UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

CISCO SYSTEMS, INC.
Petitioner

v.

DYNAMINC MESH NETWORKS, INC.
D/B/A MESHDYNAMICS
Patent Owner

Case No. IPR2025-01304
U.S. Patent No. 7,885,243

PETITION FOR *INTER PARTES* REVIEW OF U.S. PATENT NO. 7,885,243

CHALLENGING CLAIMS 1–7, 9–13
UNDER 35 U.S.C. §312 AND 37 C.F.R. §42.104

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PETITIONER'S TABLE OF EXHIBITS

Exhibit No.	DESCRIPTION
1001	U.S. Patent No. 7,885,243 ("'243 Patent")
1002	Declaration of Dr. Christopher Hansen
1003	U.S. Patent Publication No. 2002/0062388 to *Ogier* et al. ("Ogier")
1004	U.S. Patent Publication No. 2002/0161917 to *Shapiro* et al. ("Shapiro")
1005	U.S. Patent Publication No. 2002/0016840 to *Herzog* et al. ("Herzog")
1006	U.S. Patent Publication No. 2003/0051051 to *O'Neal* et al. ("O'Neal")
1007	U.S. Patent Publication No. 2004/0001467 to *Cromer* et al. ("Cromer")
1008	File History of U.S. Patent No. 7,885,243
1009	File History of U.S. Patent No. 7,420,952
1010	U.S. Patent No. 6,839,350 to *Inouchi* et al. ("Inouchi")
1011	U.S. Patent No. 6,377,782 to *Bishop* et al. ("Bishop")
1012	International Publication WO2000/035130 to *Rakoshitz* et al. ("Rakoshitz")
1013	U.S. Patent No. 6,744,775 to *Beshai* et al. ("Beshai")
1014	Infringement Contentions For '243 Patent In Dynamic Mesh Networks, Inc. d/b/a/ MeshDynamics v. Cisco Systems, Inc., No. 2:25-cv-00472, (E.D. Tex.)
1015	Curriculum Vitae of Dr. Christopher Hansen

Throughout the Petition, all annotations, coloring, and emphases have been added unless indicated otherwise.

LISTING OF CLAIMS

[1Pre] A wireless mesh network comprising:

[1A] an access server wherein the access server sets one or more functioning parameters of the wireless mesh network;

[1B] one or more root nodes connected to said access server and an external network;

[1C] one or more AP nodes wherein each AP node is in wireless two-way data communication with an associated parent node wherein said associated parent node is selected from all available parent nodes wherein an available parent node is another AP node within wireless communication range of the AP node and the associated parent node is an available parent node meeting one or more communication criteria or the associated parent node is a root node within wireless communication range;

[1D] wherein an AP node is in wireless communication with zero or more clients; and

[1E] wherein an AP node includes a means for switching two-way data communication from a first associated parent node to a second associated parent node based on the functioning parameters of the wireless mesh network and wherein an AP node contains one or more datasets;

[1F] wherein the communication criteria comprises instructions for the AP node to select the associated parent node wherein an available parent node is selected to become the associated parent node if the available parent node is in wireless communication with a root node or if a root node is contained in the available parent node's route path dataset;

[1G] wherein one of the datasets contained in an AP node comprises a route path dataset comprising an identifier for the associated parent node appended to the route path dataset for the associated parent node; and

[1H] wherein one of the datasets contained in the AP node comprises an amount of AP data traffic wherein the amount of AP data traffic comprises the amount of data exchanged between the AP node and the zero or more clients in communication with the node and wherein another of the datasets contained in the AP node comprises a maximum capacity amount of the AP node.

[2] The wireless mesh network of claim 1 wherein one of the datasets

[3] The wireless mesh network of claim 1 wherein the communication criteria comprises instructions for the AP node to select the associated parent node wherein the cost to connect of the associated parent is the lowest of all available parent nodes

[4]The wireless mesh network of claim 1 wherein the communication criteria comprises instructions for the AP node to associate with an available parent node wherein the amount of AP data traffic is less than the sum of the maximum capacity amount of the available parent node and the available parent amount of AP data traffic.

[5] The wireless mesh network of claim 4 wherein the communication criteria comprises instructions for the AP node to associate with a single suitable parent node wherein a parent node is suitable if the throughput capacity of the parent node is the highest of all available parent nodes.

[6] The wireless mesh network of claim 1 wherein one of the datasets contained in an AP node comprises a throughput capacity of the AP node.

[7] The wireless mesh network of claim 1 wherein the means for switching two-way data communications selects the second associated parent node when the first associated parent node amount of AP data traffic approaches the parent node maximum capacity amount within a congestion value set by the access server.

[8] The wireless mesh network of claim 1 wherein the wireless communication with clients includes a means to adjust a signal strength of the AP node wireless communication with clients and wherein the means for adjusting the signal strength of the AP node decreases the signal strength of the AP node when the amount of data sent from the zero or more clients exceeds a data congestion threshold value.

[9Pre] A wireless mesh network comprising:

[9A] an access server wherein the access server sets one or more functioning parameters of the wireless mesh network;

[9B] one or more root nodes connected to said access server and an external network;

[9C] one or more AP nodes wherein each AP node is in wireless two-way data communication with an associated parent node wherein said associated parent node is selected from all available parent nodes wherein an available parent node is another AP node within wireless communication range of the AP node and the associated parent node is an available parent node meeting one or more communication criteria or the associated parent node is a root node within wireless communication range;

[9D] wherein an AP node is in wireless communication with zero or more clients; and

[9E] wherein an AP node includes a means for switching two-way data communication from a first associated parent node to a second associated parent node based on the functioning parameters of the wireless mesh network and wherein an AP node contains one or more datasets

[9F] wherein one of the datasets contained in an AP node comprises a route path dataset comprising an identifier for the associated parent node appended to the route path dataset for the associated parent node

[9G] wherein the communication criteria comprises instructions for the AP node to select the associated parent node wherein an available parent node is selected to become the associated parent node if the available parent node is in wireless communication with a root node or if a root node is contained in the available parent node's route path dataset; and

[9H] wherein one of the datasets contained in an AP node comprises a dataset of child node identifiers wherein the dataset of child node identifiers is a dataset identifying each AP node in wireless communication with the AP..

[10] The wireless mesh network of claim 9 wherein the dataset of child node identifiers is accessible to each child node.

[11] The wireless mesh network of claim 10 wherein the AP node dataset of child nodes contains two or more child nodes wherein the zero or more clients in communication with a first child node sends data wherein a destination of the data is a second child node, the first child node sends the data directly to the second child node.

[12Pre] A wireless mesh network comprising:

[12A] an access server wherein the access server sets one or more functioning parameters of the wireless mesh network;

[12B] one or more root nodes connected to said access server and an external network;

[12C] one or more AP nodes wherein each AP node is in wireless two-way data communication with an associated parent node wherein said associated parent node is selected from all available parent nodes wherein an available parent node is another AP node within wireless communication range of the AP node and the associated parent node is an available parent node meeting one or more communication criteria or the associated parent node is a root node within wireless communication range;

[12D] wherein an AP node is in wireless communication with zero or more clients; and

[12E] wherein an AP node includes a means for switching two-way data communication from a first associated parent node to a second associated parent node based on the functioning parameters of the wireless mesh network and wherein an AP node contains one or more datasets

[12F] wherein one of the datasets contained in an AP node comprises a route path dataset comprising an identifier for the associated parent node appended to the route path dataset for the associated parent node

[12G] wherein the communication criteria comprises instructions for the AP node to select the associated parent node wherein an available parent node is selected to become the associated parent node if the available parent node is in wireless communication with a root node or if a root node is contained in the available parent node's route path dataset; and

[12H] wherein the communication criteria further comprises instructions for the AP node to associate with a single suitable parent node wherein the route path dataset of the parent node is the shortest route path dataset of all available parent nodes.

[13Pre] A wireless mesh network comprising:

[13A] an access server wherein the access server sets one or more functioning parameters of the wireless mesh network;

[13B] one or more root nodes connected to said access server and an external network;

[13C] one or more AP nodes wherein each AP node is in wireless two-way data communication with an associated parent node wherein said associated parent node is selected from all available parent nodes wherein an available parent node is another AP node within wireless communication range of the AP node and the associated parent node is an available parent node meeting one or more communication criteria or the associated parent node is a root node within wireless communication range;

[13D] wherein an AP node is in wireless communication with zero or more clients; and

[13E] wherein an AP node includes a means for switching two-way data communication from a first associated parent node to a second associated parent node based on the functioning parameters of the wireless mesh network and wherein an AP node contains one or more datasets

[13F] wherein one of the datasets contained in an AP node comprises a route path dataset comprising an identifier for the associated parent node appended to the route path dataset for the associated parent node

[13G] wherein the communication criteria comprises instructions for the AP node to select the associated parent node wherein an available parent node is selected to become the associated parent node if the available parent node is in wireless communication with a root node or if a root node is contained in the available parent node's route path dataset; and

[13H] wherein the access server functioning parameters includes a latency modifier wherein the AP node means for switching from the first associated parent node to a second associated parent node result in selection of the second associated parent wherein the route path of the second associated parent node is shorter than the first associated route path by a value related to the latency modifier.

Petitioner respectfully requests *inter partes* review and cancellation of claims 1–7 and 9–13 in U.S. Patent No. 7,885,243 ("'243 Patent").

I. MANDATORY NOTICES

A. Real Party-In-Interest (37 C.F.R. §42.8(b)(1))

Cisco Systems, Inc., the Petitioner, identifies itself as a real party-in-interest.

B. Related Matters (37 C.F.R. §42.8(b)(2))

On May 5, 2025, Patent Owner Dynamic Mesh Networks filed a patent infringement suit against Petitioner, asserting U.S. Patent Nos. 11,368,537; 7,420,952; ***7,885,243***; 7,894,385; and 8,520,691. *Dynamic Mesh Networks, Inc. d/b/a MeshDynamics v. Cisco Systems, Inc. et al.*, No. 2:25-cv-00472 (E.D. Tex.). On July 18, 2025, Patent Owner served its Infringement Contentions for the '243 Patent, contending that Petitioner Cisco infringed claims 1-7, 9-13 of the '243 Patent. *See* EX1014. Then, on July 31, 2025, Patent Owner voluntarily dismissed the case without prejudice.

On July 31, 2025, Petitioner Cisco filed an action for declaratory judgment of non-infringement on the following patents: U.S. Patent Nos. 11,368,537; 7,420,952; ***7,885,243***; 7,894,385; 8,477,762; 8,514,852; 8,520,691; 9,049,000. *Cisco Systems Inc. v. Dynamic Mesh Networks, Inc. d/b/a/ MeshDynamics et al.*, No. 5-25-cv-06441 (N.D. Cal.). On August 12, 2025, Patent Owner Dynamic Mesh Networks filed a patent infringement suit against Petitioner, asserting U.S. Patent Nos.

11,368,537; 7,420,952; ***7,885,243***; 7,894,385; and 8,520,691. *Dynamic Mesh Networks, Inc. d/b/a MeshDynamics v. Cisco Systems, Inc. et al.*, No. 2-25-cv-00781 (E.D. Tex.). That same day, Patent Owner Dynamic Mesh Networks filed another patent infringement suit against Petitioner, asserting U.S. Patent Nos. 8,514,852; 9,049,000; and 8,477,762. *Dynamic Mesh Networks, Inc. d/b/a MeshDynamics v. Cisco Systems, Inc. et al.*, No. 2-25-cv-00783 (E.D. Tex.).

C. Lead And Back-up Counsel (37 C.F.R. §42.8(b)(3))

Petitioner is filing a Power of Attorney appointing the practitioners associated with Customer Number 132,593. Petitioner designates the following lead and back-up counsel:

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II. FEES

Petitioner is concurrently electronically submitting the required fees for this Petition. The Board is authorized to charge Desmarais LLP's deposit account, No. 50-6822, for any fee deficiency.

III. CERTIFICATION OF GROUNDS FOR STANDING

Petitioner certifies that the '243 Patent is available for *inter partes* review and that Petitioner is not barred or estopped from requesting *inter partes* review.

IV. OVERVIEW OF CHALLENGE AND RELIEF REQUESTED

Under 37 C.F.R. §§42.22(a)(1) and 42.104(b)(1)-(2), Petitioner requests *inter partes* review and cancellation of claims 1–7 and 9–13 of the '243 Patent.

A. Identification of Prior Art

The '243 Patent is entitled to a priority date no earlier than October 28, 2002. This Petition applies pre-AIA provisions of 35 U.S.C. §§ 102, 103. The following references are pertinent to the grounds of unpatentability:

Pat. Pub. No. or Title	**Publication/Priority Date**	**Prior Art Under At Least (35 U.S.C.)**
US2002/0062388 ("Ogier") (EX1003)	filed December 1, 2000	102(e)
US2002/0161917 ("Shapiro") (EX1004)	filed April 30, 2001	102(e)
US 2002/0016840 ("Herzog") (EX1005)	filed May 11, 2001	102(e)
US2003/0051051 ("O'Neal") (EX1006)	filed September 13, 2001	102(e)
US2004/0001467 ("Cromer") (EX1007)	filed June 26, 2002	102(e)
US6,839,350 ("Inouchi") (EX1010)	filed February 28, 2000	102(e)

B. Statutory Grounds of Unpatentability

Petitioner requests cancellation of Claims 1–7 and 9–13 under 35 U.S.C. §103 based on the following Grounds.

Ground	Claims	References
I	9, 12, 13	Ogier, Shapiro, Herzog
II	9, 12, 13	Ogier, Shapiro, Herzog, Inouchi
III	10, 11	References in Ground I or II, O'Neal
IV	1-7	Ogier, Shapiro, Herzog, Cromer
V	1-7	Ogier, Shapiro, Herzog, Cromer, Inouchi

This Petition demonstrates that there is a reasonable likelihood that Petitioner would prevail with respect to at least one of the challenged claims. 35 U.S.C. §314(a).

V. OVERVIEW OF THE '243 PATENT

The '243 Patent is directed to a Wireless Local Area Network ("WLAN") that serves "diverse applications" with "potentially conflicting latency and throughput needs." EX1001, Abstract, 1:18–51. Before the '243 Patent, networks allegedly accommodated such conflicting needs using "one access server" that "centrally managed" diverse applications, but such centralized approach suffered from poor scalability, poor redundancy, and high cost. EX1001, 1:40–48, 2:17–39. EX1002, ¶¶28−31.

The '243 Patent purports to address such conflicting needs using a "distributed approach." EX1001, 2:33–34. For instance, consider a network comprising: (1) "[t]he Access server (10)"; (2) "[t]he 'Root' Node (20)"; and (3) "AP nodes (30)," as shown in Figure 1 (below). EX1001, 5:62–6:6. Under the disputed approach, each AP node sets up a communication path ***locally*** using a "parent selection algorithm." EX1001, 7:41–9:39. Specifically, when an AP node seeks to communicate with the root node, it can select and connect to a parent AP node that provides a route to the root. In making this selection, the AP node takes into account the "latency and throughput requirements" specified by the Access Server. EX1001, 6:7–11; 9:30–39. EX1002, ¶¶32–35.

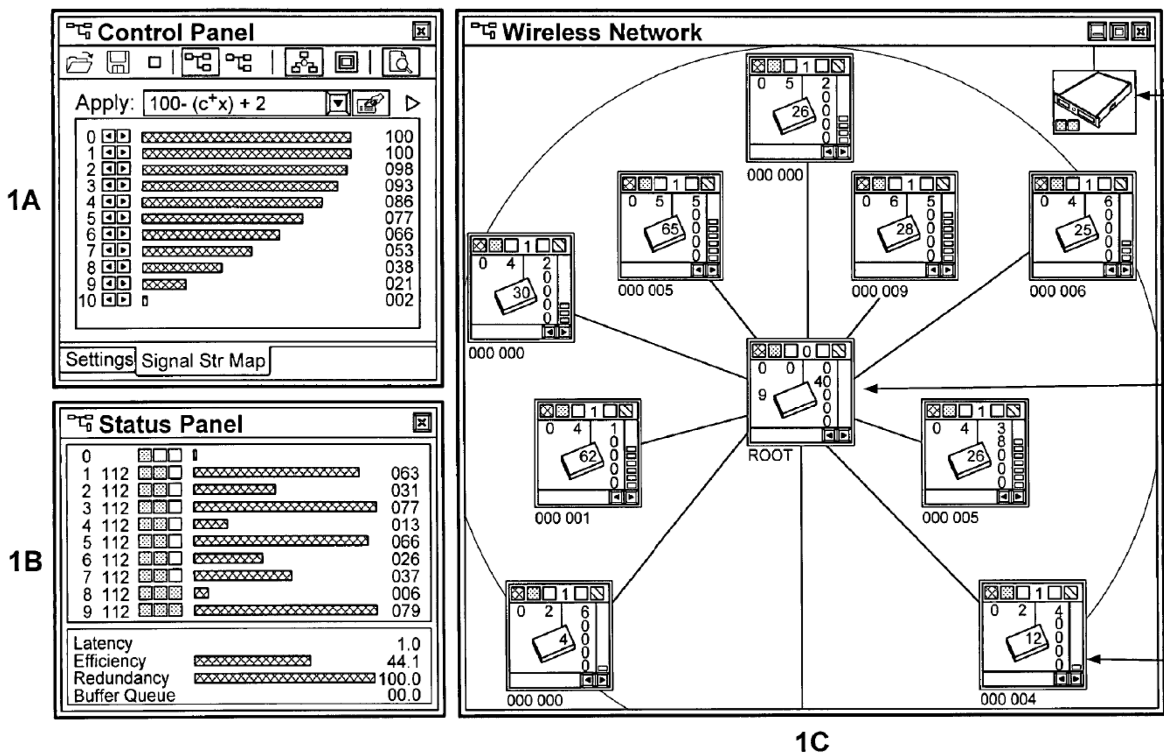


FIG. 1

EX1001, Figure 1.

A. Prosecution History

The '243 Patent's claims issued after only one round of substantive Office Action rejecting certain claims as obvious, but indicating that then-pending claims 7–9, 11–14, and 16–17 would be allowable if rewritten in an independent form.

EX1008, 150–156. In response, Applicant cancelled the rejected claims, and amended the allowable claims in an independent form. EX1008, 163–170. EX1002, ¶¶36–38.

VI. LEVEL OF ORDINARY SKILL IN THE ART

A Person of Ordinary Skill in the Art ("POSITA"), as of the claimed priority date of October 28, 2002, would have had working knowledge of the wireless mesh networking art that is pertinent to the '243 patent, including familiarity with standards such as IEEE 802.11 and mesh networking and route discovery protocols. EX1002, ¶18.

A POSITA would have had a bachelor's degree in computer science, computer engineering, electrical engineering, or equivalent training, and approximately two years of experience working in the field of network communications. Additional work experience could have been substituted for educational experience, and vice versa. EX1002, ¶19.

VII. CLAIM CONSTRUCTION

Aside from the term identified below, no additional terms require construction in this IPR.[1] EX1002, ¶¶42–43.

[1] Petitioner reserves all rights to advance different claim constructions in other forums.

A. Means-Plus-Function Limitation

1. "a means for switching two-way data communication from a first associated parent node to a second associated parent node based on the functioning parameters of the wireless mesh network" (All Claims)

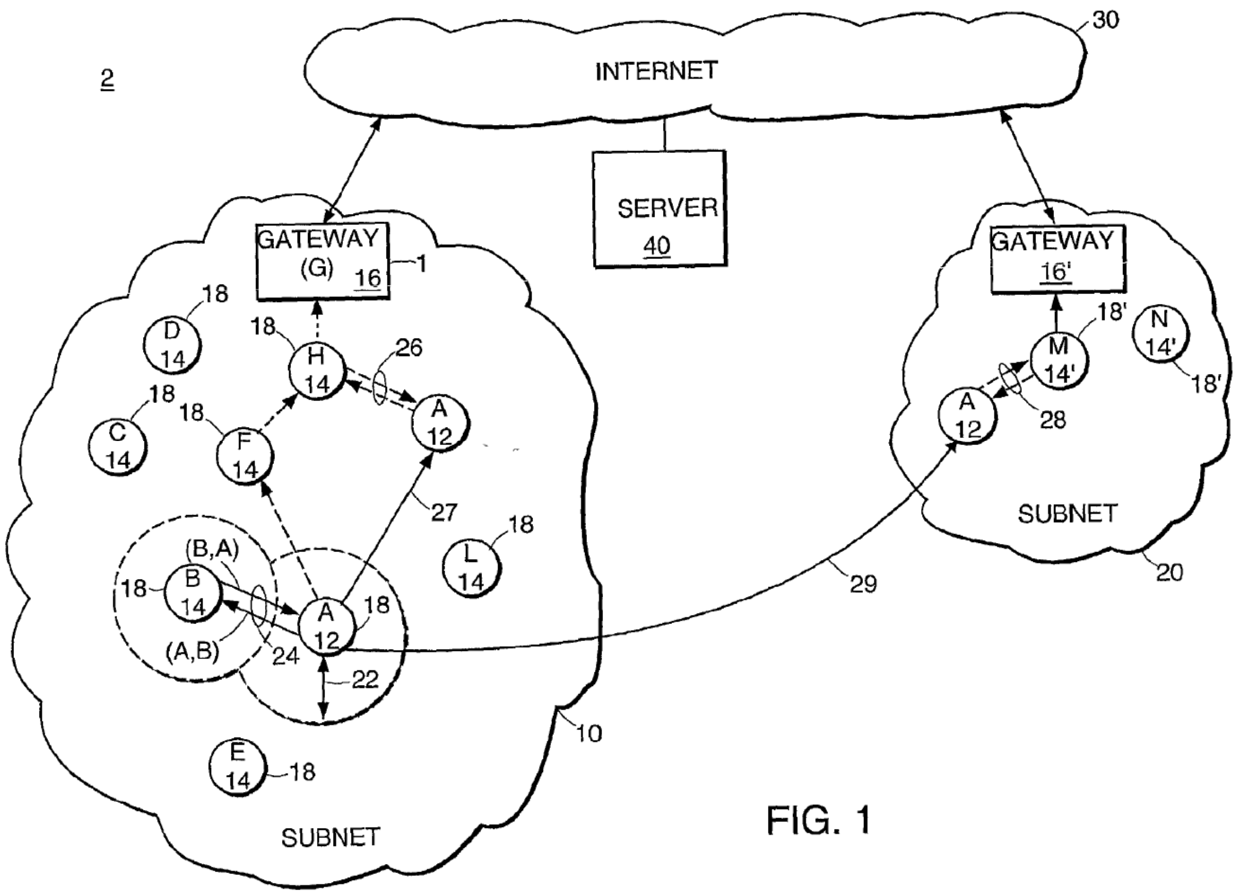
This term should be interpreted under 35 U.S.C. 112 ¶6. The claimed function is "switching two-way data communication from a first associated parent node to a second associated parent node based on the functioning parameters of the wireless mesh network." The corresponding structure is a processor and a storage medium with instructions that perform the identified function based on latency and throughput. *See, e.g.,* EX1001, 8:1–9:12, 9:40–54, 15:15–30. Indeed, during prosecution, Applicant stated that this limitation is supported by paragraph 60 of the originally-submitted specification, corresponding to EX1001, 9:46–54. EX1008, 118. EX1002, ¶¶44–47.

VIII. SPECIFIC GROUNDS FOR CHALLENGE

A. Ground I: Ogier In View Of Shapiro And Herzog Renders Obvious Claims 9, 12, And 13.

1. Ogier (EX1003)

Ogier discloses "an internetworking system" in which routing nodes "appl[y] a path selection algorithm to compute preferred paths to all possible destinations, and [] update these paths when link states are updated." EX1003, [0038], [0198]. Ogier illustrates this system in Figure 1 (below), which depicts "communication subnetworks ('subnets') 10, 20" connected to the Internet 30. EX1003, [0038]. "The subnet 10 includes IP hosts 12, routers 14, and a gateway 16 (collectively referred to as nodes 18)." EX1003, [0040]. "[E]ach node 18 can establish connectivity with one or more other nodes 18 through broadcast or point-to-point links." EX1003, [0043]. EX1002, ¶¶48–51.



EX1003, Figure 1.

Ogier teaches that each node can independently select a "routing path" for transmitting packets to a destination node. EX1003, [0196]–[0197]. For example, Ogier assigns "at least one positive cost (or metric)" to links between pairs of nodes.

EX1003, [0044]. Based on those link costs, "[e]ach routing node 14 [] applies a path selection algorithm to compute preferred paths to all possible destinations." EX1003, [0198]. "One exemplary path selection algorithm is [the] Dijkstra's algorithm [that] compute[s] shortest paths (with respect to cost, c) to all destinations." EX1003, [0198]. This way, node F, for example, can establish a routing path to the gateway G 16, as illustrated below. EX1002, ¶¶52–54.

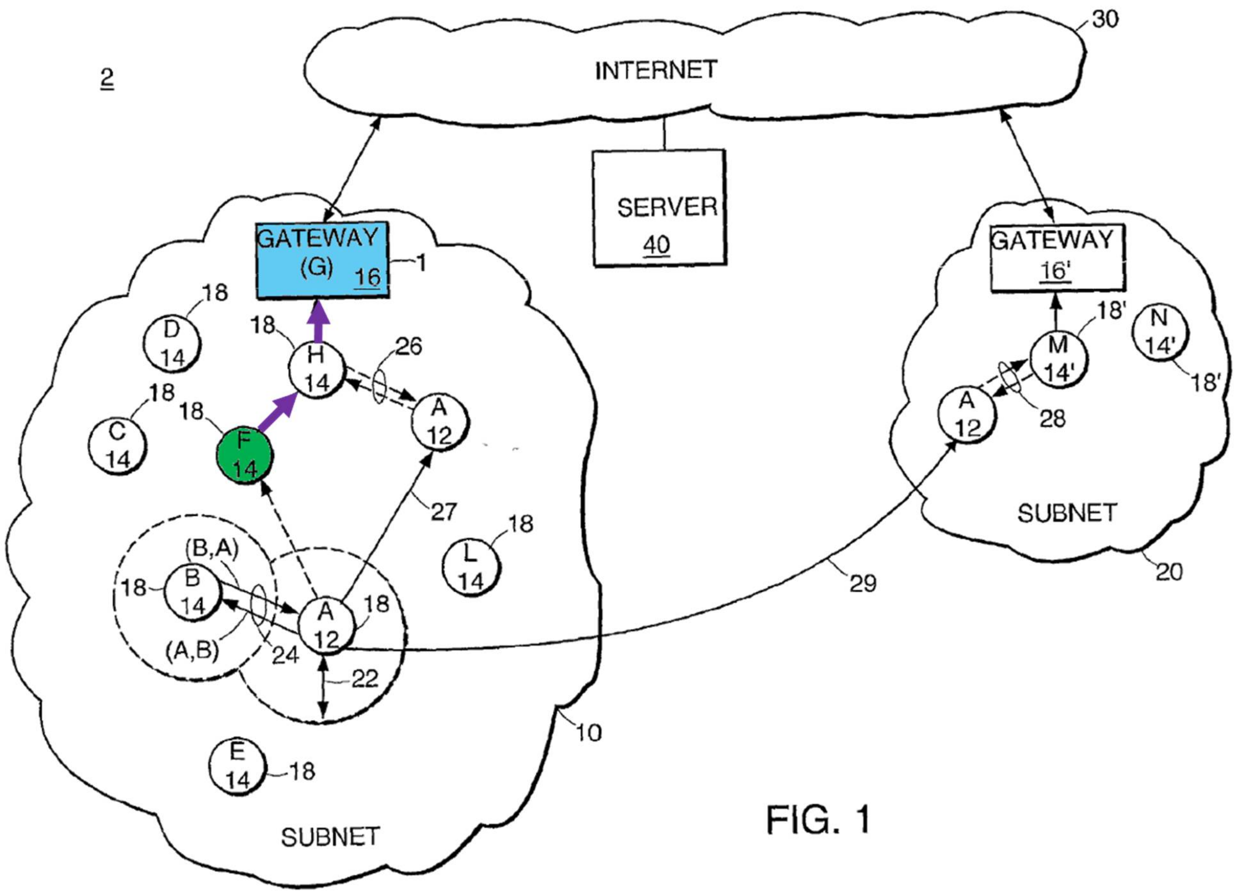


FIG. 1

EX1003, Figure 1.[2]

[2] All annotations are added unless noted otherwise.

Ogier's nodes maintain the link cost information in a "topology table." EX1003, [0060]–[0061]. For example, "each routing node 14 (or node i, when referred to generally)" has "[a] topology table, denoted TT_i, consisting of all link-states stored at node i." EX1003, [0060]–[0061]. "The entry for link (u, v) in this table is denoted TT_i(u, v)" and it includes "[t]he component c [that] represents the ***cost*** associated with the link." EX1003, [0061]. EX1002, ¶¶55–57.

When a node detects a change in the link cost to a neighboring node, it executes a "link-state-routing protocol"—namely, the "topology broadcast based on reverse-path forwarding (TBRPF) protocol"—to disseminate link-state information, such as link costs, to other routers 14. EX1003, [0047], [0048], [0135]. EX1002, ¶¶58–59.

A node executing the TBRPF protocol—referred to as the "source node"—disseminates its link cost information to other nodes along a "path tree." EX1003, Abstract, [0010]. "Each path tree has the source node as a root node, a parent node, and zero or more children nodes." EX1003, Abstract. The path tree may take various forms, such as a "minimum-hop-path tree," a "shortest path tree," or "other types of trees," and it is "updated dynamically using the topology and link-state information that are received along the []path trees themselves." EX1003, [0058], [0064], [0084]. The path tree update occurs by "running a shortest-path algorithm such as Dijkstra's algorithm." EX1003, [0084]. EX1002, ¶¶60–63.

The gateway 16 can serve as the "source node" of the path tree because "each router 14 in the subnet 10 runs a link-state-routing protocol" (such as TBRPF), and "[t]he gateway 16 is a particular type of routing node 14 that connects the subnet 10 to the Internet 30." EX1003, [0040], [0047]. Accordingly, Ogier teaches that the nodes may be arranged as a path tree (shown by the dotted red line) in which: (1) the root node is the gateway G 16, and (2) the rest of the nodes 14 (e.g., **F**, **H**) are arranged in a parent-child relationship. EX1002, ¶¶64–66.

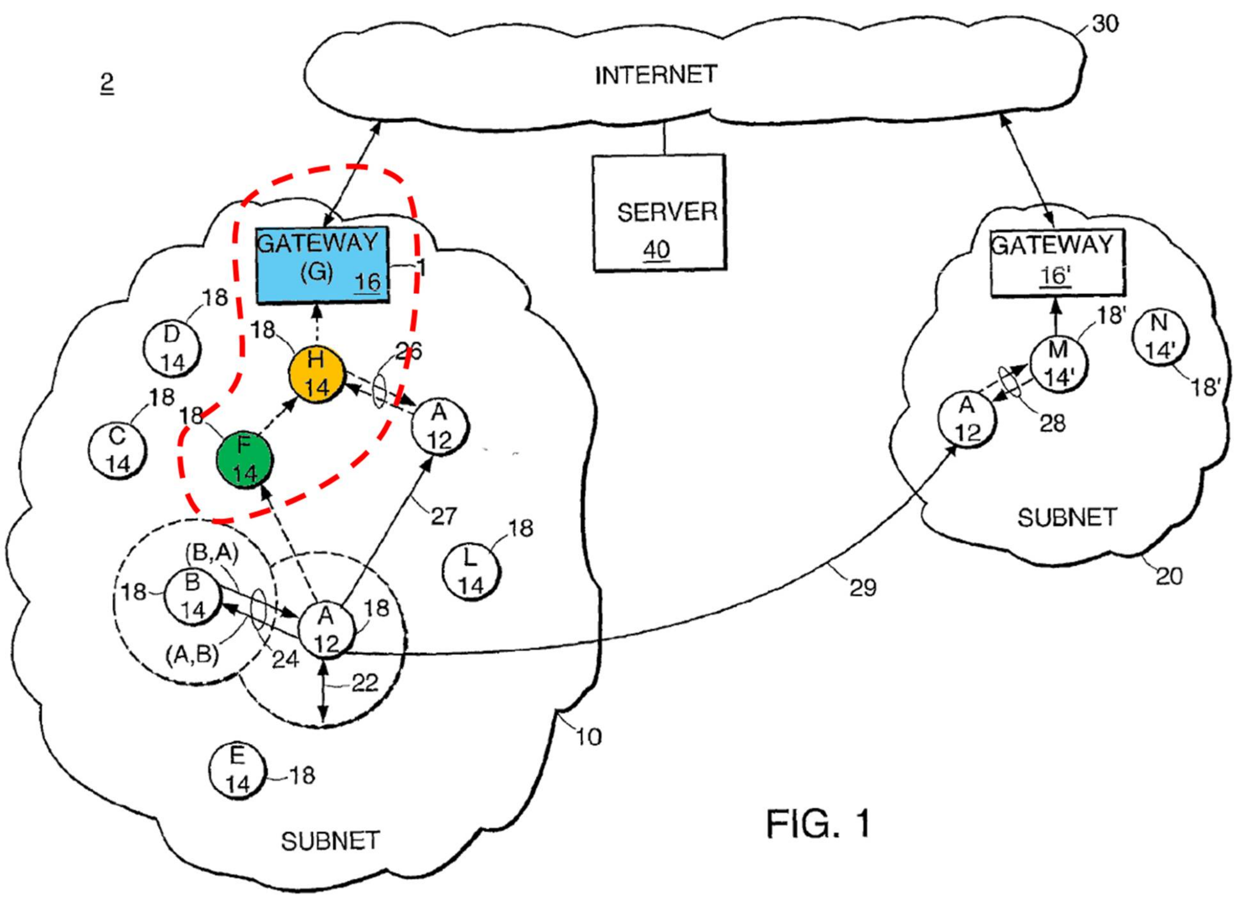


FIG. 1

EX1003, Figure 1.

2. Shapiro (EX1004)

Shapiro teaches "systems for dynamically routing data" that "takes into account the quality or speed of a link." EX1004, [0001], [0008]. In these systems, each node maintains a "dynamic routing table" with "routing information" (EX1004, [0009], [0046]), which it uses to "determine the best route to send the data" to the destination node (EX1004, [0009], [0049]). EX1002, ¶¶67–68.

To determine such "best route," a node calculates "an efficiency factor" "for each possible route" to the destination and selects the route with the best efficiency factor. EX1004, [0053]. *See also* EX1004, [0046]–[0048]. The efficiency factor may be computed using various types of information in a dynamic routing table. EX1004, [0053]. As illustrated in Figure 3 (below), the dynamic routing table includes, for each candidate route: (1) the "number of nodes … from the current node to the destination node" (also known as "Hops"), and (2) a "goodness factor" that "represents any number of qualitative and quantitative feature of the corresponding route." EX1004, [0009], [0047], [0048]. The goodness factor is a flexible metric and may be "a decaying average of periodically sampled ***throughput*** for a node." EX1004, [0048]. EX1002, ¶¶69–73.

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DYNAMIC ROUTING TABLE		
ROUTE	HOPS	GOODNESS
110 VIA120	2	.1
120 VIA120	1	.6
130 VIA120	2	.4
140 VIA120	3	.8
150 VIA120	4	.2
160 VIA120	5	.1
170 VIA120	5	.9
110 VIA160	5	1
120 VIA160	5	.3
130 VIA160	4	0
140 VIA160	3	.2
150 VIA160	2	.5
160 VIA 160	1	.5
170 VIA 160	3	.3

EX1004, Figure 3.

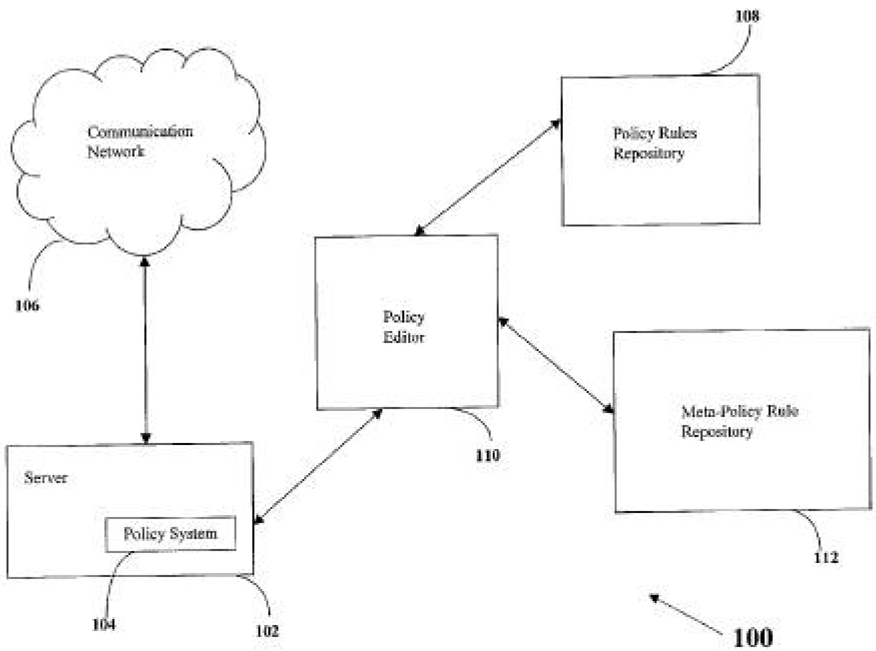
3. Herzog (EX1005)

Herzog describes a "Policy Based Networking (PBN)" technique that "control[s] network operation." EX1005, [0005]. Herzog explains:

> In general, with PBN, network administrators first define networking goals (i.e., "network policy"). Those networking goals are then provided to a policy system which automates and translates the policy into a set of lower-level instructions. Network devices understand the instructions, and the specified goals thus can be accomplished.

EX1005, [0005]. *See also* EX1005, [0023]. EX1002, ¶74.

Herzog explains that the "policy system" typically resides on a server computer system, as illustrated in Figure 1 (below). EX1005, [0029]. EX1002, ¶¶75–77.



EX1005, Figure 1.

4. Ogier-Shapiro-Herzog Combination

a) Computing Link Costs Based Additionally On Goodness Factor, Per Shapiro

As explained in Section VIII.A.1 [Ogier], Ogier discloses that a node may locally determine the routing path and path-tree based on link costs between nodes. EX1003, [0058], [0084], [0198]. The link cost between two nodes "can be ***one***, for minimum-hop routing, or the ***link delay plus a constant bias***," but may also be set using "[a]ny technique." EX1003, [0044]. This flexibility would have motivated a

POSITA to consult prior art for additional cost features to enable more context-sensitive routing decisions. EX1002, ¶¶78–80.

Indeed, it was well known that the link cost may incorporate additional features. For example, as explained in Section VIII.A.2 [Shapiro], Shapiro teaches selecting the "best route" based on an "efficiency factor," which depends on a "goodness factor" representing "any number of qualitative and quantitative feature[s] of the corresponding route." EX1004, [0048], [0053]–[0054]. For instance, the goodness factor may reflect "a decaying average of periodically sampled ***throughput*** for a node." EX1004, [0048]. EX1002, ¶81.

A POSITA would have found it obvious to combine Ogier with Shapiro by incorporating Shapiro's "goodness factor" into Ogier's link cost. EX1004, [0048]. For example, as taught by Shapiro's efficiency factor that is computed as the weight sum of the goodness factor and another feature (see EX1004, [0053]), a POSITA would have found it obvious to modify Ogier's link cost as a weighted sum of: (1) "one, for minimum-hop routing, or the link delay plus a constant bias" as taught by

Ogier (EX1003, [0044]); and (2) the goodness factor as taught by Shapiro (EX1004, [0048])[3]. The resulting link cost would have been expressed as:

- LC_1 = 1 + W*GF; or
- LC_2 = (LD + bias) + W*GF

where LC stands for the link cost, LD for the link delay, GF for the goodness factor, and W for the relative weight between Ogier's cost (*i.e.,* 1 or LD+ bias) and the goodness factor. EX1004, [0053]. LC_1 is the link cost when Ogier's minimum-hop routing teaching is used; and LC_2 is the link cost when Ogier's link delay teaching is used. EX1002, ¶¶82–84.

Thus, when LC_1 is used as the link cost, the resulting routing path or path tree would reflect both "minimum-hop routing" and the characteristics captured by the goodness factor (e.g., sampled throughput). When LC_2 is applied, the routing path or tree would instead reflect both link delay (latency) and the goodness factor. EX1003, [0198]. EX1002, ¶85.

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[3] Although some examples of Shapiro's goodness factor reflect characteristics of an entire route (e.g., all nodes and links along the route), a POSITA would have understood that those same characteristics would be easily definable for an individual link, since a link is a one-hop route. EX1002, ¶84.

a. Reasons To Combine Ogier And Shapiro

A POSITA would have been motivated to incorporate Shapiro's node throughput into Ogier's link cost. EX1002, ¶86.

First, Ogier itself motivates the combination. Ogier teaches that "***[a]ny technique*** for assigning costs to links can be used to practice the invention." EX1003, [0044]. Accordingly, a POSITA would have looked to incorporate additional features into the link costs, and would have readily recognized that Shapiro's goodness factor—which captures additional characteristics, such as aggregate throughput of nodes along the path—is a suitable candidate. EX1004, [0048]. Indeed, Ogier likewise identifies throughput as an important parameter affecting communication quality. EX1003, [0352] ("A factor in determining the packet length is the tradeoff between data ***throughput*** and the percentage of packet loss."). EX1002, ¶¶87–89.

Second, Shapiro also motivates the combination. Shapiro identifies "a need for dynamic routing of data that takes into account the quality or speed of a link." EX1004, [0008]. To address that need, Shapiro selects a routing path based on a goodness factor that "represents any number of qualitative and quantitative feature of the corresponding route," such as "a decaying average of periodically sampled throughput for a node." EX1004, [0048]. Shapiro further explains that this way, a network manager can "encourage traffic via a certain route or away from a certain route." EX1004, [0048]. Accordingly, a POSITA would have been motivated to incorporate the goodness factor into Ogier's link cost to select the routing path / path tree "tak[ing] into account the quality or speed of a link." EX1004, [0008]. EX1002, ¶90.

Third, Ogier and Shapiro are highly compatible. Both teach routing-path or path-tree selection that optimizes a cost metric. For instance, Ogier teaches applying Dijkstra's algorithm to determine shortest paths "with respect to cost, c." EX1003, [0198] ("One exemplary path selection algorithm is to apply Dijkstra's algorithm to compute shortest paths (with respect to ***cost, c***)"); [0084]. Likewise, Shapiro teaches selecting the "best route" based on an "efficiency factor." EX1004, [0053] ("[T]he dynamic routing table 300 is used to lookup the ***best route*** …. An algorithm calculates, for each possible route in the table, an ***efficiency factor***."). EX1002, ¶¶91–92.

Similarly, both teach that the optimized cost metric reflects the status or quality of links between nodes. *Compare* EX1003, [0044] ("assigning costs to links"); [0045] ("Such movement by one node 18 … may diminish the ***quality of the communications*** with another node 18 ***over that link***. In this case, a ***cost of that link has increased***."); [0108] ("A cost of infinity represents a failed link."), *with* EX1004, [0045] ("The goodness factor G_{170} is representative of ***the quality of the link*** from node 170 to node 150."); [0048]. Indeed, it was well known that "[t]he cost of a link may be defined according to several criteria including such qualities as reliability and delay." EX1013, 1:27–29. EX1002, ¶¶93–94.

Accordingly, a POSITA would have understood that Shapiro's metric—a goodness factor reflecting characteristics such as throughput—would readily be applicable to computing link costs in Ogier. Using Shapiro's goodness factor to assign link costs in Ogier would have merely amounted to combining one prior art element (Shapiro's goodness factor) with another prior art element (Ogier's cost, i.e., 1 or "link delay plus a constant bias") according to known methods (weighted sum of the elements, as taught by Shapiro) to yield predictable results of using the combined elements as the link cost for Ogier's route path selection. EX1002, ¶95.

A POSITA would have had a reasonable expectation of success in incorporating Shapiro's goodness factor into Ogier's link cost as described above. EX1002, ¶96.

First, the combination of Ogier and Shapiro merely amounts to modifying link costs that are input to Ogier's route-selection process or path-tree generation process, yielding the predictable results of computing paths that optimize the modified costs. For example, Ogier teaches that paths are selected using Dijkstra's algorithm. EX1003, [0198] ("apply Dijkstra's algorithm to compute shortest paths (with respect to cost, c)"); [0084]. A POSITA would have understood that applying Dijkstra's algorithm to the Ogier-Shapiro's link cost is straightforward, as it was well known that Dijkstra's algorithm finds optimal-cost paths under any cost metric. *See* EX1013, 13:51–67. EX1002, ¶¶97–98.

Second, both Ogier and Shapiro teach that route selection can account for different types of information. Ogier teaches that "***[a]ny technique*** for assigning costs to links can be used to practice the invention." EX1003, [0044]. Shapiro likewise teaches that its goodness factor "represents any number of qualitative and quantitative feature of the corresponding route." EX1004, [0048]. Accordingly, a POSITA would have had a reasonable expectation that the link cost of the Ogier-Shapiro combination would be effective in selecting route paths. EX1002, ¶¶99–100.

Third, a POSITA would have understood that Ogier's path selection technique is implemented in program code because it uses the Dijkstra's algorithm. The Ogier–Shapiro combination therefore would have merely entailed writing program code to modify how link costs are computed before executing the Dijkstra algorithm. That was well within the skill of a POSITA. *Keynetik, Inc. v. Samsung Elecs. Co., Ltd.*, No. 2022-1127, 2023 WL 2003932, at *2 (Fed. Cir. Feb. 15, 2023) ("Normally, once the function to be performed by software has been identified, writing code to achieve that function is within the skill of the art."). EX1002, ¶101.

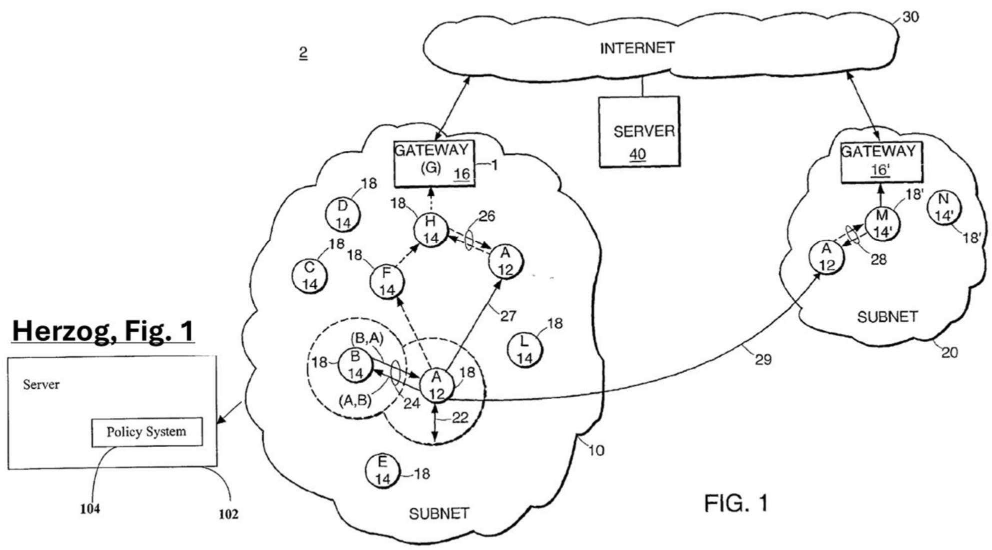
b) Setting Cost Criteria Using Policy Server, Per Herzog

Shapiro explains that a "network manager" can use the "goodness factor" to "encourage traffic via a certain route or away from a certain route." EX1004, [0048]. Accordingly, a POSITA would have understood that the network manager provides parameters for the Ogier-Shapiro link cost calculation—such as whether to use LC_1 or LC_2, the definition of the goodness factor, and/or the weight W. But, neither Ogier nor Shapiro discloses how the "network manager" would supply these parameters to Ogier's nodes. EX1002, ¶¶102–103.

That was well known in the art. For example, Herzog teaches that "network administrators" can define a "network policy" and provide it to a policy system inside a server. EX1005, [0005]. The policy server then "translates the policy into a set of lower-level instructions," and transmits those instructions to network nodes for execution. EX1005, [0005], [0029]. EX1002, ¶¶104–105.

Accordingly, a POSITA would have found it obvious to combine Ogier and Shapiro with Herzog to incorporate a policy server. In the resulting system, Herzog's policy server would provide network nodes with "a set of lower-level instructions" specifying the link cost definition (e.g., LC_1 or LC_2), the goodness factor, and the weight *W*. The combination of Ogier, Shapiro, and Herzog ("Ogier-Shapiro-Herzog Combination") is illustrated below. EX1002, ¶¶106–108.

Ogier-Shapiro-Herzog Combination



EX1003, Figure 1; EX1005, Figure 1.

a. Reasons To Combine Ogier-Shapiro With Herzog

A POSITA would have been motivated to use Herzog's policy server in the Ogier-Shapiro combination. EX1002, ¶109.

First, although neither Ogier nor Shapiro discloses how a "network manager" provides nodes with parameters for computing link costs, Herzog teaches a policy server that can do so. Accordingly, a POSITA would have been motivated to incorporate Herzog's policy server into the Ogier-Shapiro combination to provide "a set of lower-level instructions" to Ogier's nodes, which would then "understand the instructions" and execute them. EX1005, [0005]. A POSITA would have understood that Herzog's policy server is well-suited for this combination because

Herzog teaches that its policy server can implement network policies concerning communication delay and bandwidth. *See* EX1005, [0005]. EX1002, ¶¶110–112.

Second, combining the Ogier–Shapiro system with Herzog's policy server would have merely amounted to combining prior art elements (Ogier-Shapiro system and Herzog's policy server) according to known methods (using a communications link to connect Herzog's policy server to the Ogier-Shapiro's subnet) to yield the predictable result of distributing link-cost parameters so that Ogier's nodes compute link costs in accordance with those parameters. EX1002, ¶113.

Third, Ogier and Shapiro both contemplate a network that is managed by an administrator. Ogier teaches that the system includes "an administrative authority for the subnet 10" that enforces network policies. EX1003, [0302], [0315] ("The administrative authority … may institute a policy …"), [0325]. Similarly, Shapiro describes a "network manager" that controls network traffic. EX1004, [0048]. Accordingly, a POSITA would have been motivated to introduce a policy server to enforce network policies—such as a link-cost computation policy—and would have readily understood that Herzog's policy server is readily applicable to the Ogier-Shapiro combination. EX1002, ¶¶114–115.

A POSITA would have had a reasonable expectation of success in incorporating Herzog's policy server into the Ogier-Shapiro's system as described above. EX1002, ¶116.

First, Herzog's policy server would have operated predictably in the Ogier-Shapiro system. For example, if a network manager seeks to "encourage traffic via a certain route" (EX1004, [0048]) with higher throughput and lower delay, the manager can define that "network policy" and provide it to Herzog's policy server. The server would then "translate[] the policy into a set of lower-level instructions" (e.g., parameters instructing the nodes to compute the link cost using LC_2 with the goodness factor being the node throughput (EX1004, [0048])) and provide them to Ogier's nodes. EX1005, [0005]. If, on the other hand, the network manager defined a policy that prioritizes routes with fewer hops, the server would translate the policy into parameters instructing the nodes to compute the link cost using LC_1 with weight W set to 0. In either case, Ogier's nodes would "understand the instructions" and compute link costs accordingly. EX1005, [0005]. EX1002, ¶¶117–118.

Therefore, Herzog's policy server yields the predictable results of enabling the network manager to define a policy, have that policy translated into parameters, and have those parameters implemented by Ogier's nodes. EX1002, ¶119.

Second, as explained above, both Ogier and Shapiro contemplate networks managed by an administrator. Thus, a POSITA would have readily understood that Herzog's policy server is fully compatible with the Ogier-Shapiro system. Integrating Herzog's policy server into the Ogier-Shapiro system would have required no significant architectural changes; it would have merely entailed connecting Herzog's policy server to Ogier-Shapiro's subnet. EX1002, ¶120.

Third, because Herzog's policy server is designed to distribute instructions that are "understand[able]" by network nodes (EX1005, [0005]), a POSITA would have reasonably expected that the same server would be readily applicable to the Ogier-Shapiro system to deliver link cost parameters to network nodes. And since all three references address routing and traffic control in communications networks, a POSITA would have had a reasonable expectation of success in integrating them into a system. EX1002, ¶121.

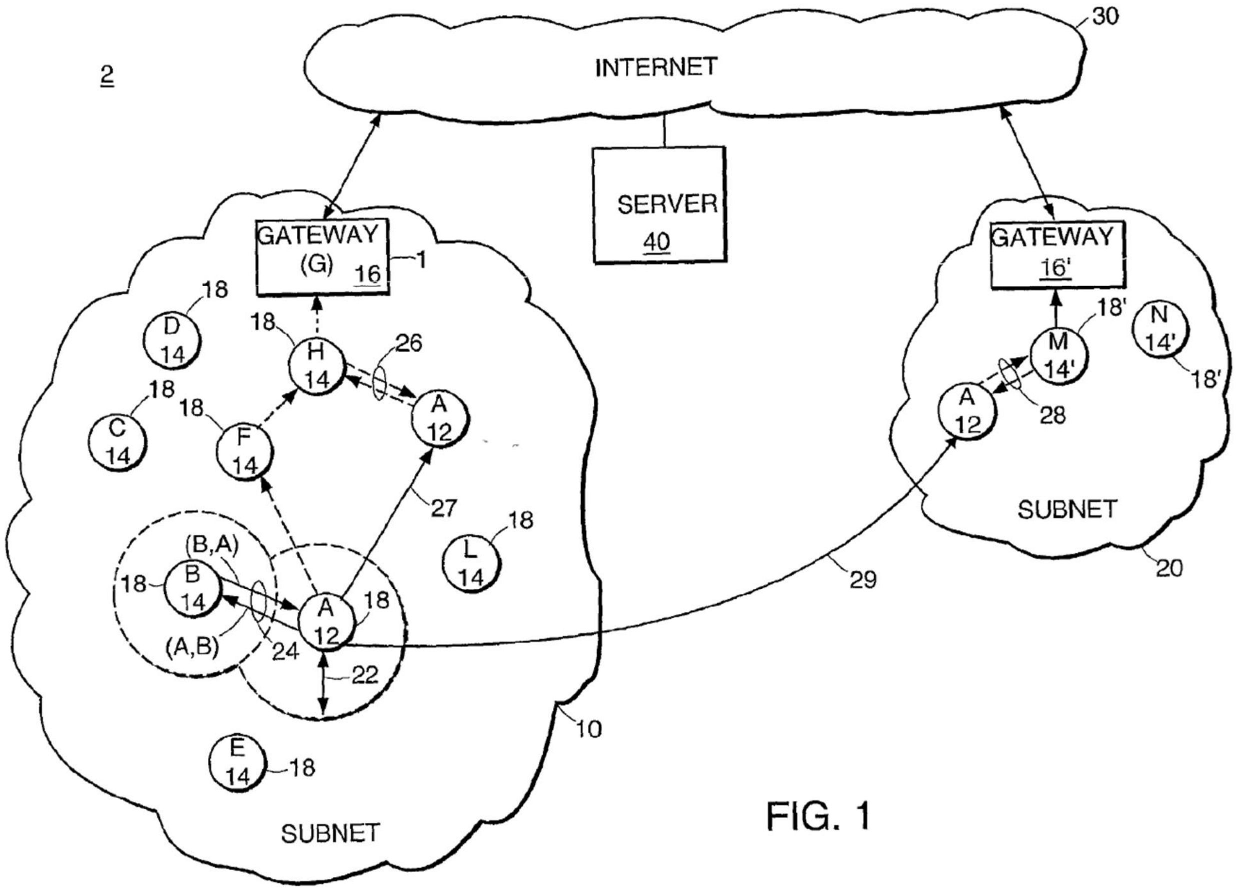
5. Claim 9

a) [9Pre] A wireless mesh network comprising:

To the extent the preamble is limiting, Ogier-Shapiro-Herzog teaches [9Pre]. EX1002, ¶122.

First, Ogier discloses a "*mesh network*." Ogier discloses a "method for disseminating topology and link-state information over a ***multi-hop network*** comprised of nodes." EX1003, [0010]. "***Each subnet 10***, 20 includes one or more ***networks***." EX1003, [0040]. "The subnet 10 includes IP hosts 12, routers 14, and a gateway 16 (collectively referred to as nodes 18)," (EX1003, [0040]), and "each node 18 can establish connectivity with one or more other nodes 18" (EX1003,

[0043]). Accordingly, the subnet 10 is a "*mesh network*" of nodes 18. EX1002, ¶123



EX1003, Figure 1.

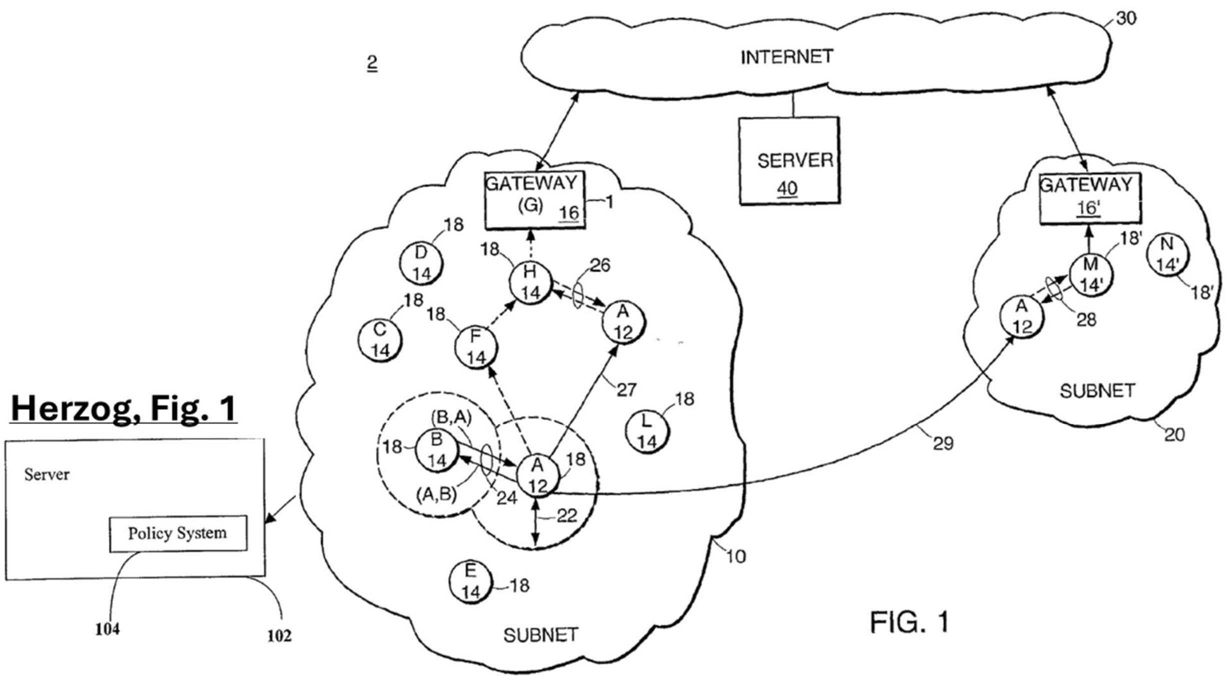
Second, Ogier teaches that the subnet 10 is a "*wireless*" mesh network. The nodes 18 in subnet 10 are in ***wireless*** communication with one another. EX1003, [0043] ("In the subnet 10, each node 18 can establish connectivity with one or more other nodes 18 … Such communication links can be … ***wireless***."). EX1002, ¶124.

b) [9A] an access server wherein the access server sets one or more functioning parameters of the wireless mesh network;

Ogier-Shapiro-Herzog teaches [9A]. EX1002, ¶125.

First, Ogier-Shapiro-Herzog teaches "*an access server*." Herzog's "server" includes a "policy system" that "translates the policy rules into a set of lower-level instructions that network devices understand." EX1005, [0023]. In the context of Ogier-Shapiro-Herzog, that set of lower-level instructions defines the link cost, goodness factor and weight *W*, as explained in Section VIII.A.4 [Ogier-Shapiro-Herzog]. Thus, Herzog's policy server manages the subnet 10 by determining and distributing the link cost parameters—just like the '243 Patent's "*access server*" that "'manages' the network, by setting control parameters for the network." EX1001, 3:34–37, 5:66–67. Accordingly, the policy server in Ogier-Shapiro-Herzog teaches "*an access server*." EX1002, ¶126.

Ogier-Shapiro-Herzog Combination



EX1003, Figure 1; EX1005, Figure 1.

Second, the policy server "*sets one or more functioning parameters of the wireless mesh network*." As described above, the server "translates the policy rules into a ***set of lower-level instructions***" that are used by the nodes 18 in the subnet 10 to compute link costs. EX1005, [0029]. In the context of Ogier-Shapiro-Herzog described in Section VIII.A.4 [Ogier-Shapiro-Herzog], the "set of lower-level instructions"—including the definition of the link cost (e.g., LC_1 vs. LC_2), goodness factor GF, and/or weight W—are "*one or more functioning parameters of the wireless mesh network*." EX1002, ¶127.

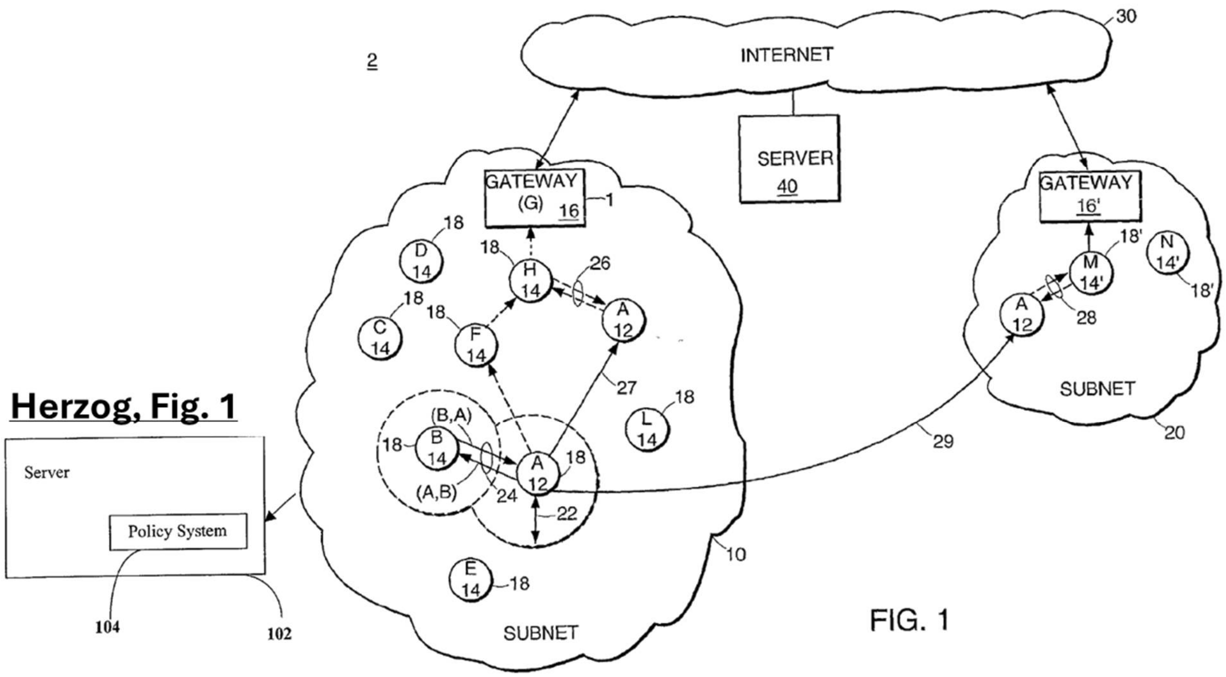
c) [9B] one or more root nodes connected to said access server and an external network;

Ogier-Shapiro-Herzog teaches [9B]. EX1002, ¶128.

First, Ogier discloses "*one or more root nodes*." In Ogier, "[t]he subnet 10 includes … a ***gateway 16***." EX1003, [0040]. "The ***gateway 16*** is a particular type of routing node 14 that ***connects the subnet 10 to the Internet 30***." EX1003, [0040]. Specifically, for subnet 10, "[a]ny route taken by packets sent by the IP host A12 to the server 40 on the Internet 30 necessarily traverses IPv4 infrastructure to reach the ***gateway 16***." EX1003, [0261]. Accordingly, the gateway 16 serves the "*root node*" of subnet 10, just like the "root node" of the '243 Patent that "acts as the interface between the wireless communication devices (30) and the Ethernet." EX1001, 6:15–19. EX1002, ¶¶129–130.

Second, in Ogier-Shapiro-Herzog, the gateway 16 is "*connected to*" Herzog's policy server ("*access server*") over the subnet 10. Herzog's server "is in communication with the [subnet 10] such that the server can communicate with any other devices [i.e., Ogier's nodes, including gateway 16] also connected to the [subnet 10]." EX1005, [0029]. EX1002, ¶131.

Ogier-Shapiro-Herzog Combination



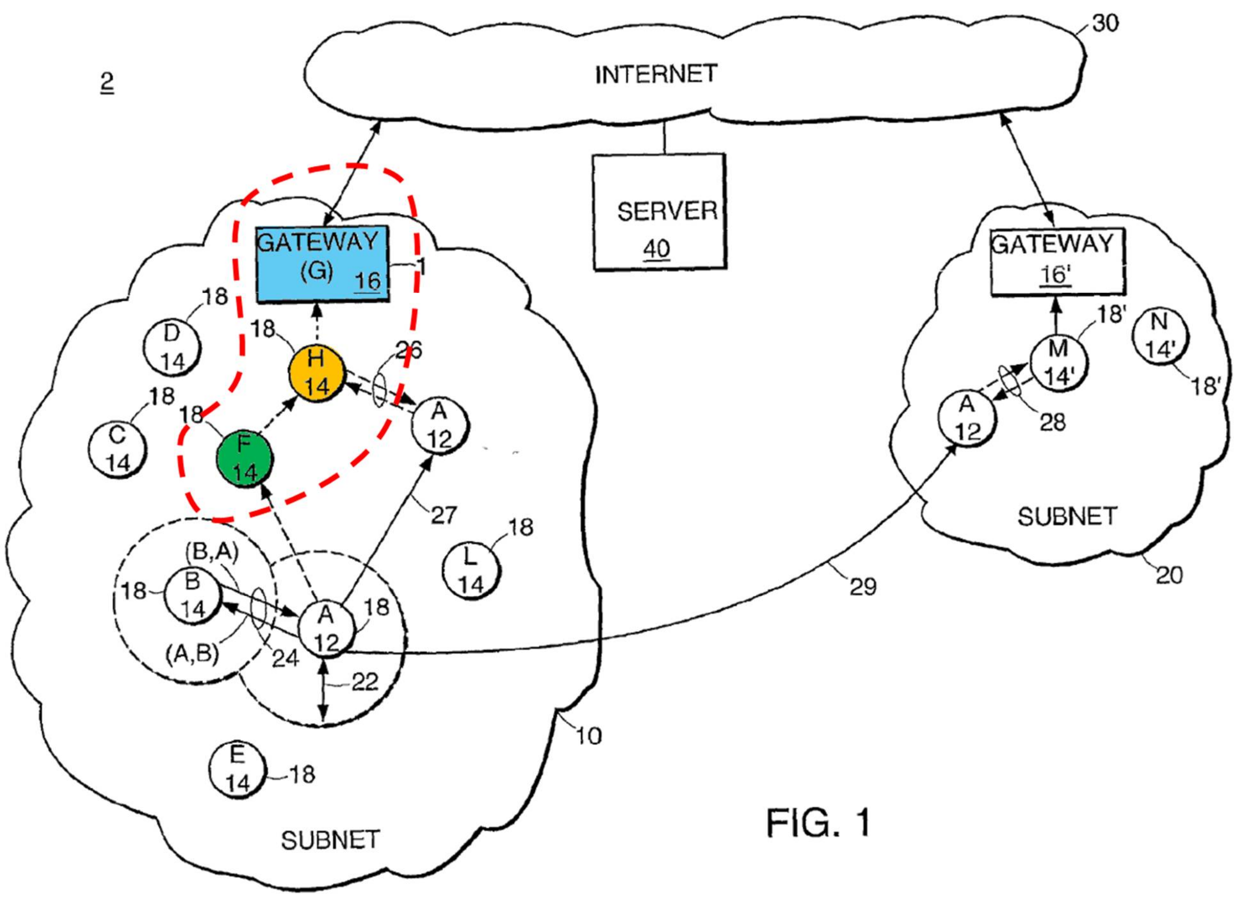
EX1003, Figure 1; EX1005, Figure 1.

Third, the gateway 16 is "*connected to … an external network*." For example, the gateway 16 "connects the subnet 10 to the Internet 30" ("*external network*"). EX1003, [0040]; [0261]. EX1002, ¶132.

d) [9C] one or more AP nodes wherein each AP node is in wireless two-way data communication with an associated parent node wherein said associated parent node is selected from all available parent nodes wherein an available parent node is another AP node within wireless communication range of the AP node and the associated parent node is an available parent node meeting one or more communication criteria or the associated parent node is a root node within wireless communication range;

Ogier-Shapiro-Herzog teaches [9C]. EX1002, ¶133.

First, Ogier discloses "*one or more AP nodes*." For example, Ogier's subnet 10 includes one or more routers 14 ("*one or more AP nodes*")—such as node F—"that forward[] IP packets not explicitly addressed to itself." EX1003, [0040]. Each router 14 operates as an access point (or "AP") node because it provides IP hosts 12 with a point of access to the subnet 10 and, via the gateway 16, to the Internet 30. EX1003, [0046] ("***node A [IP host 12]*** is communicating with the server 40 over a route through subnet 10 that includes the ***link (A, B) to node B [router] 14***."); [0050]. EX1002, ¶¶134–135.



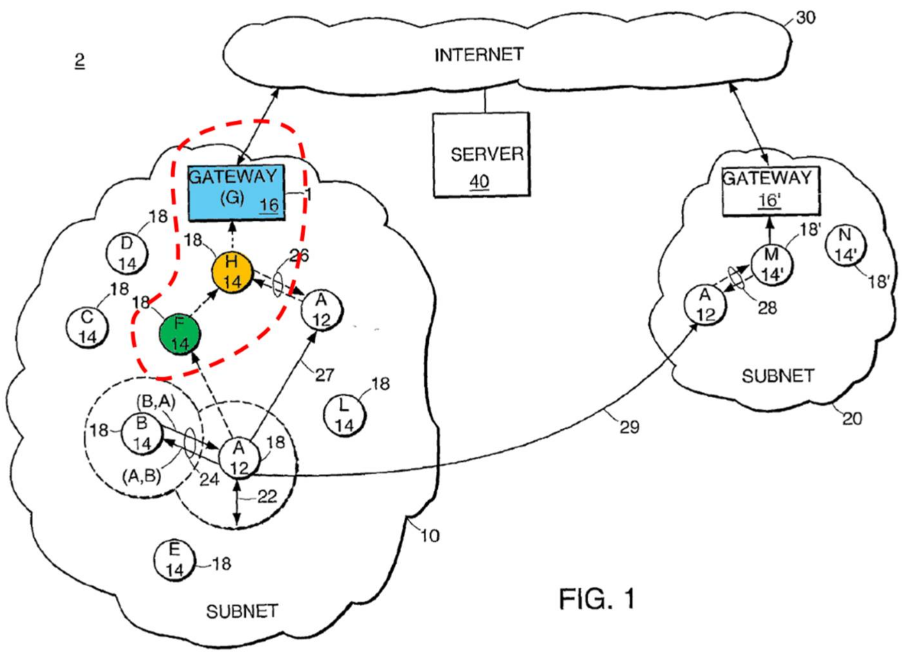
EX1003, Figure 1.

Second, Ogier discloses "*wherein each AP node is in wireless two-way data communication with an associated parent node*." For example, Ogier teaches that "each node 18 [including router 14] can establish connectivity with one or more other nodes 18 through ***broadcast … links***," which "can be … ***wireless***." EX1003, [0043]. "Each broadcast link … is mapped into multiple point-to-point ***bi-directional links***." EX1003, [0044]. Further, Ogier teaches that the "bi-directional links" are formed between router nodes 14 ("*AP nodes*"). EX1003, [0155] ("neighboring ***router nodes 14*** that have established ***bi-directional links***"); [0200]. EX1002, ¶¶136–137.

Ogier also teaches that each router 14 ("*each AP node*") communicates with "*an associated parent node*" because Ogier's neighboring routers have a parent-child relationship. For example, a router 14 selects a routing path to a destination using a "path selection algorithm" that "appl[ies] Dijkstra's algorithm to compute shortest paths (with respect to cost, c) to [the destination node.]" EX1003, [0198]. In doing so, the node identifies and communicates with the "parent node[]" (e.g., another router 14) on the selected path to the destination node, as it was well known. EX1003, [0059] ("When forwarding data packets to a destination node, each routing node 14 selects the ***next node*** on a route to the destination."); EX1006, [0067] (explaining that path comprises series of parent-child node pairs). EX1002, ¶¶138–141.

Also, a source node distributing link-state information (e.g., link cost) over a "path tree" functions as a root node, with the tree comprising parent and child nodes. EX1003, Abstract, [0010] ("Each path tree has the source node as a root node, a parent node, and zero or more children nodes."); *see also* EX1003, [0084]; [0093]; Section VIII.A.1 [Ogier]. For example, in Figure 1 of Ogier (below), when gateway 16 is the source node, it becomes the root node[4] of the path tree, node H becomes the parent node, and node F becomes the child node. EX1002, ¶¶142–145.

[4] Ogier uses the term "root node" differently from the '243 Patent. In Ogier, the "root node" is the node that executes the TBRPF protocol and disseminates the link-state update messages. EX1003, Abstract, [0010]; Section VIII.A.1 [Ogier]. In the '243 Patent, by contrast, the "root node" is the node that "acts as the interface between the wireless communication devices (30) and the Ethernet." EX1001, 6:15–19. In an example where the gateway 16 executes the TBRPF protocol, gateway 16 would qualify as a "root node" under both interpretations. EX1002, ¶¶143–144.



EX1003, Figure 1.

Accordingly, Ogier teaches that "*each AP node* [e.g., node F] *is in wireless two-way data communication with an associated parent node* [e.g., node H]." EX1002, ¶146.

Third, Ogier discloses "*wherein said associated parent node is selected from all available parent nodes wherein an available parent node is another AP node within wireless communication range of the AP node*." EX1002, ¶147.

Ogier teaches that the routing path and the TBRPF path tree are selected by minimizing the total link cost. *See* EX1003, [0058], [0084], [0197]–[0198]. For example, "each routing node 14 has complete link-state information" (EX1003, [0198]) stored in a topology table (EX1003, [0060]–[0061]). The "topology table, denoted TT_i, consist[s] of all link-states stored at node i" and maintains the link cost for each pair of nodes u, v in the subnet 10. EX1003, [0061]. *See also* EX1003, [0152] ("each node 14 has link information for every link in the subnet 10"). Ogier uses this "link-state information" both to select the routing path for packet transmission (EX1003, [0196], [0198]) and to build the "shortest path tree" for TBRPF (EX1003, [0058], [0084]). EX1002, ¶¶148–150.

Ogier further explains that "[e]ach wireless node 18 … has a range 22 of communication within which that node 18 can establish a connection to the subnet 10." EX1003, [0043]. And Ogier excludes "failed links (represented by an infinite cost) and links that are unreachable" from the topology table. EX1003, [0101]. As a result, any route determined at node i accounts only for routers reachable through active links ("*all available parent nodes wherein an available parent node is another AP node within wireless communication range of the AP node*"). In Figure 1, for instance, the "*associated parent node*" (e.g., Node H) is selected from "*all available parent nodes*" (e.g., Nodes D, H) that are "*within wireless communication range*" of Node F. *See* EX1003, [0090] ("the parent 124 for node F with respect to source node D is node H"), [0152] (link "(D, F)"); Figure 4 (showing that Node F is within wireless communication range of Node H); Figure 5 (showing that Node F is within wireless communication range of Node D). EX1002, ¶¶150–152.

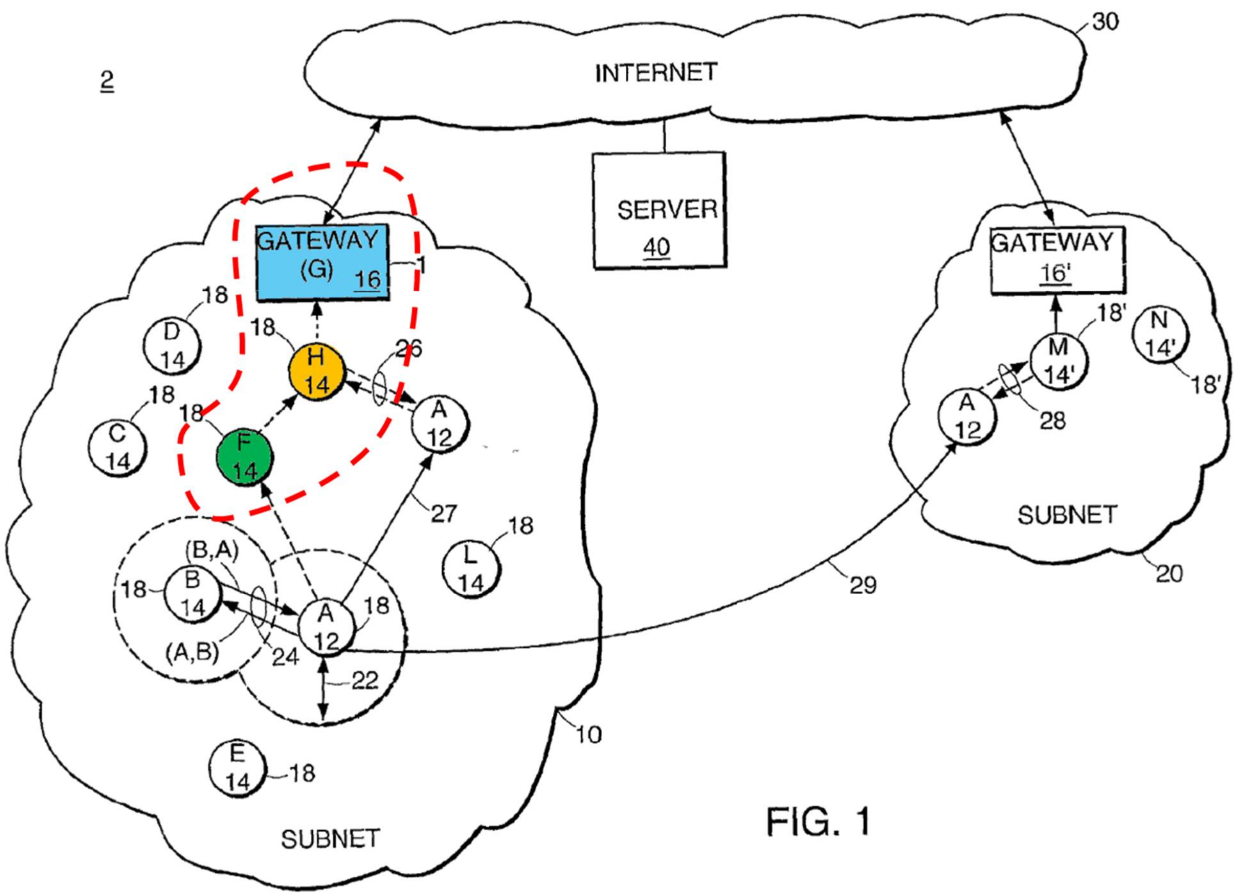


FIG. 1

EX1003, Figure 1.

Fourth, Ogier-Shapiro-Herzog discloses that "*the associated parent node is an available parent node meeting one or more communication criteria or the associated parent node is a root node within wireless communication range*." EX1002, ¶153.

In Figure 1, node F selects its associated parent node H, and node H selects its associated parent node gateway 16, by identifying the neighboring node toward the destination node (gateway 16) along the path that minimizes the total link cost. *See* EX1003, [0058], [0084], [0197]–[0198]. Accordingly, the associated parent node H is "*an available parent node meeting one or more communication criteria*," namely that it is in the path toward the destination node and that path minimizes the total link cost based on throughput and latency, as described further below in Section VIII.A.5.h) [9G]. EX1002, ¶154.

Also, because gateway 16 is the "*root node*," "*the associated parent node* [of node H] *is a root node* [gateway 16] *within wireless communication range*." EX1002, ¶154.

e) [9D] wherein an AP node is in wireless communication with zero or more clients; and

Ogier-Shapiro-Herzog teaches [9D]. EX1002, ¶155.

First, Ogier discloses a subnet with "*clients*." As explained in Section VIII.A.5.c) [9B], subnet 10 includes "***IP hosts 12***." EX1003, [0040]. An IP host is a "*client*" because it receives IP packets directly addressed to itself. EX1003, [0040] ("a router 14 is any node 18 that forwards IP packets not explicitly addressed to itself, and an IP host 12 is any node 18 that is not a router 14."). Indeed, Ogier expressly refers to node 12 as "client 12." EX1003, [0335]–[0336]. EX1002, ¶156.

Second, Ogier teaches that a router 14 ("*AP node*") "*is in wireless communication with zero or more*" IP hosts 12 ("*clients*"). For example, Ogier teaches that nodes 18—including routers 14 and IP hosts 12—may be "wireless," and a router 14 is in wireless communication with an IP host A 12, as also shown in

Figure 1 (below). EX1003, [0043] ("***[N]odes 18*** are referred to as ***wireless***…"; "Each ***wireless node 18*** …"); [0040]. As also shown in Figure 1, a router 14 may be in communication with "*zero*" IP host (like router D), or with "*more*" IP hosts (like router F). EX1002, ¶¶157–158.

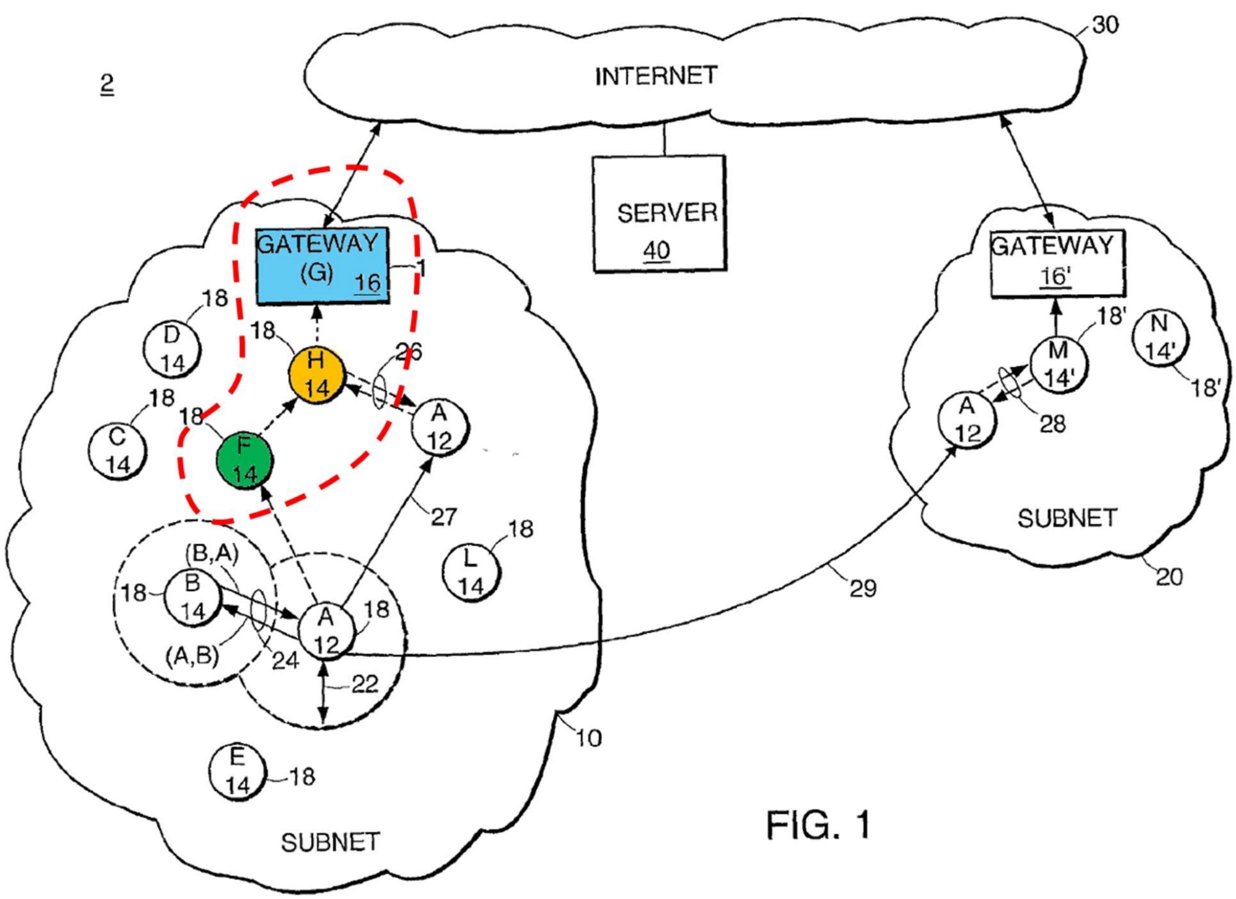


FIG. 1

EX1003, Figure 1.

f) [9E]

a. [9E-1] wherein an AP node includes a means for switching two-way data communication from a first associated parent node to a second associated parent node based on the functioning parameters of the wireless mesh network and

As explained in Section VII.A.1, "a means for switching two-way data communication from a first associated parent node to a second associated parent node based on the functioning parameters of the wireless mesh network" should be interpreted under 35 U.S.C. 112 ¶6 to require: (1) *a processor and a storage medium with instructions that* (2) *perform the identified function* (3) *based on latency and throughput*. Ogier-Shapiro-Herzog teaches [9E-1] under such construction. EX1002, ¶¶159-160.

(1): Ogier teaches a router that includes *a processor and a storage medium with instructions*. It was well known that routers operate using a processor executing instructions stored in memory. *See* EX1010 [Inouchi], 9:46–48; 13:29–32; 13:33–41 ("The ***routing controller*** 50 comprises a ***processor*** 20, a ***program memory*** 21"); 13:43–44 ("The ***program memory*** 21 contains an OS 211 and a variety of ***programs to be carried out by the processor 20***."). Accordingly, a POSITA would have understood that Ogier's routers perform their functions using a processor executing instructions stored in a storage medium. EX1002, ¶¶161–163.

(2): Ogier-Shapiro-Herzog teaches that the router 14 performs "*switching two-way data communication from a first associated parent node to a second associated parent node based on the functioning parameters of the wireless mesh network*." EX1002, ¶164.

Ogier teaches "*switching two-way data communication from a first associated parent node to a second associated parent node*" for two independent reasons. ***First***, Ogier discloses that a router 14 selects a routing path using "a path selection algorithm" that minimizes the total link cost. EX1003, [0198]. Because link costs change over time (EX1003, [0044]), each router "update[s] [the preferred] paths when link states are updated" (EX1003, [0198]). As explained in Section VIII.A.5.d) [9C], such updates result in selecting a new parent node on the recomputed path and switching the bi-directional links ("*two-way data communication*") (EX1003, [0044]) to that new parent node. ***Second***, Ogier discloses that a router updates the "shortest path tree" for TBRPF (EX1003, [0058]) by "run[ning] a shortest-path algorithm such as Dijkstra's algorithm" (EX1003, [0084]). "If this computation results in a ***change to the parent node*** p_i(u) …, node i then sends a NEW PARENT(u, sn) message … to the new parent node p_i(u) ["*second associated parent node*"] and a CANCEL PARENT message to the old parent node ["*first associated parent node*"]." EX1003, [0084]. Sending the NEW

PARENT message thus results in switching the bi-directional links ("*two-way data communication*") (EX1003, [0044]) to the new parent node. EX1002, ¶¶164–167.

Ogier-Shapiro-Herzog also teaches that the parent-node switching is "*based on the functioning parameters of the wireless mesh network*." As explained in Section VIII.A.4, link costs are computed as either:

- LC_1 = 1 + W*GF; or
- LC_2 = (LD + bias) + W*GF.

As further explained in Section VIII.A.4.b) [Ogier-Shapiro-Herzog] and Section VIII.A.5.b) [9A], each node receives from Herzog's server a "set of lower-level instructions"—including the link-cost definition (LC_1 vs. LC_2), goodness factor (GF), and/or weight (W)—which the node then uses to compute the link cost and to select the routing path and path tree. EX1005, [0005]. EX1002, ¶¶168–169.

Accordingly, the node selects a new routing path or path tree—and hence a new associated parent node—based on link costs defined by these "lower-level instructions" ("*functioning parameters of the wireless mesh network*"). EX1002, ¶170.

(3): Ogier-Shapiro-Herzog teaches that the parent-node switching is "*based on latency and throughput*." As explained above, a node switches parent nodes based on "lower-level instructions" defining the link cost (e.g., LC_1 vs. LC_2), goodness factor (GF), and/or weight (W). *See* Section VIII.A.4 [Ogier-Shapiro-

Herzog]. Ogier teaches that LC_1 favors a "minimum-hop route," whereas LC_2 favors a route with small "***link delay***" (EX1003, [0044]); and Shapiro teaches that GF reflects "a decaying average of periodically sampled ***throughput*** for a node" (EX1004, [0048]). Accordingly, router 14 executes instructions that switch parent nodes based on the link delay and throughput ("*latency and throughput*")[5]—for example, under LC_2. EX1002, ¶¶171–175.

b. [9E-2] wherein an AP node contains one or more datasets

Ogier-Shapiro-Herzog teaches "*wherein an AP node contains one or more datasets*" because a router includes a "*route path dataset*" (*see* Section VIII.A.5.g) [9F]), and "*a dataset of child node identifiers*" (*see* Section VIII.A.5.i) [9H]). EX1002, ¶176.

g) [9F] wherein one of the datasets contained in an AP node comprises a route path dataset comprising an identifier for the associated parent node appended to the route path dataset for the associated parent node;

Ogier-Shapiro-Herzog teaches [9F]. EX1002, ¶177.

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[5] The '243 Patent uses the term "delay" and "latency" synonymously, as was common in the art. EX1001, 1:51–53 ("For example, voice needs to be transmitted with low ***delay (latency)***."); EX1011, 11:32–36. EX1002, ¶174.

During prosecution, Applicant introduced [9F] as claim 3 of the Preliminary Amendment filed on December 8, 2009. EX1008, 114. With the amendment, Applicant stated that "[s]pecification ¶45 and Figure 4 provide that each network node contains a ***connection path dataset (the 'RP: Route Path') as is claimed in new claim 3***." EX1008, 118. Paragraph 45 of the originally-submitted specification provides: "***RP: Route Path***. In FIG. 6(1), the route path for 005 is 000 002 005, its connection route." EX1008, 12. Figures 4 and 6 of the originally-submitted figures are also provided below. EX1002, ¶178.

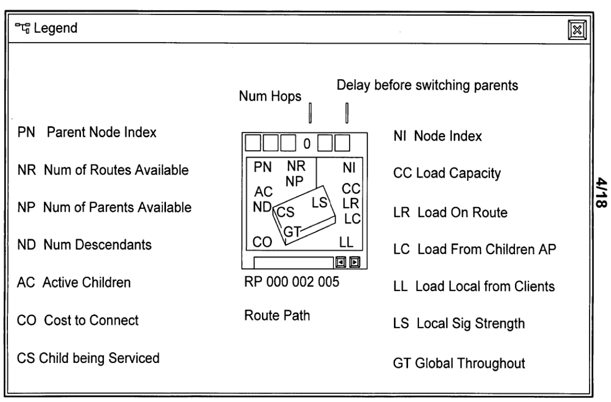

FIG. 4

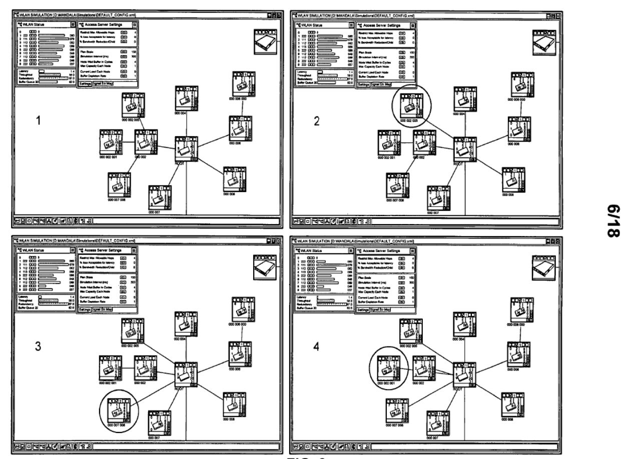

FIG. 6

EX1008, 49, 51.

To the extent paragraph 45 and Figure 4 of the originally-submitted application provide sufficient written-description support for the claimed "*route path dataset,*" Ogier-Shapiro-Herzog teaches [9F].[6] EX1002, ¶180.

Ogier teaches that "[e]ach routing node 14 … compute[s] ***preferred paths*** to all possible destinations." EX1003, [0198]. The preferred path for a particular destination includes identifiers of nodes along the path. *See* EX1003, [0145] ("using as path name the ***sequence of nodes in the path***"), [0067] ("The routing table entry for node u, consisting of the next node on a preferred path to node u."), [0335] ("through routers along the path"). Indeed, it was well known that a path is represented by a sequence of node identifiers. *See* EX1006, [0073] ("***Path D-B-A-S*** (where 'S' is the server) represents the shortest available path."). Accordingly, Ogier-Shapiro-Herzog's preferred path teaches the claimed "*route path dataset.*" EX1002, ¶¶181–183.

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[6] Patent Owner has advanced a substantially similar interpretation of "*route path dataset*" in its Infringement Contentions for the '243 Patent. EX1014, 21 (mapping "*route path dataset*" to "a dataset comprising 'the best path back to a RAP [root AP]'"). EX1002, ¶179.

h) [9G] wherein the communication criteria comprises instructions for the AP node to select the associated parent node wherein an available parent node is selected to become the associated parent node if the available parent node is in wireless communication with a root node or if a root node is contained in the available parent node's route path dataset; and

Ogier-Shapiro-Herzog teaches [9G]. EX1002, ¶184.

First, Ogier-Shapiro-Herzog teaches "*wherein the communication criteria comprises instructions for the AP node to select the associated parent node*."[7] For example, as explained in Section VIII.A.5.d) [9C], node F in Figure 1 selects its associated parent node (H) by identifying from the neighboring nodes (available parent nodes) the one that: (1) lies along a path toward the destination node, and (2) where that path minimizes the total link cost. *See* EX1003, [0058], [0084], [0197]–

[7] [9C] requires that it comprises "criteria" that can be "me[]t" by a node whereas [9G] requires that it comprises "***instructions*** … to select" a node based on certain criteria. Regardless of whether the "communication criteria" comprises "criteria" or "instructions," Ogier-Shapiro-Herzog teaches the claimed "communication criteria" because Ogier's router selects its associated parent node by identifying the node that satisfies certain criteria, and as explained in Section VIII.A.5.f)a [9E], a POSITA would have understood that the router implements its functionalities using "*instructions*" executed by a processor. EX1002, ¶186.

[0198]. Accordingly, "*the communication criteria comprises instructions for the AP node* [e.g., node F] *to select the associated parent node* [node H]" in accordance with those criteria. EX1002, ¶¶185–188.

Second, Ogier teaches "*wherein an available parent node is selected to become the associated parent node if the available parent node is in wireless communication with a root node or if a root node is contained in the available parent node's route path dataset*." As explained in Section VIII.A.1 [Ogier], a router 14 (e.g., node F) can establish a path to gateway 16 by "comput[ing] shortest paths (with respect to ***cost, c***) to" the gateway 16. EX1003, [0198]. *See also* EX1003, [0084] ("running a shortest-path algorithm"). Such shortest path between node F and gateway 16 in Figure 1 is shown below (in purple). Here, node F selects node H as the "*associated parent node*" because it is "*in wireless communication with a root node*" (gateway 16). EX1003, [0090]. *See also* EX1003 [0261] ("Any route taken by packets sent by the IP host A 12 to the server 40 on the Internet 30 necessarily traverses IPv4 infrastructure to ***reach the gateway 16***."). Furthermore, because node H is on the routing path to gateway 16 ("*root node*"), node H's routing path to gateway 16 would include the identifier of the gateway 16 ("*root node*"). EX1003, [0198]. *See also* EX1003, [0145] ("using as path name the ***sequence of nodes in the path***"), [0067], [0335]; EX1006, [0073]. EX1002, ¶¶189–192.

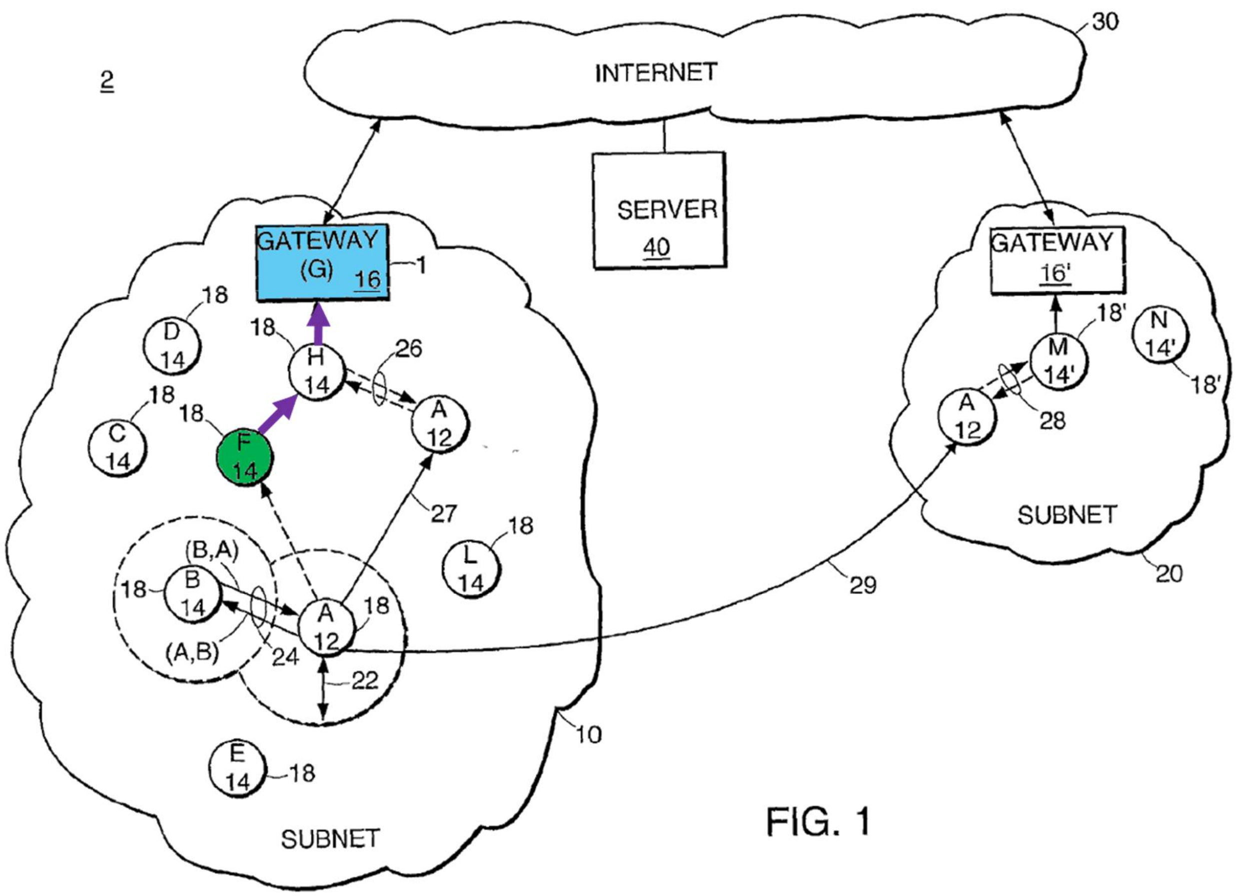


FIG. 1

EX1003, Figure 1.

i) [9H] wherein one of the datasets contained in an AP node comprises a dataset of child node identifiers wherein the dataset of child node identifiers is a dataset identifying each AP node in wireless communication with the AP.

Ogier-Shapiro-Herzog teaches [9H]. EX1002, ¶193.

During prosecution, Applicant introduced [9H] as claim 9 of the Preliminary Amendment filed on December 8, 2009. EX1008, 115. With the amendment, Applicant stated that "[t]he specification ¶84 also teaches that each node will be aware of the children that are connected to the node, as claimed by claim 9."

EX1008, 119. *See also* EX1008, 119 ("the mesh node must be aware of all active children as otherwise the mesh node could not service each of the child nodes."). EX1002, ¶194.

To the extent paragraph 84 of the originally-submitted application provides sufficient written description support for [9H], Ogier-Shapiro-Herzog teaches [9H]. EX1002, ¶195.

Ogier teaches that each node i includes, "[f]or each node u other than node i," "[a] ***list of children nodes*** of node i, denoted children_i(u)." EX1003, [0065]; *see also* [0085]. This list is "the set of neighbor nodes from which node i has received a NEW PARENT message containing the identity of source node [u] without receiving a subsequent CANCEL PARENT message for that source node [u]." EX1003, [0088]. Accordingly, the list of children nodes includes ***all active*** children. Indeed, Ogier explains that "[i]n one embodiment, the link-state update passes to ***every child node*** in children_i" to service all children nodes. EX1003, [0111]; *see also* [0113] ("those nodes having ***only one child node*** for the source node [u] can send updates … to ***that child node only***."). EX1002, ¶¶196–198.

Ogier further teaches that each pair of neighboring router nodes (e.g., node i and its active children) communicate over wireless bidirectional links. *See* EX1003, [0043]–[0044]; Section VIII.A.5.d) [9C]. EX1002, ¶199.

6. Claim 12

Claim 12 is identical to claim 9 except for limitation [12H]. The combination of Ogier, Shapiro, and Herzog renders obvious claim limitations [12Pre]–[12G] for the reasons provided above for claim limitations [9Pre]–[9G], respectively. EX1002, ¶200.

a) [12H] wherein the communication criteria further comprises instructions for the AP node to associate with a single suitable parent node wherein the route path dataset of the parent node is the shortest route path dataset of all available parent nodes.

During prosecution, Applicant introduced [12H] as claim 12 of the Preliminary Amendment filed on December 8, 2009. EX1008, 116. With the amendment, Applicant stated that "[c]laim 12 covers selection of a parent for association based on the ***shortest route path***, which is discussed in the Specification ¶¶51 and 55 which discuss that a minimal latency is achieved by selecting shortest paths to the root." EX1008, 119. At least under such understanding, Ogier-Shapiro-Herzog teaches [12H]. EX1002, ¶¶201–202.

First, Ogier teaches "*wherein the communication criteria further comprises instructions for the AP node to associate with a single suitable parent node*." In the Ogier-Shapiro-Herzog combination, a router ("*AP node*") selects a routing path or path tree "by running a ***shortest-path algorithm*** such as Dijkstra's algorithm." EX1003, [0084]. *See also* EX1003, [0198]; Sections VIII.A.5.d) and VIII.A.5.f) [9C and 9E]. In doing so, the router selects a single suitable parent node. *See* EX1003, [0059] ("When forwarding data packets to a destination node, each routing node 14 selects ***the*** ***next node*** on a route to the destination."); [0064] ("The parent, denoted p_i(u), which is ***the*** ***neighbor node*** ('nbr') of node i that is the next node on a [] path from node i to node u."). EX1002, ¶¶203–205.

Second, Ogier teaches that the "*single suitable parent node*" is associated with the "*AP node*" "*wherein the route path dataset of the parent node is the shortest route path dataset of all available parent nodes*." Because the router selects the routing path or path tree by running a ***shortest-path algorithm*** (EX1003, [0084]; [0198]), the route path for the selected parent node is also the shortest route path of all available parent nodes. *See* EX1003, [0047], [0197]; Sections VIII.A.5.d) and VIII.A.5.f) [9C and 9E]. EX1002, ¶¶206–207.

To the extent that "*shortest route path dataset*" is interpreted as the route path with the least number of hops to gateway 16 ("*root node*")—which appears to be Patent Owner's apparent interpretation of "*shortest route path dataset*" in its Infringement Contentions (*see* EX1014, 53-55 (mapping "*shortest route path dataset*" to "route path dataset with the lowest number of hops back to the RAP)")—the Ogier-Shapiro-Herzog combination also teaches that. When Herzog's policy server configures the link cost as LC_1 with W=0 (*see* Section VIII.A.4.a), running a "***shortest-path algorithm*** such as Dijkstra's algorithm" would have yielded the minimum-hop path. *See* EX1003, [0044] ("the cost of a link can be one, for minimum-hop routing."). EX1002, ¶¶208–209.

7. Claim 13

Claim 13 is identical to claim 9 except for limitation [13H]. The combination of Ogier, Shapiro, and Herzog renders obvious claim limitations [13Pre]–[13G] for the reasons provided above for claim limitations [9Pre]–[9G], respectively. EX1002, ¶210.

a) [13H] wherein the access server functioning parameters includes a latency modifier wherein the AP node means for switching from the first associated parent node to a second associated parent node result in selection of the second associated parent wherein the route path of the second associated parent node is shorter than the first associated route path by a value related to the latency modifier.

During prosecution, Applicant introduced [13H] as claim 14 of the Preliminary Amendment filed on December 8, 2009. EX1008, 116. With the amendment, Applicant stated that "[t]he use of the access server to increase a ***latency modifier*** thereby causing some of the mesh nodes to switch parents, ***covered by claim 14***, is discussed in ¶66 ('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 ….')." EX1008, 119. At least under such understanding, Ogier-Shapiro-Herzog teaches [13H]. EX1002, ¶¶211–212.

First, Ogier-Shapiro-Herzog teaches "*wherein the access server functioning parameters includes a latency modifier*." As discussed in Section VIII.A.5.b) [9A], the "*functioning parameters*" include: (1) the link cost definition (LC_1 vs. LC_2); (2) the goodness factor (GF) definition; and/or (3) the weight (W). When Herzog's policy server configures the routers to use LC_2, the weight W modifies how much weight the goodness factor GF receives relative to the link delay (LD). *See* Section VIII.A.4 [Ogier-Shapiro-Herzog] ("LC_2 = (LD + bias) + W*GF"); EX1004, [0053]. For example, a small W reduces the impact of GF and increases the impact of LD in the cost calculation. Accordingly, W—a "*functioning parameter[]*"—is a "*latency modifier*." EX1002, ¶¶213–215.

Second, Ogier-Shapiro-Herzog teaches "*wherein the AP node means for switching from the first associated parent node to a second associated parent node result in selection of the second associated parent*." As explained in Section VIII.A.5.f)a [9E-1], the "*means for switching*" selects and switches to the "*second associated parent*." EX1002, ¶216.

Third, Ogier-Shapiro-Herzog teaches "*wherein the route path of the second associated parent node is shorter than the first associated route path by a value related to the latency modifier*." In the combination, a router determines the routing path or path tree "by running a shortest-path algorithm" on the total link costs. EX1003, [0047], [0084], [0197]-[0198]. *See also* Sections VIII.A.5.d) and

VIII.A.5.f) [9C and 9E]. Thus, "*the route path of the second associated parent node is shorter than the first associated route path*" when measured by LC_2. Because LC_2 is a function of W, the route path of the "*second associated parent node*" would be "*shorter*" than that of the "*first associated parent node*" "*by a value related to*" W ("*latency modifier*"). EX1002, ¶¶217–221.

B. Ground II: Ogier In View Of Shapiro, Herzog, And Inouchi Renders Obvious Claims 9, 12, And 13.

To the extent Patent Owner contends that Ogier-Shapiro-Herzog in Ground I fails to render Claims 9, 12, and 13 obvious because it does not expressly teach "*a processor and a storage medium with instructions*" as required under the proposed construction of "*means for switching*" (limitation [9E]), that feature would have been obvious in view of Inouchi. EX1002, ¶222.

Inouchi discloses a router with a "routing controller 50 [that] comprises a processor 20, [and] a program memory 21." EX1010 [Inouchi], 9:47–49 ("The node apparatus 1A is referred to as an origination ***router***"); 13:29–32 ("The node apparatus comprises … a ***routing controller*** 50"); 13:33–41 ("The ***routing controller*** 50 comprises a ***processor*** 20, a ***program memory*** 21"). "The ***program memory*** 21 contains an OS 211 and a variety of ***programs to be carried out by the processor 20***." EX1010, 13:43–44. EX1002, ¶¶223–224.

It would have been obvious to modify Ogier's router to include a processor and a storage medium with instructions, as in Inouchi. The combination would have merely amounted to combining prior art elements (e.g., the router in Ogier-Shapiro-Herzog and the processor and program memory in a router of Inouchi) according to known methods (e.g., by providing electrical connections) to yield predictable results (e.g., the processor and program memory performing the routing processes of the router in Ogier-Shapiro-Herzog). EX1002, ¶¶225–226.

C. Ground III: Ground I or II, Further In View Of O'Neal Renders Obvious Claims 10 And 11.

1. O'Neal (EX1006)

O'Neal discloses a system that "arrang[es] nodes for distribution of data over a computer network." EX1006, [0002]. O'Neal teaches that each node maintains a topology database (EX1006, [0030])—illustrated in Figure 13—comprising a "sibling database" (EX1006, [0165]). O'Neal explains that "a parent node reports to each of its child nodes the addresses of their siblings" (EX1006, [0120]), and "the child node stores information about its sibling (or siblings) in the sibling portion (or sibling database)." EX1006, [0165]. Thus, in Figure 23, "nodes Q and X know that they are each other's siblings and nodes A and B know that they are each other's siblings." EX1006, [0165]. EX1002, ¶¶227–229.

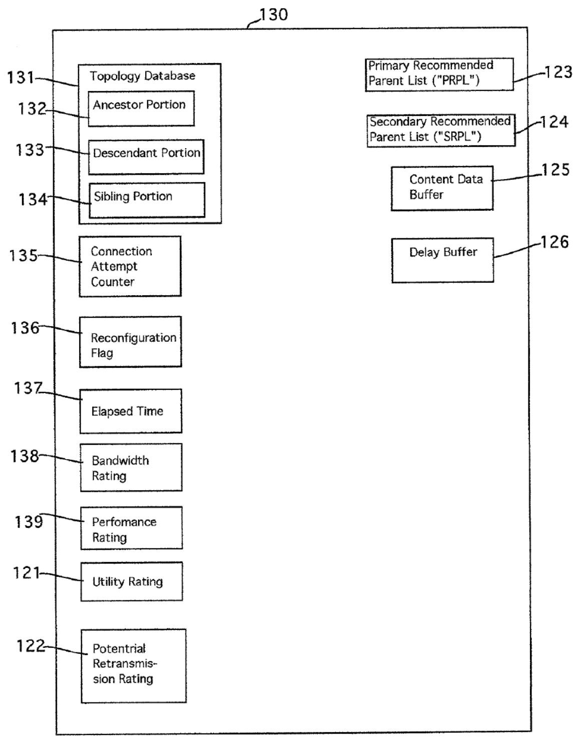


Fig. 13

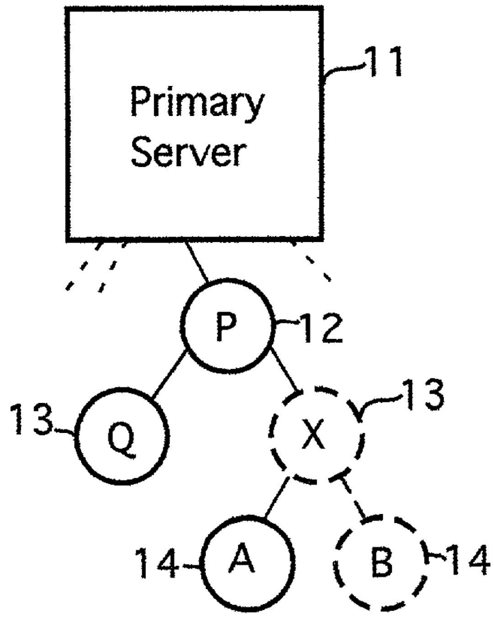


Fig. 23

EX1006, Figures 13, 23.

When a node becomes unavailable, its child nodes can communicate directly without involving the unavailable node. EX1006, [0166]. For example, in Figure 23, "[i]n the event that node X were to leave the distribution network, nodes A and B would of course stop receiving content data from node X." EX1006, [0166]. That triggers a "reconfiguration event." EX1006, [0166]. To reconfigure the network in the absence of node X, its child node (e.g., node A) "dock[s] (or remained docked), for purposes of receiving content data, with the node" that relays the "reconfiguration event" signal, and "allow[s] its sibling [e.g., node B] to dock with it [node A] as a child node for the purpose of transmitting content data to that child node." EX1006, [0168]. *See* EX1006, [0170] ("[N]ode A … docks with node P" and "[n]ode B … docks with node A to receive content data."). EX1002, ¶¶230–231.

2. Ogier-Shapiro-Herzog(-Inouchi)[8]-O'Neal Combination

It would have been obvious to implement O'Neal's teaching in Ogier-Shapiro-Herzog(-Inouchi)'s routers so that, when a router becomes unavailable, its child nodes communicate directly. EX1002, ¶232.

For example, Ogier teaches that each node i includes, "[f]or each node u other than node i," "[a] list of children nodes of node i." EX1003, [0065], [0085]; Sections VIII.A.1 and VIII.A.5.i) [Ogier and 9H]. As taught by O'Neal, node i would "report[] to each of its child nodes the addresses of their siblings" (EX1006, [0120]), and each "child node stores information about its sibling (or siblings) in the sibling portion (or sibling database) 134." EX1006, [0165]. Then, when node i becomes unavailable, one child node (e.g., node j) can communicate directly with its sibling nodes by having the sibling nodes "dock with" it. *See* EX1006, [0168], [0170]. This localized failover mechanism allows the sibling nodes to remain connected to the

[8] The parenthetical around Inouchi means that Inouchi is a reference used only when the argument builds on Ground II.

subnet and continue receiving data through node j, at least until the routing path or tree is recomputed according to Ogier's teachings. EX1002, ¶¶233–237.

a) Reasons To Combine Ogier-Shapiro-Herzog(-Inouchi) with O'Neal

A POSITA would have been motivated to implement O'Neal's localized failover mechanism in Ogier-Shapiro-Herzog(-Inouchi). EX1002, ¶238.

First, a POSITA would have understood that O'Neal's localized reconfiguration reduces delay in addressing link failures. In Ogier-Shapiro-Herzog, when a node's parent becomes unavailable, it would have had to: (1) share the parent node's link-state information with all other nodes in the network (EX1003, Abstract, [0010], [0047]); and (2) recompute the routing path and path tree to select a new parent node. A POSITA would have understood that, while effective, this process would introduce latency before data flow resumes. O'Neal's method, by contrast, provides a localized response—allowing child nodes to maintain data exchange without waiting for the global reorganization. Accordingly, a POSITA would have been motivated to use O'Neal's failover process to quickly address local link failures, at least until Ogier's network-wide update occurs. EX1002, ¶¶239–241.

Second, Ogier-Shapiro-Herzog(-Inouchi) and O'Neal are compatible. Ogier already maintains topology information, including a list of children nodes. This naturally aligns with O'Neal's approach that merely requires the parent node to inform its children of their siblings' addresses. EX1006, [0165]. This compatibility would have reduced implementation complexity and cost. EX1002, ¶¶242–243.

A POSITA would have had a reasonable expectation of success in incorporating O'Neal's mechanism into Ogier-Shapiro-Herzog(-Inouchi). EX1002, ¶244.

First, as explained above, Ogier-Shapiro-Herzog(-Inouchi) and O'Neal are compatible. It would have been straightforward to apply O'Neal's technique to Ogier-Shapiro-Herzog(-Inouchi) so that: (1) the parent node shares its list of child nodes (taught by Ogier, EX1003, [0065]) with its child nodes (taught by O'Neal, EX1006, [0120]); and (2) the child nodes communicate directly when the parent becomes unavailable (taught by O'Neal, EX1006, [0168], [0170]). Such application would have yielded predictable results of providing localized failover until the route path is recomputed. EX1002, ¶¶245–246.

Second, the combination of Ogier-Shapiro-Herzog(-Inouchi) and O'Neal would have merely amounted to using a known technique (O'Neal's localized failover technique) to improve a similar system (to rapidly address the local failure in Ogier-Shapiro-Herzog(-Inouchi)'s subnet) in the same way (providing a communication link between siblings to address the parent node's unavailability). EX1002, ¶¶247–248.

3. Claim 10

a) [10] The wireless mesh network of claim 9 wherein the dataset of child node identifiers is accessible to each child node.

Ogier-Shapiro-Herzog(-Inouchi)-O'Neal teaches the additional limitation of claim 10. EX1002, ¶249.

As explained in Section VIII.A.5.i) [9H], each node i (e.g., routing node 14) includes, "[f]or each node u other than node i," "[a] ***list of children nodes*** of node i, denoted children_i(u)." EX1003, [0060], [0065], [0085]. And as explained in Section VIII.C.2 [Ogier-Shapiro-Herzog(-Inouchi)-O'Neal], node i would "report[] to ***each of its child nodes*** the addresses of their siblings" (EX1006, [0120]), and each "child node stores information about its sibling (or siblings) in the sibling portion (or sibling database) 134 of its topology database." EX1006, [0165]; *see also* [0165] ("In the example shown in FIG. 23, nodes Q and X know that they are each other's siblings and nodes A and B know that they are each other's siblings."). EX1002, ¶250.

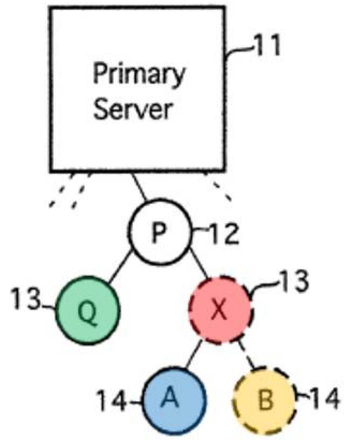


Fig. 23

EX1006, Figure 23.

4. Claim 11

a) [11] The wireless mesh network of claim 10 wherein the AP node dataset of child nodes contains two or more child nodes wherein the zero or more clients in communication with a first child node sends data wherein a destination of the data is a second child node, the first child node sends the data directly to the second child node.

Ogier-Shapiro-Herzog(-Inouchi)-O'Neal teaches the additional limitation of claim 11. EX1002, ¶251.

First, Ogier-Shapiro-Herzog(-Inouchi)-O'Neal teaches "*wherein the AP node dataset of child nodes contains two or more child nodes*." As explained in Section VIII.A.5.i) [9H], each node i includes, "[f]or each node u other than node i," "[a] ***list of children nodes*** of node i, denoted children_i(u)." EX1003, [0065], [0085]. Ogier further discloses that "each node 18 in the subnet 10 computes a parent node and

children nodes...," thereby teaching multiple child nodes. EX1003, [0059]. Indeed, in Ogier-Shapiro-Herzog(-Inouchi)-O'Neal, node i would "report[] to ***each of its child nodes*** the addresses of their siblings." EX1006, [0120]; *see also* Figure 23. EX1002, ¶252.

Second, Ogier teaches that "*the zero or more clients in communication with a first child node sends data wherein a destination of the data is a second child node*." ***Each*** node in a subnet (including the "*child nodes*" referenced above) communicates with IP hosts 12 (EX1003, [0046], [0050]) and with other nodes in the subnet (including other "*child nodes*" referenced above) (EX1003, [0043] ("In the subnet 10, ***each node*** 18 can establish connectivity with ***one or more other nodes*** 18.")). Therefore, the "*destination of the data*" received by the "*first child node*" from the "*zero or more clients*" may be the "*second child node*." EX1002, ¶¶253–254.

Third, Ogier-Shapiro-Herzog(-Inouchi)-O'Neal teaches that "*the first child node sends the data directly to the second child node*." As explained in Section VIII.C.2 [Ogier-Shapiro-Herzog(-Inouchi)-O'Neal], when the parent node is unavailable, one child node ("*first child node*") would send data directly to its siblings ("*second child node*") by having the siblings "dock with" it. *See* EX1006, [0168], [0170] ("Node B ["*second child node*"] … docks with node A ["*first child node*"] to ***receive content data***."). EX1002, ¶255.

D. Ground IV: Ogier In View Of Shapiro, Herzog, And Cromer ("Ogier-Shapiro-Herzog-Cromer") Renders Obvious Claims 1–7.

1. Cromer (EX1007)

Cromer is directed to "dynamic load balancing of network bandwidth between access points in an 802.11 wireless LAN." EX1007, Abstract. In particular, Cromer teaches a load balancing technique in which an Access Point "transfer[s] the [client's] connection to the less-congested Access Point thus forcing the client to roam." EX1007, [0030]. EX1002, ¶256.

To implement this "dynamic load balancing," each Access Point maintains a table that "stores information relative to each client device that is connected to the Access Point," as shown in Figure 5 (below). EX1007, [0038]. This table includes: (1) column 508, in which "the access point stores the average bandwidth used by each client"; and (2) entry 512, which "stores the aggregate bandwidth which is the sum of all the bandwidth used by each client." EX1007, [0038]. EX1002, ¶257.

Fig 5

500

502	504	506	508	
Client	IP Address	Signal Strength	Avg Bandwidth	
		(1-10)	(Mbps)	
1				
2				
3				
n				
			Aggregate Bandwidth	Force Roam Flag
			512	510

EX1007, Figure 5.

An Access Point uses table 500 to perform dynamic load balancing. When the aggregate bandwidth in entry 512 "exceeds a predetermined threshold," the Access Point sends a request to another Access Point—e.g., Access Point B—to accept one of its clients. EX1007, [0038], [0041], [0048]. Upon receiving the request, Access Point B determines whether it has "extra capacity" by computing the "difference between the Max. Capacity and the aggre[g]ate capacity 512" at Access Point B. EX1007, [0050]. If it does, it accepts the new client. EX1007, [0050]. EX1002, ¶258.

2. Ogier-Shapiro-Herzog-Cromer Combination

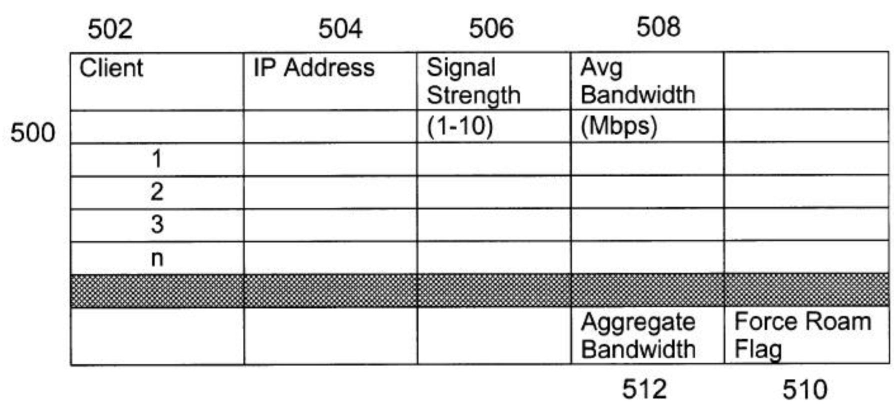
As explained in Section VIII.A.4 [Ogier-Shapiro-Herzog], the link cost in Ogier-Shapiro-Herzog is computed based on Shapiro's goodness factor. EX1004, [0048]. Shapiro explains that "[t]he goodness factor represents any number of qualitative and quantitative feature of the corresponding route," and can reflect "the status of the communications path between a series of nodes." EX1004, [0048]. EX1002, ¶¶259–260.

It was well known that the "status of the communications path between a series of nodes" depends on node capacity. For example, Cromer teaches that each node has the "Max. capacity" of data traffic (EX1007, [0050]); when a node reaches a threshold amount of traffic, the node has to offload one or more clients so that it has sufficient "bandwidth to service the [remaining] clients" (EX1007, [0014]). Furthermore, before accepting another client, a node determines whether it has "extra capacity" to do so, and only accepts another client only when there is extra capacity. EX1007, [0050]. EX1002, ¶261.

It would have been obvious to combine Ogier-Shapiro-Herzog with Cromer so that Shapiro's goodness factor favors links to nodes with greater extra capacity and excludes nodes exceeding their maximum capacity (e.g., by making the link cost "infinite" and excluding it from the topology table as taught by Ogier (EX1003, [0101])). EX1002, ¶¶262–263.

For example, in the combination, each router (e.g., router u) can maintain a table like Cromer's, including the aggregate bandwidth entry 512. EX1007, [0038]. The router u can then compute its "extra capacity" ("EC") (e.g., maximum bandwidth – current bandwidth) (EX1007, [0050]) and distribute its EC to other nodes using Ogier's TBRPF protocol. EX1003, [0047]. When another node i receives node u's EC, node i updates link costs for all links connected to node u to reflect the new EC so that the route selection process favors paths with nodes having higher ECs. This way, the EC is incorporated into the route-selection metric, favoring routes with higher EC (and thus less congestion) and excluding routes through nodes with negative EC (by making the link cost infinite). EX1002, ¶¶264–265.

Fig 5



EX1007, Figure 5.

a. Reasons To Combine Ogier-Shapiro-Herzog With Cromer

A POSITA would have been motivated to combine Ogier-Shapiro-Herzog with Cromer. EX1002, ¶266.

First, Shapiro explains that the goodness factor can reflect "the status of the communications path between a series of nodes." EX1004, [0048]. A POSITA would have understood that one such status includes a node's extra capacity (EC) to handle additional traffic. Indeed, Cromer teaches that it is important not to overload a node beyond its maximum capacity, and should offload clients when bandwidth reaches a threshold. *See* EX1007, [0038], [0041], [0048]. Accordingly, a POSITA would have been motivated to incorporate EC into the goodness factor so that the route-path selection and path-tree selection processes exclude paths having nodes whose bandwidth exceeds the maximum capacity. And to that end, a POSITA would have been motivated to maintain Cromer's table in each of Ogier's nodes, as explained above. EX1002, ¶¶267–268.

Second, Cromer also motivates the combination. Cromer teaches that each node has a maximum capacity, and when a node operates at or near capacity, the node should offload one or more clients so that it has sufficient "bandwidth to service the [remaining] clients." EX1007, [0014]. Accordingly, a POSITA would have been motivated to modify Shapiro's goodness factor so that path selection prefers routes with sufficient extra capacity to avoid paths connected to nodes operating at or near capacity. EX1002, ¶269.

Third, a POSITA would have understood that combining Ogier-Shapiro-Herzog with Cromer merely amounts to using a known technique (modifying Shapiro's goodness factor to "account the quality or speed of a link" (EX1004, [0008]), by incorporating into the link cost the extra capacity EC of nodes along the route) to improve a similar system (Ogier-Shapir-Herzog's routers) ready for improvement (ready to improve the route selection process) to yield predictable results (selecting a routing path or path tree based also on extra capacity EC of nodes along the path). EX1002, ¶270.

Fourth, a POSITA would have understood that combining Ogier-Shapiro-Herzog with Cromer merely amounts to a simple substitution of one known element (Shapiro's goodness factor that reflects throughput) for another (goodness factor that reflects both throughput and extra capacity EC) to obtain predictable results (selecting a routing path or path tree based on both the link's throughput and extra capacity EC). EX1002, ¶271.

A POSITA would have had a reasonable expectation of success in making the combination. EX1002, ¶272.

First, similar to the combination of Ogier and Shapiro (see Section VIII.A.4.a)a [Ogier-Shapiro]), combining Ogier-Shapiro-Herzog with Cromer merely amounts to modifying the link costs input to Ogier's route selection process or path tree generation. Such modification predictably results in paths that reduce the modified link costs. For example, Ogier teaches that the paths are selected using Dijkstra's algorithm. EX1003, [0198]; [0084]. A POSITA would have understood that optimization of link costs using Dijkstra's algorithm is straightforward, as it was well known that Dijkstra's algorithm finds optimal-cost routes. EX1013, 13:51–67. EX1002, ¶¶273–275.

Second, both Ogier and Shapiro teach that path selection can account for various types of information. EX1003, [0044]; EX1004, [0048]. Accordingly, a POSITA would have had a reasonable expectation that the modified link cost of the Ogier-Shapiro-Herzog-Cromer combination would be effective in selecting preferred paths under a modified metric. EX1002, ¶¶276–277.

Third, a POSITA would have understood that Ogier's path selection technique is implemented in program code because it uses the Dijkstra algorithm. Accordingly, a POSITA would have understood that the Ogier-Shapiro-Herzog-Cromer combination would have merely involved writing program code to adjust the link-cost calculation before executing the Dijkstra algorithm. That was well within the skill of a POSITA. *Keynetik*, 2023 WL 2003932, at *2. EX1002, ¶278.

3. Claim 1

Claim 1 is identical to claim 9 except for limitation [1H]. Ogier-Shapiro-Herzog renders obvious claim limitations [1Pre]-[1G] for the reasons provided above for claim limitations [9Pre]-[9G], respectively. EX1002, ¶279.

a) [1H] wherein one of the datasets contained in the AP node comprises an amount of AP data traffic wherein the amount of AP data traffic comprises the amount of data exchanged between the AP node and the zero or more clients in communication with the node and wherein another of the datasets contained in the AP node comprises a maximum capacity amount of the AP node.

Ogier-Shapiro-Herzog-Cromer teaches [1H]. EX1002, ¶280.

First, Ogier-Shapiro-Herzog-Cromer teaches "*wherein one of the datasets contained in the AP node comprises an amount of AP data traffic wherein the amount of AP data traffic comprises the amount of data exchanged between the AP node and the zero or more clients in communication with the node*." For example, each router includes table 500 with entry 512, which "stores the ***aggregate bandwidth*** which is the sum of all the bandwidth ***used by each client***." EX1007, [0038]. Accordingly, each router includes a "*dataset*" (table 500) comprising "*the amount of data exchanged between the AP node and the zero or more clients in communication with the node*" (entry 512). EX1002, ¶¶281–282.

Second, Ogier-Shapiro-Herzog-Cromer teaches "*wherein another of the datasets contained in the AP node comprises a maximum capacity amount of the AP node*." As explained in Section VIII.D.2 [Ogier-Shapiro-Herzog-Cromer], each router computes its extra capacity EC and supplies the EC to every other node in the subnet 10. To compute EC, each router determines the "difference between the ***Max. Capacity*** and the aggre[g]ate capacity 512." EX1007, [0050] ("[E]xtra capacity [of an Access Point] is determined by difference between the Max. Capacity and the aggre[g]ate capacity 512."). Accordingly, to compute its EC, each router maintains its "Max. Capacity" information ("*a maximum capacity amount of the AP node*"). EX1002, ¶283.

4. Claim 2

a) [2] The wireless mesh network of claim 1 wherein one of the datasets contained in the AP node comprises a cost to connect and said cost to connect is calculated using the level of network congestion experienced by the available parent node.

Ogier-Shapiro-Herzog-Cromer teaches the additional limitation of claim 2. EX1002, ¶284.

As explained in Section VIII.A.1 [Ogier], each router includes "[a] topology table, denoted TT_i" that records, for each link between nodes u and v, "the ***cost*** associated with the link." EX1003, [0060]-[0061]. Thus, TT_i includes the link cost between itself (node i) and its available parent nodes. Furthermore, as described in Section VIII.D [Ogier-Shapiro-Herzog-Cromer], a POSITA would have found it obvious to revise this link cost based, in part, on the extra capacity EC (which is based on the current bandwidth, "*level of network congestion*") of the node to which the link is connected ("*available parent node*"). *See* Section VIII.D.2 [Ogier-Shapiro-Herzog-Cromer]. EX1002, ¶¶285–286.

5. Claim 3

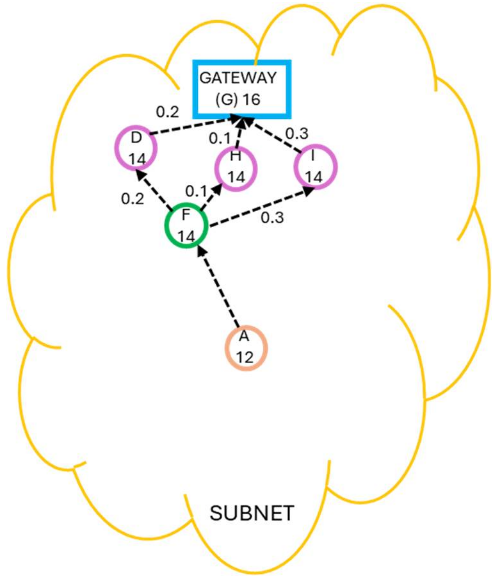
a) [3] The wireless mesh network of claim 1 wherein the communication criteria comprises instructions for the AP node to select the associated parent node wherein the cost to connect of the associated parent is the lowest of all available parent nodes.

Ogier-Shapiro-Herzog-Cromer teaches the additional limitation of claim 3. EX1002, ¶287.

First, Ogier teaches "*wherein the communication criteria comprises instructions for the AP node to select the associated parent node*" for the reasons provided in Section VIII.A.5.d) and VIII.A.5.f) [9C and 9E]. For example, a router (node F) selects its associated parent node (node H) by identifying the neighboring toward the destination (gateway 16) along the path that minimizes the total link cost. *See* EX1003, [0058], [0084], [0197]-[0198]. EX1002, ¶288.

Second, Ogier-Shapiro-Herzog-Cromer also teaches that the "*associated parent node*" is selected "*wherein the cost to connect of the associated parent is the lowest of all available parent nodes*." For example, the router can select a path to a destination using a "path selection algorithm" that "appl[ies] ***Dijkstra's algorithm*** to compute shortest path[] (with respect to cost, c) to [the destination node]." EX1003, [0198]. Similarly, Ogier discloses that the routing node can update the "shortest path tree" for TBRPF (EX1003, [0058]) by "run[ning] a shortest-path algorithm such as ***Dijkstra's algorithm***" (EX1003, [0084]). Because Dijkstra's algorithm finds the shortest path to the destination with respect to the total link costs, a POSITA would have understood that it would most likely find and select the parent node whose link cost is "*the lowest of all available parent nodes.*" EX1002, ¶¶289–290.

At a minimum, for certain networks, Dijkstra's algorithm would select the parent node whose link cost is "*the lowest of all available parent nodes*." For example, when Ogier's subnet 10 is arranged as below, with link costs shown as edge weights, Dijkstra's algorithm would select node H as the parent because the total link cost along the path F-H-G (=0.2) is lower than the total link costs along the path F-D-G (=0.4) and F-I-G (=0.6). In this case, the link cost to the associated parent node H is "*the lowest of all available parent nodes*" D, H, and I. EX1002, ¶¶290–291.



6. Claim 4

a) [4] The wireless mesh network of claim 1 wherein the communication criteria comprises instructions for the AP node to associate with an available parent node wherein the amount of AP data traffic is less than the sum of the maximum capacity amount of the available parent node and the available parent amount of AP data traffic.

During prosecution, Applicant introduced the additional limitation of claim 4 as claim 8 of the Preliminary Amendment filed on December 8, 2009. EX1008, 115. With the amendment, Applicant stated that "[i]n regards to claims 7 and 8, ¶45 teaches that each node, prior to selecting a parent for association, checks the capacity of the available parent as well as current network congestion levels of the available parent, and ***only associates with an available parent whose capacity has not been exceeded***." EX1008, 118. EX1002, ¶292.

To the extent the additional limitation of claim 4 merely requires "check[ing] the capacity of the available parent as well as current network congestion levels of the available parent, and only associat[ing] with an available parent whose capacity has not been exceeded," Ogier-Shapiro-Herzog-Cromer also teaches this limitation. EX1002, ¶293.

First, Ogier teaches that "*the communication criteria comprises instructions for the AP node to associate with an available parent node*" for the reasons provided in Section VIII.A.5.d) and VIII.A.5.f) [9C and 9E]. For example, a router (e.g., node F) selects its associated parent node (node H) by identifying the neighboring toward the destination (gateway 16) along the path that minimizes the total link cost. *See* EX1003, [0058], [0084], [0197]-[0198]. EX1002, ¶294.

Second, Ogier-Shapiro-Herzog-Cromer also teaches that the "*available parent node*" is associated with the AP node "*wherein the amount of AP data traffic is less than the sum of the maximum capacity amount of the available parent node and the available parent amount of AP data traffic*." EX1002, ¶295.

For example, in Figure 1 of Ogier, node F is not connected to any child node. Thus, the "*amount of AP data traffic*" for node F is zero, and that is less than the "*sum of the maximum capacity amount of the available parent node* [node D, H, or I] *and the available parent amount of AP data traffic*" because the maximum capacity amount for the available parent node (D, H, or I) would be non-zero. EX1002, ¶295.

Furthermore, the router would only associate with an available parent whose capacity has not been exceeded. As explained in Section VIII.D.2 [Ogier-Shapiro-Herzog-Cromer], if the available parent's capacity has exceeded, the link cost between the router and the available parent would be "infinite" (EX1003, [0101]), and the "path selection algorithm" would not choose the path (and thus the parent node) associated with an infinite link cost. EX1002, ¶296.

7. Claim 5

a) [5] The wireless mesh network of claim 4 wherein the communication criteria comprises instructions for the AP node to associate with a single suitable parent node wherein a parent node is suitable if the throughput capacity of the parent node is the highest of all available parent nodes.

During prosecution, Applicant introduced the additional limitation of claim 5 as claim 11 of the Preliminary Amendment filed on December 8, 2009. EX1008, 116. With the amendment, Applicant stated that "[c]laims 10 and 11 relate to throughput capacities. … Maximizing throughput as the parent selection criterion is discussed in ¶48." EX1008, 119. Paragraph 48 of the originally-submitted specification states: "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)." EX1008, 14. EX1002, ¶297.

To the extent the additional limitation of claim 5 requires "choos[ing] a parent that ensures the highest global throughput (GT)," Ogier-Shapiro-Herzog-Cromer teaches this limitation. EX1002, ¶298.

First, Ogier teaches "*wherein the communication criteria comprises instructions for the AP node to associate with a single suitable parent node*" for the reasons provided in Section VIII.A.6.a) [12H]. EX1002, ¶299.

Second, Ogier-Shapiro-Herzog-Cromer also teaches "*wherein a parent node is suitable if the throughput capacity of the parent node is the highest of all available parent nodes*." As explained in Section VIII.A.4 [Ogier-Shapiro-Herzog], the goodness factor reflects "a decaying average of periodically sampled ***throughput*** for a node." EX1004, [0048]. Thus, when Herzog's policy server defines the goodness factor as such and sets the weight W sufficiently high, Dijkstra's algorithm (EX1003, [0084], [0198]) would find a path that maximizes the total throughput along the path, i.e., global throughput. EX1002, ¶300.

8. Claim 6

a) The wireless mesh network of claim 1 wherein one of the datasets contained in an AP node comprises a throughput capacity of the AP node.

During prosecution, Applicant introduced the additional limitation of claim 6 as claim 10 of the Preliminary Amendment filed on December 8, 2009. EX1008, 115. With the amendment, Applicant stated that "[c]laims 10 and 11 relate to throughput capacities. The ***calculation of the throughput capacity at each node*** is discussed in ¶45 which provides a sample calculation of the throughput at a sample node. (See '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%.')." EX1008, 119. EX1002, ¶301.

To the extent the "calculation of the throughput capacity at each node" provides written description support for the additional limitation of claim 6, Ogier-Shapiro-Herzog-Cromer teaches it. EX1002, ¶302.

As described in Section VIII.D.7 [Claim 5], when Herzog's policy server defines the goodness factor based on "a decaying average of periodically sampled ***throughput*** for a node" and sets the weight W sufficiently high, Ogier's nodes would store, as link costs, the throughput of nodes forming the link, and Ogier's Dijkstra algorithm (EX1003, [0084], [0198]) would find a path that maximizes ***the global***

throughput of all nodes on the path. Thus, Ogier-Shapiro-Herzog-Cromer teaches calculating and storing the throughput capacity at each node, and also calculating the global throughput. EX1002, ¶¶303–304.

9. Claim 7

a) The wireless mesh network of claim 1 wherein the means for switching two-way data communications selects the second associated parent node when the first associated parent node amount of AP data traffic approaches the parent node maximum capacity amount within a congestion value set by the access server.

Ogier-Shapiro-Herzog-Cromer teaches the additional limitation of claim 7. EX1002, ¶305.

First, Ogier teaches "*wherein the means for switching two-way data communications selects the second associated parent node*" for the reasons provided in Section VIII.A.5.f)a [9E-1]. EX1002, ¶306.

Second, Ogier-Shapiro-Herzog-Cromer teaches that the "*second associated parent node*" is selected "*when the first associated parent node amount of AP data traffic approaches the parent node maximum capacity amount*." As described in Section VIII.D.2 [Ogier-Shapiro-Herzog-Cromer] and Sections VIII.D.4 and VIII.D.5 [Claims 2 and 3], a router selects a routing path or path tree with the lowest link cost, where the link cost reflects the extra capacity EC. When EC at the currently-associated parent node ("*first associated parent node*") is low ("*the first* *associated parent node amount of AP data traffic approaches the parent node maximum capacity amount*"), Ogier's path selection process would select another parent node ("*second associated parent node*") with a higher extra capacity EC, and thus, lower the link cost. *See* EX1003, [0084], [0198]. EX1002, ¶¶307–308.

Third, Ogier-Shapiro-Herzog-Cromer teaches or renders obvious that the "*maximum capacity amount within a congestion value set by the access server*." As an initial matter, the '243 Patent specification does not provide any written description—either directly or indirectly—for the requirement that the "*maximum capacity amount*" is set by the "*access server*." Thus, Ogier-Shapiro-Herzog-Cromer described in Section VIII.D.2 [Ogier-Shapiro-Herzog-Cromer] teaches this aspect of claim 7 to the same extent it is supported by the '243 Patent. EX1002, ¶309.

Moreover, it would have been obvious to further modify Ogier-Shapiro-Herzog-Cromer so that Herzog's policy server ("*access server*") distributes the instructions ("*congestion value*") specifying the "*maximum capacity amount*" for the routers. EX1002, ¶310.

As explained in Section VIII.A.4 [Ogier-Shapiro-Herzog], Herzog's server "translates the [network] policy into a set of lower-level instructions," and transmits the instructions to the nodes. *See* EX1005, [0005], [0029]. It was well known that the "*maximum capacity amount*" for routers would be set by the network policy provided by a policy server, such as Herzog's. EX1012, 27:16–18 ("Policies can be specified to control traffic flows in terms of overall bandwidth guarantees, ***bandwidth limits***, ..."); 50:17–18 ("Policy Server communicates the bandwidth requirement to the Internet router, which supports this function"). EX1002, ¶¶311–312.

Accordingly, it would have been obvious to further modify Ogier-Shapiro-Herzog-Cromer so that Herzog's policy server distributes the "instructions" specifying the "*maximum capacity amount*" for the routing nodes. A POSITA would have made such modification for substantially the same reasons set forth in Section VIII.A.4.b)a [Reasons-To-Combine Ogier-Shapiro-Herzog]. EX1002, ¶313.

E. Ground V: Ogier In View Of Shapiro, Herzog, Cromer, And Inouchi Renders Obvious Claims 1–7.

To the extent Patent Owner contends that Ogier-Shapiro-Herzog-Cromer in Ground IV fails to render Claims 1–7 obvious because it does not expressly teach "*a processor and a storage medium with instructions*" as required under the proposed construction of "*means for switching*" (limitation [1E]), that feature would have been obvious in view of Inouchi for the reasons provided in Section VIII.B [Ground II]. EX1002, ¶314.

IX. CONCLUSION

Petitioner respectfully requests that the Board institute *inter partes* review, and cancel the challenged claims.

Dated: August 27, 2025

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CERTIFICATION UNDER 37 C.F.R. § 42.24(d)

I hereby certify that this Petition for *Inter Partes* Review of U.S. Patent No. 7,885,243 has, excluding the portions exempted under 37 C.F.R. § 42.24(a), 13,955 words as counted by the word-processing system used to prepare this document, in compliance with 37 C.F.R. § 42.24(d).

Dated: August 27, 2025

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CERTIFICATE OF SERVICE

Under 37 C.F.R. §§ 42.6(e) and 42.105, the undersigned certifies that on August 27, 2025, complete copies of the foregoing and any accompanying exhibits were caused to be served by sending them via Federal Express Priority Overnight shipping, which is at least as fast and reliable as U.S. Priority Mail Express, to the correspondence address of record for U.S. Patent No. 7,885,243 as indicated in Patent Center:

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