05-12-03 10434948.050803

PTO/SB/05 (03-01)
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UTILITY PATENT APPLICATION TRANSMITTAL

(Only for new nonprovisional applications under 37 CFR 1.53(b))

Attorney Docket No.	DACOSTAF.PT1
First Inventor	Francis daCosta
Title	High Performance Wireless Networks Using ...
Express Mail Label No.	EL046701720US

APPLICATION ELEMENTS

See MPEP chapter 600 concerning utility patent application contents.

1. [✔] Fee Transmittal Form (e.g., PTO/SB/17) *(Submit an original and a duplicate for fee processing)*
2. [✔] Applicant claims small entity status. See 37 CFR 1.27.
3. [✔] Specification [*Total Pages* 67] *(preferred arrangement set forth below)*
   - Descriptive title of the invention
   - Cross Reference to Related Applications
   - Statement Regarding Fed sponsored R & D
   - Reference to sequence listing, a table, or a computer program listing appendix
   - Background of the Invention
   - Brief Summary of the Invention
   - Brief Description of the Drawings (*if filed*)
   - Detailed Description
   - Claim(s)
   - Abstract of the Disclosure
4. [✔] Drawing(s) *(35 U.S.C. 113)* [*Total Sheets* 14]
5. Oath or Declaration [*Total Pages* 4]
   a. [✔] Newly executed (original or copy)
   b. [ ] Copy from a prior application (37 CFR 1.63 (d)) *(for continuation/divisional with Box 18 completed)*
      i. [ ] DELETION OF INVENTOR(S) Signed statement attached deleting inventor(s) named in the prior application, see 37 CFR 1.63(d)(2) and 1.33(b).
6. [ ] Application Data Sheet. See 37 CFR 1.76

ADDRESS TO: Assistant Commissioner for Patents, Box Patent Application, Washington, DC 20231

7. [ ] CD-ROM or CD-R in duplicate, large table or Computer Program (*Appendix*)
8. Nucleotide and/or Amino Acid Sequence Submission (*if applicable, all necessary*)
   a. [ ] Computer Readable Form (CRF)
   b. Specification Sequence Listing on:
      i. [ ] CD-ROM or CD-R (2 copies); or
      ii. [ ] paper
   c. [ ] Statements verifying identity of above copies

ACCOMPANYING APPLICATION PARTS

9. [ ] Assignment Papers (cover sheet & document(s))
10. [ ] 37 CFR 3.73(b) Statement *(when there is an assignee)* [✔] Power of Attorney
11. [ ] English Translation Document *(if applicable)*
12. [ ] Information Disclosure Statement (IDS)/PTO-1449 [ ] Copies of IDS Citations
13. [ ] Preliminary Amendment
14. [✔] Return Receipt Postcard (MPEP 503) *(Should be specifically itemized)*
15. [ ] Certified Copy of Priority Document(s) *(if foreign priority is claimed)*
16. [ ] Nonpublication Request under 35 U.S.C. 122 (b)(2)(B)(i). Applicant must attach form PTO/SB/35 or its equivalent.
17. [ ] Other: .....

18. If a CONTINUING APPLICATION, *check appropriate box, and supply the requisite information below and in a preliminary amendment, or in an Application Data Sheet under 37 CFR 1.76:*

[ ] Continuation [ ] Divisional [ ] Continuation-in-part (CIP) of prior application No.: _____/_____

Prior application information: Examiner: _____ Group Art Unit: _____

For CONTINUATION OR DIVISIONAL APPS only: The entire disclosure of the prior application, from which an oath or declaration is supplied under Box 5b, is considered a part of the disclosure of the accompanying continuation or divisional application and is hereby incorporated by reference. The incorporation can only be relied upon when a portion has been inadvertently omitted from the submitted application parts.

19. CORRESPONDENCE ADDRESS

[ ] *Customer Number or Bar Code Label* *(Insert Customer No. or Attach bar code label here)* or [✔] *Correspondence address below*

Name	Otto O. Lee				
Address	Intellectual Property Law Group LLP 12 South First St., Suite 1205				
City	San Jose	State	CA	Zip Code	95113
Country	U.S.A.	Telephone	408-286-8933	Fax	408-286-8932

Name (Print/Type)	Juneko Jackson	Registration No. (Attorney/Agent)	48,870
Signature	[signature]	Date	05/08/2003

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[redacted]

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FEE TRANSMITTAL for FY 2003

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

☑ Applicant claims small entity status. See 37 CFR 1.27

TOTAL AMOUNT OF PAYMENT ($) 393

Complete if Known	
Application Number	
Filing Date	
First Named Inventor	Francis daCosta
Examiner Name	
Art Unit	
Attorney Docket No.	DACOSTAF.PT1

METHOD OF PAYMENT *(check all that apply)*

☑ Check ☐ Credit card ☐ Money Order ☐ Other ☐ None

☑ Deposit Account:

Deposit Account Number: 50-1037

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The Commissioner is authorized to: *(check all that apply)*

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FEE CALCULATION

1. BASIC FILING FEE

Large Entity Fee Code	Large Entity Fee ($)	Small Entity Fee Code	Small Entity Fee ($)	Fee Description	Fee Paid
1001	750	2001	375	Utility filing fee	375.00
1002	330	2002	165	Design filing fee	
1003	520	2003	260	Plant filing fee	
1004	750	2004	375	Reissue filing fee	
1005	160	2005	80	Provisional filing fee	

SUBTOTAL (1) ($) 375.00

2. EXTRA CLAIM FEES FOR UTILITY AND REISSUE

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

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

SUBTOTAL (2) ($) 18.00

***or number previously paid, if greater; For Reissues, see above*

FEE CALCULATION (continued)

3. ADDITIONAL FEES

Large Entity Fee Code	Large Entity Fee ($)	Small Entity Fee Code	Small Entity Fee ($)	Fee Description	Fee Paid
1051	130	2051	65	Surcharge - late filing fee or oath	
1052	50	2052	25	Surcharge - late provisional filing fee or cover sheet	
1053	130	1053	130	Non-English specification	
1812	2,520	1812	2,520	For filing a request for *ex parte* reexamination	
1804	920*	1804	920*	Requesting publication of SIR prior to Examiner action	
1805	1,840*	1805	1,840*	Requesting publication of SIR after Examiner action	
1251	110	2251	55	Extension for reply within first month	
1252	410	2252	205	Extension for reply within second month	
1253	930	2253	465	Extension for reply within third month	
1254	1,450	2254	725	Extension for reply within fourth month	
1255	1,970	2255	985	Extension for reply within fifth month	
1401	320	2401	160	Notice of Appeal	
1402	320	2402	160	Filing a brief in support of an appeal	
1403	280	2403	140	Request for oral hearing	
1451	1,510	1451	1,510	Petition to institute a public use proceeding	
1452	110	2452	55	Petition to revive - unavoidable	
1453	1,300	2453	650	Petition to revive - unintentional	
1501	1,300	2501	650	Utility issue fee (or reissue)	
1502	470	2502	235	Design issue fee	
1503	630	2503	315	Plant issue fee	
1460	130	1460	130	Petitions to the Commissioner	
1807	50	1807	50	Processing fee under 37 CFR 1.17(q)	
1806	180	1806	180	Submission of Information Disclosure Stmt	
8021	40	8021	40	Recording each patent assignment per property (times number of properties)	
1809	750	2809	375	Filing a submission after final rejection (37 CFR 1.129(a))	
1810	750	2810	375	For each additional invention to be examined (37 CFR 1.129(b))	
1801	750	2801	375	Request for Continued Examination (RCE)	
1802	900	1802	900	Request for expedited examination of a design application	

Other fee (specify) _____

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SUBMITTED BY				(Complete *if applicable*)	
Name (Print/Type)	Juneko Jackson	*Registration No. (Attorney/Agent)*	48,870	*Telephone* 408-286-8933	
Signature				*Date*	May 8, 2003

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SAN DIEGO
Emerald Plaza Center
402 West Broadway, Suite 400
San Diego, California 92101

SEATTLE
Two Union Square Center
601 Union Street, 42nd Floor
Seattle, Washington 98101



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Old Bank of America Building
12 South First Street, 12th Floor
San Jose, California 95113
TEL: 408.286.8933
FAX: 408.286.8932
URL:www.iplg.com

LOS ANGELES
2600 Mission Street
Suite 100
San Marino, California 91108

WASHINGTON D.C.
601 Pennsylvania Avenue Center
South Building Suite 900
Washington, D.C. 20004

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10/434948
05/08/03

May 8, 2003

VIA EXPRESS MAIL
EL046701720US

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

Re: NEW UTILITY NON-PROVISIONAL PATENT APPLICATION

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

Dear Sir:

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

Please find enclosed the following:

1. a cover letter;
2. a utility transmittal letter;
3. a fee transmittal;
4. an application of a total of 67 pages: including a written description (30 pages), a set of claims (4 pages), an abstract (1 page), an Appendix A (12 pages), an Appendix B (20 pages);
5. a set of drawings (14 sheets);
6. a signed joint declaration/power of attorney by the inventor;
7. a check of $393.00 to cover the filing fee for the patent application (small entity) including the two extra claims fee; and
8. a return receipt postcard.

The commissioner is hereby authorized to charge any underpayment or credit any overpayment to Deposit Account Number 501037. If you should have any questions, please contact us.

Sincerely,
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Juneko Jackson (Reg. No.: 48,870)
Enclosures

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"EXPRESS MAIL" mailing label number: EL046701720US Date of Deposit: May 8, 2003.
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Juneko Jackson
Name of Person Mailing Paper or Fee

Signature

[redacted]

HIGH PERFORMANCE WIRELESS NETWORKS USING DISTRIBUTED CONTROL

Inventors: Francis daCosta and Sriram Dayanandan

CROSS-REFERENCE

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

FIELD OF THE INVENTION

[0002] The present invention describes an adaptive software layer for a distributed set of wireless communication devices that communicate with each other in a wireless network. The software control layer addresses low latency requirements (for applications such as voice) and high throughput requirements (for applications involving data transfer). One embodiment of the present invention provides the software control for wireless (devices, such as, but not limited to Access Points, employed in a convergent enterprise network supporting voice, video and data. A topical application of the software control layer is a home or personal networking environment (PAN) using Ultra Wide Band or Wi-Fi as the communications medium. Another topical application of the adaptive software control layer is extending wireless communication range using mesh networks for Metropolitan Area Networks (MAN). Lastly, the software control layer is also relevant to both home and enterprise Wireless Local Area Networks (WLANS),

BACKGROUND OF THE INVENTION

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

[redacted]

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

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

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

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

[0006] Changing the rate the queue is serviced can also be accomplished by specialized communications between wireless communication devices such as Access Point (AP) nodes and the access server to ensure that voice and data, for example, are serviced at different time intervals. Unfortunately, this adversely affects scalability and redundancy of the system: the access server is now micromanaging the network and has become a single point of failure. A paramount concern of any network is distributed control, especially a network handling voice, video and data.

[redacted]

[0007] Another shortcoming of a centralized approach – central control and central execution - is the cost of maintaining a central control point with all intelligence and control at one location and dumb communication devices distributed in the enterprise. The cost of the central control point is high, , and the dumb access points are not any less expensive than smart access points – since the smarts is in the software. Thus a distributed approach is far less expensive –. In addition to being more cost effective a distributed approach is more fault tolerant and has built in fail-safe redundancy. The only way to get redundancy out of centralized approaches is to buy multiple central control points – an expensive approach.

[0008] Building a reliable wireless network comes with other constraints specific to wireless. Some routing paths may be best for voice and video, others for data. In Ethernet applications separate routing paths is easily accomplished. But in a wireless network, operating over radio, the cost of associating and disassociating with a relay node - to switch to new routing paths - is prohibitive. Multiple radios, supporting separate voice and data channels is possible but expensive. It is preferable, therefore, if each AP node can support both voice and data transmissions with a one "channel".

[0009] Furthermore, mesh networks have been around for years now, the Internet being an excellent example. Routers exchange information about each other and build up their routing tables, and use the entries in the routing table to make routing decisions. Although they work, these algorithms are sub-optimal at best and are more oriented towards wired or wire-like interfaces, which are exclusive "non-shared" communication mediums. Wireless Personal Area Networks (WPANs) pose an entirely different set of challenges for AD-HOC networks because of the following reasons: shared non exclusive medium with finite communication channels; dynamically changing environment; shorter distances; used by resource constrained low power devices. There is therefore a need for an approach to solving these sets of challenges, using a low footprint distributed adaptive control layer that is aware of the above set of problems.

[redacted]

SUMMARY OF THE INVENTION

[0010] Accordingly, there is a need for, and an objective of the present invention, to develop an adaptive wireless network, based on "smart" communication devices such as Access Points (AP) that provide embedded intelligence at the edge of the network, are application aware and provide cost effective distributed sensing and control of the network. An additional objective of this invention is to allow the characteristics of the network to be set by a centralized access server, which can thus "tune" the character of the network to be anything between the two extremes of low latency to high throughput, based on the needs of applications running in the enterprise. The invention also supports the possibility of running multiple types of networks supporting anything between the two extremes of low latency and high throughput, using multiple radios at each node for each distinct type of network.

[0011] As an illustration of central control but distributed intelligence, consider **Fig. 1**, where the star network depicted has low latency (See **Fig. 1B** for the latency in the status panel). However, since the signal strength varies inversely with the distance from the Access Point, as shown in **Fig. 1A** in the look up table (control panel) on the top left corner, the price is poor throughput. If all devices are required to connect directly to the root node as shown, regardless of their distance from the root node, then the overall throughput of the network can be low.

[0012] Since the signal strength varies inversely with the distance, it may be advantageous, from the perspective of better signal strength and overall better throughput for some AP nodes to connect to an intermediate AP rather than to the root, as shown in **Fig. 2C.** In **Fig. 2**, the throughput of the network has increased, see **Fig. 2B**, because two nodes are connecting to other nodes (relays) with an overall increased throughput from 44.1 to 62.2. (See **Figs. 1B and 2B).**

[0013] The number 44.1 is a measure of the throughput computed based on the look up table shown in **Figs. 1** and **2** where distance from the root causes a rapid decrease in throughput. The throughput is expressed as a percentage, where a connection to the root at zero distance would be the maximum possible throughput: 100%.

[redacted]

[0014] While the throughput increased to 62.2, the tradeoff is more hops, resulting in a loss of latency for higher throughput. In **Fig. 2**, the latency has increased as a measure of the number of hops from an Access Point (AP) to the root node. It is 1.6, since some nodes now are 2 hops away from the root node.

[0015] The objective of this invention is to allow the Access Server to set some latency/throughput constraints that causes each AP node to change their relationships to each other and consequently the character of the network. Control parameters, set by an access server can then tune the wireless network to provide a mix between the two extremes of max throughput and low latency. As shown in **Fig. 3,** parameters set by the access server cause the network to self configure providing an average latency to 1.3 from 1.6. (See **Figs. 3B and 2B).** Even though the throughput has reduced from 62.2 to 57.0%, it is still better than 44.1, the case in **Fig. 1.**

[0016] The approach taken to modify the network is completely decentralized - the changes in the network take place with algorithms running in each AP node. The Access Server does not change the characteristics of each node, it simply sets the parameters governing the characteristic of the network – and let the AP nodes reconfigure their relationships to meet the objectives set by the Access Server. Thus the Access Server can control the behavior of the network without necessarily controlling the behavior of each node of the network. Benefits of this approach include a highly scaleable, redundant wireless network. Some other benefits include:

1. Installs out of the box. No site survey or installation involved, since system self configures
2. Network is redundant. Mesh network formalism is supported, ensuring multiple paths.
3. Load balancing supported: Network nodes reroute data to avoid load-congested nodes.
4. No single point of failure. If a node "dies", another optimal routing path is selected
5. Decentralized execution: Algorithms controlling the network nodes resident in every node.
6. Central control: Setting system level "tuning" parameters changes network configuration

[redacted]

7. Network application aware: latency/throughput profiles defined in the access server
8. Application awareness: Based on the application profile in the access server, the network configures itself to satisfy all application requirements as best as possible.
9. Network is very scaleable – since execution is completely decentralized

[0017] Uses of a self configuring application aware wireless network range from providing voice/data access to warehouses, factory floors, communications with process control equipment to home networking applications involving voice/data/video streaming. Some applications under consideration include:

- Monitoring process control equipment with a Publish/Subscribe Stream server built on top of the wireless network. Examples include chemical plants, medical devices, industrial controls.
- Voice over IP (VOIP) based low cost communication devices for mobility within enterprises
- Video streaming over wireless for remote surveillance.

[0018] Furthermore, another object of the embodiment of the present invention, is to solve the problems associated with ad-hoc wireless personal area networks by using a low footprint distributed adaptive control layer with algorithm that is aware of such problems (e.g. shared non exclusive medium with finite communication channels; dynamically changing environment; shorter distances; used by resource constrained low power devices).

[0019] These and other embodiments of the present invention are further made apparent, in the remainder of the present document, to those of ordinary skill in the art.

BRIEF DESCRIPTION OF DRAWINGS

[0020] In order to more fully describe embodiments of the present invention, reference is made to the accompanying drawings. These drawings are not to be considered limitations in the scope of the invention, but are merely illustrative.

[redacted]

[0021] FIG. 1 illustrates a wireless network in star configuration, with low latency but poor throughput according to an embodiment of the present invention; Fig. 1A illustrates the control panel; Fig. 1B illustrates the status panel and Fig. 1C illustrates the wireless network.

[0022] FIG. 2 illustrates a wireless network with improved throughput but poor latency according to an embodiment of the present invention; Fig. 2A illustrates the control panel; Fig. 2B illustrates the status panel and Fig. 2C illustrates the wireless network.

[0023] FIG. 3 shows the result of how wireless network self configures to meet Access Server requirements according to an embodiment of the present invention; Fig. 3A illustrates the control panel; Fig. 3B illustrates the status panel and Fig. 3C illustrates the wireless network.

[0024] FIG. 4A indicates terminology for variables used by parent selection and load balancing algorithms according to an embodiment of the present invention.

[0025] FIG. 4B illustrates Routing paths selected for maximizing throughput according to an embodiment of the present invention.

[0026] FIG. 5 illustrates Routing paths selected for low latency according to an embodiment of the present invention.

[0027] FIG. 6 illustrates how progressively changing the latency cost factor affects the network configuration according to an embodiment of the present invention.

[0028] FIG. 7 illustrates how node increases its Cost of connectivity from 0 to 3 to reduce congestion according to an embodiment of the present invention.

[0029] FIG. 8 illustrates how progressively increasing the cost of connectivity causes children to seek other routes according to an embodiment of the present invention.

[redacted]

[0030] FIG. 9 shows the modeling of both the DCF and PCF algorithms described, based on 802.11X specifications according to an embodiment of the present invention.

[0031] FIG. 10 illustrates how the worst timing constraint for an Isochronous PCF mode would be 5T according to an embodiment of the present invention.

[0032] FIG. 11 shows the Key distribution for AES symmetric private key distribution under PKI for distribution according to an embodiment of the present invention.

[0033] FIG. 12 illustrates ACG RTOS running algorithms in Intel PXA250 emulation environment according to an embodiment of the present invention.

[0034] FIG. 13 illustrates the process for low footprint code generation from Java or C, with ACG RTOS library components according to an embodiment of the present invention.

[0035] FIG. 14 illustrates the implementation of a method to generate low footprint code from Java according to an embodiment of the present invention.

[0036] FIG. 15 illustrates an implementation of a complete system including three components of one product offering, according to an embodiment of the present invention.

[0037] FIG. 16 illustrates an implementation of a Dynamic Channel Allocation Scheme to ensure non-interfering radio channel selection (enlargement) according to an embodiment of the present invention.

[0038] FIG. 17 illustrates an implementation of a Dynamic Channel Allocation Scheme to ensure non-interfering radio channel selection according to an embodiment of the present invention.

[redacted]

[0039] FIG. 18 illustrates an implementation of a Dynamic Channel Allocation Scheme to ensure seamless roaming in a multi hop mesh network according to an embodiment of the present invention.

DETAILED DESCRIPTION OF SPECIFIC EMBODIMENTS

[0040] The description above and below and the drawings of the present document focus on one or more currently preferred embodiments of the present invention and also describe some exemplary optional features and/or alternative embodiments. The description and drawings are for the purpose of illustration and not limitation. Those of ordinary skill in the art would recognize variations, modifications, and alternatives. Such variations, modifications, and alternatives are also within the scope of the present invention. Section titles are terse and are for convenience only.

[0041] The object of this invention is a new type of wireless AP nodes that:

- Configure them selves based on considerations, set by the access server for the network.
- Support automatic load balancing: AP nodes avoid data congestion hot spots.
- Support fail over: if one node dies, nodes connected to it automatically switch to another.
- Is fully functional when powered up: no installation procedure or site survey required.
- Support software upgrades to them selves through a communications interface
- Support both isochronous and asynchronous application requirements in the same network
- Support the wireless equivalent of switches
- Supports centralized control and is application aware based on settings provided by the access server.

[0042] Each AP Node is implemented as a self-contained embedded system, with all algorithms resident in its operating system. The normal day-to-day functioning of the AP node is based entirely on resident control algorithms. Upgrades are possible through a communications interface described later.

[redacted]

Description of system components

[0043] There are three typical components of the system proposed. In **Fig. 1**:

1. The Access server **(10)** "manages" the network, by setting control parameters for the network
2. The "Root" Node **(20)**, is connected to the Access Server through an Ethernet link
3. Wireless communication Devices such as AP nodes **(30)** that connect to the Root or other AP nodes devices to form a communications path terminating at an Ethernet link.

To enable voice and data types of requirements to be serviced satisfactorily within the same network configuration, the access server **(10)** maintains a list of applications and their latency and throughput requirements. Based on those application "profiles", the access server **(10)** sets the Network "profile" that each wireless communication device **(30)** in the network strives towards.

[0044] In one implementation of the invention, the root node **(20)** acts as the interface between the wireless communication devices **(30)** and the Ethernet. All wireless devices **(30)** communicate to the Ethernet through a root node **(20)**, which is has a radio interface and an Ethernet link.

[0045] In that implementation of the invention, other wireless communications devices or AP nodes **(30)** have two radios: one to communicate with its clients which includes wireless devices such as laptops, VOIP wireless phones etc. Clients to one AP node **(30)** also include other AP nodes **(30)** connecting to it. In **Fig. 4B**, for example, Node 002 has nodes 005 connected to it. In addition all nodes **(30)** may have local clients – laptops etc. – connected to them directly. Each node, therefore, is dual purpose: It acts as a relay node – relaying traffic from a (child) node and also acts as an Access Point to local devices. In this implementation of the invention, redundancy is assured because of the mesh characteristic of the network.

[redacted]

[0046] In an alternate implementation of the invention, all Wireless AP Nodes are roots- they are all wired. In this case the network is not a mesh network and redundancy is dependant on having a large number of nearby AP nodes. However there is still communication between the nodes so load balancing and wireless switching, as described later, is supported.

Description of Variables used by Algorithm

[0047] **Figs. 4A, 4B**, describe the variables used by the algorithms. With reference to **Fig. 4A**, some relevant variables are:

- NI: Node Index: the unique Identifier for each wireless communication node
- PN: Parent Node Index: Node Index for a node connects to in order to transmit data, For example, In **Fig. 4B**, the parent of Node 005 is 002.
- RP: Route Path. In **Fig. 4B**, the route path for 005 is 000 002 005, its connection route.
- NP: Number of parents available: Each Node has choices regarding which parent it selects to connect to, based on latency/throughput requirements. In **Fig. 4B**, Node 005 can connect to 004, 001, 002, and 000 (the root), all of whom are within the wireless range.
- NR: Number of unique paths some of the parents may be children of another node in the list of NP. NR is therefore the list of unique roots the node has. In **Fig. 4B**, 001 is a child of 005. The number of unique roots is therefore 3.
- AC: Number of Active children. This is the number of immediate children a node has: In **Fig. 4B**, Node 005 has 3 children: 005, 001, 008
- ND: Number of Descendants: Child nodes may also have their own children. ND is the total number of descendants that are connected, directly or indirectly to the parent node.
- CO: Cost to connect. When a node is congested it raises the cost of connectivity for a prospective child, thereby dissuading new connections till the congestion is alleviated. The cost to connect is a number transmitted to the child node. It is related to the level of congestion
- LR: Load on Route, is the total communications traffic (load) from all children and their descendants that a Node sees. Thus in **Fig. 4B**, the LR for Root Node 000 will be all

[redacted]

nodes connected to it, directly on indirectly. This information is needed to determine if a particular parent can support the communication needs (load) of a new child node

- CC Load Capacity is the amount of communication traffic or load that the node is capable of handling. It will be driven by the buffer size of the node – since data from a node's children is typically buffered before being retransmitted to the node's parent.
- LC Load from Children: This is the sum total of all traffic being passed on from children to their parent for retransmission to the parent's parent. In **Fig. 4B** Node 002 has load from children 005, 001, 008. Each of those nodes may have children with their loads.
- LL Local Load: In addition to servicing children, each node may also be servicing individual clients that comprise their local load. For example, Node 002 services three child nodes. But in addition, there could be laptops in its vicinity that connect to it directly. They constitute a local load.
- LS Local Signal Strength: is related to signal strength that a node sees from its parent. It is actually the throughput expected based on the actual signal strength seen by the radio and is computed based on a look up table as shown in **Figs. 1** and **2**.
- GT Global Throughput: This is the product of all throughputs each node along the route provides. Nodes connected to the root have a throughput related to LS. Thus the throughput of Node 002 in **Fig. 4B** is 79%, based on the throughput table shown in **Figs. 1** and **2** and its distance from the root.

The Global Throughput of Node 005 is (LS to Node 002)* (GT of Node 002) = .79*70= .55

Description of Parent Selection Algorithm

[0048] Since there is no central point of control in a distributed system, the same algorithms, running in every node, must determine what is best, based on the information it received from the Access Server and other nearby nodes. Much of this relates to selecting correct "route" or path to the root node. As an illustration, in **Fig. 4B** the route for Node 005 is 000-002-005. The Node 002 is the parent for Node 005 while Node 000 is the parent for 002.

[redacted]

[0049] Assuming for the present, that the Access Server wishes the network to have the maximum throughput. Then, if each node independently makes the best selection of its parent – to maximize throughput - then a question arises of whether one can be assured that the network as a whole is running as "best" as possible.

[0050] To answer this, consider the network in **Fig. 4B.** If the parameter set by the Access Server is to maximize throughput. Node 002 would examine all nodes it can connect to and choose a parent that ensures the highest global throughput (GT).

[0051] Since GT is product function of the LS times the GT of the potential node. Node 005 would have examined all potential parent nodes before selecting node 002. Similarly Node 002 has chosen Node 000. Other nodes would yield a lower GT. Thus, since each node is making a parent selection based on the "best" throughput, the throughput of the network as a whole is also maximized.

[0052] Thus, each node, starting from those closest to the root and spreading outwards maximizes its GT based on products related to the GT at each previous node, the overall throughput of the system is the sum of all individual throughputs, which have been maximized by the selection algorithm.

[0053] The implementation steps taken by the selection algorithm are:

1. Seek out and list all active nearby nodes.
2. Remove descendants: nodes that are connected to it, or children of nodes connected to it.
3. Order the list: push nodes closer to the route (shorter routing paths) up in the list.
4. Compute total throughput for each routing in the list of connection nodes
5. Select the node that provides the best latency or max throughput or combination of both.
6. Repeat steps 1,5 on a periodic basis.

To compute throughput, Nodes receive the following pieces of information from all nearby nodes:

[redacted]

1) The current routing path of the node. This is a list of nodes that the AP node has to connect to, in order to reach a root node. In **Fig. 4B,** Node 005 has a routing path of 000-002-005.

2) The current throughput of that node. The signal strength of that node's parent as seen by the node, is correlated to a look up table that maps the signal strength to throughput. For Node 002 (**Fig. 4B**), that is shown as 79.

[0054] Based on these two pieces of information, collected for all nearby AP nodes, the node selects one parent node that satisfies the requirements of low latency or high throughput. If low latency is the issue then a short routing path is desirable: In **Fig. 5** Node 005 chooses the root node 000. Note that the overall throughput for Node 005 is low – 17% because of the large distance away from the root node, resulting in poor signal strength. Conversely, if high throughput were required, Node 005 would connect to Node 002. The overall throughput for that connection is:

Throughput (Node 002 – Node 000)	*	Throughput (Node 005 – Node 002):
0.79	*	0.70 = .55.

[0055] At the end of step 4, the global throughput – computed as a product of the local signal strength to that potential parent node and the GT of the potential parent node – is computed and compared for each potential parent in the list of nearby nodes. The one with the highest throughput wins.

Controlling Network latency/throughput

[0056] The section on the selection of the parent assumed that only maximizing throughput was the sole objective. Often there is a tradeoff between low latency and high throughput as evidenced in **Figs. 1, 2,** and **3.** Since each AP node is in all likelihood supporting multiple applications with diverse needs, the access server setting is probably not either extreme but something between low latency and max throughput.

[0057] The aforementioned describes the algorithm for maximized throughput. For lowest latency, the choice of parent is restricted to the parent with the highest throughput

[redacted]

with an upper bound on the number of hops the parent is away from the root. There are two ways in which the Access Server can control the latency of the network:

1. Place an upper bound on the number of hops admissible for any node – this forces nodes on the fringe of the network to choose shorter path routes. This approach acts a cut off: it forces nodes at the fringe of the network towards selecting low latency routes, regardless of the loss in throughput. In terms of the routing algorithm, this translates to computing the throughput for selecting a parent with the highest throughput that fall in a group with latency better or equal to the upper bound.
2. Define a latency loss threshold whereby selecting a longer route path requires throughput gain to more than offset the loss of latency:

   Throughput (Longer Route) + Latency_loss_threshold > Throughput (Shorter route)

[0058] If the latency loss threshold is set high, the choices a node in selecting its parent is restricted, to nodes closer to the root, with shorter route paths. In contrast to the cutoff approach this approach is more forgiving: Selecting a longer path is allowed if throughput gains in choosing a longer routing path offset increased latency. In terms of the routing algorithm, this translates to computing the throughput for all nearby nodes.

[0059] Reference is now made to re-examining the parent selection process with latency restrictions in place. With reference to **Fig. 4B**, if the latency restriction of the first type is enforced, and the maximum number of hops allowed for any node is set to 1, then the list of accessible nodes is reduced to node 000. Alternatively, or in conjunction with this restriction, if the latency threshold is set high, then even if other nodes are acceptable potential parents, the latency threshold will reduce their attractiveness and again Node 000 could be selected.

[0060] Combinations of both restrictions, based on the parameters set, result in networks that address both latency and throughput requirements. This was shown in **Fig. 3,** where the overall network configuration was somewhat mid way the two extremes. It is further evidenced in **Fig. 6**, where increasing the latency loss threshold results in progressively lower latency network configurations. Nodes circled in each snap shot of the

[redacted]

simulation show movement towards shorter routing paths as the latency cost factor is progressively increased.

Automatic Load Balancing

[0061] Described thus far is how the parent selection process takes into account latency/throughput criteria set by the access server. However, one must also take into account how the system behaves under load, when the load increases at one node, causing congestion.

[0062] Since this is a distributed system, each node is responsible for selecting a parent that can service it satisfactorily – it is not part of a congested route. During the selection process, the connect cost associated with selecting a new parent is supplied by the parent. Thus a congested route will have a higher connect cost than a less congested route – and a lower throughput. The routing algorithm selects the parent with the highest throughput. As its connect cost increases a congested parent is increasing less attractive.

[0063] In **Fig. 7**, the cost of connectivity is raised from 0 to 3, resulting in one node "leaving" in favor of a better route. As the cost of connectivity is progressively increased, more nodes select alternate paths as evidenced in **Fig. 8**.

[0064] Increasing the cost of connectivity acts as an incentive for nodes to find other routes, but does not prevent a child node from continuing its association. This ensures that all child nodes are serviced always. Additionally, the cost of connectivity is increased only until all child nodes that have the option to leave have left- for example, in **Fig. 7**, the cost in increased only while child nodes that have multiple alternate route are still attached to a congested parent node. In other words, there is no reason to increase the connectivity cost for child nodes that have no alternate route and are "stuck" with the current congested parent node.

[0065] As the load is balanced, the congestion is reduced and the cost of connectivity is gradually reduced, enabling the child nodes that left to return. If this is not done, then

[redacted]

nodes leaving one parent would contribute to congestion elsewhere, resulting in increased cost of connectivity elsewhere and system instability.

[0066] One characteristic of a mesh network is the ability for nodes to select alternate routes, in case one node fails or becomes congested. As shown in **Fig. 7**, each node, when computing the throughput of nearby nodes, also infers from the routing path for those nodes, how many alternate paths are available to it. This is done by examining the routing paths of each nearby node and classifying them based on the node that connects to the root.

[0067] In **Fig. 7**, Nodes 002 and 004 connect to the root - as do other nodes shown in one embodiment with a color indicated square on their top left corner **(40)**, for instance this may be a blue square. Node 005, therefore, can have two routing paths: 000-002-005 and 000-004-005. Other nodes may also have multiple paths, but may not find a parent that, if it accepts them as child, has the capacity to service them, based on their current load. Hence, some of the nodes show one parent and one route, in another color indicator, for instance red **(50)**.

[0068] It is desirable to configure the network to ensure all nodes have alternate paths. This is achieved by increasing the number of nodes connecting to the root. The access server can force this by increasing the latency cost factor, resulting in nodes that can connect to the root directly to do so rather than through another node closer to them to the root. This was described earlier as depicted in **Figs. 4, 5,** and **6**. It can also force some nodes to work in either low latency or high throughput modes- in **Fig. 7**, the check box for each node (checked in each case) depicts that each node is currently in high throughput mode, working within the constraints set by the access server.

[0069] By controlling the latency cost factor, or the upper bound of the max hops, the access server can change the configuration of the network resulting in a higher redundancy of the system and less likelihood of load congestion hot spots.

[redacted]

Real World Constraints to Load Balancing Algorithm

[0070] Implementation of the load balancing algorithm on the wireless devices, required modifications to the connect cost algorithms based on real world constraints. Wireless devices communicating with devices running the load balancing software may not all be running the same software. As an example, consider the case where the load balancing software is loaded on wireless Access Points but not on laptops communicating with the access points. Clearly, the laptop has no way of knowing that the connect cost has increased and therefore will continue to "stick" to the access point.

[0071] The load balancing algorithm has therefore been modified to work where there is no communication regarding connect cost by the following approach: When the load exceeds a cut off threshold, the Access Point (or other wireless device performing load balancing) will drop its signal strength to the lowest possible – thereby dissuading clients such as laptops from associating with it and encouraging them to seek another association with a higher signal strength access point.

[0072] Since the laptops seek the access point with the highest signal strength, this is a necessary but not sufficient cause for a re-association: some laptops may continue to "stick" to the access point, due to proximity or a sticky algorithm. The Access Point must therefore forcibly disassociate the laptop.

[0073] After disassociating all the stations that it needed to, in order to shed load, the access point can gradually increase its signal strength to attract back some the stations that it disassociated. Those that did not find other associations, will return, almost immediately after association, and the access point takes them back because despite the lowered signal strength, these devices have no place to go.

[0074] This load balancing algorithm has been implemented and demonstrated to

[redacted]

shed load by moving one laptop from one root node to another when overloaded by two laptops on the same root node.

Monitoring the Health of the Network

[0075] By controlling the latency cost factor, or the upper bound of the max hops, the access server can change the configuration of the network resulting in a higher redundancy of the system and less likelihood of load congestion hot spots. In **Fig 7,** Node 002 is shown congested and available "parents" that will accept it are reduced to 1 (shown in red **(50)**). As a result the redundancy and fail safe nature of the wireless network has been adversely affected.

[0076] Congestion in **Fig 7** is being caused by the fact that there is only one root node transporting all wireless traffic to the wired network. Clearly, another root node would improve the fail safe nature of the network.

[0077] Algorithms have been implemented that reside in the device and periodically check to see what potential associations are possible. If the number is reduced to one then a warning (shown in red) is forwarded to the Network Management System. The system administrator is then advised to add another root node to preserve the fail safe nature of the network. Note that this type of warning is coming from the edge device to the management system and without the algorithm in place, the management system would not know that a problem existed

Dynamic Channel Allocation and RF Interference Control

[0078] Managing the throughput of voice, video and data traffic in a wireless network is complicated by the nature of the wireless medium. Since wireless is a shared medium, all traffic can potentially interfere with other traffic on the same radio channel- at any point in time only one device can be active on any one given channel. This limits the bandwidth in cases where high bandwidth traffic (e.g. video) needs to be transported or when there are many devices on the network.

[redacted]

[0079] One solution is to allocate different channels to devices communicating on different portions of the network. For example, in **Fig. 10,** each of the 3 sub networks shown in Red **(70)**, Black **(80)** and Blue **(90)** circles can communicate on one channel internally and another channel externally through the parent – that is part of the other BSS.

[0080] An algorithm to define what the best channel allocations should be between devices and their parents has been devised and shown in **Fig. 16** and in **Fig. 17.** The algorithm sends out a beacon on all channels to inform all neighboring devices that it is intending to select a channel. All neighboring devices – that can hear the beacon – respond over the wired network with the channel numbers they are using. The algorithm then takes care to select a channel, from a list of available channels that does not conflict with channels selected by neighboring devices

Dynamic Channel Allocation and Seamless Roaming Requirements

[0081] A situation can occur when, as shown in **Fig. 18**, some overlap between neighboring channels is called for. One reason for this is seamless roaming where a laptop leaves one wireless area and enters another adjoining area. If the signal strengths are managed, so that the overlap between adjoining areas is minimized, then adjoining areas can share the same RF channel and yet cause a reduction in bandwidth. Further, devices moving from one region to another will do so without having to change channels, which is time consuming and hence disruptive.

[0082] The algorithm implemented addresses the case where siblings of a multi layered wireless network are to be assigned the same channels. In **Fig. 18** BSS [1,1] and [1,2] share the same channel for access by their client stations. Also BSS [2,1], [2,2],[2,3] also share the same channels for seamless roaming by their client stations. The implementation of the algorithm therefore requires that when one sibling makes a channel assignment, ALL adjoining siblings have to make the same channel assignment. The channel selection process therefore requires a list of all neighboring nodes for all siblings and their RF channels. This extension has been incorporated into the channel allocation algorithm.

[redacted]

[0083] Protocols for sharing this information have been implemented and tested. Appendix A hereto describes the 802.11 Infrastructure Control Layer Protocol version 2.0. In addition, Appendix B hereto describes in another embodiment of the present invention, a distributed adaptive control algorithm for ad-hoc wireless personal area networks.

[0084] Note that seamless roaming requires that the Wireless AP shown in **Fig. 18** have incorporated the features needed for switching – that is auto discovery of new clients in its BSS. Else messages being sent to a new client (previously connected to another BSS) will not be forwarded to the client, now part of the another BSS. The wireless equivalent of a wired switch has been implemented and is covered in a subsequent section.

Asynchronous Application Data Flow

[0085] Algorithms that show how data from nodes will flow to the root node have been modeled for both high throughput and for low latency requirements. High throughput data flow requirements are discussed first.

[0086] To service asynchronous applications each node services its children in a round robin manner, ensuring that all children are serviced in sequence. But to ensure that all children receive at least one service request, each recently serviced child must wait for at least another child to be serviced before it can be serviced again. Additionally, some child nodes servicing applications with higher priority will be serviced before others.

[0087] In one implementation of this algorithm, related to this invention, the priorities may be stored in the Access server and different applications fall into different priority buckets. By changing the priorities in the Access Server, applications with higher priority are serviced before other competing applications with a lower priority. Also with a priority bucket, applications with more data to transfer are serviced first.

[redacted]

[0088] In another implementation, the determination regarding which child to service next is based on which child needs servicing the most. This is determined by examining the load of each child, each time; the node services its children. It is done each time because:

- Child nodes may have made other connections, if load balancing is also active
- Child nodes data may have changed – data with short time to live, will have been removed

[0089] The node then makes the decision to service the child with the highest need, in a priority bucket, provided it has not serviced that same child most recently. This is simply to avoid any one child from "hogging" all the attention.

[0090] This proprietary PCF (Point Control Function) implementation worked well for asynchronous applications, when compared to 802.11a standard DCF (Distributed Control Function) approach that was also implemented for benchmarking reasons as shown in **Fig. 9**. The PCF protocol implemented per the approach described above was approximately twice as fast, largely because nodes did not have to deal with delays caused by collision avoidance contention window delays required for wireless transmissions in a DCF mode.

Isochronous Application Data Flow

[0091] Isochronous applications require more deterministic service intervals that are less sensitive to variations of load. The algorithm described above is not suitable when:

- Each child must be serviced by the parent in a regular and predictable time interval
- The amount of data transferred is relatively fixed – else it will affect the time interval.

[0092] The algorithm to service Isochronous Application has also been implemented. In **Fig. 10**, there are two service cycles. One service cycle **(70)** services 3 children, the other one **(80)** 5 children, one of which is the parent node of the three children in the first service cycle **(70)**. In each service cycle, each child is visited at a regular interval defined by 1) the

time interval between each switching from one child to another and 2) the number of children in each service cycle.

[0093] Thus if the parent of the red service cycle **(70)** spends 10ms with each child, it will revisit each child every 3* 10 = 30 ms. Data from each child cannot then be retrieved at a rate faster than once every 30 ms.

[0094] Having retrieved the data, it will sit at the buffer of the parent, until the parent is serviced (the black **(80)** circle). Since there are 5 children in that service cycle, the service period is 5*10 = 50ms.

[0095] Since both service cycles are running independently of each other with no synchronization, it is impossible to predict when the parent in either service cycle will service its children. It can be stated, however that each child in service cycle marked red **(70)** (005, 001, 008) will have data transferred to the root at best every 30ms and at worst every 50ms. In other words, in the isochronous network, the worst time interval is the maximum time period of all service cycles.

[0096] If it is assumed that, to ensure multiple routing paths, there are more nodes connected to the root, then the service cycle will be driven by the number of 1 hop nodes, in this case 5. Note that the network configuration is set for high throughput. In this configuration the worst service cycle is 5T. Ironically, the network configuration for a "low latency". Isochronous network would have been 9T, will all nodes connected to the root. In other words, in the case of isochronous networks, the algorithm proposed provides a better service cycle and a better throughput. In general, splitting the number of nodes into two or more service cycles will improve the service cycle. The high throughput mode setting for the routing algorithm makes that happen naturally.

Internal Traffic Flow/ Wireless equivalent of Switching

[0097] Referring again to **Fig. 10**, Nodes 005, 001, 008 are children of Node 002. The red oval **(70)** indicates that these form a "family". In the technical parlance of 802.11,

they are a "Basic Service Set" (BSS). Likewise the nodes in the black circle **(80)** form another family or BSS.

[0098] Traffic from Node 005 to Node 001 would logically travel to Parent 002 and then from 002 to 001. This affects the throughput of the entire system because the traffic is buffered in 002 and then retransmitted. If node 005 was aware of its siblings, within its wireless range, then Node 005 and Node 001 could communicate directly over wireless. In effect this would be a wireless equivalent of Ethernet switches.

[0099] This direct communication link between siblings (within range) increases throughput 100%. This is so because 2 transfers of data (Source node to parent and then Parent to destination node) are now reduced to 1 transfer (Source node to destination node).

[0100] In this embodiment, the algorithm has been implemented whereby traffic intended for a destination node is automatically sent to the destination node if it is within the family/BSS and within range. When the routing algorithm runs, the routing paths of each nearby node is recorded to determine the number of hops it is away from the root. From the routing paths, the list of siblings within range can be inferred – they all share the same parent in their routing paths. If data intended for these siblings is received, it will automatically be sent to the sibling, without involving the parent.

[0101] If the destination node is not in the list of nearby siblings, then the data has to be sent onwards to the parent node. At that point the parent node, which "knows" its siblings, can route traffic to one if its siblings. Thus the switching algorithm ensures that traffic is routed only as far as a parent whose child is a destination node.

Extensions with Multiple Radios

[0102] As shown in **Fig. 10**, there are at least two families or BSS in the network. Node 002 belongs to both – as a parent of one (the red oval BSS) **(70)** and as a child to another (the black circle BSS) **(80)**. To communicate with its children, Node 002 has one radio, and another to communicate with its parent. There is preferably therefore, at the

[redacted]

minimum, two radios in each node for the system to work- One radio to support the inward interface (the children, red oval **(70)**) and one to support the outward interface (the parent, black circle**(80)**).

[0103] Adding more radios to the outward interface increases throughput but also enables more freedom in making choices related to latency/throughput tradeoffs. For example, suppose that some traffic requires high throughput and other traffic low latency. If the compromise approach described in this invention is unacceptable because the range of requirements are too high, then two radios for the outward interface can reduce the range of requirements: One radio will address more of the low latency traffic with a low latency traffic route while the other will address the high throughput needs with a different high throughput traffic route. The wireless node now begins to resemble a wireless equivalent of network routers.

[0104] The algorithms described in this invention are still applicable: only the range of applicability has changed. The embodiment of the present invention is also relevant for wireless routers.

Security of the Network

[0105] Wireless transmissions are inherently insecure. While the technology to encrypt/decrypt secure data exists, the problem is communication of the keys over wireless to the nodes, from the access server. This common key distribution problem is addressed by the following embodiment of the system.

[0106] The wireless communication devices will have, as part of the algorithms resident in their operating system, the ability to generate a public and private key based on the RSA algorithm. These keys will be based on some unique identifier in the AP node –the processor Chip Serial Number as an example.

[0107] When the Wireless device is first deployed, it will be connected via Ethernet cable to the access server and the node's public key will be transmitted to the Access Server.

[redacted]

This public key will be used by the Access Server to transmit a common private key (using the symmetric AES encryption algorithm) to all nodes. Since only the Access Server knows the public key for each node, only the access server will be able to transmit this private key. Further, since the common private key for all nodes was transmitted in encrypted form to all nodes, it is impossible to decipher the common private key without knowing the public key for the node it was intended for. In addition, even if that public key for that node is known, it is useless since the private key for that node was never exchanged. The transmission of the common Private Key is thus secure.

[0108] Secure data transmitted by one AP node will then be encrypted with the common private key and be decrypted only at a destination AP node. By the same token, all data from the Ethernet to an AP node will be encrypted with the same private key for onward transmission.

[0109] The enterprise Access Server can be used to generate a new private key at regular intervals and transmit it to all Wireless AP Nodes in the system. The system is thus doubly secure.

Implementation of algorithm in Firmware

[0110] The control algorithms described above require significant resources – CPU. Memory – resulting in large footprint applications. Wireless devices and other network aware communication devices are typically embedded systems with low foot print requirements. A challenge that must be addressed – if this technology is to have practical applications is how to reduce the footprint of the software control layer to fit into embedded devices with 64KB or 128KB RAM.

[0111] A self-standing executable containing some of the algorithms and support functions has been produced within a footprint of less than 100KB running on an Intel PXA250 Processor. Additionally in an embodiment of the present invention, the mesh and load balancing algorithms have been successfully ported to run on the hardware depicted in **Fig. 15**, with a footprint of 64KB.

[redacted]

[0112] The reason for the small footprint is that the approach of the embodiment of the present invention to building software is to include only the portions of an operating system needed by the programs. Thus, only functional blocks needed by the algorithms are added to the make file needed by the compiler to create the executable. If string functions are not required by any procedures in the program, then the string function library is not included when the executable is made. In contrast, a typical embedded operating system is more general purpose, requiring a larger footprint and possibly more CPU resources.

[0113] The language in which the algorithms are written is currently Java, and will may also include Microsoft ™ .NET languages. In the embodiment of the present invention, a Java Class file converter has been built that takes Java Byte Code and disassembles it to produce what is referred to internally as R (for Real) classes. R classes are the C code equivalent of the Java Op codes, used by a Java Virtual Machine (JVM) to run the Java program. The R classes map to C code which is produced after examining the functional libraries needed and adding them to the list of support libraries needed to make an executable self standing. Once that is completed a self-standing executable is made for the processor.

[0114] An extensible service library of software components needed to build a complete Operating system (OS) is implemented through the embodiment of the present invention. This component based approach to building an Operating system from scratch enables one to select only the essential services needed by an application when it is ported from high level languages to small footprint embedded devices. Since only the essential services and not an entire general purpose OS is included, the footprint is compact. Additionally, there is a significant (3X-6X) performance improvement because layers of software needed to run code written in high level languages like Java or .NET languages are no longer needed.

[0115] **Fig. 13** depicts how the approach of the embodiment of the present invention to lean code generation differs from more traditional approaches. On the left of the figure are the layers or stacks needed to run Java (JVM on top of linux) or C (on top of a custom RTOS

[redacted]

OS like VxWorks). On the right is an embodiment where Java code is examined at the Byte code level to identify essential services. These services are added when the Java Byte code is converted to C – by mapping Java Op codes intended for a JVM to code blocks from a library of C equivalent code blocks. For C code, this means simply adding the OS service code blocks needed for the C program to run without an RTOS below it. In both cases, as depicted in **Fig. 13**, A monolith block C code is produced, much like a compiler would, except that all the services are statically bound at development time and no dynamic bindings are required at run time, as is the case with the layered approach on the left.

[0116] Thus there is a clear migration strategy in place from high level code generation to low level object code that includes all the functionality provided by an operating system to ensure that the object code is self contained.

[0117] There is implemented one version of this migration strategy where one begins with high level code written and tested in a development environment and can swiftly migrate it to a low footprint executable. **Fig. 14**, depicts an extension to IBM's open extensible framework for development, called Eclipse (www.eclipse.org). As shown, there is built a framework on top of eclipse that enables one to model processes as a flow graph, where at each node of the flow graph one can insert code that needs to be tested. The framework is also used to do a performance analysis of code blocks at each node to determine where the bottlenecks are. At the end of the debug and analysis cycle, Java Byte Code is passed on to the Byte code converter (shown in **Fig. 13**) for low footprint code generation.

[0118] Since there is no OS, there is no easy way to tamper with the system. This approach –internally referred to as Application Specific Embedded OS software - thereby protects the security of the algorithms and enables the algorithms to run on low power (and less expensive) processors and with lower (and less expensive) memory requirements.

[0119] The simulations depicted are running the same code in each node shown in the figures. The code running in each node has been compiled to object code for the Intel ™

[redacted]

PX250 processor as a proof of concept (**Fig. 12**). It has also been compiled to run on a embedded system development platform shown in **Fig. 15.**

Upgrade Path for new algorithms

[0120] A distributed network poses problems related to upgrading the software at each node. If the software is cast in concrete – as in an ASIC implementation – then there is no upgrade path available. Since the wireless standards are evolving, this is not a practical approach.

[0121] In the description of the embodiment of the modular approach to generating a self standing executable, it becomes apparent that there is no migration path available to the system to upgrade the executable easy.

[0122] This is resolved by providing a simple communication protocol for uploading new object code into the system. This has also been implemented as is internally called Simple Upgrade Protocol (SUP).

[0123] When the executable is made, a simple communication protocol is added, which, with proper authentication, using the public key of the node, can be used upload object code into the Flash memory of the device. A very thin boot kernel with the AP Node and the rest of the code is remotely installed. The boot kernel contains the simple communications protocol to upload object code and the security to ensure that only the Access Server can access the device. By building security at the boot level, one ensures that all code loaded into the system has to be authorized- since the security code cannot be overwritten.

[0124] Throughout the description and drawings, example embodiments are given with reference to specific configurations. It will be appreciated by those of ordinary skill in the art that the present invention can be embodied in other specific forms. Those of ordinary skill in the art would be able to practice such other embodiments without undue experimentation. The scope of the present invention, for the purpose of the present patent

[redacted]

document, is not limited merely to the specific example embodiments of the foregoing description, but rather is indicated by the appended claims. All changes that come within the meaning and range of equivalents within the claims are intended to be considered as being embraced within the spirit and scope of the claims.

5

[redacted]

APPENDIX A

EXEMPLARY 802.11 INFRASTRUCTURE CONTROL LAYER PROTOCOL VERSION 2.0

DESIGN CONSIDERATIONS

Size Limitation

Since an Ethernet packet can only be a maximum of 1500 bytes the maximum length of a UDP datagram so as to not cause IP fragmentation is 1472 (1500 - 20 byte IP header - 8 byte UDP header). Every SNIP packet consists of a 8 byte SNIP header followed by parameters. Since all IMCP functions use only 1 SNIP parameter the maximum length of the parameter value is therefore 1462 (1472 - 8 byte SNIP header - 2 byte param length).

Packet Destination

All SNIP packets (either from Access Manager or from A/P) are sent via UDP to either the limited broadcast (FF: FF: FF: FF: FF: FF) or a chosen multicast address (01:00:5E:XX:XX:XX).

This method ensures that all A/P's get the message and also obviates the need for assigning I/P addresses to every A/P.

DEFINITIONS

Network Health Monitoring

Health Index

The number of unique Root paths determines the Health Index of an Access Point. In an "All-Root" network the Health Index determines the degree of redundancy of the Access Point's location. In an infrastructure mesh network for Relay nodes the Health Index determines the number of unique paths to the "wire".

Heartbeat Interval

This attribute specifies the interval at which Access Points send in a "heartbeat" signal, that specifies the conditions of their operations.

[redacted]

Location Awareness Scan Interval

This attribute specifies the interval, at which Access Points scan the "airspace" to know about other Access Points in their vicinity, to determine their Health Index and for Dynamic Load Balancing purposes.

Dynamic Load Balancing

This Boolean attribute, determines whether an Access Point enables the adaptive dynamic load balancing functionality during its operation. If enabled the Kick-in Threshold and Delta T attributes determines the way this functionality is put to use.

Connect Cost

The Connect Cost is a value in the range [0,3] where 0 being the minimum Connect Cost. The Access Point increases its cost of connectivity during Dynamic Load Balancing, after it determines that the load has stayed beyond the Kick-in Threshold for a period of Delta T units. The Connect Cost is adaptively reduced according to the load.

Delta T

This attribute determines the duration of sampling for the Access Point to determine that the load was higher or lower than the Kick-in threshold for Dynamic Load Balancing purposes.

Kick-in Threshold

This attribute is a percentage of the total capacity of the Access Point. This is used in conjunction with Delta T for Dynamic Load Balancing purposes.

Dynamic Channel Allocation

Channel Number

When Dynamic Channel Allocation is disabled, this attribute specifies the channel of operation for the Access Point.

Topology

Latency Throughput Control

When zero, this instructs the Access Point to always choose a Parent, whose hop count is lowest. When non-zero, the Access Point may choose to "tradeoff" latency for

[redacted]

throughput provided the difference in throughput is more than Latency/Throughput Trade-Off attribute.

Max Allowable Hops

This attribute controls the topology of the wireless network so that, any Access Point is never more than Max Allowable Hops away from the "wire".

Latency/Throughput Trade-off

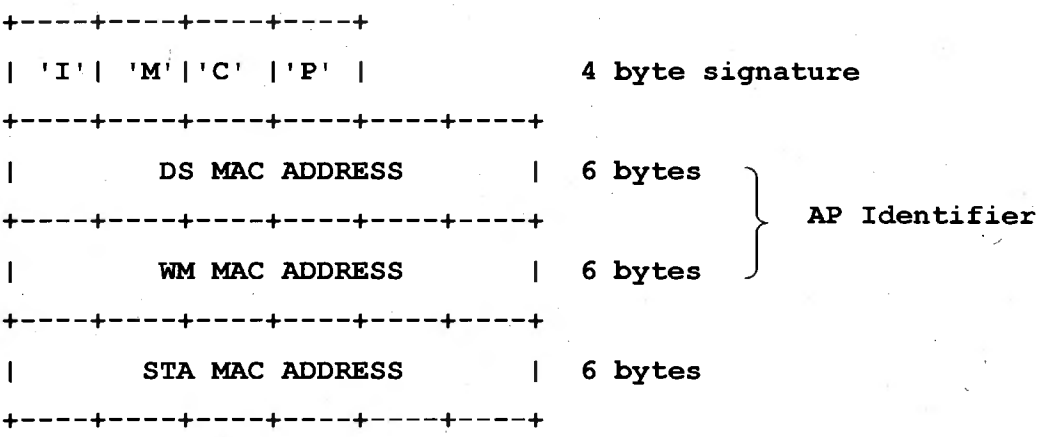
This attribute determines, the difference threshold for an Access Point to choose a parent with more number of hops in exchange for lower latency.

PACKET INFORMATION

STA Association Notification

Direction	***AP to Broadcast/Multicast***
When Sent	***Upon STA association***
SNIP FUNCTION ID	**3**
Purpose	**Topology Updating**

Param 0 Value Format



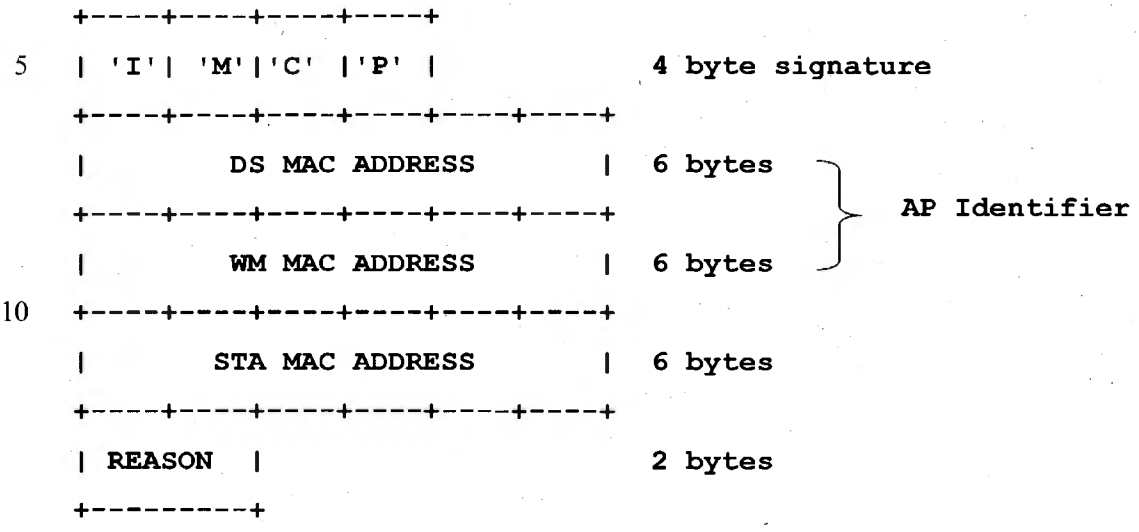
Total Size

22 Octets

STA Disassociation Notification

Direction	***AP to Broadcast/Multicast***
When Sent	***Upon STA disassociation***
SNIP FUNCTION ID	**4**
Purpose	**Topology Updating**

Param 0 Value Format



Total Size

24 Octets

Access Point IMCP Synchronization

Direction	***AP to AP***
When Sent	***When an AP starts up or during scanning***
SNIP FUNCTION ID	**11**
Purpose	**Identification, Health, Topology**

Param 0 Value Format

```
+----+----+----+----+
| 'I'| 'M'|'C' |'P' |            4 byte signature
+----+----+----+----+----+----+
|             BSSID             |  6 bytes
+----+----+----+----+----+----+
```

Total Size

10 Octets

Access Point IMCP Acknowledgement

Direction	***AP to AP***
When Sent	***Upon receipt of IMCP Sync***
SNIP FUNCTION ID	**12**
Purpose	**Identification, Health, Topology**

Param 0 Value Format

```
+----+----+----+----+
| 'I'| 'M'|'C' |'P' |            4 byte signature
+----+----+----+----+----+----+
|             BSSID             |  6 bytes
+----+----+----+----+----+----+
|          ROOT BSSID           |  6 bytes
+----+----+----+----+----+----+
```

Total Size

16 Octets

[redacted]

Seek Best Parent Request

Direction	***AP to Access Server***
When Sent	***Upon startup and frequently***
SNIP FUNCTION ID	**13**
Purpose	**Topology Formation, Operation**

Param 0 Value Format

```
+----+----+----+----+
| 'I'| 'M'|'C' |'P' |            4 byte signature
+----+----+----+----+----+----+
|        DS MAC ADDRESS        |  6 bytes
+----+----+----+----+----+----+                  } AP Identifier
|        WM MAC ADDRESS        |  6 bytes
+----+----+----+----+----+----+
| CC | PC | FR | HI | CH |       5 bytes
+----+----+----+----+----+----+
|           BSSID[0]           |  6 bytes
+----+----+----+----+----+----+
|S[0]|N[0]|                     2 bytes
+----+----+----+----+----+----+
|           BSSID[1]           |  6 bytes
+----+----+----+----+----+----+
|S[1]|N[1]|                     2 bytes
+----+----+----+----+----+----+
:                              :
:                              :
+----+----+----+----+----+----+
|           BSSID[X]           |  6 bytes
+----+----+----+----+----+----+
|S[X]|N[X]|                     2 bytes
+----+----+----+----+----+----+
```


[redacted]

X = **PC – 1**

CC = **CONNECT COST (0,1,2,3 with 0 being minimum)**

HI = **HEALTH INDEX (NUMBER OF UNIQUE ROOT PATHS)**

FR = **FORCE REPLY**

CH = **CHANNEL**

PC = **PARENT COUNT (ROOT NODES SET PC TO 0)**

S[i] = **Signal strength from Parent i**

N[i] = **Noise from Parent i**

BSSID[i] = **BSSID of Parent I**

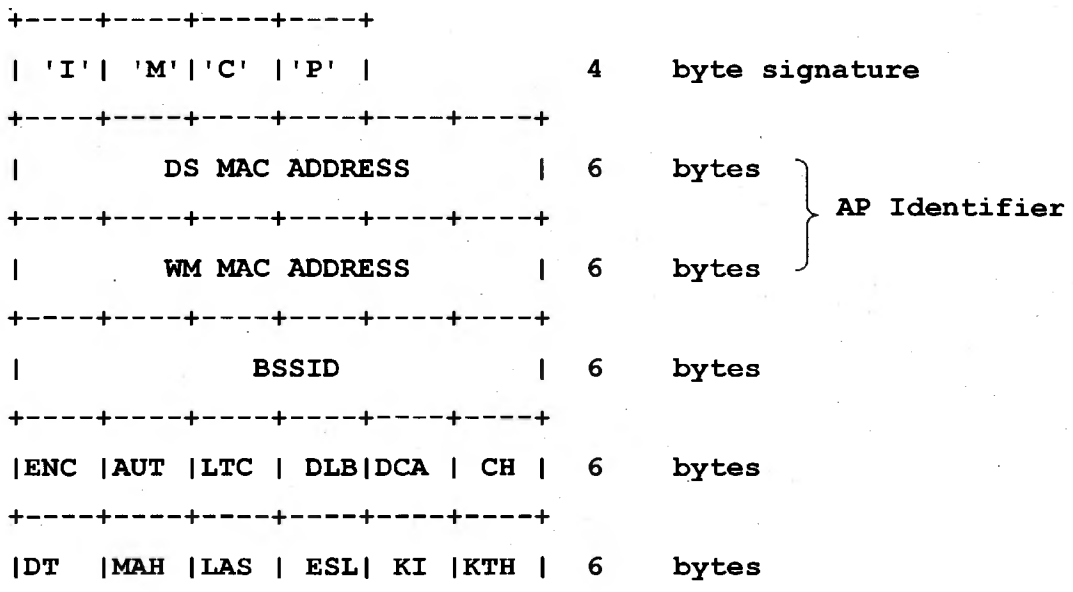
Total Size

21 + 8 * PC (MIN 21, MAX 1461)

Seek Best Parent Response

Direction	***Access Server to AP***
When Sent	***Upon receipt of SEEK request***
SNIP FUNCTION ID	14
Purpose	**Topology Formation, Operation**

Param 0 Value Format



```
+----+----+----+----+----+----+
| TO |SKL |NASL|HBI |            4    bytes
+----+----+----+----+----+----+
|  PRIMARY RADIUS   | AUTPRT  |  6    bytes
+----+----+----+----+----+----+
|    SEC  RADIUS    | ACCPRT  |  6    bytes
+----+----+----+----+----+----+
|          WEP KEY 1          |  13   bytes
+----+----+----+----+----+----+
|          WEP KEY 2          |  13   bytes
+----+----+----+----+----+----+
|          WEP KEY 3          |  13   bytes
+----+----+----+----+----+----+
|          WEP KEY 4          |  13   bytes
+----+----+----+----+----+----+
|            ESSID            |  ESL  bytes
+----+----+----+----+----+----+
|         SHARED KEY          |  SKL  bytes
+----+----+----+----+----+----+
|          NAS NAME           |  NASL bytes
+----+----+----+----+----+----+
```

ENC = ENCRYPTION TYPE

AUT = AUTHENTICATION TYPE

ESL = ESSID LENGTH

KI = WEP KEY INDEX

SKL = SHARED KEY LENGTH

NASL = NAS ID LENGTH

PRIMARY RADIUS = PRIMARY 802.1X RADIUS SERVER IP ADDRESS

AUTPRT = AUTHENTICATION PORT

SECONDARY RADIUS = SECONDARY 802.1X RADIUS SERVER IP ADDRESS

[redacted]

ACCPRT = ACCOUNTING PORT

DLB = DYNAMIC LOAD BALANCING

DCA = DYNAMIC CHANNEL ALLOCATION

LTC = LATENCY THROUGHPUT CONTROL (0 for Lowest Latency, 1 for Tradeoff)

MAH = MAX ALLOWABLE HOPS

HBI = HEARTBEAT INTERVAL

LAS = LOCATION AWARENESS SCAN INTERVAL

CH = CHANNEL NUMBER

DT = DELTA T

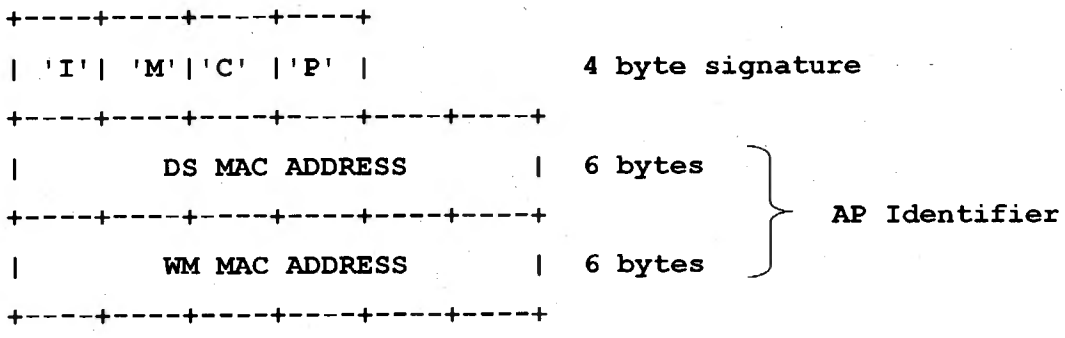
KTH = DYNAMIC LOAD BALANCING KICKIN THRESHOLD

TO = LATENCY/THROUGHPUT TRADEOFF

Channel Scan Lock Request

Direction	***AP to Access Server***
When Sent	***Before scanning***
SNIP FUNCTION ID	**15**
Purpose	**Health**

Param 0 Value Format



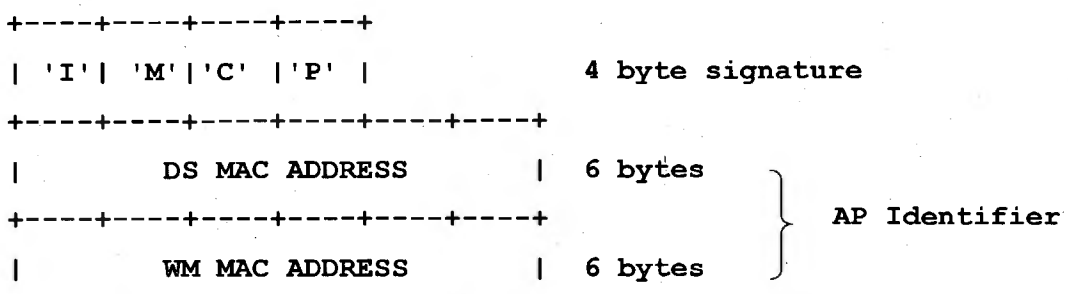
Total Size

16 Octets

Channel Scan Lock Response

Direction	***Access Server to AP***
When Sent	***When Access Server determines***
SNIP FUNCTION ID	**16**
Purpose	**Health**

Param 0 Value Format



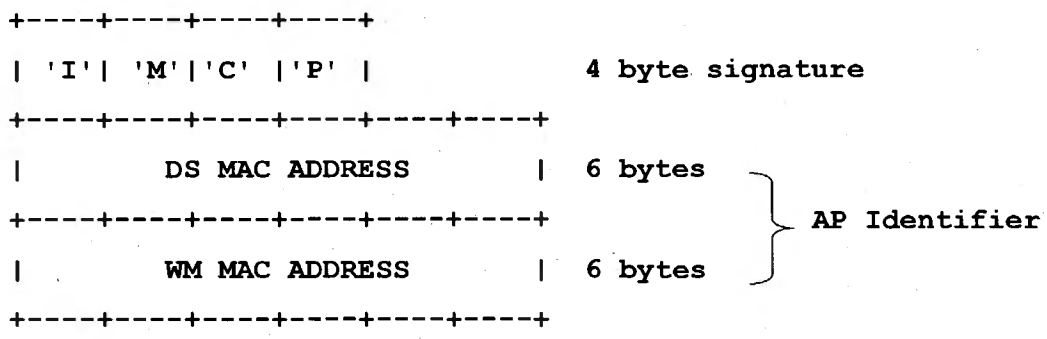
Total Size

16 Octets

Channel Scan Release Lock Request

Direction	***AP to Access Server***
When Sent	***After finishing scanning***
SNIP FUNCTION ID	**17**
Purpose	**Health**

Param 0 Value Format



[redacted]

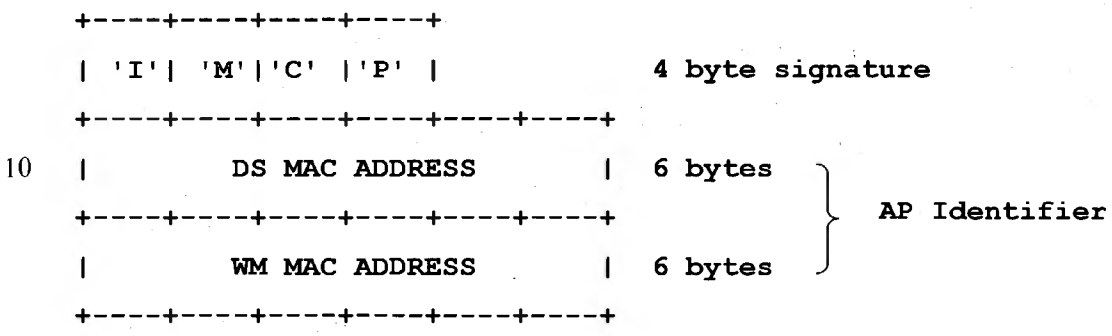
Total Size

16 Octets

Channel Scan Release Lock Response

Direction	***Access Server to AP***
When Sent	***Upon receipt of Lock Release Request***
SNIP FUNCTION ID	**18**
Purpose	**Health**

Param 0 Value Format



Total Size

16 Octets

Access Point Reset

Direction	***Access Server to AP***
When Sent	***When settings change***
SNIP FUNCTION ID	**19**
Purpose	**Operation**

Param 0 Value Format

```
+----+----+----+----+
| 'I'| 'M'|'C' |'P' |            4 byte signature
+----+----+----+----+----+----+
|         DS MAC ADDRESS        |  6 bytes  }
+----+----+----+----+----+----+              } AP Identifier
|         WM MAC ADDRESS        |  6 bytes  }
+----+----+----+----+----+----+
```

Total Size

16 Octets

References

1. Simple Network Information Protocol **SNIP**, Sriram Dayanandan, January 2003.

[redacted]

APPENDIX B

DISTRIBUTED ADAPTIVE CONTROL ALGORITHM FOR AD-HOC WIRELESS PERSONAL AREA NETWORKS © 1992-2003 Advanced Cybernetics Group, Inc. All rights reserved.

TECHNOLOGY DESCRIPTION

CONVENTIONAL ROUTING PROTOCOLS

Distance-Vector Routing (DV)

Each node maintains a table of approximate distances of nodes. Nodes send the table out to nearest neighbors. The receiving nodes update their tables and recalculate routes using a shortest path algorithm. Thus routing decisions are made using sub-global approximations and are not optimal especially in a dynamically changing environment like WPANs.

Link State Routing (LS)

Each node maintains a view of the entire network and broadcasts the state of the link to its nearest neighbors. The receiving nodes update their tables and recalculate routes using a shortest path algorithm. Pros include: widely used and commercialized; well tested; well documented. Cons include: well suited for static environments, not for dynamic environments; infrastructure oriented (dedicated hosts are organized for routing); not suited for resource constrained, low power devices

STANDARD AD-HOC ROUTING ALGORITHMS

The IETF Mobile Ad-Hoc Networking Standard (MANET) has proposed the following AD-HOC routing algorithms.

Destination Sequenced Distance Vector Routing (DSDV)

- A version of DV adjusted for AD-HOC networks.
- Power management is not considered
- Does not have dynamic adaptive load balancing
- Convergence times can be large
- No support for QOS

[redacted]

- No zonal/multi-channel support

AD-HOC On Demand Distance Vector Routing (AODV)

- Reactive as opposed to pro-active
- Uses L3, hence is shielded from the MAC and PHY layers
- Supports only one route per destination
- Does not have dynamic adaptive load balancing
  - Power management is not considered
- Does not support unidirectional links
- No support for QOS
  - No zonal/multi-channel support

Dynamic Source Routing (DS)

- Reactive as opposed to pro-active. Routes are learnt on-demand and hence can slow down the performance
- Does not have dynamic adaptive load balancing
  - Power management is not considered
- Needs support from either the MAC layer or the network layer for including the route information
- No support for QOS
  - No zonal/multi-channel support

Zone Routing Protocol (ZRP)

- Divides the network into zones
- Intra-zone routing is left to the implementer
- Inter-zone routing uses a reactive as opposed to pro-active protocol
- Does not have dynamic adaptive load balancing
  - Power management is not considered
- No support for QOS

ALGORITHM DESIGN CONSIDERATIONS

No Central Control

AD-HOC WPAN's typically work in environments where there cannot be any level of central intelligence as far as routing and parametric decisions are concerned. This requires the algorithm to be truly distributed and every device must be able to make decisions by itself.

Self-configuring

AD-HOC WPAN's by definition need to be self-configuring without having the need for any network plan.

Self-healing/Fault Tolerant

AD-HOC WPAN's need to be self-corrective and fault tolerant. Devices must be able to change their routing decisions in real-time as soon as a path gets clogged or closes down.

Dynamic Adaptive Load Balancing

The load on the network must be balanced fairly across all possible paths, and this decision must happen dynamically in an adaptive manner.

Pro-active Routing

The routing decisions need to be made on a pro-active as opposed to an on-demand basis. This ensures that the task of routing does not interfere with the device's primary responsibility, which is to accomplish its own functionality.

Varied Bandwidth/QOS/Power requirements

Devices have varied bandwidth requirements, some need isochronous performance (fixed latency), and some need bounded latency, and some might be power constrained and must use very low power for their transmissions.

Low memory footprint

The design of the algorithm must consider the fact that WPAN would typically consist of low footprint resource constrained devices.

Multi-Zone/Multi-Channel Support

The design of the algorithm must consider the support for routing between multiple Pico-cells or multiple network zones.

[redacted]

Network layer independent

The algorithm must not depend on the existence of a network layer protocol like IP. The algorithm must directly use the services provided by the MAC sub-layer.

Efficient Topology Lookup and Modification

Every device in an AD-HOC WPAN plays dual roles:

- Accomplish its own functionality, which could involve sending packets either directly or via another device. (Primary Role)
- Forward packets of other devices. (Secondary Role)

The design of the algorithm must consider the fact that, the primary role of every device on the network is to accomplish its own functionality, and routing of packets of other devices is secondary (unless the device is a special node that is just present for forwarding) and must not affect the performance of its primary role.

For the primary role, this means whenever the device has to send out its own data packet, to another device the routing decision must be very fast.

For the secondary role, this means whenever a device receives from another source destined to another device, it must be able to readily reference the routing decisions made by the source according to its Bandwidth/QOS/Power requirements.

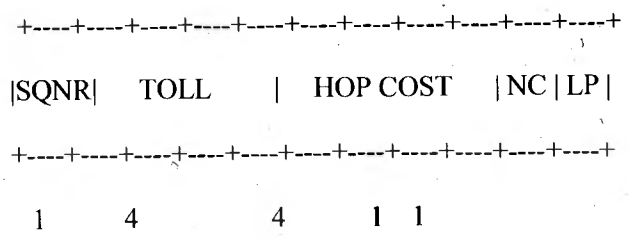
When a device goes down, the topology and the routing decisions need to be modified in real-time so that network performance levels are maintained.

[redacted]

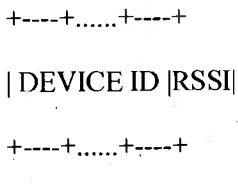
TECHNOLOGY IMPLEMENTATION

The Algorithm uses control systems approach wherein every device sends out a broadcast heartbeat packet into the medium, at a specified frequency.

Header



Payload



SQNR = 1 BYTE SEQUENCE NUMBER (0-255)

TOLL = 4 BYTE DEVICE TOLL COST

HOP COST = 4 BYTE DEVICE HOP COST

NC = 1 BYTE NEIGHBOUR COUNT (0-255)

LP = 1 BYTE LOW POWER/HIGH THROUGHPUT FLAG

DEVICE ID = DEVICE IDENTIFICATION SEQUENCE (e.g. MAC ADDRESS)

RSSI = 1 BYTE RELATIVE SIGNAL STRENGTH INDEX

TOTAL SIZE OF HEARBEAT PACKET = HEADER SIZE + NC * PAYLOAD SIZE

= 11 + NC * (ID SIZE + 1)

[redacted]

Sequence Number

Sequence Number is a one-byte counter incremented upon the transmission of a heartbeat packet. This counter will wrap to 0 after it reaches a value of 255.

Whenever a device receives a heartbeat packet, it updates the sequence number for the source in its own tables. The device then retransmits the heartbeat packet so that other devices distant from the source can also receive it. If a device receives a heartbeat packet with a sequence number less than or equal to the noted sequence number for the source, the packet is discarded.

The sequence number is significant because of the shared nature of the wireless medium. Lets consider Figure 1 and a scenario where node "2" has just come up.

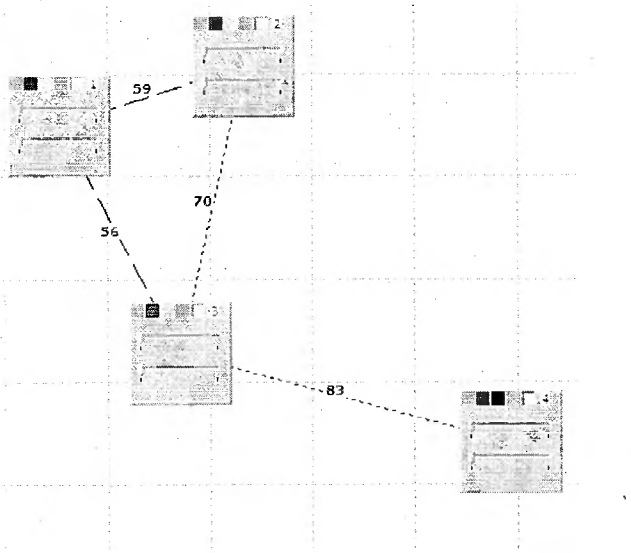


Figure 1

When the node labeled "2" sends out its heartbeat with sequence number "1" node "1" and "3" will hear the packet and update the entry corresponding to node "2" with the value "1". Since both "1" and "3" have heard "2" for the first time, they both will retransmit the packet so that distant devices and new devices which have just come up can receive the heartbeat. Lets assume that node "1" relays the heartbeat first. Nodes "2" and "3" would hear the packet again. "2" would discard it because the original sender is itself, whereas "3" would discard it as its tables already indicate sequence number "1" for node "2".

[redacted]

Now "3" relays the packet and "4" receives it and updates its tables before retransmitting it. For a network with *N* nodes every heartbeat packet is transmitted *N* times for the first time. Thus the sequence number helps prevent broadcast flooding for heartbeat packets. This mechanism is only used for the first heartbeat packet. For broadcast/multicast data packets and subsequent heartbeat packets, an optimized technique is used which is discussed below.

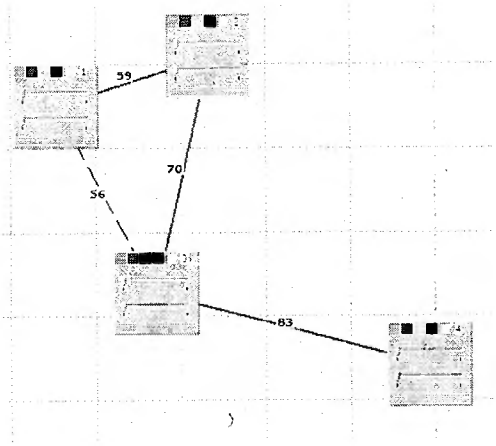


Figure 2

When the node "2" sends out the heartbeat packet with sequence number "2", both 1 and 3 hear the heartbeat and update the table entries corresponding to node "2". Both "1" and "3" would then refer to the Single Source Shortest Path (SSSP) tree corresponding to node "2" as shown by the solid blue lines in Figure 2 above. According to the tree "1" does not have any "child" and hence will not forward the packet further. "3" on the other hand has "4" as its child and hence will forward the packet to "4".

Hence subsequent heartbeat packets are sent $M <= N$ times, where M is the number of levels in the SSSP tree for the source node, and N is the number of devices on the network. If in the mean time another node comes up and hears the heartbeat for the first time, it will retransmit the packet, but the sequence number will help other nodes discard the packet.

Multi-zone/Multi-channel support is explained later in the document for the purposes of brevity.

Device Toll Cost (Dtc)

The Device Toll Cost is the value charged by the device for forwarding a packet to one of its neighbors. This value is used in determining the optimal routes. This value helps in the dynamic adaptive load balancing of the network.

Device Hop Cost (Dhc)

The Device Hop Cost is the expense incurred every time a packet needs to be sent via another device. This value helps in the determining QOS requirements of the node.

Low Power/High Throughput Flag (Lp)

This flag is set to "1" for devices that use a routing table optimized for low power consumption/high throughput.

ALGORITHM DATA-STRUCTURES

Network Representation

The algorithm uses a Directed Weighted Graph (DWG) for representing the networks, which may have unidirectional links and Un-Directed Weighted Graph (UWG) for networks having bidirectional links only. The devices on the network form the set of vertices for the graph. Based on the information in the heartbeat packet, edges are added to the graph with an initial weight that is inversely proportional to the RSSI.

Graph Representation

Traditionally graphs have been represented using either adjacency matrices or adjacency lists. Adjacency matrices offer fast *O (1)* edge lookup and modification, but tend to be wasteful if the number of edges in the graph is a lot less than N^2, where N is the number of devices. The maximum number of edges is ${}^{n}P_2$ for a DWG and ${}^{n}C_2$ for a UWG.

[redacted]

Practically the number of edges N_e in a WPAN would be much lesser than ${}^nP_2$ and hence much lesser than N^2 number of edges, for $N>= 2$, ${}^nC_2 < {}^nP_2$, $N_e < {}^nC_2 < N^2$.

Adjacency lists on the other hand save memory, but offer *O (M)* worst-case edge lookup and modification, where *M* is the number of edges on the list, and hence tend to affect the overall routing performance. The algorithm uses a specialized representation of a graph that offers acceptable performance and has lower runtime memory requirements.

A graph object in the algorithm has the following attributes:

- A vertex hash table for fast vertex lookup and modification
- An edge hash table for fast edge lookup and modification
- A vertex list for vertex enumeration
- An edge list for edge enumeration

A vertex object exists in both the graph's vertex hash table and on the graph's vertex list. A vertex object also includes an edge list for all incident edges. In addition, a vertex object also has 2 spare link pointers through which it can exist in 2 more lists.

An edge object on the other hand exists not only on both the graph's edge hash table and the graph's edge list, but also exists on the following:

- If un-directed, on the edge lists of both the vertices it is incident upon
- If directed, on the edge list of the source vertex.

In addition an edge object also has 2 spare link pointers through which it can exist in 2 more lists.

The 2 spare link pointers on the vertex and edge objects are helpful for algorithms that operate on graphs for sorting purposes. These algorithms can sort vertices/edges in any manner they deem without having to allocate/free additional memory.

Graph algorithms can also save custom data pointers within the vertex and edge objects.

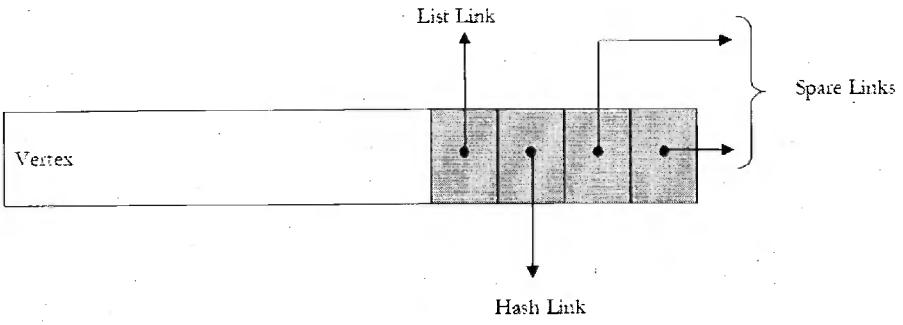


Figure 3

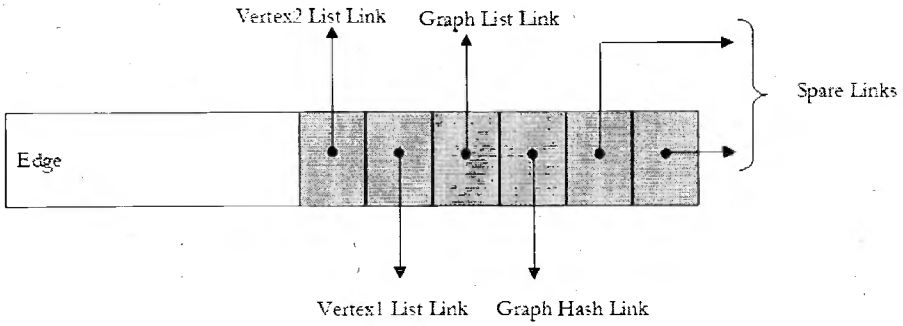


Figure 4

This specialized data structure helps answer the following questions regarding the graph very quickly.

- Is Vertex 'X' on the graph?
- Is there an edge between Vertex 'X' and Vertex 'Y'? If yes what is the initial edge cost?
- What are the edges incident upon Vertex 'Z'?
- Enumeration of all the edges on the graph
- Enumeration of all the vertices on the graph

The edge and vertex lookup times are dependant on the bucket size of the hash tables used. The value of the bucket size can be changed as required.

[redacted]

ALGORITHM OPERATION

Direct Heartbeat Reception

Upon receipt of a direct heartbeat (from a source we can directly hear), the algorithm takes the following steps:

1. Lookup vertex for the source. If the vertex is not present, create a new vertex for the source and initialize its corresponding custom vertex data.
2. Lookup edge between the source and us. If an edge is not present, create a new edge between the source and us and initialize its corresponding custom edge data.
3. If the sequence number of the heartbeat is less than or equal to the sequence number noted in the custom vertex data, discard the packet. End.
4. Update the RSSI information and the last known good time in the custom edge data.
5. Update the sequence number, toll cost, hop cost, and low power flag in the custom vertex data.
6. If the source was heard for the first time (an edge was just created), then forward the packet by re-transmitting it, and go to step 8.
7. Lookup our position on the source's SSSP tree. If we have nodes below us on the tree forward the packet by re-transmitting it.
8. For every payload entry
    a. Lookup vertex and create it of not present.
    b. Lookup an edge between the source and the vertex, and create it if not present.
    c. Update the RSSI information and the last known good time in the custom edge data.

In-direct Heartbeat Reception

Upon receipt of an in-direct heartbeat (from a source we cannot directly hear), the algorithm takes the following steps:

1. Lookup vertex for immediate transmitter. If the vertex is not present, create a new vertex for the immediate transmitter and initialize its corresponding custom vertex data.
2. Lookup edge between the immediate transmitter and us. If the edge is not present, create a new edge and initialize its corresponding custom edge data.

[redacted]

3. Lookup vertex for the source. If the vertex is not present, create a new vertex for the source and initialize its corresponding custom vertex data.
4. If the sequence number of the heartbeat is less than or equal to the sequence number entered in the source vertex's custom vertex data, discard the packet. End.
5. Update the RSSI information and the last known good time in the custom edge data, for the immediate sender.
6. Update the sequence number, toll cost, hop cost, and low power flag in the custom vertex data for the source.
7. If the source was heard for the first time (an edge was just created), then forward the packet by re-transmitting it, and go to step 9.
8. Lookup our position on the source's SSSP tree. If we have nodes below us on the tree forward the packet by re-transmitting it.
9. For every payload entry
    a. Lookup vertex and create it of not present.
    b. Lookup an edge between the source and the vertex, and create it if not present.
    c. Update the RSSI information and the last known good time in the custom edge data.

Heartbeat Transmission

Before transmitting the heartbeat packet, the algorithm takes the following steps:

1. Check the last known good timestamp for every edge, and delete edges whose last known good times are greater than $K * U$, where $K>=2$ is a chosen constant, and U is the heartbeat update interval chosen for the network.
2. Calculate our own Redundancy Index *RI* for health indication purposes. This is done as follows:
    a. Initialize Good Nodes Count *GNC* to 0
    b. For every vertex we can reach, using an edge incident upon us, mark the edge as closed, and try to reach the vertex using any other path. If the vertex can be reached, increment *GNC*.
    c. Good Nodes Ratio *GNR = (GNC/TOTAL_INCIDENT_EDGES)*
    d. Incidence Ratio *IR = TOTAL_INCIDENT_EDGES/(TOTAL_VERTEX_COUNT-1)*

[redacted]

e. $RI = (GNR * 0.6 + IR * 0.4)*100$

3. For every vertex compute the SSSP tree for this vertex, using the SSSP algorithm described below.
4. Add every edge incident upon us to the heartbeat packet and send out the heartbeat packet, with our *DTC*, *DHC* and sequence numbers.
5. Increment sequence number.

Single Source Shortest Path (SSSP) algorithm

The SSSP algorithm used here is a modified version of Dijkstra's SSSP algorithm. The original Dijkstra SSSP algorithm uses pre-computed edge costs, where as in this modified algorithm instead of using the edge costs, we compute the Destination Vertex Cost *DVC* from the RSSI information, dynamically as we proceed in the algorithm.

The modified algorithm makes use of the spare links provided by the vertex and edge objects.

1. Initialize the Vertex Cost *VC* to ∞, and the Vertex Edge *VE* to *NULL* for all vertices, other than the source. For the source vertex, set *VC* to 0 and *VE* to *NULL*.
2. We use the two spare links provided in the vertex object, to form a doubly linked list of vertices, without having to allocate or free any additional memory. Set the source vertex as the head of this doubly linked list, set the Hop Count *HC* for the source vertex to be 0.
3. For every vertex in the doubly linked list
    a. We use the two spare links provided in the edge object, to form a doubly linked list of edges, without having to allocate or free any additional memory. For every edge incident on the vertex, compute the Final Edge Cost *FEC* using the equation given below.

    $FEC = (100 - RSSI) + HC * DHC + TC$

    $TC = 0$ *if* $HC = 0$, *DTC if* $HC <> 0$

    Use insertion sort to insert the edge onto the doubly linked list sorted in ascending order of *FEC*. We call the vertex in context the *Control Vertex*, and the edge destination the *Destination Vertex*.
    b. For every edge on the doubly linked list

[redacted]

i. Compute *DVC* using the equation given below.

For Low Power Consumption:

DVC = MAX (VC of Control Vertex, FEC)

Otherwise:

DVC = VC of Control Vertex + FEC

ii. If *VC* for *Destination Vertex* = ∞ then, set *VC* for *Destination Vertex* to *DVC*, *VE* for *Destination Vertex* to the current edge, *HC* for *Destination Vertex* to *HC* of *Control Vertex + 1*. Go to Step iv.

iii. If *VC* for *Destination Vertex* > *DVC* then, set *VC* for *Destination Vertex* to *DVC*, *VE* for *Destination Vertex* to current edge, *HC* for *Destination Vertex* to *HC* of *Control Vertex + 1*. Remove *Destination Vertex* from doubly linked list.

iv. Use insertion sort, to insert *Destination Vertex* into doubly linked list.

4. Create a new graph object for the SSSP tree.
5. Add every vertex in the original graph, to the SSSP tree and every vertex's *VE* to the SSSP tree.

TECHNOLOGY EVALUATION

No Central Control

The implementation of the algorithm makes it clear that it is truly distributed without the need for any central control. The implementer has to choose appropriate values for *K* and *U* depending on the physical characteristics of the network.

Self-Configuring

Any device can join the network instantly. Devices already present on the network can discover the new device after the heartbeat packet transmitted by it is propagated through the network. The device itself can report its health using the value of *RI*. This information can help the user choose an appropriate location for the device.

[redacted]

Self-Healing/Fault Tolerant

The heartbeat packets sent by the devices, make sure that the system can recover from route and device failures.

Dynamic Adaptive Load Balancing

The devices can adaptively increase or decrease the value of their *DTC*, so as to trigger changes in the SSSP trees of other devices. E.g. when a device detects that a lot of devices are using it for forwarding packets, it could adaptively increase its *DTC* so that the traffic then flows through other devices on the network. Similarly when the device detects that the traffic load through it has decreased, it could adaptively decrease its *DTC*.

Pro-Active Routing

The computation of the SSSP tree by every vertex, for every vertex makes the algorithm very pro-active. This means route planning times are minimized at the time of packet sending and forwarding.

Varied Bandwidth/Qos/Power Requirements

The *DHC* value of a device changes the way in which its SSSP tree is computed. Low latency driven devices can set *DHC* to a high value to make sure their SSSP trees are computed with minimum number of hops. Low Power Flag chooses edges so as to minimize the transmit power for the devices.

Low Memory Footprint

The specialized data structures used by the algorithm provided acceptable performance and use reasonably low memory. For a network with very large number of devices e.g. 10,000, the network could be divided into multiple zones, so as to provide acceptable performance using low memory. Multi-Zoning is explained in the next section.

Multi-Zone/Multi-Channel Support

A WPAN can be divided into 2 or more Pico-nets using different RF channels, so as to minimize the interference between them. Two attractive approaches are explained below.

[redacted]

Common Device Approach

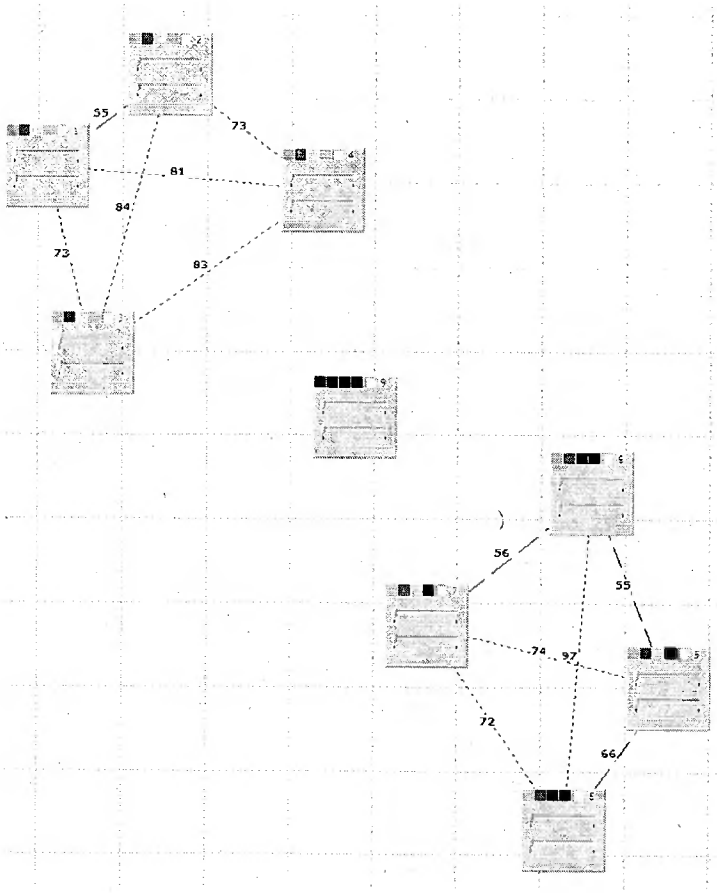


Figure 5

Figure 5 shows two Pico-nets comprising of nodes (1,2,3,4) and (5,6,7,8) respectively. Both Pico-nets are operating on different RF channels so as to not interfere with each other. Node 9 is a node having two interfaces, one listening to the RF channel for the first Pico-net and the other listening to the RF channel for the second Pico-net. Hence Node 9 is designated as the *Common Device*.

When Node 9 is turned off both Pico-nets can only operate independently.

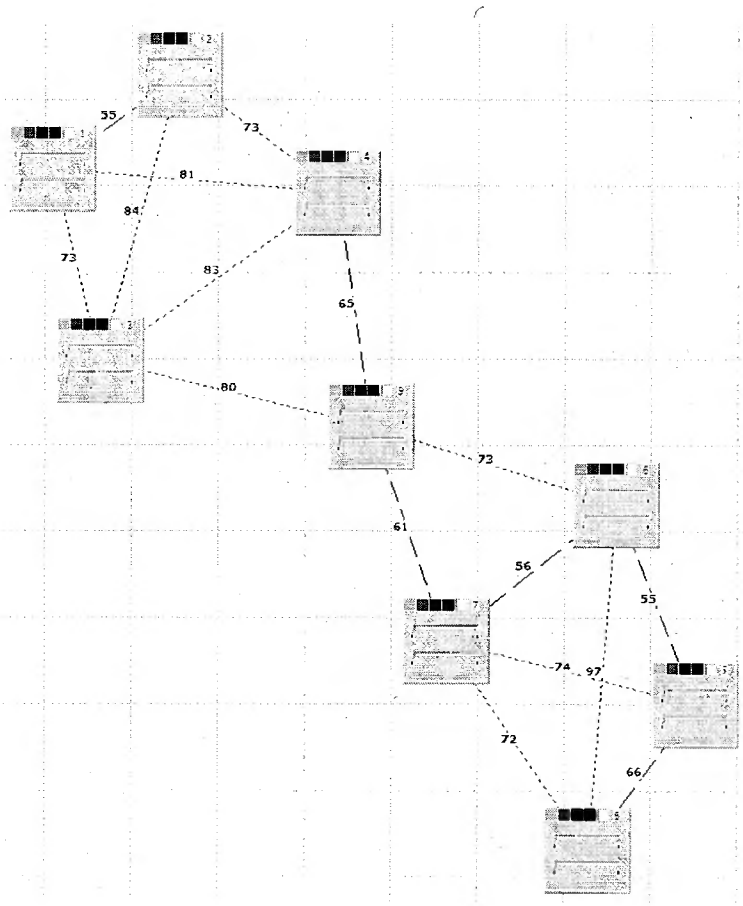


Figure 6

When Node 9 is turned on both Pico-nets can now not only work independently, but can also use Node 9 to route information between the Pico-nets. Node 9 ensures that the heartbeat packets generated in both Pico-nets are forwarded to the other Pico-net. Thus devices of both Pico-nets view the network as one combined Pico-net.

Common Router Approach

[redacted]

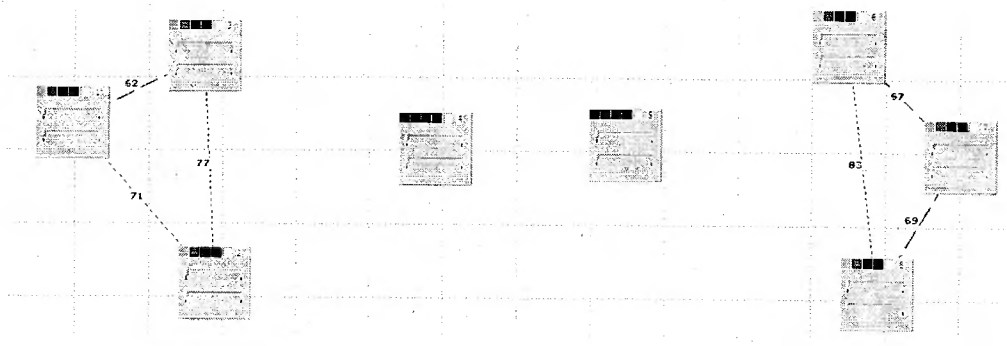


Figure 7

Figure 7 above shows two Pico-nets comprising of Nodes (1,2,3,4) and (5,6,7,8) respectively. Here the Nodes 4 and 5 have been designated as *Common Routers*. Separate RF channels are used for the Intra Pico-net and Inter Pico-net communications. When the *Common Routers* are turned off, both Pico-nets can only work independently.

When the *Common Routers* are turned on, the Figures 8 and 9 below show the Intra Pico-net SSSP trees of both Pico-nets respectively, Figure 10 shows the entire topology.

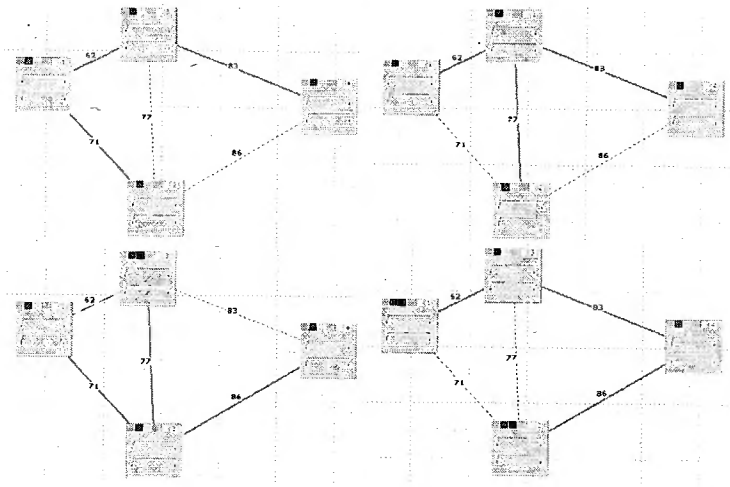


Figure 8

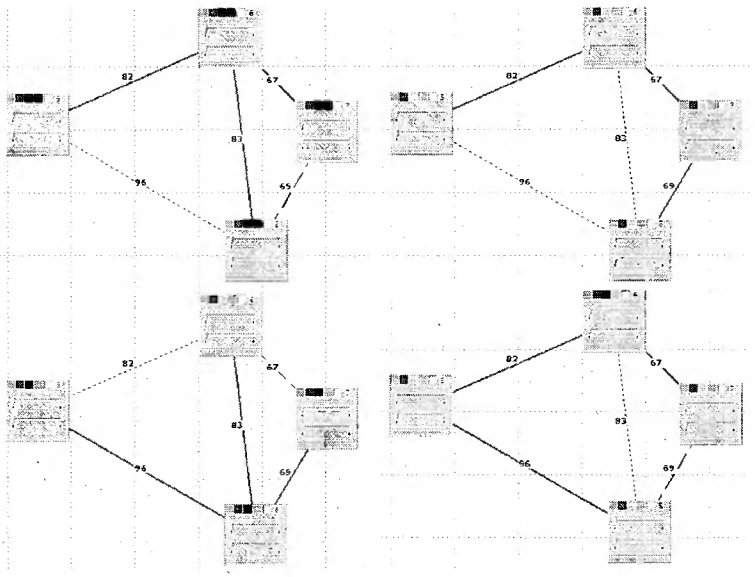


Figure 9

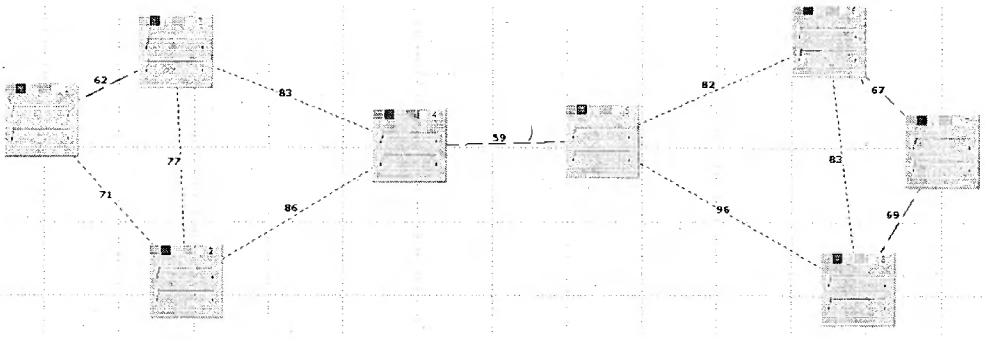


Figure 10

The heartbeat packets transmitted by the *Common Routers* are different for Inter Pico-net and Intra Pico-net communication. For Intra Pico-net communications, the *Common Routers* include only the Pico-net members they hear in their heartbeat packets. Hence for the first Pico-net, the Intra Pico-net heartbeat sent out by 4 would include entries for Nodes 1,2 and 3. Even though Node 4 can also hear Node 5, the Intra Pico-net will not have an entry for Node 5.

The Inter Pico-net heartbeat transmitted by Node 4 will include entries for Nodes 1,2,3 and 5. Hence only the *Common Routers* will need to know about the entire topology, whereas individual devices will only need to know the topology of their Pico-net.

Whenever a device needs to send a packet to a device that is outside its Pico-net, the packet is sent to the *Common Router* for that Pico-net.

Network Layer Independent

Clearly the algorithm described does not depend on any Network Layer protocol like IP. This algorithm is also independent of the MAC sub-layer although its use is intended to be at the MAC sub-layer.

Efficient Topology Lookup And Modification

The specialized graph data structures used by the algorithm are designed for efficient topology lookup, offering acceptable performance over a reasonably large number of nodes.

What is claimed is:

1. A dynamic wireless network comprising:

a) an access server that controls overall operating parameters of said wireless network;

b) a first set of control algorithms on said access server for establishing and communicating operating parameters for said wireless network;

c) at least one root node in communication with said access server;

d) a plurality of wireless access point devices capable of communication with said root node and access server;

e) a second set of control algorithms running on at least one of said plurality of access point devices for operating said access point devices within the parameters defined by said access server, and

wherein said plurality of access point devices alter their relationship to one another to function optimally within the operating parameters of the network established by said access server.

2. The dynamic wireless network as in claim 1 wherein said root node serves as an interface between said access point devices and an outside link, wherein the outside link can be an Ethernet, token ring, phone line or serial cable.

3. The dynamic wireless network as in claim 1 wherein all access point devices serve as root nodes connected to an outside link, wherein the outside link can be an Ethernet, token ring, phone line or serial cable.

4. The dynamic wireless network of claim 1 wherein code unnecessary for essential functions of the control algorithm and its accompanying operating system is removed from the control algorithm, resulting in decreased size.

5. The dynamic wireless network of claim 1 wherein the access point devices are capable of generating encryption keys for providing a secure network.

[redacted]

6. A control system for managing wireless LANs comprising:

a) readily available information for defining characteristics of a wireless network;

b) a set of control algorithms to use said readily available information to select a best routing path of each of a node of the network;

c) implementation of said control algorithms in a low footprint to extend capabilities of a plurality of existing low cost wireless access point nodes and a plurality of other wireless enabled communication devices; and

d) a plurality of settings passed from a network management system (NMS) for dynamically tuning the network or any node of the network,

wherein a self-configuring, dynamically expandable wireless network is provided.

7. The system of claim 6 wherein the control algorithms are specially designed to run effectively within a small footprint embedded system.

8. The system of claim 6 implemented with a minimal footprint so as to run on a multitude of wireless enabled devices, including low cost, resource limited hardware.

9. The system of claim 6, wherein the low footprint, is generated as a result of a library of components of a plurality of operating system services with which a plurality of self standing executables is generated to include only components of an operating system essential for an operation of an application.

10. The system of claim 6, wherein the control algorithms are implemented to run on at least two readily available pieces of data, comprising a signal strength of a wireless radio of nearby nodes in the network and a number of hops of nearby nodes to a wired connection.

11. The system of claim 6, wherein the control algorithms run above a MAC layer of the communication device and is thereby both hardware and protocol agnostic.

[redacted]

12. The system of claim 11 wherein the control algorithms are capable of being embedded in wireless communication devices running on different operating systems but managed by one NMS.

13. The system of claim 6 wherein the control algorithms common to all devices in the network are instrumental in changing the network characteristics, based on a plurality of settings passed to said algorithms from a NMS.

14. The system of claim 6 wherein the implementation of the low footprint algorithms include the functionality of bridging, switching, load balancing in addition to a plurality of performance characteristics of the network related to latency and signal throughput.

15. The system of claim 14 wherein the performance characteristics of the network is tuned to be low latency, or high throughput or somewhere in between low latency and high throughput.

16. The system of claim 6, wherein performance of the network is predicated on a plurality of low footprint control layer algorithms running in wireless access point nodes.

17. The system of claim 16, wherein the running of the control algorithms in each device results in a low footprint distributed control system approach wherein said approach is more scaleable than centralized control systems, when the number of nodes of the network increases.

18. The system of claim 17 wherein the low footprint distributed control approach comprises an ability for control algorithms to be upgraded remotely using a simple upgrade protocol, thereby allowing a modifiable and extensible implementation of the system.

19. The system of claim 6 wherein the control algorithms manage the RF Interference of neighboring wireless devices by sensing and exchanging information regarding Radio channels in operation in the vicinity and selecting non interfering radio channels based on a algorithm described.

[redacted]

20. The system of claim 6 wherein the control algorithms manage the RF Interference of neighboring wireless devices in a multi hop wireless network and maintain seamless roaming for stations as they move from one BSS to an adjoining BSS.

21. The system of claim 6 wherein the control algorithms monitor the health of the wireless network and inform the NMS if node congestion occurs or the network has not been designed to be fail safe and redundant.

22. A method for implementing a control system for managing Wireless LANs comprising:

a) defining characteristics of a wireless network using readily available information;

b) utilizing control algorithms to use said readily available information to select a best routing path of each of a node of the network;

c) implementing said control algorithms in a low footprint to extend capabilities of a plurality of existing low cost wireless access point nodes and a plurality of other wireless enabled communication devices; and

d) dynamically tuning the network or any node of the network by a plurality of settings passed from a network management system,

wherein a self-configuring, dynamically expandable wireless network is provided.

[redacted]

ABSTRACT

A design and proof of concept of a new type of WLAN, complete with simulation and results from the simulation has been described. Each AP Node is implemented as a self -contained embedded OS unit, with all algorithms resident in its Operating system. The normal day-to-day functioning of the AP node is based entirely on resident control algorithms. Upgrades are possible through a simple secure communications interface supported by the OS kernel for each AP node. Benefits provided by a wireless network, as proposed in this invention, are that: it installs out of the box; the network is self-configuring; the network is redundant in that mesh network formalism is supported, ensuring multiple paths; load balancing is supported; there is no single point of failure; allows for decentralized execution; there is a central control; it is network application aware; there is application awareness; there is automatic channel allocation to manage and curtail RF interference, maximize non interference bandwidth and enable seamless roaming between adjoining wireless sub networks (BSS) and it supports the wireless equivalent for switching – for seamless roaming requirements.

[redacted]

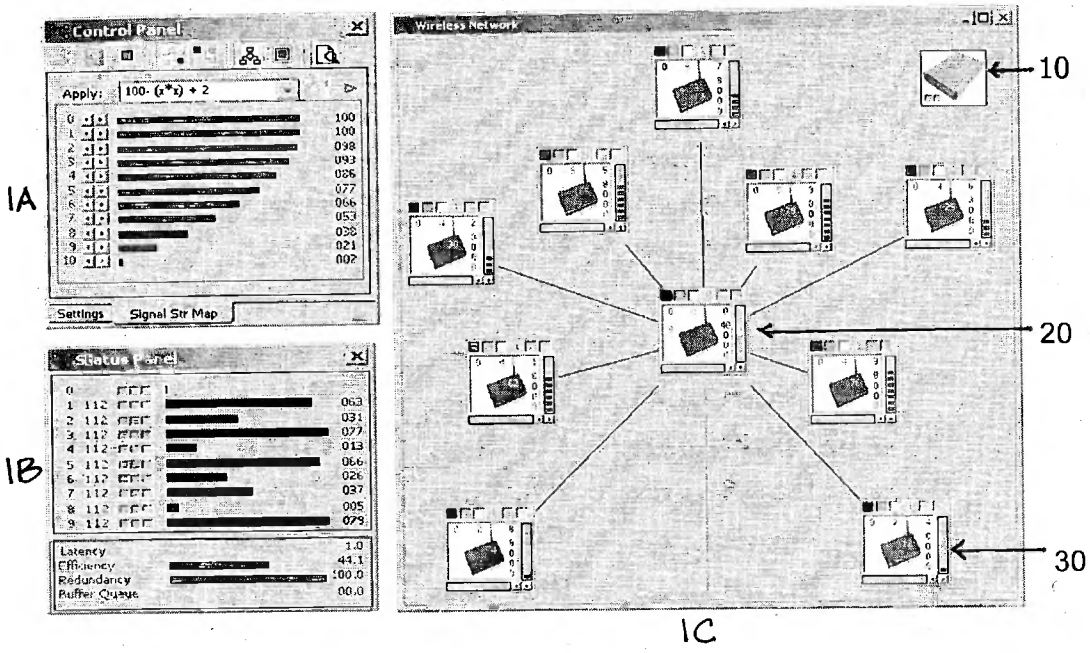

Control Panel
Apply:
100- (x*x) + 2
Settings
Signal Str Map
Status Panel
Latency
Efficiency
Redundancy
Buffer Queue
Wireless Network
10
20
30
1A
1B
1C

FIG. 1

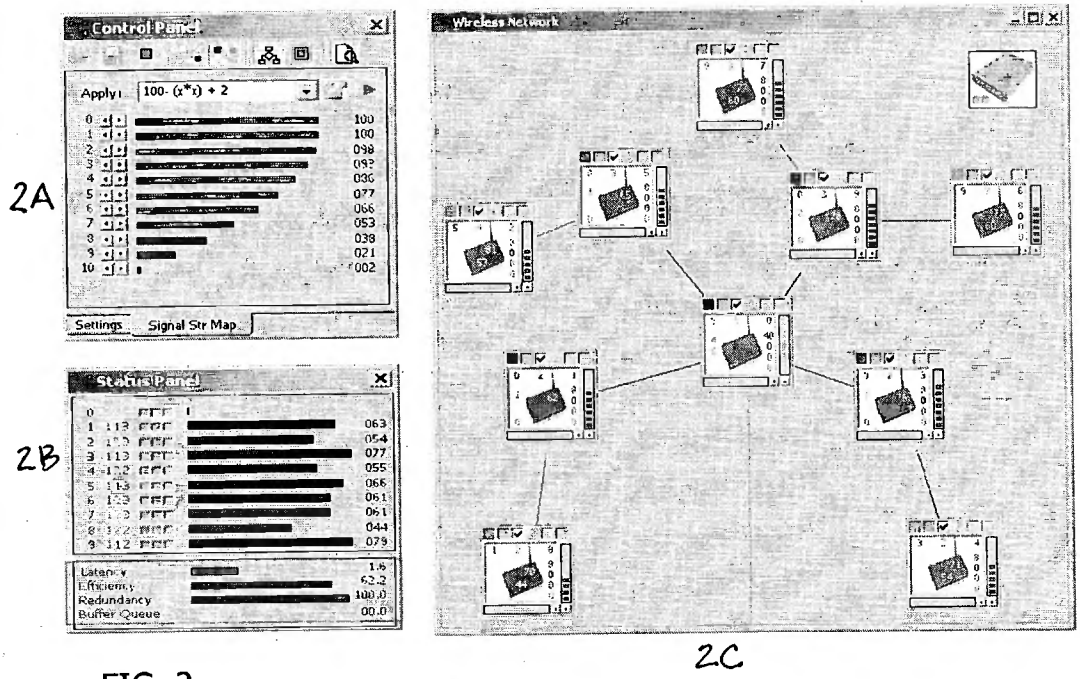

Control Panel
Apply:
100- (x*x) + 2
Settings
Signal Str Map
Status Panel
Latency
Efficiency
Redundancy
Buffer Queue
Wireless Network
2A
2B
2C

FIG. 2

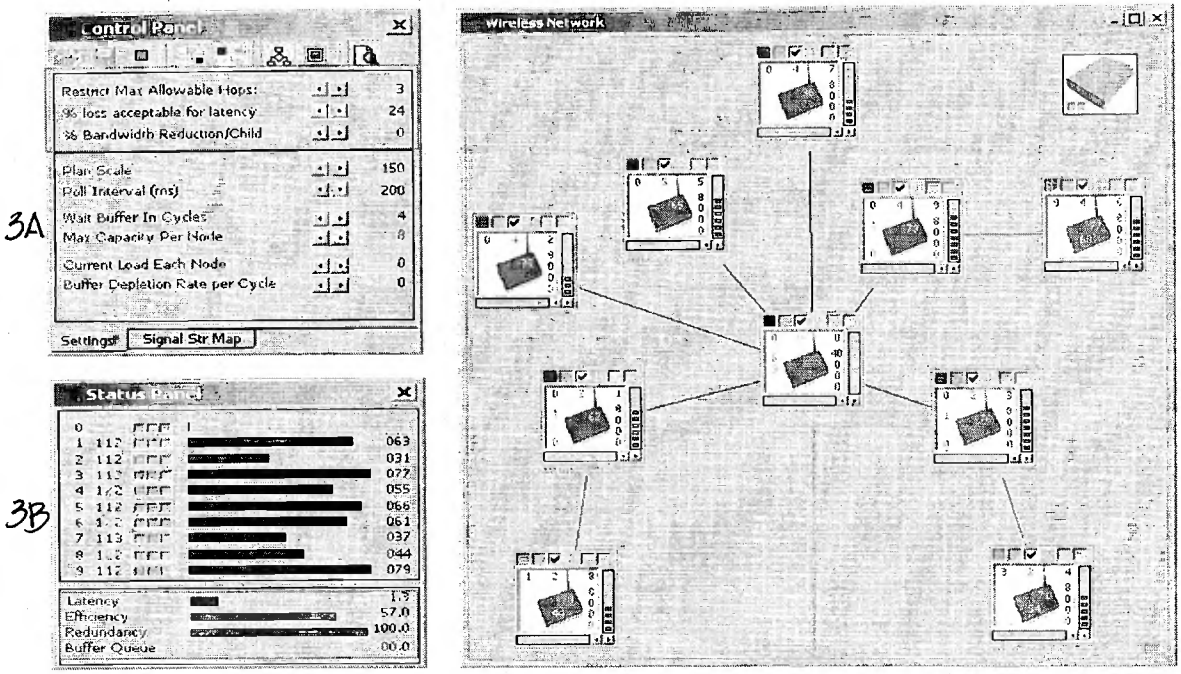

Control Panel
Restrict Max Allowable Hops: 3
% loss acceptable for latency 24
% Bandwidth Reduction/Child 0
Plan Scale 150
Poll Interval (ms) 200
Wait Buffer In Cycles 4
Max Capacity Per Node 8
Current Load Each Node 0
Buffer Depletion Rate per Cycle 0
Settings
Signal Str Map
3A
Status Panel
063
031
077
055
066
061
037
044
079
Latency 1.5
Efficiency 57.0
Redundancy 100.0
Buffer Queue 00.0
3B
Wireless Network
3C

FIG. 3

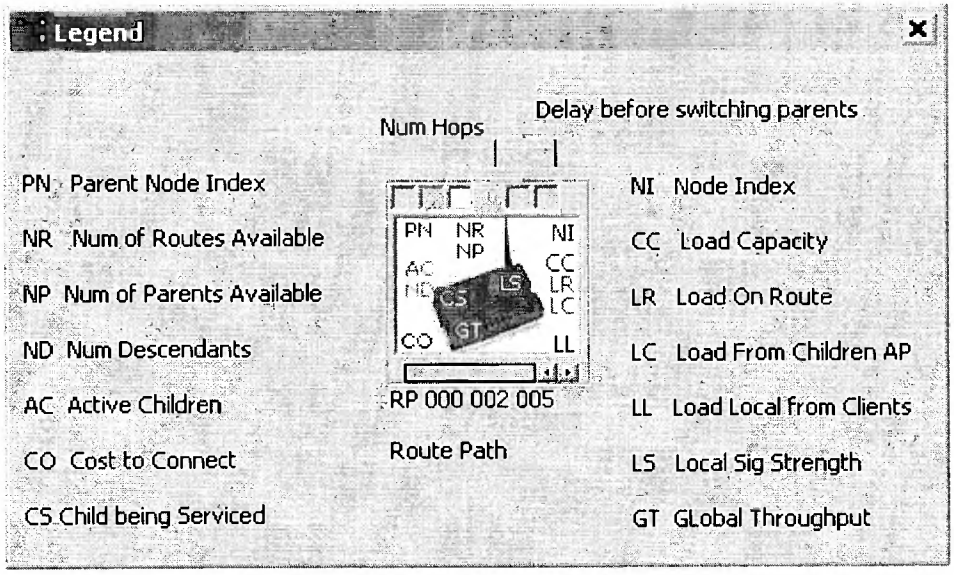

Legend
Num Hops
Delay before switching parents
PN Parent Node Index
NR Num of Routes Available
NP Num of Parents Available
ND Num Descendants
AC Active Children
CO Cost to Connect
CS Child being Serviced
PN NR NP
NI
AC
ND
CC
LR
LC
LS
CS
GT
CO
LL
RP 000 002 005
Route Path
NI Node Index
CC Load Capacity
LR Load On Route
LC Load From Children AP
LL Load Local from Clients
LS Local Sig Strength
GT GLobal Throughput

FIG. 4A

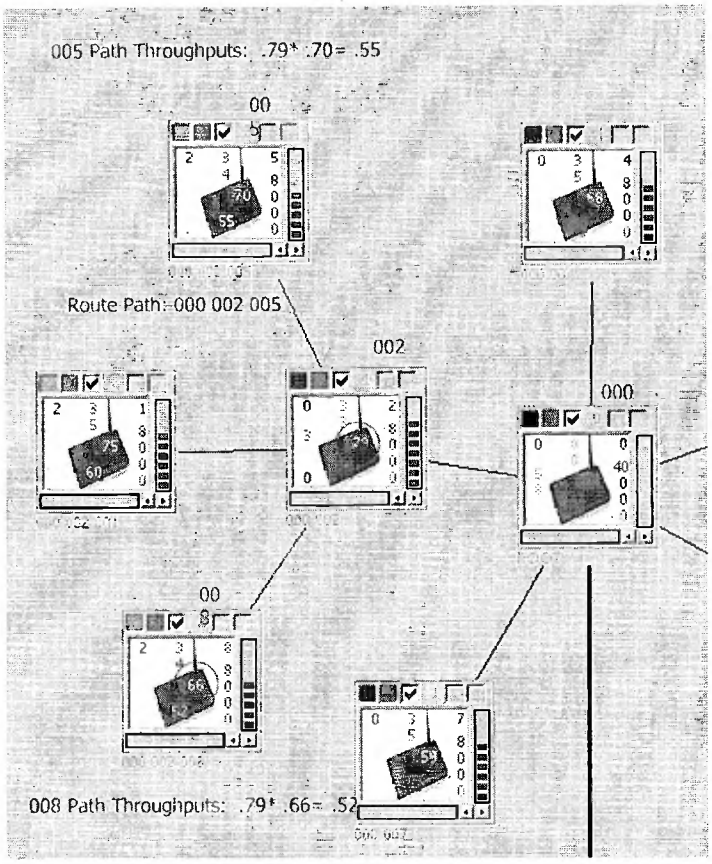

005 Path Throughputs: .79* .70= .55
00
Route Path: 000 002 005
002
000
00
008 Path Throughputs: .79* .66= .52

FIG. 4B

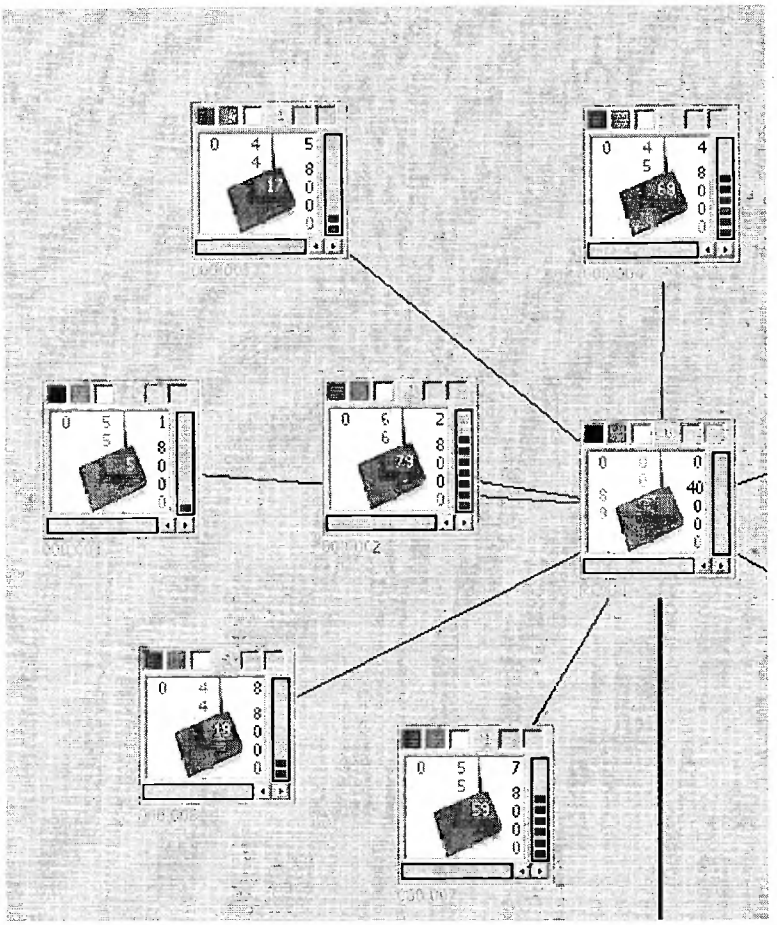


FIG. 5

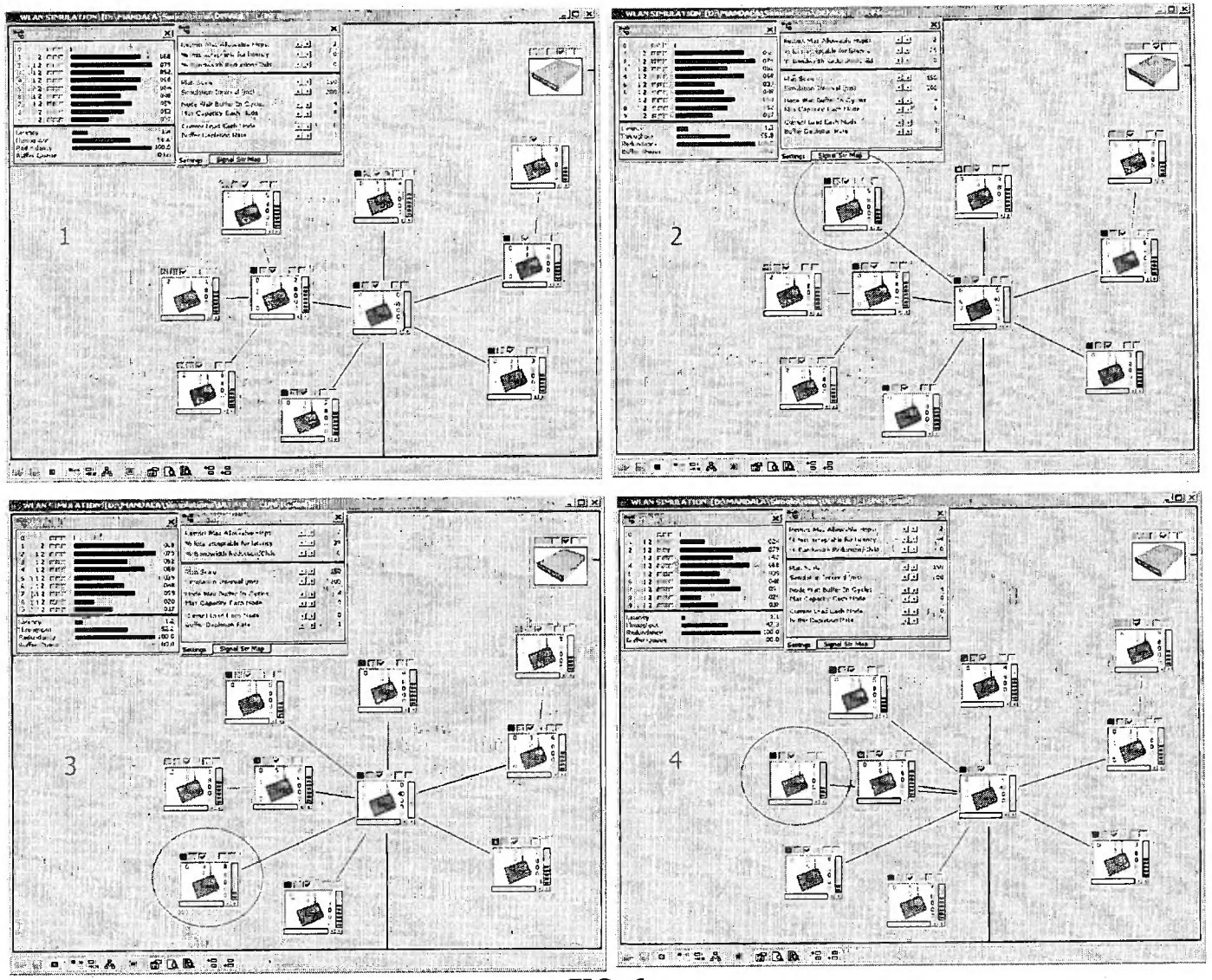


FIG. 6

EX1023, Page 75

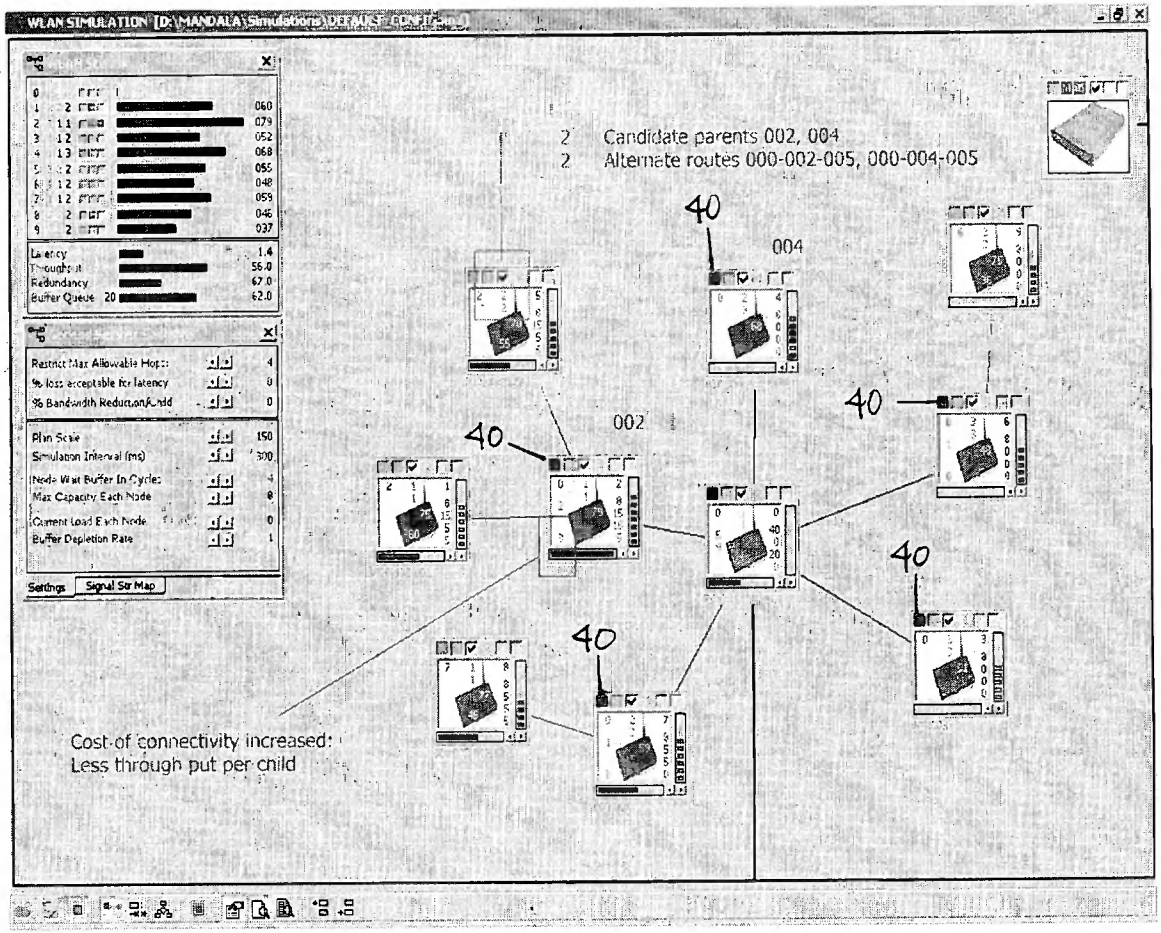

WLAN SIMULATION
Latency
Throughput
Redundancy
Buffer Queue
Restrict Max Allowable Hops
% loss acceptable for latency
% Bandwidth Reduction Allowed
Plan Scale
Simulation Interval (ms)
Node Wait Buffer In Cycles
Max Capacity Each Node
Current Load Each Node
Buffer Depletion Rate
Settings
Signal Str Map
2 Candidate parents 002, 004
2 Alternate routes 000-002-005, 000-004-005
40
004
002
Cost of connectivity increased:
Less through put per child

FIG. 7

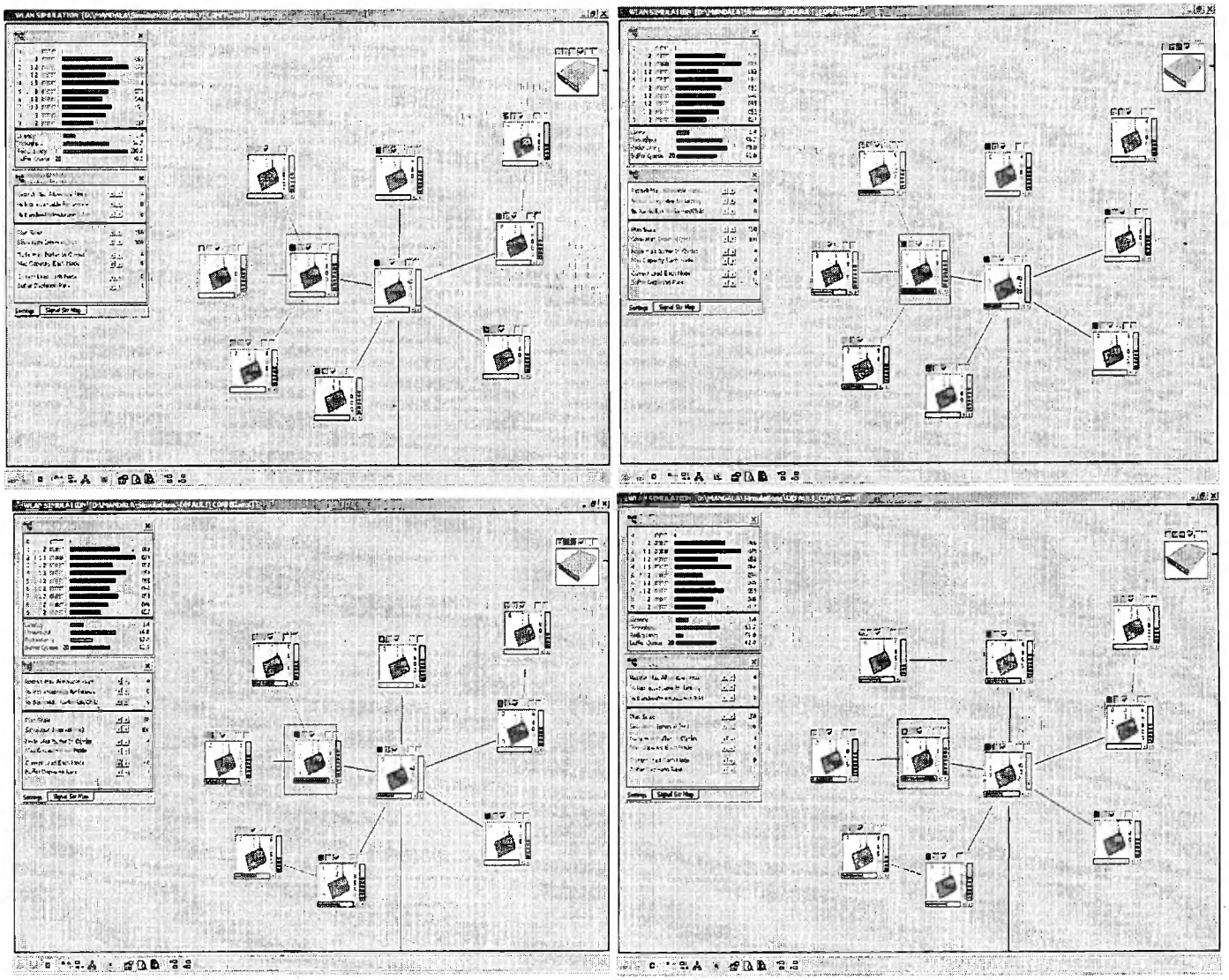


FIG. 8

EX1023, Page 77

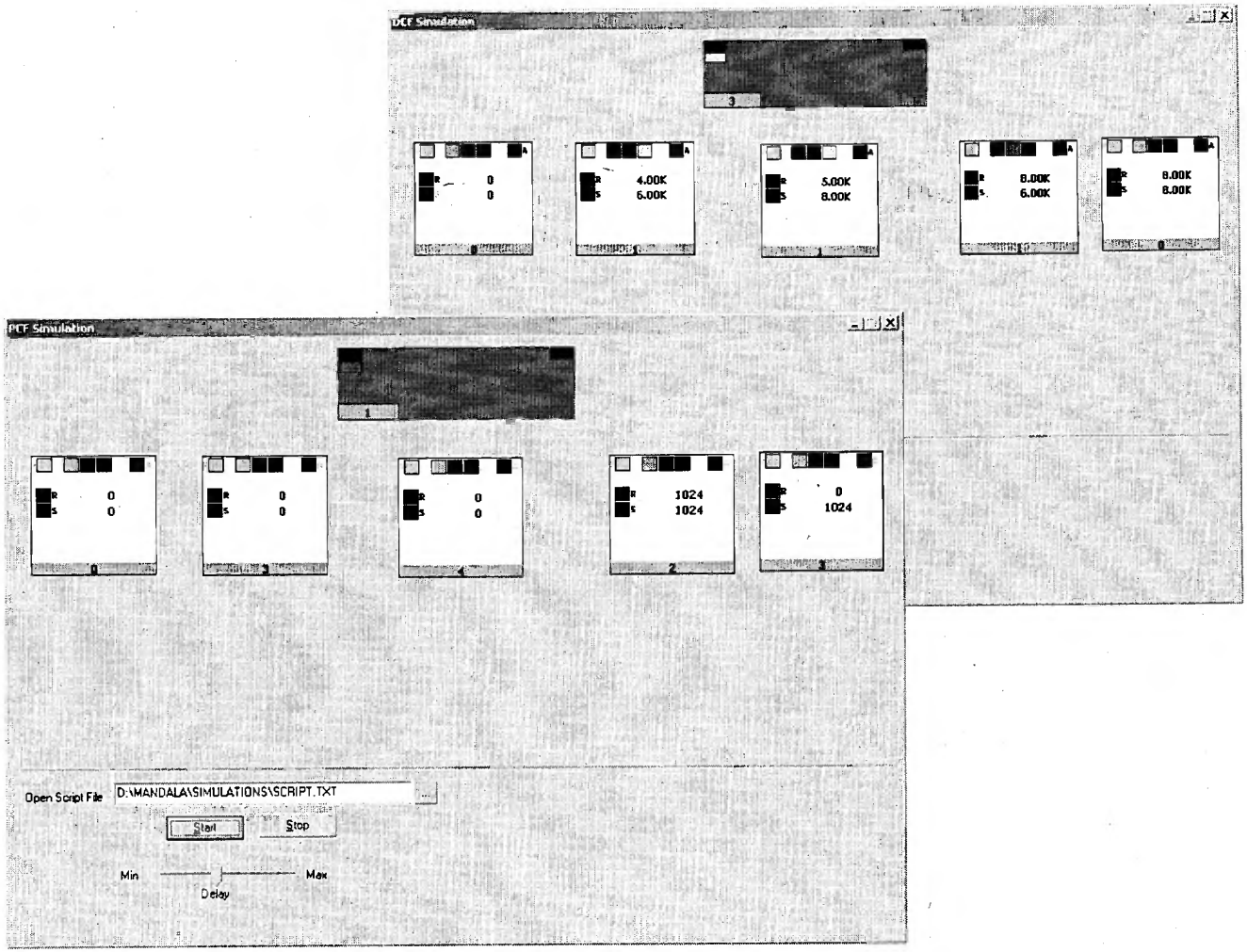


FIG. 9

EX1023, Page 78

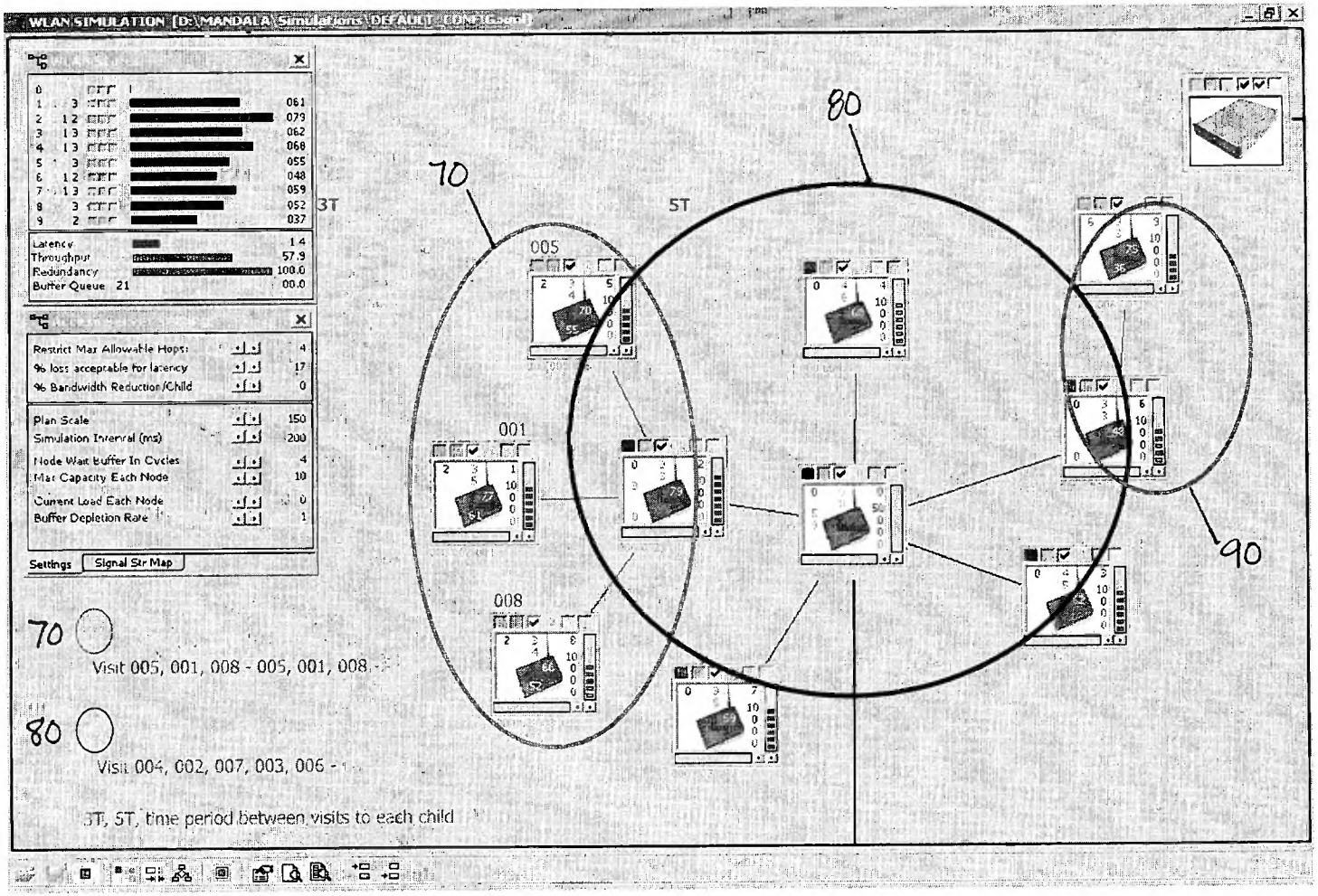


FIG. 10

EX1023, Page 79

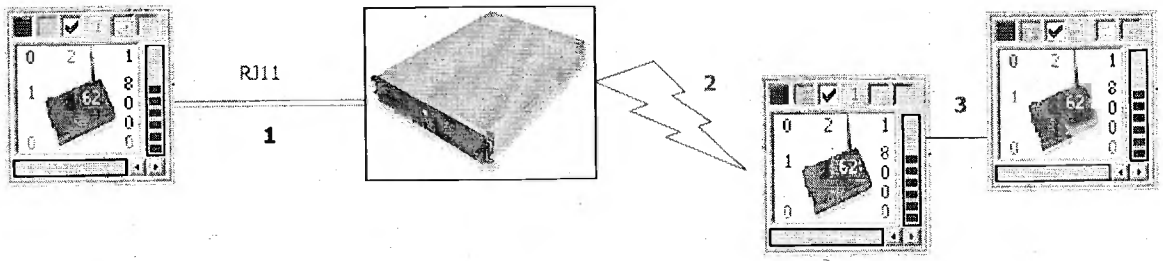


FIG. 11

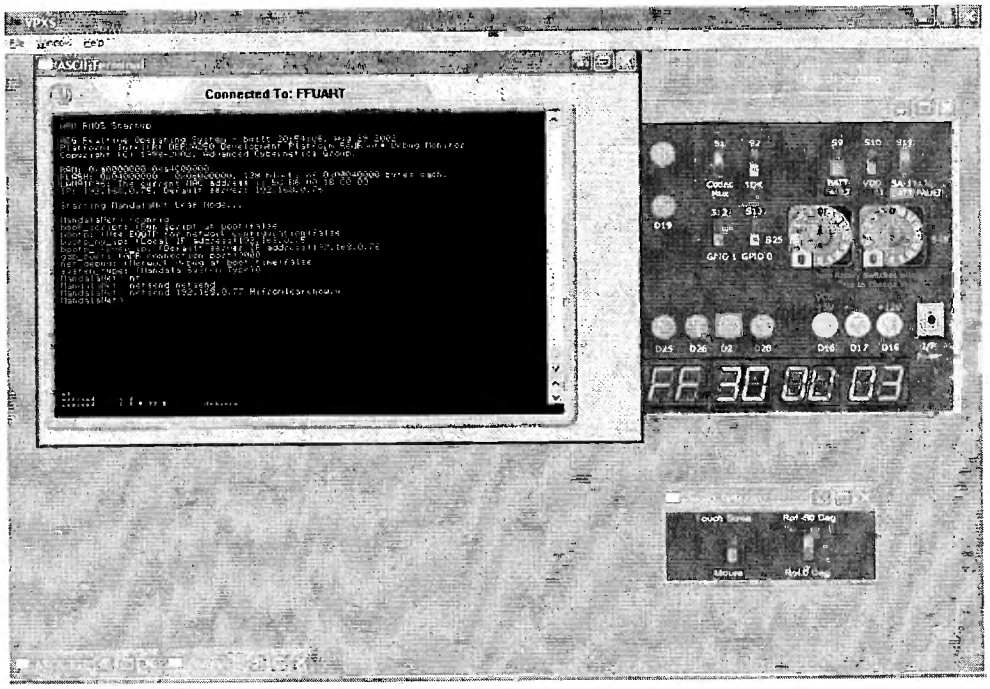


FIG. 12

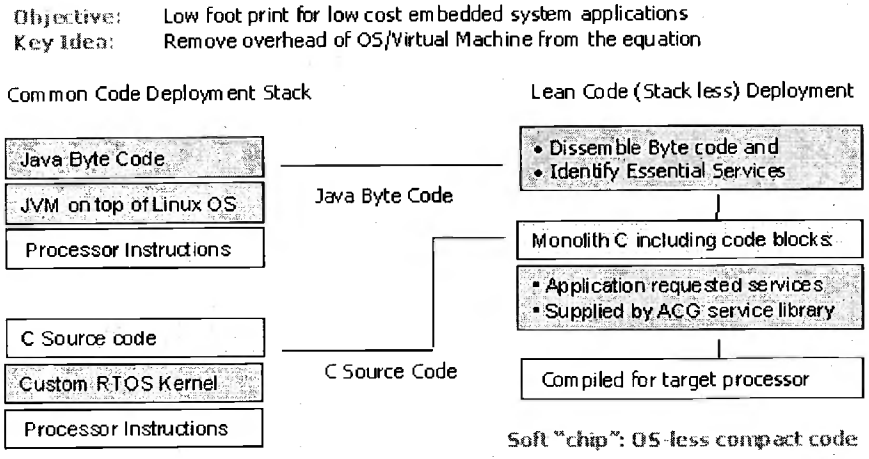

Objective: Low foot print for low cost embedded system applications
Key Idea: Remove overhead of OS/Virtual Machine from the equation
Common Code Deployment Stack
Lean Code (Stack less) Deployment
Java Byte Code
JVM on top of Linux OS
Processor Instructions
Java Byte Code
• Dissemble Byte code and
• Identify Essential Services
Monolith C including code blocks
• Application requested services
• Supplied by ACG service library
C Source code
Custom RTOS Kernel
Processor Instructions
C Source Code
Compiled for target processor
Soft "chip": OS-less compact code

FIG. 13

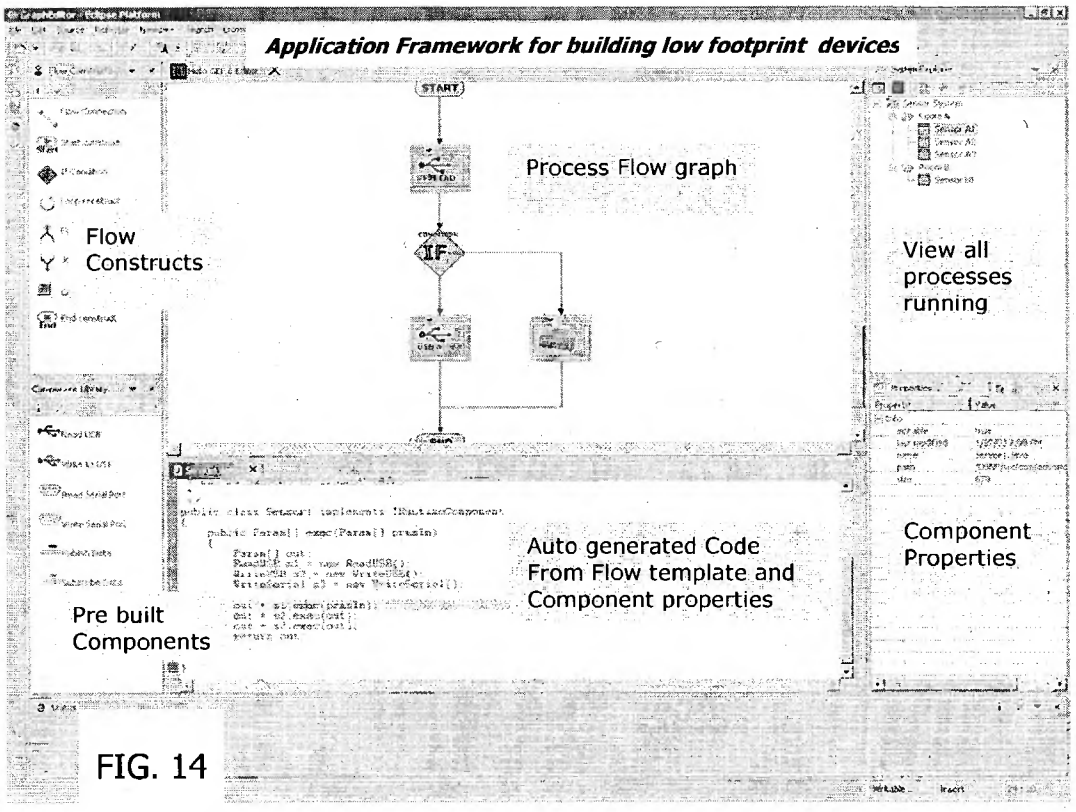

Application Framework for building low footprint devices
Process Flow graph
Flow Constructs
View all processes running
Auto generated Code From Flow template and Component properties
Component Properties
Pre built Components

FIG. 14

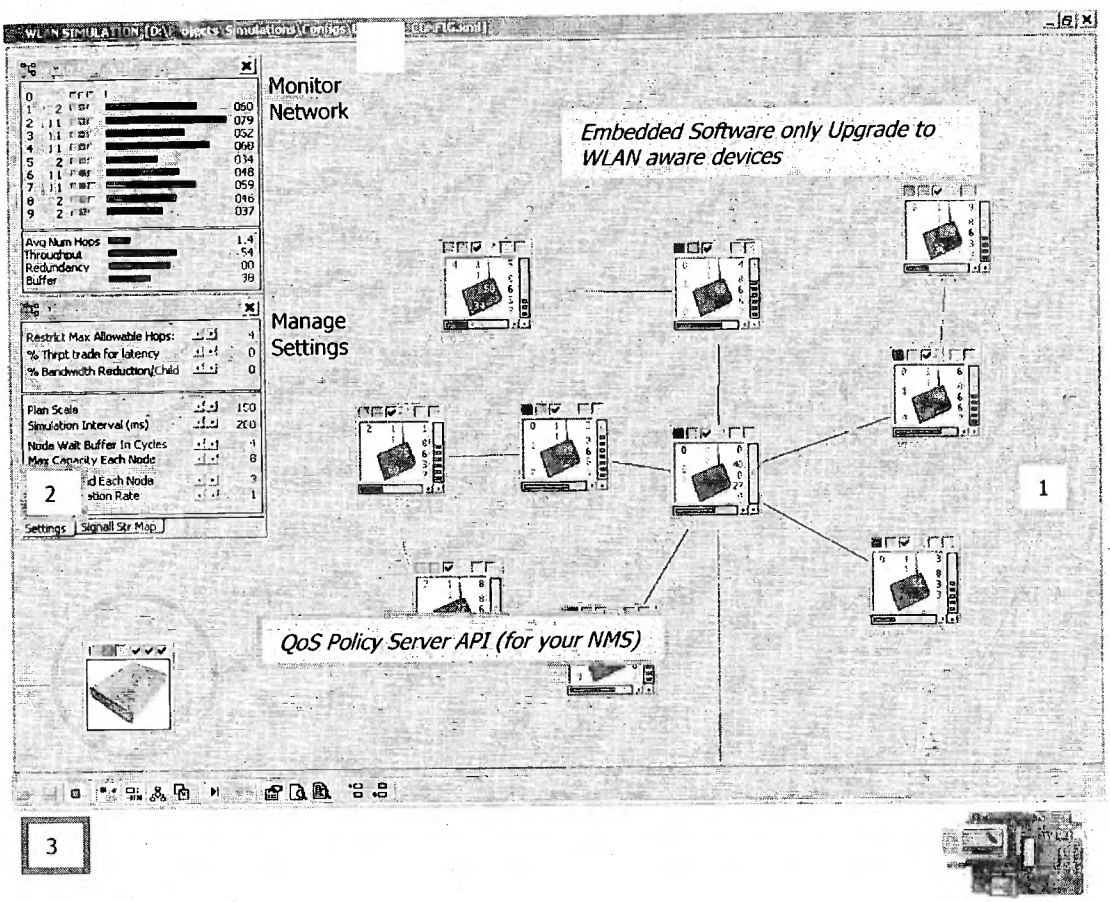

Monitor Network
Manage Settings
Embedded Software only Upgrade to WLAN aware devices
QoS Policy Server API (for your NMS)
1
2
3

FIG. 15

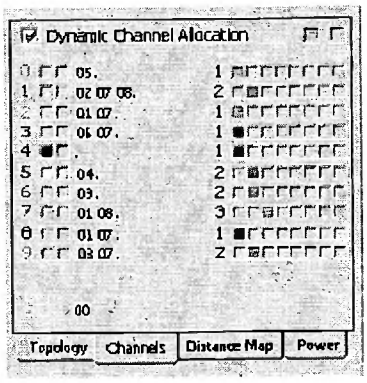

Dynamic Channel Allocation
Topology
Channels
Distance Map
Power

FIG. 16

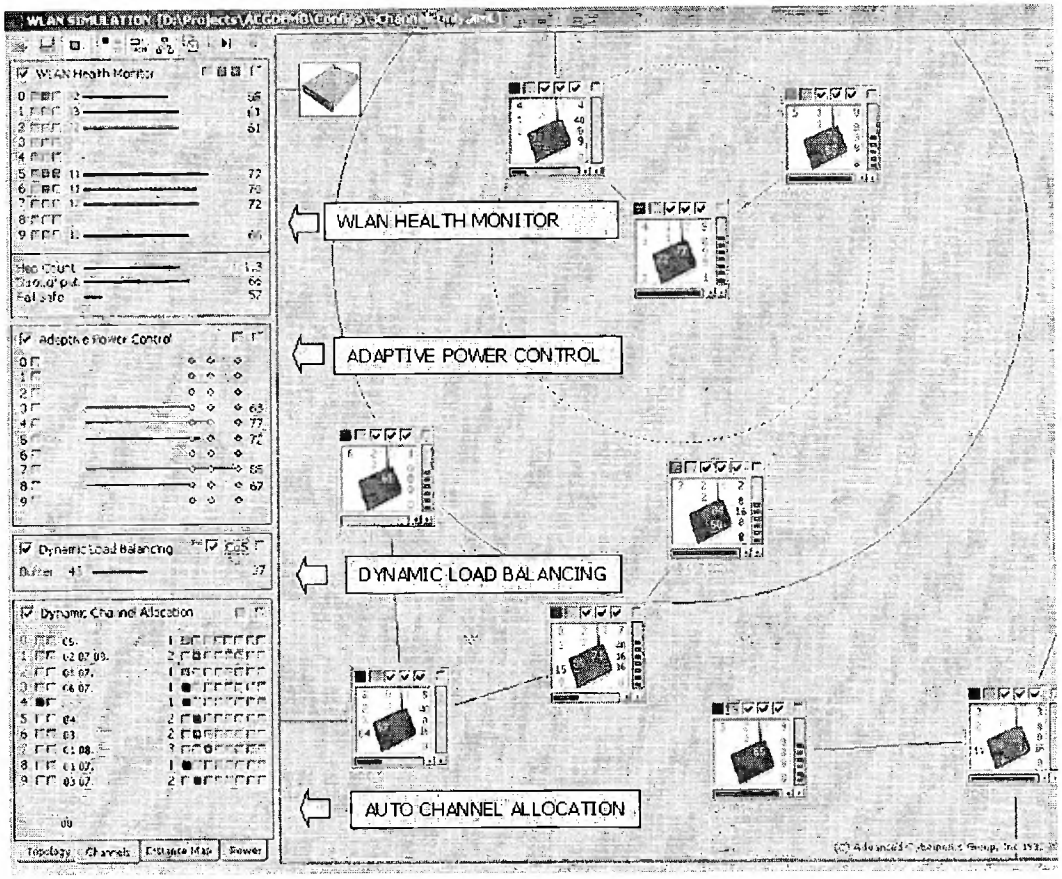

WLAN HEALTH MONITOR
ADAPTIVE POWER CONTROL
DYNAMIC LOAD BALANCING
AUTO CHANNEL ALLOCATION

FIG. 17

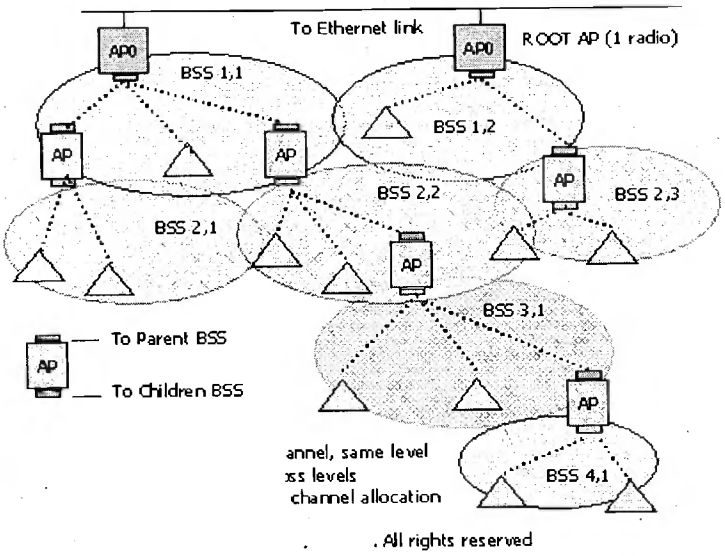

To Ethernet link
AP0
ROOT AP (1 radio)
BSS 1,1
BSS 1,2
AP
BSS 2,2
BSS 2,3
BSS 2,1
BSS 3,1
To Parent BSS
To Children BSS
annel, same level
ss levels
channel allocation
BSS 4,1
. All rights reserved

FIG. 18

DECLARATION

DACOSTAF.PT1

UTILITY APPLICATION

As a below-named inventor, I hereby declare that:

My residence, post office address, and citizenship are as stated below next to my name.

I believe I am the original, first, and sole inventor (if only one name is listed below) or an original, first, and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled HIGH PERFORMANCE WIRELESS NETWORKS USING DISTRIBUTED CONTROL the specification of which

CHECK ONE

[X] is attached hereto.

[ ] was filed on _____ as
Application Serial No. _____
and was amended on _____
(if applicable)

I have read the applicable statutes and rules reprinted on the attached page of this declaration which I understand to describe subject matter which is material under 37 C.F.R. § 1.56(a).

I hereby state that I have reviewed and understand the contents of the above-identified specification, including the claims, as amended by any amendment(s) referred to above. I acknowledge the duty to disclose information which is material to the examination of this application in accordance with Title 37, Code of Federal Regulations, § 1.56(a). I hereby claim foreign priority benefits under Title 35, United States Code, § 119 of any foreign application(s) for patent or inventor's certificate listed below and have also identified below any foreign application for patent or inventor's certificate having a filing date before that of the application on which priority is claimed.

Application Number	Country	Date of Filing	Priority Claimed	
			Yes√	No√
N/A				

[redacted]

I hereby claim the benefit under Title 35, United States § 119(e) of any United States provisional application(s) listed below.

Application Number	Date of Filing
60/421,930	10/28/2002

I hereby claim the benefit under Title 35, United States Code, § 120 of any United States application(s) listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States application in the manner provided by the first paragraph of Title 35, United States Code, § 112, I acknowledge the duty to disclose material information as defined in Title 37, Code of Federal Regulations, § 1.56, including for continuation-in-part applications, material information which became available between the filing date of the prior application and the national or PCT international filing date of the continuation-in-part application.

Application Number	Date of Filing	Status -Patented, Pending, or Abandoned
N/A		

APPLICABLE STATUTES & RULES

37 C.F.R. § 1.56 - DUTY OF DISCLOSURE; FRAUD; STRIKING OR REJECTION OF APPLICATIONS

(a) A duty of candor and good faith toward the Patent and Trademark Office rests on the inventor, on each attorney or agent who prepares or prosecutes the application and on every other individual who is substantively involved in the preparation or prosecution of the application and who is associated with the inventor, with the assignee or with anyone to whom there is an obligation to assign the application. All such individuals have a duty to disclose to the Office information they are aware of which is material to the examination of the application. Such information is material where there is a substantial likelihood that a reasonable examiner would consider it important in deciding whether to allow the application to issue as a patent. The duty is commensurate with the degree of involvement in the preparation or prosecution of the application.

Information relating to the following factual situations enumerated in 35 U.S.C. § 102 and § 103 should be considered material under 37 C.F.R. § 1.56(a):

A person shall be entitled to a patent unless --

(a) The invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for patent, or

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of the application for patent in the United States, or

(c) he has abandoned the invention, or

(d) the invention was first patented or caused to be patented, or was the subject of an inventor's certificate, by the applicant or his legal representatives or assigns in a foreign country prior to the date of the application for patent in this country on an application for patent or

[redacted]

inventor's certificate filed more than twelve months before the filing of the application in the United States, or

(e) the invention was described in a patent granted on an application for patent by another filed in the United States before the invention thereof by the applicant for patent, or on an international application by another who has fulfilled the requirements of paragraphs (1), (2), and (4) of section 371(c) of this title before the invention thereof by the applicant for patent, or

(f) he did not himself invent the subject matter sought to be patented, or

(g) before the applicant's invention thereof the invention was made in this country by another who had not abandoned, suppressed, or concealed it. In determining priority of invention there shall be considered not only the respective dates of conception and reduction to practice of the invention, but also the reasonable diligence of one who was first to conceive and last to reduce to practice, from a time prior to conception by the other.

35 U.S.C. § 103 - CONDITIONS FOR PATENTABILITY; NON-OBVIOUS SUBJECT MATTER

A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

35 U.S.C. § 119 - BENEFIT OF EARLIER FILING DATE IN FOREIGN COUNTRY; RIGHT OF PRIORITY (Applicable Portion)

An application for patent for an invention filed in this country by any person who has, or whose legal representatives or assigns have, previously regularly filed an application for a patent for the same invention in a foreign country which affords similar privileges shall have the same effect as the same application would have if filed in this country on the date on which the application for patent for the same invention was first filed in such foreign country, if the application in this country is filed within twelve months from the earliest date on which such foreign application was filed; but no patent shall be granted on any application for patent for an invention which has been patented or described in a printed publication in any country more than one year before the date of the actual filing of the application in this country, or which had been in public use or on sale in this country more than one year prior to such filing.

35 U.S.C. § 120 - BENEFIT OF EARLIER FILING DATE IN THE UNITED STATES

An application for patent for an invention disclosed in the manner provided by the first paragraph of section 112 of this title in an application previously filed in the United States, or as provided by section 363 of this title, by the same invention shall have the same effect, as to such invention, as though filed on the date of the prior application, if filed before the patenting or abandonment of or termination of proceedings on the first application or on an application similarly entitled to the benefit of the filing date of the first application and if it contains or is amended to contain a specific reference to the earlier filed application.

35 U.S.C. § 112 - SPECIFICATION (Applicable Portion)

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make use the same, and shall set forth the best mode contemplated by the inventor of carrying out his invention.

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

[redacted]

I hereby appoint as attorneys of record with full power of substitution and revocation, to prosecute this application and transact all business in the Patent and Trademark Office connected therewith: Otto O. Lee, Reg. No. 37,871, Debbie Chun, Reg. No. 38,700, Naren Chaganti, Reg. No. 44,602, and Juneko C. Jackson, Reg. No. 48,870.

Send Correspondence to:	Intellectual Property Law Group LLP 12 South First Street, Twelfth Floor San Jose, CA 95113	Direct Telephone Calls to: Otto O. Lee (408) 286-8933

2	FULL NAME OF INVENTOR FIRST Name: Francis	Middle Initials(s):	LAST Name: da Costa	
0	RESIDENCE & CITIZENSHIP City: San Jose	State or Foreign Country: California	Country of Citizenship: USA	
1	POST OFFICE ADDRESS Post Office Address: 1299 PARKMOOR AVE, #153	City: San Jose	State or Country: CA	Zip Code: 95126

2	FULL NAME OF INVENTOR FIRST Name: Sriram	Middle Initials(s):	LAST Name: Dayanandan	
0	RESIDENCE & CITIZENSHIP City: San Jose	State or Foreign Country: CA	Country of Citizenship: INDIA	
2	POST OFFICE ADDRESS Post Office Address: 1299 PARKMOOR AVE, #153	City: San Jose	State or Country: CA	Zip Code: 95126

I further declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application of any patent issuing thereon.

Signature of Inventor 201: Sriram Francis da Costa	Signature of Inventor 202:
Date 05/07/2003	Date 05/07/2003

(Signatures should conform to names as presented at 201 *et seq.* above.)

05-12-03

10434948.050803

PTO/SB/05 (03-01)
Approved for use through 10/31/2002. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
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UTILITY PATENT APPLICATION TRANSMITTAL

(Only for new nonprovisional applications under 37 CFR 1.53(b))

Attorney Docket No.	DACOSTAF.PT1
First Inventor	Francis daCosta
Title	High Performance Wireless Networks Using ...
Express Mail Label No.	EL046701720US

APPLICATION ELEMENTS

See MPEP chapter 600 concerning utility patent application contents.

1. [✔] Fee Transmittal Form (e.g., PTO/SB/17) *(Submit an original and a duplicate for fee processing)*
2. [✔] Applicant claims small entity status. See 37 CFR 1.27.
3. [✔] Specification [*Total Pages* 67] *(preferred arrangement set forth below)*
   - Descriptive title of the invention
   - Cross Reference to Related Applications
   - Statement Regarding Fed sponsored R & D
   - Reference to sequence listing, a table, or a computer program listing appendix
   - Background of the Invention
   - Brief Summary of the Invention
   - Brief Description of the Drawings (*if filed*)
   - Detailed Description
   - Claim(s)
   - Abstract of the Disclosure
4. [✔] Drawing(s) *(35 U.S.C. 113)* [*Total Sheets* 14]
5. Oath or Declaration [*Total Pages* 4]
   a. [✔] Newly executed (original or copy)
   b. [ ] Copy from a prior application (37 CFR 1.63 (d)) *(for continuation/divisional with Box 18 completed)*
      i. [ ] DELETION OF INVENTOR(S) Signed statement attached deleting inventor(s) named in the prior application, see 37 CFR 1.63(d)(2) and 1.33(b).
6. [ ] Application Data Sheet. See 37 CFR 1.76

ADDRESS TO: Assistant Commissioner for Patents, Box Patent Application, Washington, DC 20231

7. [ ] CD-ROM or CD-R in duplicate, large table or Computer Program (*Appendix*)
8. Nucleotide and/or Amino Acid Sequence Submission (*if applicable, all necessary*)
   a. [ ] Computer Readable Form (CRF)
   b. Specification Sequence Listing on:
      i. [ ] CD-ROM or CD-R (2 copies); or
      ii. [ ] paper
   c. [ ] Statements verifying identity of above copies

ACCOMPANYING APPLICATION PARTS

9. [ ] Assignment Papers (cover sheet & document(s))
10. [ ] 37 CFR 3.73(b) Statement *(when there is an assignee)* [✔] Power of Attorney
11. [ ] English Translation Document *(if applicable)*
12. [ ] Information Disclosure Statement (IDS)/PTO-1449 [ ] Copies of IDS Citations
13. [ ] Preliminary Amendment
14. [✔] Return Receipt Postcard (MPEP 503) *(Should be specifically itemized)*
15. [ ] Certified Copy of Priority Document(s) *(if foreign priority is claimed)*
16. [ ] Nonpublication Request under 35 U.S.C. 122 (b)(2)(B)(i). Applicant must attach form PTO/SB/35 or its equivalent.
17. [ ] Other: .....

18. If a CONTINUING APPLICATION, *check appropriate box, and supply the requisite information below and in a preliminary amendment, or in an Application Data Sheet under 37 CFR 1.76:*

[ ] Continuation [ ] Divisional [ ] Continuation-in-part (CIP) of prior application No.: ____/____

Prior application information: *Examiner:* _____ *Group Art Unit:* _____

For CONTINUATION OR DIVISIONAL APPS only: The entire disclosure of the prior application, from which an oath or declaration is supplied under Box 5b, is considered a part of the disclosure of the accompanying continuation or divisional application and is hereby incorporated by reference. The incorporation can only be relied upon when a portion has been inadvertently omitted from the submitted application parts.

19. CORRESPONDENCE ADDRESS

[ ] *Customer Number or Bar Code Label* *(Insert Customer No. or Attach bar code label here)* or [✔] *Correspondence address below*

Name	Otto O. Lee				
Address	Intellectual Property Law Group LLP				
	12 South First St., Suite 1205				
City	San Jose	*State*	CA	*Zip Code*	95113
Country	U.S.A.	*Telephone*	408-286-8933	*Fax*	408-286-8932

Name (Print/Type)	Juneko Jackson	*Registration No. (Attorney/Agent)*	48,870
Signature		*Date*	05/08/2003

Burden Hour Statement: This form is estimated to take 0.2 hours to complete. Time will vary depending upon the needs of the individual case. Any comments on the amount of time you are required to complete this form should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, Washington, DC 20231. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Assistant Commissioner for Patents, Box Patent Application, Washington, DC 20231.

PTO/SB/17 (01-03)
Approved for use through 04/30/2003. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
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FEE TRANSMITTAL for FY 2003

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

☑ Applicant claims small entity status. See 37 CFR 1.27

TOTAL AMOUNT OF PAYMENT ($) 393

Complete if Known	
Application Number	
Filing Date	
First Named Inventor	Francis daCosta
Examiner Name	
Art Unit	
Attorney Docket No.	DACOSTAF.PT1

METHOD OF PAYMENT *(check all that apply)*

☑ Check ☐ Credit card ☐ Money Order ☐ Other ☐ None

☑ Deposit Account:

Deposit Account Number: 50-1037

Deposit Account Name: IP Law Group LLP

The Commissioner is authorized to: *(check all that apply)*

☑ Charge fee(s) indicated below ☑ Credit any overpayments

☑ Charge any additional fee(s) during the pendency of this application

☑ Charge fee(s) indicated below, **except for the filing fee** to the above-identified deposit account.

FEE CALCULATION

1. BASIC FILING FEE

Large Entity Fee Code	Large Entity Fee ($)	Small Entity Fee Code	Small Entity Fee ($)	Fee Description	Fee Paid
1001	750	2001	375	Utility filing fee	375.00
1002	330	2002	165	Design filing fee	
1003	520	2003	260	Plant filing fee	
1004	750	2004	375	Reissue filing fee	
1005	160	2005	80	Provisional filing fee	

SUBTOTAL (1) ($) 375.00

2. EXTRA CLAIM FEES FOR UTILITY AND REISSUE

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

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

SUBTOTAL (2) ($) 18.00

***or number previously paid, if greater; For Reissues, see above*

FEE CALCULATION (continued)

3. ADDITIONAL FEES

Large Entity Fee Code	Large Entity Fee ($)	Small Entity Fee Code	Small Entity Fee ($)	Fee Description	Fee Paid
1051	130	2051	65	Surcharge - late filing fee or oath	
1052	50	2052	25	Surcharge - late provisional filing fee or cover sheet	
1053	130	1053	130	Non-English specification	
1812	2,520	1812	2,520	For filing a request for ex *parte* reexamination	
1804	920*	1804	920*	Requesting publication of SIR prior to Examiner action	
1805	1,840*	1805	1,840*	Requesting publication of SIR after Examiner action	
1251	110	2251	55	Extension for reply within first month	
1252	410	2252	205	Extension for reply within second month	
1253	930	2253	465	Extension for reply within third month	
1254	1,450	2254	725	Extension for reply within fourth month	
1255	1,970	2255	985	Extension for reply within fifth month	
1401	320	2401	160	Notice of Appeal	
1402	320	2402	160	Filing a brief in support of an appeal	
1403	280	2403	140	Request for oral hearing	
1451	1,510	1451	1,510	Petition to institute a public use proceeding	
1452	110	2452	55	Petition to revive - unavoidable	
1453	1,300	2453	650	Petition to revive - unintentional	
1501	1,300	2501	650	Utility issue fee (or reissue)	
1502	470	2502	235	Design issue fee	
1503	630	2503	315	Plant issue fee	
1460	130	1460	130	Petitions to the Commissioner	
1807	50	1807	50	Processing fee under 37 CFR 1.17(q)	
1806	180	1806	180	Submission of Information Disclosure Stmt	
8021	40	8021	40	Recording each patent assignment per property (times number of properties)	
1809	750	2809	375	Filing a submission after final rejection (37 CFR 1.129(a))	
1810	750	2810	375	For each additional invention to be examined (37 CFR 1.129(b))	
1801	750	2801	375	Request for Continued Examination (RCE)	
1802	900	1802	900	Request for expedited examination of a design application	

Other fee (specify) _____

*Reduced by Basic Filing Fee Paid **SUBTOTAL (3)** ($)

SUBMITTED BY				(Complete *(if applicable)*)	
Name (Print/Type)	Juneko Jackson	*Registration No. (Attorney/Agent)*	48,870	*Telephone* 408-286-8933	
Signature				*Date*	May 8, 2003

WARNING: Information on this form may become public. Credit card information should not be included on this form. Provide credit card information and authorization on PTO-2038.

This collection of information is required by 37 CFR 1.17 and 1.27. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, Washington, DC 20231. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, Washington, DC 20231.**

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

10434948 .050803

SAN DIEGO
Emerald Plaza Center
402 West Broadway, Suite 400
San Diego, California 92101

SEATTLE
Two Union Square Center
601 Union Street, 42nd Floor
Seattle, Washington 98101



INTELLECTUAL PROPERTY LAW GROUP LLP

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Old Bank of America Building
12 South First Street, 12th Floor
San Jose, California 95113
TEL: 408.286.8933
FAX: 408.286.8932
URL:www.iplg.com

LOS ANGELES
2600 Mission Street
Suite 100
San Marino, California 91108

WASHINGTON D.C.
601 Pennsylvania Avenue Center
South Building Suite 900
Washington, D.C. 20004



May 8, 2003

VIA EXPRESS MAIL
EL046701720US

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

Re: NEW UTILITY NON-PROVISIONAL PATENT APPLICATION

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

Dear Sir:

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

Please find enclosed the following:

1. a cover letter;
2. a utility transmittal letter;
3. a fee transmittal;
4. an application of a total of 67 pages: including a written description (30 pages), a set of claims (4 pages), an abstract (1 page), an Appendix A (12 pages), an Appendix B (20 pages);
5. a set of drawings (14 sheets);
6. a signed joint declaration/power of attorney by the inventor;
7. a check of $393.00 to cover the filing fee for the patent application (small entity) including the two extra claims fee; and
8. a return receipt postcard.

The commissioner is hereby authorized to charge any underpayment or credit any overpayment to Deposit Account Number 501037. If you should have any questions, please contact us.

Sincerely,
INTELLECTUAL PROPERTY LAW GROUP LLP

Juneko Jackson (Reg. No.: 48,870)
Enclosures

CERTIFICATE OF EXPRESS MAIL

"EXPRESS MAIL" mailing label number: EL046701720US Date of Deposit: May 8, 2003.
I hereby certify that the above-identified correspondence, which is attached, is being deposited with the United States Postal Service "Express Mail Post Office to Addressee" service under 37 C.F.R. ' 1.10 on the date indicated above and is addressed to Mail Stop Patent Application, Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.

Juneko Jackson
Name of Person Mailing Paper or Fee

Signature

PATENT APPLICATION SERIAL NO. _____

U.S. DEPARTMENT OF COMMERCE
PATENT AND TRADEMARK OFFICE
FEE RECORD SHEET

05/13/2003 SDIRETA1 00000035 10434948

01 FC:2001	375.00 OP
02 FC:2202	18.00 OP

PTO-1556
(5/87)

*U.S. Government Printing Office: 2002 — 489-267/69033

PATENT APPLICATION FEE DETERMINATION RECORD
Effective January 1, 2003

Application or Docket Number: 10/439,548

CLAIMS AS FILED - PART I

	(Column 1)	(Column 2)
TOTAL CLAIMS	22	
FOR	NUMBER FILED	NUMBER EXTRA
TOTAL CHARGEABLE CLAIMS	22 minus 20=	* 2
INDEPENDENT CLAIMS	3 minus 3 =	*
MULTIPLE DEPENDENT CLAIM PRESENT		☐

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

SMALL ENTITY TYPE ☐		OR	OTHER THAN SMALL ENTITY	
RATE	FEE		RATE	FEE
BASIC FEE	375.00	OR	BASIC FEE	750.00
X$ 9=	18	OR	X$18=	
X42=		OR	X84=	
+140=		OR	+280=	
TOTAL	393	OR	TOTAL	

CLAIMS AS AMENDED - PART II

AMENDMENT A	(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA
Total	*	Minus	**	=
Independent	*	Minus	***	=
FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM				☐

1, 6 22

SMALL ENTITY		OR	OTHER THAN SMALL ENTITY	
RATE	ADDITIONAL FEE		RATE	ADDITIONAL FEE
X$ 9=		OR	X$18=	
X42=		OR	X84=	
+140=		OR	+280=	
TOTAL ADDIT. FEE		OR	TOTAL ADDIT. FEE	

AMENDMENT B	(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA
Total	*	Minus	**	=
Independent	*	Minus	***	=
FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM				☐

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

AMENDMENT C	(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA
Total	*	Minus	**	=
Independent	*	Minus	***	=
FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM				☐

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

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

FORM PTO-875 (Rev. 12/02) *U.S. Government Printing Office: 2003 — 498-278/69151 Patent and Trademark Office, U.S. DEPARTMENT OF COMMERCE

CLAIMS ONLY

SERIAL NO. 10434948

FILING DATE

APPLICANT(S)

CLAIMS

	AS FILED		AFTER 1ST AMENDMENT		AFTER 2ND AMENDMENT											
	IND	DEP	IND	DEP	IND	DEP		IND	DEP	IND	DEP	IND	DEP		IND	DEP
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48							98									
49							99									
50							100									
TOTAL IND.	3						TOTAL IND.									
TOTAL DEP.	19						TOTAL DEP.									
TOTAL CLAIMS	22						TOTAL CLAIMS									

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
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APPLICATION NUMBER	PATENT NUMBER	GROUP ART UNIT	FILE WRAPPER LOCATION
10/434,948		2663	06B0

Change of Address/Power of Attorney

The following fields have been set to Customer Number 24943 on

- Correspondence Address
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The address of record for Customer Number 24943 is:
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SUITE 1205
SAN JOSE, CA 95113

The Practitioners of record for Customer Number 24943 are:

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PATENT & TRADEMARK OFFICE

In the United States Patent and Trademark Office

Serial Number: 10/434,948
Appn. Filed: MAY 8, 2003
Applicant(s): FRANCIS DACOSTA AND SRIRAM DAYANANDAN
Appn. Title: HIGH PERFORMANCE WIRELESS NETWORKS USING DISTRIBUTED CONTROL
Examiner/GAU: UNKNOWN / 2661

Mailed: 8-25-05
At: SANTA CLARA, CA

Petition to Make Special

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

Sir:

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

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

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

08/30/2005 EFLORES 00000042 10434948
01 FC:1464 130.00 OP

Very respectfully,
Applicant(s): Francis Dalisto

Attachment(s): Fee if indicated and supporting Declaration

Applicant(s): FRANCIS DACOSTA
SRIRAM DAYANANDAN
c/o: MESH Dynamics, Inc
2953 Bunker Hill LA, Suite 400
SANTA CLARA, CA 95054
Telephone: 408-373-7700

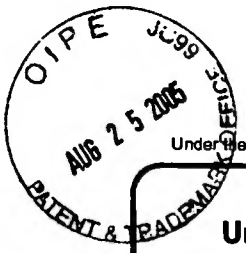
Certificate of Mailing

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

Date: 2005, AUGUST 25 Francis Dalisto, Applicant

8-29-05

2661$



PTO/SB/17p (11-04)
Approved for use through 07/31/2007. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
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IFW

PETITION FEE
Under 37 CFR 1.17(f), (g) & (h)
TRANSMITTAL

(Fees are subject to annual revision)

Send completed form to: Commissioner for Patents
P.O. Box 1450, Alexandria, VA 22313-1450

Application Number	10/434,948
Filing Date	MAY 8, 2003
First Named Inventor	FRANCIS DACOSTA
Art Unit	2661
Examiner Name	UNKNOWN
Attorney Docket Number	MESHP001

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

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

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

☐ The Commissioner is hereby authorized to charge the following fees to Deposit Account No._____:
☐ petition fee under 37 CFR 1.17(f), (g) or (h) ☐ any deficiency of fees and credit of any overpayments
Enclose a duplicative copy of this form for fee processing.

☒ Check in the amount of $ 130 is enclosed.

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

Petition Fees under 37 CFR 1.17(f): Fee $400 Fee Code 1462
For petitions filed under:
§ 1.53(e) - to accord a filing date.
§ 1.57(a) - to accord a filing date.
§ 1.182 - for decision on a question not specifically provided for.
§ 1.183 - to suspend the rules.
§ 1.378(e) - for reconsideration of decision on petition refusing to accept delayed payment of maintenance fee in an expired patent.
§ 1.741(b) - to accord a filing date to an application under § 1.740 for extension of a patent term.

Petition Fees under 37 CFR 1.17(g): Fee $200 Fee Code 1463
For petitions filed under:
§ 1.12 - for access to an assignment record.
§ 1.14 - for access to an application.
§ 1.47 - for filing by other than all the inventors or a person not the inventor.
§ 1.59 - for expungement of information.
§ 1.103(a) - to suspend action in an application.
§ 1.136(b) - for review of a request for extension of time when the provisions of section 1.136(a) are not available.
§ 1.295 - for review of refusal to publish a statutory invention registration.
§ 1.296 - to withdraw a request for publication of a statutory invention registration filed on or after the date the notice of intent to publish issued.
§ 1.377 - for review of decision refusing to accept and record payment of a maintenance fee filed prior to expiration of a patent.
§ 1.550(c) - for patent owner requests for extension of time in ex parte reexamination proceedings.
§ 1.956 - for patent owner requests for extension of time in inter partes reexamination proceedings.
§ 5.12 - for expedited handling of a foreign filing license.
§ 5.15 - for changing the scope of a license.
§ 5.25 - for retroactive license.

Petition Fees under 37 CFR 1.17(h): Fee $130 Fee Code 1464
For petitions filed under:
§ 1.19(g) - to request documents in a form other than that provided in this part.
§ 1.84 - for accepting color drawings or photographs.
§ 1.91 - for entry of a model or exhibit.
§ 1.102(d) - to make an application special. *
§ 1.138(c) - to expressly abandon an application to avoid publication.
§ 1.313 - to withdraw an application from issue.
§ 1.314 - to defer issuance of a patent.

Francis DaCosta
Signature

8-25-05
Date

FRANCIS DACOSTA
Typed or printed name

Registration No., if applicable

This collection of information is required by 37 CFR 1.17. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 5 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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

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PATENT & TRADEMARK OFFICE

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

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

DECLARATION IN SUPPORT OF ACCOMPANYING PETITION TO MAKE SPECIAL

REASON XI -- COUNTERS TERRORISM

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

1. I am the applicant in the above identified patent application.

2. The invention of the above application will materially enhance systems for countering terrorism by enabling wide area video surveillance by way of a unique wireless mesh network architecture as described below.

3. Mesh networks provide long range wireless connectivity by relaying packets from one mesh router to another (each relay called a "hop"), like a bucket brigade. With conventional mesh technology, one radio (and one frequency channel) is typically used to do this, and as a result, the performance (bandwidth, latency and jitter) degrades substantially after each additional hop. Video surveillance requires high bandwidth with low latency and jitter through the mesh over many hops and thus, applicant's mesh architecture with multi-radio and multi-channel relay capability will support the high bandwidth required for critical video surveillance applications.

4. Applicant's assignee company, Advanced Cybernetics Group/MeshDynamics, has already sold its mesh products to the USAF BattleLab (for force protection), the Department of the Navy (for border surveillance), and the Canadian Government

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

5. I further declare that all statements made herein of my own knowledge are true and that all statements made upon information and belief are believed to be true, and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application and any patent issuing therefrom.

Very Respectfully,



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

August 25, 2005

AUG 2 5 2005
PATENT & TRADEMARK OFFICE

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

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

CERTIFICATE OF MAILING

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

8-25-05, 2005. /Lucy Dalsk/

EV841795951US

PRELIMIANRY AMENDMENT A

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

Dear Sir:

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

IN THE CLAIMS

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

Listing of Claims:

Claims 1-22 (Canceled)

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

a) configuring the wireless mesh network with a first configuration;

b) determining that a first node in the wireless mesh network requires a channel selection change;

c) dynamically selecting a second node to form a parent-child relationship with the first node; and

d) making a channel selection change.

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

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

26. (New) A method as recited in Claim 23, wherein the first node includes a plurality of radios.

27. (New) A method as recited in Claim 23, wherein making a channel selection includes making a channel selection change to meet a performance requirement.

28. (New) A method as recited in Claim 23, wherein making a channel selection includes making a channel selection change to meet a latency requirement.

29. (New) A method as recited in Claim 23, wherein making a channel selection includes making a channel selection change to meet a throughput requirement.

30. (New) A method as recited in Claim 23, wherein determining that the first node requires a channel selection change includes determining that the channel selection change is required due to a performance requirement change.

31. (New) A method as recited in Claim 23, wherein determining that the first node requires a channel selection change includes determining that the channel selection change is required due to congestion.

32. (New) A method as recited in Claim 23, wherein the channel selection change is made to avoid channel interference.

33. (New) A method as recited in Claim 23, wherein the channel selection change is made based on a change to network topology.

34. (New) A method as recited in Claim 23, further comprising repeating b)-d).

35. (New) A method as recited in Claim 23, further comprising receiving a monitoring signal that includes information about available nodes from which the second node is selected.

36. (New) A system in a wireless mesh network, comprising:

a processor configured to:

configure a first node in a first configuration;

determine that the first node in the wireless mesh network requires a channel selection change;

dynamically select a second node to form a parent-child relationship with the first node; and

make a channel selection change; and

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

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

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

39. (New) A system as recited in Claim 36, further comprising a plurality of radios.

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

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

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

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

44. (New) A system as recited in Claim 36, wherein the processor is configured to determine that the channel selection change is required due to congestion.

45. (New) A system as recited in Claim 36, wherein the processor is configured to determine the channel selection change based on network topology.

46. (New) A system as recited in Claim 36, wherein the processor is further configured to repeat b)-d).

47. (New) A system as recited in Claim 36, wherein the processor is further configured to receive a monitoring signal that includes information about available nodes from which the second node is selected.

48. (New) A system as recited in Claim 36, wherein the processor is further configured to receive a monitoring signal that includes information about available nodes from which the second node is selected.

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

a) configuring the wireless mesh network with a first configuration;

b) determining that a first node in the wireless mesh network requires a channel selection change;

c) dynamically selecting a second node to form a parent-child relationship with the first node; and

d) making a channel selection change.

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

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

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

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

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

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

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

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

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

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

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

REMARKS

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

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

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

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

Respectfully submitted,

Dated: 8-25-05

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

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

OIPE AUG 25 2005 PATENT & TRADEMARK OFFICE

U.S. Patent Documents							
*Examiner Intials		Document Number	Date	Name	Class	Subclass	Filing Date if Appropriate
	1.	20040137924	7-15-2004	Herscovich, Bernard ; et al.	455	500	1-10-2003
	2.	20040001442	1-1-2004	Rayment, Stephen G. ; et al.	370	238	6-28-2002
	3.	6,704,301	3-9-2004	Chari , et al.	370	351	12-29-2000
	4.	6,904,275	June 7, 2005	Stanforth; Peter	455	343.1	May 18, 2001
	5.	6,892,068	May 10, 2005	Karabinis , et al.	455	429	Aug 1, 2001
	6.	20030114204	June 19, 2003	Allen, Vernon Anthony ; et al.	455	574	Dec 13, 2001
	7.	20030012176	Jan 16, 2003	Kondylis, George ; et al.	370	348	Nov 9, 2001
	8.	20050122925	June 9, 2005	Chitre; Dattakumar M et al.	370	310	Nov 19, 1999
	9.	6,865,170	June 19, 1998	Zendle	370	338	Mar 8, 2005
	10	6,859,652	Feb 22, 2005	Karabinis , et al.	455	427	Dec 4, 2001
	11	*5,166,929*	Nov 24, 1992	Lo	370	448	June 18, 1990
	12	6,831,921	Dec 14, 2004	Higgins	370	401	Mar 27, 2002
	13	6,026,303	Feb 15, 2000	Minamisawa	455	446	Nov 6, 1997

Foreign Patent Documents								
							Translation	
		Document	Date	Country	Class	Subclass	Yes	No

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

Examiner:	Date Considered:

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

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

OIPE AUG 25 2005 PATENT & TRADEMARK OFFICE

U.S. Patent Documents							
*Examiner Intials		Document Number	Date	Name	Class	Subclass	Filing Date if Appropriate
	14.	6,597,919	July 22, 2003	Kumar , et al.	455	510	June 23, 2000
	15	6,426,814	July 30, 2002	Berger , et al.	398	45	Nov 3, 1999
	16	6,363,062	March 26, 2002	Aaronson , et al.	370	348	June 8, 1999
	17	6,683,865	Jan 27, 2004	Garcia-Luna-Aceves , et al.	370	349	Oct 15, 1999
	18	6,665,536	Dec 16, 2003	Mahany	455	434	July 20, 1999
	19	20030002442	Jan 2, 2003	Flammer, George H. III, et al.	370	230	June 27, 2001
	20	6,298,053	Oct 2, 2001	Flammer, III , et al.	370	349	Jan 14, 2000
	21	20040014491	Jan 22, 2004	*Weigand, Gilbert* G.	455	552.1	April 15, 2003
	22	20020181427	Dec 5, 2002	*Sparr*, Robert H. ; et al.	370	338	April 15, 2002
	23	20020176390	Nov 28, 2002	*Sparr*, Robert H. ; et al.	370	338	April 15, 2002
	24	20020097696	July 25, 2002	Kossi, Jouni ; et al.	370	330	Jan 19, 2001
	25	20030185169	Oct 2, 2003	Higgins, James A.	370	329	Mar 27, 2002
	26	20030026356	Feb 6, 2003	Brommer, Karl D.	375	324	April 18, 2002

Foreign Patent Documents								
							Translation	
		Document	Date	Country	Class	Subclass	Yes	No

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

Examiner:	Date Considered:

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

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

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

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

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(19) World Intellectual Property Organization
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02018385.1 14 August 2002 (14.08.2002) EP

(71) Applicant *(for all designated States except US)*: SONY INTERNATIONAL (EUROPE) GMBH [DE/DE]; Kemperplatz 1, 10785 Berlin (DE).

(72) Inventors; and
(75) Inventors/Applicants *(for US only)*: STADELMEIER, Lothar [DE/DE]; c/o Advanced Technology Center Stuttgart, Sony International (Europe) GmbH, Hedelfinger Strasse 61, 70327 Stuttgart (DE). DAWIDOWSKY, Frank [DE/DE]; c/o Advanced Technology Center Stuttgart, Sony International (Europe) GmbH, Hedelfinger Strasse 61, 70327 Stuttgart (DE). HOEFFLINGER, Jens [DE/DE]; c/o Advanced Technology Center Stuttgart, Sony International (Europe) GmbH, Hedelfinger Strasse 61, 70327 Stuttgart (DE).

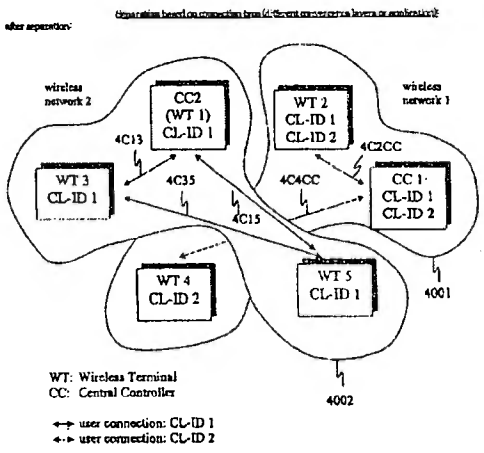
(74) Agent: MÜLLER, Frithjof, E.; Müller Hoffmann & Partner, Innere Wiener Strasse 17, 81667 München (DE).

(81) Designated States *(national)*: CN, JP, US.

Published:
— *with international search report*

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

(54) Title: BANDWIDTH ORIENTED RECONFIGURATION OF WIRELESS AD HOC NETWORKS



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

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BANDWIDTH ORIENTED RECONFIGURATION OF WIRELESS AD HOC NETWORKS

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

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

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

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

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

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

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

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

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

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

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

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

The wireless terminal of a wireless ad hoc network controlled by a central controller of said wireless ad hoc network according to the present invention comprises a receiving means adapted to receive a requesting command (SPAWN_NETWORK) from the central controller of the wireless ad hoc network, i.e. the first wireless ad hoc network, indicating certain operating conditions for the wireless terminal, a condition checking means to check if the wireless terminal can be operated under said certain conditions, and a sending means that sends out a confirmation command (SPAWN_NETWORK_ACK), if the condition checking means determines that the wireless terminal can be operated under said certain conditions, i.e. in the new (second) wireless ad hoc network.

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

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

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

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

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

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

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

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

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

Further, advantageously a wireless terminal stops using its entire wireless connections (radio link control - RLC) the moment it sent out said confirmation command (SPAWN_NETWORK_ACK), moves to one of said at least one new wireless ad hoc network, waits until it receives a start command (RLC_CC_START_OPERATION) sent out by a central controller, and then starts using its wireless connections according to the information (e.g. time stamp) provided by said start command (RLC_CC_START_OPERATION). It may also be possible that within said requesting command (SPAWN_NETWORK) a time stamp is transmitted and a wireless terminal stops its entire connections at the moment in time indicated by this time stamp. Thus, all wireless terminals that are moved to said at least one new wireless ad hoc network (second ad hoc wireless network) stop their radio link control at the same time.

The invention and advantageous details thereof will be explained by way of an exemplary embodiment thereof in the following with reference to the accompanying drawings in which

Fig. 1 shows an example of a state of the art wireless ad hoc network where the setup of a new connection fails because there is not enough available bandwidth to establish the connection;

Fig. 2A shows an example of a wireless ad hoc network with different user connections wherein a wireless terminal requires more bandwidth and a wireless terminal wants to join the network;

Fig. 2B shows the splitting based on application level of the wireless ad hoc network of Fig. 2A according to the invention to provide more band width;

Fig. 3 shows a flow chart illustrating the process of splitting a wireless ad hoc network;

Fig. 4A shows an example of a wireless ad hoc network with wireless connections with different convergence layers, i.e. different connection types, wherein a wireless terminal requires more bandwidth to set up a new wireless connection;

Fig. 4B shows the splitting based on connection type of the wireless ad hoc network of Fig. 4A according to the invention to provide more band width; and

Fig. 5 shows a message sequence chart (MSC) for the ETSI BRAN HIPERLAN/2 standard that describes the process of splitting the wireless ad hoc network of Fig. 4A and 4B, wherein new commands according to the invention are used.

Figs. 2A and 2B show an example of a wireless ad hoc network according to the invention. In Fig. 2A, the first original wireless network 200 comprises four wireless terminals, i.e. a first wireless terminal WT1, a second wireless terminal WT2, a third wireless terminal WT3, and a fourth wireless terminal WT4, and a central controller CC. There are three wireless connections (user connections), i.e. a first wireless connection 2C13 (connecting the first wireless terminal WT1 and the third wireless terminal WT3), a second wireless connection 2C12 (connecting the first wireless terminal WT1 and the second wireless terminal WT2), and a third wireless connection 2C4CC (connecting the fourth wireless terminal WT4 and the central controller CC). In the example, the second wireless terminal WT2 requests the setup of a fourth wireless connection 2C23 with the third wireless terminal WT3 requiring a certain amount of bandwidth. Further, a fifth wireless terminal WT5 wants to join the first original wireless network 200 requesting a fifth wireless connection 2C35 with the third wireless terminal WT3 requiring a certain amount bandwidth. The central controller CC therefore checks, if all conditions for establishing the new connections, i.e. the fourth wireless connection 2C23 and the fifth wireless connection 2C35, are met, i.e. especially the central controller CC checks, if there is enough bandwidth available. In the example, there is not enough bandwidth available to establish the new connections. If the network would run according to state of the art HIPERLAN/2 standard the required connections could not be established, or if the network would run according to IEEE 802.11 standard a desired user application would not be possible.

As can be seen in Fig. 2B, according to the invention, the first original wireless ad hoc network 200 is split up into two wireless ad hoc networks such that a first new wireless ad hoc network is spawned. In Fig. 2B, wire-

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

are provided with the following information:

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

SPAWN NETWORK

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

parameters:

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

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

SPAWN NETWORK ACK

functionality: wireless terminals acknowledge SPAWN_NETWORK command

parameters:

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

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

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

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

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

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

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

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

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

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

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

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

Claims

1. A method to provide additional bandwidth for a wireless ad hoc network operating in a certain communication channel with a certain amount of available bandwidth comprising a plurality of wireless terminals, **characterized in that**

- said wireless ad hoc network is split up such that at least one new wireless ad hoc network is spawned, if more bandwidth than said certain amount of available bandwidth is required by said plurality of wireless terminals,

- wherein after the split of said wireless ad hoc network at least one wireless terminal of said wireless ad hoc network and/or one or more new wireless terminals belong(s) to said at least one new wireless ad hoc network, and

- said at least one new wireless ad hoc network is operating in a respective different communication channel,

- wherein the decision which of said wireless terminals of said wireless ad hoc network and/or which of said at least one wireless terminal are moved to said at least one new wireless ad hoc network is based on certain separation criteria,

- which certain separation criteria assure that wireless terminals that

  • have the same convergence layers, and/or

  • are of the same application layer, and/or

  • have the same connection, and/or

  • provide the same or corresponding functions

are not separated into different wireless ad hoc networks.

2. The method according to claim 1, **characterized in that**

said wireless ad hoc network and the splitting of said wireless ad hoc network are controlled by a central controller of said wireless ad hoc network that decides which wireless terminals of said wirel--ess ad hoc network and/or which new wireless terminals are moved to said at least one new wireless ad hoc network,

wherein the decision is based on said certain separation criteria, and

said central controller determines a new central controller for said at least one new wireless ad hoc network.

3. The method according to claim 1 or 2, **characterized in that**

said wireless ad hoc network and said at least one new wireless ad hoc network are operated according to the IEEE802.11 or ETSI BRAN HIPERLAN/2 standard.

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

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

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

providing new commands in order to spawn said at least one new wireless ad hoc network,

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

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

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

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

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

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

then starts using its wireless connections according to the information provided by said start command (RLC_CC_START_OPERATION).

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

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

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

operated under said certain conditions, and

a sending means that sends out a confirmation command (SPAWN_NETWORK_ACK), if the condition checking means determines that the wireless terminal can be operated under said certain conditions.

8. The wireless terminal according to claim 7, **characterized in that** said certain conditions define

if said wireless terminal can operate as a central controller of a wireless ad hoc network,

a certain communication channel at which said wireless terminal is able to operate, and/or

a moment in time at which said wireless terminal shall operate in said certain communication channel and at which it may be controlled by a different central controller.

9. A central controller of a wireless ad hoc network comprising a plurality of wireless terminals, **characterized by**

a splitting means that controls the splitting of said wireless ad hoc network, wherein a new wireless ad hoc network is spawned that comprises at least one of said plurality of wireless terminals and/or one or more new wireless terminals.

10. The central controller according to claim 10, **characterized in that** the splitting means comprises

a sending means that sends out requesting commands (SPAWN_NETWORK) to wireless terminals,

a receiving means that receives confirmation commands (SPAWN_NETWORK_ACK), and

an operating means that decides which of said plurality of wireless terminals and/or of said new wireless terminals may be moved to said new wireless ad hoc network and determines a wireless terminal of said plurality of wireless terminals and/or of said new wireless terminals that becomes the central controller of said new wireless ad hoc network.

11. A wireless ad hoc network comprising

a plurality of wireless terminals according to claim 7 or 8, and

a central controller according to claim 9 or 10.

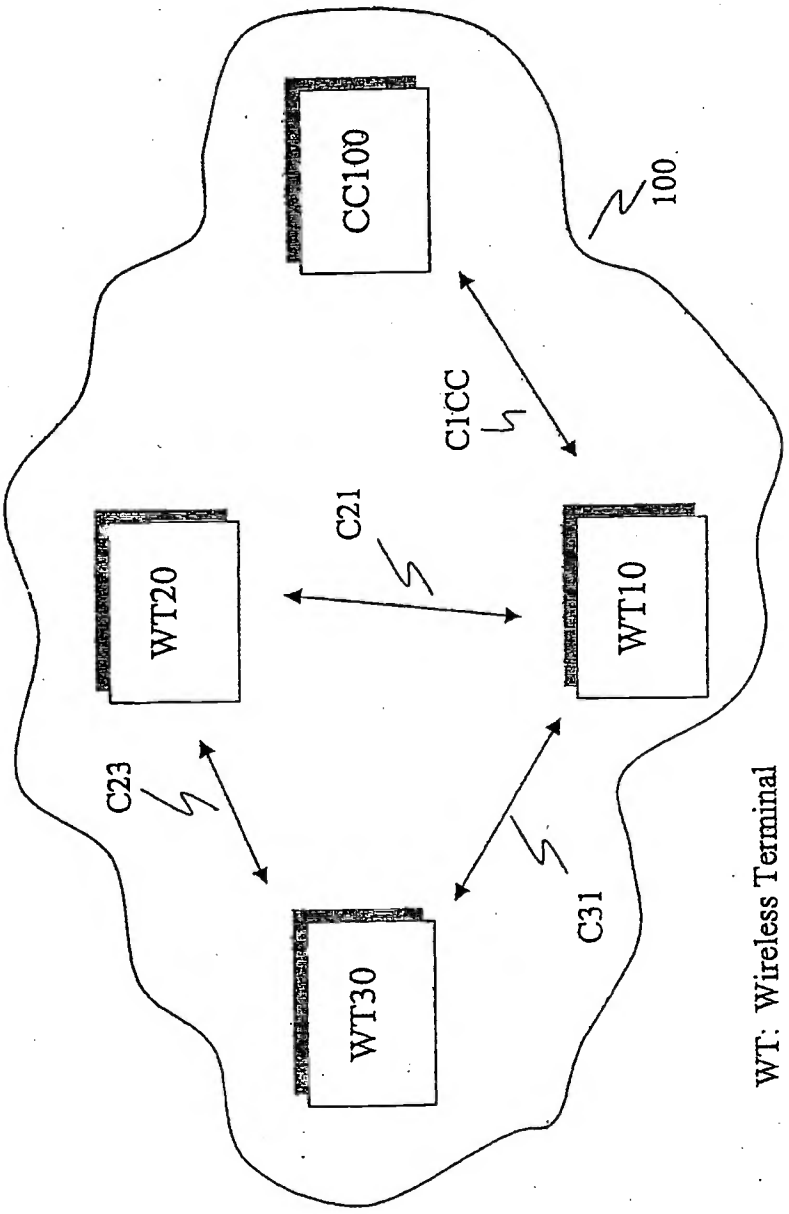

CC100
100
C1CC
C21
WT20
WT10
C23
C31
WT30
WT: Wireless Terminal
CC: Central Controller

Figure 1

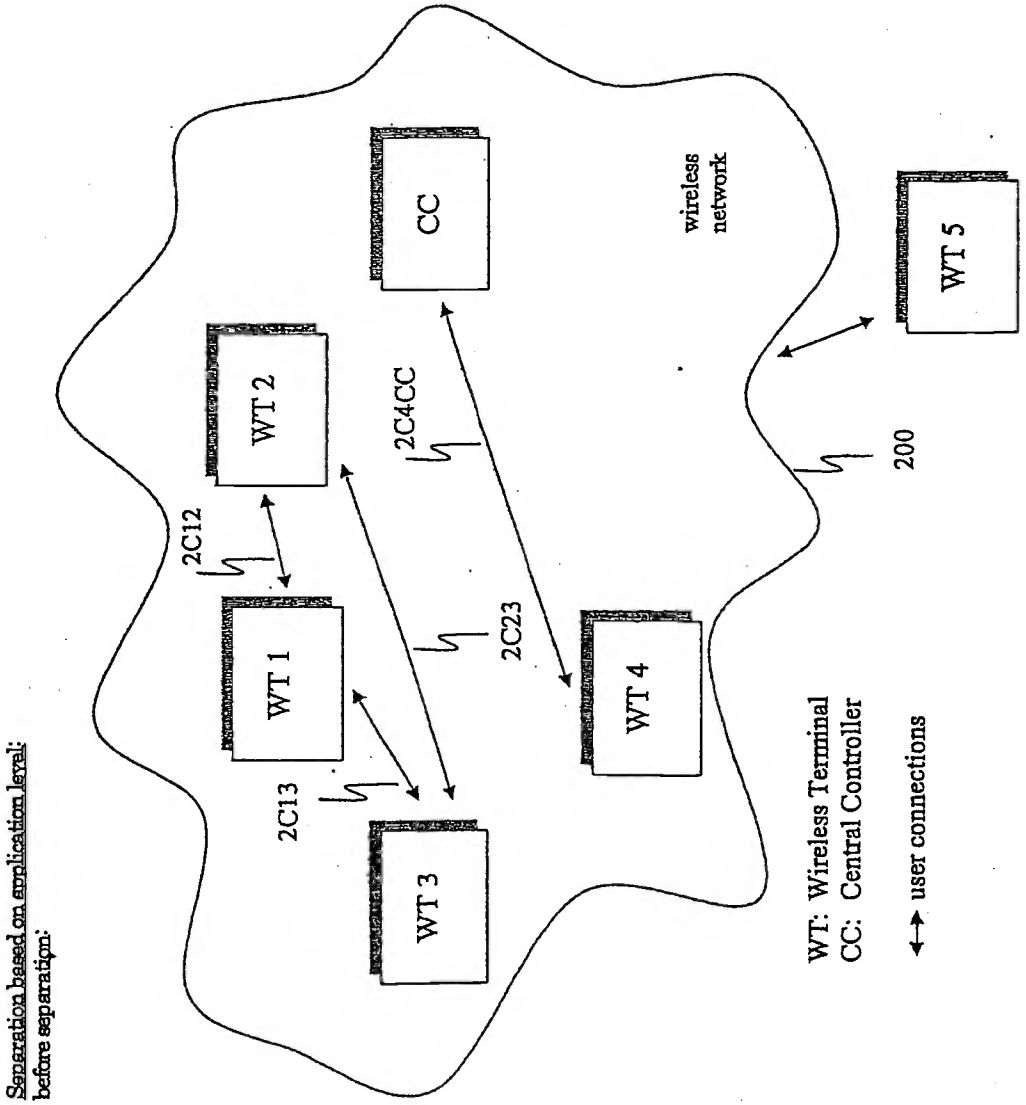

Separation based on application level:
before separation:
WT 1
WT 2
WT 3
WT 4
WT 5
CC
wireless network
2C12
2C13
2C23
2C4CC
200
WT: Wireless Terminal
CC: Central Controller
user connections

Figure 2A

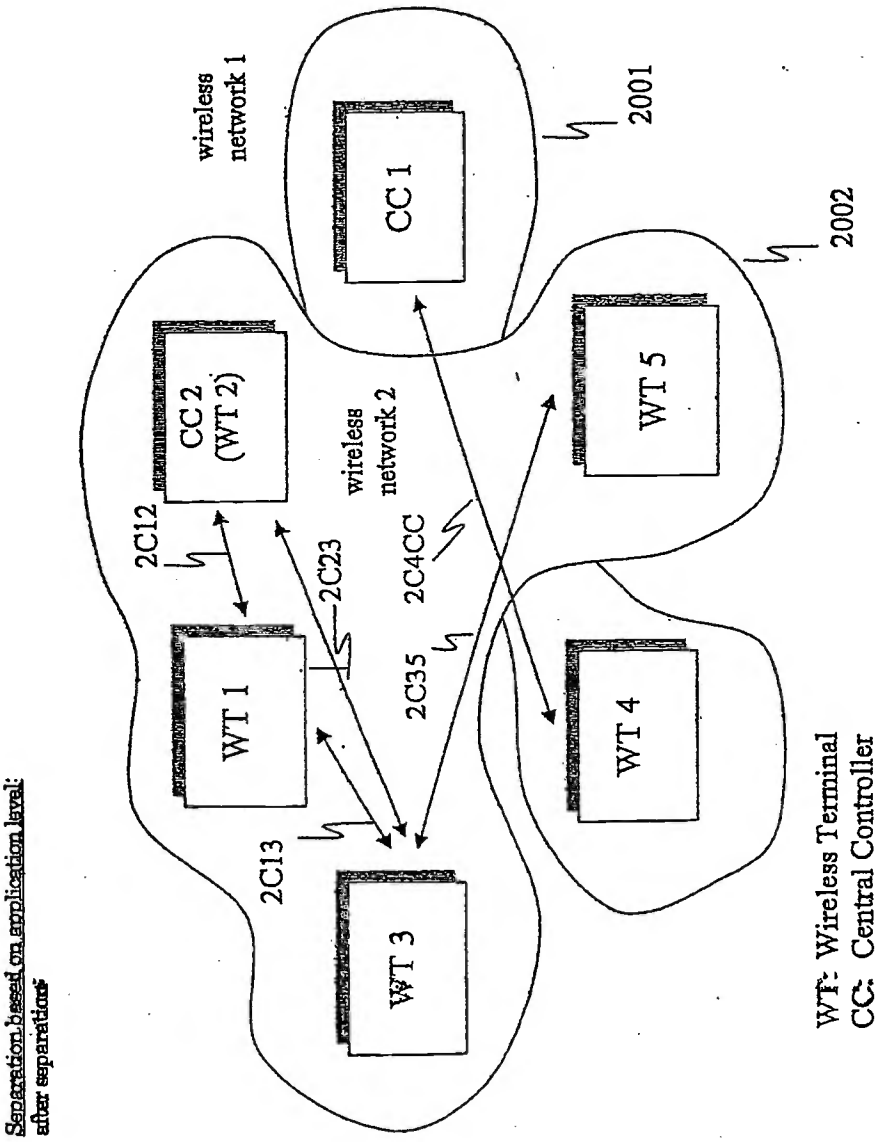


Figure 2B

Separation based on application level: after separation

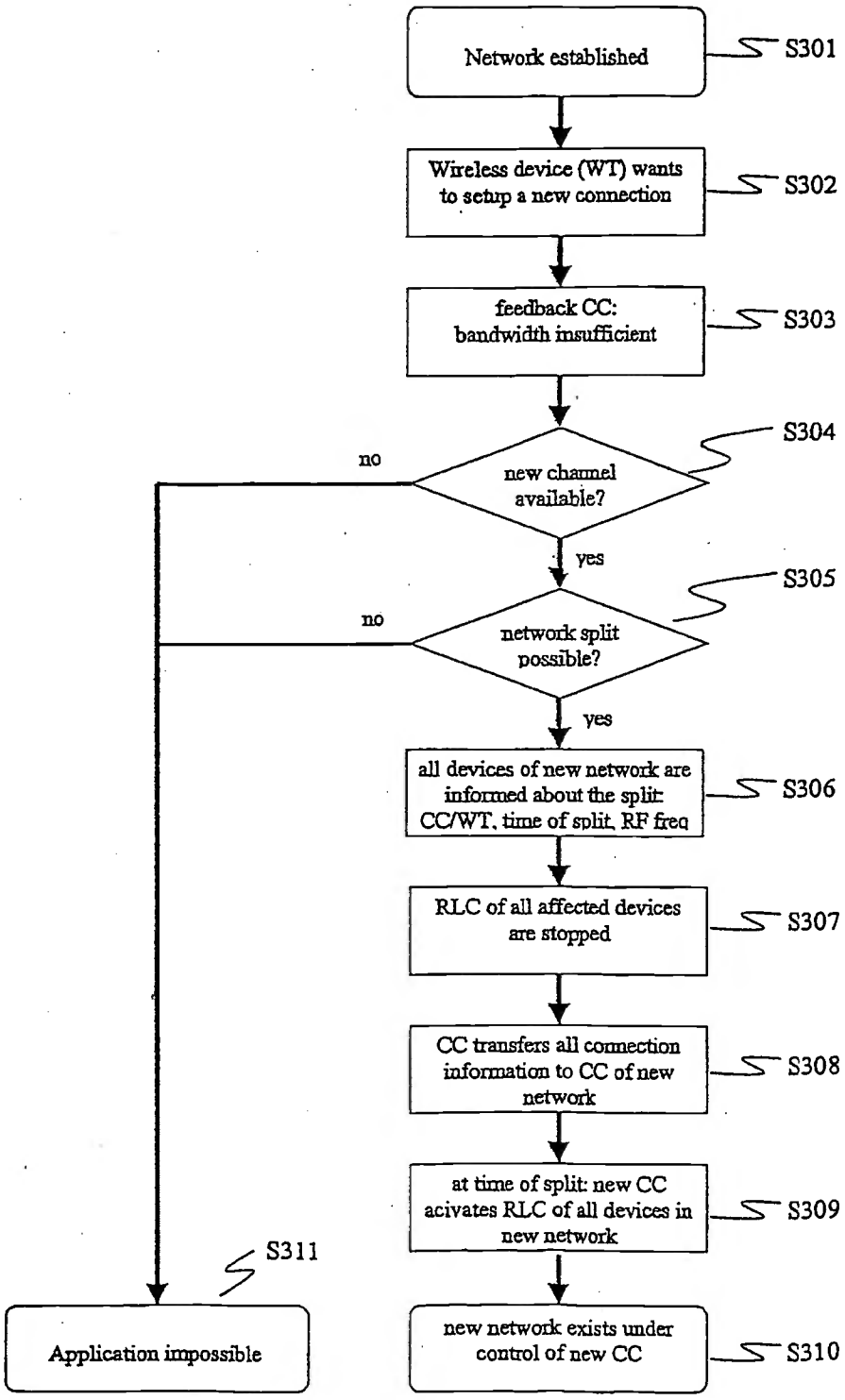

Network established
S301
Wireless device (WT) wants to setup a new connection
S302
feedback CC: bandwidth insufficient
S303
new channel available?
S304
no
yes
network split possible?
S305
no
yes
all devices of new network are informed about the split: CC/WT, time of split, RF freq
S306
RLC of all affected devices are stopped
S307
CC transfers all connection information to CC of new network
S308
at time of split: new CC acivates RLC of all devices in new network
S309
new network exists under control of new CC
S310
S311
Application impossible

Figure 3

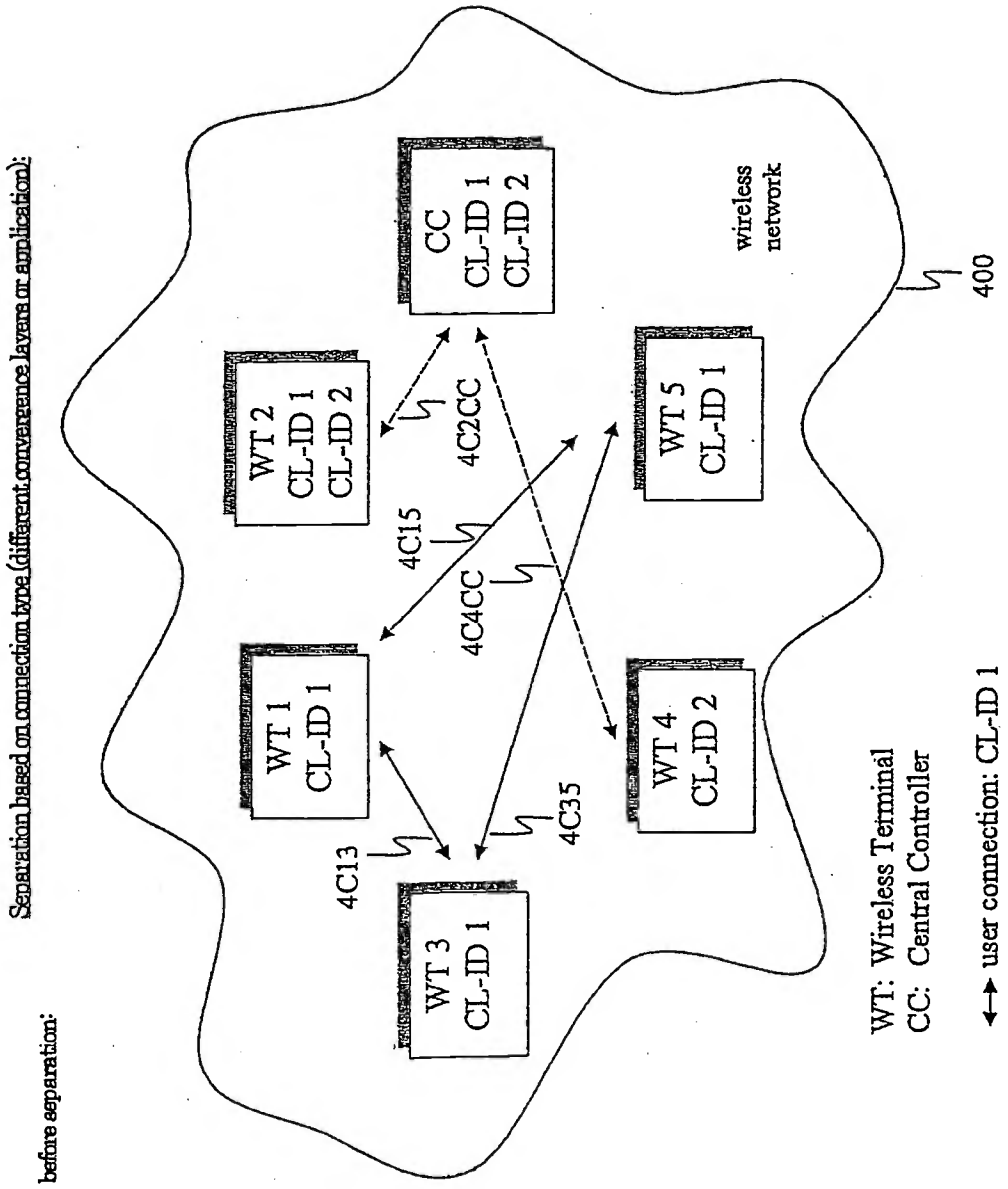

Separation based on connection type (different convergence layers or application):
before separation:
WT 1
CL-ID 1
WT 2
CL-ID 1
CL-ID 2
WT 3
CL-ID 1
WT 4
CL-ID 2
WT 5
CL-ID 1
CC
CL-ID 1
CL-ID 2
4C13
4C15
4C2CC
4C4CC
4C35
wireless network
400
WT: Wireless Terminal
CC: Central Controller
user connection: CL-ID 1
user connection: CL-ID 2

Figure 4A

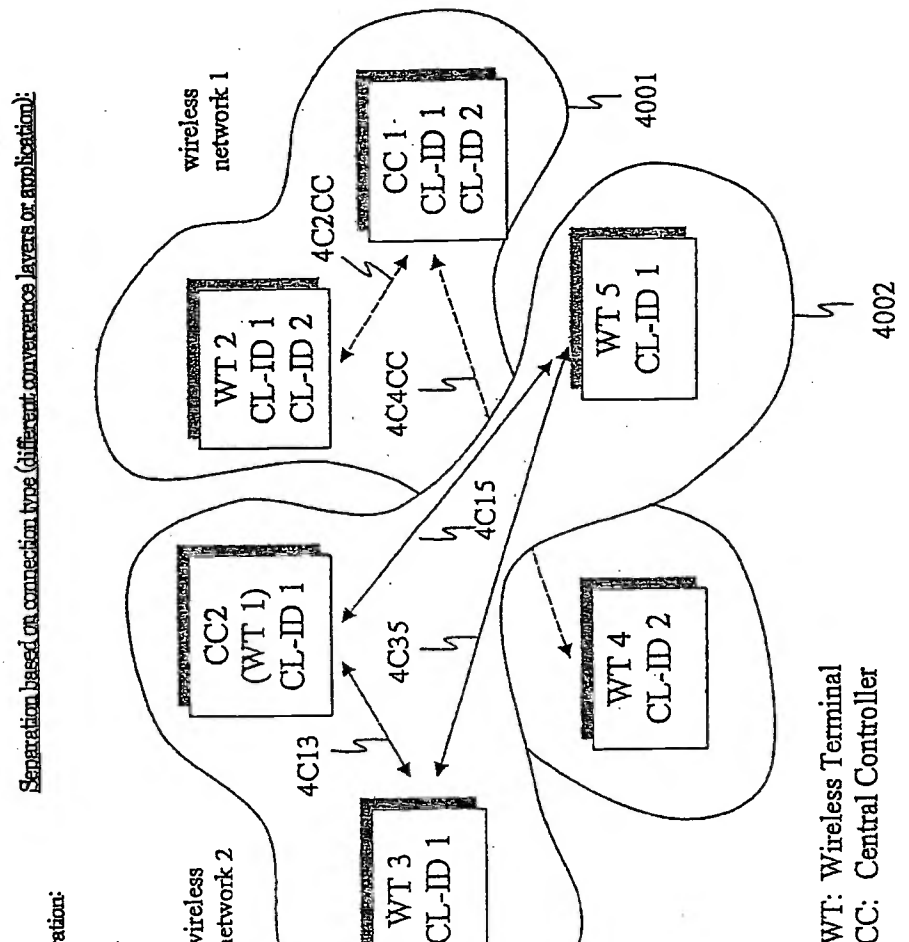
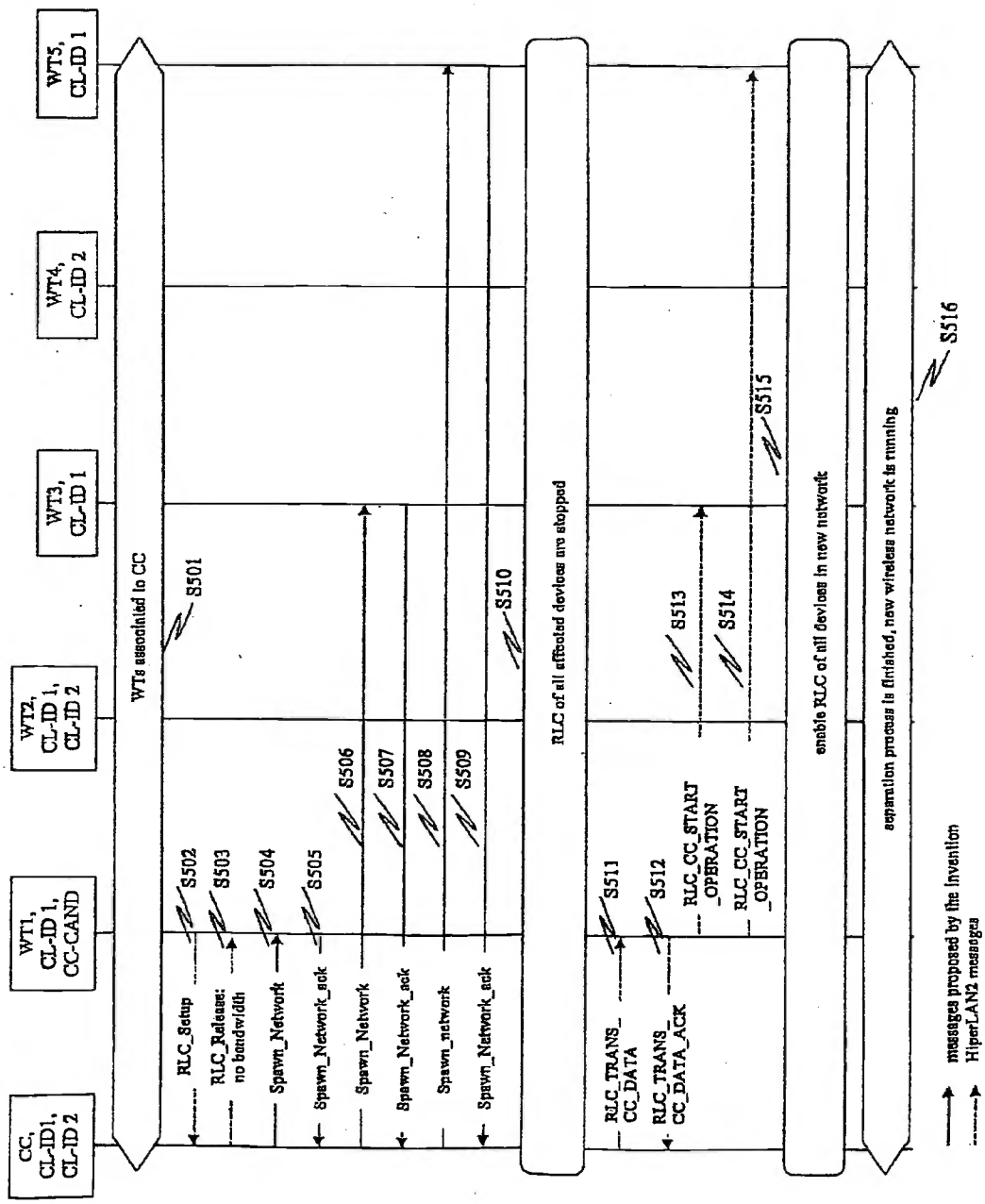

Separation based on connection type (different convergence layers or application):
after separation:
wireless network 1
wireless network 2
WT 2 CL-ID 1 CL-ID 2
CC 1 CL-ID 1 CL-ID 2
WT 5 CL-ID 1
CC2 (WT 1) CL-ID 1
WT 3 CL-ID 1
WT 4 CL-ID 2
4C2CC
4C4CC
4C13
4C35
4C15
4001
4002
WT: Wireless Terminal
CC: Central Controller
user connection: CL-ID 1
user connection: CL-ID 2

Figure 4B

Figure 5


CC, CL-ID1, CL-ID 2
WT1, CL-ID 1, CC-CAND
WT2, CL-ID 1, CL-ID 2
WT3, CL-ID 1
WT4, CL-ID 2
WT5, CL-ID 1
WTs associated to CC
RLC_Setup
RLC_Release: no bandwidth
Spawn_Network
Spawn_Network_ack
S501
S502
S503
S504
S505
S506
S507
S508
S509
S510
RLC of all affected devices are stopped
RLC_TRANS_CC_DATA
RLC_TRANS_CC_DATA_ACK
RLC_CC_START_OPERATION
S511
S512
S513
S514
S515
enable RLC of all devices in new network
separation process is finished, new wireless network is running
S516
messages proposed by the invention
HiperLAN2 messages

INTERNATIONAL SEARCH REPORT

International Application No
PCT/EP 03/09062

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 H04L12/28

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

B. FIELDS SEARCHED

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

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

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

C. DOCUMENTS CONSIDERED TO BE RELEVANT

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

-/—

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

[X] Patent family members are listed in annex.

° Special categories of cited documents :

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

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"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
17 November 2003	25/11/2003

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	Heinrich, D

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C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

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

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INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No
PCT/EP 03/09062

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

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12 SOUTH FIRST STREET
SUITE 1205
SAN JOSE CA 95113

MAIL

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DIRECTOR OFFICE
TECHNOLOGY CENTER 2600

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

HIGH PERFORMANCE WIRELESS NETWORKS USING DISTRIBUTED CONTROL

DECISION ON PETITION
TO MAKE SPECIAL

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

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

> International terrorism as defined in 18 U.S.C. 2331 includes "activities that - (A) involve violent acts or acts dangerous to human life that are a violation of the criminal laws of the United States or of any State, or that would be a criminal violation if committed within the jurisdiction of the United States or of any State; [and] (B) appear to be intended - (i) to intimidate or coerce a civilian population; (ii) to influence the policy of a government by intimidation or coercion; or (iii) to affect the conduct of a government by assassination or kidnapping..." The types of technology for countering terrorism could include, but are not limited to, systems for detecting/identifying explosives, aircraft sensors/security systems, and vehicular barricades/disabling systems.
>
> Applicants who desire that an application relating to inventions for countering terrorism be made special should file a petition with the petition fee under 37 CFR 1.17(h) requesting the Patent and Trademark Office to make the application special. The petition for special status should be accompanied by a statement explaining how the invention contributes to countering terrorism.

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

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

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

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

Krista Zele
Special Program Examiner
Technology Center 2600

PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

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

STATUS INQUIRY

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

Attn: Wellington Chin

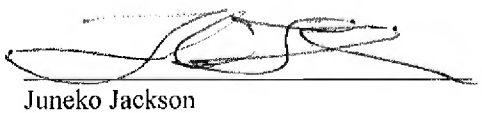
Dear Sir:

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

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

Respectfully submitted,

8/16/2006
Date



Juneko Jackson
Reg. No. 48,870

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

Electronic Acknowledgement Receipt

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

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)	Multi Part	Pages
1	Request for status of Application	STATUS_INQUIRY_DACOSTAFPT1.pdf	36740	no	1

Warnings:	
Information:	
Total Files Size (in bytes):	36740

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.

EAST Search History

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

EAST Search History

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

EAST Search History

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

EAST Search History

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

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/434,948	05/08/2003	Francis da Costa	DACOSTAF.PT1	7871

24943 7590 11/20/2006

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

EXAMINER	
D'AGOSTA, STEPHEN M	

ART UNIT	PAPER NUMBER
2617	

DATE MAILED: 11/20/2006

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

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

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

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *25 August 2005*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *23-60* is/are pending in the application.

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

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *23-60* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *08 May 2003* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Preliminary Amendment

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

Claim Objections

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

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

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Also see Para #9 which teaches QoS.

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

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

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

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

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

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

Also see Para #9 which teaches QoS.

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

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

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

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

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

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

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

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

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

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

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

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

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

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

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

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

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

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

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

Conclusion

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

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

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

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Bill Trost can be reached on 571-272-7872. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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

STEVE M. D'AGOSTA
PRIMARY EXAMINER

11-7-06

~~IDS 08/25/2005~~

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

USPTO PATENT & TRADEMARK OFFICE AUG 25 2005

U.S. Patent Documents

*Examiner Intials		Document Number	Date	Name	Class	Subclass	Filing Date if Appropriate
SD	1.	20040137924	7-15-2004	Herscovich, Bernard ; et al.	455	500	1-10-2003
	2.	20040001442	1-1-2004	Rayment, Stephen G. ; et al.	370	238	6-28-2002
	3.	6,704,301	3-9-2004	Chari , et al.	370	351	12-29-2000
	4.	6,904,275	June 7, 2005	Stanforth; Peter	455	343.1	May 18, 2001
	5.	6,892,068	May 10, 2005	Karabinis , et al.	455	429	Aug 1, 2001
	6.	20030114204	June 19, 2003	Allen, Vernon Anthony ; et al.	455	574	Dec 13, 2001
	7.	20030012176	Jan 16, 2003	Kondylis, George ; et al.	370	348	Nov 9, 2001
	8.	20050122925	June 9, 2005	Chitre; Dattakumar M et al.	370	310	Nov 19, 1999
	9.	6,865,170	June 19, 1998	Zendle	370	338	Mar 8, 2005
	10	6,859,652	Feb 22, 2005	Karabinis , et al.	455	427	Dec 4, 2001
	11	*5,166,929*	Nov 24, 1992	Lo	370	448	June 18, 1990
	12	6,831,921	Dec 14, 2004	Higgins	370	401	Mar 27, 2002
	13	6,026,303	Feb 15, 2000	Minamisawa	455	446	Nov 6, 1997

Foreign Patent Documents

							Translation	
		Document	Date	Country	Class	Subclass	Yes	No

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

Examiner:	/Stephen D Agosta/	Date Considered:	11/08/2006

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

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

OIPE AUG 25 2006 PATENT & TRADEMARK OFFICE

U.S. Patent Documents

*Examiner Initials		Document Number	Date	Name	Class	Subclass	Filing Date if Appropriate
SD	14.	6,597,919	July 22, 2003	Kumar, et al.	455	510	June 23, 2000
	15	6,426,814	July 30, 2002	Berger, et al.	398	45	Nov 3, 1999
	16	6,363,062	March 26, 2002	Aaronson, et al.	370	348	June 8, 1999
	17	6,683,865	Jan 27, 2004	Garcia-Luna-Aceves, et al.	370	349	Oct 15, 1999
	18	6,665,536	Dec 16, 2003	Mahany	455	434	July 20, 1999
	19	20030002442	Jan 2, 2003	Flammer, George H. III, et al.	370	230	June 27, 2001
	20	6,298,053	Oct 2, 2001	Flammer, III, et al.	370	349	Jan 14, 2000
	21	20040014491	Jan 22, 2004	*Weigand, Gilbert* G.	455	552.1	April 15, 2003
	22	20020181427	Dec 5, 2002	*Sparr*, Robert H.; et al.	370	338	April 15, 2002
	23	20020176390	Nov 28, 2002	*Sparr*, Robert H.; et al.	370	338	April 15, 2002
	24	20020097696	July 25, 2002	Kossi, Jouni; et al.	370	330	Jan 19, 2001
	25	20030185169	Oct 2, 2003	Higgins, James A.	370	329	Mar 27, 2002
	26	20030026356	Feb 6, 2003	Brommer, Karl D.	375	324	April 18, 2002

Foreign Patent Documents

							Translation	
		Document	Date	Country	Class	Subclass	Yes	No

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

Examiner:	/Stephen D Agosta/	Date Considered:	11/08/2006

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

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	First Named Inventor:	Francis daCosta
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(Use several sheets if necessary)	Confirmation No.:	na
	Attorney Docket No.:	MESHP001

OIPE AUG 25 2006 PATENT & TRADEMARK OFFICE

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

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

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

Examiner:	/Stephen D Agosta/	Date Considered:	11/08/2006

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

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

U.S. PATENT DOCUMENTS

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

FOREIGN PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Country	Name	Classification
	N					
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	R					
	S					
	T					

NON-PATENT DOCUMENTS

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

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

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

SEARCHED			
Class	Subclass	Date	Examiner

INTERFERENCE SEARCHED			
Class	Subclass	Date	Examiner

SEARCH NOTES (INCLUDING SEARCH STRATEGY)		
	DATE	EXMR
Inventor Search	11-7-04	
Ios Art		
East DA's		
Text Search		

EX1023, Page 165

Index of Claims

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

√	Rejected	–	(Through numeral) Cancelled	N	Non-Elected	A	Appeal
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Claim		Date
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UNITED STATES PATENT AND TRADEMARK OFFICE

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www.uspto.gov

Bib Data Sheet

CONFIRMATION NO. 7871

SERIAL NUMBER	FILING OR 371(c) DATE	CLASS	GROUP ART UNIT	ATTORNEY DOCKET NO.
10/434,948	05/08/2003 RULE	370	2617	DACOSTAF.PT1

APPLICANTS

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

MESH DYNAMICS Co.

** CONTINUING DATA **********

This appln claims benefit of 60/421,930 10/28/2002

** FOREIGN APPLICATIONS **********

IF REQUIRED, FOREIGN FILING LICENSE GRANTED ** SMALL ENTITY **
** 06/30/2003

Foreign Priority claimed	STATE OR COUNTRY	SHEETS DRAWING	TOTAL CLAIMS	INDEPENDENT CLAIMS
☐ yes ☑ no	CA	14	22	3
35 USC 119 (a-d) conditions met: ☐ yes ☑ no ☐ Met after Allowance				
Verified and Acknowledged: Examiner's Signature / Initials				

ADDRESS
24943

TITLE
High performance wireless networks using distributed control

FILING FEE RECEIVED	FEES: Authority has been given in Paper	
393	No. _____ to charge/credit DEPOSIT ACCOUNT No. _____ for following:	☐ All Fees ☐ 1.16 Fees (Filing) ☐ 1.17 Fees (Processing Ext. of time) ☐ 1.18 Fees (Issue) ☐ Other _____ ☐ Credit

PTO/SB/83 (01-06)
Approved for use through 12/31/2008. OMB 0651-0035
U.S. Patent and Trademark Office, U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

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

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

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

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

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

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

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

CORRESPONDENCE ADDRESS

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

[ ] The address associated with Customer Number:

OR

[x] Firm *or* Individual Name	Lee Van Pelt, Esq.				
Address	Van Pelt, Yi & James LLP 10050 N. Foothill Blvd., Suite 200				
City	Cupertino	State	CA	Zip	95014-5601
Country	USA				
Telephone	408-973-2585	Email			

Signature	/Juneko Jackson/		
Name	Juneko Jackson	Registration No.	48,870
Date	03/08/2007	Telephone No.	408-286-8933

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

This collection of information is required by 37 CFR 1.36. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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

Electronic Acknowledgement Receipt

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

Payment information:

Submitted with Payment	no

File Listing:

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

Warnings:

Information:	
Total Files Size (in bytes):	326005

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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MAR 16 2007
PATENT & TRADEMARK OFFICE

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

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

CERTIFICATE OF MAILING

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

3/13, 2007. Elaine Nguyen

Elaine Nguyen

AMENDMENT B

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

Dear Sir:

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

IN THE CLAIMS

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

Listing of Claims:

Claims 1-22 (Canceled)

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

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

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

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

d) making a channel selection change.

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

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

26. (Previously Presented) A method as recited in Claim 23, wherein the first node includes a plurality of radios.

27. (Previously Presented) A method as recited in Claim 23, wherein making a channel selection includes making a channel selection change to meet a performance requirement.

28. (Previously Presented) A method as recited in Claim 23, wherein making a channel selection includes making a channel selection change to meet a latency requirement.

29. (Previously Presented) A method as recited in Claim 23, wherein making a channel selection includes making a channel selection change to meet a throughput requirement.

30. (Previously Presented) A method as recited in Claim 23, wherein determining that the first node requires a channel selection change includes determining that the channel selection change is required due to a performance requirement change.

31. (Previously Presented) A method as recited in Claim 23, wherein determining that the first node requires a channel selection change includes determining that the channel selection change is required due to congestion.

32. (Previously Presented) A method as recited in Claim 23, wherein the channel selection change is made to avoid channel interference.

33. (Previously Presented) A method as recited in Claim 23, wherein the channel selection change is made based on a change to network topology.

34. (Previously Presented) A method as recited in Claim 23, further comprising repeating b)-d).

35. (Previously Presented) A method as recited in Claim 23, further comprising receiving a monitoring signal that includes information about available nodes from which the second node is selected.

36. (Previously Presented) A system in a wireless mesh network, comprising:

a processor configured to:

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

determine that the first relay node in the wireless mesh network requires a channel selection change;

dynamically select a second relay node from the plurality of relay nodes to form a parent-child relationship with the first relay node; and

make a channel selection change; and

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

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

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

39. (Previously Presented) A system as recited in Claim 36, further comprising a plurality of radios.

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

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

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

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

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

45. (Previously Presented) A system as recited in Claim 36, wherein the processor is configured to determine the channel selection change based on network topology.

46. (Previously Presented) A system as recited in Claim 36, wherein the processor is further configured to repeat b)-d).

47. (Previously Presented) A system as recited in Claim 36, wherein the processor is further configured to receive a monitoring signal that includes information about available nodes from which the second node is selected.

48. (Cancelled)

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

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

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

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

d) making a channel selection change.

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

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

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

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

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

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

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

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

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

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

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

REMARKS

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

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

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

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

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

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

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

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

Respectfully submitted,

Dated: 3/9/07

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

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

OIPE
MAR 16 2007
PATENT & TRADEMARK OFFICE

IFW 2617

PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

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

CERTIFICATE OF MAILING

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3/13, 2007.

Elaine Nguyen

Elaine Nguyen

TRANSMITTAL OF AMENDMENT B

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

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

Sir:

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

The fee has been calculated as shown below.

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

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

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

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

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

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

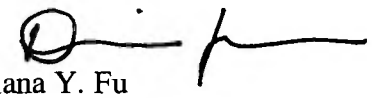
☐ Enclosed are _____sheets replacement drawings.

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

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

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

Respectfully submitted,
VAN PELT, YI & JAMES LLP



Diana Y. Fu
Registration No. 52,924

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

OIPE MAR 16 2007 PATENT & TRADEMARK OFFICE

PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

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

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3/13, 2007. Elaine Nguyen

Elaine Nguyen

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

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

Dear Sir:

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

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

03/19/2007 CCHAU1 00000007 10434948
02 FC:1806 180.00 OP

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

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

Respectfully submitted,
VAN PELT, YI & JAMES LLP



Diana Y. Fu
Registration No. 52,924

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

OIPE MAR 16 2007 PATENT & TRADEMARK OFFICE

Substitute for form 1449/PTO

Information Disclosure Statement By Applicant

(Use as many sheets as necessary)

Sheet 1 of 1

Complete if Known	
Application No.:	10/434,948
Filing Date	May 8, 2003
First Named Inventor	Francis da Costa
Art Unit	2617
Examiner Name	Stephen M. D'Agosta
Atty Docket No.	MESHP001

U.S. Patent Documents

Examiner Initials	Cite No.	Document Number Number-Kind Code (if known)	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
	A.	7,164,667 B2	01-16-2007	RAYMENT et al.	
	B.				
	C.				
	D.				
	E.				
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	G.				
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	I.				
	J.				
	K.				
	L.				
	M.				
	N.				
	O.				
	P.				

FOREIGN PATENT DOCUMENTS

Examiner Initials	Cite No.	Foreign Patent Document Country Code–Number–Kind Code (if known)	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
	Q.				
	R.				
	S.				

NON PATENT LITERATURE DOCUMENTS

Examiner Initials	Cite No.	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.), date, page(s), volume-issue number(s), publisher, city and/or country where published	T^2
	T.		
	U.		
	V.		
	W.		
	X.		
	Y.		
	Z.		

Examiner	Date Considered

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

T^2 = Applicant is to place a check mark here if English language Translation is attached

10-434-948

PATENT APPLICATION FEE DETERMINATION RECORD
Effective January 1, 2003

Application or Docket Number: 10434948

CLAIMS AS FILED - PART I

	(Column 1)	(Column 2)
TOTAL CLAIMS	22	
FOR	NUMBER FILED	NUMBER EXTRA
TOTAL CHARGEABLE CLAIMS	22 minus 20=	* 2
INDEPENDENT CLAIMS	3 minus 3 =	*
MULTIPLE DEPENDENT CLAIM PRESENT		☐

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

SMALL ENTITY TYPE ☐		OR	OTHER THAN SMALL ENTITY	
RATE	FEE		RATE	FEE
BASIC FEE	375.00	OR	BASIC FEE	750.00
X$ 9=	18	OR	X$18=	
X42=		OR	X84=	
+140=		OR	+280=	
TOTAL	393	OR	TOTAL	

CLAIMS AS AMENDED - PART II

AMENDMENT A

	(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA
Total	* 97	Minus	** 98	=
Independent	* 3	Minus	*** 3	=
FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM				☐

1, 6 22

SMALL ENTITY		OR	OTHER THAN SMALL ENTITY	
RATE	ADDITIONAL FEE		RATE	ADDITIONAL FEE
X$ 9=		OR	X$18=	
X42=		OR	X84=	
+140=		OR	+280=	
TOTAL ADDIT. FEE		OR	TOTAL ADDIT. FEE	

AMENDMENT B

	(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA
Total	*	Minus	**	=
Independent	*	Minus	***	=
FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM				☐

SMALL ENTITY		OR	OTHER THAN SMALL ENTITY	
RATE	ADDITIONAL FEE		RATE	ADDITIONAL FEE
X$ 9=		OR	X$18=	
X42=		OR	X84=	
+140=		OR	+280=	
TOTAL ADDIT. FEE		OR	TOTAL ADDIT. FEE	

AMENDMENT C

	(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA
Total	*	Minus	**	=
Independent	*	Minus	***	=
FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM				☐

SMALL ENTITY		OR	OTHER THAN SMALL ENTITY	
RATE	ADDITIONAL FEE		RATE	ADDITIONAL FEE
X$ 9=		OR	X$18=	
X42=		OR	X84=	
+140=		OR	+280=	
TOTAL ADDIT. FEE		OR	TOTAL ADDIT. FEE	

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

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
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www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/434,948	05/08/2003	Francis da Costa	DACOSTAF.PT1	7871

24943 7590 04/16/2007

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

EXAMINER	
D AGOSTA, STEPHEN M	
ART UNIT	**PAPER NUMBER**
2617	

SHORTENED STATUTORY PERIOD OF RESPONSE	MAIL DATE	DELIVERY MODE
3 MONTHS	04/16/2007	PAPER

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

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

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

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

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *3-16-2007*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *23-47 and 49-60* is/are pending in the application.

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

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *23-47 and 49-60* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Response to Arguments

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

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Also see Para #9 which teaches QoS.

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

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

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

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

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

Also see Para #9 which teaches QoS.

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

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

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

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

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

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

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

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

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

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

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

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

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

Conclusion

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

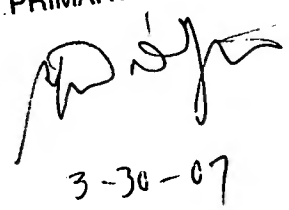
A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

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

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Bill Trost can be reached on 571-272-7872. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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

STEVE M. D'AGOSTA
PRIMARY EXAMINER



3-30-07

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

U.S. PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	Classification
*	A	US-2003/0012193	01-2003	Novaes, Marcos N.	370/390
*	B	US-2002/0159409	10-2002	Wolfe et al.	370/329
	C	US-			
	D	US-			
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FOREIGN PATENT DOCUMENTS

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

*		Include as applicable: Author, Title Date, Publisher, Edition or Volume, Pertinent Pages)
	U	
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*A copy of this reference is not being furnished with this Office action. (See MPEP § 707.05(a).)
Dates in MM-YYYY format are publication dates. Classifications may be US or foreign.

OIPE MAR 16 2007 PATENT & TRADEMARK OFFICE

Substitute for form 1449/PTO

Information Disclosure Statement By Applicant

(Use as many sheets as necessary)

Sheet 1 of 1

Complete if Known	
Application No.:	10/434,948
Filing Date	May 8, 2003
First Named Inventor	Francis da Costa
Art Unit	2617
Examiner Name	Stephen M. D'Agosta
Atty Docket No.	MESHP001

U.S. Patent Documents

Examiner Initials	Cite No.	Document Number Number-Kind Code (if known)	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
/SD/	A.	7,164,667 B2	01-16-2007	RAYMENT et al.	
	B.				
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Examiner Initials	Cite No.	Foreign Patent Document Country Code–Number–Kind Code (if known)	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
	Q.				
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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, page(s), volume-issue number(s), publisher, city and/or country where published	T^2
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Examiner	/Stephen D Agosta/	Date Considered	03/30/2007

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

T^2 = Applicant is to place a check mark here if English language Translation is attached

Index of Claims

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

√	Rejected	–	(Through numeral) Cancelled	N	Non-Elected	A	Appeal
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Claim		Date
Final	Original	3 30 07
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Claim		Date
Final	Original	3 30 07
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Claim		Date
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Search Notes

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

SEARCHED			
Class	Subclass	Date	Examiner

INTERFERENCE SEARCHED			
Class	Subclass	Date	Examiner

SEARCH NOTES (INCLUDING SEARCH STRATEGY)		
	DATE	EXMR
Inventor Search	11-7-04	
Ios Art		
EAST DB's		
Text Search		
Updated Search	3-30-07	

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AUG 07 2007

FACSIMILE COVER SHEET

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

Date: August 7, 2007

CONFIDENTIALITY NOTE

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COMPANY: U.S. Patent & Trademark Office
FAX NO.: 571-273-8300

FROM: Diana Y. Fu
RE: Revocation of Power of Attorney with New Power of Attorney and Change of Correspondence Address
REF. NO.: MESHP001
PATENT APPLICATION NO.: 10/434,948
NO. PAGES: 3 pages total

MESSAGE:

Dear Official Fax Filing:

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

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

Best Regards,

Diana Y. Fu

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PTO/SB/82 (04-05)
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REVOCATION OF POWER OF ATTORNEY WITH NEW POWER OF ATTORNEY AND CHANGE OF CORRESPONDENCE ADDRESS

Application Number	10/434,848
Filing Date	May 8, 2003
First Named Inventor	Francis daCosta
Art Unit	2617
Examiner Name	Stephen M. D'Agosta
Attorney Docket Number	MESHP001

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

☐ A Power of Attorney is submitted herewith.

OR

☑ I hereby appoint the practitioners associated with the Customer Number: 21912

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

☐ The address associated with Customer Number: 21912

OR

☐ Firm or Individual Name					
Address					
City		State		Zip	
Country					
Telephone		Email			

I am the:

☐ Applicant/Inventor.

☑ Assignee of record of the entire interest. See 37 CFR 3.71.
Statement under 37 CFR 3.73(b) is enclosed. (Form PTO/SB/96)

SIGNATURE of Applicant or Assignee of Record

Signature	Francis daCosta		
Name	Francis daCosta		
Date	Aug - 3 - 2007	Telephone	408-373-7700

NOTE: Signatures of all the inventors or assignees of record of the entire interest or their representative(s) are required. Submit multiple forms if more than one signature is required, see below*.

☑ *Total of 1 forms are submitted.

This collection of information is required by 37 CFR 1.36. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 3 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: **Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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U.S. Patent and Trademark Office: U.S. DEPARTMENT OF COMMERCE
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STATEMENT UNDER 37 CFR 3.73(b)

Applicant/Patent Owner: DACOSTA et al.

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

Entitled: HIGH PERFORMANCE WIRELESS NETWORKS USING DISTRIBUTED CONTROL

Mesh Dynamics, Inc. (Name of Assignee), a Corporation (Type of Assignee, e.g., corporation, partnership, university, government agency, etc.)

states that it is:

1. ☑ the assignee of the entire right, title, and interest; or

2. ☐ an assignee of less than the entire right, title and interest
(The extent (by percentage) of its ownership interest is_____ %)

in the patent application/patent identified above by virtue of either:

A. ☑ An assignment from the inventor(s) of the patent application/patent identified above. The assignment was recorded in the United States Patent and Trademark Office at Reel 019345, Frame 0124, or for which a copy thereof is attached.

OR

B. ☐ A chain of title from the inventor(s), of the patent application/patent identified above, to the current assignee as follows:

1. From:_____ To:_____
The document was recorded in the United States Patent and Trademark Office at
Reel _____, Frame _____, or for which a copy thereof is attached.

2. From:_____ To:_____
The document was recorded in the United States Patent and Trademark Office at
Reel _____, Frame _____, or for which a copy thereof is attached.

3. From:_____ To:_____
The document was recorded in the United States Patent and Trademark Office at
Reel _____, Frame _____, or for which a copy thereof is attached.

☐ Additional documents in the chain of title are listed on a supplemental sheet.

☐ As required by 37 CFR 3.73(b)(1)(i), the documentary evidence of the chain of title from the original owner to the assignee was, or concurrently is being, submitted for recordation pursuant to 37 CFR 3.11.

[NOTE: A separate copy (*i.e.*, a true copy of the original assignment document(s)) must be submitted to Assignment Division in accordance with 37 CFR Part 3, to record the assignment in the records of the USPTO. See MPEP 302.08]

The undersigned (whose title is supplied below) is authorized to act on behalf of the assignee.

Signature	Date: 8/7/07
Diana Y. Fu	408-973-2585
Printed or Typed Name	Telephone Number
Reg. No. 52,924	
Title	

This collection of information is required by 37 CFR 3.73(b). The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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PATENT & TRADEMARK OFFICE

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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

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

CERTIFICATE OF MAILING

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

8/9, 2007. Elaine Nguyen

Elaine Nguyen

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

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

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

1. Submission required under 37 CFR §1.114

a. ☐ Previously submitted:

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

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

☐ Other _____

b. ☒ Enclosed:

☒ Amendment/Reply

☐ Affidavit(s)/Declaration(s)

☐ Information Disclosure Statement (IDS)

☐ Other

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EX1023, Page 202

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

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

2. Miscellaneous:

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

b ☐ Other _____

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

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

4. ☒ Applicant(s) hereby petition that any additional required extension of time be granted.

5. ☒ Enclosed is our Check No. 3145 in the amount of $910.00 to cover the RCE Fee required under 37 CFR §1.17 (e), the additional claim fee, if any, and/or extension of time fees.

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

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

8. ☐ Applicant Initiated Interview Request Form.

9. ☒ Please continue to send correspondence to the following address:

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

Date: 8/9/07

Diana Y. Fu
Reg. No. 52,924

OIPE IAP76
AUG 14 2007
PATENT & TRADEMARK OFFICE

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

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

CERTIFICATE OF MAILING

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

8/9, 2007.

Elaine Nguyen

AMENDMENT C

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

Dear Sir:

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

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IN THE CLAIMS

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

Listing of Claims:

Claims 1-22 (Canceled)

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

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

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

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

d) making a channel selection change.

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

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

26. (Currently Amended) A method as recited in Claim 23, wherein ~~the first node includes a plurality of radios.~~ prior to being dynamically selected, the second relay node was a sibling node of the first relay node.

27. (Previously Presented) A method as recited in Claim 23, wherein making a channel selection includes making a channel selection change to meet a performance requirement.

28. (Previously Presented) A method as recited in Claim 23, wherein making a channel selection includes making a channel selection change to meet a latency requirement.

29. (Previously Presented) A method as recited in Claim 23, wherein making a channel selection includes making a channel selection change to meet a throughput requirement.

30. (Previously Presented) A method as recited in Claim 23, wherein determining that the first node requires a channel selection change includes determining that the channel selection change is required due to a performance requirement change.

31. (Previously Presented) A method as recited in Claim 23, wherein determining that the first node requires a channel selection change includes determining that the channel selection change is required due to congestion.

32. (Previously Presented) A method as recited in Claim 23, wherein the channel selection change is made to avoid channel interference.

33. (Previously Presented) A method as recited in Claim 23, wherein the channel selection change is made based on a change to network topology.

34. (Previously Presented) A method as recited in Claim 23, further comprising repeating b)-d).

35. (Previously Presented) A method as recited in Claim 23, further comprising receiving a monitoring signal that includes information about available nodes from which the second node is selected.

36. (Currently Amended) A relay node system in a wireless mesh network that includes a plurality of relay nodes, comprising:

a first radio interface configurable to relay traffic to a parent relay node;

a second dual purpose radio interface configurable to both relay traffic from a child relay node and to communicate with a client node that is not a relay node;

a processor configured to:

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

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

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

d) make a channel selection change; and

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

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

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

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

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

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

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

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

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

45. (Previously Presented) A system as recited in Claim 36, wherein the processor is configured to determine the channel selection change based on network topology.

46. (Previously Presented) A system as recited in Claim 36, wherein the processor is further configured to repeat b)-d).

47. (Previously Presented) A system as recited in Claim 36, wherein the processor is further configured to receive a monitoring signal that includes information about available nodes from which the second node is selected.

48. (Cancelled)

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

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

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

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

d) making a channel selection change.

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

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

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

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

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

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

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

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

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

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

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

REMARKS

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

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

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

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

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

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

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

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

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

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

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

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

Respectfully submitted,

Dated: 8/9/07

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

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

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PATENT APPLICATION FEE DETERMINATION RECORD

Substitute for Form PTO-875

Application or Docket Number: 10/434,948

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))							
SEARCH FEE (37 CFR 1.16(k), (i), or (m))							
EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))							
TOTAL CLAIMS (37 CFR 1.16(i))	minus 20 =	*	x =		OR	x =	
INDEPENDENT CLAIMS (37 CFR 1.16(h))	minus 3 =	*	x =			x =	
APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is $250 ($125 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).						
MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))							
* If the difference in column 1 is less than zero, enter "0" in column 2.			TOTAL			TOTAL	

APPLICATION AS AMENDED – PART II

8-1407

AMENDMENT A

	(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 ($)	OTHER THAN SMALL ENTITY ADDITIONAL FEE ($)
Total (37 CFR 1.16(i))	* 37	Minus	** 37	=	x =		OR	x =	
Independent (37 CFR 1.16(h))	* 3	Minus	*** 3	=	x =		OR	x =	
Application Size Fee (37 CFR 1.16(s))							OR		
FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
					TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE	

AMENDMENT B

	(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 ($)	OTHER THAN SMALL ENTITY ADDITIONAL FEE ($)
Total (37 CFR 1.16(i))	*	Minus	**	=	x =		OR	x =	
Independent (37 CFR 1.16(h))	*	Minus	***	=	x =		OR	x =	
Application Size Fee (37 CFR 1.16(s))									
FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
					TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE	

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

This collection of information is required by 37 CFR 1.16. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
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Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NUMBER	FILING OR 371 (c) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
10/434,948	05/08/2003	Francis da Costa	MESHP001

CONFIRMATION NO. 7871

OC000000025441992

OC000000025441992

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

Date Mailed: 08/17/2007

NOTICE OF ACCEPTANCE OF POWER OF ATTORNEY

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

The Power of Attorney in this application is accepted. Correspondence in this application will be mailed to the above address as provided by 37 CFR 1.33.

EIBS

Office of Initial Patent Examination (571) 272-4000, or 1-800-PTO-9199
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UNITED STATES PATENT AND TRADEMARK OFFICE

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

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

CONFIRMATION NO. 7871

OC000000025441952

OC000000025441952

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

Date Mailed: 08/17/2007

NOTICE REGARDING CHANGE OF POWER OF ATTORNEY

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

- The Power of Attorney to you in this application has been revoked by the assignee who has intervened as provided by 37 CFR 3.71. Future correspondence will be mailed to the new address of record(37 CFR 1.33).

2138

Office of Initial Patent Examination (571) 272-4000, or 1-800-PTO-9199
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UNITED STATES PATENT AND TRADEMARK OFFICE

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

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

21912 7590 09/17/2007
VAN PELT, YI & JAMES LLP
10050 N. FOOTHILL BLVD #200
CUPERTINO, CA 95014

EXAMINER	
D AGOSTA, STEPHEN M	
ART UNIT	**PAPER NUMBER**
2617	
MAIL DATE	**DELIVERY MODE**
09/17/2007	PAPER

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

The time period for reply, if any, is set in the attached communication.

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

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

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *14 August 2007*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *23-60* is/are pending in the application.

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

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *23-60* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 8-14-2007 has been entered.

- New art has been added to address the claim amendments.

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

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Also see Para #9 which teaches QoS.

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

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

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

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

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

Also see Para #9 which teaches QoS.

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

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

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

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

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

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

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

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

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

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

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

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

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

Conclusion

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

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

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

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Bill Trost can be reached on 571-272-7872. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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

STEVE M. D'AGOSTA
PRIMARY EXAMINER

8-17-07

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

U.S. PATENT DOCUMENTS

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

FOREIGN PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Country	Name	Classification
	N					
	O					
	P					
	Q					
	R					
	S					
	T					

NON-PATENT DOCUMENTS

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

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

Index of Claims

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

√	Rejected	–	(Through numeral) Cancelled	N	Non-Elected	A	Appeal
=	Allowed	÷	Restricted	I	Interference	O	Objected

Claim		Date
Final	Original	8/17/09
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Claim		Date
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	51	✓
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Claim		Date
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Search Notes	Application/Control No.	Applicant(s)/Patent under Reexamination
	10/434,948	DA COSTA ET AL.
	Examiner: Stephen M. D'Agosta	Art Unit: 2617

SEARCHED			
Class	Subclass	Date	Examiner

INTERFERENCE SEARCHED			
Class	Subclass	Date	Examiner

SEARCH NOTES (INCLUDING SEARCH STRATEGY)		
	DATE	EXMR
INVENTOR SEARCH	11-7-04	
IOS ART		
EAST DB's		
TEXT SEARCH		
FLOATED SEARCH	3-30-07	
" "	8-17-07	

OIPE IAP35 DEC 10 2007 PATENT & TRADEMARK OFFICE

IFW 2617

PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

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

CERTIFICATE OF MAILING

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

12/4, 2007. Elaine Nguyen

Elaine Nguyen

TRANSMITTAL OF AMENDMENT D

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

Sir:

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

The fee has been calculated as shown below.

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

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

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

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

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

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

☐ Enclosed are _____sheets replacement drawings.

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

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

☐ OTHER:

Respectfully submitted,
VAN PELT, YI & JAMES LLP



Diana Y. Fu
Registration No. 52,924

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

OIPE IAP35
DEC 10 2007
PATENT & TRADEMARK OFFICE

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

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

CERTIFICATE OF MAILING

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

12/4, 2007. Elaine Nguyen

Elaine Nguyen

AMENDMENT D

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

Dear Sir:

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

IN THE CLAIMS

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

Listing of Claims:

Claims 1-22 (Canceled)

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

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

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

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

d) making a channel selection change;

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

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

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

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

26. (Cancelled)

27. (Cancelled)

28. (Previously Presented) A method as recited in Claim 23, wherein making a channel selection includes making a channel selection change to meet a latency requirement.

29. (Previously Presented) A method as recited in Claim 23, wherein making a channel selection includes making a channel selection change to meet a throughput requirement.

30. (Previously Presented) A method as recited in Claim 23, wherein determining that the first node requires a channel selection change includes determining that the channel selection change is required due to a performance requirement change.

31. (Previously Presented) A method as recited in Claim 23, wherein determining that the first node requires a channel selection change includes determining that the channel selection change is required due to congestion.

32. (Previously Presented) A method as recited in Claim 23, wherein the channel selection change is made to avoid channel interference.

33. (Previously Presented) A method as recited in Claim 23, wherein the channel selection change is made based on a change to network topology.

34. (Previously Presented) A method as recited in Claim 23, further comprising repeating b)-d).

35. (Previously Presented) A method as recited in Claim 23, further comprising receiving a monitoring signal that includes information about available nodes from which the second node is selected.

36. (Currently Amended) A relay node system in a wireless mesh network that includes a plurality of relay nodes, comprising:

a first radio interface configurable to relay traffic to a parent relay node;

a second dual purpose radio interface configurable to both relay traffic from a child relay node and to communicate with a client node that is not a relay node;

a processor configured to:

a) configure the relay node system in a first configuration to relay traffic from a child relay node to a parent relay node;

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

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

d) make a channel selection change; and

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

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

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

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

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

39. (Cancelled)

40. (Cancelled)

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

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

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

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

45. (Previously Presented) A system as recited in Claim 36, wherein the processor is configured to determine the channel selection change based on network topology.

46. (Previously Presented) A system as recited in Claim 36, wherein the processor is further configured to repeat b)-d).

47. (Previously Presented) A system as recited in Claim 36, wherein the processor is further configured to receive a monitoring signal that includes information about available nodes from which the second node is selected.

48. (Cancelled)

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

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

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

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

d) making a channel selection change;

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

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

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

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

52. (Cancelled)

53. (Cancelled)

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

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

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

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

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

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

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

REMARKS

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

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

35 USC §103 Rejections

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

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

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

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

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

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

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

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

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

Respectfully submitted,

Dated: 12/3/07

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

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

PTO/SB/06 (07-06)
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PATENT APPLICATION FEE DETERMINATION RECORD

Substitute for Form PTO-875

Application or Docket Number	Filing Date	☐ To be Mailed
10/434,948	05/08/2003	

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			N/A	
☐ SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A	N/A			N/A	
☐ EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A			N/A	
TOTAL CLAIMS (37 CFR 1.16(i))	minus 20 =	*	X $ =		OR	X $ =	
INDEPENDENT CLAIMS (37 CFR 1.16(h))	minus 3 =	*	X $ =			X $ =	
☐ APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is $250 ($125 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).						
☐ MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))							
* If the difference in column 1 is less than zero, enter "0" in column 2.			TOTAL			TOTAL	

APPLICATION AS AMENDED – PART II

AMENDMENT	12/10/2007	(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 ($)	OTHER THAN SMALL ENTITY ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	* 31	Minus	** 37	= 0	X $25 =	0	OR	X $ =	
	Independent (37 CFR 1.16(h))	* 3	Minus	***3	= 0	X $105 =	0	OR	X $ =	
	☐ Application Size Fee (37 CFR 1.16(s))									
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
						TOTAL ADD'L FEE	0	OR	TOTAL ADD'L FEE	

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

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.

** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".

*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".

The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1.

Legal Instrument Examiner:
dante r. smith

This collection of information is required by 37 CFR 1.16. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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

21912 7590 01/07/2008
VAN PELT, YI & JAMES LLP
10050 N. FOOTHILL BLVD #200
CUPERTINO, CA 95014

EXAMINER	
D AGOSTA, STEPHEN M	
ART UNIT	PAPER NUMBER
2617	
MAIL DATE	DELIVERY MODE
01/07/2008	PAPER

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

The time period for reply, if any, is set in the attached communication.

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

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

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *10 December 2007*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *23-25,28-38,41-47, 49-51 and 54-60* is/are pending in the application.

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

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

6)☒ Claim(s) *36-38 and 41-47* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Response to Arguments

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

1. All other claims are in condition for allowance.

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

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

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

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

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Furthermore, (Para #6 teaches performance:

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

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

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

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

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

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

Also see Para #9 which teaches QoS.

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

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

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

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

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

Also see Para #9 which teaches QoS.

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

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

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

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

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

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

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

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

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

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

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

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

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

Allowable Subject Matter

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

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

Conclusion

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

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

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Bill Trost can be reached on 571-272-7872. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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

STEVE M. D'AGOSTA
PRIMARY EXAMINER

12-27-07

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

SEARCHED			
Class	Subclass	Date	Examiner

INTERFERENCE SEARCHED			
Class	Subclass	Date	Examiner

SEARCH NOTES (INCLUDING SEARCH STRATEGY)		
	DATE	EXMR
Inventor Search	11-7-04	
Ios Art		
East DB's		
Text Search		
Updated Search	3-30-07	
" "	8-17-07	
" "	12-27-07	

Index of Claims

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

√	Rejected	–	(Through numeral) Cancelled	N	Non-Elected	A	Appeal
=	Allowed	÷	Restricted	I	Interference	O	Objected

Claim		Date								
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PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

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

CERTIFICATE OF MAILING

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

2/26, 2008. Elaine Nguyen

Elaine Nguyen

TRANSMITTAL OF AMENDMENT E

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

Sir:

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

The fee has been calculated as shown below.

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

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

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

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

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

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

☐ Enclosed are _____sheets replacement drawings.

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

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

☐ OTHER:

Respectfully submitted,
VAN PELT, YI & JAMES LLP

Diana Y. Fu
Registration No. 52,924

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

O.I.P.E. IAP66 MAR 03 2008 PATENT & TRADEMARK OFFICE

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

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

CERTIFICATE OF MAILING

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

2/26, 2008. Elaine Nguyen

Elaine Nguyen

AMENDMENT E

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

Dear Sir:

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

IN THE CLAIMS

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

Listing of Claims:

Claims 1-22 (Canceled)

23. (Previously Presented) A method of controlling a wireless mesh network, comprising:

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

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

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

d) making a channel selection change;

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

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

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

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

26. (Cancelled)

27. (Cancelled)

28. (Previously Presented) A method as recited in Claim 23, wherein making a channel selection includes making a channel selection change to meet a latency requirement.

29. (Previously Presented) A method as recited in Claim 23, wherein making a channel selection includes making a channel selection change to meet a throughput requirement.

30. (Previously Presented) A method as recited in Claim 23, wherein determining that the first node requires a channel selection change includes determining that the channel selection change is required due to a performance requirement change.

31. (Previously Presented) A method as recited in Claim 23, wherein determining that the first node requires a channel selection change includes determining that the channel selection change is required due to congestion.

32. (Previously Presented) A method as recited in Claim 23, wherein the channel selection change is made to avoid channel interference.

33. (Previously Presented) A method as recited in Claim 23, wherein the channel selection change is made based on a change to network topology.

34. (Previously Presented) A method as recited in Claim 23, further comprising repeating b)-d).

35. (Previously Presented) A method as recited in Claim 23, further comprising receiving a monitoring signal that includes information about available nodes from which the second node is selected.

36. (Cancelled)

37. (Cancelled)

38. (Cancelled)

39. (Cancelled)

40. (Cancelled)

41. (Cancelled)

42. (Cancelled)

43. (Cancelled)

44. (Cancelled)

45. (Cancelled)

46. (Cancelled)

47. (Cancelled)

48. (Cancelled)

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

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

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

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

d) making a channel selection change;

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

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

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

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

52. (Cancelled)

53. (Cancelled)

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

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

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

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

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

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

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

REMARKS

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

Respectfully submitted,

Dated: 2/26/2008

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

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

PTO/SB/06 (07-06)
Approved for use through 1/31/2007. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

PATENT APPLICATION FEE DETERMINATION RECORD

Substitute for Form PTO-875

Application or Docket Number	Filing Date	☐ To be Mailed
10/434,948	05/08/2003	

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			N/A	
☐ SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A	N/A			N/A	
☐ EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A			N/A	
TOTAL CLAIMS (37 CFR 1.16(i))	minus 20 =	*	X $ =		OR	X $ =	
INDEPENDENT CLAIMS (37 CFR 1.16(h))	minus 3 =	*	X $ =			X $ =	
☐ APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is $250 ($125 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).						
☐ MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))							
* If the difference in column 1 is less than zero, enter "0" in column 2.			TOTAL			TOTAL	

APPLICATION AS AMENDED – PART II

AMENDMENT	03/03/2008	(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 ($)	OTHER THAN SMALL ENTITY ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	* 21	Minus	** 37	= 0	X $25 =	0	OR	X $ =	
	Independent (37 CFR 1.16(h))	* 2	Minus	***3	= 0	X $105 =	0	OR	X $ =	
	☐ Application Size Fee (37 CFR 1.16(s))									
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
						TOTAL ADD'L FEE	0	OR	TOTAL ADD'L FEE	

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

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.

** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".

*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".

The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1.

Legal Instrument Examiner:
/JASON B. EADDY/

This collection of information is required by 37 CFR 1.16. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
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NOTICE OF ALLOWANCE AND FEE(S) DUE

21912 7590 03/25/2008

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

EXAMINER	
D AGOSTA, STEPHEN M	
ART UNIT	PAPER NUMBER
2617	

DATE MAILED: 03/25/2008

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

TITLE OF INVENTION: HIGH PERFORMANCE WIRELESS NETWORKS USING DISTRIBUTED CONTROL

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

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

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

HOW TO REPLY TO THIS NOTICE:

I. Review the SMALL ENTITY status shown above.

If the SMALL ENTITY is shown as YES, verify your current SMALL ENTITY status:

A. If the status is the same, pay the TOTAL FEE(S) DUE shown above.

B. If the status above is to be removed, check box 5b on Part B - Fee(s) Transmittal and pay the PUBLICATION FEE (if required) and twice the amount of the ISSUE FEE shown above, or

If the SMALL ENTITY is shown as NO:

A. Pay TOTAL FEE(S) DUE shown above, or

B. If applicant claimed SMALL ENTITY status before, or is now claiming SMALL ENTITY status, check box 5a on Part B - Fee(s) Transmittal and pay the PUBLICATION FEE (if required) and 1/2 the ISSUE FEE shown above.

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

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

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

PART B - FEE(S) TRANSMITTAL

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

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

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

21912 7590 03/25/2008

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Certificate of Mailing or Transmission

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

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

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

TITLE OF INVENTION: HIGH PERFORMANCE WIRELESS NETWORKS USING DISTRIBUTED CONTROL

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

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

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

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

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

2. For printing on the patent front page, list

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

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

1 _____

2 _____

3 _____

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

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

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

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

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

❑ Issue Fee

❑ Publication Fee (No small entity discount permitted)

❑ Advance Order - # of Copies _____

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

❑ A check is enclosed.

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

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

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

❑ a. Applicant claims SMALL ENTITY status. See 37 CFR 1.27.

❑ b. Applicant is no longer claiming SMALL ENTITY status. See 37 CFR 1.27(g)(2).

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

Authorized Signature _____ Date _____

Typed or printed name _____ Registration No. _____

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

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

EX1023, Page 266

UNITED STATES PATENT AND TRADEMARK OFFICE

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

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

21912 7590 03/25/2008

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

EXAMINER	
D AGOSTA, STEPHEN M	
ART UNIT	PAPER NUMBER
2617	

DATE MAILED: 03/25/2008

Determination of Patent Term Adjustment under 35 U.S.C. 154 (b)

(application filed on or after May 29, 2000)

The Patent Term Adjustment to date is 841 day(s). If the issue fee is paid on the date that is three months after the mailing date of this notice and the patent issues on the Tuesday before the date that is 28 weeks (six and a half months) after the mailing date of this notice, the Patent Term Adjustment will be 841 day(s).

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

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

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

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

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

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

1. ☒ This communication is responsive to *the amendment received 3-3-08*.

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

3. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
   a) ☐ All b) ☐ Some* c) ☐ None of the:
      1. ☐ Certified copies of the priority documents have been received.
      2. ☐ Certified copies of the priority documents have been received in Application No. _____ .
      3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

   * Certified copies not received: _____.

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

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

5. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
   (a) ☐ including changes required by the Notice of Draftsperson's Patent Drawing Review (PTO-948) attached
      1) ☐ hereto or 2) ☐ to Paper No./Mail Date _____.
   (b) ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____.

   Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).

6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

1. ☐ Notice of References Cited (PTO-892)
2. ☐ Notice of Draftperson's Patent Drawing Review (PTO-948)
3. ☐ Information Disclosure Statements (PTO/SB/08), Paper No./Mail Date _____
4. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material
5. ☐ Notice of Informal Patent Application
6. ☐ Interview Summary (PTO-413), Paper No./Mail Date _____ .
7. ☐ Examiner's Amendment/Comment
8. ☒ Examiner's Statement of Reasons for Allowance
9. ☐ Other _____.

DETAILED ACTION

Response to Amendment

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

Allowable Subject Matter

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

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

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

Conclusion

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

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Bill Trost can be reached on 571-272-7872. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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

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

O.I.P.E. IAP66 MAR 03 2008 PATENT & TRADEMARK OFFICE

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

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

CERTIFICATE OF MAILING

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

2/26, 2008. Elaine Nguyen

Elaine Nguyen

AMENDMENT E

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

Dear Sir:

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

OK TO ENTER: /SD/

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

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

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

CLAIM		DATE								
Final	Original	03/12/2008								
	1									
	2									
	3									
	4									
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	27									
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5	29	=								
6	30	=								
7	31	=								
8	32	=								
9	33	=								
10	34	=								
11	35	=								
	36									

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

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

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

CLAIM		DATE								
Final	Original	03/12/2008								
	37									
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	41									
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14	51	=								
	52									
	53									
15	54	=								
16	55	=								
17	56	=								
18	57	=								
19	58	=								
20	59	=								
21	60	=								

Issue Classification

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

ORIGINAL		INTERNATIONAL CLASSIFICATION	
CLASS	SUBCLASS	CLAIMED	NON-CLAIMED
370	338	H 0 4 Q 7 / 24 (2006.01.01)	

CROSS REFERENCE(S)

CLASS	SUBCLASS (ONE SUBCLASS PER BLOCK)				
370	319	321	328	336	442
370	445				
455	41.2	41.3	450	502	507

NONE (Assistant Examiner) (Date)		**Total Claims Allowed:** 21
/Stephen M D'Agosta/ (Primary Examiner)	3-12-2008 (Date)	O.G. Print Claim(s) 23 / O.G. Print Figure 14

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

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

SEARCH NOTES		
Search Notes	Date	Examiner

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

EAST Search History

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

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

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

3/12/08 7:50:26 AM
C:\Documents and Settings\SDagosta\My Documents\EAST\Workspaces\10_434948.wsp

MAY 0 1 2008
PATENT & TRADEMARK OFFICE

PART B - FEE(S) TRANSMITTAL

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

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

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21912 7590 03/25/2008

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

05/01/2008 AFEKADU2 00000033 10434948
01 FC:2501 720.00 OP
02 FC:1504 300.00 OP
05 FC:1504 12.00 OP

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

Elaine Nguyen	(Depositor's name)
Elaine Nguyen	(Signature)
4/25/2008	(Date)

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

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

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

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

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

(A) NAME OF ASSIGNEE: Mesh Dynamics, Inc.
(B) RESIDENCE: (CITY and STATE OR COUNTRY): Santa Clara, CA

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

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

4b. Payment of Fee(s): **(Please first reapply any previously paid issue fee shown above)**
☑ A check is enclosed.
☐ Payment by credit card. Form PTO-2038 is attached.
☑ The Director is hereby authorized to charge the required fee(s), any deficiency, or credit any overpayment, to Deposit Account Number 50-0685 (enclose an extra copy of this form).

5. **Change in Entity Status** (from status indicated above)
☐ a. Applicant claims SMALL ENTITY status. See 37 CFR 1.27.
☐ b. Applicant is no longer claiming SMALL ENTITY status. See 37 CFR 1.27(g)(2).

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

Authorized Signature _____ Date 4/25/08
Typed or printed name Diana Y. Fu Registration No. 52,924

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

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PATENT & TRADEMARK OFFICE

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

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

CERTIFICATE OF MAILING

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4/25, 2008. Elaine Nguyen

REPLACEMENT DRAWING(S)

MAIL STOP – ISSUE FEE
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

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

Attachment: Replacement Sheet

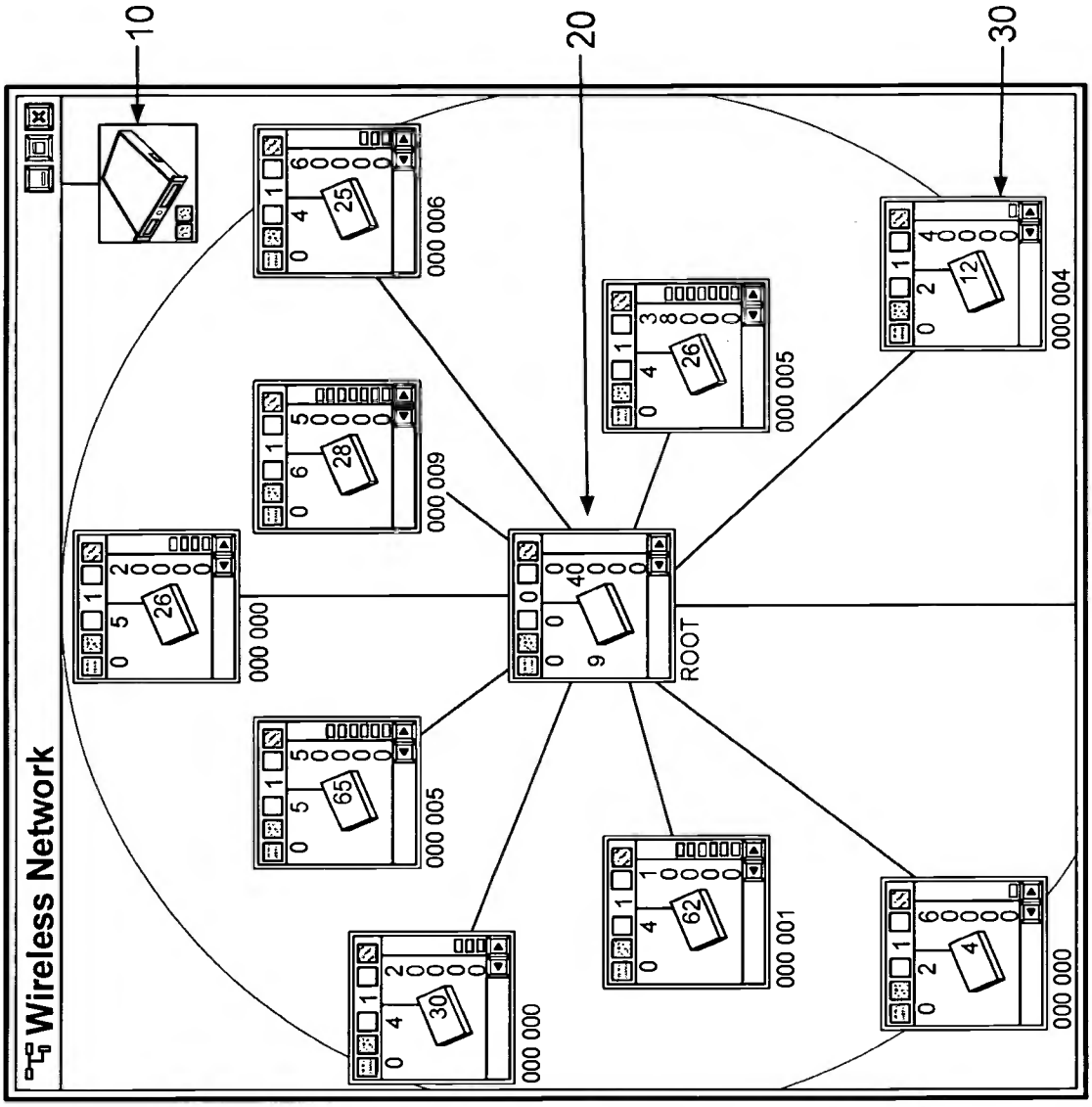
Respectfully submitted,

Dated: 4/25/08

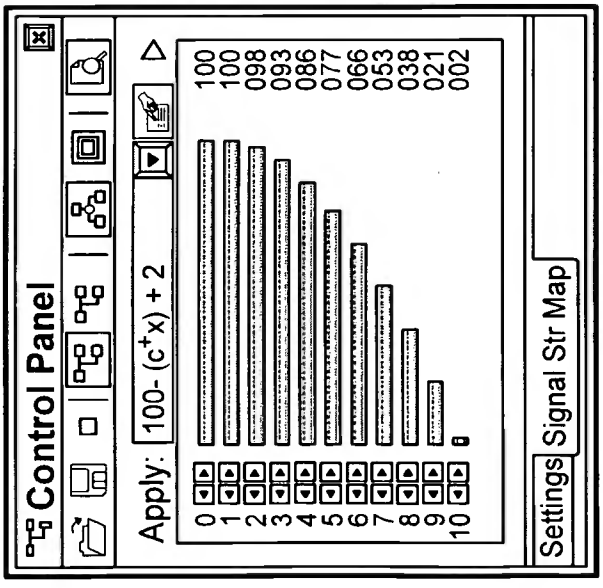
Diana Y. Fu
Registration No. 52,924
V 408-973-2593
F 408-973-2595

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

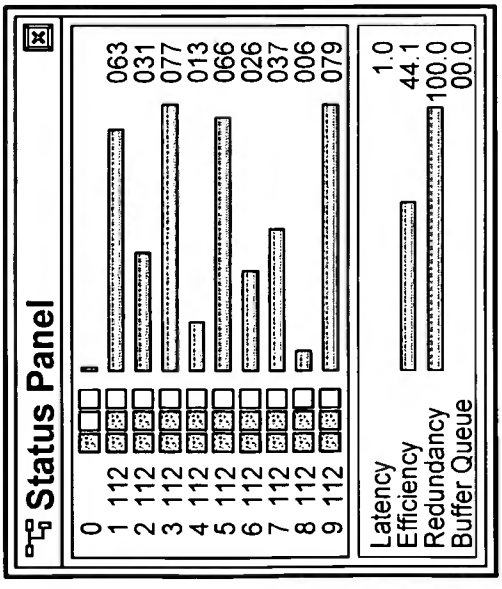
MAY 01 2008
PATENT & TRADEMARK OFFICE



1C



1A



1B

FIG. 1

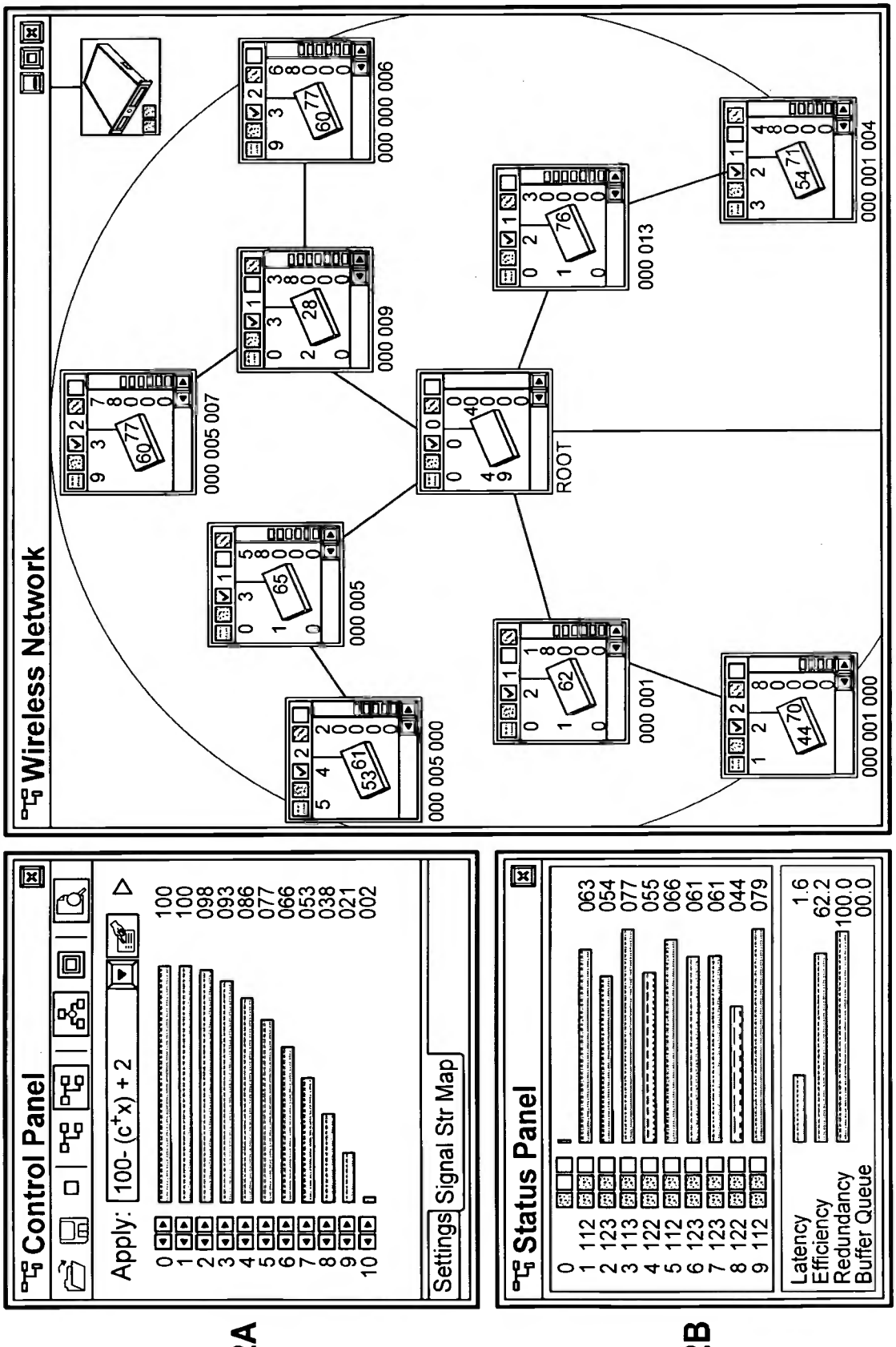

Wireless Network
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000 001 004
Control Panel
Apply:
100- (c+x) + 2
Settings
Signal Str Map
Status Panel
Latency
Efficiency
Redundancy
Buffer Queue
2A
2B
2C

FIG. 2

3/18

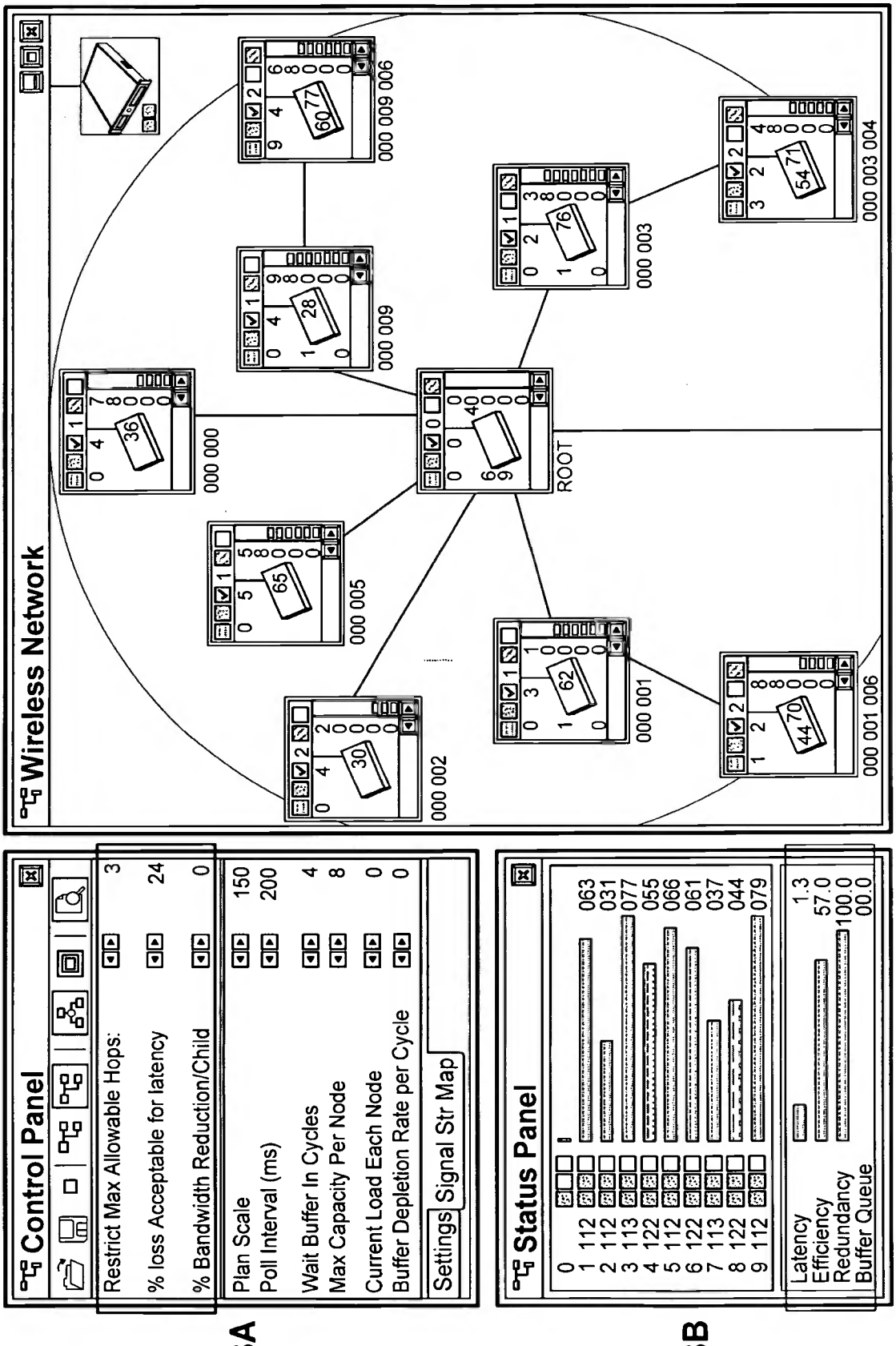

Control Panel
Restrict Max Allowable Hops: 3
% loss Acceptable for latency 24
% Bandwidth Reduction/Child 0
Plan Scale 150
Poll Interval (ms) 200
Wait Buffer In Cycles 4
Max Capacity Per Node 8
Current Load Each Node 0
Buffer Depletion Rate per Cycle 0
Settings
Signal Str Map
3A
Status Panel
0
1 112 063
2 112 031
3 113 077
4 122 055
5 112 066
6 122 061
7 113 037
8 122 044
9 112 079
Latency 1.3
Efficiency 57.0
Redundancy 100.0
Buffer Queue 00.0
3B
Wireless Network
000 000
000 009
000 009 006
000 003
000 003 004
ROOT
000 005
000 002
000 001
000 001 006
3C

FIG. 3

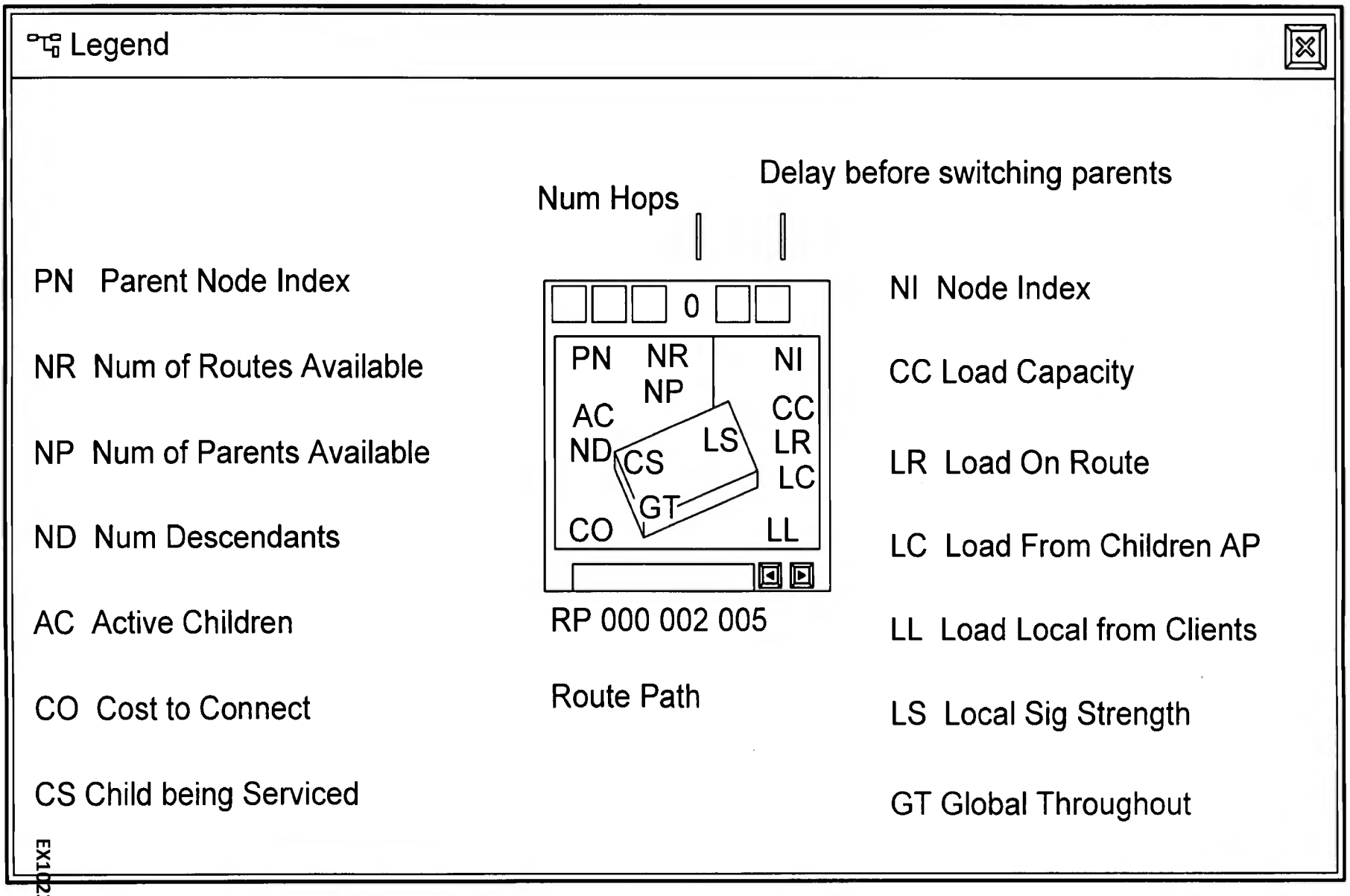


FIG. 4

EX1023, Page 284

REPLACEMENT SHEET
App. No.: 10/434,948
Att. Dkt. No.: MESHP001
Sheet 4 of 18

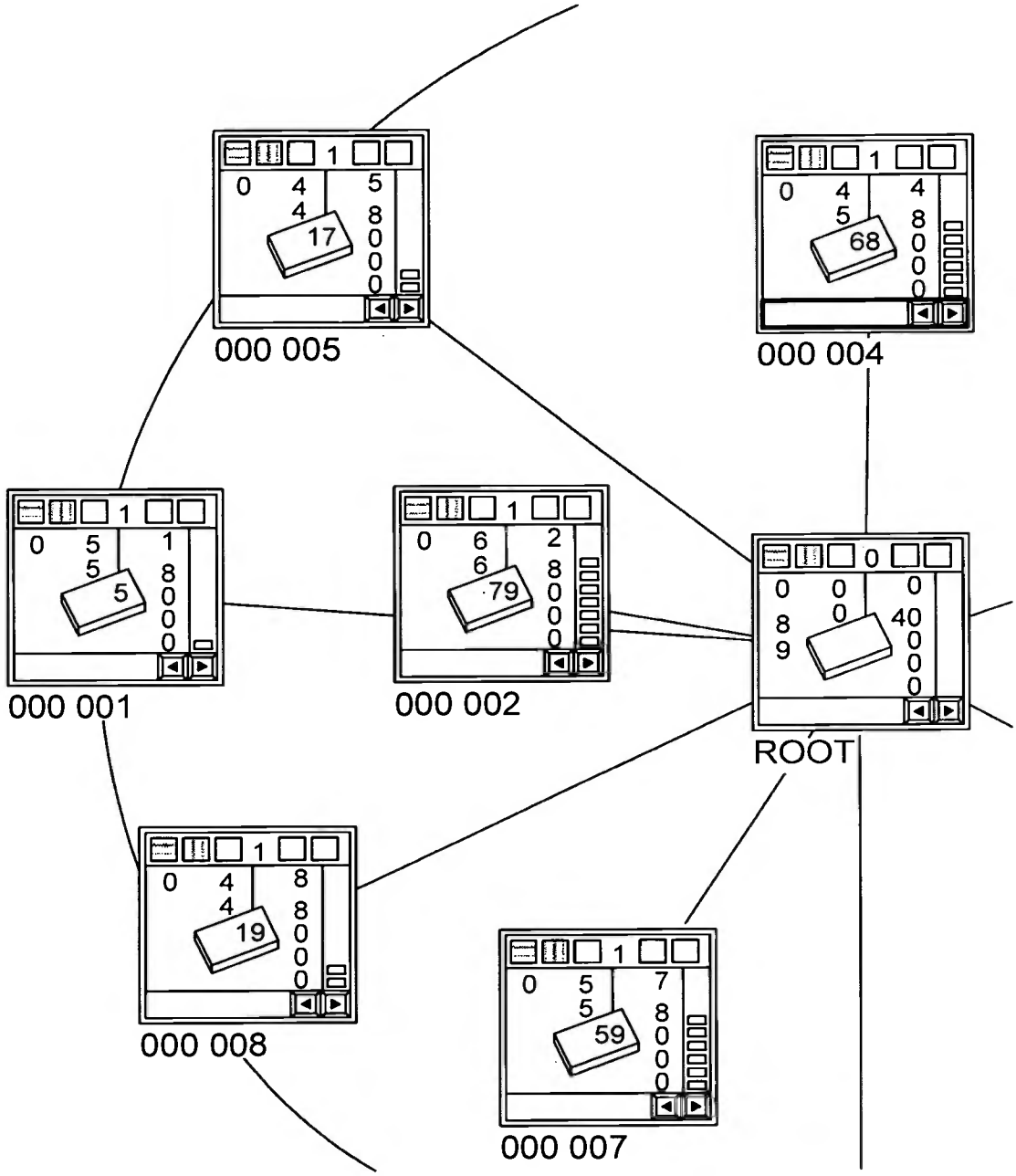


FIG. 5

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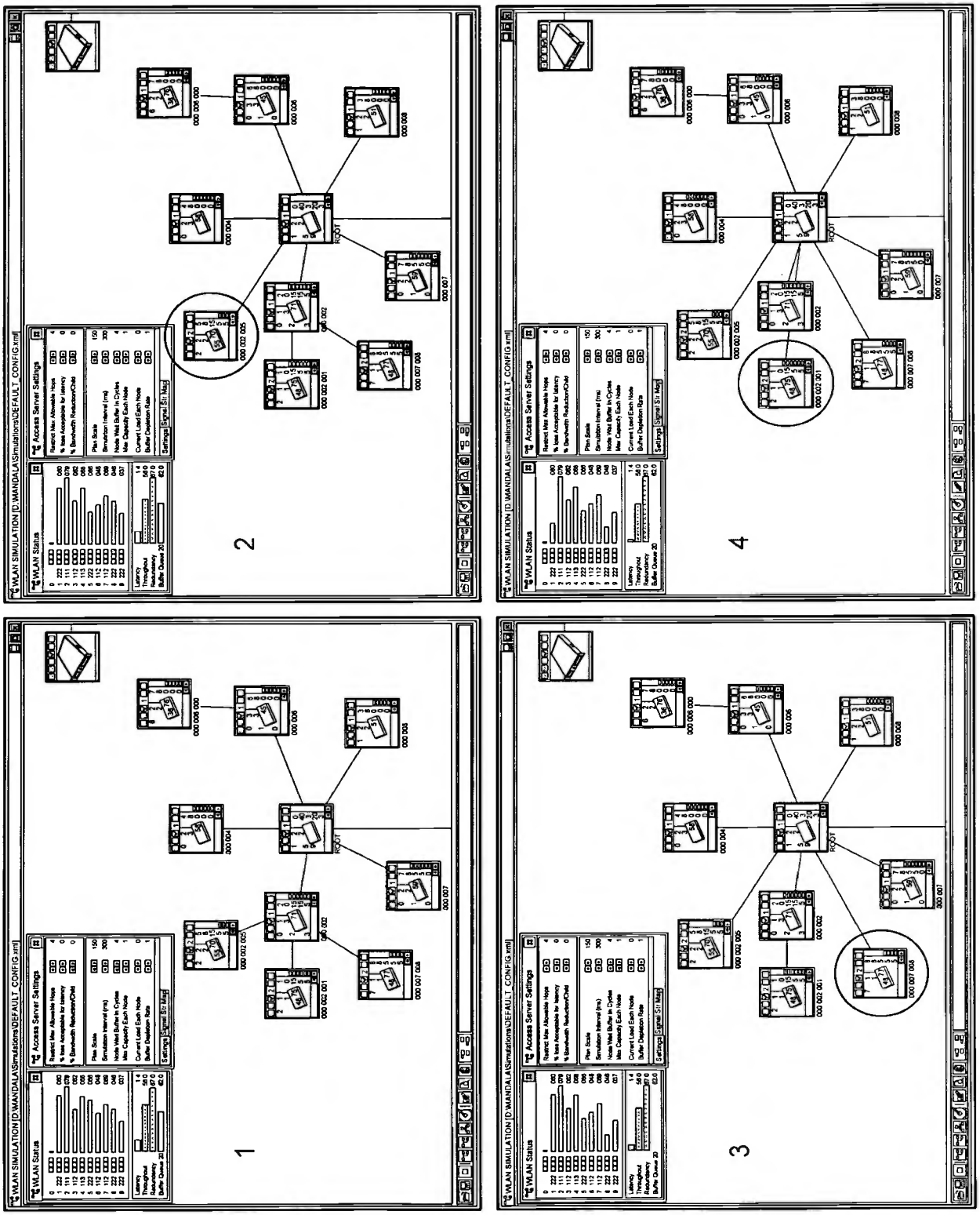

WLAN SIMULATION [D:\MANDALA\Simulations\DEFAULT_CONFIG.xml]
WLAN Status
Access Server Settings
Settings
Signal
Bit Map
ROOT
1
2
3
4

FIG. 6

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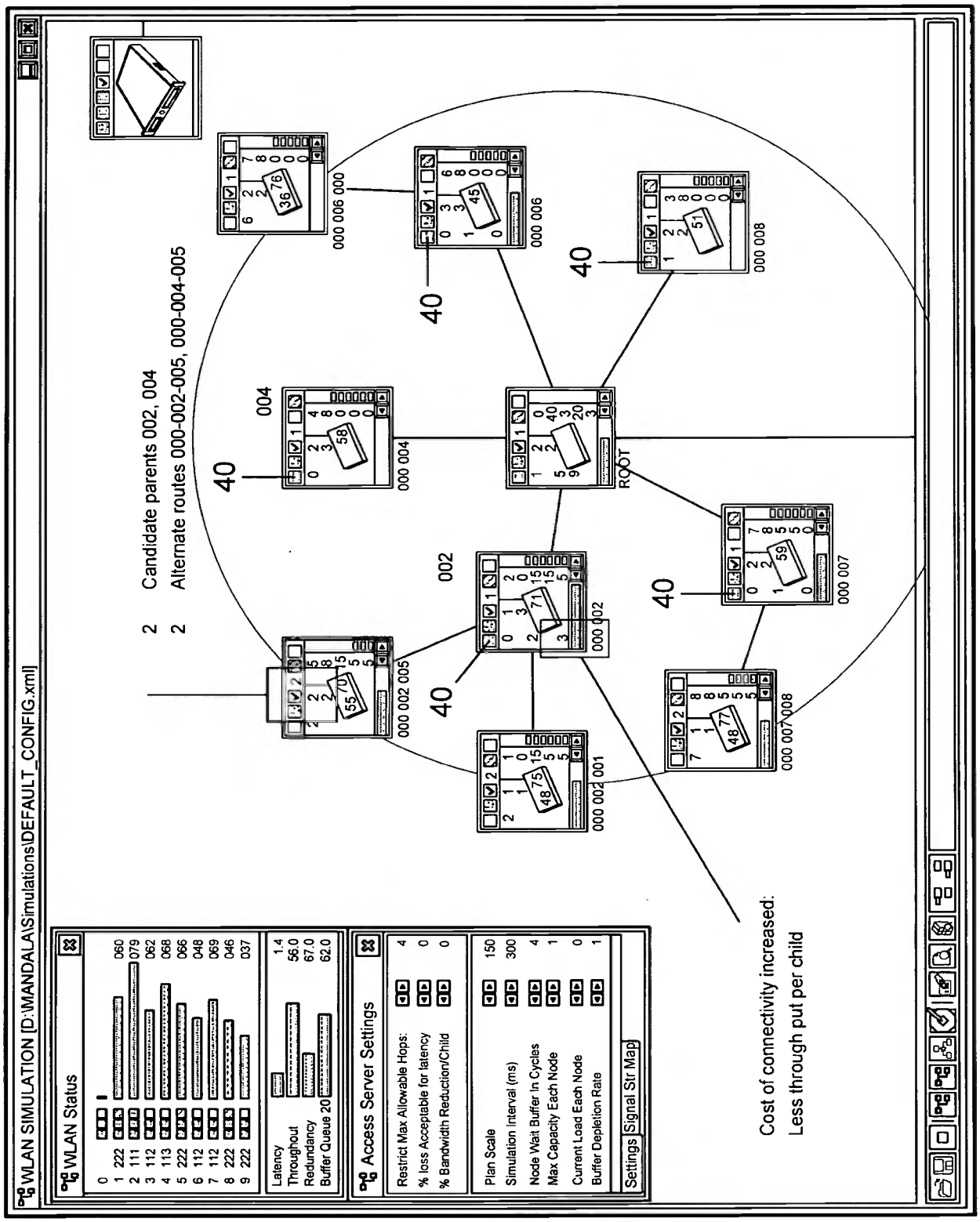

WLAN SIMULATION [D:\MANDALA\Simulations\DEFAULT_CONFIG.xml]
WLAN Status
Access Server Settings
Restrict Max Allowable Hops:
% loss Acceptable for latency
% Bandwidth Reduction/Child
Plan Scale
Simulation Interval (ms)
Node Wait Buffer In Cycles
Max Capacity Each Node
Current Load Each Node
Buffer Depletion Rate
Settings
Signal Str Map
Latency
Throughput
Redundancy
Buffer Queue 20
2 Candidate parents 002, 004
2 Alternate routes 000-002-005, 000-004-005
Cost of connectivity increased:
Less through put per child
ROOT
000 002 001
000 002 005
000 002
000 004
000 006 000
000 006
000 007 008
000 007
000 008
40

FIG. 7

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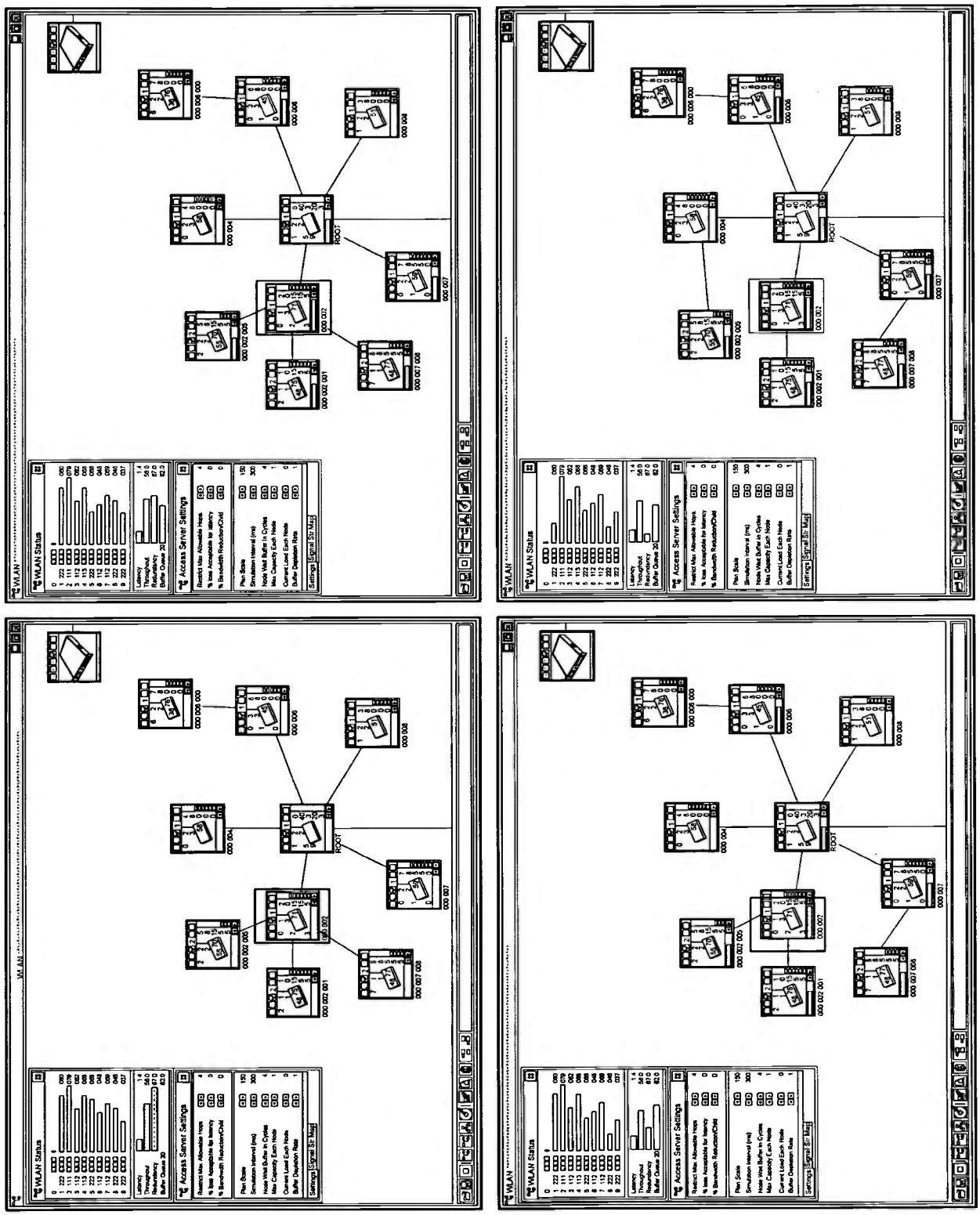


FIG. 8

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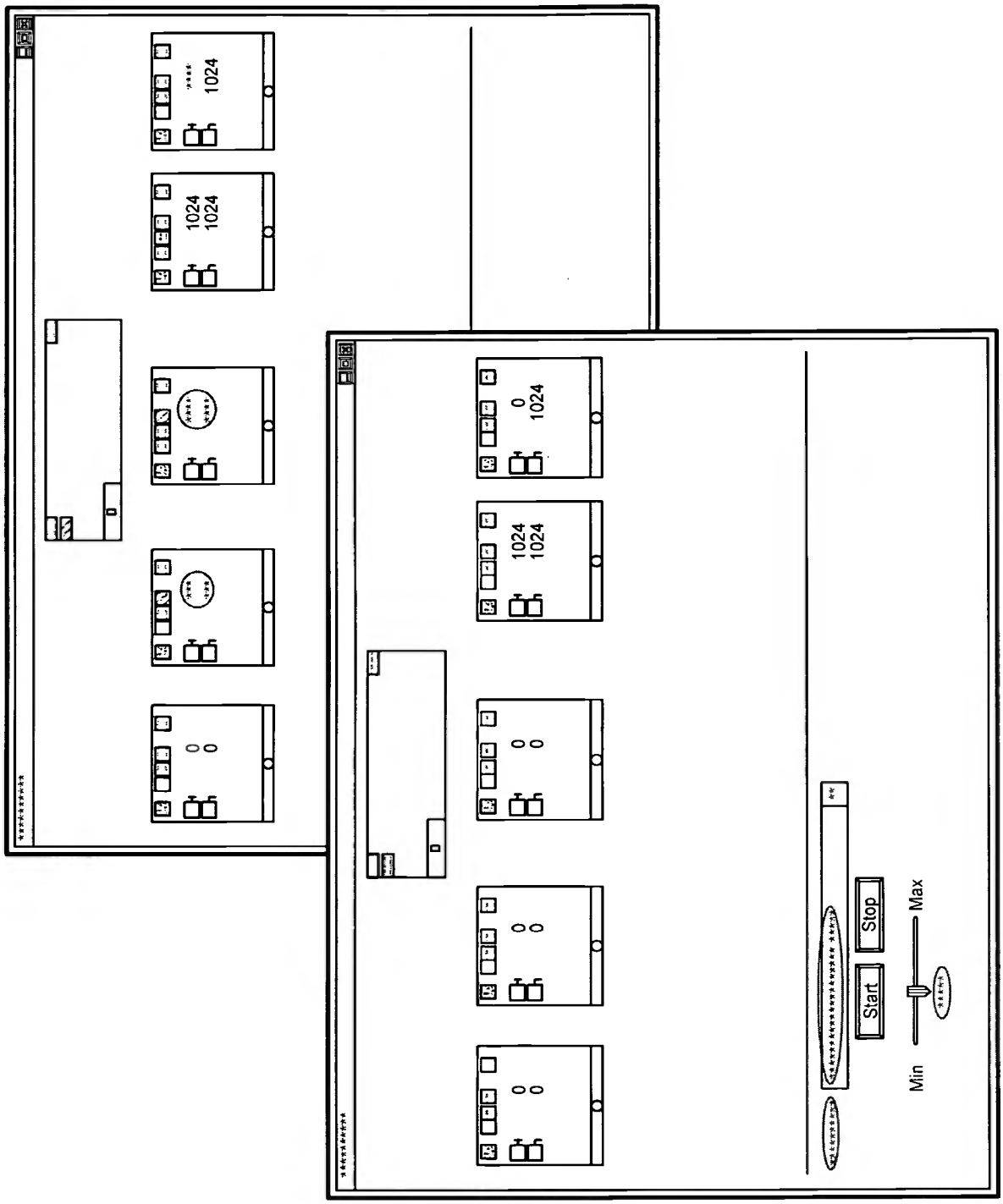


FIG. 9

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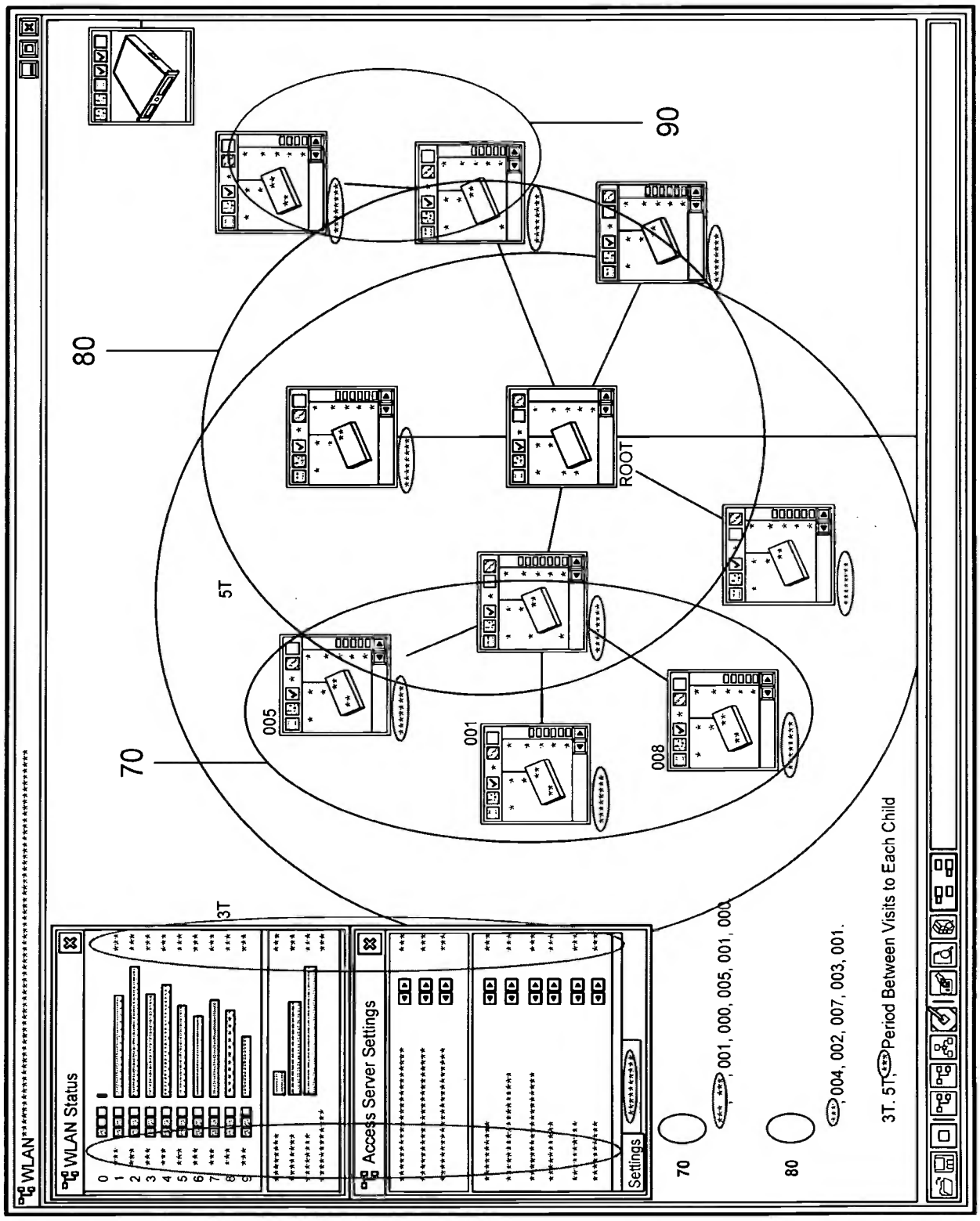

WLAN
WLAN Status
Access Server Settings
Settings
3T
5T
70
80
90
ROOT
005
001
008
3T. 5T, Period Between Visits to Each Child
001, 000, 005, 001, 000
004, 002, 007, 003, 001.

FIG. 10

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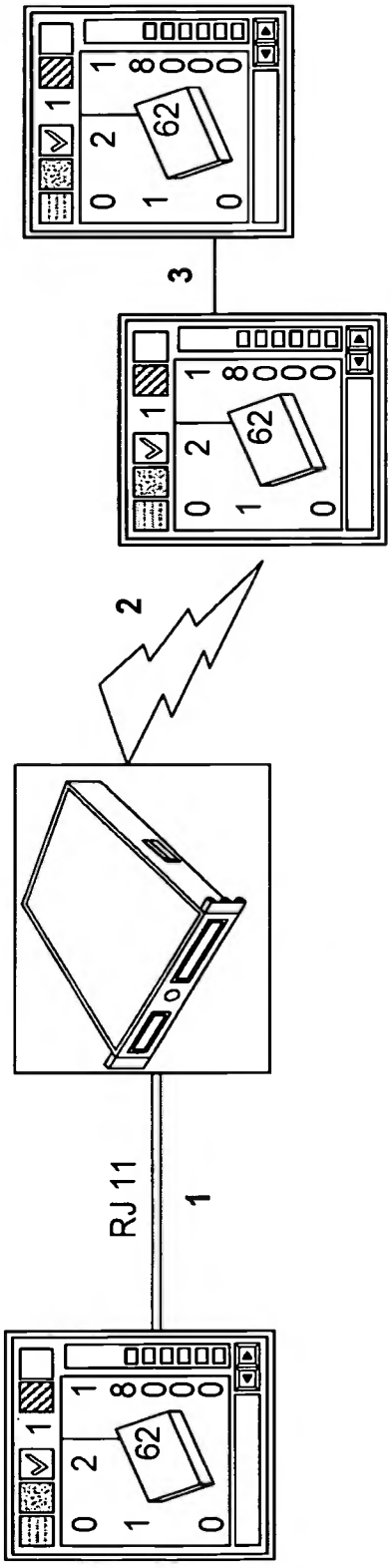


FIG. 11

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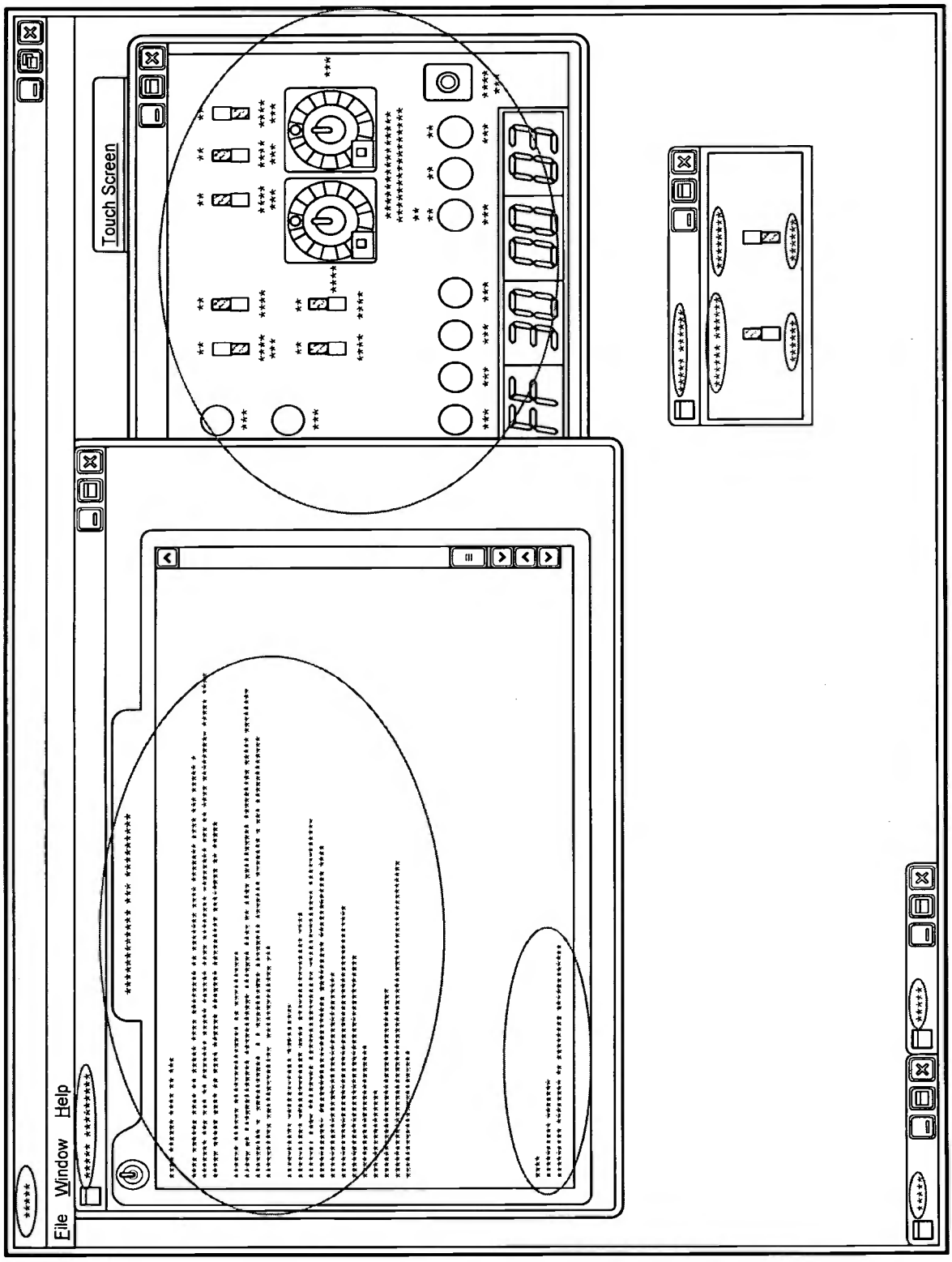


FIG. 12

Objective: Low Foot Print for Low Cost Embedded System Applications

Key Idea: Remove Overhead of OS/Virtual Machine from the Equation

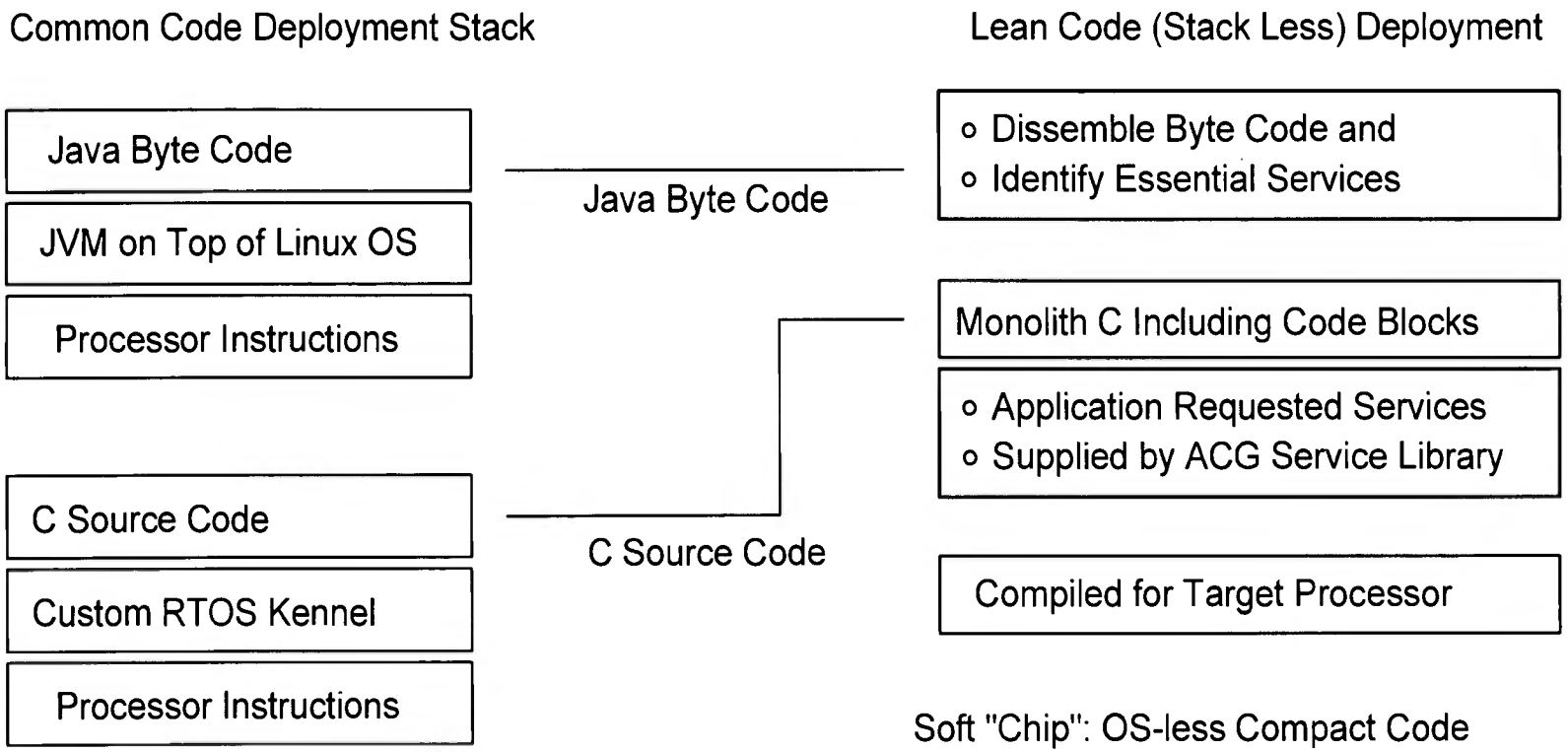


FIG. 13

EX1023, Page 293

REPLACEMENT SHEET
App. No.: 10/434,948
Att. Dkt. No.: MESHP001
Sheet 13 of 18

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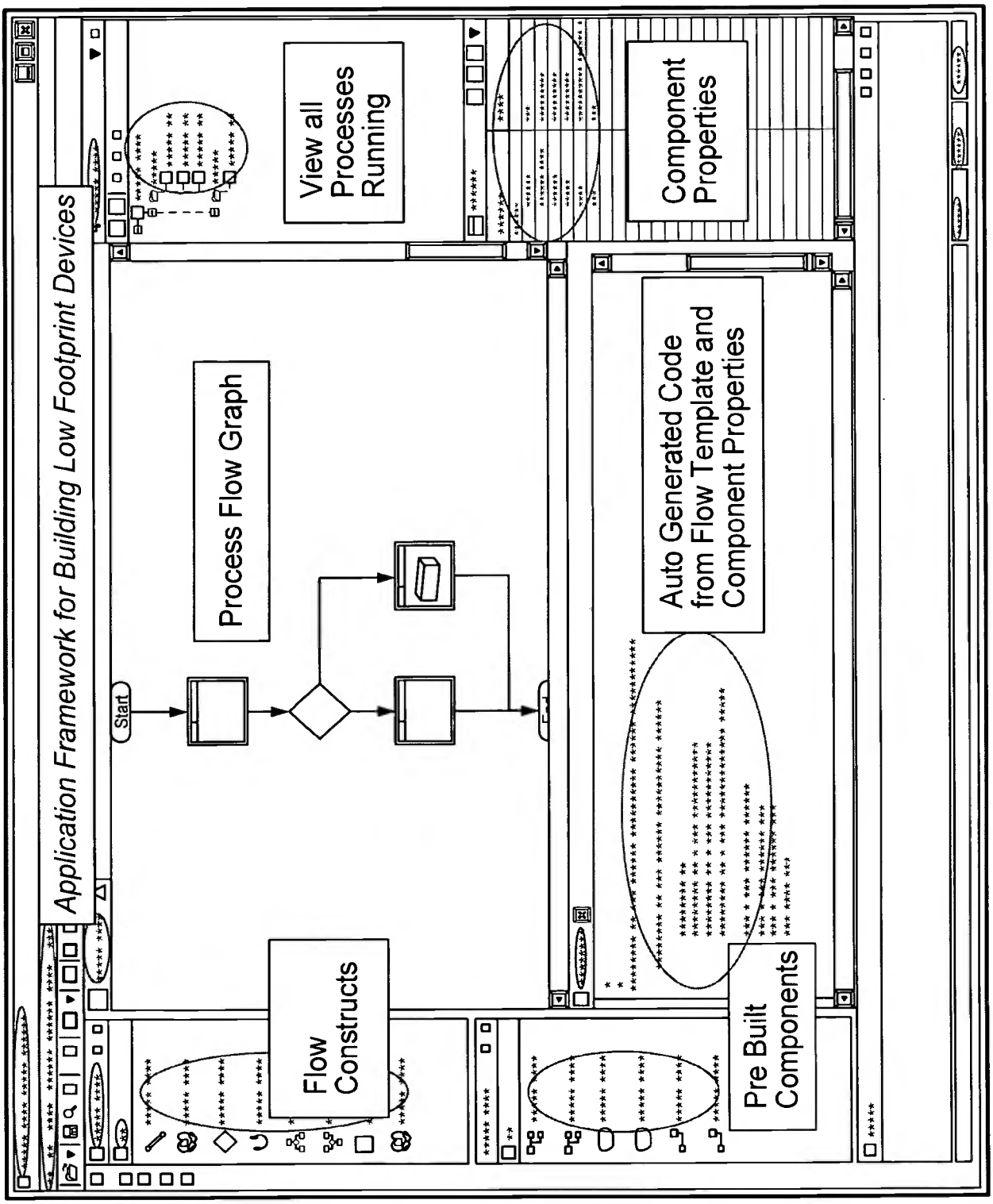

Application Framework for Building Low Footprint Devices
View all Processes Running
Component Properties
Process Flow Graph
Auto Generated Code from Flow Template and Component Properties
Start
Flow Constructs
Pre Built Components

FIG. 14

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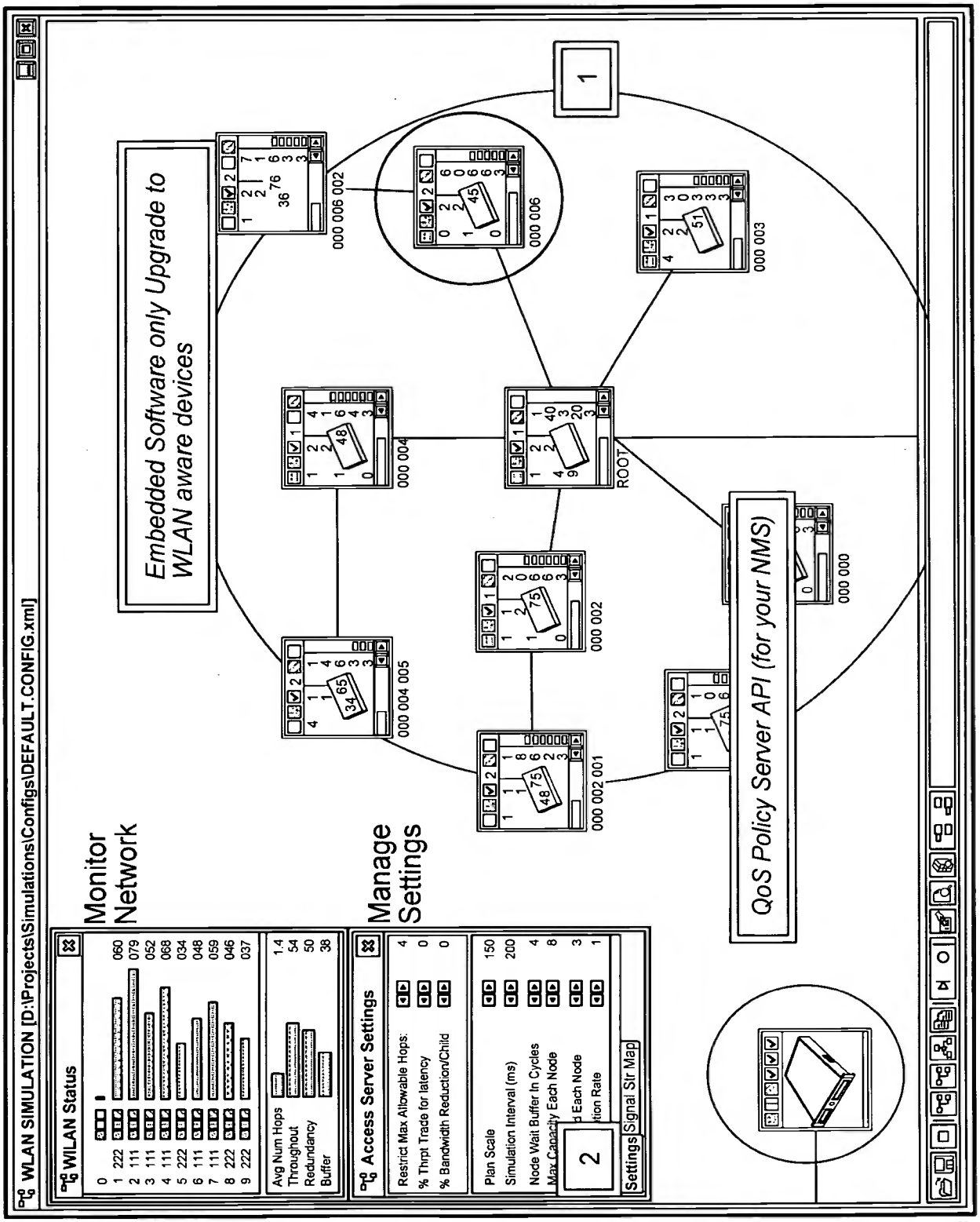

WLAN SIMULATION [D:\Projects\Simulations\Configs\DEFAULT.CONFIG.xml]
WLAN Status
Monitor Network
Manage Settings
Access Server Settings
Embedded Software only Upgrade to WLAN aware devices
QoS Policy Server API (for your NMS)
ROOT
000 002 001
000 004 005
000 002
000 004
000 006 002
000 006
000 003
000 000
Settings
Signal Str Map

FIG. 15

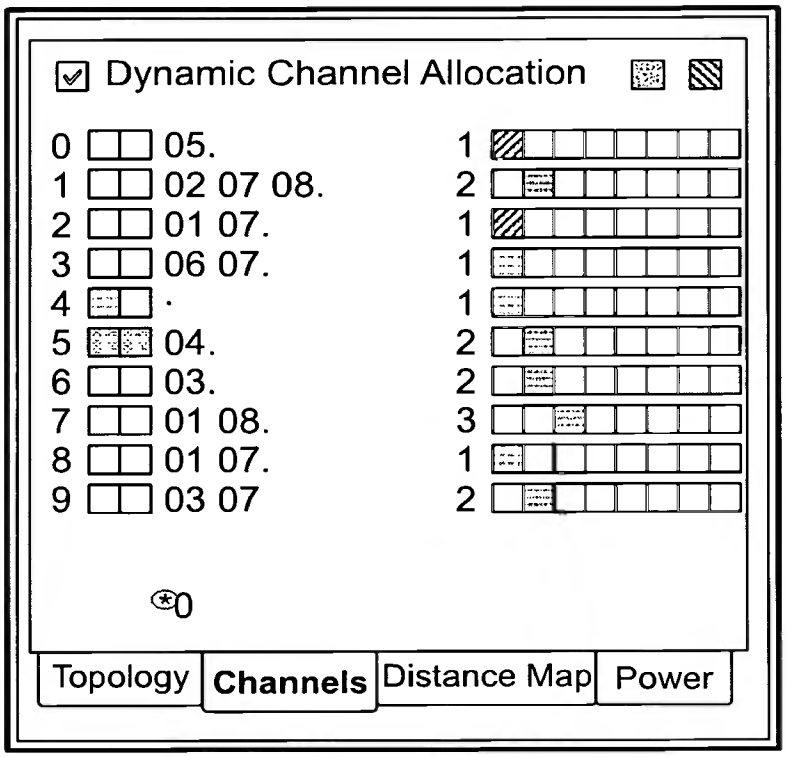

Dynamic Channel Allocation
0 05. 1
1 02 07 08. 2
2 01 07. 1
3 06 07. 1
4 · 1
5 04. 2
6 03. 2
7 01 08. 3
8 01 07. 1
9 03 07 2
0
Topology
Channels
Distance Map
Power

FIG. 16

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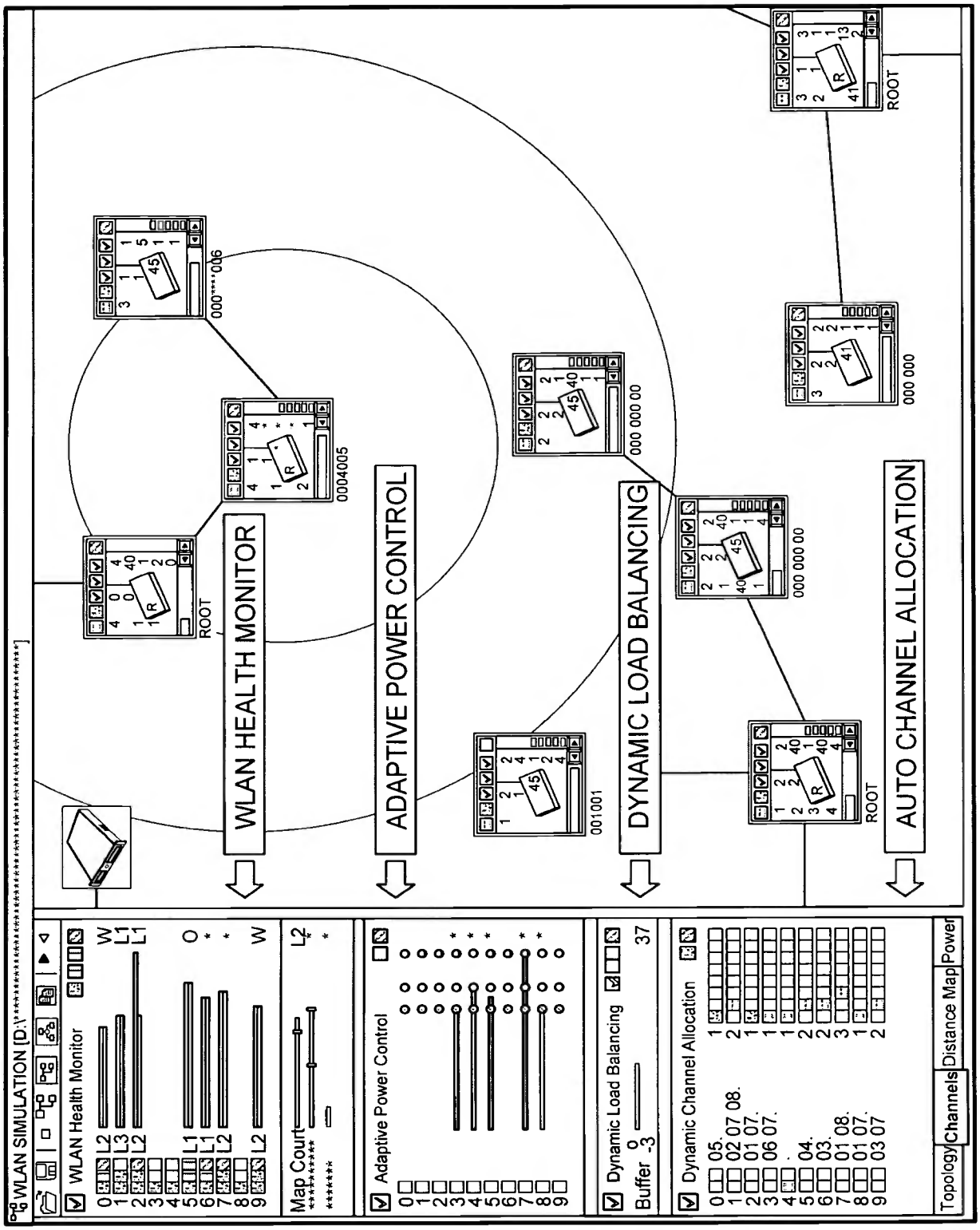

WLAN SIMULATION
WLAN Health Monitor
Adaptive Power Control
Dynamic Load Balancing
Buffer -3
Dynamic Channel Allocation
Map Count
Topology
Channels
Distance Map
Power
WLAN HEALTH MONITOR
ADAPTIVE POWER CONTROL
DYNAMIC LOAD BALANCING
AUTO CHANNEL ALLOCATION
ROOT
0004005
001001
000 000 00
000 000 00
000 000
000****006

FIG. 17

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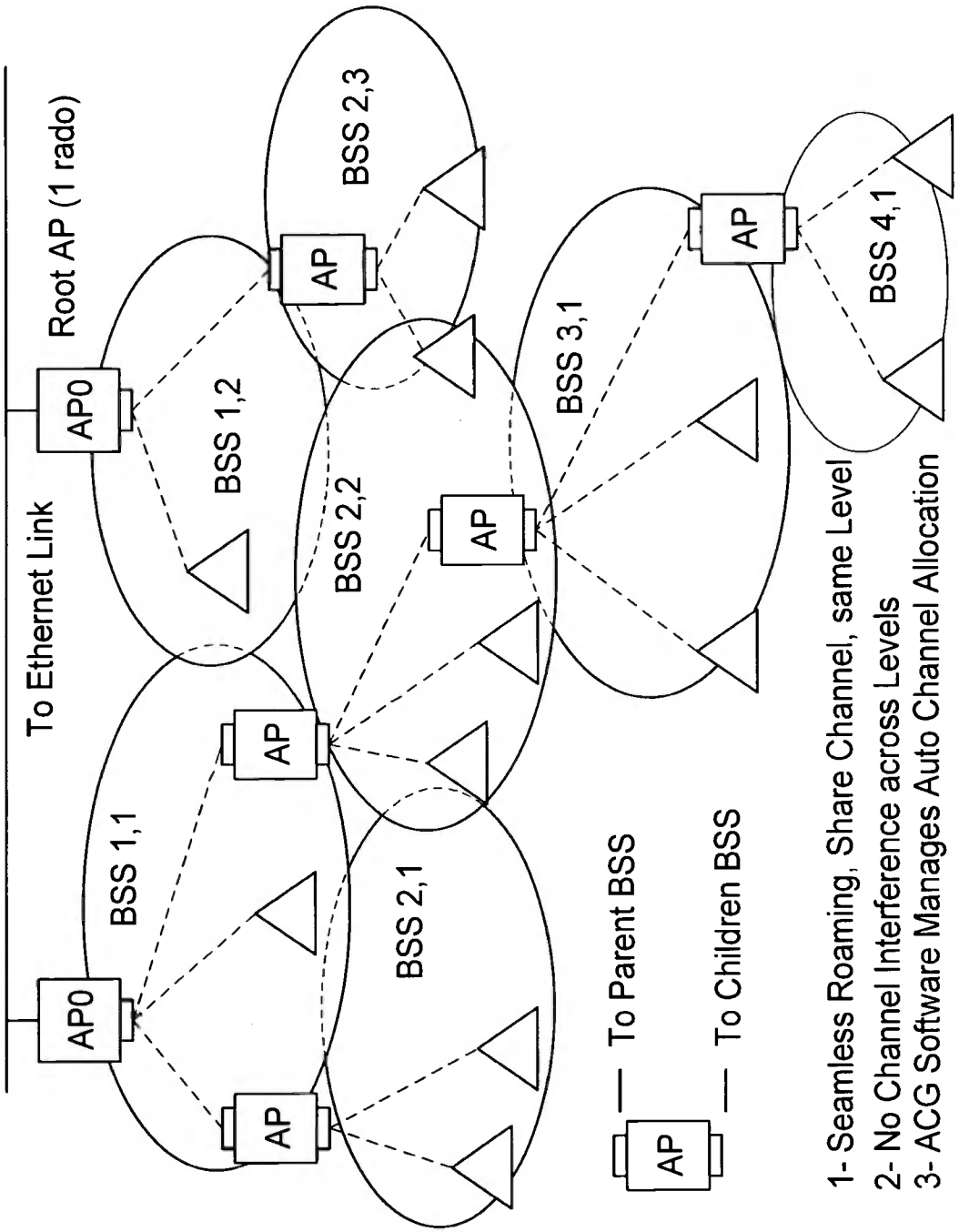

To Ethernet Link
Root AP (1 rado)
AP0
AP0
AP
AP
AP
AP
AP
BSS 1,1
BSS 1,2
BSS 2,1
BSS 2,2
BSS 2,3
BSS 3,1
BSS 4,1
To Parent BSS
To Children BSS
1- Seamless Roaming, Share Channel, same Level
2- No Channel Interference across Levels
3- ACG Software Manages Auto Channel Allocation

FIG. 18

~~IDS 08/25/2005~~

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

OIPE AUG 25 2006 PATENT & TRADEMARK OFFICE

U.S. Patent Documents

*Examiner Intials		Document Number	Date	Name	Class	Subclass	Filing Date if Appropriate
SD	1.	20040137924	7-15-2004	Herscovich, Bernard ; et al.	455	500	1-10-2003
	2.	20040001442	1-1-2004	Rayment, Stephen G. ; et al.	370	238	6-28-2002
	3.	6,704,301	3-9-2004	Chari , et al.	370	351	12-29-2000
	4.	6,904,275	June 7, 2005	Stanforth; Peter	455	343.1	May 18, 2001
	5.	6,892,068	May 10, 2005	Karabinis , et al.	455	429	Aug 1, 2001
	6.	20030114204	June 19, 2003	Allen, Vernon Anthony ; et al.	455	574	Dec 13, 2001
	7.	20030012176	Jan 16, 2003	Kondylis, George ; et al.	370	348	Nov 9, 2001
	8.	20050122925	June 9, 2005	Chitre; Dattakumar M et al.	370	310	Nov 19, 1999
03-08-2005	9.	6,865,170	~~June 19, 1998~~	Zendle	370	338	Mar 8, 2005
	10	6,859,652	Feb 22, 2005	Karabinis , et al.	455	427	Dec 4, 2001
	11	*5,166,929*	Nov 24, 1992	Lo	370	448	June 18, 1990
	12	6,831,921	Dec 14, 2004	Higgins	370	401	Mar 27, 2002
	13	6,026,303	Feb 15, 2000	Minamisawa	455	446	Nov 6, 1997

AE 5-7-08

Foreign Patent Documents

							Translation	
		Document	Date	Country.	Class	Subclass	Yes	No

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

Examiner:	/Stephen D Agosta/	Date Considered:	11/08/2006

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

UNITED STATES PATENT AND TRADEMARK OFFICE

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www.uspto.gov

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

21912 7590 08/06/2008

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

EXAMINER	
D AGOSTA, STEPHEN M	

ART UNIT	PAPER NUMBER
2617	

MAIL DATE	DELIVERY MODE
08/06/2008	PAPER

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

The time period for reply, if any, is set in the attached communication.

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

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

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

1. ☒ This communication is responsive to *an interview with applicant's attorney on 7-24-2008.*.

2. ☒ The allowed claim(s) is/are *23-25,28-35,49-51 and 54-60*.

3. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
   a) ☐ All b) ☐ Some* c) ☐ None of the:
      1. ☐ Certified copies of the priority documents have been received.
      2. ☐ Certified copies of the priority documents have been received in Application No. _____ .
      3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

   * Certified copies not received: _____.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.
THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

4. ☐ A SUBSTITUTE OATH OR DECLARATION must be submitted. Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL PATENT APPLICATION (PTO-152) which gives reason(s) why the oath or declaration is deficient.

5. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
   (a) ☐ including changes required by the Notice of Draftsperson's Patent Drawing Review (PTO-948) attached
      1) ☐ hereto or 2) ☐ to Paper No./Mail Date _____.
   (b) ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____.

   Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).

6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

1. ☐ Notice of References Cited (PTO-892)
2. ☐ Notice of Draftperson's Patent Drawing Review (PTO-948)
3. ☐ Information Disclosure Statements (PTO/SB/08), Paper No./Mail Date _____
4. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material
5. ☐ Notice of Informal Patent Application
6. ☐ Interview Summary (PTO-413), Paper No./Mail Date _____ .
7. ☒ Examiner's Amendment/Comment
8. ☐ Examiner's Statement of Reasons for Allowance
9. ☐ Other _____.

EXAMINER'S AMENDMENT

An examiner's amendment to the record appears below. Should the changes and/or additions be unacceptable to applicant, an amendment may be filed as provided by 37 CFR 1.312. To ensure consideration of such an amendment, it MUST be submitted no later than the payment of the issue fee.

Authorization for this examiner's amendment was given in a telephone interview with Diana Fu on 7-24-2008.

1. Please delete pages 47-62 from the specification.

This amendment serves to remove the figures contained in the specification (which is improper).

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Stephen M. D'Agosta whose telephone number is 571-272-7862. The examiner can normally be reached on M-F, 8am to 5pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Dwayne Bost can be reached on 571-272-7023. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Stephen M. D'Agosta/
Primary Examiner, Art Unit 2617

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www.uspto.gov

APPLICATION NO.	ISSUE DATE	PATENT NO.	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/434,948	09/02/2008	7420952	MESHP001	7871

21912 7590 08/13/2008

VAN PELT, YI & JAMES LLP
10050 N. FOOTHILL BLVD #200
CUPERTINO, CA 95014

ISSUE NOTIFICATION

The projected patent number and issue date are specified above.

Determination of Patent Term Adjustment under 35 U.S.C. 154 (b)
(application filed on or after May 29, 2000)

The Patent Term Adjustment is 744 day(s). Any patent to issue from the above-identified application will include an indication of the adjustment on the front page.

If a Continued Prosecution Application (CPA) was filed in the above-identified application, the filing date that determines Patent Term Adjustment is the filing date of the most recent CPA.

Applicant will be able to obtain more detailed information by accessing the Patent Application Information Retrieval (PAIR) WEB site (http://pair.uspto.gov).

Any questions regarding the Patent Term Extension or Adjustment determination should be directed to the Office of Patent Legal Administration at (571)-272-7702. Questions relating to issue and publication fee payments should be directed to the Customer Service Center of the Office of Patent Publication at (571)-272-4200.

APPLICANT(s) (Please see PAIR WEB site http://pair.uspto.gov for additional applicants):

Francis da Costa, San Jose, CA;
Sriram Dayanandan, San Jose, CA;

Print Form

PTO/SB/81 (07-08)
Approved for use through 12/31/2008. OMB 0651-0035
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
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POWER OF ATTORNEY OR REVOCATION OF POWER OF ATTORNEY WITH A NEW POWER OF ATTORNEY AND CHANGE OF CORRESPONDENCE ADDRESS

Application Number	10/434,948
Filing Date	May 8, 2003
First Named Inventor	Francis daCosta
Title	High Performance Wireless Networks Using Distributed
Art Unit	2617
Examiner Name	Stephen M. D'Agosta
Attorney Docket Number	0357-02201

I hereby revoke all previous powers of attorney given in the above-identified application.

☐ A Power of Attorney is submitted herewith.

OR

☒ I hereby appoint Practitioner(s) associated with the following Customer Number as my/our attorney(s) or agent(s) to prosecute the application identified above, and to transact all business in the United States Patent and Trademark Office connected therewith: 27197

OR

☐ I hereby appoint Practitioner(s) named below as my/our attorney(s) or agent(s) to prosecute the application identified above, and to transact all business in the United States Patent and Trademark Office connected therewith:

Practitioner(s) Name	Registration Number

Please recognize or change the correspondence address for the above-identified application to:

☐ The address associated with the above-mentioned Customer Number.

OR

☒ The address associated with Customer Number: 27197

OR

☐ Firm or Individual Name					
Address					
City		State		Zip	
Country					
Telephone		Email			

I am the:

☐ Applicant/Inventor.

OR

☒ Assignee of record of the entire interest. See 37 CFR 3.71.
Statement under 37 CFR 3.73(b) (Form PTO/SB/96) submitted herewith or filed on _____.

SIGNATURE of Applicant or Assignee of Record

Signature		Date	October 31, 2008
Name	Francis daCosta	Telephone	+1 (408) 373-7700
Title and Company	President, MESH DYNAMICS INC.		

NOTE: Signatures of all the inventors or assignees of record of the entire interest or their representative(s) are required. Submit multiple forms if more than one signature is required, see below*.

☒ *Total of 1 forms are submitted.

This collection of information is required by 37 CFR 1.31, 1.32 and 1.33. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 3 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

PTO/SB/96 (10-08)
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STATEMENT UNDER 37 CFR 3.73(b)

Applicant/Patent Owner: DACOSTA ET AL.

Application No./Patent No.: 10/434,948 Filed/Issue Date: 05/08/2003

Entitled: HIGH PERFORMANCE WIRELESS NETWORKS USING DISTRIBUTED CONTROL

MESH DYNAMICS INC. , a corporation
(Name of Assignee) (Type of Assignee, e.g., corporation, partnership, university, government agency, etc.)

states that it is:

1. ☑ the assignee of the entire right, title, and interest; or
2. ☐ an assignee of less than the entire right, title and interest
(The extent (by percentage) of its ownership interest is _____ %)

in the patent application/patent identified above by virtue of either:

A. ☑ An assignment from the inventor(s) of the patent application/patent identified above. The assignment was recorded in the United States Patent and Trademark Office at Reel 019345, Frame 0124, or for which a copy therefore is attached.

OR

B. ☐ A chain of title from the inventor(s), of the patent application/patent identified above, to the current assignee as follows:

1. From: _____ To: _____
The document was recorded in the United States Patent and Trademark Office at
Reel _____, Frame _____, or for which a copy thereof is attached.

2. From: _____ To: _____
The document was recorded in the United States Patent and Trademark Office at
Reel _____, Frame _____, or for which a copy thereof is attached.

3. From: _____ To: _____
The document was recorded in the United States Patent and Trademark Office at
Reel _____, Frame _____, or for which a copy thereof is attached.

☐ Additional documents in the chain of title are listed on a supplemental sheet.

☐ As required by 37 CFR 3.73(b)(1)(i), the documentary evidence of the chain of title from the original owner to the assignee was, or concurrently is being, submitted for recordation pursuant to 37 CFR 3.11.

[NOTE: A separate copy (*i.e.*, a true copy of the original assignment document(s)) must be submitted to Assignment Division in accordance with 37 CFR Part 3, to record the assignment in the records of the USPTO. See MPEP 302.08]

The undersigned (whose title is supplied below) is authorized to act on behalf of the assignee.

/Szymon M. Gurda/ Oct. 31, 2008
Signature Date

Szymon M. Gurda 312-621-1330
Printed or Typed Name Telephone Number

Attorney
Title

This collection of information is required by 37 CFR 3.73(b). The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

Electronic Acknowledgement Receipt

EFS ID:	4218010
Application Number:	10434948
International Application Number:	
Confirmation Number:	7871
Title of Invention:	HIGH PERFORMANCE WIRELESS NETWORKS USING DISTRIBUTED CONTROL
First Named Inventor/Applicant Name:	Francis da Costa
Customer Number:	21912
Filer:	Szymon Maciej Gurda
Filer Authorized By:	
Attorney Docket Number:	MESHP001
Receipt Date:	01-NOV-2008
Filing Date:	08-MAY-2003
Time Stamp:	16:58:16
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Power of Attorney	2201PoA.pdf	194267 27cdbe068067d86cb016dd74b87a543ae4c73822	no	2

Warnings:

Information:

Total Files Size (in bytes):	194267

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
10/434,948	05/08/2003	Francis da Costa	0357-02201

CONFIRMATION NO. 7871

POA ACCEPTANCE LETTER

27197
CHERSKOV & FLAYNIK
THE CIVIC OPERA BUILDING
20 NORTH WACKER DRIVE, SUITE 1447
CHICAGO, IL 60606

OC000000032990190

Date Mailed: 11/13/2008

NOTICE OF ACCEPTANCE OF POWER OF ATTORNEY

This is in response to the Power of Attorney filed 11/01/2008.

The Power of Attorney in this application is accepted. Correspondence in this application will be mailed to the above address as provided by 37 CFR 1.33.

/nmohammed/

Office of Data Management, Application Assistance Unit (571) 272-4000, or (571) 272-4200, or 1-888-786-0101

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
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APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
10/434,948	05/08/2003	Francis da Costa	MESHP001

CONFIRMATION NO. 7871

POWER OF ATTORNEY NOTICE

21912
VAN PELT, YI & JAMES LLP
10050 N. FOOTHILL BLVD #200
CUPERTINO, CA 95014

OC000000032990188

Date Mailed: 11/13/2008

NOTICE REGARDING CHANGE OF POWER OF ATTORNEY

This is in response to the Power of Attorney filed 11/01/2008.

- The Power of Attorney to you in this application has been revoked by the assignee who has intervened as provided by 37 CFR 3.71. Future correspondence will be mailed to the new address of record(37 CFR 1.33).

/nmohammed/

Office of Data Management, Application Assistance Unit (571) 272-4000, or (571) 272-4200, or 1-888-786-0101

PTO/SB/47 (03-09)
Approved for use through 03/31/2012. OMB 0651-0016
U.S. Patent and Trademark Office; U. S. DEPARTMENT OF COMMERCE
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"FEE ADDRESS" INDICATION FORM

Address to:
Mail Stop M Correspondence
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

- OR -

Fax to:
571-273-6500

INSTRUCTIONS: The issue fee must have been paid for application(s) listed on this form. In addition, only an address represented by a Customer Number can be established as the fee address for maintenance fee purposes (hereafter, fee address). A fee address should be established when correspondence related to maintenance fees should be mailed to a different address than the correspondence address for the application. **When to check the first box below**: If you have a Customer Number to represent the fee address. **When to check the second box below**: If you have no Customer Number representing the desired fee address, in which case a completed Request for Customer Number (PTO/SB/125) must be attached to this form. For more information on Customer Numbers, see the Manual of Patent Examining Procedure (MPEP) § 403.

For the following listed application(s), please recognize as the "Fee Address" under the provisions of 37 CFR 1.363 the address associated with:

☑ Customer Number: 27197

OR

☐ The attached Request for Customer Number (PTO/SB/125) form.

PATENT NUMBER (if known)	APPLICATION NUMBER
7,420,952	10/434,948

Completed by (check one):

☐ Applicant/Inventor — /Szymon M. Gurda/ (Signature)

☑ Attorney or Agent of record 58451 (Reg. No.) — Szymon M. Gurda (Typed or printed name)

☐ Assignee of record of the entire interest. See 37 CFR 3.71. Statement under 37 CFR 3.73(b) is enclosed. (Form PTO/SB/96) — 312-621-1330 (Requester's telephone number)

☐ Assignee recorded at Reel _____ Frame_____ — October 25, 2011 (Date)

NOTE: Signatures of all the inventors or assignees of record of the entire interest or their representative(s) are required. Submit multiple forms if more that one signature is required, see below*.

☐ * Total of _____forms are submitted.

This collection of information is required by 37 CFR 1.363. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1. 11 and 1.14. This collection is estimated to take 5 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND COMPLETED FORMS TO THIS ADDRESS.
SEND TO: Mail Stop M Correspondence, Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

Privacy Act Statement

The **Privacy Act of 1974 (P.L. 93-579)** requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether disclosure of these records is required by the Freedom of Information Act.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (*i.e.*, GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

Electronic Acknowledgement Receipt

EFS ID:	11259033
Application Number:	10434948
International Application Number:	
Confirmation Number:	7871
Title of Invention:	HIGH PERFORMANCE WIRELESS NETWORKS USING DISTRIBUTED CONTROL
First Named Inventor/Applicant Name:	Francis da Costa
Customer Number:	27197
Filer:	Szymon Maciej Gurda
Filer Authorized By:	
Attorney Docket Number:	0357-02201
Receipt Date:	25-OCT-2011
Filing Date:	08-MAY-2003
Time Stamp:	13:44:04
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Change of Address	SB47.pdf	311993 2685c7bd7ef6af90d6752b79bb9c5703ce16dd3a	no	2

Warnings:	
Information:	

Total Files Size (in bytes):	311993

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

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New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

PETITION TO ACCEPT UNINTENTIONALLY DELAYED PAYMENT OF MAINTENANCE FEE IN AN EXPIRED PATENT (37 CFR 1.378(b))

Patent Number	Issue Date	Application Number	Filing Date	Docket Number (if applicable)
7420952	02-Sep-2008	10434948	08-May-2003	

CAUTION: Maintenance fee (and surcharge, if any) payment must correctly identify: (1) the patent number and (2) the application number of the actual U.S. application leading to issuance of that patent to ensure the fee(s) is/are associated with the correct patent. 37 CFR 1.366(c) and (d).

Applicants claims the following fee status:

(◉) Small Entity

( ) Micro Entity

( ) Regular Undiscounted

Applicants selects the following :

( ) 3 1/2	( ) 7 1/2	(◉) 11 1/2

PETITION FEE
The petition fee required by 37 CFR 1.17(m) (Fee Code 1558/2558) must be paid as a condition of accepting unintentionally delayed payment of the maintenance fee.

MAINTENANCE FEE (37 CFR 1.20(e)-(g))
The appropriate maintenance fee must be submitted with this petition.

STATEMENT

The delay in payment of the maintenance fee for this patent was unintentional.

Petitioner is reminded that a delay resulting from a deliberately chosen course of action or a change in circumstance is not an unintentional delay.

Petitioner is further reminded that a person seeking reinstatement of an expired patent should not make a statement that the delay in payment of the maintenance fee was unintentional unless the entire delay was unintentional, including the period from discovery that the maintenance fee was not timely paid until payment of the maintenance fee. For example, a statement that the delay in payment of the maintenance fee was unintentional would not be proper when the patentee becomes aware of an unintentional failure to timely pay the maintenance fee and then intentionally delays filing a petition for reinstatement of the patent under 37 CFR 1.378. See MPEP 2590.

NOTE: Where the petition under 37 CFR 1.378 is filed more than two years after the date the patent expired for nonpayment of the maintenance fee, the United States Patent and Trademark Office requires an additional explanation of the circumstances surrounding the delay that establishes the entire delay was unintentional. This requirement is in addition to the requirement to provide a statement that the entire delay was unintentional. See *Clarification of the Practice for Requiring Additional Information in Petitions Filed in Patent Applications and Patents Based on Unintentional Delay*, 85 FR 12222 (March 2, 2020). See MPEP 711.03(c)(II)(C)-(F) for additional guidance on the information required to establish that the entire delay was unintentional.

PETITIONER(S) REQUEST THAT THE DELAYED PAYMENT OF THE MAINTENANCE FEE BE ACCEPTED AND THE PATENT REINSTATED

THIS PORTION MUST BE COMPLETED BY THE SIGNATORY OR SIGNATORIES

37 CFR 1.378(c) states: "Any petition under this section must be signed in compliance with 37 CFR 1.33(b) ."

I certify, in accordance with 37 CFR 1.4(d)(4) that I am

- (●) An attorney or agent registered to practice before the Patent and Trademark Office who has been given power of attorney in this application.
- ( ) An attorney or agent registered to practice before the Patent and Trademark Office
- ( ) A sole patentee
- ( ) A joint patentee; I certify that I am authorized to sign this submission on behalf of all the other patentees as evidenced by the power of attorney in the application
- ( ) A joint patentee; all of whom are signing this e-petition
- ( ) The assignee of record of the entire interest that qualifies as an authorized party under 37 CFR 1.33(b)

Attorney			
A signature of the applicant or representative is required in accordance with 37 CFR 1.33 and 10.18. Please see 37 CFR 1.4(d) for the form of the signature			
Signature	/Szymon M. Gurda/		
Name	Szymon Gurda	Registration Number	58451

Electronic Patent Application Fee Transmittal

Application Number:	10434948
Filing Date:	08-May-2003
Title of Invention:	HIGH PERFORMANCE WIRELESS NETWORKS USING DISTRIBUTED CONTROL
First Named Inventor/Applicant Name:	Francis da Costa
Filer:	Szymon Maciej Gurda
Attorney Docket Number:	0357-02201

Filed as Small Entity

Filing Fees for Utility under 35 USC 111(a)

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
MAINTENANCE FEE DUE AT 11.5 YEARS	2553	1	3850	3850
PET. DELAY PYMT MAINTAIN PATENT IN FORCE	2558	1	1050	1050
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				
Miscellaneous:				
			Total in USD ($)	**4900**

UNITED STATES PATENT AND TRADEMARK OFFICE

Commissioner for Patents
United States Patent and Trademark Office
P.O. Box 1450
Alexandria, VA 22313-1450
www.uspto.gov

In re Patent No. 7420952
Issue Date: September 2,2008
Application No. 10434948
Filed: May 8,2003
Attorney Docket No. 0357-02201

:
:DECISION GRANTING PETITION
:UNDER 37 CFR 1.378(b)
:

This is a decision on the electronic petition, filed March 2,2022 ,under 37 CFR 1.378(b) to accept the unintentionally delayed payment of the 11.5 year maintenance fee for the above-identified patent.

The petition is **GRANTED**.

The maintenance fee is accepted, and the above-identified patent reinstated as of March 2,2022 . This decision also constitutes notice that the fee has been accepted. An electronic copy of the petition and this decision has been created as an entry in the Image File Wrapper. Nevertheless, petitioner should print and retain an independent copy.

Telephone inquiries related to this electronic decision should be directed to the Electronic Business Center at 1-866-217-9197.

Electronic Acknowledgement Receipt

EFS ID:	45131060
Application Number:	10434948
Patent Number:	7420952
Confirmation Number:	7871
Petition Issued Date:	March 2,2022
Title of Invention:	HIGH PERFORMANCE WIRELESS NETWORKS USING DISTRIBUTED CONTROL
First Named Inventor/Applicant Name:	Francis da Costa
Customer Number:	27197
Filer:	Szymon Maciej Gurda
Filer Authorized By:	
Attorney Docket Number:	0357-02201
Receipt Date:	02-MAR-2022
Filing Date:	08-MAY-2003
Time Stamp:	19:02:42
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	CARD
Payment was successfully received in RAM	$4900
RAM confirmation Number	E202232J02363797
Deposit Account	
Authorized User	
The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:	

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	ePetition Request Form	petition-request.pdf	47927 d0fa67bcd9dc067ca6344263a860149531e3a27b	no	2
Warnings:					
Information:					
2	Fee Worksheet (SB06)	fee-info.pdf	40239 a0bef0d5a4905f34405eac494af4775a5123edad	no	2
Warnings:					
Information:					
		Total Files Size (in bytes):	88166		

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