pointed out that besides the above-mentioned applications, the mobile device might comprise further applications that are not aware of the application manager 12.

[0035] During the QoS assignment 29, the application manager 12 is informed about the respective QoS requirements of the various applications. The protocol manager 13, which is initialised (30) by the application manager 12, is also informed about the applications and their QoS requirements. In case the system set-up is changed, a re-initialisation of the application manager 12 might either be induced by the applications or by the main controller 19.

[0036] QoS classes are assigned to the various applications in order to differentiate the traffic in accordance with the needs of said applications. This differentiation might be based upon the required reliability, priority, delay and the required bandwidth. In general, the respective QoS requirements are specified in terms of four basic QoS classes that have been defined by 3GPP (3rd Generation Partnership Project), though other classifications might be used as well.

Conversational class

[0037] Traffic of the conversational class is very delay sensitive, and transfer delay and time variance between packets must stay below a certain value so that the human perception will accept the quality of the link. For traffic of the conversational class, it is most important that data is delivered in time. The bit error rate (BER) of the data traffic is not that critical. Examples for traffic of the conversational class comprise IP telephony and video telephony. In the example of Fig. 2, data traffic of the

application Video 27 belongs to the conversational class.

Streaming class

[0038] Traffic of the streaming class comprises one way real-time traffic. For traffic of the streaming class, a low transfer delay is not necessarily required, but the delay variation of the real-time data stream should be limited. In Fig. 2, data traffic of the application Push2talk 28 belongs to the streaming class.

Interactive class

[0039] Traffic of this class might for example emerge from an application where a user exchanges data interactively with an opposite party, which might either be another user or a computer system. The response to a request is generally expected within a certain time limit. Although the transfer delay may be higher than in case of traffic of the conversational class, the round trip time (RTT) is a key parameter. Traffic of the interactive class should show a low BER. Examples for this kind of traffic comprise web browsing or Telnet. In the example of Fig. 2, data traffic of the applications IM and JVM belongs to the interactive class.

Background class

[0040] For data traffic of the background class, low delay or a short delivery time is not an issue, but the bit error rate (BER) has to be low. Data traffic of this class is usually received by a computer. Email traffic is a typical example for this kind of traffic. Accordingly, data traffic of the application mail 25 in Fig. 2 belongs to the background class.

[0041] Each one of the basic QoS classes may be further split into subclasses. For example, within the interactive class, Telnet traffic might be found in a different QoS subclass than http traffic.

[0042] The applications for the mobile device may be provided by different third-party companies. Based on the same reference platform, a lot of different mobile terminals comprising different applications might be developed. If different handsets are built that are based on one reference design, the application manager 12 will usually be the only instance that will have to be adapted. All the other modules of the QoS management system will usually not have to be modified.

[0043] The protocol manager 13 is aware of the applications and of the QoS classes that have been assigned to said applications. Besides that, the protocol manager 13 has to be aware of the available set of protocol optimisers. The protocol optimisers 14-18 shown in Fig. 2 are respectively responsible for optimising the protocols RTP/RTCP/UDP lite, for optimising the set of WAP-protocols 31, and for optimising the protocols TCP, WTCP, and UDP. The protocol manager 13 initialises (32) the protocol optimisers 14-18. During the initialisation, the parameters of a protocol optimiser are set in accordance with the QoS class of the application that utilizes the respective protocol. After the protocol optimisers have been initialised, they adapt their corresponding protocols in accordance with the QoS class assignment and/or the properties of the link layer. The parameters of the corresponding transport protocol stacks are modified in a way that the overall data flow is optimised with respect to the applications' QoS requirements.

[0044] The protocol manager 13 is also responsible for initialising (33) the QoS packet processor 20. The QoS packet processor 20 is informed about the protocols and the protocol parameters (for example the ports) the applications are using. After the protocol manager 13 has performed the initialisations, it transfers (34) the control of the protocol optimisers 14-18 to the main controller 19. The control of the QoS packet processor 20 is also transferred to the main controller 19. Besides that, the protocol manager 13 is responsible for carrying out re-initialisations of the protocol optimisers and/or of the QoS packet processor. Said re-initialisations might be induced by the application manager 12 and/or by the main controller 19.

[0045] The main controller 19 is responsible for coordinating the overall data flow within the mobile device. For this purpose, the main controller 19 acquires data from all parts of the system. First of all, the main controller 19 initialises (35, 36) the stack manager 21, the collector 23 and the state predictor 24. After said units have been initialised, the main controller 19 receives, via the collector 23, measured data from all parts of the system, e.g. from the transmission protocol stack. Besides that, the main controller 19 receives predicted data indicating the future system state from the state predictor 24. Based on this information, the main controller 19 decides how the parameters within the system, in particular the QoS parameters, have to be set, whereby the QoS requirements of the various applications are considered. The main controller 19 controls (37) the protocol optimisers 14-18 and the QoS packet processor 20. The main controller 19 also controls (38) the stack manager 21. All these functional units are provided with the current set of optimised parameters. If the main controller 19 becomes aware of an event like a cell reselection, it will inform the protocol optimisers, the QoS packet processor and the stack manager about said event. Thus, the data traffic can be adapted to the new situation. If it becomes necessary, the main controller will induce (39) a re-initialisation of the application manager 12 and/or of the protocol manager 13.

[0046] In addition to line status control, feedback control and decision making, the main controller 19 is also responsible for validating the decisions that have been taken in the past. In particular, the main controller 19 has to prevent that different protocol optimisers work against each other. In case they do, a re-initialisation of

the protocol optimisers has to be initiated. Feedback channels from the protocol optimisers to the main controller 19 are used for collecting additional status information on the protocol optimisation procedures.

[0047] The Mobility/Radio Resource Management 41 is responsible for the mobility management, for authorization, and for establishing and terminating a wireless connection. The Mobility/Radio Resource Management 41 is also responsible for performing cell reselections, i.e. for switching from one base station to an adjacent base station.

[0048] The stack manager 21 is responsible for dynamically adapting (40) the GPRS GSM/EDGE stack shown in Fig. 2. There exist a variety of possibilities how the stack manager 21 can do that: It might for example influence the Mobility/Radio Resource Management 41 in a way that a cell reselection is either initiated or delayed. Furthermore, it might reset the RLC buffer 42 and/or delete selected PDUs (Packet Data Units) in the RLC buffer 42. It might as well exert a TBF (Temporary Block Flow) control by using at least one of the RLC manager 22 and the Mobility/Radio Resource Management 41. Besides that, the stack manager 21 might define and administrate different PDP contexts for different service classes. In this respect, it might make use of the predefined GPRS QoS classes by signalling to the GPRS stack that a certain QoS class shall be selected, either for one or for all the PDP contexts. Furthermore, the stack manager 21 might set the filter rules on the part of the GGSN (Gateway GPRS Serving Note) in accordance with the QoS requirements of the respective traffic. In addition, class marks and watermarks might be set in accordance with the QoS profile. Furthermore, by setting the RLC mode, the stack manager 21 might specify whether an acknowledged or an unacknowledged mode shall be used for the data transmission, and how the delivery of defective RLC blocks shall be handled.

[0049] The state predictor 24 is responsible for predicting the future behaviour of the system parameters or for predicting special events like for example cell reselections. The predictions are based on measurement or statistics from the GPRS stack or higher layer protocols that are received (43) from the collector 23. The state predictor 24 forwards (44) its predictions to the main controller 19. The state predictor 24 might comprise a multitude of different state predictor modules. For example, the state predictor 24 might comprise a state predictor module 45 adapted for predicting round trip time (RTT) and throughput. Furthermore, the state predictor 24 might comprise a state predictor module 46 adapted for predicting cell reselections. During a cell reselection, data transmission is interrupted for a period of time in the order of several seconds. For this reason, predicting cell reselections is an important task. Additionally, the state predictor 24 might comprise a state predictor module 47 adapted for predicting the coding scheme and the BER (Bit Error Rate), which is particularly relevant for GSM CS3 (Coding Scheme 3) and CS4 (Coding Scheme 4) and for EDGE. Additional state predictor modules for different networks or different network parameters may be added to the state predictor 24. In order to incorporate new strategies, the algorithms used by the state predictor modules may be updated dynamically, whereby the updating may either be controlled by the user or by a network component. The main rules for the optimisation can either be set by the user, by the operator, or by the network.

[0050] The collector 23 is responsible for collecting measured data from all parts of the system. For example, the collector 23 receives RLC buffer information 48 from the RLC layer, radio resource management information 49 from the Mobility/Radio Resource Management 41, status information 50 from the QoS packet processor 20, bit error rates 51 from the layer L1, as well as the used coding scheme, and feedback information 52 from the RTP/RTCP, UDP lite protocol stack. The collector 23 provides (43) the measured data to the state predictor 24. Besides that, the measured data is also provided to the main controller 19. If any one of the protocol stacks is modified, or if different versions of a protocol stack are used for different handsets, in most cases only the collector 23 will have to be modified.

[0051] The protocol optimisers 14-18 adapt the properties of their corresponding protocol stacks in accordance with the measured or predicted properties of the link layer, and in accordance with the desired QoS class of a corresponding application, whereby the respective settings for the protocol stacks are provided (37) by the main controller 19. Protocol optimisers may control third party protocol stacks (as e.g. the WAP stack) as well as protocol stacks developed by the applicant (as e.g. RTP/RTCP/UDP lite). For some of the applications, a direct control channel between the application and the corresponding protocol optimiser might be required. For example, the applications Video 27 and Push2talk 28 need a direct link 53 to the UDP lite protocol optimiser 14. In addition to the optimisation of transport protocols, an optimisation of built-in protocols (games) or modules (voice or video codec) might be desired for some of the applications. For this purpose, the application itself might request measurements and predictions from the application manager 12 that are delivered (54) by the main controller 19.

[0052] The RLC manager 22 is an entity provided by the applicant that is part of the QoS management system. The RLC manager 22 may set various parameters of the RLC, delete RLC blocks or reorder RLC blocks. In addition to the feedback channel from the RLC manager 22 to the stack manager 21, there exists a further feedback channel 55 from the RLC manager 22 to the QoS packet processor 20. By using this feedback channel 55, the QoS packet processor 20 may quickly access the RLC buffer status information in order to decide whether to hold back more packets or to deliver the next packets to the lower layers.

[0053] The QoS packet processor 20 provides for an

additional adaptation of the data flow within the system. It is especially useful if more than one application is running at the same time (for example mail 25 and a real-time application such as Video 27) and/or if a PDA 56 or a laptop uses the handset as a modem while applications are running. It has to be avoided that the packet flow of a real-time application is slowed down by the packets of a typical background application such as mail. In this example, if the mail packets slow down throughput of the video packets, the QoS packet processor 20 will start holding back the mail packets. In addition to that, the QoS packet processor 20 is able to monitor the packet flow. Packets from applications or protocols that are not aware of the QoS management system and that are therefore not optimised can be detected dynamically by means of protocol type port and service description in the header. Then, the packet flow of the respective application can be optimised.

[0054] The QoS packet processor 20 closely cooperates with the RLC manager 22. Based on the information obtained via the feedback channel 55, the QoS packet processor 20 decides whether to hold back the next packets or to send them to the lower layers. If the available bandwidth is not sufficient to transfer all the packets and some packets have minor importance, these packets may be dropped by the QoS packet processor 20. In this case, re-initialisation may be necessary. Information about the packet flow is sent (57) from the QoS packet processor 20 to the main controller 19. The main controller 19 draws up packet flow statistics that is used for validating the actual QoS parameters. The QoS packet processor 20 might also be prepared for additional packet manipulation and optimising techniques, e.g. with respect to data compression or header compression. For example, it might fragment large data packets that are e.g. issued by third party applications.

[0055] From the modules that have been described so far, the application manager 12, the protocol manager 13 and the collector 23 comprise external interfaces that are realized by means of APIs (Application Programmer Interfaces). These well-defined interfaces simplify the adaptation of the application manager 12, the protocol manager 13 and the collector 23 to new applications, protocol stacks and layers. All the other interfaces of the QoS management system's modules are realized as internal interfaces. In fact, the application manager 12, the protocol manager 13, and the collector 23 are the only modules that have to be adapted to the respective handset and to the software running on said handset.

[0056] In the following, several examples will be discussed in order to illustrate how the QoS management system works. As a first example, a mail/message application and a real-time application like Voice over IP or Video are considered that are running at the same time. First, the mail/message application indicates to the application manager 12 that it intends to send and receive messages. The QoS class "background", which has the lowest priority, is assigned to the mail/message application, which will use the protocol WTCP. The application manager 12 informs the protocol manager 13. The protocol manager 13 initialises the WTCP protocol optimiser 17 and the QoS packet processor 20 and passes the control to the main controller 19. The main controller 19 initialises the stack manager 21, the collector 23 and the state predictor 24. The state predictor module 46 adapted for predicting cell reselections is started. The collector 23 starts to collect messages from the Mobility/Radio Resource Management 41 and sends them (43) to the state predictor module 46. The stack manager 21 sets the right GPRS parameters and RLC parameters in order to build up a GPRS connection with suitable QoS settings. The mail/message application starts to send messages. Data packets that are queued in the QoS packet processor 20 are passed to the RLC buffer 42 in a way that the RLC buffer 42 contains an optimum amount of data.

[0057] Now, the real-time application (Video or Voice over IP) is started. It indicates to the application manager 12 that the highest QoS class "conversational", non-acknowledged mode is requested. It also indicates the required bandwidth. The real-time application uses the protocols RTP/RTCP and UDP lite. The application manager 12 informs the protocol manager 13. The protocol manager 13 initialises the RTP/RTCP/UDP lite protocol optimiser 14 and reinitialises the QoS packet processor 20. Then, the control is passed to the main controller 19. The main controller 19 re-initialises the stack manager 21, the collector 23 and the state predictor 24. The state predictor module 45 adapted for predicting roundtrip time (RTT) is started. The collector 23 starts to collect (48) RLC buffer status messages and forwards them to the main controller 19. The stack manager 21 sets the right GPRS parameters and RLC parameters. The main controller 19 starts to monitor the bandwidth. Both applications start to send data. The real-time packets are given to the lower layer directly without queuing. The WTCP packets are queued in the QoS packet processor 20. If the allocated bandwidth is more than required by the real-time application, the QoS packet processor 20 will forward these packets to the lower layers. Additionally, the data packets of the background class may be intermittently transmitted between the data packets of the real-time data stream.

[0058] As a second example, a real-time video application will be discussed that comprises two RTP streams, one for the voice, and one for the pictures. The initialisation is carried out as described above. From the user's point of view, the voice data stream is more important than the video data stream. The user can rather accept some missing pictures than missing or delayed voice data. For this reason, the QoS subclass of the voice RTP stream is higher than that of the video RTP stream. If the allocated bandwidth is not sufficient for transferring both streams, the RLC manager 22 will inform the QoS packet processor 20 via the feedback

channel 55. In this situation, the QoS packet processor 20 will drop as many RTP packets of the video stream as necessary to fit both streams into the allocated bandwidth. The packets of the voice RTP stream are not dropped, they are transferred as fast as possible.

[0059] As a third example, a re-initialisation of QoS settings is carried out for a real-time Voice over IP application. Again, the initialisation is done as described in connection with the first example. For the Voice over IP application, the best codec mode (highest quality, biggest data payload) is employed. The main controller 19 monitors the allocated bandwidth. If it can be seen that the allocated bandwidth is not sufficient for transferring the RTP packets in time, the main controller 19 will send a re-initialisation command to the application manager 12. The application manager 12 informs the VoIP application about the amount of allocated bandwidth. The VoIP application re-initialises and starts to use another codec mode (less quality, less data payload). The protocol manager 13 re-initialises the corresponding protocol optimisers and passes the control back to the main controller 19.

Claims

1. A controller module (19) for coordinating data flow in a mobile device that comprises at least one application (25-28, JVM, IM, MMS) adapted for exchanging data with at least one protocol stack (2, 3); said protocol stacks (2, 3) being adapted for transferring data between at least one of said applications and a wireless connection;
   characterized in that
   - said controller module (19) is adapted for receiving information about the respective quality-of-service requirements of at least one of said applications, and at least one of actual parameters and predicted parameters within the mobile device that indicate at least one of an actual state and a future state of said data flow; and
   - said controller module (19) is adapted for deriving, from said inputs, control settings for the mobile device in a way that said quality-of-service requirements are fulfilled as far as possible.

2. The controller module of claim 1, **characterized in that** said controller module (19) receives said actual parameters from at least one of: the applications, the protocol stacks (2, 3), the wireless connection.

3. The controller module of claim 1 or any one of the above claims, **characterized in that** said actual parameters comprise at least one of: workload of at least one of the protocol stacks, fill level of buffers, available bandwidth, signal strength on the wireless link.

4. The controller module of claim 1 or any one of the above claims, **characterized in that** said control settings comprise control settings for at least one of: the protocol stacks, the applications, and the wireless connection.

5. The controller module mobile device of claim 1 or any one of the above claims, **characterized in that** said protocol stacks comprise:
   - at least one transport protocol stack (2) adapted for transferring data between at least one of the applications and a transmission control stack (3);
   - the transmission protocol stack (3), which is adapted for transferring data between at least one of said transport protocol stacks (2) and the wireless connection.

6. The controller module mobile device of claim 1 or any one of the above claims, **characterized in that** said controller module (19) is adapted for at least one of validating whether the derived control settings have been well-suited for fulfilling said quality-of-service requirements and whether the predicted parameters have been correct.

7. A mobile device comprising
   - at least one application (25-28, JVM, IM, MMS) adapted for exchanging data with at least one protocol stack (2, 3);
   - at least one protocol stack (2, 3) adapted for transferring data between at least one of said applications and a wireless connection;

   characterized by
   - a controller module (19) adapted for coordinating data flow in the mobile device,
   - wherein said controller module (19) is adapted for receiving information about the respective quality-of-service requirements of at least one of said applications, and at least one of actual parameters and predicted parameters within the mobile device that indicate at least one of an actual state and a future state of said data flow; and
   - wherein said controller module (19) is adapted for deriving, from said inputs, control settings for the mobile device in a way that said quality-of-service requirements are fulfilled substantially in the best possible way.

8. The mobile device of claim 7 or any one of the above claims, **characterized in that** said controller mod-

ule (19) receives said actual parameters from at least one of: the applications, the protocol stacks, the wireless connection.

9. The mobile device of claim 7, **characterized in that** said actual parameters comprise at least one of: workload of at least one of the protocol stacks, fill level of buffers, available bandwidth, signal strength on the wireless link.

10. The mobile device of claim 7 or any one of the above claims, **characterized in that** said control settings comprise control settings for at least one of: the protocol stacks, the applications and the wireless connection.

11. The mobile device of claim 7 or any one of the above claims, **characterized in that** said protocol stacks comprise:

- at least one transport protocol stack (2) adapted for transferring data between at least one of the applications and a transmission control stack (3);
- the transmission protocol stack (3), which is adapted for transferring data between at least one of said transport protocol stacks (2) and the wireless connection.

12. The mobile device of claim 11, **characterized in that** the transport protocols comprise at least one of the protocols WAP, TCP, WTCP, UDP, UDP lite, RTP/ RTCP.

13. The mobile device of claim 11 or any one of the above claims, **characterized in that** said transmission protocol stack (3) is a stack for at least one of: GPRS/GSM, GPRS/EDGE, CDMA, UMTS, wireless LAN, Bluetooth.

14. The mobile device of claim 11 or any one of the above claims, **characterized in that** said transmission protocol stack (3) comprises at least one of a SNDCP, LLC, RLC, MAC, L1 layer.

15. The mobile device of claim 7 or any one of the above claims, **characterized by** a collector module (23) adapted for collecting at least one of said actual parameters within the mobile device that indicate the actual state of the data flow.

16. The mobile device of claim 7 or any one of the above claims, **characterized by** a state predictor module (24) adapted for deriving, from at least one of said actual parameters, predicted parameters within the mobile device that indicate a future state of the data flow.

17. The mobile device of claim 16, **characterized in that** said state predictor module (24) provides predictions for at least one of: round trip time, throughput, coding scheme, bit error rate, cell reselections.

18. The mobile device of claim 7 or any one of the above claims, **characterized by** at least one protocol optimiser module (14-18) adapted for accessing the settings of corresponding transport protocol stacks, preferably in accordance with control settings provided by the controller module (19).

19. The mobile device of claim 7 or any one of the above claims, **characterized by** a stack manager module (21) adapted for accessing the settings of the transmission protocol stack, preferably in accordance with control settings provided by the controller module (19).

20. The mobile device of claim 19, **characterized in that** said stack manager module (21) is adapted for at least one of:

- modifying the timing of a cell reselection;
- interacting with the RLC layer of the transmission protocol stack;
- indicating to the transmission protocol stack that a certain quality-of-service class is required;
- managing PDP contexts of the transmission protocol stack in accordance with quality-of-service requirements;
- setting or modifying GGSN filter rules.

21. The mobile device of claim 7 or any one of the above claims, **characterized by** a quality-of-service packet processor module (20) adapted for at least one of monitoring and modifying the data flow between said at least one transport protocol stack and the transmission protocol stack.

22. The mobile device of claim 21, **characterized in that** said quality-of-service packet processor module (20) is adapted for buffering data packets in order to optimise the data flow.

23. The mobile device of claim 7 or any one of the above claims, **characterized by** a RLC manager module (22) adapted for accessing the RLC layer.

24. The mobile device of claim 23, **characterized in that** said RLC manager module (22) establishes a feedback channel to the quality-of-service packet processor module (20) in order to provide the quality-of-service packet processor module (20) with information about the RLC layer.

25. The mobile device of claim 7 or any one of the above

claims, **characterized by** an application manager module (12) adapted for collecting information about the applications and their respective quality-of-service requirements.

26. The mobile device of claim 7 or any one of the above claims, **characterized by** a protocol manager module (13) adapted for initialising said protocol optimisers (14-18) in accordance with at least one of: the required transport protocols and the quality-of-service requirements of the applications.

27. A method for coordinating data flow in a mobile device, said mobile device comprising at least one application (25-28, JVM, IM, MMS) adapted for exchanging data with at least one protocol stack (2, 3); said protocol stacks (2, 3) being adapted for transferring data between at least one of said applications and a wireless connection; with said method comprising the following steps:

- collecting information about the respective quality-of-service requirements of at least one of said applications;
- collecting at least one of actual parameters and predicted parameters within the mobile device that indicate at least one of an actual state and a future state of said data flow;
- deriving, from the collected data, control settings for the mobile device in a way that said quality-of-service requirements are fulfilled as far as possible.

28. Computer program product, comprising computer program means adapted to embody the features of the controller module as defined in any one of claims 1 to 6 when said computer program product is executed on a mobile device, processing system, digital signal processor, or the like.

29. Computer program product, comprising computer program means adapted to perform the method steps as defined in claim 27 when said computer program product is executed on a mobile device, processing system, digital signal processor, or the like.

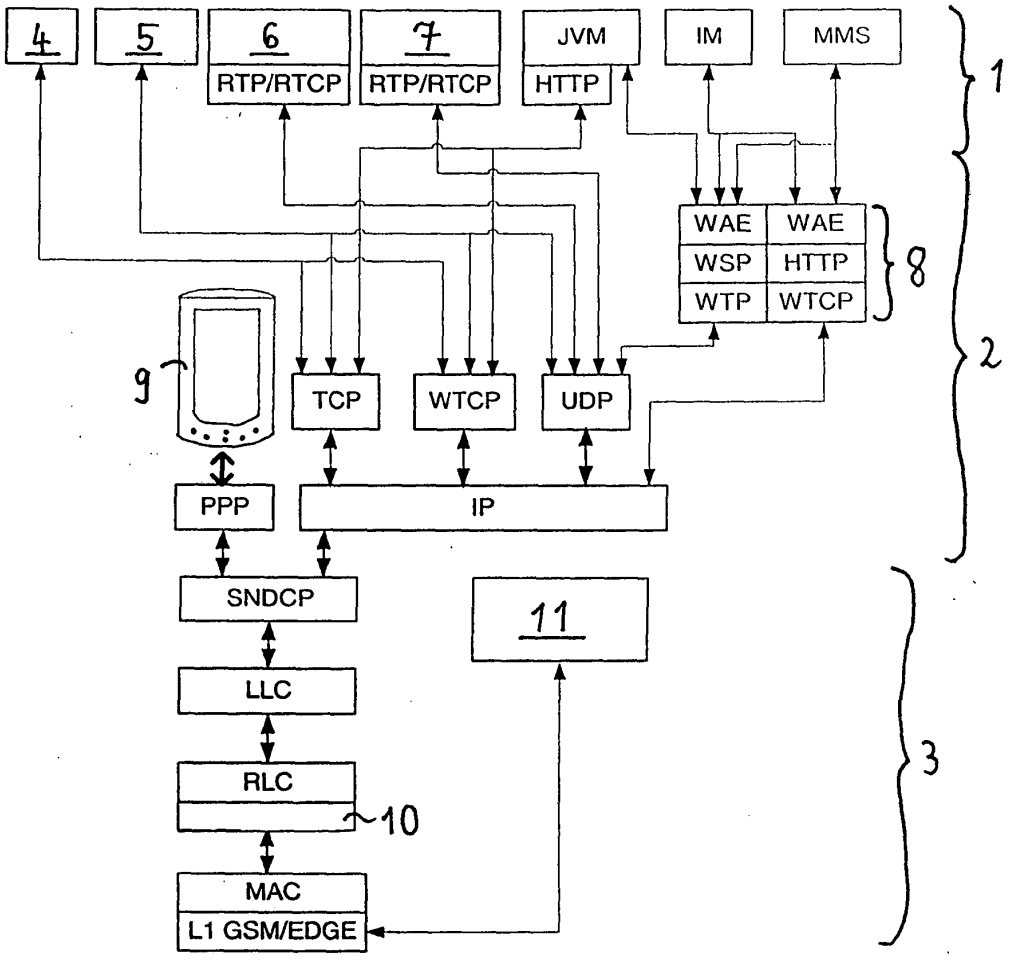

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RTP/RTCP
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PPP
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SNDCP
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RLC
10
MAC
L1 GSM/EDGE
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Fig. 1

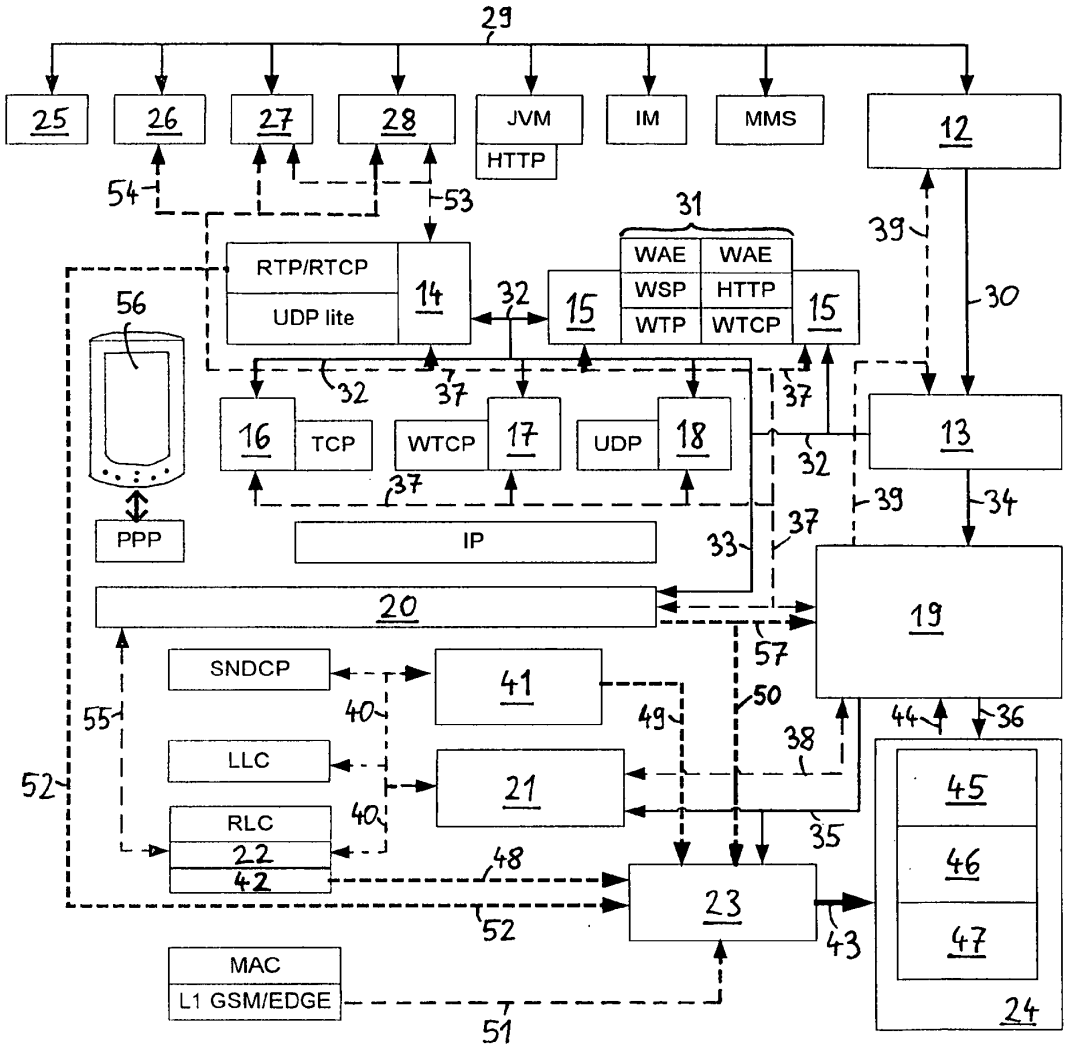

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MAC
L1 GSM/EDGE
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Fig. 2

European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 03 01 2613

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
X	WO 01 17291 A (NOKIA MOBILE PHONES LTD ;SUUMAEKI JAN (FI); KALLIOKULJU JUHA (FI)) 8 March 2001 (2001-03-08) * page 2, line 7 - page 23, line 11; figures 2A-3B; table 1 *	1-5, 7-12,14, 16-29	H04L12/56 H04Q7/32 H04L29/06
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X	WO 00 76230 A (NOKIA MOBILE PHONES LTD ;JOUPPI JARKKO (FI); RINNE JANNE (FI); TUR) 14 December 2000 (2000-12-14) * page 1, line 1 - page 11, line 29; figure 2 *	1-5, 7-12,14, 16-29	
Y	US 2001/055971 A1 (KIRKIRIS NECTAR A ET AL) 27 December 2001 (2001-12-27) * the whole document *	6,13,15	
A	US 2002/114305 A (OYAMA J, WIDEGREN I B, WILLIAMS B C) 22 August 2002 (2002-08-22) * page 1, paragraph 3. - page 4, paragraph 40.; figures 4-6,8,9,11 *	1-29	
			TECHNICAL FIELDS SEARCHED (Int.Cl.7)
A	EP 1 150 534 A (SAGEM) 31 October 2001 (2001-10-31) * column 1, line 1 - column 2, line 34; figure 2 *	1-29	H04L H04Q

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
MUNICH	7 October 2003	Günther, S

CATEGORY OF CITED DOCUMENTS

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07-10-2003

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

Electronic Acknowledgement Receipt

EFS ID:	48353227
Application Number:	18088450
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Confirmation Number:	4358
Title of Invention:	Communications Device with Secure Data Path Processing Agents
First Named Inventor/Applicant Name:	Gregory G. Raleigh
Customer Number:	106963
Filer:	Michael Farjami/Evan Gunderman
Filer Authorized By:	Michael Farjami
Attorney Docket Number:	RALEP038D1C1C1C1C1
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Application Type:	Utility under 35 USC 111(a)

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Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Information Disclosure Statement (IDS) Form (SB08)	RALEP038D1C1C1C1C1_IDS_July_26_23.pdf	989416 9eeac02c57794369030cfed98b2c762e5a4d1bf4	no	5

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3	Non Patent Literature	IPR2023-01157_Petition_for_Inter_Partes_Review.pdf	5708690 b5fc5c4e3c56487868f220daebad06dd20359c4c	no	101
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INFORMATION DISCLOSURE STATEMENT BY APPLICANT
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Application Number	18088450
Filing Date	2022-12-23
First Named Inventor	RALEIGH, GREGORY
Art Unit	OPAP
Examiner Name	NOT YET ASSIGNED
Attorney Docket Number	RALEP038D1C1C1C1C1

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	1	101437224	CN	A	2009-05-20	Yang et al.		
	2	2381711	EP	A1	2011-10-26	Yang et al.		

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	Filing Date	2022-12-23
	First Named Inventor	RALEIGH, GREGORY
	Art Unit	OPAP
	Examiner Name	NOT YET ASSIGNED
	Attorney Docket Number	RALEP038D1C1C1C1C1

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	Art Unit	OPAP
	Examiner Name	NOT YET ASSIGNED
	Attorney Docket Number	RALEP038D1C1C1C1C1

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That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).

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See attached certification statement.

The fee set forth in 37 CFR 1.17 (p) has been submitted herewith.

☒ A certification statement is not submitted herewith.

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A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

Signature	/Farshad Farjami/	Date (YYYY-MM-DD)	2023-07-07
Name/Print	Farshad Farjami	Registration Number	41014

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CN101437224A

Method for updating mobile terminal software and mobile terminal

Abstract

The invention discloses an updating method and a mobile terminal of mobile terminal software. The method comprises the following steps: the mobile terminal software and/or tool software for updating the mobile terminal software shake hands according to the enciphered hand-shaking data sent by the counterpart; and under the condition of successful hand-shaking, the mobile terminal software or tool software carries out verification for new mobile terminal software according to pre-enciphered characterization identifiers of the mobile terminal software and characterization identifiers of the new mobile terminal software, and determines whether to allow updating according to verification result. Through introducing two authentications of hand-shaking data and characterization identifiers, the method greatly eliminates possibility that the terminal is modified by software, avoids terminal unlock and machine-locking phenomena in relevant technology, overcomes the disadvantages of the prior unlocking and machine-locking technology, ensures terminal safety to the utmost extent, and effectively maintains benefit of an operator.

Technical field

The present invention relates to the communications field, and especially, relate to a kind of update method and portable terminal of mobile terminal software.

Background technology

At present, the development in global mobile communication market is very fast, and the competition between each operator is also very fierce.Especially in end product market, each operator releases a series of sales promotion policies one after another in order to attract the user, with terminal with the very big preferential user that sells, some operator even free terminal given to the user.

But for the consideration to interests own, operator can take a series of restrictions usually.Wherein, more common ways to restrain is exactly a control terminal, make terminal only can use under the network of its preferential operator, the card that perhaps must insert certain regulation just can make terminal be in spendable state, this class ways to restrain can be called lock net or pintle hook lock usually.

Although operator can limit the use of its terminal, but lock net or pintle hook lock terminal still can be changed by some modes by some lawless persons, make the terminal that is modified lose lock net or locking and blocking, removed the restriction of operator, and then can or can use terminal in other operators or other uses off the net by the card that inserts outside the regulation, even the interface of terminal can be modified to other languages and then in the use off the net of other languages operator, this obviously understands the grievous injury benefits of operators. Therefore, protection lock network and card terminal how prevents that it from being changed by software and become release terminal (that is, preventing release), prevent that the A languages of terminal from being changed to B languages (that is, preventing the cover machine) by software, and the protection benefits of operators just becomes an important topic.

At present, field of mobile terminals has proposed to prevent on a small quantity that mobile terminal device from illegally being changed the scheme of software, wherein a kind of is at the memory area that can only carry out one-time programming, write down international mobile equipment identification number (International Mobile Equipment Identity simultaneously, abbreviate IMEI as) etc. the value of necessary data and PAF-ROM storage, when software changes, these values are compared as the basic data that whether is improper change software, whether carried out illegally altering the procedure thereby judge.This mode has problems and is: must divide one in the terminal and can only carry out the memory block of one-time programming or add a programmable read only memory (Programmable Read Only Memory separately, abbreviate PROM as) chip, realization cost height, and the judgement of this mode focuses on the result who is changed, need just be continued to use after illegally being altered the procedure judging with further stoping by the change terminal, there is hysteresis quality, can not be changed by software from truly preventing terminal.
At present, do not propose as yet effectively to prevent the technical scheme that terminal is changed by software.

Summary of the invention

Consider can't prevent terminal in the correlation technique by software change problem and make the present invention, for this reason, main purpose of the present invention is to provide a kind of update method and portable terminal of mobile terminal software.
A kind of update method of mobile terminal software is provided according to an aspect of the present invention.
Update method according to mobile terminal software of the present invention comprises: mobile terminal software and/or the tool software that is used for mobile terminal software is upgraded are shaken hands according to the cryptographic handshake data that the other side sends; Under the case of successful of shaking hands, mobile terminal software or tool software are verified the new software of portable terminal according to the identifier of encrypted feature in advance and the new Characteristic of Software identifier of portable terminal of mobile terminal software, and are determined whether to allow to upgrade according to the checking result.
Wherein, above-mentioned shaking hands specifically can comprise following processing: the side in mobile terminal software and/or the tool software is decrypted the cryptographic handshake data from the opposing party, and judges whether the handshake data after the deciphering is identical with default handshake data; In judged result is under the situation that is, mobile terminal software is determined to shake hands successfully, otherwise the failure of shaking hands.
On the one hand, under the case of successful that determines whether to shake hands by mobile terminal software, the processing of shaking hands specifically comprises: mobile terminal software utilizes pre-defined algorithm that predefined parameter is calculated predetermined handshake data, and receives from the handshake data after the encryption of tool software; Mobile terminal software is to being decrypted from the handshake data after the encryption of tool software, and the handshake data after will deciphering and predetermined handshake data compare.
On the other hand, under the case of successful that determines whether to shake hands by mobile terminal software, the processing of shaking hands specifically comprises: mobile terminal software utilizes pre-defined algorithm that predefined parameter is calculated

predetermined handshake data, and receives the special parameter of being encrypted transmission by tool software as handshake data; Mobile terminal software obtains special parameter to being decrypted from the handshake data after the encryption of tool software, and according to pre-defined algorithm special parameter is calculated, and will the result of calculation and the predetermined handshake data of special parameter be compared.

In addition, the processing that the new software of portable terminal is verified of mobile terminal software or tool software specifically can comprise: mobile terminal software or tool software are decrypted the identifier of encrypted feature in advance of mobile terminal software; Mobile terminal software or tool software compare the characteristic identifier and the new Characteristic of Software identifier of portable terminal of the mobile terminal software of deciphering; Under the characteristic identifier of the mobile terminal software situation identical, determine that the new software of portable terminal is by checking with the new Characteristic of Software identifier of portable terminal; Under the characteristic identifier of mobile terminal software and the new Characteristic of Software identifier of portable terminal situation inequality, determine that the new software of portable terminal is by checking.

Wherein, the result determines whether that the processing that allows to upgrade specifically can comprise according to checking: under the situation of the new software of portable terminal by checking, tool software utilizes portable terminal latest software update mobile terminal software; Do not pass through under the situation of checking at the new software of portable terminal, stop to upgrade and handle.

Preferably, the new Characteristic of Software identifier of the characteristic identifier of mobile terminal software and portable terminal can comprise following one of at least: operator's sign, locking network and card sign, languages sign.

According to a further aspect in the invention, provide a kind of portable terminal.

Portable terminal according to the present invention comprises: the handshake data module, be used to generate handshake data, according to determining from the handshake data of tool software and the handshake data of generation whether mobile terminal software and tool software shake hands successfully, and will determine that the result returns to tool software; The characteristic identifier module is used to store the predetermined characteristic identifier through encrypting, and uses the characteristic identifier of storage that the new software of portable terminal that upgrades mobile terminal software is verified for mobile terminal software or tool software; Encrypting module is used for handshake data and unencrypted characteristic identifier that the handshake data module generates are encrypted; The communication command module, the handshake data that is used for encrypting through encrypting module is sent to tool software, and receives from the handshake data after the encryption of tool software.

Wherein, the handshake data module is used for and will compares from the handshake data of tool software and the handshake data of generation, under the situation identical with the handshake data of generation, determine to shake hands successfully the failure of under the situation inequality, determining to shake hands from the handshake data of the handshake data of tool software and generation from the handshake data of tool software.

Preferably, the new Characteristic of Software identifier of the characteristic identifier of mobile terminal software and portable terminal comprise following one of at least: operator's sign, locking network and card sign, languages sign.

By means of technique scheme of the present invention, by introducing the double probate of handshake data and characteristic identifier, greatly eliminated terminal by the possibility of software modification, terminal release that occurs in the correlation technique and the

phenomenon of overlapping machine have been avoided, overcome the existing deficiency that prevents on release and the cover machine technology, guarantee the fail safe of terminal to greatest extent, effectively safeguarded benefits of operators.

Description of drawings

Accompanying drawing described herein is used to provide further understanding of the present invention, constitutes the application's a part, and illustrative examples of the present invention and explanation thereof are used to explain the present invention, do not constitute improper qualification of the present invention.In the accompanying drawings:
Fig. 1 is the flow chart according to the update method of the mobile terminal software of the inventive method embodiment;
Fig. 2 is the flow chart according to the processing example of the update method of the mobile terminal software of the inventive method embodiment;
Fig. 3 is the portable terminal block diagram according to apparatus of the present invention embodiment.

Embodiment

Functional overview

The problem of being changed by software easily at terminal in the correlation technique; the present invention is directed to the software change needs through data wire; the characteristics of the data wire that the data-interface that portable terminal is built-in and this interface connect; carrying out one-way/two-way by implementation tool software (being used to carry out the software of renewal) and mobile terminal software (software to be updated) shakes hands; and mobile terminal software is to the checking of the new software of portable terminal (software that need replace mobile terminal software); from illegal change procedure rather than the result of illegal change eliminated that mobile terminal software illegally upgraded may, thereby can protect portable terminal in nondestructive mode to greatest extent.

Method embodiment
In the present embodiment, provide a kind of update method of mobile terminal software, be used to prevent that the mobile terminal software of portable terminal from illegally being upgraded.
As shown in Figure 1, the update method according to the mobile terminal software of present embodiment comprises:
Step S102, mobile terminal software and/or the tool software that is used for mobile terminal software is upgraded are shaken hands according to the handshake data of the encryption of the other side's transmission, that is to say that the handshake data of the encryption that mobile terminal software and a root that is used for tool software that mobile terminal software is upgraded send according to the opposing party is carried out both sides unidirectionally shakes hands or carry out both sides' two-way handshake by the handshake data of mutual transmission encryption separately;
Step S104, under the case of successful of shaking hands, (this characteristic identifier can be an identified group according to the identifier of encrypted feature in advance of mobile terminal

software for mobile terminal software or tool software, its composition is independent assortment and adjustment according to the actual requirements, for example, can comprise operator's sign, the locking network and card sign, with or its combination in the languages sign, also may further include information such as version number) with the new Characteristic of Software identifier of portable terminal that needs to upgrade mobile terminal software the new software of portable terminal is verified, and according to verifying that the result determines whether to allow to upgrade, that is, determine whether to allow to utilize portable terminal latest software update mobile terminal software.

Wherein, in step S102, carry out unidirectional shake hands or the processing of two-way handshake specifically comprises: no matter be unidirectional shaking hands or two-way handshake, side in mobile terminal software and the tool software all needs the handshake data from the opposing party's encryption is decrypted, and judges that the handshake data after the deciphering is whether identical with predetermined handshake data; In judged result is under the situation that is, determine to shake hands successfully, otherwise the failure of shaking hands.

And in step S102, handshake data can be that mobile terminal software generates at random according to some information, and mobile terminal software and legal tool software are all known the content of handshake data.By introducing handshake data, guaranteed that illegal tool software can't the carrying out shake communication success; Simultaneously, by handshake data is encrypted, guaranteed and to have listened to correct handshake data from transmission package.Encryption method to handshake data can adopt mobile terminal software and tool software to consult the same set of cryptographic algorithm of sharing.

And, carrying out under the unidirectional situation of shaking hands, the handshake data of encrypting can send command transfer to mobile terminal software as master control side by tool software, receive handshake data and deciphering as recipient's mobile terminal software after, calculate relatively with the handshake data of self solidifying; The handshake data of encrypting also can be crossed certain command response bag as the master control square tube by mobile terminal software and be transferred to tool software, receive handshake data and deciphering as recipient's tool software after, the handshake data of solidifying with self is calculated relatively.Preferably, no matter handshake data in mobile terminal software or in the tool software, all is set to read only attribute, can not rewrite this handshake data by any external mode.

In above-mentioned processing, handshake data can be to calculate according to predefined parameter (for example, the terminal serial number that mobile terminal software and tool software can both be known etc.), also parameter directly can be carried out encrypted transmission as handshake data.Usually, these predefined parameters can be kept in tool software and/or the mobile terminal software.The initiator who shakes hands can be in end software and the tool software either party.

But, preferably, final result can be judged that being placed on the mobile terminal software side carries out, skip the determining step of the success of shaking hands to avoid some pirate instruments, further guarantee the fail safe of upgrading.

In the end side success judgment mode of shaking hands can be a kind of in the following mode: (mode one) mobile terminal software utilizes pre-defined algorithm that predefined parameter is calculated predetermined handshake data, and receives from the handshake data after the encryption of tool software; Mobile terminal software is to being decrypted from the handshake data after the encryption of tool software, and the handshake data after will deciphering and predetermined handshake data compare.

(mode two) mobile terminal software utilizes pre-defined algorithm that predefined parameter is calculated predetermined handshake data, and receives the special parameter of being encrypted transmission by tool software as handshake data; Mobile terminal software obtains special parameter to being decrypted from the handshake data after the encryption of tool software, and according to pre-defined algorithm special parameter is calculated, and will the result of calculation and the predetermined handshake data of special parameter be compared.
Should be noted that in aforesaid way two, special parameter as handshake data, and will be placed on end side and carry out to the processing of the calculating of special parameter.
In addition, in step S104, the processing that mobile terminal software or tool software are verified the new software of portable terminal specifically comprises: mobile terminal software or tool software are decrypted the identifier of encrypted feature in advance of mobile terminal software; Mobile terminal software or tool software compare the characteristic identifier and the new Characteristic of Software identifier of portable terminal of the mobile terminal software of deciphering; Under the characteristic identifier of the mobile terminal software situation identical with the new Characteristic of Software identifier of portable terminal, determine the new software of portable terminal by checking, allow to upgrade; Under the characteristic identifier of mobile terminal software and the new Characteristic of Software identifier of portable terminal situation inequality, determine the new software of portable terminal by checking, and stop to upgrade handling process.
Wherein, under by the tool software situation that new software is verified to portable terminal, tool software need send the order of the characteristic identifier of obtaining mobile terminal software to mobile terminal software, and, its characteristic identifier is sent in the process of tool software at mobile terminal software, can carry out encrypted transmission to characteristic identifier, and then strengthen the fail safe of renewal process.
On the other hand, under by the mobile terminal software situation that new software is verified to portable terminal, need to receive the new Characteristic of Software identifier of portable terminal from tool software, and can carry out encrypted transmission to the new Characteristic of Software identifier of portable terminal, and then strengthen the fail safe of renewal process.
Situation about will verify the new software of portable terminal with tool software is that example is described below.
As shown in Figure 2, in the middle of practical application, under by the tool software situation that new software is verified to portable terminal, specifically can comprise following processing according to the update method of the mobile terminal software of present embodiment:
Be connected by data wire between the step 201, personal computer (Personal Computer abbreviates PC as) that can running tool software and terminal, and the beginning communication;
Step 202, the handshake data that terminal self software and tool software transmission were encrypted;
Step 203 judges whether to shake hands successfully; Wherein, under unidirectional situation of shaking hands, if tool software is the handshake data that encryption is sent out by master control side in the step 202, then do whether right judgement work of handshake data by mobile terminal software, judged result is encrypted and return to tool software by the command response bag; If mobile terminal software is the handshake data that encryption is sent out by master control side in the step 202, then does whether right judgement work of handshake data, and return the judged result of encryption by tool software; If two-way handshake, then both sides need all to judge whether the other side's handshake data is correct, and return the judged result of

encryption to the other side; (step 202 and step 203 are corresponding to above-mentioned steps S102)

Step 204 according to the judged result in the step 203, can determine whether to shake hands successfully, if if determine to shake hands unsuccessful, the tool software process ends; If shake hands successfully, then tool software sends special command to mobile terminal software, to obtain mobile terminal software through the encrypted feature identifier, this special command is by consulting with ad hoc base between tool software and the mobile terminal software, the cryptographic algorithm of characteristic identifier can be decided by mobile terminal software and common negotiation of tool software, and the algorithm that characteristic identifier is encrypted can be identical with the algorithm that handshake data is encrypted, the encrypted transmission of characteristic identifier has guaranteed that True Data is not listened in transmission course, further strengthen the protection to terminal security;

Step 205 judges whether the characteristic identifier in characteristic identifier deciphering back that gets access to and the mobile terminal software (that is the new software of above-mentioned portable terminal) that will upgrade is in full accord; (step 204 and step 205 are corresponding to above-mentioned steps S104)

Step 206 is if the comparative result in the step 205 is unanimity then can begins mobile terminal software and upgrade (renewal process can be that tool software utilizes the new software of portable terminal to change mobile terminal software), otherwise process ends.

Device embodiment

In the present embodiment, provide a kind of portable terminal, this terminal can prevent that the terminal software on it from illegally being upgraded.

As shown in Figure 3, the portable terminal according to present embodiment comprises:

Handshake data module 10, be used to generate handshake data, read handshake data, according to determining from the handshake data of tool software and the handshake data of generation whether mobile terminal software and tool software shake hands successfully, and will determine that the result returns to tool software from tool software;

Characteristic identifier module 20 is used to store the predetermined characteristic identifier through encrypting, and uses the characteristic identifier of storage that the new software of portable terminal of changing mobile terminal software is verified for mobile terminal software or tool software;

Encrypting module (also can be called enciphering algorithm module) 30, be used for handshake data and unencrypted characteristic identifier that handshake data module 10 generates are encrypted, prevent to listen in the communication process handshake data of transmission and the characteristic identifier of mobile terminal software;

Communication command module 40, be used for and be sent to tool software through the handshake data that encrypting module 30 is encrypted, and receive from the handshake data after the encryption of tool software, and can also be used for the characteristic identifier of mobile terminal software being encoded and organizing bag, and transmit.Preferably, when enforcement is of the present invention, can order and other generic command of the transmission of communication command module is separated from each other, can further guarantee the fail safe of terminal like this.

Wherein, handshake data module 10 can will compare from the handshake data of tool software and the handshake data of generation, under the situation identical with the handshake data of generation, determine to shake hands successfully from the handshake data of tool software, otherwise the failure of determining to shake hands.Here, the handshake data of generation can

be the handshake data that calculates according to predefined parameter (for example, sequence number of terminal etc.), it also can be the predefined parameter that extracts, and when shaking hands, concrete processing procedure can be with reference to the processing described in above-mentioned mode one and the mode two.
The handshake data that 30 pairs of handshake data modules of encrypting module 10 generate carries out method of encrypting and the unencrypted characteristic identifier is carried out method of encrypting can be the same or different.
Preferably, characteristic identifier be following one of at least: operator's sign, locking network and card sign, languages sign.Here said characteristic identifier can be an identified group, and its composition can be adjusted and change according to actual needs, enumerates no longer one by one here.
As can be seen, in technical scheme of the present invention, the cryptographic algorithm that all has a cover to consult in terminal self software and the tool software, when carrying out the mobile terminal software replacing by data wire, can only change the locking network and card software of this operator and the mobile terminal software of this operator languages, the illegal software that has effectively prevented terminal upgrades, and has guaranteed the safety of terminal.
In sum, the present invention is by introducing the double probate of handshake data and characteristic identifier, greatly eliminated terminal by the possibility of software modification, terminal release that occurs in the correlation technique and the phenomenon of overlapping machine have been avoided, overcome the existing deficiency that prevents on release and the cover machine technology, guarantee the fail safe of terminal to greatest extent, effectively safeguarded benefits of operators; In addition, therefore the present invention realizes simple and reliable only by increasing the safety assurance that a small amount of processing just can realize.
The above is the preferred embodiments of the present invention only, is not limited to the present invention, and for a person skilled in the art, the present invention can have various changes and variation.Within the spirit and principles in the present invention all, any modification of being done, be equal to replacement, improvement etc., all should be included within protection scope of the present invention.

Claims (10)

Hide Dependent

1. the update method of a mobile terminal software is characterized in that, described method comprises:
Described mobile terminal software and/or the tool software that is used for described mobile terminal software is upgraded are shaken hands according to the cryptographic handshake data that the other side sends;
Under the case of successful of shaking hands, described mobile terminal software or described tool software are verified the new software of described portable terminal according to the identifier of encrypted feature in advance and the new Characteristic of Software identifier of portable terminal of described mobile terminal software, and are determined whether to allow to upgrade according to the checking result.

2. the update method of mobile terminal software according to claim 1 is characterized in that, described shaking hands specifically comprises:
Side in described mobile terminal software and/or the described tool software is decrypted the cryptographic handshake data from the opposing party, and judges whether the handshake data after the deciphering is identical with default handshake data;
In judged result is under the situation that is, described mobile terminal software is determined to shake hands successfully, otherwise the failure of shaking hands.
3. the update method of mobile terminal software according to claim 2 is characterized in that, under the case of successful that determined whether to shake hands by described mobile terminal software, the processing of shaking hands specifically comprises:
Described mobile terminal software utilizes pre-defined algorithm that predefined parameter is calculated described predetermined handshake data, and receives from the handshake data after the encryption of described tool software;
Described mobile terminal software is to being decrypted from the described handshake data after the encryption of described tool software, and the described handshake data after will deciphering and described predetermined handshake data compare.
4. the update method of mobile terminal software according to claim 2 is characterized in that, under the case of successful that determined whether to shake hands by described mobile terminal software, the processing of shaking hands specifically comprises:
Described mobile terminal software utilizes pre-defined algorithm that predefined parameter is calculated described predetermined handshake data, and receives the special parameter of being encrypted transmission by described tool software as handshake data;
Described mobile terminal software obtains described special parameter to being decrypted from the described handshake data after the encryption of described tool software, and described special parameter is calculated, and will the result of calculation and the described predetermined handshake data of described special parameter be compared according to described pre-defined algorithm.
5. the update method of mobile terminal software according to claim 1 is characterized in that, the processing that described mobile terminal software or described tool software are verified the new software of described portable terminal specifically comprises:
Described mobile terminal software or described tool software are decrypted the described characteristic identifier of encrypting in advance of described mobile terminal software;
The new Characteristic of Software identifier of the characteristic identifier of the described mobile terminal software that described mobile terminal software or described tool software will be deciphered and described portable terminal compares;
Under the characteristic identifier of the described mobile terminal software situation identical, determine that the new software of described portable terminal is by checking with the new Characteristic of Software identifier of described portable terminal;
Under the characteristic identifier of described mobile terminal software and the new Characteristic of Software identifier of described portable terminal situation inequality, determine that the new software of described portable terminal is by checking.
6. the update method of mobile terminal software according to claim 5 is characterized in that, and is described according to verifying that the result determines whether that the processing that allows to upgrade specifically comprises:

Under the situation of the new software of described portable terminal by checking, described tool software utilizes the described mobile terminal software of described portable terminal latest software update;
Do not pass through under the situation of checking at the new software of described portable terminal, stop to upgrade and handle.
7. according to the update method of each described mobile terminal software in the claim 1 to 6, it is characterized in that, the new Characteristic of Software identifier of the characteristic identifier of described mobile terminal software and described portable terminal comprise following one of at least: operator's sign, locking network and card sign, languages sign.
8. a portable terminal is characterized in that, described portable terminal comprises:
The handshake data module is used to generate handshake data, according to determining from the handshake data of tool software and the described handshake data of generation whether described mobile terminal software and described tool software shake hands successfully, and will determine that the result returns to described tool software;
The characteristic identifier module is used to store the predetermined characteristic identifier through encrypting, and uses the described characteristic identifier of storage that the new software of portable terminal that upgrades described mobile terminal software is verified for described mobile terminal software or described tool software;
Encrypting module is used for described handshake data and the described characteristic identifier of unencrypted that described handshake data module generates are encrypted;
The communication command module, the described handshake data that is used for encrypting through described encrypting module is sent to described tool software, and receives from the handshake data after the encryption of described tool software.
9. portable terminal according to claim 8, it is characterized in that, described handshake data module is used for and will compares from the handshake data of described tool software and the described handshake data of generation, under the situation identical with the described handshake data of generation, determine to shake hands successfully the failure of under the situation inequality, determining to shake hands from the described handshake data of the handshake data of described tool software and generation from the handshake data of described tool software.
10. according to Claim 8 or 9 described portable terminals, it is characterized in that, the new Characteristic of Software identifier of the characteristic identifier of described mobile terminal software and described portable terminal comprise following one of at least: operator's sign, locking network and card sign, languages sign.

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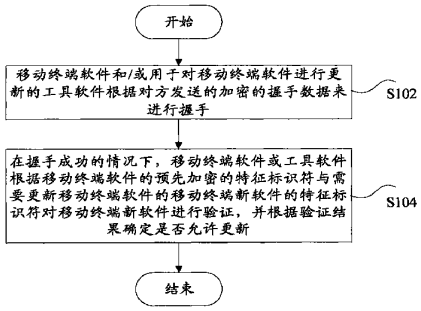
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[54] 发明名称

移动终端软件的更新方法和移动终端

[57] 摘要

本发明公开了一种移动终端软件的更新方法和移动终端，其中，该方法包括：移动终端软件和/或用于对移动终端软件进行更新的工具软件根据对方发送的加密握手数据来进行握手；在握手成功的情况下，移动终端软件或工具软件根据移动终端软件的预先加密的特征标识符与移动终端新软件的特征标识符对移动终端新软件进行验证，并根据验证结果确定是否允许更新。借助本发明，通过引入握手数据和特征标识符的两次认证，极大地消除了终端被软件修改的可能，避免了相关技术中出现的终端解锁和套机的现象，克服了现有的防止解锁和套机技术上的不足，最大限度地保证了终端的安全性，有效维护了运营商的利益。



1. 一种移动终端软件的更新方法，其特征在于，所述方法包括:

所述移动终端软件和/或用于对所述移动终端软件进行更新的工具软件根据对方发送的加密握手数据来进行握手;

在握手成功的情况下，所述移动终端软件或所述工具软件根据所述移动终端软件的预先加密的特征标识符与移动终端新软件的特征标识符对所述移动终端新软件进行验证，并根据验证结果确定是否允许更新。

2. 根据权利要求 1 所述的移动终端软件的更新方法，其特征在于，所述握手具体包括:

所述移动终端软件和/或所述工具软件中的一方对来自另一方的加密握手数据进行解密，并判断解密后的握手数据是否与预设的握手数据相同;

在判断结果为是的情况下，所述移动终端软件确定握手成功，否则握手失败。

3. 根据权利要求 2 所述的移动终端软件的更新方法，其特征在于，在由所述移动终端软件确定是否握手成功的情况下，进行握手的处理具体包括:

所述移动终端软件利用预定算法对预定参数计算得到所述预定握手数据，并接收来自所述工具软件的加密后的握手数据;

所述移动终端软件对来自所述工具软件的加密后的所述握手数据进行解密，并将解密后的所述握手数据与所述预定握手数据进行比较。

4. 根据权利要求 2 所述的移动终端软件的更新方法，其特征在于，在由所述移动终端软件确定是否握手成功的情况下，进行握手的处理具体包括：

所述移动终端软件利用预定算法对预定参数计算得到所述预定握手数据，并接收由所述工具软件作为握手数据加密发送的特定参数；

所述移动终端软件对来自所述工具软件的加密后的所述握手数据进行解密得到所述特定参数，并根据所述预定算法对所述特定参数进行计算，并将对所述特定参数的计算结果与所述预定握手数据进行比较。

5. 根据权利要求 1 所述的移动终端软件的更新方法，其特征在于，所述移动终端软件或所述工具软件对所述移动终端新软件进行验证的处理具体包括：

所述移动终端软件或所述工具软件对所述移动终端软件的预先加密的所述特征标识符进行解密；

所述移动终端软件或所述工具软件将解密的所述移动终端软件的特征标识符与所述移动终端新软件的特征标识符进行比较；

在所述移动终端软件的特征标识符与所述移动终端新软件的特征标识符相同的情况下，确定所述移动终端新软件通过验证；

在所述移动终端软件的特征标识符与所述移动终端新软件的特征标识符不相同的情况下，确定所述移动终端新软件未通过验证。

6. 根据权利要求 5 所述的移动终端软件的更新方法，其特征在于，所述根据验证结果确定是否允许更新的处理具体包括：

在所述移动终端新软件通过验证的情况下，所述工具软件利用所述移动终端新软件更新所述移动终端软件；

在所述移动终端新软件未通过验证的情况下，停止更新处理。

7. 根据权利要求 1 至 6 中任一项所述的移动终端软件的更新方法，其特征在于，所述移动终端软件的特征标识符和所述移动终端新软件的特征标识符包括以下至少之一：运营商标识、锁网锁卡标识、语种标识。

8. 一种移动终端，其特征在于，所述移动终端包括：

握手数据模块，用于生成握手数据，根据来自工具软件的握手数据与生成的所述握手数据确定所述移动终端软件与所述工具软件是否握手成功，并将确定结果返回给所述工具软件；

特征标识符模块，用于存储经过加密的预定的特征标识符，以供所述移动终端软件或所述工具软件使用存储的所述特征标识符对更新所述移动终端软件的移动终端新软件进行验证；

加密模块，用于对所述握手数据模块生成的所述握手数据以及未加密的所述特征标识符进行加密；

通讯命令模块，用于将经过所述加密模块加密的所述握手数据发送至所述工具软件，以及接收来自所述工具软件的加密后的握手数据。

9. 根据权利要求 8 所述的移动终端，其特征在于，所述握手数据模块用于将来自所述工具软件的握手数据与生成的所述握手数据进行比较，在来自所述工具软件的握手数据与生成的所述握手数据相同的情况下确定握手成功，在来自所述工具软件的握手数据与生成的所述握手数据不相同的情况下确定握手失败。

10. 根据权利要求 8 或 9 所述的移动终端，其特征在于，所述移动终端软件的特征标识符和所述移动终端新软件的特征标识符包括以下至少之一：运营商标识、锁网锁卡标识、语种标识。

移动终端软件的更新方法和移动终端

技术领域

本发明涉及通信领域，并且特别地，涉及一种移动终端软件的更新方法和移动终端。

背景技术

目前，全球移动通信市场的发展非常迅速，各运营商之间的竞争也很激烈。尤其是在终端产品市场，各运营商为了吸引用户，纷纷推出一系列促销政策，将终端以很大的优惠卖给用户，有些运营商甚至将终端免费赠送给用户。

但是，出于对本身利益的考虑，运营商通常会采取一系列限制措施。其中，比较常见的限制方式就是控制终端，使得终端仅能够在给其优惠的运营商的网络下使用，或者必须插入某种规定的卡才能使终端处于可使用的状态，通常可以将这类限制方式称为锁网或锁卡。

尽管运营商能够对其终端的使用进行限制，但是锁网或锁卡终端还是会被一些不法分子通过一些方式进行更改，使被更改的终端失去了锁网或锁卡功能，解除了运营商的限制，进而可以在其他运营商或其他网下使用、或者可以通过插入规定之外的卡来使用终端，甚至可以将终端的界面更改成其它语种进而在其它语种运营商的网下使用，这显然会严重损害运营商的利益。

因此，如何保护锁网锁卡终端，防止其被软件更改而成为解锁终端(即，防止解锁)、防止终端的A语种被软件更改为B语种(即，防止套机)，保护运营商的利益，就成为了一个重要课题。

目前，移动终端领域提出了少量防止移动终端设备被非法更换软件的方案，其中一种是在只能进行一次编程的存储器区域，同时记录国际移动设备识别码（International Mobile Equipment Identity，简称为IMEI）等必要数据和PAF-ROM存储的值，在软件变更时将这些值作为是否为非正常变更软件的基础数据来进行比较，从而判断出是否进行了非法变更程序。该方式存在问题在于：终端中必须划分一块只能进行一次编程的存储区或单独加一个可编程只读存储器（Programmable Read Only Memory，简称为PROM）芯片，实现成本高，并且该方式的判断着重于被变更的结果上，需要在判断出已经被非法变更程序后才用进一步阻止被变更终端被继续使用，存在滞后性，不能够从真正意义上防止终端被软件更改。

目前，尚未提出能够有效防止终端被软件更改的技术方案。

发明内容

考虑到相关技术中无法防止终端被软件更改问题而做出本发明，为此，本发明的主要目的在于提供一种移动终端软件的更新方法以及移动终端。

根据本发明的一个方面，提供了一种移动终端软件的更新方法。

根据本发明的移动终端软件的更新方法包括：移动终端软件和/或用于对移动终端软件进行更新的工具软件根据对方发送的加密握手数据来进行握手；在握手成功的情况下，移动终端软件或工具软件根据移动终端软件的预先加密的特征标识符与移动终端新软件的

特征标识符对移动终端新软件进行验证，并根据验证结果确定是否允许更新。

其中，上述的握手具体可以包括以下处理：移动终端软件和/或工具软件中的一方对来自另一方的加密握手数据进行解密，并判断解密后的握手数据是否与预设的握手数据相同；在判断结果为是的情况下，移动终端软件确定握手成功，否则握手失败。

一方面，在由移动终端软件确定是否握手成功的情况下，进行握手的处理具体包括：移动终端软件利用预定算法对预定参数计算得到预定握手数据，并接收来自工具软件的加密后的握手数据；移动终端软件对来自工具软件的加密后的握手数据进行解密，并将解密后的握手数据与预定握手数据进行比较。

另一方面，在由移动终端软件确定是否握手成功的情况下，进行握手的处理具体包括：移动终端软件利用预定算法对预定参数计算得到预定握手数据，并接收由工具软件作为握手数据加密发送的特定参数；移动终端软件对来自工具软件的加密后的握手数据进行解密得到特定参数，并根据预定算法对特定参数进行计算，并将对特定参数的计算结果与预定握手数据进行比较。

此外，移动终端软件或工具软件对移动终端新软件进行验证的处理具体可以包括：移动终端软件或工具软件对移动终端软件的预先加密的特征标识符进行解密；移动终端软件或工具软件将解密的移动终端软件的特征标识符与移动终端新软件的特征标识符进行比较；在移动终端软件的特征标识符与移动终端新软件的特征标识符相同的情况下，确定移动终端新软件通过验证；在移动终端软件的特征标识符与移动终端新软件的特征标识符不相同的情况下，确定移动终端新软件未通过验证。

其中，根据验证结果确定是否允许更新的处理具体可以包括：在移动终端新软件通过验证的情况下，工具软件利用移动终端新软件更新移动终端软件；在移动终端新软件未通过验证的情况下，停止更新处理。

优选地，移动终端软件的特征标识符和移动终端新软件的特征标识符可以包括以下至少之一：运营商标识、锁网锁卡标识、语种标识。

根据本发明的另一方面，提供了一种移动终端。

根据本发明的移动终端包括：握手数据模块，用于生成握手数据，根据来自工具软件的握手数据与生成的握手数据确定移动终端软件与工具软件是否握手成功，并将确定结果返回给工具软件；特征标识符模块，用于存储经过加密的预定的特征标识符，以供移动终端软件或工具软件使用存储的特征标识符对更新移动终端软件的移动终端新软件进行验证；加密模块，用于对握手数据模块生成的握手数据以及未加密的特征标识符进行加密；通讯命令模块，用于将经过加密模块加密的握手数据发送至工具软件，以及接收来自工具软件的加密后的握手数据。

其中，握手数据模块用于将来自工具软件的握手数据与生成的握手数据进行比较，在来自工具软件的握手数据与生成的握手数据相同的情况下确定握手成功，在来自工具软件的握手数据与生成的握手数据不相同的情况下确定握手失败。

优选地，移动终端软件的特征标识符和移动终端新软件的特征标识符包括以下至少之一：运营商标识、锁网锁卡标识、语种标识。

借助于本发明的上述技术方案，通过引入握手数据和特征标识符的两次认证，极大地消除了终端被软件修改的可能，避免了相关

技术中出现的终端解锁和套机的现象，克服了现有的防止解锁和套机技术上的不足，最大限度地保证了终端的安全性，有效维护了运营商的利益。

附图说明

此处所说明的附图用来提供对本发明的进一步理解，构成本申请的一部分，本发明的示意性实施例及其说明用于解释本发明，并不构成对本发明的不当限定。在附图中：

图 1 是根据本发明方法实施例的移动终端软件的更新方法的流程图；

图 2 是根据本发明方法实施例的移动终端软件的更新方法的处理实例的流程图；

图 3 是根据本发明装置实施例的移动终端框图。

具体实施方式

功能概述

针对相关技术中终端容易被软件更改的问题，本发明针对软件变更需要经过数据线、移动终端内置的数据接口及该接口连接的数据线的特点，通过实现工具软件（用于执行更新的软件）与移动终端软件（待更新的软件）进行单向/双向握手、以及移动终端软件对移动终端新软件（需要对移动终端软件进行替换的软件）的验证，从非法更改过程中而不是非法更改的结果上消除了移动终端软件被非法更新的可能，从而能够最大限度的以非破坏性的方式对移动终端进行保护。

方法实施例

在本实施例中，提供了一种移动终端软件的更新方法，用于防止移动终端的移动终端软件被非法更新。

如图 1 所示，根据本实施例的移动终端软件的更新方法包括：

步骤 S102，移动终端软件和/或用于对移动终端软件进行更新的工具软件根据对方发送的加密的握手数据来进行握手，也就是说，移动终端软件与用于对移动终端软件进行更新的工具软件中的一方根据另一方发送的加密的握手数据来进行双方的单向握手、或通过相互发送各自的加密的握手数据进行双方的双向握手；

步骤 S104，在握手成功的情况下，移动终端软件或工具软件根据移动终端软件的预先加密的特征标识符（该特征标识符可以是一个标识组，其组成可以根据实际需求自由组合和调整，例如，可以包括运营商标识、锁网锁卡标识、和语种标识中的一个或其组合，也可以进一步包括版本号等信息）与需要更新移动终端软件的移动终端新软件的特征标识符对移动终端新软件进行验证，并根据验证结果确定是否允许更新，即，确定是否允许利用移动终端新软件更新移动终端软件。

其中，在步骤 S102 中，进行单向握手或双向握手的处理具体包括：不论是单向握手还是双向握手，移动终端软件与工具软件中的一方均需要对来自另一方的加密的握手数据进行解密，并判断解密后的握手数据是否与预定的握手数据相同；在判断结果为是的情况下，确定握手成功，否则握手失败。

并且，在步骤 S102 中，握手数据可以是移动终端软件根据一些信息随机生成的，且移动终端软件与合法的工具软件均知晓握手数据的内容。通过引入握手数据，保证了非法工具软件无法握手通

讯成功；同时，通过对握手数据进行加密，保证了无法从传输包上侦听到正确的握手数据。对握手数据的加密方法可以采用移动终端软件和工具软件协商共享的同一套加密算法。

并且，在进行单向握手的情况下，加密过的握手数据可以由工具软件作为主控方发送命令传输给移动终端软件，作为接收方的移动终端软件收到握手数据并解密后，同自身固化的握手数据计算比较；加密过的握手数据也可以由移动终端软件作为主控方通过某个命令响应包传输给工具软件，作为接收方的工具软件收到握手数据并解密后，同自身固化的握手数据计算比较。优选地，握手数据不论在移动终端软件中还是工具软件中，都设置为只读属性，不能通过任何外部方式改写该握手数据。

在上述处理中，握手数据可以是根据预定参数（例如，移动终端软件和工具软件都能获知的终端序列号等）计算得到的，也可以将参数直接作为握手数据进行加密传输。通常，这些预定参数可以保存在工具软件和/或移动终端软件中。握手的发起方可以是端软件和工具软件中任何一方。

但是，优选地，可以将最终的结果判断放在移动终端软件侧执行，以避免一些盗版工具跳过握手成功的判断步骤，进一步保证更新的安全性。

在终端侧进行握手成功判断的方式可以是以下方式中的一种：

（方式一）移动终端软件利用预定算法对预定参数计算得到预定握手数据，并接收来自工具软件的加密后的握手数据；移动终端软件对来自工具软件的加密后的握手数据进行解密，并将解密后的握手数据与预定握手数据进行比较。

（方式二）移动终端软件利用预定算法对预定参数计算得到预定握手数据，并接收由工具软件作为握手数据加密发送的特定参数；移动终端软件对来自工具软件的加密后的握手数据进行解密得到特定参数，并根据预定算法对特定参数进行计算，并将对特定参数的计算结果与预定握手数据进行比较。

应当注意，在上述方式二中，将特定参数作为握手数据，并且将对特定参数的计算的处理放在终端侧执行。

此外，在步骤 S104 中，移动终端软件或工具软件对移动终端新软件进行验证的处理具体包括：移动终端软件或工具软件对移动终端软件的预先加密的特征标识符进行解密；移动终端软件或工具软件将解密的移动终端软件的特征标识符与移动终端新软件的特征标识符进行比较；在移动终端软件的特征标识符与移动终端新软件的特征标识符相同的情况下，确定移动终端新软件通过验证，允许更新；在移动终端软件的特征标识符与移动终端新软件的特征标识符不相同的情况下，确定移动终端新软件未通过验证，并停止更新处理流程。

其中，在由工具软件对移动终端新软件进行验证的情况下，工具软件需要向移动终端软件发送获取移动终端软件的特征标识符的命令，并且，在移动终端软件将其特征标识符发送给工具软件的过程中，可以对特征标识符进行加密传输，进而加强更新过程的安全性。

另一方面，在由移动终端软件对移动终端新软件进行验证的情况下，需要接收来自工具软件的移动终端新软件的特征标识符，且可以对移动终端新软件的特征标识符进行加密传输，进而加强更新过程的安全性。

下面将以工具软件对移动终端新软件进行验证的情况为例进行描述。

如图 2 所示，在实际应用当中，在由工具软件对移动终端新软件进行验证的情况下，根据本实施例的移动终端软件的更新方法具体可以包括以下处理：

步骤 201，可以运行工具软件的个人计算机（Personal Computer，简称为 PC）与终端之间通过数据线连接，并开始通讯；

步骤 202，终端自身软件和工具软件传输加密过的握手数据；

步骤 203，判断是否握手成功；其中，在单向握手的情况下，如果步骤 202 中工具软件是主控方发加密的握手数据，则由移动终端软件做握手数据是否正确的判断工作，将判断结果加密并通过命令响应包回传给工具软件；如果步骤 202 中移动终端软件是主控方发加密的握手数据，则由工具软件做握手数据是否正确的判断工作，并返回加密的判断结果；如果是双向握手，则双方均需要判断对方的握手数据是否正确，并向对方返回加密的判断结果；（步骤 202 和步骤 203 对应于上述步骤 S102）

步骤 204，根据步骤 203 中的判断结果，可以确定是否握手成功，如果确定如果握手不成功，工具软件结束流程；如果握手成功，则工具软件向移动终端软件发送特殊命令，以获取移动终端软件经过加密的特征标识符，该特殊命令由工具软件和移动终端软件之间以特别方式协商，特征标识符的加密算法可以由移动终端软件和工具软件共同协商而定，且对特征标识符加密的算法可以与对握手数据加密的算法相同，特征标识符的加密传输保证了真实数据在传输过程中不被侦听到，进一步加强对终端安全性的保护；

步骤 205，判断获取到的特征标识符解密后和要更新的移动终端软件（即，上述移动终端新软件）中的特征标识符是否完全一致；（步骤 204 和步骤 205 对应于上述步骤 S104）

步骤 206，如果步骤 205 中的比较结果为一致则可以开始移动终端软件更新（更新过程可以是工具软件利用移动终端新软件更换移动终端软件），否则结束流程。

装置实施例

在本实施例中，提供了一种移动终端，该终端可以防止其上的终端软件被非法更新。

如图 3 所示，根据本实施例的移动终端包括：

握手数据模块 **10**，用于生成握手数据，读取来自工具软件的握手数据，根据来自工具软件的握手数据与生成的握手数据确定移动终端软件与工具软件是否握手成功，并将确定结果返回给工具软件；

特征标识符模块 **20**，用于存储经过加密的预定的特征标识符，以供移动终端软件或工具软件使用存储的特征标识符对更换移动终端软件的移动终端新软件进行验证；

加密模块（也可以称为加密算法模块）**30**，用于对握手数据模块 **10** 生成的握手数据以及未加密的特征标识符进行加密，防止通讯过程中侦听到传输的握手数据和移动终端软件的特征标识符；

通讯命令模块 **40**，用于将经过加密模块 **30** 加密的握手数据发送至工具软件，以及接收来自工具软件的加密后的握手数据，且还可以用于将移动终端软件的特征标识符进行编码和组包，并进行传输。优选地，在实施本发明时，可以将通讯命令模块传输的命令与其它通用命令彼此分离开，这样可以进一步保证终端的安全性。

其中，握手数据模块 **10** 可以将来自工具软件的握手数据与生成的握手数据进行比较，在来自工具软件的握手数据与生成的握手数据相同的情况下确定握手成功，否则确定握手失败。这里，生成的握手数据可以是根据预定参数（例如，终端的序列号等）计算得到的握手数据，也可以是提取的预定参数，并且，在进行握手时，具体的处理过程可以参照上述的方式一和方式二中所描述的处理。

加密模块 **30** 对握手数据模块 **10** 生成的握手数据进行加密的方法与对未加密的特征标识符进行加密的方法可以相同也可以不同。

优选地，特征标识符为以下至少之一：运营商标识、锁网锁卡标识、语种标识。这里所说的特征标识符可以是一个标识组，其组成可以根据实际需要进行调整和改变，这里不再一一列举。

可以看出，在本发明的技术方案中，终端自身软件和工具软件中都有一套协商好的加密算法，在通过数据线进行移动终端软件更换时，只能更换本运营商的锁网锁卡软件及本运营商语种的移动终端软件，有效防止了终端的非法软件更新，保证了终端的安全。

综上所述，本发明通过引入握手数据和特征标识符的两次认证，极大地消除了终端被软件修改的可能，避免了相关技术中出现的终端解锁和套机的现象，克服了现有的防止解锁和套机技术上的不足，最大限度地保证了终端的安全性，有效维护了运营商的利益；此外，本发明仅通过增加少量处理就能够实现的安全保证，因此实现简单并且可靠。

以上所述仅为本发明的优选实施例而已，并不用于限制本发明，对于本领域的技术人员来说，本发明可以有各种更改和变化。凡在本发明的精神和原则之内，所作的任何修改、等同替换、改进等，均应包含在本发明的保护范围之内。

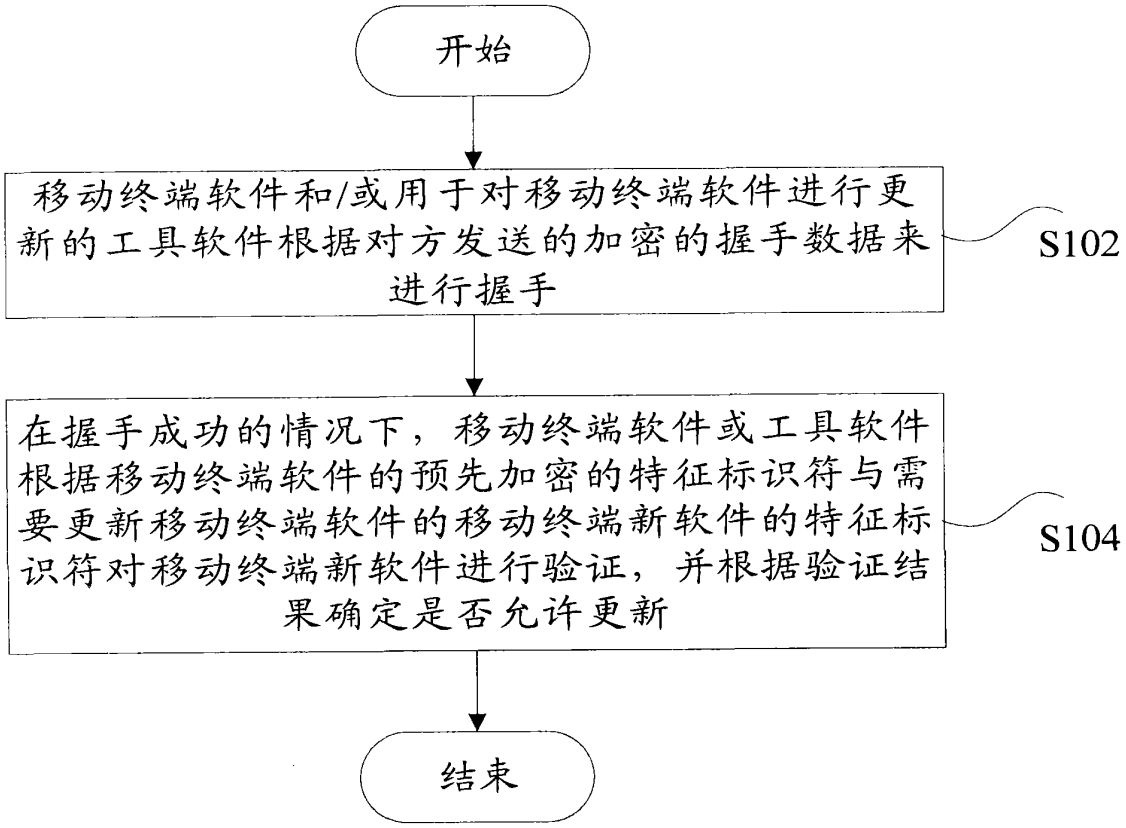

开始
移动终端软件和/或用于对移动终端软件进行更新的工具软件根据对方发送的加密的握手数据来进行握手
S102
在握手成功的情况下，移动终端软件或工具软件根据移动终端软件的预先加密的特征标识符与需要更新移动终端软件的移动终端新软件的特征标识符对移动终端新软件进行验证，并根据验证结果确定是否允许更新
S104
结束

图 1

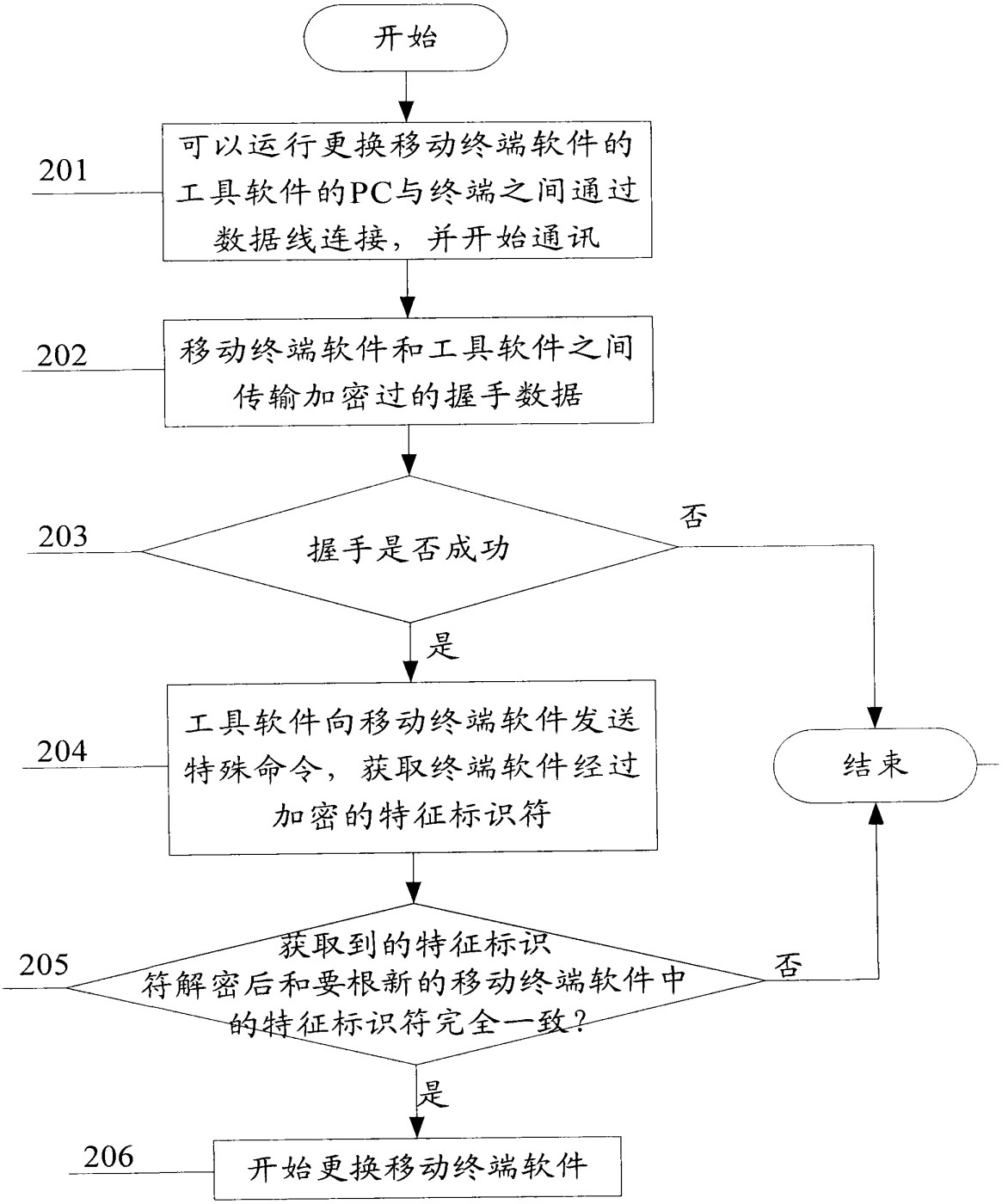

开始
201
可以运行更换移动终端软件的工具软件的PC与终端之间通过数据线连接，并开始通讯
202
移动终端软件和工具软件之间传输加密过的握手数据
203
握手是否成功
否
是
204
工具软件向移动终端软件发送特殊命令，获取终端软件经过加密的特征标识符
结束
205
获取到的特征标识符解密后和要根新的移动终端软件中的特征标识符完全一致?
否
是
206
开始更换移动终端软件

图 2

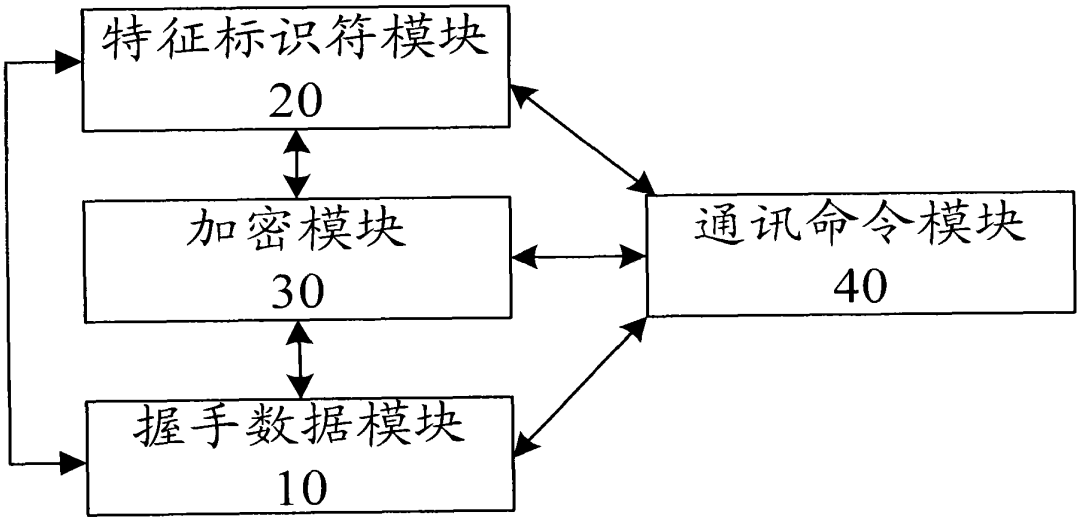


图 3

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(54) METHOD FOR UPDATING MOBILE TERMINAL SOFTWARE AND MOBILE TERMINAL

(57) Disclosed are a method for updating mobile terminal software and a mobile terminal. The method comprises the following steps: the mobile terminal software and/or the tool software used for updating the mobile terminal software perform hand-shaking according to encrypted hand-shaking data sent by the other party; wherein in the case that said hand-shaking is successful, the mobile terminal software or the tool software carries out verification of new mobile terminal software according to the pre-encrypted feature identifier of the mobile terminal software and the feature identifier of the new mobile terminal software, and determines whether the update is allowable according to the verification result. By introducing the two authentications of both the handshaking data and of the feature identifier, this invention greatly eliminates the possibility that the terminal may be modified by a software, avoids terminal unlocking and modification of language in the relevant technology, overcomes the deficiencies of the prior art in preventing such unlocking and language modification, ensures to the largest extend the terminal security, and effectively protects the interests of providers.

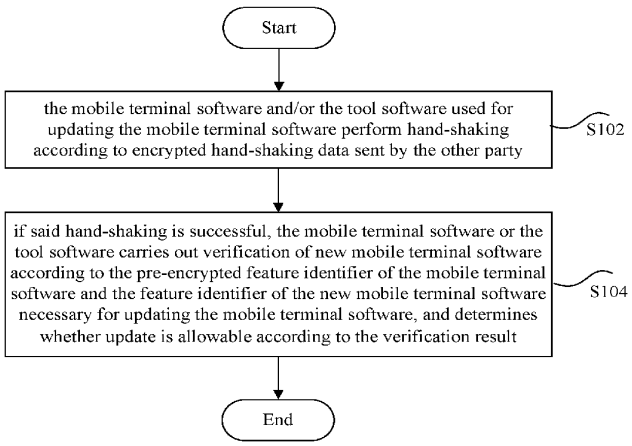


Fig. 1

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Description

Field of the Invention

[0001] The present invention relates to the communication field, and more particularly, to a method for updating mobile terminal software and a mobile terminal.

Background of the Invention

[0002] At present, along with the rapid development of global mobile communication market, the competitions among various operators are also intense. Especially in the terminal product market, operators release various series of promotion policies one after another to attract users, and sell terminals to users with great preferential benefit; and some operators even give terminals to users for free.

[0003] However, considering of theirs own benefits, operators generally adopt a series of restrictive measures. The common restrictive manner is to restrict a terminal, so that the terminal can only be used in the network of the operator giving the user with preferential benefit, or it is required to insert a specified card to enable the terminal into the usable state. Such restrictive manner is usually called as network-locking or card-locking.

[0004] Though operators can restrict the usage of their terminals, it is still possible that the terminals of network-locking or card-locking may be modified by some law-breakers via some methods, so that the modified terminals lose the function of network-locking or card-locking, which releases the restriction of operators and makes the terminals capable of being used by other operators or other networks; or makes the terminals used by inserting cards apart from the specified card, and it is even possible to change the interface of the terminal to other languages and further causes the changed terminal to be used in the network of the operators with other languages, which obviously damages the benefits of operators seriously.

[0005] Therefore, an important issue is how to prevent network-locking and card-locking terminal from being changed to an unlocked terminal by software (i.e. avoiding the unlocking), and to prevent language A of terminals from being changed to language B by software (i.e. avoid modification of language), so as to protect the benefits of operators.

[0006] At present, there are a few methods provided in the mobile terminal field, for preventing the software of the mobile terminal device from being modified illegally , wherein one method is to record the value stored in PAF-ROM and necessary data such as international mobile equipment identity (IMEI) simultaneously in a memory area that can only be programmed once, and with such values as the basic data, a comparison is made to determine whether it is abnormal changed software, when being changed by the software, so as to determine whether the software is illegally changed. The problem of the above method is that a portion of the terminal must be divided as a memory that can only be programmed once, or a programmable read only memory (PROM) chip must be added independently, so that the cost of implementation is high; moreover, the determination of the above method is focused on the changed result, and it is necessary to prevent the changed terminal from being used continuously after determining that the software of terminal is illegally changed, which has lag and is unable to prevent the terminal from being changed by software in fact.

[0007] There is no effective solution provided in the related art to solve the problem that it is impossible for preventing the terminal from being changed by software.

Summary of the Invention

[0008] The present invention is provided to solve the problem that it is impossible for preventing the terminal from being changed by software in the related art; and the major objective of the present invention is to provide a method for updating mobile terminal software and mobile terminal to solve the above problem.

[0009] To achieve the above objectives, according to one aspect of the present invention, a method for updating mobile terminal software is provided.

[0010] The method for updating mobile terminal software comprises the following steps:mobile terminal software and/or tool software used for updating the mobile terminal software performing hand-shaking according to encrypted hand-shaking data sent by the other party; if the hand-shaking is successful, the mobile terminal software or the tool software carrying out verification of new mobile terminal software according to a pre-encrypted feature identifier of the mobile terminal software and a feature identifier of the new mobile terminal software, and determining whether the update is allowable according to the verification result.

[0011] The above hand-shaking comprises the following steps: one party of the mobile terminal software and/or the tool software decrypting the encrypted hand-shaking data from the other party, and determining whether the decrypted hand-shaking data is identical to preset hand-shaking data; if the determining result is yes, the mobile terminal software determining that the hand-shaking is successful, otherwise, the mobile terminal software determining that the hand-shaking is failed.

[0012] On the one hand, in the case of determining whether the hand-shaking is successful by the mobile terminal software, the processing for performing the hand-shaking comprises: the mobile terminal software performing the calculation on preset parameter(s) by using a preset algorithm to obtain the preset hand-shaking data, and receiving the encrypted hand-shaking data from the tool software; and the mobile terminal software decrypting the encrypted hand-shaking data from the tool software, and comparing the decrypted hand-shaking data with the preset hand-shaking data.

[0013] On the other hand, in the case of determining whether the hand-shaking is successful by the mobile terminal software, the processing for performing the hand-shaking comprises: the mobile terminal software performing the calculation on preset parameter(s) by using a preset algorithm to obtain the preset hand-shaking data, and receiving the specific parameters served as the hand-shaking data encrypted and sent by the tool software; and the mobile terminal software decrypting the encrypted hand-shaking data from the tool software to obtain the specific parameters, performing the calculation on the specific parameters according to the preset algorithm, and comparing the calculated result of the specific parameters with the preset hand-shaking data.

[0014] In addition, the processing for verifying the new mobile terminal software by the mobile terminal software or the tool software comprises: the mobile terminal software or the tool software decrypting the pre-encrypted feature identifier of the mobile terminal software; the mobile terminal software or the tool software comparing the decrypted feature identifier of the mobile terminal software with the feature identifier of the new mobile terminal software; if the feature identifier of the mobile terminal software is identical to the feature identifier of the new mobile terminal software, determining that the new mobile terminal software passes the verification; and if the feature identifier of the mobile terminal software is different from the feature identifier of the new mobile terminal software, determining that the new mobile terminal software does not pass the verification.

[0015] The processing for determining whether the update is allowable according to the verification result comprises:. if the new mobile terminal software passes the verification, the tool software updating the mobile terminal software by using the new mobile terminal software; and if the new mobile terminal software does not pass the verification, stopping the update processing.

[0016] Preferably, the feature identifier of the mobile terminal software and the feature identifier of the new mobile terminal software comprise at least one of the following: an operator identifier, a network-locking card-locking identifier, and a language identifier.

[0017] To achieve the above objectives, according to another aspect of the present invention, a mobile terminal device is provided.

[0018] The mobile terminal comprises: a hand-shaking data module, configured to generate hand-shaking data, determine whether the hand-shaking between mobile terminal software and tool software is successful according to hand-shaking data from the tool software and the generated hand-shaking data, and return the determination result to the tool software; a feature identifier module, configured to store the encrypted preset feature identifier which is used for the mobile terminal software or the tool software to carry out the verification of the new mobile terminal software for updating the mobile terminal software; an encryption module, configured to encrypt the hand-shaking data generated by the hand-shaking data module and the unencrypted feature identifier; and a communication command module, configured to send the hand-shaking data encrypted by the encryption module to the tool software, and receive the encrypted hand-shaking data from the tool software.

[0019] The hand-shaking data module is configured to compare the hand-shaking data from the tool software with the generated hand-shaking data, determine the hand-shaking is successful if the hand-shaking data from the tool software is identical to the generated hand-shaking data, and determine the hand-shaking is failed if the hand-shaking data from the tool software is different from the generated hand-shaking data.

[0020] Preferably, the feature identifier of the mobile terminal software and the feature identifier of the new mobile terminal software comprise at least one of the following: an operator identifier, a network-locking card-locking identifier, and a language identifier.

[0021] By means of the above technical solution of the present invention, by introducing the two authentications of both the handshaking data and the feature identifier, this invention greatly eliminates the possibility that the terminal may be modified by a software, avoids terminal unlocking and modification of language in the relevant technology, overcomes the deficiencies of the technology of preventing such unlocking and language modification in the prior art, ensures maximum terminal security, and effectively protects the interests of providers.

Brief Description of the Drawings

[0022] The accompanying drawings described herein are used for further illustrating the present invention and constitute a part of the application. The illustrative embodiments of the present invention and the description thereof are used for further explaining the present invention and are not used for limiting unduly the protection scope thereof, in which:

Fig. 1 is a flowchart illustrating the method for updating mobile terminal software according to method embodiment of the present invention;

Fig. 2 is a flowchart illustrating a processing example of the method for updating mobile terminal software according to method embodiment of the present invention;and

Fig. 3 is a block diagram illustrating the mobile terminal according to device embodiment of the present invention.

Detailed Description of the Preferred Embodiments

Function Summary

[0023] To solve the problem that the terminal can easily be changed by software in the related art, the present

invention implements the unidirectional/bidirectional hand-shaking of the tool software (software for performing the update) and the mobile terminal software (he software to be updated) and the verification of the new software of the mobile terminal (the software that will replace the mobile terminal software) performed by the mobile terminal software by taking into account the feature that the changing of software needs pass through a data line, a built-in data interface of mobile terminal and the data line connected to the interface, so as to eliminate the possibility of illegally updating the mobile terminal software during the illegal changing process rather than based on the illegally-changed result, thereby protecting to the largest extend the mobile terminal in the nondestructive manner.

Method Embodiment

[0024] In accordance with the embodiment of the present invention, a method for updating mobile terminal software is provided for preventing the mobile terminal software of the mobile terminal from being illegally updated.

[0025] Fig. 1 is a flowchart illustrating the method for updating mobile terminal software according to method embodiment of the present invention. As shown in fig. 1, the method comprises the following steps S102-S104.

[0026] Step S102, mobile terminal software and/or tool software used for updating the mobile terminal software perform hand-shaking according to encrypted hand-shaking data sent by the other part, that is to say, one party of the mobile terminal software and the tool software used for updating the mobile terminal software performs an unidirectional hand-shaking of both parties according to the encrypted hand-shaking data sent by the other party, or the mobile terminal software and the tool software used for updating the mobile terminal software perform the bidirectional hand-shaking of both parties according to the encrypted hand-shaking data that both parties send to each other

[0027] Step S104, if said hand-shaking is successful, the mobile terminal software or the tool software carries out verification of new mobile terminal software according to a pre-encrypted feature identifier of the mobile terminal software (the feature identifier may be a identification group, of which the composition may be combined and adjusted freely according to the practical requirement, for example, it may include one or the combination of an operator identifier, a network-locking card-locking identifier and a language identifier, and further include information such as a version number) and a feature identifier of the new mobile terminal software required for updating the mobile terminal software, and determines whether the update is allowable according to the verification result, i.e. determines whether it is allowable that the new mobile terminal software is used to update the mobile terminal software.

[0028] In step S102, The processing for performing the unidirectional or bidirectional hand-shaking specifically comprises the following steps: no matter it is unidirectional hand-shaking or bidirectional hand-shaking, one party of the mobile terminal software and the tool software needs to decrypt the encrypted hand-shaking data from the other party, and determines whether the decrypted hand-shaking data are identical to the preset hand-shaking data, wherein if said determining result is yes, the hand-shaking is determined to be successful; otherwise, the hand-shaking is determined to be failed.

[0029] Moreover, in step S102, the hand-shaking data may be generated randomly by the mobile terminal software according to some information; the mobile terminal software and the legal tool software both know the content of hand-shaking data. By introducing the hand-shaking data, it is guaranteed that the illegal tool software can not implement successfully the hand-shaking communication; at the same time, by encrypting the hand-shaking data, it is guaranteed that the correct hand-shaking data can not be monitored from the transmission packet. The method for encrypting the hand-shaking data may adopt a same set of encryption algorithm negotiated and shared by the mobile terminal software and the tool software.

[0030] Additionally, if the unidirectional hand-shaking is performed, the encrypted hand-shaking data may be transmitted as a command by the tool software served as the master control side to the mobile terminal software. After receiving and decrypting the hand-shaking data, the mobile terminal software served as the receiving side compares the hand-shaking data with its hand-shaking data firmly stored (in read only memory). The encrypted hand-shaking data may also be transmitted to the tool software by the mobile terminal software served as the master control side via a command response packet. After receiving and decrypting the hand-shaking data, the tool software served as the receiving side compares the hand-shaking data with its hand-shaking data firmly stored (in read only memory). Preferably, no matter the hand-shaking data is in the mobile terminal software or in the tool software, the hand-shaking data is set as read only attribute, so that the hand-shaking data can not be changed through any external manner.

[0031] In the above processing, the hand-shaking data may be calculated according to the preset parameters (for example, the terminal serial number that canbe acquired by the mobile terminal software and the tool software); and the parameters can also be directly served as the hand-shaking data for encrypted transmission. In general, such preset parameters may be stored in the tool software and/or the mobile terminal software. The initiating side of hand-shaking may be any one of the terminal software and the tool software.

[0032] However, preferably, the final result determination may be performed at the mobile terminal software side to prevent some pirated tools from skipping the step for determining whether the hand-shaking is successful, which further guarantees the security of update.

[0033] The manner for performing the hand-shaking

success determination at the terminal side may be one of the following manners.

[0034] (Manner 1) the mobile terminal software performs calculation on preset parameters by using preset algorithm(s) to obtain preset hand-shaking data, and receives the encrypted hand-shaking data from the tool software; and the mobile terminal software decrypts the encrypted hand-shaking data from the tool software, and compares the decrypted hand-shaking data with preset hand-shaking data.

[0035] (Manner 2) the mobile terminal software performs calculation on preset parameters by using preset algorithm(s) to obtain preset hand-shaking data, and receives the specific parameters served as the hand-shaking data encrypted and sent by the tool software; the mobile terminal software decrypts the encrypted hand-shaking data from the tool software to obtain the specific parameters, performs calculation on the specific parameters according to the preset algorithm(s), and compares the calculation result of the specific parameters with the preset hand-shaking data.

[0036] It should be noted that, in the above Manner 2, the specific parameters are severed as the hand-shaking data, and the processing for the calculation of the specific parameters is performed at the terminal side.

[0037] In addition, in step 104, the processing of verifying new mobile terminal software performed by the mobile terminal software or tool software comprises following steps: the mobile terminal software or the tool software decrypts the pre-encrypted feature identifier of the mobile terminal software; and the mobile terminal software or the tool software compares the decrypted feature identifier of the mobile terminal software with the feature identifier of the new mobile terminal software wherein if the feature identifier of the mobile terminal software is identical to the feature identifier of the new mobile terminal software, it is determined that the new mobile terminal software passes the verification and the update is allowed; and if the feature identifier of the mobile terminal software is different from the feature identifier of the new mobile terminal software, it is determined that the new mobile terminal software does not pass the verification and the update processing is stopped.

[0038] In the case of verifying the new mobile terminal software by the tool software, the tool software needs to send a command for acquiring the feature identifier of mobile terminal software to the mobile terminal software; moreover, in the process of the mobile terminal software sending its feature identifier to the tool software, the feature identifier may be encrypted and then be transmitted, which enhances the security of the update process.

[0039] On the other hand, in the case of verifying the new mobile terminal software by the mobile terminal software, it is necessary for receiving the feature identifier of the new mobile terminal software from the tool software; and the feature identifier of the new mobile terminal software may be encrypted and then be transmitted, which enhances the security of the update process.

[0040] The verification of the new mobile terminal software performed by the tool software is described as example.

[0041] Fig. 2 is a flowchart illustrating an example of the method for updating mobile terminal software according to the method embodiment of the present invention As shown in fig. 2, in practical application, in the case of verifying the new mobile terminal software by the tool software, the method for updating mobile terminal software according to the present embodiment may comprise the following steps 201-206.

[0042] Step 201, a personal computer (PC) capable of executing tool software is connected to a terminal via a data line, and starts to communicate with the terminal.

[0043] Step 202, the software of the terminal itself and the tool software transmit encrypted hand-shaking data

[0044] Step 203, it is determined whether the hand-shaking is successful, wherein in the case of the unidirectional hand-shaking, if the tool software served as the master control side sends the encrypted hand-shaking data in step 202, the mobile terminal software determines whether the hand-shaking data are correct, encrypts the determination result and returns it to the tool software via a command response packet, and if the mobile terminal software served as the master control side sends the encrypted hand-shaking data in step 202, the tool software determines whether the hand-shaking data are correct, and returns the encrypted determination result; and in the case of the bidirectional hand-shaking, each of the two sides needs to determine whether the hand-shaking data of the other side is correct, and returns the encrypted determination result to the other side (steps 202 and 203 correspond to the above step S 1 02).

[0045] Step 204, it can be determined whether the hand-shaking is successful according to the determination result of step 203, wherein if the hand-shaking is failed, the tool software terminates the procedure; and if the hand-shaking is successful, the tool software sends a specific command to the mobile terminal software to acquire the encrypted feature identifier of mobile terminal software, wherein the specific command is negotiated between the tool software and the mobile terminal software in a special manner the algorithm for encrypting the feature identifier may be negotiated by the mobile terminal software and the tool software together, and the algorithm for encrypting the feature identifier may be the same as the algorithm for encrypting the hand-shaking data; and the encryption transmission of the feature identifier guarantees that the real data can not be monitored during transmission, which enhances the protection of terminal security

[0046] Step 205, it is determined whether the acquired decrypted feature identifier isidentical to the feature identifier of the mobile terminal software to be updated (i.e. the above new mobile terminal software) (steps 204 and 205 correspond to the above step S104).

[0047] Step 206, if the comparing result of step 205 is "being identical", it is started to update the mobile terminal

software (which can have the update procedure in which the tool software replaces the mobile terminal software with the new mobile terminal software), otherwise, the procedure is terminated.

Device Embodiment

[0048] In the present embodiment, a mobile terminal is provided for implementing the above method for updating mobile terminal software and the mobile terminal can avoid the illegal update of its terminal software.

[0049] Fig. 3 is a block diagram illustrating the mobile terminal according to the device embodiment of the present invention. As shown in fig. 3, the mobile terminal according to the present embodiment comprises: a hand-shaking data module 10, a feature identifier module 20, an encryption module 30, a communication command module 40, of which the above structure is described hereinafter.

[0050] The hand-shaking data module 10 is used for generating the hand-shaking data, reading the hand-shaking data from the tool software, determining whether the hand-shaking of the mobile terminal software and the tool software is successful according to the handshaking data from the tool software and the generated hand-shaking data, and returning the determination result to the tool software.

[0051] The feature identifier module 20 is used for storing the encrypted preset feature identifier, so that the mobile terminal software or the tool software carries out the verification of the new mobile terminal software for replacing the mobile terminal software, by using the stored feature identifier;

[0052] The encryption module (may also be referred to as encryption algorithm module) 30 is used for encrypting the hand-shaking data generated by the hand-shaking data module 10 and the unencrypted feature identifier, so as to avoid that the transmitted hand-shaking data and the feature identifier of the mobile terminal software are monitored in the process of communication.

[0053] The communication command module 40 is used for sending the hand-shaking data encrypted by the encryption module 30 to the tool software, receiving the encrypted hand-shaking data from the tool software, and encoding, packing and transmitting the feature identifier of the mobile terminal software. Preferably, during the implementation of the present invention, the command transmitted by the communication command module can be separated from other general commands, so as to further guarantee the security of terminal.

[0054] The hand-shaking data module 10 may compare the hand-shaking data from the tool software with the generated hand-shaking data, determine the hand-shaking is successful if the hand-shaking data from the tool software are the same as the generated hand-shaking data, otherwise, determine the hand-shaking is failed. Herein, the generated hand-shaking data may be the hand-shaking data which calculated according preset parameters (for example the serial number of terminal), or may be the extracted preset parameters; moreover, during the hand-shaking, the processing described in the above Manner 1 and Manner 2 can be referred to for the detailed processing.

[0055] The method of the encryption module 30 for encrypting the hand-shaking data generated by the hand-shaking data module 10 may be the same as or different from the method for encrypting the unencrypted feature identifier

[0056] Preferably, the feature identifier is at least one of the following: an operator identifier, a network-locking card-locking identifier, a language identifier. The feature identifier herein may be an identification group, of which the composition may be adjusted and changed according to the practical requirements, which is not listed herein one by one any more.

[0057] It can be seen from the above that, in the technical solution of the present invention, the software of the terminal itself and the tool software both have a set of negotiated encryption algorithm. When the mobile terminal software is changed through the data line, it is only possible to replace the mobile terminal software with the network-locking card-locking software of the local operator and the mobile terminal software of the local operator language, which effectively avoids the illegal software update of terminal and guarantees the security of terminal.

[0058] To sum up, by introducing the two authentications of both the handshaking data and the feature identifier, this invention greatly eliminates the possibility that the terminal may be modified by software, avoids terminal unlocking and modification of language in the relevant technology, overcomes the deficiencies of the prior art in preventing such unlocking and language modification, ensures to the largest extent the terminal security, and effectively protects the interests of operators; in addition, the security may be ensured only by adding a little processing, which is implemented simply and reliably

[0059] The foregoing is only preferred embodiments of the present invention and is not for use in limiting the protection scope thereof, and for those skilled in the art, there may be various modifications and changes to the present invention. Any modification, equivalent replacement and improvement made under the spirit and principle of the present invention should be included in the protection scope thereof.

Claims

1. A method for updating mobile terminal software, **characterized by** comprising:

   mobile terminal software and/or tool software used for updating the mobile terminal software performing hand-shaking according to encrypted hand-shaking data sent by the other party;

and
if the hand-shaking is successful, the mobile terminal software or the tool software carrying out verification of new mobile terminal software according toa pre-encrypted feature identifier of the mobile terminal software and a feature identifier of the new mobile terminal software, and determining whether the update is allowable according to the verification result.

2. The method for updating mobile terminal software according to claim 1, **characterized in that** the hand-shaking comprises:

one party of the mobile terminal software and/or the tool software decrypting the encrypted hand-shaking data from the other party, and determining whether the decrypted hand-shaking data is identical to preset hand-shaking data; and
if the determining result is yes, the mobile terminal software determining that the hand-shaking is successful, otherwise, the mobile terminal software determining that the hand-shaking is failed.

3. The method for updating mobile terminal software according to claim 2, **characterized in that** in the case of determining whether the hand-shaking is successful by the mobile terminal software, the processing for performing the hand-shaking comprises:

the mobile terminal software performing the calculation on preset parameter(s) by using a preset algorithm to obtain the preset hand-shaking data, and receiving the encrypted hand-shaking data from the tool software; and
the mobile terminal software decrypting the encrypted hand-shaking data from the tool software, and comparing the decrypted hand-shaking data with the preset hand-shaking data.

4. The method for updating mobile terminal software according to claim 2, **characterized in that** in the case of determining whether the hand-shaking is successful by the mobile terminal software, the processing for performing the hand-shaking comprises:

the mobile terminal software performing the calculation on preset parameter(s) by using a preset algorithm to obtain the preset hand-shaking data, and receiving the specific parameters served as the hand-shaking data encrypted and sent by the tool software; and
the mobile terminal software decrypting the encrypted hand-shaking data from the tool software to obtain the specific parameters, performing the calculation on the specific parameters according to the preset algorithm, and comparing the calculated result of the specific parameters with the preset hand-shaking data.

5. The method for updating mobile terminal software according to claim 1, **characterized in that** the processing for verifying the new mobile terminal software by the mobile terminal software or the tool software comprises:

the mobile terminal software or the tool software decrypting the pre-encrypted feature identifier of the mobile terminal software;
the mobile terminal software or the tool software comparing the decrypted feature identifier of the mobile terminal software with the feature identifier of the new mobile terminal software;
if the feature identifier of the mobile terminal software is identical to the feature identifier of the new mobile terminal software, determining that the new mobile terminal software passes the verification; and
if the feature identifier of the mobile terminal software is different from the feature identifier of the new mobile terminal software, determining that the new mobile terminal software does not pass the verification.

6. The method for updating mobile terminal software according to claim 5, **characterized in that** the processing for determining whether the update is allowable according to the verification result comprises:

if the new mobile terminal software passes the verification, the tool software updating the mobile terminal software by using the new mobile terminal software; and
if the new mobile terminal software does not pass the verification, stopping the update processing.

7. The method for updating mobile terminal software according to any of claims 1-6, **characterized in that** the feature identifier of the mobile terminal software and the feature identifier of the new mobile terminal software comprise at least one of the following: an operator identifier, a network-locking card-locking identifier, and a language identifier.

8. A mobile terminal, **characterized by** comprising:

a hand-shaking data module, configured to generate hand-shaking data, determine whether the hand-shaking between mobile terminal software and tool software is successful according to hand-shaking data from the tool software and

the generated hand-shaking data, and return the determination result to the tool software;

a feature identifier module, configured to store the encrypted preset feature identifier which is used for the mobile terminal software or the tool software to carry out the verification of the new mobile terminal software for updating the mobile terminal software;

an encryption module, configured to encrypt the hand-shaking data generated by the hand-shaking data module and the unencrypted feature identifier; and

a communication command module, configured to send the hand-shaking data encrypted by the encryption module to the tool software, and receive the encrypted hand-shaking data from the tool software.

9. The mobile terminal according to claim 8, **characterized in that** the hand-shaking data module is configured to compare the hand-shaking data from the tool software with the generated hand-shaking data, determine the hand-shaking is successful if the hand-shaking data from the tool software is identical to the generated hand-shaking data, and determine the hand-shaking is failed if the hand-shaking data from the tool software is different from the generated hand-shaking data.

10. The mobile terminal according to claim 8 or 9, **characterized in that** the feature identifier of the mobile terminal software and the feature identifier of the new mobile terminal software comprise at least one of the following: an operator identifier, a network-locking card-locking identifier, and a language identifier.

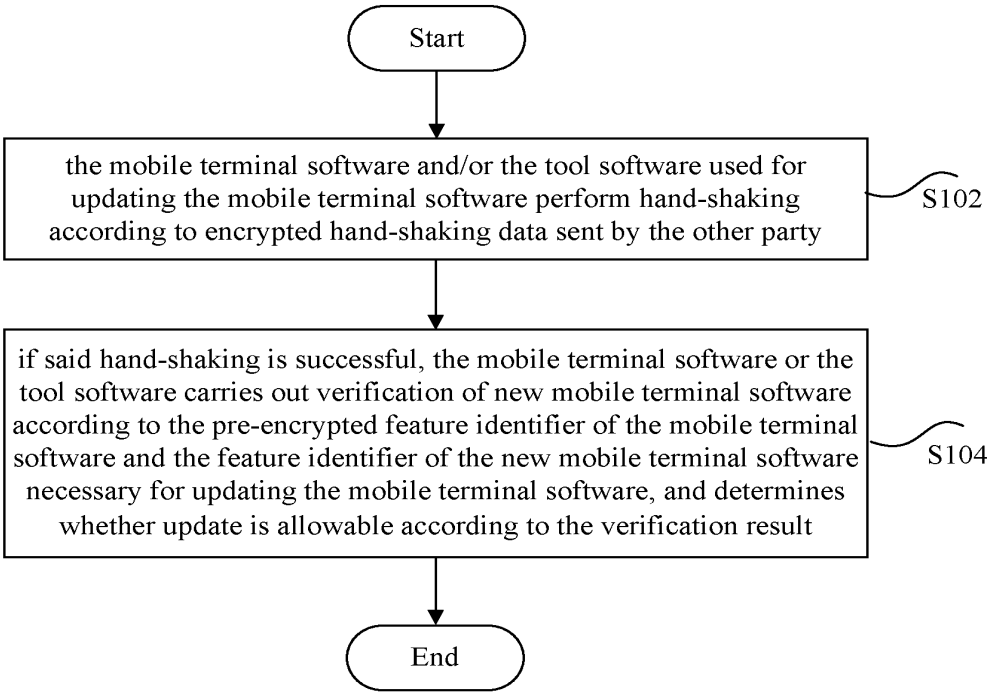

Start
the mobile terminal software and/or the tool software used for updating the mobile terminal software perform hand-shaking according to encrypted hand-shaking data sent by the other party
S102
if said hand-shaking is successful, the mobile terminal software or the tool software carries out verification of new mobile terminal software according to the pre-encrypted feature identifier of the mobile terminal software and the feature identifier of the new mobile terminal software necessary for updating the mobile terminal software, and determines whether update is allowable according to the verification result
S104
End

Fig. 1

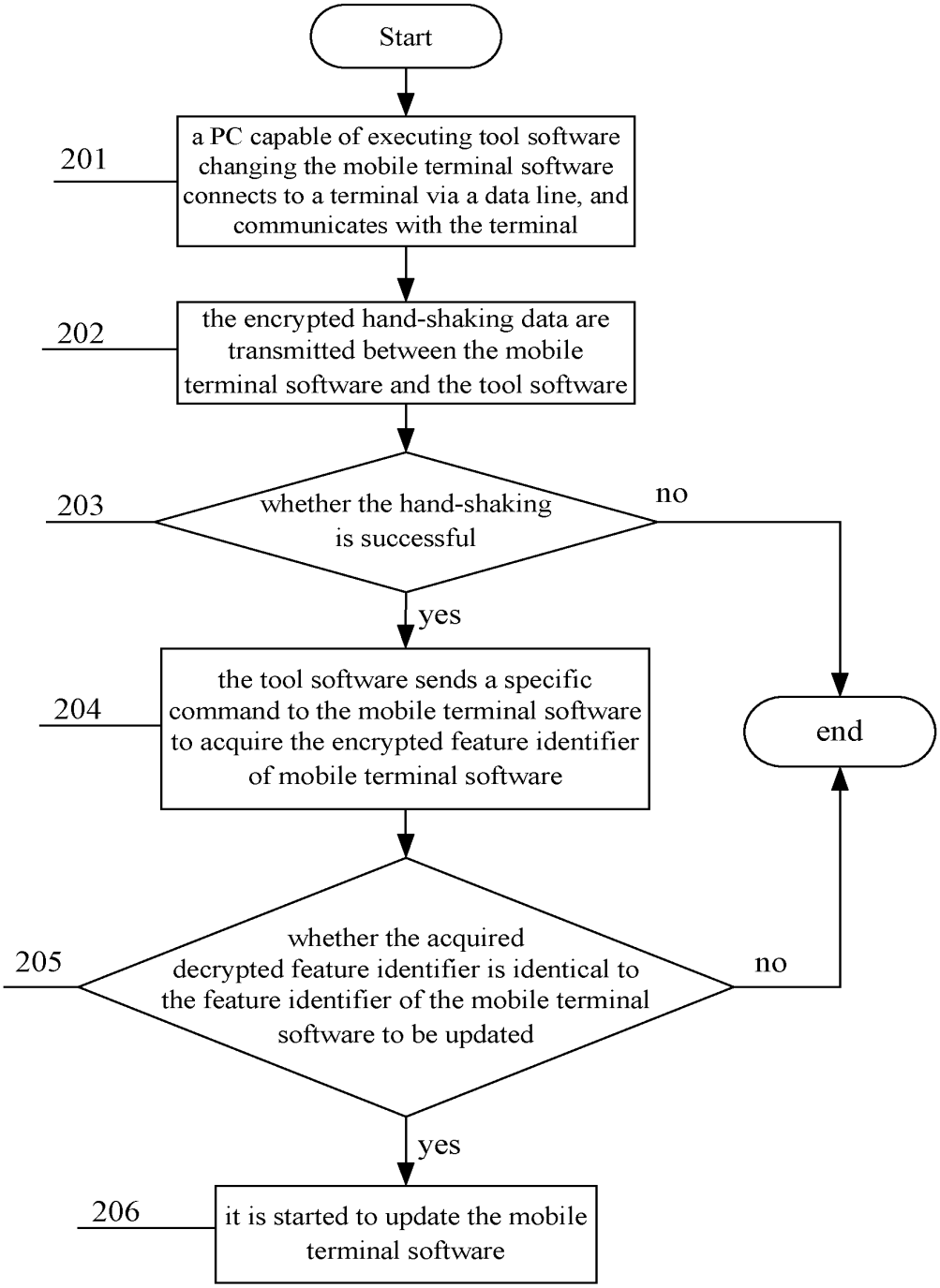

Start
201
a PC capable of executing tool software changing the mobile terminal software connects to a terminal via a data line, and communicates with the terminal
202
the encrypted hand-shaking data are transmitted between the mobile terminal software and the tool software
203
whether the hand-shaking is successful
no
yes
204
the tool software sends a specific command to the mobile terminal software to acquire the encrypted feature identifier of mobile terminal software
end
205
whether the acquired decrypted feature identifier is identical to the feature identifier of the mobile terminal software to be updated
no
yes
206
it is started to update the mobile terminal software

Fig. 2

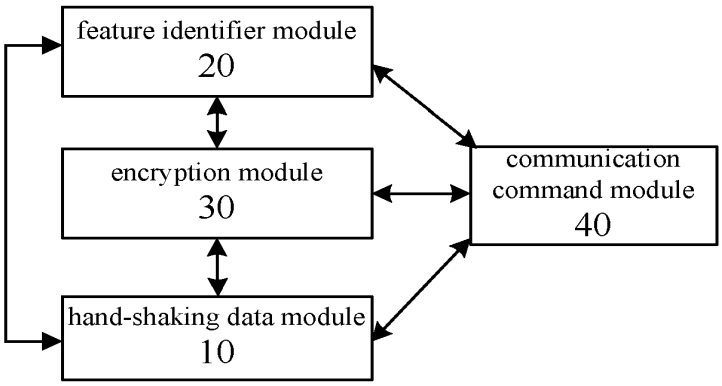

feature identifier module
20
encryption module
30
hand-shaking data module
10
communication
command module
40

Fig. 3

INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2009/073219

A. CLASSIFICATION OF SUBJECT MATTER

H04W12/02(2009.01)i

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:H04W,H04Q,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 practicable, search terms used)

WPI,EPODOC,PAJ,CNPAT,CNKI,IEEE: software,program,data,update,updating,download,downloading,upgrade,upgrading, handshake,hand-shaking,encrypt,cipher,verify,verification,identifier

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	CN101043680A (ZTE CORPORATION) 26 Sep.2007(26.09.2007) page 4 line 15-page 8 line 18	1-10
X	CN1570865A (HANGZHOU UTSTARCOM TELECOM. CO., LTD.)26 Jan.2005(26.01.2005) page 4 line 16-page 6 line 20	1, 7-8, 10
PX	CN101437224A (ZTE CORPORATION) 20 May 2009(20.05.2009) page 2 line 21-page 4 line 23	1-10
A	CN101258505A (APPLE COMPUTER, INC.) 03 Sep. 2008(03.09.2008) the whole document	1-10
A	US2005/0149718A1(BERLIN, Volker Jens) 07 Jul.2005(07.07.2005) the whole document	1-10
A	JP2004297125A (KYOCERA CORPORATION) 21 Oct. 2004(21.10.2004) the whole document	1-10

☐ Further documents are listed in the continuation of Box C. ☒ See patent family annex.

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

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

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

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

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

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

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

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

"&"document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
22 Sep.2009(22.09.2009)	**22 Oct. 2009 (22.10.2009)**
Name and mailing address of the ISA/CN The State Intellectual Property Office, the P.R.China 6 Xitucheng Rd., Jimen Bridge, Haidian District, Beijing, China 100088 Facsimile No. 86-10-62019451	Authorized officer LI,Yan Telephone No. (86-10)62413496

Form PCT/ISA /210 (second sheet) (July 2009)

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/CN2009/073219

Patent Documents referred in the Report	Publication Date	Patent Family	Publication Date
CN101043680A	26.09.2007	NONE	
CN1570865A	26.01.2005	NONE	
CN101437224A	20.05.2009	NONE	
CN101258505A	03.09.2008	WO2007/014314A2	01.02.2007
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Form PCT/ISA /210 (patent family annex) (July 2009)

Electronic Acknowledgement Receipt	
EFS ID:	48266197
Application Number:	18088450
International Application Number:	
Confirmation Number:	4358
Title of Invention:	Communications Device with Secure Data Path Processing Agents
First Named Inventor/Applicant Name:	Gregory G. Raleigh
Customer Number:	106963
Filer:	Michael Farjami/Evan Gunderman
Filer Authorized By:	Michael Farjami
Attorney Docket Number:	RALEP038D1C1C1C1C1
Receipt Date:	07-JUL-2023
Filing Date:	23-DEC-2022
Time Stamp:	17:45:31
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Information Disclosure Statement (IDS) Form (SB08)	RALEP038D1C1C1C1C1_IDS.pdf	1282248 e4c0232af2df6c396a27cabfc2136aaeda3e5f4e	no	4

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2	Foreign Reference	CN101437224.pdf	978722 16cf8e4636549f97740c2108868deb28a562f260	no	29
Warnings:					
Information:					
3	Foreign Reference	EP2381711A1.pdf	384495 8c69dc168e5399519832e0f6cf2035f6ce25c042	no	13
Warnings:					
Information:					
			Total Files Size (in bytes):	2645465	

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

New Applications Under 35 U.S.C. 111

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

National Stage of an International Application under 35 U.S.C. 371

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

New International Application Filed with the USPTO as a Receiving Office

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

Doc code: IDS
Doc description: Information Disclosure Statement (IDS) Filed

PTO/SB/08a (01-22)
Approved for use through 05/31/2024. OMB 0651-0031
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INFORMATION DISCLOSURE STATEMENT BY APPLICANT (**Not for submission under 37 CFR 1.99)**		
	Application Number	18088450
	Filing Date	2022-12-23
	First Named Inventor	RALEIGH, GREGORY
	Art Unit	
	Examiner Name	not yet assigned
	Attorney Docket Number	RALEP038D1C1C1C1C1

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Examiner Initial*	Cite No	Patent Number	Kind Code[1]	Issue Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
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	42	8472371		2013-06-25	Bari, Farooq et al.	
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	Attorney Docket Number	RALEP038D1C1C1C1C1

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	Art Unit	
	Examiner Name	not yet assigned
	Attorney Docket Number	RALEP038D1C1C1C1C1

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	Attorney Docket Number	RALEP038D1C1C1C1C1

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	Art Unit	
	Examiner Name	not yet assigned
	Attorney Docket Number	RALEP038D1C1C1C1C1

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	Examiner Name	not yet assigned
	Attorney Docket Number	RALEP038D1C1C1C1C1

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	Art Unit	
	Examiner Name	not yet assigned
	Attorney Docket Number	RALEP038D1C1C1C1C1

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	Examiner Name	not yet assigned
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	148	8654952	B2	2014-02-18	Wang et al.	
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	152	8666395	B2	2014-03-04	Silver, Andrew	
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Please see 37 CFR 1.97 and 1.98 to make the appropriate selection(s):

☐ That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).

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A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

Signature	/Farshad Farjami/	Date (YYYY-MM-DD)	2023-05-25
Name/Print	Farshad Farjami	Registration Number	41014

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International Application Number:	
Confirmation Number:	4358
Title of Invention:	Communications Device with Secure Data Path Processing Agents
First Named Inventor/Applicant Name:	Gregory G. Raleigh
Customer Number:	106963
Filer:	Michael Farjami/Evan Gunderman
Filer Authorized By:	Michael Farjami
Attorney Docket Number:	RALEP038D1C1C1C1C1
Receipt Date:	25-MAY-2023
Filing Date:	23-DEC-2022
Time Stamp:	17:26:13
Application Type:	Utility under 35 USC 111(a)

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If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.
New International Application Filed with the USPTO as a Receiving Office
If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
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	Art Unit	
	Examiner Name	not yet assigned
	Attorney Docket Number	RALEP038D1C1C1C1C1

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	Attorney Docket Number	RALEP038D1C1C1C1C1

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Examiner Initial*	Cite No	Foreign Document Number[3]	Country Code[2]	Kind Code[4]	Publication Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear	T[5]
	1	2008080430	WO	A1	2008-07-10	Costa et al.		☐

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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, pages(s), volume-issue number(s), publisher, city and/or country where published.	T[5]
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	Examiner Name	not yet assigned
	Attorney Docket Number	RALEP038D1C1C1C1C1

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Please see 37 CFR 1.97 and 1.98 to make the appropriate selection(s):

☐ That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).

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☐ See attached certification statement.

☐ The fee set forth in 37 CFR 1.17 (p) has been submitted herewith.

☒ A certification statement is not submitted herewith.

SIGNATURE

A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

Signature	/Farshad Farjami/	Date (YYYY-MM-DD)	2023-05-24
Name/Print	Farshad Farjami	Registration Number	41014

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EFS ID:	48060454
Application Number:	18088450
International Application Number:	
Confirmation Number:	4358
Title of Invention:	Communications Device with Secure Data Path Processing Agents
First Named Inventor/Applicant Name:	Gregory G. Raleigh
Customer Number:	106963
Filer:	Michael Farjami/Evan Gunderman
Filer Authorized By:	Michael Farjami
Attorney Docket Number:	RALEP038D1C1C1C1C1
Receipt Date:	25-MAY-2023
Filing Date:	23-DEC-2022
Time Stamp:	17:14:56
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Information Disclosure Statement (IDS) Form (SB08)	P038D1C1C1C1C1_IDS3_May_25_23.pdf	4691624 4625aac542a826a737a3dcfa2b7ec9b146b405da	no	32

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Doc code: IDS
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Examiner Initial*	Cite No	Patent Number	Kind Code[1]	Issue Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
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	24	10536983	B2	2020-01-14	Raleigh et al.	
	25	10567930	B2	2020-02-18	Silver	
	26	10582375	B2	2020-03-03	Raleigh	
	27	10616818	B2	2020-04-07	Silver	
	28	10771980	B2	2020-09-08	Raleigh et al.	
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	30	10783581	B2	2020-09-22	Raleigh	

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	25	20030013434		2003-01-16	ROSENBERG et al.	
	26	20030018524		2003-01-23	FISHMAN et al.	
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	37	20030161265		2003-08-28	CAO et al.	
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	47	20030224781		2003-12-04	MILFORD et al.	
	48	20030229900		2003-12-11	REISMAN, Richard	
	49	20030229900	A1	2003-12-11	Reisman	
	50	20030233332	A	2003-12-18	Keeler, James D. et al.	
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	58	20040044623		2004-03-04	WAKE et al.	
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	61	20040073672		2004-04-15	FASCENDA, Anthony C.	
	62	20040082346		2004-04-29	SKYTT et al.	
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	64	20040098715		2004-05-20	AGHERA et al.	
	65	20040102182	A	2004-05-27	Reith, Lothar et al.	
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	69	20040114553	A1	2004-06-17	Jiang et al.	
	70	20040116140	A1	2004-06-17	Babbar et al.	
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	72	20040127200		2004-07-01	SHAW et al.	
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	74	20040127256	A1	2004-07-01	Goldthwaite et al.	
	75	20040132427		2004-07-08	Lee, Wan-Yeon et al.	
	76	20040133668	A1	2004-07-08	Nicholas III, Henry T.	
	77	20040137890	A1	2004-07-15	Kalke, Catherine	
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	80	20040168052		2004-08-26	CLISHAM et al.	
	81	20040170191	A	2004-09-02	Guo et al.	
	82	20040176104	A	1841-03-12	Arcens	
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	84	20040198331		2004-10-07	COWARD et al.	
	85	20040203755		2004-10-14	BRUNET, Jeffrey et al.	
	86	20040203833	A	2004-10-14	Rathunde, Dale F. et al.	
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	92	20040249918		2004-12-09	SUNSHINE, Roger N.	
	93	20040255145	A	2004-12-16	Chow, Jerry	
	94	20040259534	A1	2004-12-23	Chaudhari et al.	
	95	20040260766	A1	2004-12-23	Barros et al.	
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	98	20050007993		2005-01-13	Chambers, Mahdi et al.	
	99	20050009499		2005-01-13	KOSTER, Karl	
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	101	20050041617	A1	2005-02-24	Huotari et al.	
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	103	20050055291		2005-03-10	BEVENTE et al.	
	104	20050055309		2005-03-10	WILLIAMS et al.	
	105	20050055595	A	2005-03-10	Frazer et al.	
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	109	20050079863	A	2005-04-14	Macaluso, Anthony G.	
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	112	20050097516		2005-05-05	DONNELLY et al.	
	113	20050107091		2005-05-19	VANNITHAMBY et al.	
	114	20050108075	A1	2005-05-19	Douglis et al.	
	115	20050111463	A1	2005-05-26	Leung et al.	
	116	20050128967		2005-06-16	SCOBBIE, Donald MacGregor	
	117	20050135264	A1	2005-06-23	Popoff et al.	
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	121	20050183143		2005-08-18	ANDERHOLM et al.	
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	124	20050216421		2005-09-29	BARRY et al.	
	125	20050226178	A1	2005-10-13	Forand et al.	
	126	20050228985		2005-10-13	YLIKOSKI et al.	
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	134	20050266825		2005-12-01	CLAYTON, Steve	
	135	20050266880		2005-12-01	GUPTA, Vivek G.	
	136	20050286476	A1	2005-12-29	Crosswy et al.	
	137	20060014519		2006-01-19	MARSH et al.	
	138	20060019632		2006-01-26	CUNNINGHAM et al.	
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	140	20060026679	A1	2006-02-02	Zakas	
	141	20060030306	A1	2006-02-09	Kuhn, Brian Gerald	
	142	20060034256		2006-02-16	ADDAGATLA et al.	
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	146	20060045245		2006-03-02	AARON et al.	
	147	20060048223		2006-03-02	LEE et al.	
	148	20060068796	A	2006-03-30	Millen, Stephanie L. et al.	
	149	20060072451	A1	2006-04-06	Ross, Alan D.	
	150	20060072550	A1	2006-04-06	Davis et al.	
	151	20060072646		2006-04-06	FEHER, Kamilo	
	152	20060075506	A1	2006-04-06	Sanda et al.	
	153	20060085543		2006-04-20	HRASTAR et al.	
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	157	20060099970	A1	2006-05-11	Morgan et al.	
	158	20060101507	A1	2006-05-11	Camenisch, Ja L.	
	159	20060112016		2006-05-25	ISHIBASHI, Yoshihito	
	160	20060114821	A1	2006-06-01	Willey et al.	
	161	20060114832	A	2006-06-01	Hamilton et al.	
	162	20060126562	A1	2006-06-15	Liu, Huitao	
	163	20060135144	A	2006-06-22	Jothipragasam, Premkumar	
	164	20060135144	A1	2006-06-22	Jothipragasam	
	165	20060136882	A1	2006-06-22	Noonan et al.	
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	169	20060156398	A	2006-07-13	Ross et al.	
	170	20060160536	A	2006-07-20	Chou, Joey	
	171	20060165060		2006-07-27	DUA, Robin	
	172	20060168128	A	2006-07-27	Sistla et al.	
	173	20060173959	A	2006-08-03	Mckelvie et al.	
	174	20060174035	A	2006-08-03	Tufail, Mudassir	
	175	20060178917		2006-08-10	MERRIAM et al.	
	176	20060178918		2006-08-10	MIKURAK, Michael G.	
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	179	20060183462		2006-08-17	KOLEHMAINEN, Mikko	
	180	20060190314		2006-08-24	HERNANDEZ, Rick	
	181	20060190987	A1	2006-08-24	Ohta et al.	
	182	20060193280	A1	2006-08-31	Lee et al.	
	183	20060199608		2006-09-07	DUNN et al.	
	184	20060200663	A1	2006-09-07	Thornton, Andrew J.	
	185	20060206709	A1	2006-09-14	Labrou et al.	
	186	20060206904		2006-09-14	WATKINS et al.	
	187	20060218395		2006-09-28	MAES, Stephane H.	
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	190	20060233166		2006-10-19	BOU-DIAB et al.	
	191	20060236095		2006-10-19	SMITH et al.	
	192	20060242685		2006-10-26	HEARD et al.	
	193	20060258341		2006-11-16	MILLER et al.	
	194	20060274706	A1	2006-12-07	Chen et al.	
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	196	20060291419	A1	2006-12-28	McConnell et al.	
	197	20060291477		2006-12-28	CROAK et al.	
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	201	20070022289		2007-01-25	ALT et al.	
	202	20070025301	A	2007-02-01	Petersson et al.	
	203	20070033194	A	2007-02-08	Srinivas et al.	
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	205	20070035390	A1	2007-02-15	Thomas et al.	
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	207	20070038763	A1	2007-02-15	Oestvall	
	208	20070055694		2007-03-08	RUGE et al.	
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	213	20070073899	A1	2007-03-29	Judge et al.	
	214	20070076616		2007-04-05	NGO et al.	
	215	20070093243		2007-04-26	KAPADEKAR et al.	
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	217	20070101426		2007-05-03	LEE et al.	
	218	20070104126		2007-05-10	CALHOUN et al.	
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	220	20070109983	A	2007-05-17	Shankar, Rohit et al.	
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	223	20070130283	A1	2007-06-07	Klein et al.	
	224	20070130315	A1	2007-06-07	Friend et al.	
	225	20070140113	A1	2007-06-21	Gemelos	
	226	20070140145	A	2007-06-21	Kumar et al.	
	227	20070140275		2007-06-21	BOWMAN et al.	
	228	20070143824	A1	2007-06-21	Shahbazi, Majid	
	229	20070147317	A	2007-06-28	Smith et al.	
	230	20070147324		2007-06-28	McGary, Faith	
	231	20070155365	A	2007-07-05	Kim, Sung-Jun et al.	
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	234	20070168499	A	2007-07-19	Chu, Jing-Long	
	235	20070171856	A1	2007-07-26	Bruce et al.	
	236	20070174490	A1	2007-07-26	Choi et al.	
	237	20070191006	A1	2007-08-16	Carpenter	
	238	20070192460	A1	2007-08-16	Choi et al.	
	239	20070198656		2007-08-23	MAZZAFERRI et al.	
	240	20070201502	A1	2007-08-30	Abramson	
	241	20070213054	A1	2007-09-13	Han, Seung-Wook	
	242	20070220251		2007-09-20	ROSENBERG et al.	
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	246	20070242619	A1	2007-10-18	Murakami et al.	
	247	20070242659	A1	2007-10-18	Cantu et al.	
	248	20070243862		2007-10-18	COSKUN et al.	
	249	20070244965	A1	2007-10-18	Dowling	
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Examiner Initial*	Cite No	Foreign Document Number[3]	Country Code[2]	Kind Code[4]	Publication Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear	T[5]
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International Application Number:	
Confirmation Number:	4358
Title of Invention:	Communications Device with Secure Data Path Processing Agents
First Named Inventor/Applicant Name:	Gregory G. Raleigh
Customer Number:	106963
Filer:	Michael Farjami/Evan Gunderman
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Attorney Docket Number:	RALEP038D1C1C1C1C1
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	Examiner Name	not yet assigned
	Attorney Docket Number	RALEP038D1C1C1C1C1

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U.S.PATENT APPLICATION PUBLICATIONS

Examiner Initial*	Cite No	Publication Number	Kind Code[1]	Publication Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
	1	20140080539	A1	2015-09-15	Scherzer, et al	

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FOREIGN PATENT DOCUMENTS

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	Attorney Docket Number	RALEP038D1C1C1C1C1

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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, pages(s), volume-issue number(s), publisher, city and/or country where published.	T[5]
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	Attorney Docket Number	RALEP038D1C1C1C1C1

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Please see 37 CFR 1.97 and 1.98 to make the appropriate selection(s):

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☐ The fee set forth in 37 CFR 1.17 (p) has been submitted herewith.

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A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

Signature	/Farshad Farjami/	Date (YYYY-MM-DD)	2023-05-25
Name/Print	Farshad Farjami	Registration Number	41014

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EFS ID:	48060569
Application Number:	18088450
International Application Number:	
Confirmation Number:	4358
Title of Invention:	Communications Device with Secure Data Path Processing Agents
First Named Inventor/Applicant Name:	Gregory G. Raleigh
Customer Number:	106963
Filer:	Michael Farjami/Evan Gunderman
Filer Authorized By:	Michael Farjami
Attorney Docket Number:	RALEP038D1C1C1C1C1
Receipt Date:	25-MAY-2023
Filing Date:	23-DEC-2022
Time Stamp:	17:30:46
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Information Disclosure Statement (IDS) Form (SB08)	P038D1C1C1C1C1_IDS7_May_25_23.pdf	1422123 11d98b6773c625ae413a0073e2419380d8f4701c	no	6

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Doc code: IDS
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	First Named Inventor	RALEIGH, GREGORY
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	Examiner Name	not yet assigned
	Attorney Docket Number	RALEP038D1C1C1C1C1

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Examiner Initial*	Cite No	Patent Number	Kind Code[1]	Issue Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
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Please see 37 CFR 1.97 and 1.98 to make the appropriate selection(s):

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☐ The fee set forth in 37 CFR 1.17 (p) has been submitted herewith.

☒ A certification statement is not submitted herewith.

SIGNATURE

A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

Signature	/Farshad Farjami/	Date (YYYY-MM-DD)	2023-05-24
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Confirmation Number:	4358
Title of Invention:	Communications Device with Secure Data Path Processing Agents
First Named Inventor/Applicant Name:	Gregory G. Raleigh
Customer Number:	106963
Filer:	Michael Farjami/Evan Gunderman
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Attorney Docket Number:	RALEP038D1C1C1C1C1
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1	Information Disclosure Statement (IDS) Form (SB08)	P038D1C1C1C1C1_IDS5_May_25_23.pdf	4491746 f0e86f60df67a9d6ca5049525c81c51436819b79	no	31
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Name/Print	Farshad Farjami	Registration Number	41014

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EFS ID:	48060430
Application Number:	18088450
International Application Number:	
Confirmation Number:	4358
Title of Invention:	Communications Device with Secure Data Path Processing Agents
First Named Inventor/Applicant Name:	Gregory G. Raleigh
Customer Number:	106963
Filer:	Michael Farjami/Evan Gunderman
Filer Authorized By:	Michael Farjami
Attorney Docket Number:	RALEP038D1C1C1C1C1
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Application Type:	Utility under 35 USC 111(a)

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Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Information Disclosure Statement (IDS) Form (SB08)	P038D1C1C1C1C1_IDS2_May_25_23.pdf	5567060 7129a2128cc81c7369ecc5d4613b1bb74b82f229	no	37
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Doc code: IDS
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	Application Number	18088450
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	First Named Inventor	RALEIGH, GREGORY
	Art Unit	
	Examiner Name	not yet assigned
	Attorney Docket Number	RALEP038D1C1C1C1C1

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Examiner Initial*	Cite No	Patent Number	Kind Code[1]	Issue Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
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	Art Unit	
	Examiner Name	not yet assigned
	Attorney Docket Number	RALEP038D1C1C1C1C1

	185	7797060	B2	2010-09-14	Grgic et al.	
	186	7797204		2010-09-14	BALENT, Bruce F.	
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	Art Unit	
	Examiner Name	not yet assigned
	Attorney Docket Number	RALEP038D1C1C1C1C1

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	Attorney Docket Number	RALEP038D1C1C1C1C1

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	Attorney Docket Number	RALEP038D1C1C1C1C1

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	Attorney Docket Number	RALEP038D1C1C1C1C1

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U.S.PATENT APPLICATION PUBLICATIONS

Examiner Initial*	Cite No	Publication Number	Kind Code[1]	Publication Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
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	Art Unit	
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	Attorney Docket Number	RALEP038D1C1C1C1C1

CERTIFICATION STATEMENT

Please see 37 CFR 1.97 and 1.98 to make the appropriate selection(s):

☐ That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).

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☐ See attached certification statement.

☐ The fee set forth in 37 CFR 1.17 (p) has been submitted herewith.

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SIGNATURE

A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

Signature	/Farshad Farjami/	Date (YYYY-MM-DD)	2023-05-25
Name/Print	Farshad Farjami	Registration Number	41014

This collection of information is required by 37 CFR 1.97 and 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 1 hour to complete, including gathering, preparing and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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EFS ID:	48060479
Application Number:	18088450
International Application Number:	
Confirmation Number:	4358
Title of Invention:	Communications Device with Secure Data Path Processing Agents
First Named Inventor/Applicant Name:	Gregory G. Raleigh
Customer Number:	106963
Filer:	Michael Farjami/Evan Gunderman
Filer Authorized By:	Michael Farjami
Attorney Docket Number:	RALEP038D1C1C1C1C1
Receipt Date:	25-MAY-2023
Filing Date:	23-DEC-2022
Time Stamp:	17:17:58
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Information Disclosure Statement (IDS) Form (SB08)	P038D1C1C1C1C1_IDS4_May_25_23.pdf	4485351 f7b627a73388be9701eb9a45c678c7f64638 2985	no	31

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APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
18/088,450	12/23/2022	Gregory G. Raleigh	RALEP038D1C1C1C1C1

CONFIRMATION NO. 4358

106963
Headwater Research LLC
C/O Farjami & Farjami LLP
26522 La Alameda Ave., Suite 360
Mission Viejo, CA 92691

PUBLICATION NOTICE



Title: Communications Device with Secure Data Path Processing Agents

Publication No.US-2023-0125134-A1
Publication Date:04/27/2023

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The above-identified application will be electronically published as a patent application publication pursuant to 37 CFR 1.211, et seq. The patent application publication number and publication date are set forth above.

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Attorney Docket No.: RALEP038D1C1C1C1C1

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of: **Raleigh** Application Serial No.: **18/088,450** Filed: **12/23/2022** Title: **Communications Device with Secure Data Path Processing Agents**	Group Art Unit: Unknwon Examiner: Unknown

REQUEST FOR CORRECTION TO FILING RECEIPT

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Respectfully submitted,
Farjami & Farjami LLP

By: */Farshad Farjami/*
Farshad Farjami
Reg. No. 41,014

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18/088,450	12/23/2022		830	RALEP038D1C1C1C1C1	1	1

CONFIRMATION NO. 4358

106963
Headwater Research LLC
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FILING RECEIPT

OC00000005277915Z

Date Mailed: 01/18/2023

Receipt is acknowledged of this non-provisional utility patent application. The application will be taken up for examination in due course. Applicant will be notified as to the results of the examination. Any correspondence concerning the application must include the following identification information: the U.S. APPLICATION NUMBER, FILING DATE, NAME OF FIRST INVENTOR, and TITLE OF INVENTION. Fees transmitted by check or draft are subject to collection.

Please verify the accuracy of the data presented on this receipt. If an error is noted on this Filing Receipt, please submit a written request for a corrected Filing Receipt, including a properly marked-up ADS showing the changes with strike-through for deletions and underlining for additions. If you received a "Notice to File Missing Parts" or other Notice requiring a response for this application, please submit any request for correction to this Filing Receipt with your reply to the Notice. When the USPTO processes the reply to the Notice, the USPTO will generate another Filing Receipt incorporating the requested corrections provided that the request is grantable.

Inventor(s)

Gregory G. Raleigh, Incline Village, ~~CA;~~ NV
James Lavine, Denver, NC;
Alireza Raissinia, Monte Sereno, CA;
Michael J. Sabin, Sunnyvale, CA;

Applicant(s)

Headwater Research LLC, Tyler, TX;

Assignment For Published Patent Application

Headwater Research LLC, Tyler, TX

Power of Attorney: None

Domestic Priority data as claimed by applicant

This application is a CON of 17/008,031 08/31/2020
which is a CON of 15/977,731 05/11/2018 PAT 10,771,980
which is a CON of 15/158,522 05/18/2016 PAT 9,980,146
which is a CON of 14/272,274 05/07/2014 ABN
which is a DIV of 13/247,998 09/28/2011 PAT 8,725,123
which claims benefit of 61/389,547 10/04/2010
and claims benefit of 61/387,243 09/28/2010
and claims benefit of 61/387,247 09/28/2010
and claims benefit of 61/407,358 10/27/2010
and claims benefit of 61/418,507 12/01/2010
and claims benefit of 61/418,509 12/01/2010

and claims benefit of 61/420,727 12/07/2010
and claims benefit of 61/422,565 12/13/2010
and claims benefit of 61/422,572 12/13/2010
and claims benefit of 61/422,574 12/13/2010
and claims benefit of 61/435,564 01/24/2011
and claims benefit of 61/472,606 04/06/2011
and is a CIP of 13/134,028 05/25/2011 PAT 8,589,541
which claims benefit of 61/348,022 05/25/2010
and claims benefit of 61/381,159 09/09/2010
and claims benefit of 61/381,162 09/09/2010
and claims benefit of 61/384,456 09/20/2010
and claims benefit of 61/385,020 09/21/2010
and is a CIP of 12/695,019 01/27/2010 PAT 8,275,830
and is a CIP of 12/695,020 01/27/2010 PAT 8,406,748
and is a CIP of 12/694,455 01/27/2010 PAT 8,402,111
and is a CIP of 13/134,005 05/25/2011 PAT 8,635,335
and is a CIP of 12/695,021 01/27/2010 PAT 8,346,225
and said 12/695,019 01/27/2010 claims benefit of 61/264,126 11/24/2009
and claims benefit of 61/270,353 07/06/2009
and said 12/695,020 01/27/2010 claims benefit of 61/275,208 08/25/2009
and claims benefit of 61/237,753 08/28/2009
and said 12/694,455 01/27/2010 claims benefit of 61/264,120 11/24/2009
and said 12/695,021 01/27/2010 claims benefit of 61/252,151 10/15/2009
and claims benefit of 61/252,153 10/15/2009
and is a CIP of 12/380,780 03/02/2009 PAT 8,839,388
which claims benefit of 61/206,354 01/28/2009
and claims benefit of 61/206,944 02/04/2009
and claims benefit of 61/207,393 02/10/2009
and claims benefit of 61/207,739 02/13/2009

Foreign Applications for which priority is claimed (You may be eligible to benefit from the **Patent Prosecution Highway** program at the USPTO. Please see http://www.uspto.gov for more information.) - None.
Foreign application information must be provided in an Application Data Sheet in order to constitute a claim to foreign priority. See 37 CFR 1.55 and 1.76.

Permission to Access Application via Priority Document Exchange: Yes

Permission to Access Search Results: Yes

Applicant may provide or rescind an authorization for access using Form PTO/SB/39 or Form PTO/SB/69 as appropriate.

If Required, Foreign Filing License Granted: 01/17/2023

The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is **US 18/088,450**

Projected Publication Date: 04/27/2023

Non-Publication Request: No

Early Publication Request: No
**** SMALL ENTITY ****

Title

Communications Device with Secure Data Path Processing Agents

Preliminary Class

Statement under 37 CFR 1.55 or 1.78 for AIA (First Inventor to File) Transition Applications: No

PROTECTING YOUR INVENTION OUTSIDE THE UNITED STATES

Since the rights granted by a U.S. patent extend only throughout the territory of the United States and have no effect in a foreign country, an inventor who wishes patent protection in another country must apply for a patent in a specific country or in regional patent offices. Applicants may wish to consider the filing of an international application under the Patent Cooperation Treaty (PCT). An international (PCT) application generally has the same effect as a regular national patent application in each PCT-member country. The PCT process **simplifies** the filing of patent applications on the same invention in member countries, but **does not result** in a grant of "an international patent" and does not eliminate the need of applicants to file additional documents and fees in countries where patent protection is desired.

Almost every country has its own patent law, and a person desiring a patent in a particular country must make an application for patent in that country in accordance with its particular laws. Since the laws of many countries differ in various respects from the patent law of the United States, applicants are advised to seek guidance from specific foreign countries to ensure that patent rights are not lost prematurely.

Applicants also are advised that in the case of inventions made in the United States, the Director of the USPTO must issue a license before applicants can apply for a patent in a foreign country. The filing of a U.S. patent application serves as a request for a foreign filing license. The application's filing receipt contains further information and guidance as to the status of applicant's license for foreign filing.

Applicants may wish to consult the USPTO booklet, "General Information Concerning Patents" (specifically, the section entitled "Treaties and Foreign Patents") for more information on timeframes and deadlines for filing foreign patent applications. The guide is available either by contacting the USPTO Contact Center at 800-786-9199, or it can be viewed on the USPTO website at http://www.uspto.gov/web/offices/pac/doc/general/index.html.

For information on preventing theft of your intellectual property (patents, trademarks and copyrights), you may wish to consult the U.S. Government website, http://www.stopfakes.gov. Part of a Department of Commerce initiative, this website includes self-help "toolkits" giving innovators guidance on how to protect intellectual property in specific countries such as China, Korea and Mexico. For questions regarding patent enforcement issues, applicants may call the U.S. Government hotline at 1-866-999-HALT (1-866-999-4258).

LICENSE FOR FOREIGN FILING UNDER

Title 35, United States Code, Section 184

Title 37, Code of Federal Regulations, 5.11 & 5.15

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NOT GRANTED

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U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	RALEP038D1C1C1C1C1
	Application Number	
Title of Invention	Communications Device with Secure Data Path Processing Agents	

The application data sheet is part of the provisional or nonprovisional application for which it is being submitted. The following form contains the bibliographic data arranged in a format specified by the United States Patent and Trademark Office as outlined in 37 CFR 1.76.
This document may be completed electronically and submitted to the Office in electronic format using the Electronic Filing System (EFS) or the document may be printed and included in a paper filed application.

Secrecy Order 37 CFR 5.2:

☐ Portions or all of the application associated with this Application Data Sheet may fall under a Secrecy Order pursuant to 37 CFR 5.2 (Paper filers only. Applications that fall under Secrecy Order may not be filed electronically.)

Inventor Information:

Inventor 1 — Remove

Legal Name

Prefix	Given Name	Middle Name	Family Name	Suffix
	Gregory	G.	Raleigh	

Residence Information (Select One) ◉ US Residency ○ Non US Residency ○ Active US Military Service

City	INCLINE VILLAGE	State/Province	~~CA~~ NV	Country of Residence	US

Mailing Address of Inventor:

Address 1	110 N. COLLEGE AVENUE
Address 2	SUITE 1116

City	Tyler	State/Province	TX
Postal Code	75702	Country	US

Inventor 2 — Remove

Legal Name

Prefix	Given Name	Middle Name	Family Name	Suffix
	James		Lavine	

Residence Information (Select One) ◉ US Residency ○ Non US Residency ○ Active US Military Service

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Mailing Address of Inventor:

Address 1	110 N. COLLEGE AVENUE
Address 2	SUITE 1116

City	Tyler	State/Province	TX
Postal Code	75702	Country	US

Inventor 3 — Remove

Legal Name

Prefix	Given Name	Middle Name	Family Name	Suffix
	Alireza		Raissinia	

Residence Information (Select One) ◉ US Residency ○ Non US Residency ○ Active US Military Service

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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	RALEP038D1C1C1C1C1
	Application Number	
Title of Invention	Communications Device with Secure Data Path Processing Agents	

City	Monte Sereno	State/Province	CA	Country of Residence	US

Mailing Address of Inventor:

Address 1	110 N. COLLEGE AVENUE		
Address 2	SUITE 1116		
City	Tyler	State/Province	TX
Postal Code	75702	Country i	US

Inventor 4 Remove

Legal Name

Prefix	Given Name	Middle Name	Family Name	Suffix
	Michael	J.	Sabin	

Residence Information (Select One) (•) US Residency ( ) Non US Residency ( ) Active US Military Service

City	Sunnyvale	State/Province	CA	Country of Residence	US

Mailing Address of Inventor:

Address 1	110 N. COLLEGE AVENUE		
Address 2	SUITE 1116		
City	Tyler	State/Province	TX
Postal Code	75702	Country i	US

All Inventors Must Be Listed - Additional Inventor Information blocks may be generated within this form by selecting the **Add** button. Add

Correspondence Information:

Enter either Customer Number or complete the Correspondence Information section below.
For further information see 37 CFR 1.33(a).

☐ **An Address is being provided for the correspondence Information of this application.**

Customer Number	106963		
Email Address	patent@headwaterllc.com	Add Email	Remove Email

Application Information:

Title of the Invention	Communications Device with Secure Data Path Processing Agents		
Attorney Docket Number	RALEP038D1C1C1C1C1	Small Entity Status Claimed	☒
Application Type	Nonprovisional		
Subject Matter	Utility		
Total Number of Drawing Sheets (if any)	16	Suggested Figure for Publication (if any)	

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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	RALEP038D1C1C1C1C1
	Application Number	
Title of Invention	Communications Device with Secure Data Path Processing Agents	

Filing By Reference:

Only complete this section when filing an application by reference under 35 U.S.C. 111(c) and 37 CFR 1.57(a). Do not complete this section if application papers including a specification and any drawings are being filed. Any domestic benefit or foreign priority information must be provided in the appropriate section(s) below (i.e., "Domestic Benefit/National Stage Information" and "Foreign Priority Information").

For the purposes of a filing date under 37 CFR 1.53(b), the description and any drawings of the present application are replaced by this reference to the previously filed application, subject to conditions and requirements of 37 CFR 1.57(a).

Application number of the previously filed application	Filing date (YYYY-MM-DD)	Intellectual Property Authority or Country

Publication Information:

☐ Request Early Publication (Fee required at time of Request 37 CFR 1.219)

☐ **Request Not to Publish.** I hereby request that the attached application not be published under 35 U.S.C. 122(b) and certify that the invention disclosed in the attached application **has not and will not** be the subject of an application filed in another country, or under a multilateral international agreement, that requires publication at eighteen months after filing.

Representative Information:

Representative information should be provided for all practitioners having a power of attorney in the application. Providing this information in the Application Data Sheet does not constitute a power of attorney in the application (see 37 CFR 1.32).
Either enter Customer Number or complete the Representative Name section below. If both sections are completed the customer Number will be used for the Representative Information during processing.

Please Select One:	◉ Customer Number	○ US Patent Practitioner	○ Limited Recognition (37 CFR 11.9)
Customer Number	106963		

Domestic Benefit/National Stage Information:

This section allows for the applicant to either claim benefit under 35 U.S.C. 119(e), 120, 121, 365(c), or 386(c) or indicate National Stage entry from a PCT application. Providing benefit claim information in the Application Data Sheet constitutes the specific reference required by 35 U.S.C. 119(e) or 120, and 37 CFR 1.78.
When referring to the current application, please leave the "Application Number" field blank.

Prior Application Status	Pending		Remove
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)
thisapplication	Continuation of	17008031	2020-08-31

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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	RALEP038D1C1C1C1C1
	Application Number	
Title of Invention	Communications Device with Secure Data Path Processing Agents	

Prior Application Status	Patented			Remove

Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)	Patent Number	Issue Date (YYYY-MM-DD)
17008031	Continuation of	15977731	2018-05-11	10771980	2020-08-19

Prior Application Status	Patented			Remove

Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)	Patent Number	Issue Date (YYYY-MM-DD)
15977731	Continuation of	15158522	2016-05-18	9980146	2018-05-02

Prior Application Status	Abandoned		Remove
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)
15158522	Continuation of	14272274	2014-05-07

Prior Application Status	Patented			Remove

Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)	Patent Number	Issue Date (YYYY-MM-DD)
14272274	Division of	13247998	2011-09-28	8725123	2014-05-13

Prior Application Status	Expired		Remove
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)
13247998	Claims benefit of provisional	61389547	2010-10-04
Prior Application Status	Expired		Remove
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)
13247998	Claims benefit of provisional	61387243	2010-09-28
Prior Application Status	Expired		Remove
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)
13247998	Claims benefit of provisional	61387247	2010-09-28
Prior Application Status	Expired		Remove
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)
13247998	Claims benefit of provisional	61407358	2010-10-27
Prior Application Status	Expired		Remove
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)
13247998	Claims benefit of provisional	61418507	2010-12-01

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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	RALEP038D1C1C1C1C1
	Application Number	
Title of Invention	Communications Device with Secure Data Path Processing Agents	

Prior Application Status	Expired		Remove
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)
13247998	Claims benefit of provisional	61418509	2010-12-01
Prior Application Status	Expired		Remove
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)
13247998	Claims benefit of provisional	61420727	2010-12-07
Prior Application Status	Expired		Remove
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)
13247998	Claims benefit of provisional	61422565	2010-12-13
Prior Application Status	Expired		Remove
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)
13247998	Claims benefit of provisional	61422572	2010-12-13
Prior Application Status	Expired		Remove
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)
13247998	Claims benefit of provisional	61422574	2010-12-13
Prior Application Status	Expired		Remove
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)
13247998	Claims benefit of provisional	61435564	2011-01-24
Prior Application Status	Expired		Remove
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)
13247998	Claims benefit of provisional	61472606	2011-04-06
Prior Application Status	Patented		Remove

Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)	Patent Number	Issue Date (YYYY-MM-DD)
13247998	Continuation in part of	13134028	2011-05-25	8589541	2013-11-19

Prior Application Status	Expired		Remove
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)
13134028	Claims benefit of provisional	61348022	2010-05-25

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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	RALEP038D1C1C1C1C1
	Application Number	
Title of Invention	Communications Device with Secure Data Path Processing Agents	

Prior Application Status	Expired		Remove
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)
13134028	Claims benefit of provisional	61381159	2010-09-09
Prior Application Status	Expired		Remove
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)
13134028	Claims benefit of provisional	61381162	2010-09-09
Prior Application Status	Expired		Remove
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)
13134028	Claims benefit of provisional	61384456	2010-09-20
Prior Application Status	Expired		Remove
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)
13134028	Claims benefit of provisional	61385020	2010-09-21

Prior Application Status	Patented				Remove
Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)	Patent Number	Issue Date (YYYY-MM-DD)
13134028	Continuation in part of	12695019	2010-01-27	8275830	2012-09-25
Prior Application Status	Patented				Remove
Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)	Patent Number	Issue Date (YYYY-MM-DD)
13134028	Continuation in part of	12695020	2010-01-27	8406748	2013-03-26
Prior Application Status	Patented				Remove
Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)	Patent Number	Issue Date (YYYY-MM-DD)
13134028	Continuation in part of	12694455	2010-01-27	8402111	2013-03-19
Prior Application Status	Patented				Remove
Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)	Patent Number	Issue Date (YYYY-MM-DD)
13134028	Continuation in part of	13134005	2011-05-25	8635335	2014-01-21
Prior Application Status	Patented				Remove
Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)	Patent Number	Issue Date (YYYY-MM-DD)
13134028	Continuation in part of	12695021	2010-01-27	8346225	2013-01-01

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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	RALEP038D1C1C1C1C1
	Application Number	
Title of Invention	Communications Device with Secure Data Path Processing Agents	

Prior Application Status	Expired		Remove
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)
12695019	Claims benefit of provisional	61264126	2009-11-24
Prior Application Status	Expired		Remove
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)
12695019	Claims benefit of provisional	61270353	2009-07-06
Prior Application Status	Expired		Remove
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)
12695020	Claims benefit of provisional	61275208	2009-08-25
Prior Application Status	Expired		Remove
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)
12695020	Claims benefit of provisional	61237753	2009-08-28
Prior Application Status	Expired		Remove
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)
12694455	Claims benefit of provisional	61264120	2009-11-24
Prior Application Status	Expired		Remove
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)
12695021	Claims benefit of provisional	61252151	2009-10-15
Prior Application Status	Expired		Remove
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)
12695021	Claims benefit of provisional	61252153	2009-10-15
Prior Application Status	Patented		Remove

Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)	Patent Number	Issue Date (YYYY-MM-DD)
12695021	Continuation in part of	12380780	2009-03-02	8839388	2014-09-16

Prior Application Status	Expired		Remove
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)
12380780	Claims benefit of provisional	61206354	2009-01-28

PTO/AIA/14 (11-15)
Approved for use through 04/30/2017. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	RALEP038D1C1C1C1C1
	Application Number	
Title of Invention	Communications Device with Secure Data Path Processing Agents	

Prior Application Status	Expired		Remove
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)
12380780	Claims benefit of provisional	61206944	2009-02-04
Prior Application Status	Expired		Remove
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)
12380780	Claims benefit of provisional	61207393	2009-02-10
Prior Application Status	Expired		Remove
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)
12380780	Claims benefit of provisional	61207739	2009-02-13

Additional Domestic Benefit/National Stage Data may be generated within this form by selecting the **Add** button.

Foreign Priority Information:

This section allows for the applicant to claim priority to a foreign application. Providing this information in the application data sheet constitutes the claim for priority as required by 35 U.S.C. 119(b) and 37 CFR 1.55. When priority is claimed to a foreign application that is eligible for retrieval under the priority document exchange program (PDX)[i] the information will be used by the Office to automatically attempt retrieval pursuant to 37 CFR 1.55(i)(1) and (2). Under the PDX program, applicant bears the ultimate responsibility for ensuring that a copy of the foreign application is received by the Office from the participating foreign intellectual property office, or a certified copy of the foreign priority application is filed, within the time period specified in 37 CFR 1.55(g)(1).

			Remove
Application Number	Country[i]	Filing Date (YYYY-MM-DD)	Access Code[i] (if applicable)

Additional Foreign Priority Data may be generated within this form by selecting the **Add** button.

Statement under 37 CFR 1.55 or 1.78 for AIA (First Inventor to File) Transition Applications

☐ This application (1) claims priority to or the benefit of an application filed before March 16, 2013 and (2) also contains, or contained at any time, a claim to a claimed invention that has an effective filing date on or after March 16, 2013.
NOTE: By providing this statement under 37 CFR 1.55 or 1.78, this application, with a filing date on or after March 16, 2013, will be examined under the first inventor to file provisions of the AIA.

PTO/AIA/14 (11-15)
Approved for use through 04/30/2017. 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 contains a valid OMB control number.

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	RALEP038D1C1C1C1C1
	Application Number	
Title of Invention	Communications Device with Secure Data Path Processing Agents	

Authorization or Opt-Out of Authorization to Permit Access:

When this Application Data Sheet is properly signed and filed with the application, applicant has provided written authority to permit a participating foreign intellectual property (IP) office access to the instant application-as-filed (see paragraph A in subsection 1 below) and the European Patent Office (EPO) access to any search results from the instant application (see paragraph B in subsection 1 below).

Should applicant choose not to provide an authorization identified in subsection 1 below, applicant **must opt-out** of the authorization by checking the corresponding box A or B or both in subsection 2 below.

NOTE: This section of the Application Data Sheet is **ONLY** reviewed and processed with the **INITIAL** filing of an application. After the initial filing of an application, an Application Data Sheet cannot be used to provide or rescind authorization for access by a foreign IP office(s). Instead, Form PTO/SB/39 or PTO/SB/69 must be used as appropriate.

1. Authorization to Permit Access by a Foreign Intellectual Property Office(s)

A. Priority Document Exchange (PDX) - Unless box A in subsection 2 (opt-out of authorization) is checked, the undersigned hereby **grants the USPTO authority** to provide the European Patent Office (EPO), the Japan Patent Office (JPO), the Korean Intellectual Property Office (KIPO), the State Intellectual Property Office of the People's Republic of China (SIPO), the World Intellectual Property Organization (WIPO), and any other foreign intellectual property office participating with the USPTO in a bilateral or multilateral priority document exchange agreement in which a foreign application claiming priority to the instant patent application is filed, access to: (1) the instant patent application-as-filed and its related bibliographic data, (2) any foreign or domestic application to which priority or benefit is claimed by the instant application and its related bibliographic data, and (3) the date of filing of this Authorization. See 37 CFR 1.14(h)(1).

B. Search Results from U.S. Application to EPO - Unless box B in subsection 2 (opt-out of authorization) is checked, the undersigned hereby **grants the USPTO authority** to provide the EPO access to the bibliographic data and search results from the instant patent application when a European patent application claiming priority to the instant patent application is filed. See 37 CFR 1.14(h)(2).

The applicant is reminded that the EPO's Rule 141(1) EPC (European Patent Convention) requires applicants to submit a copy of search results from the instant application without delay in a European patent application that claims priority to the instant application.

2. Opt-Out of Authorizations to Permit Access by a Foreign Intellectual Property Office(s)

☐ A. Applicant **DOES NOT** authorize the USPTO to permit a participating foreign IP office access to the instant application-as-filed. If this box is checked, the USPTO will not be providing a participating foreign IP office with any documents and information identified in subsection 1A above.

☐ B. Applicant **DOES NOT** authorize the USPTO to transmit to the EPO any search results from the instant patent application. If this box is checked, the USPTO will not be providing the EPO with search results from the instant application.

NOTE: Once the application has published or is otherwise publicly available, the USPTO may provide access to the application in accordance with 37 CFR 1.14.

PTO/AIA/14 (11-15)
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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	RALEP038D1C1C1C1C1
	Application Number	
Title of Invention	Communications Device with Secure Data Path Processing Agents	

Applicant Information:

Providing assignment information in this section does not substitute for compliance with any requirement of part 3 of Title 37 of CFR to have an assignment recorded by the Office.

Applicant 1

If the applicant is the inventor (or the remaining joint inventor or inventors under 37 CFR 1.45), this section should not be completed. The information to be provided in this section is the name and address of the legal representative who is the applicant under 37 CFR 1.43; or the name and address of the assignee, person to whom the inventor is under an obligation to assign the invention, or person who otherwise shows sufficient proprietary interest in the matter who is the applicant under 37 CFR 1.46. If the applicant is an applicant under 37 CFR 1.46 (assignee, person to whom the inventor is obligated to assign, or person who otherwise shows sufficient proprietary interest) together with one or more joint inventors, then the joint inventor or inventors who are also the applicant should be identified in this section.

Clear

◉ Assignee	○ Legal Representative under 35 U.S.C. 117	○ Joint Inventor
○ Person to whom the inventor is obligated to assign.	○ Person who shows sufficient proprietary interest	

If applicant is the legal representative, indicate the authority to file the patent application, the inventor is:

Name of the Deceased or Legally Incapacitated Inventor:

If the Applicant is an Organization check here. ☒

Organization Name	Headwater Research LLC		
Mailing Address Information For Applicant:			
Address 1	110 N. COLLEGE AVENUE		
Address 2	SUITE 1116		
City	Tyler	**State/Province**	TX
Country	US	Postal Code	75702
Phone Number	903-201-6212	Fax Number	
Email Address	patent@headwaterllc.com		

Additional Applicant Data may be generated within this form by selecting the Add button.

Assignee Information including Non-Applicant Assignee Information:

Providing assignment information in this section does not substitute for compliance with any requirement of part 3 of Title 37 of CFR to have an assignment recorded by the Office.

PTO/AIA/14 (11-15)
Approved for use through 04/30/2017. OMB 0651-0032
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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	RALEP038D1C1C1C1C1
	Application Number	
Title of Invention	Communications Device with Secure Data Path Processing Agents	

Assignee 1

Complete this section if assignee information, including non-applicant assignee information, is desired to be included on the patent application publication. An assignee-applicant identified in the "Applicant Information" section will appear on the patent application publication as an applicant. For an assignee-applicant, complete this section only if identification as an assignee is also desired on the patent application publication.

If the Assignee or Non-Applicant Assignee is an Organization check here. ☒

Organization Name	Headwater Research LLC

Mailing Address Information For Assignee including Non-Applicant Assignee:

Address 1	110 N. COLLEGE AVENUE		
Address 2	SUITE 1116		
City	Tyler	**State/Province**	TX
Country i	US	Postal Code	75702
Phone Number	903-201-6212	Fax Number	
Email Address	patent@headwaterllc.com		

Additional Assignee or Non-Applicant Assignee Data may be generated within this form by selecting the Add button.

Signature:

NOTE: This Application Data Sheet must be signed in accordance with 37 CFR 1.33(b). **However, if this Application Data Sheet is submitted with the INITIAL filing of the application and either box A or B is not checked in subsection 2 of the "Authorization or Opt-Out of Authorization to Permit Access" section, then this form must also be signed in accordance with 37 CFR 1.14(c).**

This Application Data Sheet **must** be signed by a patent practitioner if one or more of the applicants is a **juristic entity** (e.g., corporation or association). If the applicant is two or more joint inventors, this form must be signed by a patent practitioner, **all** joint inventors who are the applicant, or one or more joint inventor-applicants who have been given power of attorney (e.g., see USPTO Form PTO/AIA/81) on behalf of **all** joint inventor-applicants.

See 37 CFR 1.4(d) for the manner of making signatures and certifications.

Signature	/Farshad Farjami/			Date (YYYY-MM-DD)	2022-12-23
First Name	FARSHAD	Last Name	FARJAMI	Registration Number	41,014

Additional Signature may be generated within this form by selecting the Add button.

PTO/AIA/14 (11-15)
Approved for use through 04/30/2017. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	RALEP038D1C1C1C1C1
	Application Number	
Title of Invention	Communications Device with Secure Data Path Processing Agents	

This collection of information is required by 37 CFR 1.76. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 23 minutes to complete, including gathering, preparing, and submitting the completed application data sheet form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

Electronic Acknowledgement Receipt	
EFS ID:	47392355
Application Number:	18088450
International Application Number:	
Confirmation Number:	4358
Title of Invention:	Communications Device with Secure Data Path Processing Agents
First Named Inventor/Applicant Name:	Gregory G. Raleigh
Customer Number:	106963
Filer:	Michael Farjami/Evan Gunderman
Filer Authorized By:	Michael Farjami
Attorney Docket Number:	RALEP038D1C1C1C1C1
Receipt Date:	18-JAN-2023
Filing Date:	23-DEC-2022
Time Stamp:	20:12:04
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		RALEP038D1C1C1C1C1_Req_For_Corrected_Filing_Receipt_Jan_18_23.pdf	507687 433d2fa349cb20f79af80ededdd0fa7dd2c93968	yes	18

	Multipart Description/PDF files in .zip description		
	Document Description	**Start**	**End**
	Transmittal Letter	1	1
	Request for Corrected Filing Receipt	2	6
	Application Data Sheet	7	18
Warnings:			
Information:			
	Total Files Size (in bytes):	507687	

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

New Applications Under 35 U.S.C. 111
If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.
National Stage of an International Application under 35 U.S.C. 371
If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.
New International Application Filed with the USPTO as a Receiving Office
If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

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ELECTRONIC TRANSMISSION COVER SHEET

Date: January 18, 2023

To: United States Patent and Trademark Office
Office of Initial Patent Examination
Examiner: Unknown; Art Unit: Unknown

Re: **Application Serial No.: 18/088,450**
Filing Date: 12/23/2022; First-Named Inventor: Raleigh
Attorney Docket No.: RALEP038D1C1C1C1C1

From: Farjami & Farjami LLP

Number of pages including the cover sheet: 18

Message:

Enclosed, please find:

1. Request for Correction to Filing Receipt;
2. Revised Application Data Sheet; and
3. Copy of USPTO Filing Receipt dated January 18, 2023.

Authorization is hereby given to the Commissioner to charge any fees associated with this communication or credit any overpayment to Deposit Account **50-0731**.

Thank you.

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PATENT APPLICATION FEE DETERMINATION RECORD

Substitute for Form PTO-875

Application or Docket Number: 18/088,450

APPLICATION AS FILED - PART I

FOR	(Column 1) NUMBER FILED	(Column 2) NUMBER EXTRA	SMALL ENTITY RATE($)	SMALL ENTITY FEE($)	OR	OTHER THAN SMALL ENTITY RATE($)	OTHER THAN SMALL ENTITY FEE($)
BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A	N/A	80		N/A	
SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A	N/A	350		N/A	
EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A	400		N/A	
TOTAL CLAIMS (37 CFR 1.16(i))	1 minus 20 =	* 0	x =	0	OR		
INDEPENDENT CLAIMS (37 CFR 1.16(h))	1 minus 3 =	*	x =	0			
APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is $310 ($155 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).			0			
MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))				0			
* If the difference in column 1 is less than zero, enter "0" in column 2.			TOTAL	830		TOTAL	

APPLICATION AS AMENDED - PART II

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

		(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	RATE($)	ADDITIONAL FEE($)	OR	RATE($)	ADDITIONAL FEE($)
AMENDMENT B	Total (37 CFR 1.16(i))	*	Minus	**	=	x =		OR	x =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=	x =		OR	x =	
	Application Size Fee (37 CFR 1.16(s))									
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							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 found in the appropriate box in column 1.