

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

CISCO SYSTEMS, INC.,
Petitioner

IPR2024-01450
U.S. Patent No. 7,596,088

**PETITION FOR *INTER PARTES* REVIEW
UNDER 35 U.S.C. § 312 AND 37 C.F.R. § 42.104**

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PETITIONER’S EXHIBIT LIST

Ex.1001	U.S. 7,596,088
Ex.1002	Prosecution History of U.S. 7,596,088
Ex.1003	Declaration of Nader F. Mir under 37 C.F.R. § 1.68
Ex.1004	<i>Curriculum Vitae</i> of Nader F. Mir, Ph.D.
Ex.1005	U.S. Patent App. Publication 2005/0220026 to Dziong et al. (“Dziong”)
Ex.1006	U.S. Patent App. Publication 2004/0190445 to Dziong and Sathyanath (“Sathyanath”)
Ex.1007	U.S. Patent App. Publication 2003/0198213 to Jensen et al. (“Jensen”)
Ex.1008	Original Complaint, <i>Portsmouth Network Corp. v. Cisco Systems, Inc.</i> , No. 2:23-cv-441, Dkt. 1 (E.D. Tex. Sept. 26, 2023).
Ex.1009	Second Amended Complaint, <i>Portsmouth Network Corp. v. Cisco Systems, Inc.</i> , No. 2:23-cv-441, Dkt. 57 (E.D. Tex. Mar. 11, 2024).
Ex.1010	U.S. Patent App. Publication No. 2003/0172180 to Reynders et al. (“Reynders”)
Ex.1011	U.S. Patent No. 6,256,309 to Daley et al. (“Daley”)
Ex.1012	U.S. Patent App. Publication 2005/0232263 to Sagara. (“Sagara”)
Ex.1013	U.S. Patent App. Publication 2005/0141567 to Jaber et al. (“Jaber”)
Ex.1014	U.S. Patent App. Publication 2003/0053485 to Chuah et al. (“Chuah”)
Ex.1015	U.S. Patent App. Publication 2004/0141463 to Acharya et al. (“Acharya”)
Ex.1016	U.S. Patent App. Publication 2004/0037279 to Zelig et al. (“Zelig”)

Ex.1017	U.S. Patent No. 6,765,927 to Martin et al. (“Martin”)
Ex.1018	U.S. Patent No. 6,721,272 to Parnafes et al. (“Parnafes”)
Ex.1019	U.S. Patent App. Publication 2004/0068558 to De Miguel. (“De Miguel”)
Ex.1020	U.S. Patent App. Publication 2002/0194362 to Rawlins et al. (“Rawlins”)
Ex.1021	U.S. Patent App. Publication 2003/0227919 to Zelig et al. (“Zelig et al”)
Ex.1022	U.S. Patent App. Publication 2005/0265365 to Wan. (“Wan”)
Ex.1023	U.S. Patent App. Publication 2005/0094554 to Nakash. (“Nakash”)
Ex.1024	U.S. Patent No. 6,594,279 to Nguyen et al. (“Nguyen”)
Ex.1025	U.S. Patent No. 6,058,104 to Snelling et al. (“Snelling”)
Ex.1026	U.S. Patent No. 5,867,666 to Harvey. (“Harvey”)
Ex.1027	U.S. Patent No. 6,731,395 to Shiohara. (“Shiohara”)
Ex.1028	U.S. Patent App. Publication 2004/0071013 to Yoon et al. (“Yoon”)
Ex.1029	U.S. Patent App. Publication 2003/0221061 to El-Batal et al. (“El-Batal”)
Ex.1030	U.S. Patent App. Publication 2004/0193729 to Saraph. (“Saraph”)
Ex.1031	U.S. Patent App. Publication 2004/0008687 to Matsubara. (“Matsubara”)
Ex.1032	U.S. Patent No. 6,839,346 to Kametani. (“Kametani”)
Ex.1033	U.S. Patent No. 6,850,976 to Xia (“Xia”)
Ex.1034	U.S. Patent App. Publication 2005/0220123 to Wybenga et al. (“Wybenga”)

Ex.1035	U.S. Patent App. Publication 2005/0232285 to Terrell et al. (“Terrell”)
Ex.1036	U.S. Patent App. Publication 2005/0262238 to Reeves et al. (“Reeves”)
Ex.1037	U.S. Patent App. Publication 2005/0259591 to Moore et al. (“Moore”)
Ex.1038	U.S. Patent App. Publication 2005/0220096 to Friskney et al. (“Friskney”)
Ex.1039	Internet Engineering Task Force Request for Comments 3031 (Jan. 2001) (“RFC3031”)
Ex.1040	RSVP-TE: Extensions to RSVP for LSP Tunnels Request for Comments 3209 (December 2001) (“RFC3209”)
Ex.1041	U.S. Patent App. Publication 2009/0052457 to Salama et al. (“Salama”)
Ex.1042	Internet Engineering Task Force Request for Comments 2026 (Oct. 1996) (“RFC2026”)

I. INTRODUCTION

Pursuant to 35 U.S.C. §§ 311, 314(a), and 37 C.F.R. § 42.100, Cisco Systems, Inc. (“Petitioner”) respectfully requests that the Board review and cancel as unpatentable under (pre-AIA) 35 U.S.C. §103(a) claims 1-4, 6-11, and 13-20 (hereinafter, the “Challenged Claims”) of U.S. 7,596,088 (the “’088 Patent,” Ex.1001).

The ’088 Patent relates to computer networks and describes the “sharing of bandwidth among connections in the network” and selecting a preferred route that requires the minimum amount of “cumulative additional bandwidth reservation.” Ex.1001, Abstract. Such concepts were not new. The prior art Dziong reference discloses that “bandwidth for [a] link can be shared with other links in the network,” and thus, a new connection may be “accommodated without requiring any additional bandwidth.” Ex.1005, [0065], [0134]. Dziong incorporates the Sathyanath reference, which further describes “bandwidth sharing” and “choosing a restoration path that would require a minimum amount of additional bandwidth to be reserved along its links.” Ex.1006, [0012], [0200].

Petitioner requests that the Board institute IPR trial and find the Challenged Claims unpatentable.

II. GROUNDS FOR STANDING

Petitioner certifies that the ’088 patent is eligible for IPR and that Petitioner

is not barred or estopped from requesting IPR challenging the patent claims. 37 C.F.R. § 42.104(a).

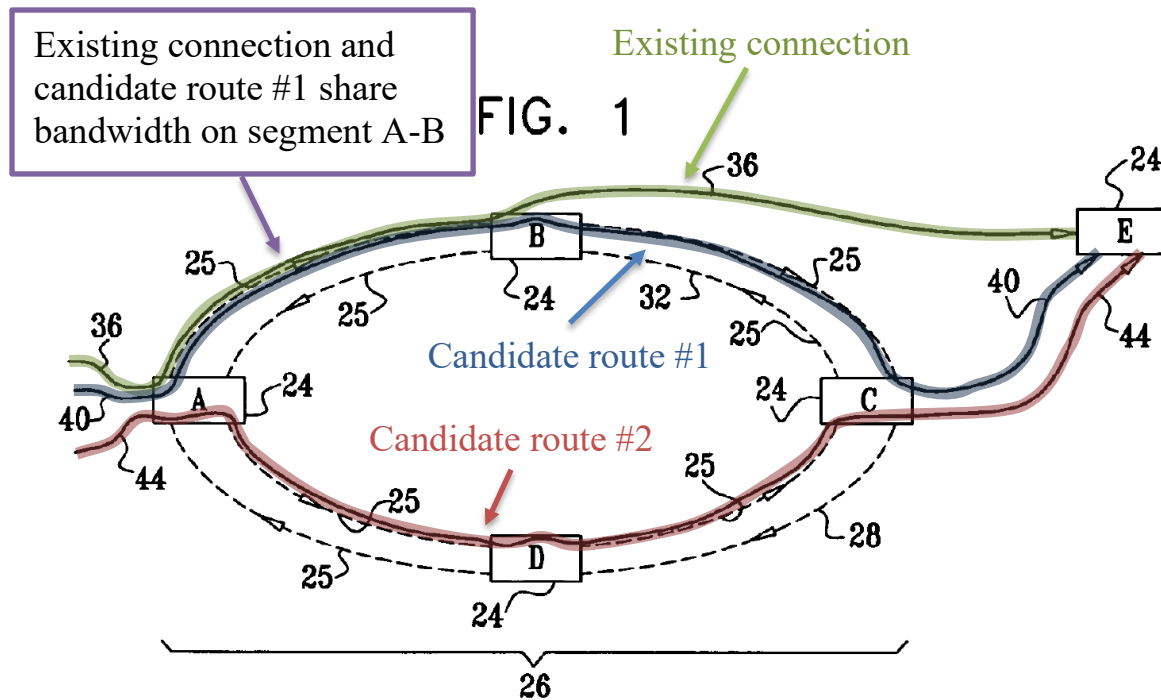
III. NOTE

Petitioner cites to exhibits' original page numbers. **Emphasis** in quoted material has been added. Claim terms are presented in *italics*.

IV. SUMMARY OF THE '088 PATENT

The '088 patent describes optimizing route selection in communication networks by allowing bandwidth sharing among connections. Ex.1001, Abstract. Bandwidth sharing may be viable when the connections will not simultaneously use their allocations, for example, where a connection acts as a protection path in the event of another connection's failure. Ex.1001, 5:4-15.

When choosing a route, multiple candidate routes are evaluated. Ex.1001, Abstract. For each segment of a candidate route, the '088 patent describes calculating the how much additional bandwidth needs to be reserved for the new connection. Ex.1001, Abstract. Where the new connection can share all its bandwidth with other, existing reservations, the additional bandwidth may be as low as zero. Ex.1001, 8:41-60, 9:1-15. A preferred route is chosen as the candidate route that requires the least amount of new bandwidth reservation across the entire route.



Ex.1001, Fig. 1 (annotated).

For example, Fig. 1 shows an existing network connection A-B-E with bandwidth of 100 Mbs. Ex.1001, 4:44-47. For a new connection between nodes A and E having bandwidth of 50 Mbs, two candidate routes are identified as A-B-C-E and A-D-C-E. Ex.1001, 4:52-63. Since the new connection can share bandwidth with the exist connection on the segment A-B, no new bandwidth needs to be reserved for the new connection on that segment. Ex.1001, 5:4-5, 5:15-19. In contrast, new bandwidth reservations are required for every segment of candidate route A-D-C-E. Thus, the method of the '088 patent will choose candidate route A-B-C-E as a preferred route. Ex.1001, 5:42-43.

V. PROSECUTION HISTORY

The application for the '088 patent (U.S. Patent Application No. 11/339,148) was filed on January 24, 2006. Ex.1002, 37.

After two non-final Office actions, the claims were rejected in a final Office action as obvious over U.S. 7,092,356 to Rabie in view U.S. 2007/0140233 to Ishibashi, and U.S. 2005/0249121 to Matsunaga. Ex.1002, 198.

In an after-final Examiner Interview, the Applicant emphasized that the “sum of link costs” disclosed in Matsunaga failed to render obvious the claimed “sum of cumulative additional bandwidth reservation” because Matsunaga’s calculation “depends on various factors other than bandwidth.” Ex.1002, 246. Applicant emphasized that in contrast with the claimed subject matter, with Matsunaga’s technique, “it is not possible to choose a path with zero link cost.” Ex.1002, 248 (emphasis in original). The claims were subsequently allowed. Ex.1002, 274-276.

VI. EFFECTIVE PRIORITY DATE OF THE '088 PATENT

The '088 patent was filed on January 24, 2006 with no claim of priority to any earlier application. Accordingly, Petitioner has not undertaken a priority date analysis. Petitioner does not waive any right or opportunity it may have to dispute the priority date of the '088 patent in this or another forum where the issue becomes relevant.

VII. LEVEL OF ORDINARY SKILL IN THE ART

A POSITA in the field of the '088 patent, as of its priority date, would have been someone knowledgeable and familiar with the network communications technologies discussed in its specification, including bandwidth reservations, quality of service techniques, routing protocols (including Open Shortest Path First (OSPF)), tunneling protocols (including Multiprotocol Label Switching (MPLS)), resource reservations (including Resource ReSerVation Protocol (RSVP)), traffic engineering (including relevant extensions to OSPF, IS-IS, and RSVP), and ring networking standards (e.g., Synchronous Optical Network (SONET) and resilient packet ring (RPR) defined by IEEE 802.17). Ex.1003, ¶¶20-21; *see* Ex.1001, 1:13-61, 2:4-12, 4:67-5:3, 5:20-26, 6:23-26.

Such a POSITA would have a bachelor's degree in computer science, computer engineering, electrical engineering, or equivalent training, and approximately four years of experience working in the field of network communications, including experience with MPLS tunnels and bandwidth allocation. Additional work experience can substitute for specific educational background, and vice versa. Ex.1003, ¶21.

VIII. CLAIM CONSTRUCTION

Claim terms in IPR are construed according to their “ordinary and customary meaning” to those of skill in the art. 37 C.F.R. § 42.100(b). Petitioner submits that,

for the purposes of this proceeding and the grounds presented herein, no claim term requires express construction. *Nidec Motor Corp. v. Zhongshan Broad Ocean Motor Co.*, 868 F.3d 1013, 1017 (Fed. Cir. 2017).

IX. RELIEF REQUESTED AND THE REASONS FOR THE REQUESTED RELIEF

Petitioner asks that the Board institute a trial for *inter partes* review and cancel the Challenged Claims.

X. IDENTIFICATION OF HOW THE CLAIMS ARE UNPATENTABLE

A. Challenged claims

Petitioner challenges claims 1-4, 6-11, and 13-20.

The '088 patent was asserted in district court litigation against Petitioner. Ex.1008, 1. Although the patent was dropped from the litigation in a later-filed amended complaint (Ex.1009, 1), the plaintiff's decision to withdraw the assertion does not affect Petitioner's deadline for challenging the '088 patent via *inter partes* review. 35 U.S.C. § 315(b). A finding by this Board that the Challenged Claims are unpatentable will definitively resolve the parties' dispute and obviate the possibility of renewed litigation involving the '088 patent.

B. Statutory grounds for challenges

Ground	Claims	Basis - 35 U.S.C. § 103 (Pre-AIA) over:
#1	1-4, 6, 8-11, 13, 15-20	Dziong and Sathyanath
#2	7, 14	Dziong, Sathyanath, and Jensen

U.S. Patent Application No. 2005/0220026 to Dziong et al. (Ex.1005, “**Dziong**”) was filed on April 2, 2004 and published on October 6, 2005.

U.S. Patent Application No. 2004/0190445 to Dziong and Sathyanath (Ex.1006, “**Sathyanath**”)¹ was published on September 30, 2004.

U.S. Patent Application No. 2003/0198213 to Jensen et al. (Ex.1007, “**Jensen**”) was published on October 23, 2003.

Dziong is prior art under Pre-AIA 35 U.S.C. § 102(a) and (e). Sathyanath, and Jensen are prior art under Pre-AIA 35 U.S.C. § 102(b).²

C. Additional prior art cited

Petitioner also cites to additional evidence demonstrating the background knowledge of a POSITA and providing contemporaneous context to support

¹ Ex.1005 and Ex.1006 share the same first-named inventor (Zbigniew M. Dziong), so this Petition refers to Ex.1006 by its second-named inventor, Ajay Sathyanath.

² Even if the ’088 patent was an AIA patent, all the references would still qualify as prior art under post-AIA 35 U.S.C. § 102(a).

Petitioner's assertions regarding what a POSITA would have understood from the prior art in the grounds. *See Qualcomm Inc. v. Apple Inc.*, 24 F.4th 1367, 1375 (Fed. Cir. 2022) (“a petitioner may rely on evidence beyond prior art documents in an *inter partes* review”); *Yeda Research v. Mylan Pharm. Inc.*, 906 F.3d 1031, 1041-1042 (Fed. Cir. 2018) (affirming the use of “supporting evidence relied upon to support the challenge”); 37 C.F.R. §42.104(b).

To the extent necessary, these background references qualify as prior art. For example, IETF Request for Comments documents, such as RFC3031 and RFC3209, are prior art printed publications. *See, e.g.*, Ex.1042, 6, (“RFCs can be obtained from a number of Internet hosts...”), 8 (IETF documents are “readily available to a wide audience”), 26 (IETF participants “shall publicly announce...every activity” relating to the standardization process). The Board has repeatedly found IETF documents, including RFCs, to be “printed publications.” *See, e.g., Apple, Inc. v. VirnetX, Inc.*, IPR2017-00337, Paper 31, 46-47 (May 30, 2018) (RFCs are “precisely the type of documents whose main purpose is for public disclosure”); *Riot Games, Inc. v. Paltalk Holdings, Inc.*, IPR2018-00130, Paper 11, 30-33 (May 15, 2018) (RFCs are printed publications). Numerous citations to these RFC documents in prior art patents and patent publications confirm that they were known to and accessed by those of skill in the art. *See* Ex.1006, [0056]; Ex.1021, [0007], [0010]. The '088 patent admits that such

documents were publicly available. Ex.1001, 1:21-30.

D. Statement of Material Facts

1. MPLS was a well-known networking protocol for creating tunnels. Ex.1003, ¶¶20, 27, 144; Ex.1012, [0005] (“MPLS (Multi-Protocol Label Switching), VPN (Virtual Private Network), etc. are well-known assurance techniques in communication quality on networks.”); Ex.1013, [0065] (“standard Multi-Protocol Label Switching (MPLS) labels, such as those described in the well-known RFC-3031 document, may also be used”); Ex.1014, [0002] (“...Multi Protocol Label Switching (MPLS), which is well-known in the art.”); Ex.1015, [0022] (“MPLS networks make use of Label Switch Paths (LSPs) which are paths established by network operators for a variety of purposes, such as...to create IP tunnels for network-based virtual private networks.... MPLS is a well known data networking protocol....”); Ex.1016, [0006] (“Since the flow of packets along a label-switched path (LSP) under MPLS is completely specified by the label applied at the ingress node of the path, a LSP can be treated as a tunnel through the network.”); Ex.1039, 32.
2. Resource Reservation Protocol (RSVP) was a well-known protocol for provisioning an end-to-end network path with a specified quality of service. Ex.1003, ¶¶20, 27; Ex.1017, 1:22-25, 4:59-61 (“One standard element is a signaling protocol through which a QoS may be provisioned end-to-end for a

flow. This signaling protocol is called the Resource Reservation Protocol (RSVP)... [The] format and content of such a packet is well known and described in RFC 2205.”); Ex.1018, 2:64-3:2 (“To obtain desired qualities of service (QoS), mechanisms can be used to reserve resources across a network along a path between a source and destination of a traffic flow. For example, the Resource Reservation Protocol (RSVP) provides a mechanism by which such resource reservations can be made”); Ex.1019, [0017] (“The protocol here is of RSVP type (‘Resource ReSeRvation Protocol’), which is well known...”); Ex.1020, [0013] (“...the well-known Resource ReSeRvation Protocol (RSVP) defined by IETF RFC 2205...”).

3. RSVP-TE was a well-known extension to the RSVP protocol that was used for creating traffic engineering tunnels. Ex.1003, ¶¶20, 27; Ex.1021, [0010] (“Label distribution protocols are needed in order to set up and bind MPLS tunnels. One example of such a protocol is RSVP-TE, which is available as the IETF document RFC-3209, entitled “RSVP-TE: Extensions to RSVP for LSP Tunnels.” RSVP-TE provides several objects that extend the well-known Resource Reservation Protocol (RSVP), allowing the establishment of explicitly routed LSP's using RSVP as a signaling protocol.”); Ex.1001, 2:4-9 (“...some known tunnel creation and reservation protocols, such as RSVP-TE...”).

4. It was known in the art to use MPLS in ring networks. Ex.1003, ¶27; Ex.1021, [0012] (“MPLS and LSP techniques have been employed to some extent in networks having ring configurations.”); Ex.1022, [0050] (“establish a ring bearing network... directly at the Multi Protocol Label Switching (MPLS) layer”); Ex.1023, [0012] (“...a method for protecting packets of MPLS traffic in networks comprising traffic nodes arranged in a ring-like configuration (a ring)...”).
5. A network node must have a network interface to transmit and receive information on a network. Ex.1003, ¶28; Ex.1024, 4:44-49 (“In order to transport IP packets over a SONET... a **network interface component is required** for multiplexing IP packets into SONET frames and demultiplexing IP packets from SONET frames.”); Ex.1025, 7:23-25 (“[D]igital services require a Network Interface especially adapted to interface to a particular medium, format and protocol.”); Ex.1026, 1:17-21 (“When the local area network uses a protocol such as ethernet or token ring, devices to be coupled to the local area network **generally require a network interface** card or a similar device to establish connectivity.”); Ex.1027, 1:37-39 (“conventional printer requires the network interface board 5 in the case of coupling the printer to the network.”); Ex.1028, [0111] (“a standalone computer that is not coupled to a network does not require [a]

Network Interface”); Ex.1029, [0042] (“The network connection requires a network interface...”).

6. A network node, such as a router or server, must have a processor. Ex.1003, ¶28; Ex.1030, [0010] (“an IP router requires a processor”); Ex.1031 [0040] (“a control program in storage that provides the intelligence of the node and is executed by the **conventional node processor** to manage information received”); Ex.1032, 1:55-58 (“in the conventional example of the packet switching apparatus, **the routing process to all packets is carried out by the microprocessor** 101 under the software control); Ex.1033, 4:50-54 (“components found in a conventional router, such as a processor, a real-time operating system, and programs and hardware that implement the routing and switching functions”); Ex.1034, [0005] (“Traditionally, a single processor is used to forward all packets in a router or switch.”); Ex.1035, [0005] (“Network nodes that implement services in a server (e.g., software running on general purpose central processor unit's (CPU's)).... Network nodes that implement services in a switch (e.g. microcode running in port processors)....”).

E. Ground 1

1. Dziong

Dziong proposes “[a] protected communication network.” Ex.1005, Abstract. In the event of a failure on a primary path, network traffic is rerouted to a backup path, also called a recovery path, link-detour path, or protection path. Ex.1005, [0007]-[0008], [0083]. Dziong notes that modern networks “have very high reliability,” so the likelihood of needing to use the backup path is low, and the chance of needing multiple backup paths simultaneously is even lower. Ex.1005, [0037]. Thus, Dziong describes how “bandwidth reserved for recovery of a particular [connection] can be shared with bandwidth reserved for recovery of other disjoint [connections].” Ex.1005, [0088]. When there are multiple potential recovery paths available, Dziong describes choosing the recovery path that will maximize the amount of bandwidth sharing in the network. Ex.1005, [0038], [0060], [0065]. Dziong does this by evaluating a “link-cost function” for each link in a candidate recovery path and summing their costs. Ex.1005, [0065], [0112]-[0113]. The candidate “path with the lowest cost” is chosen as the recovery path. Ex.1005, [0065].

Dziong is in the same field of endeavor as the ’088 patent, namely, communication networks. Ex.1001, 1:6-9; Ex.1005, [0004]. Dziong is also reasonably pertinent to a problem addressed by the ’088 patent, namely, improving

the establishment of network connections by sharing bandwidth. Ex.1001, 2:13-17; Ex.1005, [0058] (“Embodiments of the present invention may include a distributed method for calculating primary and link-detour paths in a mesh network. This method improves the number of connections admitted to a network.... Improvement... results from... sharing of the recovery bandwidth....”).

2. Sathyanath

Sathyanath describes a “method for determining a restoration path [i.e., protection path] corresponding to a primary path.” Ex.1006, Abstract, [0078] (“protection path (also known as ‘restoration path’)”). Like Dziong, Sathyanath promotes the “[e]fficient use of restoration capacity... using sharing.” Ex.1006, [0045]. Sathyanath also evaluates potential paths by evaluating a “link-cost function,” then summing the link costs to arrive at a path cost. Ex.1006, [0124]. Sathyanath’s link-cost function leads to “choosing a restoration path that would require the minimum amount of additional bandwidth to be reserved along its links.” Ex.1006, [0200].

Sathyanath is in the same field of endeavor as the ’088 patent, namely, communication networks. Ex.1001, 1:6-9; Ex.1006, [0004]. Sathyanath is also reasonably pertinent to a problem addressed by the ’088 patent, namely, improving the establishment of network connections using bandwidth sharing information. Ex.1001, 2:13-17; Ex.1006, [0009] (“Problems in the prior art are addressed in

accordance with principles of the present invention by... dissemination of the sharing information within the network, and improved service primary and restoration path calculation as a function of the sharing information.”).

3. Reasons to combine Dziong and Sathyanath

Dziong expressly refers to Sathyanath by its application number (10/673,057) and incorporates Sathyanath’s contents by reference. Ex.1005, [0001]. It would have been obvious to a POSITA considering Dziong to also refer to and consider Sathyanath because Dziong expressly directs and encourages this. Ex.1003, ¶38.

A POSITA would have found Sathyanath’s examples instructive regarding the operation of Dziong’s bandwidth-sharing concepts. Ex.1003, ¶38. Dziong and Sathyanath both describe multiple examples to illustrate how their bandwidth-sharing concepts would work in various scenarios and network designs. Petitioner’s analysis below shows how all the claimed features are taught in the prior art, with many of the claimed features repeatedly illustrated in multiple examples from Dziong and Sathyanath. Petitioner’s analysis is not based on bodily incorporating or physically combining the networks of these multiple examples; rather, Petitioner relies on what the collected examples would have suggested to a POSITA. *See In re Mouttet*, 686 F.3d 1322, 1332 (Fed. Cir. 2012); *In re Keller*, 642 F.2d 413, 425 (CCPA 1981). It would have been obvious to a POSITA to

combine various features of different examples in Dziong and Sathyanath because they both encourage doing so. Ex.1005, [0027] (separately described embodiments are not “mutually exclusive”), [0196] (contemplating “modifications of the described embodiments”); Ex.1006, [0037] (separately described embodiments are not “mutually exclusive”), [0295] (contemplating “modifications of the described embodiments”); Ex.1003, ¶39.

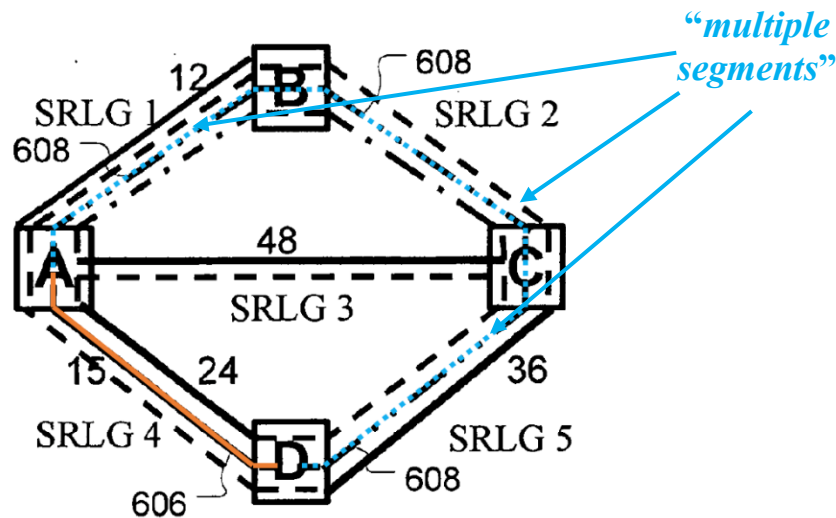
4. Claim 1

[1.0] *A method for establishing a connection through a communication network that includes multiple segments, comprising:*

Dziong describes a “variety of link-based recovery mechanisms” for calculating a recovery path for a network connection. Ex.1005, [0072]-[0073], claim 1 (“A link-based recovery **method**...”). Dziong also refers to a recovery path as a link-detour path or a protection path. Ex.1005, [0058], [0008]-[0009]. When creating a new connection between two nodes, Dziong teaches to “**establish the primary path and link-detour paths for the connection.**” Ex.1005, [0058]. “Dziong’s link-detour path is itself ‘*a connection.*’” Ex.1003, ¶43; *see* Ex.1001, 5:5-8 (describing a “new connection... set up to protect” another connection); Ex.1005, [0084] (describing “link-recovery mechanisms” that are implemented “per... connection”).

Dziong illustrates in Fig. 6a (below) a network with four nodes (A, B, C, and

D) and multiple links (“*multiple segments*”) among those nodes. *See* Ex.1001, 4:34-36 (“network links, referred to as segments”); Ex.1003, ¶¶46-47. Solid line 606 corresponds to a bandwidth demand of 15 units between nodes A and D. Ex.1005, Fig. 6a, [0088]-[0089]. Dziong refers to this demand as shared-risk link group (SRLG) 4. Ex.1005, Fig. 6a, [0070], [0089]. Broken lines 608 “between nodes A and B, nodes B and C, and nodes C and D,” are links (“*segments*”) in a recovery path (“*a connection*”) that protects the link from node A to node D. Ex.1005, Fig. 6a, [0089]. Thus, the broken lines 608 connecting node A to node D (via nodes B and C) are collectively a “*connection through a communication network that includes multiple segments.*” Ex.1003, ¶47. It would have been obvious to a POSITA to use the link detour calculation techniques described in Dziong and Sathyanath to “*establish[]*” the recovery path A-B-C-D. Ex.1003, ¶47; *see* Ex.1005, [0058] (“...signal to establish the primary path and link-detour paths for the connection...”).



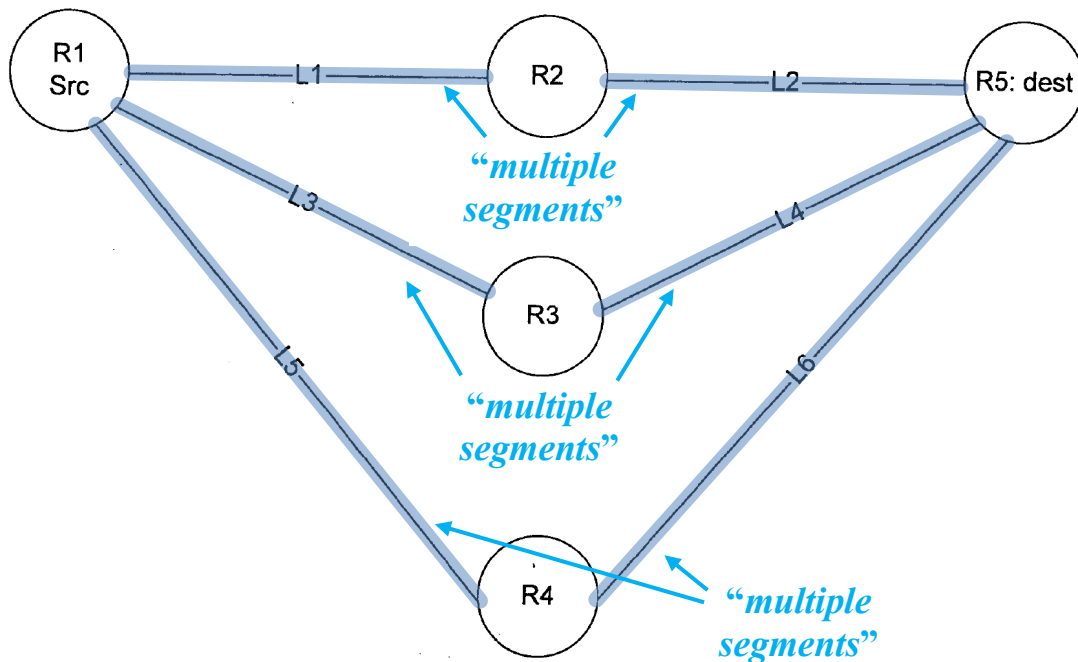
Ex.1003, ¶46; Ex.1005, Fig. 6a (annotated).

Dziong’s disclosure generally focuses on “optical or SONET network examples” but emphasizes that its techniques “can be applied to networks based on different technologies and topologies.” Ex.1005, [0076]. Dziong expressly refers to and incorporates the disclosure of Sathyanath, which describes similar failure-recovery ideas. Ex.1005, [0001]; Ex.1006, Abstract.

Sathyanath explains that recovery paths can be employed in a variety of network types, including “Sonet, ATM, frame relay, MPLS.” Ex.1006, [0049]. “MPLS” refers to multiprotocol label switching, which a POSITA would have been familiar with. Ex.1006, [0049] (referencing the MPLS “architecture standard,” RFC3031); Ex.1003, ¶¶20-21, 27; Material Fact #1. Using MPLS, label-switched paths (LSPs) are established through a network to carry traffic. Sathyanath specifically describes “establishing primary and protection LSPs.”

Ex.1006, [0056]. Sathyanath's example of establishing a protection (or recovery) LSP renders obvious "*establishing a connection.*" Ex.1003, ¶44. Since Dziong does not specify a protocol used to establish link-detour paths, it would have been obvious to use MPLS as described by Sathyanath. Ex.1003, ¶44.

Sathyanath illustrates in Fig. 17 (below) a further example of a "*communication network that includes multiple segments.*" Ex.1006, [0215]. Each of the links L1 through L6 is a "*segment[]*." Ex.1003, ¶48.



Ex.1003, ¶48; Ex.1006, Fig. 17 (annotated).

In summary, Dziong and Sathyanath describe establishing a recovery path through a network having multiple links, which renders obvious the preamble. Ex.1003, ¶¶40-49.

[1.1] *identifying two or more candidate routes for a new connection having a requested bandwidth to be established through the network;*

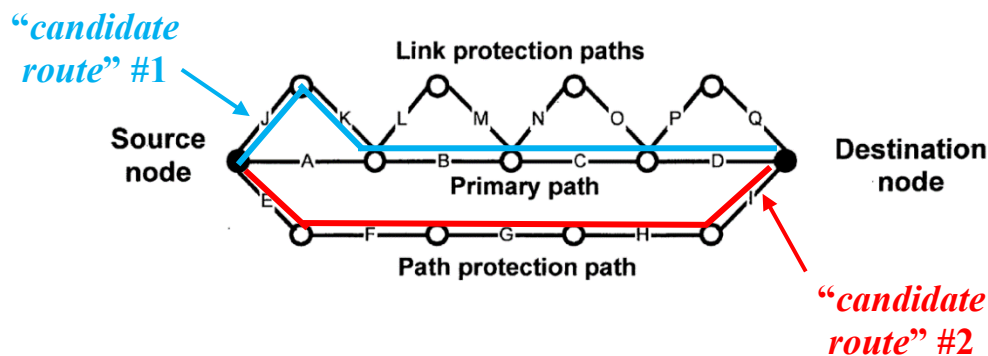
As discussed at [1.0], Dziong describes a method to “establish the primary path and link-detour paths for [a] connection.” Ex.1005, [0058], [0010].

Dziong provides that “a link’s detour path is calculated using link-state and link-cost functions” to determine “a minimum-cost link-detour path” that “takes into account link-sharing capabilities.” Ex.1005, [0104], [0107]. The detour paths considered in the minimum-cost link-detour path calculation are “*candidate routes*.” Ex.1003, ¶¶51-55.

Dziong expressly contemplates identifying and evaluating “two or more candidate LD [link-detour] paths” (“*two or more candidate routes*”). Ex.1005, claim 3. Dziong further describes evaluating and choosing among multiple potential routes by “summing the cost of each link in each candidate LD [link-detour] path” and “choosing the path with the lowest cost.” Ex.1005, [0065]. Thus, it would have been obvious to a POSITA when calculating a “minimum cost link-detour path” to consider two or more potential recovery paths (“*candidate routes*”), such that one path had less cost than the other and therefore is the **minimum** cost. Ex.1005, [0104]; *see also* [0065], [0168]; Ex.1003, ¶52.

Dziong illustrates the concept of “*identifying two or more candidate routes for a new connection... to be established*” in the example of Figure 5. The figure

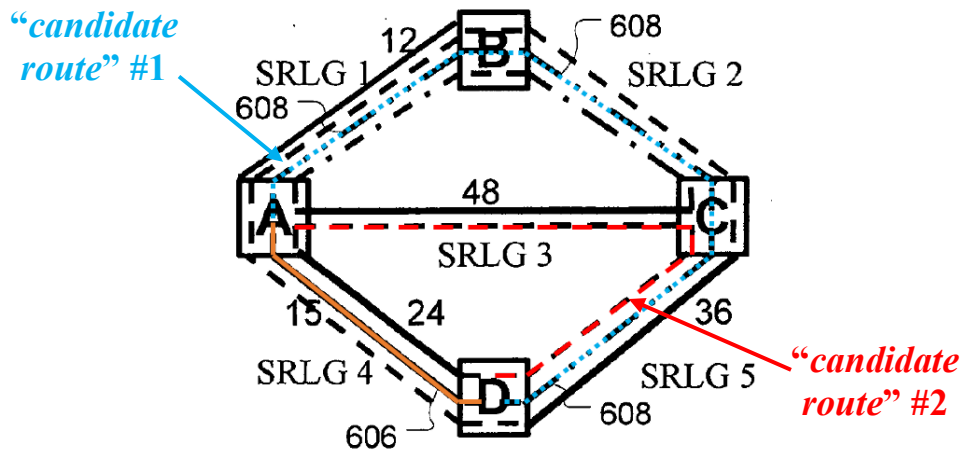
shows “a simple network with both path-based and link-based recovery paths.” Ex.1005, [0070]. In case of a failure along the path A-B-C-D, one *candidate route* is “recovery path E-F-G-H-I.” Ex.1005, [0070]. Alternatively, “in the case of a failure of link A, demands that were carried on that link can be rerouted to LD [link detour] path J-K,” and then continue along the remainder of the primary path, B-C-D; hence, a second *candidate route* is J-K-B-C-D. Ex.1005, [0070]. Yet another potential path that protects against a failure of link A is the recovery path E-F-G-H-I-D-C-M-L; hence, a third *candidate route* is E-F-G-H-I-D-C-M-L-B-C-D. Ex.1005, [0070]; Ex.1003, ¶53-54.



Ex.1003, ¶ 53; Ex.1005, Fig. 5 (annotated).

Dziong further illustrates “*identifying two or more candidate routes for a new connection... to be established*” in Figure 6a (below). As discussed at [1.0], SRLG 4 corresponds to a primary path connection from node A to node D. Ex.1005, [0089]. It would have been immediately obvious to a POSITA that two alternative pathways from node A to node D are: 1) recovery path 608 A-B-C-D

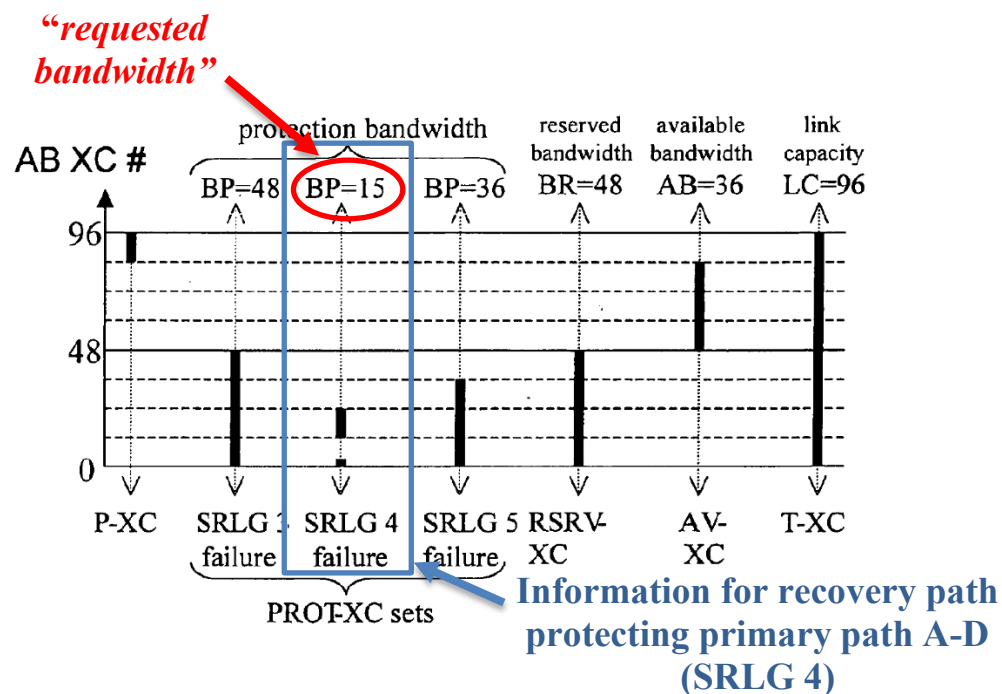
(dotted blue) and 2) recovery path A-C-D (dashed red). Ex.1005, Fig. 6a; Ex.1003, ¶55.



Ex.1003, ¶55; Ex.1005, Fig. 6a (annotated).

Dziong explains that “SRLG 4 corresponds to one or more demands totaling 15 units of bandwidth between nodes A and D.” Ex.1005, [0089]. Dziong also describes “providing sufficient recovery bandwidth... to accommodate a failure” on a primary path. Ex.1005, [0036]. In other words, a recovery path needs to provide the same amount of bandwidth as the primary path it protects. Ex.1003, ¶56. Since the reserved bandwidth on the A-D primary path is 15 units, it would have been obvious for the candidate recovery paths A-B-C-D and A-C-D to have the same “*requested bandwidth*” (15 units) to ensure that the primary path’s traffic could be accommodated on the recovery path if needed. Ex.1005, [0104] (“the protection path... should have available bandwidth AB_i at least as large as the

protected connection bandwidth”), [0105]; Ex.1003, ¶56. Dziong confirms this understanding via Fig. 6b. The bandwidth reservation table 604 for link A-B (Fig. 6b) that the same amount—15 units—is reserved to protect SRLG 4. Ex.1005, [0090], Fig. 6b; Ex.1003, ¶¶57, 68. Thus, it would have been obvious to a POSITA that when the SRLG 4 primary path was established for 15 units of bandwidth, a corresponding recovery path was requested to have an equal amount of bandwidth, that is, 15 units of bandwidth. Ex.1003, ¶57.



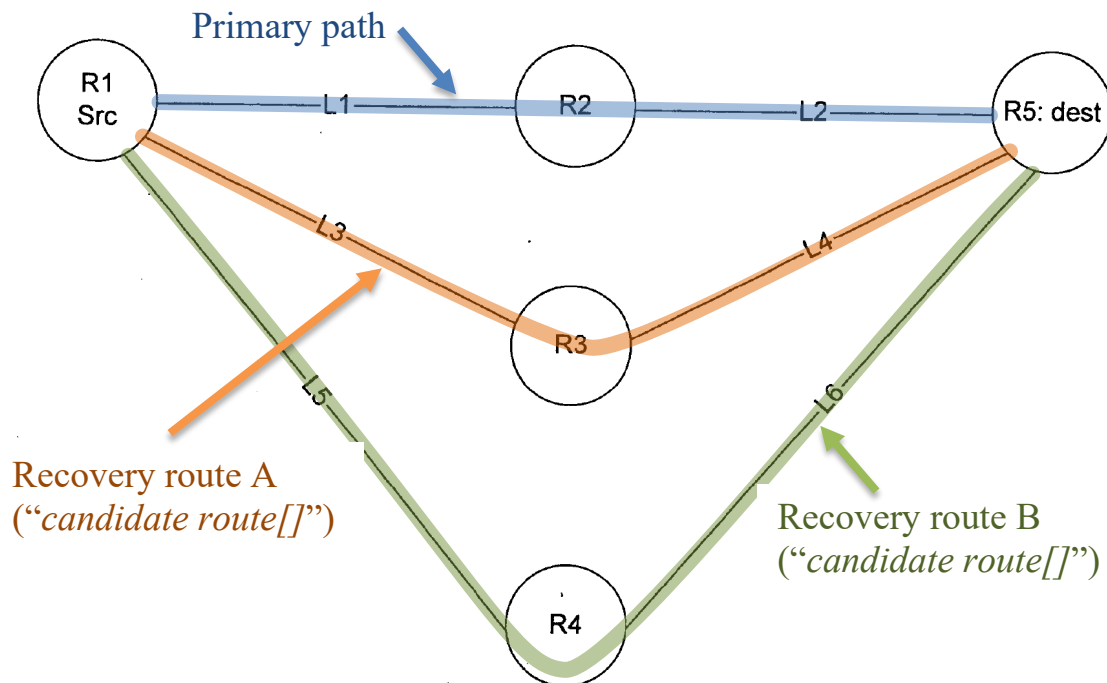
Ex.1003, ¶57; Ex.1005, Fig. 6b (annotated).

Any of Dziong’s recovery paths (any link-detour path, recovery path, or protection path) is itself “a new connection.” Dziong provides that during setup “for a new service,” a working path is computed “with **protection paths** for each

link in the working path.” Ex.1005, [0052]. A POSITA would have found it obvious that the protection paths are for “*a new connection*” because they will provide protection for a “new service” on another path. Ex.1003, ¶¶58-59. The ’088 patent specification confirms that a new protection path is a “*new connection*.” See Ex.1001, 4:64-5:19 (“...the new connection may be set up to protect the existing connection against failure of a node or segment along its route.”).

Sathyanath provides further examples of “*identifying*” potential recovery paths. Ex.1003, ¶60. Sathyanath describes how “to **identify**, for each new service, an optimal combination of a primary path and **a restoration path**.” Ex.1006, [0187]; *see also* [0078] (“protection path (also known as ‘restoration path’)”).

As discussed at [1.0], Sathyanath’s Fig. 17 illustrates a “*network*.” The figure shows a “primary path L1-L2 with four units of bandwidth.” Ex.1006, [0215]. As potential recovery paths, Sathyanath identifies “two possible disjoint routes (with respect to the primary path) to the destination, namely route A (L3-L4) and route B(L5-L6).” Ex.1006, [0215].



Ex.1003, ¶61; Ex.1006, Fig. 17 (annotated).

Sathyanath’s route A and route B in Fig. 17 are “*two or more candidate routes for a new connection... to be established.*” Since the primary path has bandwidth of four units, it would have been obvious to a POSITA that the corresponding recovery path would also require four units of bandwidth (“*having a requested bandwidth*”). Ex.1003, ¶62; *see* Ex.1006, [0222] (Route B requires “no additional units of bandwidth... since 4 units have been reserved already”).

In summary, Dziong and Sathyanath describe examples of identifying a plurality of protection paths (“*identifying two or more candidate routes for a new connection*”) that each have a corresponding bandwidth (“*having a requested bandwidth to be established through the network*”), which renders this limitation

obvious. Ex.1003, ¶¶50-63.

[1.2] *providing a sharing definition specifying one or more other connections, which have respective bandwidths and which are permitted to share a bandwidth allocation with the new connection,*

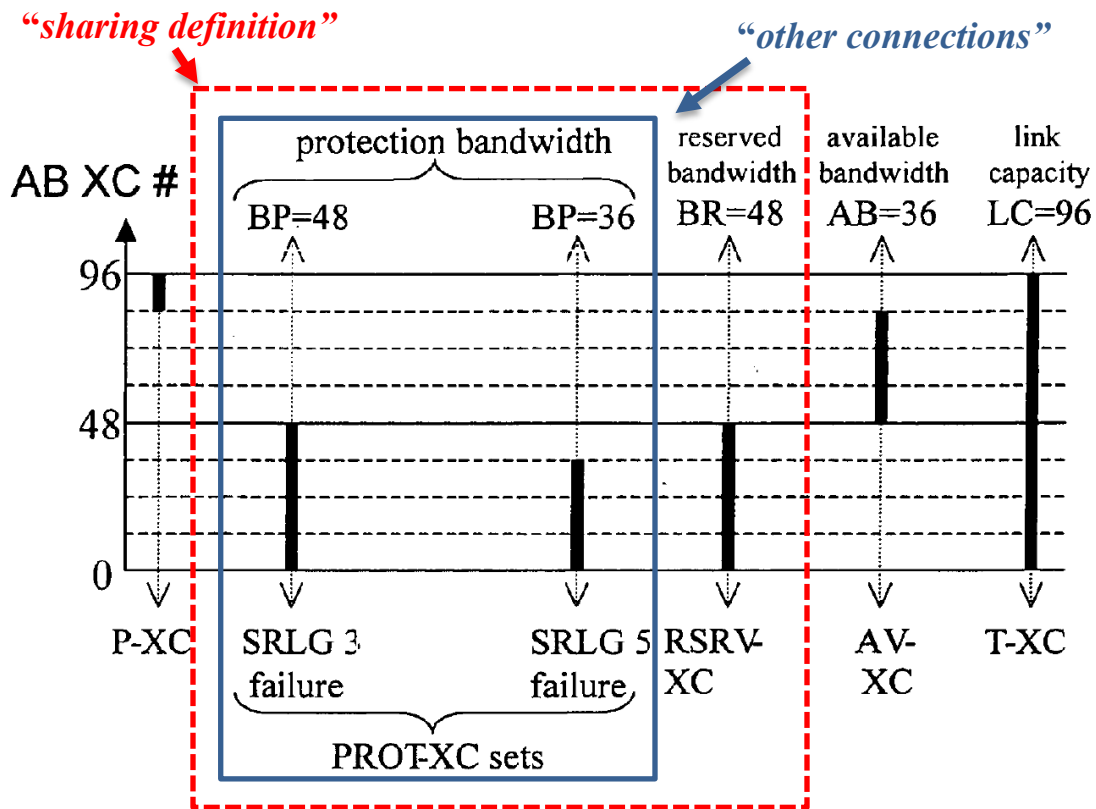
Dziong teaches that information including **“how much bandwidth can be[] shared at each link in the network”** is **“advertis[ed], across the network.”**

Ex.1005, [0060]. The advertised information ensures that “each node” in the network has “information about all recovery paths.” Ex.1005, [0060]. Advertising information about shared bandwidth corresponds to the claimed *“providing a sharing definition.”* Ex.1003, ¶67. Since every node has “information about all recovery paths,” it would have been obvious for the shared information to include information *“specifying one or more other connections,”* such as the existing recovery paths in the network. Ex.1003, ¶67. The advertised information includes the “amount of bandwidth reserved for recovery on each link,” which renders obvious that the recovery paths *“have respective bandwidths.”* Ex.1005, [0060]; *see also* [0064] “each node... advertises... the amount of protection bandwidth it currently has reserved on each of its incident links”); Ex.1003, ¶67.

Dziong illustrates in Fig. 6b an example of the protection bandwidth reserved by node A for its link to node B. Thus, the information in Fig. 6b would be advertised across the network. Ex.1005, [0064]; Ex.1003, ¶68. The figure shows the available and allocated bandwidths for link A-B in the network of Fig. 6a.

Ex.1005, [0088]. There are three protection paths (each a “*connection*”) that traverse link A-B; the three paths protect SRLGs 3, 4, and 5. Ex.1005, [0090]. These three SRLG protection paths “*have respective bandwidths,*” specifically, they have bandwidth reservations of 48 units, 15 units, and 36 units, respectively. Ex.1005, [0090]. The three SRLG protection paths share an overall protection bandwidth reservation of 48 units. Ex.1005, [0091]; *see also id.* [0075]; Ex.1003, ¶¶68-69. Thus, the three SRLG protection paths “*are permitted to share a bandwidth allocation with the new connection.*” Ex.1003, ¶69.

Prior to the establishment of SRLG 4, it would have been obvious to a POSITA for the bandwidth allocation for link A-B to include only the working path allocation (P-XC) and the recovery path allocations for SRLG 3 and 5, as shown below. Ex.1003, ¶69.



Ex.1003, ¶69; Ex.1005, Fig. 6b (modified to remove protection bandwidth allocated for SRLG 4).

This information about the existing bandwidth allocations for link A-B would have been shared with all the network nodes, and thus, corresponds to the claimed “*sharing definition*.” Ex.1003, ¶70; Ex.1005, [0060], [0064]. The recovery paths for SRLG 3 and 5 are “*other connections... which are permitted to share a bandwidth allocation with the new connection*.” Ex.1003, ¶69; see, e.g., Ex.1005, [0060] (“maximizing sharing of link-detour bandwidth”).

Alternatively, to the extent Patent Owner argues that the claim language requires the “*sharing definition*” to include bandwidth information after allocations

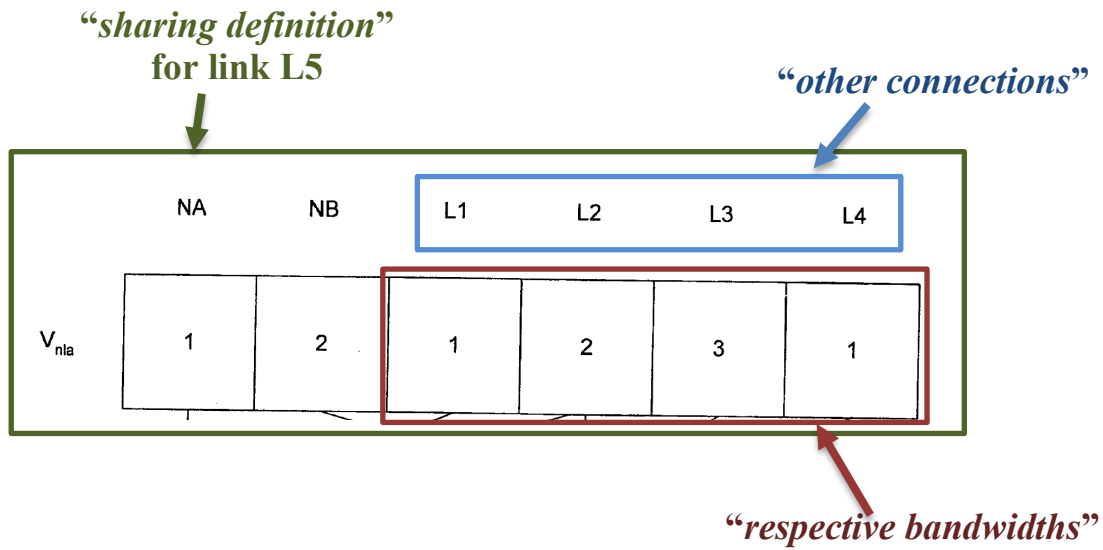
are made for the “*new connection*” (see [1.3]), it would have been obvious to advertise the bandwidth allocations as shown in Dziong’s unmodified Fig. 6b. Ex.1003, ¶71. This is because Dziong describes advertising updated bandwidth allocation information both periodically and after new allocations are made. Ex.1005, [0054] (“Signaling is used to update this sharing information with admittance of every new demand...”), [0099] (“upon the occurrence of a large change in services on the network or other periodic timer (718), the new LSA [link-state advertisement] database is flooded to the network”), [0127] (“This information is then periodically advertised...”); Ex.1003, ¶71.

While Dziong describes advertising the amount of bandwidth reserved for recovery on each link, Dziong provides limited details about the data format used for sharing this information. Like Dziong, Sathyanath explains that “sharing information... is advertised, using a data network, to other nodes in the network.” Ex.1006, [0084]. Thus, it would have been obvious to consider also Sathyanath’s examples regarding the sharing of bandwidth information. Ex.1003, ¶¶38, 72.

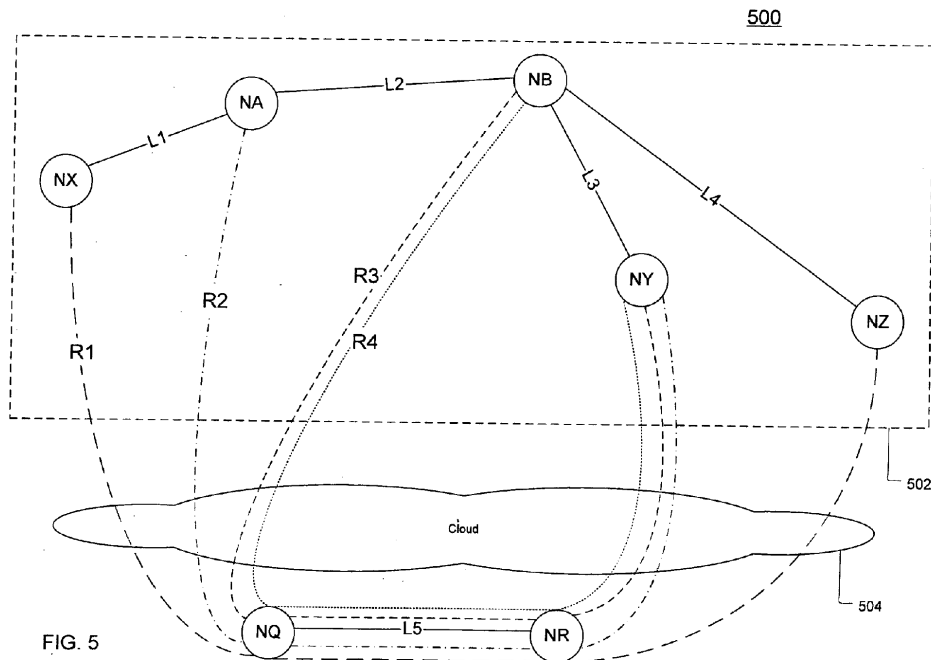
Sathyanath supplements Dziong by describing many ways that bandwidth sharing information is maintained and shared, including an “aggregate node-link vector representation” (exemplified in Fig. 6). Ex.1006, [0102]-[0103]. To facilitate bandwidth sharing, “each node disseminates aggregate link-node vectors for its connected links.” Ex.1006, [0105]. The aggregate link-node vector provides

“information about which links can share the restoration bandwidth.” Ex.1006, [0122]. Thus, Sathyanath’s aggregate link-node vector corresponds to the claimed “*sharing definition*.” Ex.1003, ¶72.

Sathyanath illustrates in Fig. 6 an exemplary “aggregate link-node vector V_{nla} for link L5 associated with the exemplary network 500 of FIG. 5.” Ex.1006, [0103]; *see also* [0021]-[0022]. Fig. 6 shows that “potential failures of links L1, L2, L3, and L4 correspond to aggregate bandwidth reservation values in V_{nla} of 1, 2, 3, and 1, corresponding to restoration paths R1, R1+R2, R2+R3+R4, and R1, respectively.” Ex.1006, [0104]. The restoration paths are “*other connections, which have respective bandwidths*.” Ex.1003, ¶¶74-75. The reserved bandwidth is the “maximum of the bandwidth requirements associated with any single network component failure,” meaning that all the restoration paths share a single bandwidth reservation (“*which are permitted to share a bandwidth allocation*”). Ex.1006, [0104]; Ex.1003, ¶75.



Ex.1003, ¶75; Ex.1006, Fig. 6 (partial, annotated).



Ex.1006, Fig. 5.

Sathyanath further describes, with respect to Figs. 8-9, adding a new service and corresponding restoration path (e.g., a “new connection”) to the network of

Fig. 5. Ex.1006, [0117]-[0118]. Sathyanath describes analyzing whether “the restoration path for the new service can share the bandwidth reserved for the restoration paths of the existing services” and concludes that it can. Ex.1006, [0120]. Thus, this example in Sathyanath shows that the links corresponding to restoration paths in Sathyanath’s aggregate node-link vector “*are permitted to share a bandwidth allocation with the new connection.*” Ex.1003, ¶75.

Sathyanath describes other data formats, including a “node-aggregate vector” (exemplified in Fig. 6), a “binary node-link vector” (exemplified in Fig. 7), a “node-binary vector” (exemplified in Fig. 7), and “alternative representations of the link-state sharing information... as would be understood to one skilled in the art.” Ex.1006, [0102]-[0103], [0106]-[0109], [0111]-[0112], [0114]; *see also* [0226]-[0243] (describing “Formats for Sharing” data via a link-state advertisement protocol). These other data formats further render obvious the claimed “*sharing definition.*” Ex.1003, ¶76.

Regarding its example network in Fig. 17, Sathyanath explains that information about the current bandwidth reservations on the links is stored in “TE/Share database.” Ex.1006, [0215]-[0219]. Sathyanath’s TE/Share database contains information about bandwidth sharing that was sent to or received from other nodes thus also corresponds to a “*sharing definition.*” Ex.1006, [0196], [0245]; Ex.1003, ¶¶77-78.

In summary, Dziong and Sathyanath both describe maintaining and distributing throughout a network information about potential bandwidth sharing among recovery paths, which renders obvious this limitation. Ex.1003, ¶79.

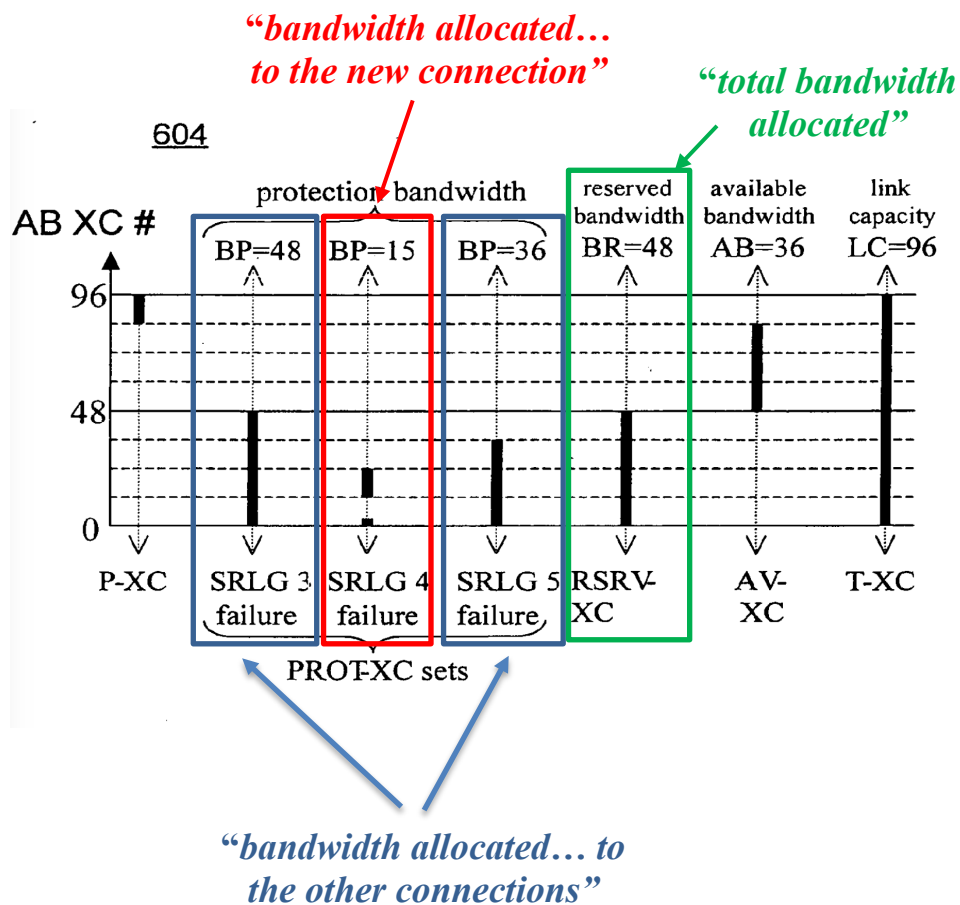
[1.3] *such that a total bandwidth allocated jointly to the new connection and to the other connections in any given segment is equal to a maximum of the requested bandwidth and of the bandwidths of the other connections in the given segment;*

Dziong describes that the protection bandwidth “actually reserved” on a link is the “**maximum of the bandwidths** required to recover” from a single failure. Ex.1005, [0063], [0052]. “In other words, the bandwidth reserved for recovery... can be shared..., since it is assumed that only one failure at a time will occur.” Ex.1005, [0088]. “[E]ach link that is part of a recovery path” reserves the “maximum of required recovery capacities.” Ex.1005, [0054]. Dziong’s “actually reserved” bandwidth corresponds to the claimed “*total bandwidth allocated.*” Ex.1003, ¶81. Dziong’s reservation of the maximum bandwidth required to recover from a single failure corresponds to a bandwidth allocation “*equal to a maximum of the requested bandwidth and of the bandwidths of the other connections in the given segment.*” Ex.1003, ¶81.

Dziong illustrates in Fig. 6b an example where the total recovery bandwidth allocation on link A-B (“*the given segment*”) is the maximum bandwidth of SRLGs 3, 4, and 5. This is because link A-B is part of a protection path for these SRLGs,

and “protection bandwidth is shared for SRLG-disjoint failures.” Ex.1005, [0091].

“RSRV-XC represents the actual amount of bandwidth that needs to be reserved on link A-B to protect against any one SRLG failure in network 602.” Ex.1005, [0091].



Ex.1003, ¶83; Ex.1005, Fig. 6b (annotated).

Fig. 6b shows that in the event of “SRLG 3 failure,” the bandwidth reserved on link A-B to provide a recovery path for SRLG 3 traffic is 48 units. Ex.1005, Fig. 6b. “SRLG 4 failure” and “SRLG 5 failure” are the bandwidths reserved to

protect demands on SRLG 4 (i.e., 15 units) and SRLG 5 (i.e., 36 units), respectively. Ex.1005, Fig. 6b. Because the 48 units required to protect SRLG 3 is the “maximum of the protection bandwidths required by SRLGs 3, 4, and 5 protected by link A-B,” the actual amount of bandwidth that is reserved on link A-B “to protect against any one SRLG failure” (i.e., RSRV-XC) is 48 units. Ex.1005, [0091], Fig. 6b.

Thus, Dziong’s Fig.6b example demonstrates that the “*total bandwidth allocated jointly*” to the recovery path for SRLG 4 (“*the new connection*”) and to SRLG 3 and SRLG 5 (“*the other connections*”)³ is the maximum of (i) bandwidth required on link A-B to recover from an “SRLG 4 failure” (“*requested bandwidth*” or 15 units), and (ii) bandwidth required on link A-B to recover from an “SRLG 3 failure” or “SRLG 5 failure” (“*bandwidths of the other connections in the given segment*,” 48 or 36 units). Ex.1003, ¶82-84.

As discussed at [1.2], Sathyanath provides further examples that illustrate Dziong’s bandwidth-sharing concept. In Sathyanath’s example of Fig. 5, “the bandwidth that is reserved on link L5 is the maximum of the bandwidth

³ The antecedent basis for “*the other connections*” is the “*one or more other connections [in the sharing definition], which have respective bandwidths **and which are permitted to share a bandwidth allocation with the new connection.***” See [1.2]. Thus, the connection P-XC shown in Fig. 6b, which supports a current traffic demand, is not an “*other connection*[].” Ex.1005, [0090]; Ex.1003, ¶84.

requirements associated with any single network component failure.” Ex.1006, [0104]. Sathyanath explains that a new service and restoration path are added to the network. Ex.1006, [0117]-[0120], Figs. 8-9. With the new restoration path added, the bandwidth required for link L5 is the “maximum value” in a revised aggregate node-link vector (Fig. 9), which is ultimately “equal to the current reservation bandwidth on link L5.” Ex.1006, [0120]. Thus, this example shows that the bandwidth allocated to link L5 (*“in [a] given segment”*) for restoration of existing services and the new service (*“total bandwidth allocated jointly to the new connection and to the other connections”*) is the maximum bandwidth required to restore any one service (*“a maximum of the requested bandwidth and of the bandwidths of the other connections in the given segment”*). Ex.1003, ¶¶85-87.

In Sathyanath’s example of Fig. 17, link “L4 needs to reserve four units of bandwidth to protect against failures on L8 and L9.” Ex.1006, [0220]. For a new recovery path to protect against the failure of link L1 (which also has capacity of 4 units bandwidth), “no additional bandwidth would need to be reserved on L4.” Ex.1006, [0221]. Thus, on link L4 (*“in the given segment”*), the *“total bandwidth allocated”* to protect against failures on any of L1, L8, and L9 is four units, which is *“equal to a maximum of the requested bandwidth”* (four units protecting L1) *“and of the bandwidths of the other connections”* (four units protecting L8 and L9). Ex.1003, ¶¶88-90.

In summary, Dziong and Sathyanath render this limitation obvious through their express disclosures and multiple examples of sharing bandwidth among new and existing restoration paths. Ex.1003, ¶¶80-91.

[1.4] *for each of the two or more candidate routes, calculating a cumulative additional bandwidth reservation to be allocated to the new connection in the segments along the candidate route, responsively to the sharing definition;*

Dziong describes calculating the cost of each candidate link-detour path (“*two or more candidate routes*”) by “summing the cost of each link” in each candidate path (“*calculating a cumulative additional bandwidth reservation... along the candidate route*”). Ex.1005, [0065], claim 3.

To calculate the cost of each link, Dziong employs a “link-cost function” which considers metrics such as “available bandwidth” and “**available shared bandwidth.**” Ex.1005, [0113]. As discussed at [1.2], Dziong explains that such bandwidth-sharing information is advertised across the network and therefore corresponds to “*the sharing definition.*” Ex.1005, [0060]. Since Dziong’s link-costs are based on the advertised bandwidth-sharing information, it would have been obvious to a POSITA for Dziong’s calculations to be performed “*responsively to the sharing definition.*” Ex.1003, ¶¶92-94.

Dziong provides limited examples of a link-cost function. For example, in Fig. 9 Dziong provides an equation for calculating a protection path cost (CPP) that is the sum of bandwidths required on each link of a protection path, multiplied

by corresponding administrative weights (AW), then divided by the new link bandwidth (12 units). Ex.1005, [0132]; Ex.1003, ¶¶95-104.

$$\text{CPP} = \frac{9 \cdot \text{AW}_1 + 2 \cdot \text{AW}_2 + 7 \cdot \text{AW}_3}{12}$$

Ex.1005, Fig. 9 (partial, annotated).

For clarity, the Fig. 9 equation calculates a protection path cost as:

$$\text{CPP} = [9 \cdot \text{AW}_1 + 2 \cdot \text{AW}_2 + 7 \cdot \text{AW}_3]/12.$$

Ex.1003, ¶104.

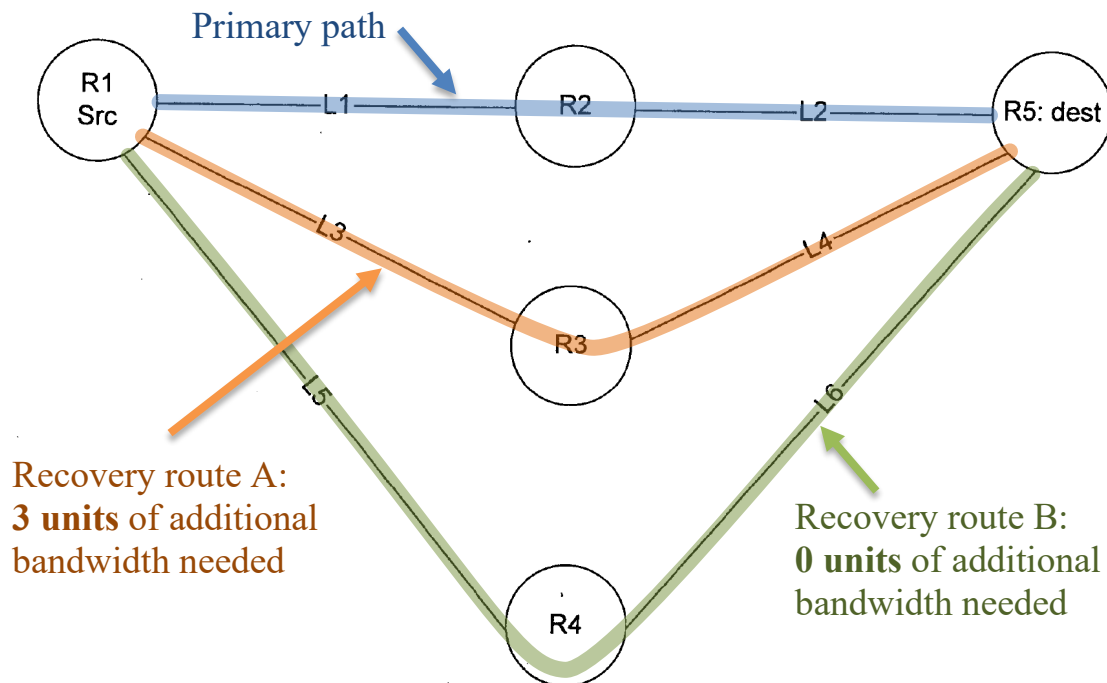
Dziong explains, however, that the use of administrative weights is optional. Ex.1005, [0012] (“**In some cases**, the link costs of the LD [link detour] paths **can be** a function of an administrative weight for the LD path links.”). Without the use of administrative weights, Dziong’s Fig. 9 example would include calculating the sum of the additional bandwidths required on the links, i.e., $\text{CPP} = \frac{9 + 2 + 7}{12}$. Ex.1003, ¶104. Thus, this example in Fig. 9 suggests calculating a “*cumulative additional bandwidth reservation to be allocated to the new connection in the segments along the candidate route.*” Ex.1003, ¶105.

Sathyanath provides further details regarding a link-cost function. Specifically, Sathyanath explains that the cost of a new protection path on a link is “the incremental bandwidth that needs to be reserved” (“*additional bandwidth*

reservation to be allocated to the new connection”). Ex.1006, [0205]. And like Dziong, Sathyanath describes how the cost of a recovery path “is calculated as a sum of the costs of its constituent links.” (“*calculating a cumulative additional bandwidth reservation to be allocated to the new connection in the segments along the candidate route*”). Ex.1006, [0209]; Ex.1003, ¶¶108-109.

In prosecution, the Applicant emphasized the alleged patentability of a “*cumulative additional bandwidth reservation*” that is zero. Ex.1002, 248; *see generally id.*, 245-249. Both Dziong and Sathyanath describe examples in which the amount of additional bandwidth to be reserved for a recovery path is zero. Ex.1005, [0134]; Ex.1006, [0204], [0207], [0222] (“no additional units of bandwidth would need to be reserved”).

Sathyanath describes a specific example of calculating recovery path costs with respect to Fig. 17 using information from a TE/Share database (a “*sharing definition*” in [1.2]).



Ex.1003, ¶113; Ex.1006, Fig. 17 (annotated).

From source R1 to destination R5, a primary path traverses the links L1 and L2 (through node R2) and has four units of bandwidth. Ex.1006, [0215]. As discussed at [1.1], there are two candidate recovery paths: “route A (L3-L4) and route B (L5-L6).” Ex.1006, [0215]. For route A to act as a recovery path, “the reservation bandwidth on L3 would need to be increased by 3... additional units of bandwidth.” Ex.1006, [0221]; Ex.1003, ¶111. For link L4, however, “no additional bandwidth would need to be reserved.” Ex.1006, [0221]. Thus, a POSITA would have understood that the “cost” of candidate path route A (L3-L4) is 3 units. Ex.1006, [0209]; Ex.1003, ¶111.

For the other recovery path, route B (L5-L6), “4 units have been reserved

already” on each link. Ex.1006, [0222], [0218]-[0220]. Thus, “no additional units of bandwidth would need to be reserved” for route B (L5-L6). Ex.1006, [0222]. The “cost” of candidate path route B (L5-L6) is therefore 0 units. Ex.1003, ¶112.

Thus, Sathyanath’s Fig. 17 example shows that for candidate routes A and B (*“for each of the two or more candidate routes”*), Sathyanath calculates the total amount of additional bandwidth that must be reserved across the route links (*“calculating a cumulative additional bandwidth reservation to be allocated to the new connection in the segments along the candidate route”*) using information from the TE/Share database (*“responsively to the sharing definition”*). Ex.1003, ¶113.

In summary, Dziong and Sathyanath describe evaluating each potential recovery path by adding up the amount of additional bandwidth that needs to be reserved on its links, based on the information obtained from bandwidth sharing advertisements, which renders obvious this limitation. Ex.1003, ¶¶92-114.

[1.5] selecting a preferred route having a minimum value of the cumulative additional bandwidth reservation out of the two or more candidate routes; and

As discussed at [1.4], Sathyanath describes calculating the cost of two candidate recovery paths in Fig. 17: route A (L3-L4) requiring 3 additional units of bandwidth, and route B (L5-L6) requiring 0 additional units of bandwidth. Ex.1006, [0215], [0221]-[0222]; Ex.1003, ¶119.

Sathyanath further teaches to then “select[]... the restoration path with the lowest path cost.” Ex.1006, Abstract. Since Sathyanath calculates a path cost as the “the incremental bandwidth that needs to be reserved,” choosing the lowest-cost path is actually “choosing a restoration path that would require the minimum amount of additional bandwidth to be reserved along its links.” Ex.1006, [0205], [0200]; Ex.1003, ¶117. Dziong similarly describes “choosing the path with the lowest cost.” Ex.1005, [0065], claim 3; Ex.1003, ¶117.

In Sathyanath’s Fig. 17 example, “the restoration path L5-L6 would be considered to be the better restoration path.” Ex.1006, [0222]. A POSITA would have understood that route B is a “*preferred route*” because route B requires less additional bandwidth to be reserved than does route A. Ex.1003, ¶120; Ex.1006, [0200].

In summary, Dziong and Sathyanath teach to select as a recovery path (“*selecting a preferred route... out of the two or more candidate routes*”) the candidate path with the lowest cost (“*having a minimum value*”), where the cost equals the amount of additional units of reservation bandwidth required (“*of the cumulative additional bandwidth reservation*”), which renders obvious this limitation. Ex.1003, ¶¶115-121.

[1.6] *establishing the new connection using the preferred route.*

As discussed at [1.5], Dziong and Sathyanath describe choosing a protection path that requires the least amount of additional bandwidth allocation (“*the preferred route*”). It would have been obvious to a POSITA for the chosen path to be established as a recovery path. Ex.1003, ¶123. For example, Dziong describes establishing a new protection path (“*the new connection*”) at the same time as a corresponding primary path:

A source node may assume that bandwidth for a new connection is available, and then start to **signal to establish the primary path and link-detour paths for the connection.**

Ex.1005, [0058].

Dziong explains that to establish a link-detour (i.e., recovery) path, a “reservation setup message is sent along the full-LD [link-detour] path.” Ex.1005, [0175]. It would have been obvious to a POSITA that Dziong’s “reservation setup message” is a “signal to establish” the recovery path. Ex.1005, [0175], [0058]; Ex.1003, ¶¶124-126.

Sathyanath further confirms this understanding, as Sathyanath describes “**pre-establishment...** of alternative paths.” Ex.1006, [0046]. For example, Sathyanath describes using “network signaling to **establish the protection LSP** [label-switched path].” Ex.1006, [0250]; *see also* [0260] (“It is assumed that **every**

protection LSP is established...”); Ex.1003, ¶127.

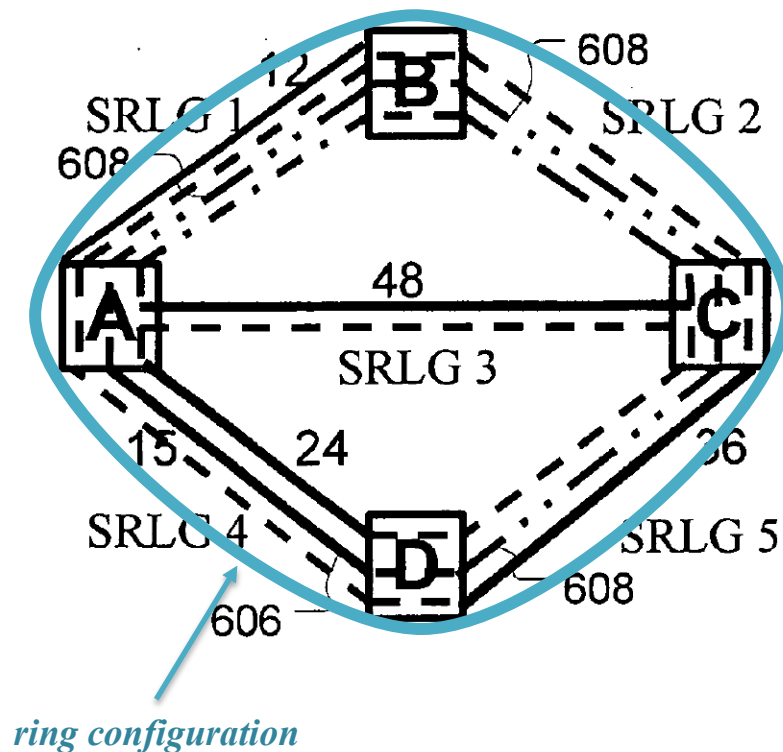
In summary, the prior art’s teaching of establishing a chosen recovery path renders obvious “*establishing the new connection using the preferred route.*”

Ex.1003, ¶¶122-128.

5. Claim 2

[2.0] *The method according to claim 1, wherein at least some of the segments are arranged in a ring configuration, and*

Dziong’s network in Fig. 6a shows links (“*segments*”) arranged in a “*ring configuration.*” Ex.1005, [0088] (describing Fig. 6a as a “SONET” network), [0036] & [0048] (describing SONET as a “ring” technology).

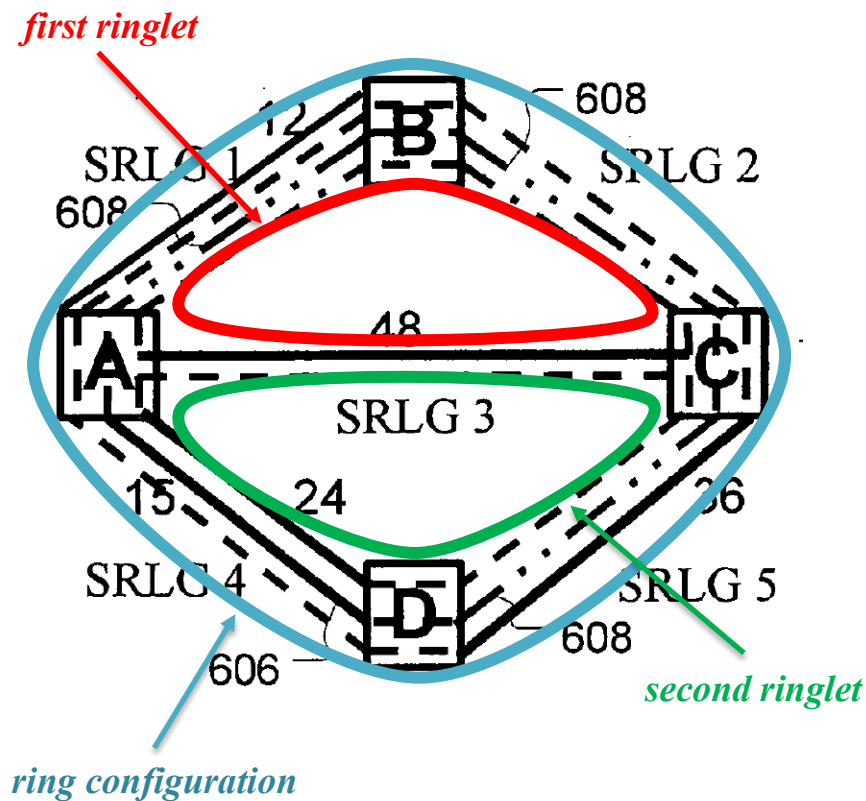


Ex.1003, ¶130; Ex.1005, Fig. 6a (annotated).

Sathyanath similarly contemplates providing path protection for a network that “has a ring topology.” Ex.1006, [0248]. It would have been obvious to a POSITA that a network with a ring topology includes “*at least some... segments... arranged in a ring configuration.*” Ex.1003, ¶131. Thus, it would have been obvious to a POSITA that Dziong and Sathyanath contemplate applying their bandwidth-sharing techniques to a network “*in a ring configuration.*” Ex.1003, ¶132.

[2.1] wherein identifying the two or more candidate routes comprises identifying first and second routes traversing respective first and second ringlets of the ring configuration.

In Dziong's Fig. 6a, the largest ring (A-B-C-D) is bisected by a connection between nodes A and C. Thus, the overall ring comprises two smaller rings, A-B-C and A-C-D ("first and second ringlets"). Ex.1003, ¶134.



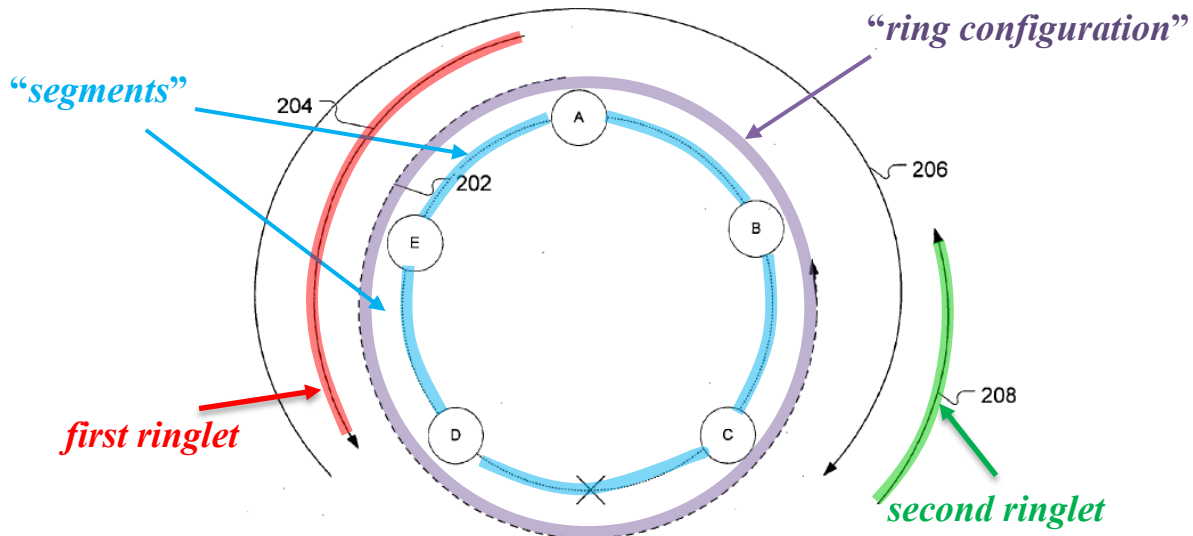
Ex.1003, ¶134; Ex.1005, Fig. 6a (annotated).

As discussed at [1.1], a POSITA would have found it obvious to consider two candidate detour paths for the primary path A-D: 1) link-detour path A-B-C-D

(“traversing... first... ringlet[]” A-B-C) and 2) link-detour path A-C-D (“traversing... second ringlet[]” A-C-D). Ex.1003, ¶135. Thus, these two candidate routes correspond to “first and second routes traversing respective first and second ringlets of the ring configuration.” Ex.1003, ¶135.

As discussed at [1.0] and [1.6], Dziong and Sathyanath render obvious a process for “establishing a connection”—in part—through the use of MPLS label-switched paths. A POSITA would have known how to employ MPLS on a ring network. Ex.1003, ¶¶20-21, 27, 139; Material Fact #4.

To the extent Patent Owner argues that the claimed “ringlets” correspond to clockwise and counterclockwise paths on the “ring configuration,” Dziong renders this claim interpretation obvious. Dziong illustrates various networks with a “ring configuration” in Figs. 1-2. Ex.1005, [0015]-[0016]. In Fig. 2 (below), arrows 204 and 208 show that traffic may be routed through the network in a clockwise or counterclockwise direction, thus corresponding to “first and second ringlets.” Ex.1003, ¶¶137-138.



Ex.1003, ¶137; Ex.1005, Fig. 2 (annotated).

It would have been obvious to apply Dziong's and Sathyanath's recovery path selection techniques to a network like that in Fig. 2. Ex.1005, [0045]-[0046] ("In the present example [of Fig. 2]... the present invention can... allow the computation and selection of the appropriate switching nodes for protection."), [0076] ("...the present invention can be applied to networks based on different technologies and topologies..."); Ex.1006, [0049] ("The concepts of the present invention... may be applied generally to any mesh network (e.g., Sonet, ATM, frame relay, MPLS)..."), [0248] (discussing "the case where the [network] to be protected has a ring topology"); Ex.1003, ¶¶138-140.

Therefore, the prior art's teaching of a links arranged in a ring and identifying clockwise and counterclockwise paths renders obvious "*at least some*

of the segments are arranged in a ring configuration, and wherein identifying the two or more candidate routes comprises identifying first and second routes traversing respective first and second ringlets of the ring configuration.” Ex.1003, ¶¶140-141.

6. Claim 3

[3.0] The method according to claim 1, wherein establishing the new connection comprises establishing a tunnel through the network in accordance with a tunnel-based communication protocol.

As discussed at [1.0], Dziong and Sathyanath render obvious “*establishing the new connection*” using MPLS. MPLS was well-known as a “*tunnel-based communication protocol*.” Material Fact #1.

With MPLS, label-switched paths (LSPs) are established through a network to carry traffic. *See* Ex.1039, 7 (defining “label switched path” as “The path... followed by [] packets...”). Sathyanath explains that a “label-switched path is effectively a tunnel between two nodes that carries service traffic according to a predetermined route.” Ex.1006, [0050]. For example, as illustrated in Fig. 1 of Sathyanath, “LSP-1 is a **tunnel** from node N3 to node N5 that follows the path N3-N2-N5.” Ex.1006, [0050]. The ’088 patent acknowledges that MPLS was known as a “tunneled protocol[.]” Ex.1001, 1:19-21.

In summary, the prior art’s disclosure of establishing a recovery path as a label-switched path using MPLS renders obvious “*establishing a tunnel through*

the network in accordance with a tunnel-based communication protocol.” Ex.1003, ¶142-145.

7. Claim 4

[4.0] *The method according to claim 1, wherein the new connection and at least one of the other connections specified in the sharing definition traverse at least one common segment along the preferred route,*

Continuing the analysis from [1.0] and [1.2]-[1.5], Dziong’s example in Fig. 6b shows that the new protection path for SRLG 4 (“*the new connection*”) and the existing protection paths for SRLG 3 and SRLG 5 (“*and at least one of the other connections specified in the sharing definition*”) are routed along link A-B (“*traverse at least one common segment along the preferred route*”). Ex.1003, ¶¶147-149.

Sathyanath’s Fig. 17 example also shows this claim limitation. As discussed at [1.5], Sathyanath’s “*preferred route*” for a recovery path (“*new connection*”) is L5-L6. Sathyanath explains that link L5 has existing recovery bandwidth reserved for links L9 and L10. Ex.1006, [0218], [0220]; Ex.1003, ¶150. Thus, L5 is a “*common segment along the preferred route*” that is traversed by both the “*new connection*” (new recovery path L5-L6 to protect primary path L1-L2) and “*at least one of the other connections specified in the sharing definition*” (recovery paths for links L9 and L10). Ex.1003, ¶151.

In summary, the prior art’s examples render obvious for a new protection

path (“*the new connection*”) and other existing protection paths (“*at least one of the other connections specified in the sharing definition*”) to share bandwidth on one or more links (“*traverse at least one common segment along the preferred route*”). Ex.1003, ¶152.

[4.1] and wherein establishing the new connection comprises allocating the maximum of the requested bandwidth and of the bandwidths of the at least one of the other connections in the at least one common segment to the new connection and to the at least one of the other connections.

Continuing the analysis from [4.1], Dziong’s Fig. 6b example shows that on link A-B (“*in the at least one common segment*”) a total of 48 units of protection bandwidth (“*maximum of the requested bandwidth and of the bandwidths of the at least one of the other connections*”) is shared among SRLGs 3, 4, and 5 (“*allocat[ed]... to the new connection and to the at least one of the other connections*”). Ex.1005, [0091]; Ex.1003, ¶¶154-155.

Sathyanath’s Fig. 17 example also demonstrates this limitation. On links L5 and L6, “4 units have been reserved already” for existing recovery paths (“*bandwidths of the at least one of the other connections in the at least one common segment*”). Ex.1006, [0222]; *see also* [0215]-[0220]; Ex.1003, ¶¶157-158. The bandwidth required for a new recovery path (to protect primary path L1-L2) is 4 units (“*the requested bandwidth*”). Ex.1006, [0215]. The maximum of these two values is also 4 units, which is the total amount that Sathyanath describes reserving

for all these recovery paths. *See* Ex.1006, [0222] (“no additional units of bandwidth would need to be reserved”). Thus, Sathyanath’s example shows that the actually reserved bandwidth is equal to the maximum of the existing and new bandwidth requirements (“*allocating the maximum... to the new connection and to the at least one of the other connections*”). Ex.1003, ¶¶156-161.

8. Claim 6

[6.0] *The method according to claim 1, wherein providing the sharing definition comprises distributing the sharing definition to nodes of the network using a reservation protocol.*

As discussed at [1.2], Dziong describes “maximizing sharing of link-detour bandwidth.” Ex.1005, [0060]. Information including “how much bandwidth can be shared at each link in the network” (part of a “*sharing definition*”) is advertised across the network. Ex.1005, [0060]. Dziong explains that such bandwidth sharing information is “distributed to each node by an advertising protocol,” such as an “extended” link state advertisement protocol. Ex.1005, [0062], [0056], Fig. 3.

Dziong’s extensions to a link state advertisement protocol include “signaling extensions in the link-detour path **reservation process**.” Ex.1005, [0138].

Sathyanath further describes using a protocol such as RSVP-TE “to reserve bandwidth for the protection path.” Ex.1006, [0078]. A POSITA would have been familiar with RSVP-TE, which defines Traffic Engineering extension to the well-known Resource Reservation Protocol (RSVP). Ex.1003, ¶166; Ex.RFC3209, 1;

Material Facts #2-3. Sathyanath also describes using RSVP-TE “for dissemination of [sharing] information.” Ex.1006, [0292]; Ex.1003, ¶165. RSVP-TE is the same protocol described in the ’088 patent for distributing a sharing definition. Ex.1001, 7:10-12.

Dziong and Sathyanath’s description of advertising bandwidth sharing information using RSVP-TE renders obvious “*distributing the sharing definition to nodes of the network using a reservation protocol.*” Ex.1003, ¶¶162-167.

9. Claim 8

Claim 8 is an apparatus claim. The claimed apparatus includes components “arranged” to perform steps generally corresponding to the steps in method claim 1. The limitations in claim 8 generally correspond to limitations in claim 1 that have simply been rewritten to claim a device instead of a method. Thus, claim 8 would have been obvious for the same reasons. Nevertheless, all the limitations of claim 8 are addressed in detail below.

[8.0] A network node, comprising:

Dziong describes performing a route-selection process on either node A (the “source” of traffic on link A-D in Fig. 6a) or on a “specialized server.” Ex.1005, [0095]-[0098]. Sathyanath similarly describes performing a protection-path-selection process on node R1 of Fig. 17. Ex.1006, [0221]. Elaborating on Dziong’s concept of a specialized server, Sathyanath also describes performing the relevant

steps on a “centralized server.” Ex.1006, [0075], [0080], [0179], [0250], [0277].

Any one of node A, the specialized server, or node R1 corresponds to the claimed “*network node*.” Ex.1003, ¶¶169-173.

[8.1] a network interface, which is arranged to communicate with other network nodes over a communication network that includes multiple segments; and

As discussed at [1.0], Dziong and Sathyanath describe numerous examples of “*a communication network that includes multiple segments*,” including Dziong’s Fig. 6a and Sathyanath’s Fig. 17. Ex.1003, ¶175.

Sathyanath describes how “the node that owns a link is the one that is **connected to the outgoing interface** side of the link...” Ex.1006, [0194]. As Dr. Mir explains:

Thus, it would have been obvious to a POSITA for a network node to include a “*network interface*” allowing it to connect to a network link and communicate with other nodes in a network. Indeed, a network node must have a network interface to do so.

Ex.1003, ¶176.

The rest of Dziong and Sathyanath confirm this understanding. Fig. 6a shows that node A communicates with other nodes, including nodes B, C, and D. Ex.1005, [0088]-[0090]. Thus, node A “*is arranged to communicate with other network nodes*.” Ex.1003, ¶177-178.

In Sathyanath’s Fig. 17, it would have been obvious that node R1 “*is arranged to communicate with other network nodes*” since Sathyanath’s entire disclosure is in the context of “network communications.” Ex.1006, [0004]; Ex.1003, ¶¶179-180.

It is inherent that node A, the specialized server, and node R1 would have each had a “*network interface*” to provide communications connectivity. Ex.1003, ¶176; Material Fact #5. In the alternative, having a “*network interface*” would have been obvious, since it was common and conventional for a device capable of communicating on a network to have a “*network interface*.” Ex.1003, ¶176. *See Randall Mfg. v. Rea*, 733 F.3d 1355, 1363 (Fed. Cir. 2013) (affirming obviousness of using the “prevalent, perhaps even predominant method” of performing a given task).

[8.2] *a processor, which is arranged*

It would have been inherent for node A, the specialized server, and node R1 to each have a “*processor*,” such as a general-purpose computer processor, to perform the various algorithms and calculations described in Dziong and Sathyanath. Ex.1003, ¶183; Material Fact #6. In the alternative, having a “*processor*” would have been obvious, since it was common and conventional for a device capable of communicating on a network to have a “*processor*.” Ex.1003, ¶184 (citing Exs.1033-1034).

[8.3] to identify two or more candidate routes for a new connection having a requested bandwidth to be established through the network,

See analysis of [1.1]. Ex.1003, ¶185.

[8.4] to accept a sharing definition specifying one or more other connections, which have respective bandwidths and which are permitted to share a bandwidth allocation with the new connection

See analysis of [1.2]. Where limitation [1.2] recites “**providing** a sharing definition,” this limitation recites “**to accept** a sharing definition.”

It would have been obvious for nodes to both send and receive bandwidth sharing information in Dziong and Sathyanath. Ex.1003, ¶187. Dziong describes how all nodes in the network performing “advertising” and “bookkeeping” such that “each node keeps track of” bandwidth allocations and “information about all recovery paths.” Ex.1005, [0054], [0060]; *see also* Ex.1006, [0076] (“each node...broadcasts that [protection capacity] information to the other nodes”), [0071]. Thus, it would have been obvious that nodes not only advertise their own bandwidth sharing information, but also “*accept*” the bandwidth sharing advertisements of other nodes. Ex.1003, ¶187.

Sathyanath further explains how a “node **updates its local reserved bandwidth database**...then passes this information to the downstream node so that both nodes... have the same view of resources and sharing.” Ex.1006, [0078]; *see also* [0079] (“TABLE 1 [containing protection capacity information] will be

updated (centrally or, in the case of a distributed architecture, at nodes N4..., N1..., and N2...)”). In this way, “all nodes in the network... will eventually have the information on the state and sharing characteristics of all the links in the network.” Ex.1006, [0084]. Sathyanath’s description of updating a local bandwidth sharing database with information advertised by other network nodes renders obvious “*to accept a sharing definition.*” Ex.1003, ¶¶188-190.

Thus, it would have been obvious for node A, the specialized server, and node R1 to receive the bandwidth sharing information sent by other network nodes as discussed at [1.2] (“*to accept a sharing definition*”). Ex.1003, ¶¶190-191.

[8.5] *such that a total bandwidth allocated jointly to the new connection and to the other connections in any given segment is equal to a maximum of the requested bandwidth and of the bandwidths of the other connections in the given segment,*

See analysis of [1.3]. Ex.1003, ¶192.

[8.6] *to calculate for each of the two or more candidate routes a cumulative additional bandwidth reservation to be allocated to the new connection in the segments along the candidate route, responsively to the sharing definition,*

See analysis of [1.4]. Ex.1003, ¶193.

[8.7] *to select a preferred route having a minimum value of the cumulative additional bandwidth reservation out of the two or more candidate routes, and*

See analysis of [1.5]. Ex.1003, ¶194.

[8.8] *to establish the new connection using the preferred route.*

See analysis of [1.6]. Ex.1003, ¶195.

10. Claim 9

[9.0] *The node according to claim 8, wherein at least some of the segments are arranged in a ring configuration associated with the node, and*

See analysis of [2.0]. Ex.1003, ¶¶196-197.

[9.1] *wherein the processor comprises a ring-level connection admission control (CAC) module,*

As discussed at [8.2] and [8.0], Dziong describes a “specialized server” that performs route selection for nodes on a ring, and it would have been obvious for the specialized server to include a “*processor*.” Ex.1003, ¶199.

Dziong describes deciding whether to admit a newly requested connection on a network. Ex.1003, ¶200. For example, Dziong explains that when establishing a new connection, “it might be found that one of the links along the paths cannot support the required bandwidths.” Ex.1005, [0058]. In this situation, any partial links that had been established are “ripped up.” Ex.1005, [0058]. To avoid this scenario (which Dziong calls a “crank-back”), Dziong promotes the use of the “specialized server” to centralize the route selection process. Ex.1005, [0096] (“The main advantage of this [specialized-server] option is that the path calculation algorithms have exact information about link and connection states so that optimal paths can be calculated and crank-backs avoided.”).

Relatedly, Sathyanath describes performing “call **admission control** (i.e., the process that accepts a new call or data communication request into the

network.” Ex.1006, [0248]; *see also* [0250] (discussing “a centralized server approach”). It would have been obvious to a POSITA that Dziong’s specialized server, in deciding whether to accept a request for a new connection, is performing “*connection admission control*.” Ex.1003, ¶202.

As discussed at [2.0], Dziong and Sathyanath describe route selection in the context of a ring. Dziong explains that the specialized server “keeps track of all connection states” and chooses routes using “exact information about link and connection states” throughout the ring network. Ex.1005, [0096]. Thus, it would have been obvious for Dziong’s specialized server to perform “*ring-level connection admission control*.” Ex.1003, ¶203. The portion of Dziong’s processor that performs this admission control function corresponds to the claimed “*ring-level connection admission control (CAC) module*.” Ex.1003, ¶203.

Thus, the prior art renders this limitation obvious. Ex.1003, ¶204.

[9.2] *which is arranged to identify first and second candidate routes traversing respective first and second ringlets of the ring configuration,*

See analysis of [2.1]. Ex.1003, ¶205.

[9.3] and to select the preferred route traversing one of the first and second singlets.⁴

See analysis of [2.1], [8.7], and [9.2]. Ex.1003, ¶206.

11. Claim 10

[10.0] The node according to claim 8, wherein the new connection comprises a tunnel established through the network in accordance with a tunnel-based communication protocol.

See analysis of [3.0]. Ex.1003, ¶207.

12. Claim 11

[11.0] The node according to claim 8, wherein the new connection and at least one of the other connections specified in the sharing definition traverse at least one common segment along the preferred route,

[11.1] and wherein the processor is arranged to allocate the maximum of the requested bandwidth and of the bandwidths of the at least one of the other connections in the at least one common segment to the new connection and to the at least one of the other connections.

See analysis of [4.0]-[4.1]. Ex.1003, ¶¶208-209.

13. Claim 13

[13.0] The node according to claim 8, wherein the processor is arranged to accept the sharing definition using a reservation protocol.

As discussed at [6.0] and [8.2], Dziong and Sathyanath render obvious distributing “the sharing definition... using a reservation protocol” and using a

⁴ The word “singlets” appears to be a typographical error that should instead recite “ringlets.” Ex.1003, ¶206 n.4.

“processor.” Ex.1003, ¶210-211. For the reasons discussed at [8.4], it would have been obvious for nodes in the network to “*accept the sharing definition*” using the same reservation protocol. Ex.1003, ¶212-213.

14. Claim 15

Claim 15 is system claim. The claimed system includes a network with a network node that generally corresponds to the node in apparatus claim 8. The limitations in claim 15 generally correspond to limitations in claims 1 and 8 that have simply been rewritten to claim a network instead of a method or a device. Thus, claim 15 would have been obvious for the same reasons. Nevertheless, all the limitations of claim 15 are addressed in detail below.

[15.0] *A communication network, comprising:*

See analysis of [1.0]. Ex.1003, ¶215.

[15.1] *a plurality of network segments;*

See analysis of [1.0]. Ex.1003, ¶216.

[15.2] *a network node, comprising:*

See analysis of [8.0]. Ex.1003, ¶217.

[15.3] *a network interface, which is arranged to communicate with other nodes in the network; and*

See analysis of [8.1]. Ex.1003, ¶218.

[15.4] *a processor, which is arranged*

See analysis of [8.2]. Ex.1003, ¶219.

[15.5] to identify two or more candidate routes for a new connection having a requested bandwidth to be established through the network,

See analysis of [8.3]. Ex.1003, ¶220.

[15.6] to accept a sharing definition specifying one or more other connections, which have respective bandwidths and which are permitted to share a bandwidth allocation with the new connection

See analysis of [1.2] and [8.4]. Ex.1003, ¶221.

[15.7] such that a total bandwidth allocated jointly to the new connection and to the other connections in any given segment is equal to a maximum of the requested bandwidth and of the bandwidths of the other connections in the given segment,

See analysis of [1.3] and [8.5]. Ex.1003, ¶222.

[15.8] to calculate for each of the two or more candidate routes a cumulative additional bandwidth reservation to be allocated to the new connection in the segments along the candidate route, responsively to the sharing definition,

See analysis of [1.4] and [8.6]. Ex.1003, ¶223.

[15.9] to select a preferred route having a minimum value of the cumulative additional bandwidth reservation out of the two or more candidate routes, and

See analysis of [1.5] and [8.7]. Ex.1003, ¶224.

[15.10] to establish the new connection using the preferred route.

See analysis of [1.6] and [8.8]. Ex.1003, ¶225.

15. Claim 16

[16.0] The network according to claim 15, wherein at least some of the segments are arranged in a ring configuration associated with the network node, and

See analysis of [2.0] and [9.0]. Ex.1003, ¶226.

[16.1] *wherein the processor comprises a ring-level connection admission control (CAC) module,*

See analysis of [9.1]. Ex.1003, ¶227.

[16.2] *which is arranged to identify first and second candidate routes traversing respective first and second ringlets of the ring configuration,*

See analysis of [2.1] and [9.2]. Ex.1003, ¶228.

[16.3] *and to select the preferred route traversing one of the first and second ringlets.*

See analysis of [8.7] and [9.3]. Ex.1003, ¶229.

16. Claim 17

Claim 17 is a computer-readable-medium claim. The claimed “*computer software product*” includes instructions for causing a computer to perform steps generally corresponding to the steps in method claim 1. The limitations in claim 17 generally correspond to limitations in claim 1 that have simply been rewritten to claim a computer software product instead of a method. Thus, claim 17 would have been obvious for the same reasons. Ex.1003, ¶230. Nevertheless, all the limitations of claim 17 are addressed in detail below.

[17.0] *A computer software product used in a network node in a communication network that includes multiple segments,*

See analysis of [1.0]. Ex.1003, ¶231.

As discussed at [8.0] and [8.2], it would have been inherent or obvious for Dziong’s node A (Fig. 6a), Dziong’s specialized server, or Sathyanath’s node R1

to use a processor to perform route selection and bandwidth allocation. Since a processor performs steps in accordance with stored instructions, it would have been obvious for Dziong's route selection and bandwidth allocation process to be implemented as a "*computer software product*." Ex.1003, ¶232.

[17.1] *the product comprising a tangible storage medium, in which program instructions are stored, which instructions, when read by a computer, cause the computer*

As discussed at [8.0] and [8.2], it would have been inherent or obvious for Dziong's node A (Fig. 6a), Dziong's specialized server, or Sathyanath's node R1 to use a general-purpose computer processor to perform route selection and bandwidth allocation. It was well-known in the art for a computer processor to execute instructions that were stored in a tangible storage medium. Ex.1003, ¶233. Thus, Dziong renders obvious that the claimed "*computer software product*" includes "*a tangible storage medium, in which program instructions are stored.*" Ex.1003, ¶233. When executed by the processor, the stored instructions would cause the computer processor to perform the recited steps as discussed below.

[17.2] *to identify two or more candidate routes for a new connection having a requested bandwidth to be established through the network,*

See analysis of [1.1] and [8.3]. Ex.1003, ¶234.

[17.3] to accept a sharing definition specifying one or more other connections, which have respective bandwidths and which are permitted to share a bandwidth allocation with the new connection

See analysis of [1.2] and [8.4]. Ex.1003, ¶235.

[17.4] such that a total bandwidth allocated jointly to the new connection and to the other connections in any given segment is equal to a maximum of the requested bandwidth and of the bandwidths of the other connections in the given segment,

See analysis of [1.3] and [8.5]. Ex.1003, ¶236.

[17.5] to calculate for each of the two or more candidate routes a cumulative additional bandwidth reservation to be allocated to the new connection in the segments along the candidate route, responsively to the sharing definition,

See analysis of [1.4] and [8.6]. Ex.1003, ¶237.

[17.6] to select a preferred route having a minimum value of the cumulative additional bandwidth reservation out of the two or more candidate routes, and

See analysis of [1.5] and [8.7]. Ex.1003, ¶238.

[17.7] to establish the new connection using the preferred route.

See analysis of [1.6] and [8.8]. Ex.1003, ¶239.

17. Claim 18

[18.0] The product according to claim 17, wherein at least some of the segments are arranged in a ring configuration associated with the node, and

[18.1] wherein the instructions cause the computer to identify first and second candidate routes traversing respective first and second ringlets of the ring configuration,

See analysis of [2.0]-[2.1], [9.0], and [9.2]. Ex.1003, ¶¶240-241.

[18.2] and to select the preferred route traversing one of the first and second ringlets.

See analysis of [1.5], [2.1], and [9.3]. Ex.1003, ¶242.

18. Claim 19

[19.0] The product according to claim 17, wherein the new connection comprises a tunnel established through the network in accordance with a tunnel-based communication protocol.

See analysis of [3.0]. Ex.1003, ¶243.

19. Claim 20

[20.0] The product according to claim 17, wherein the new connection and at least one of the other connections specified in the sharing definition traverse at least one common segment along the preferred route,

[20.1] and wherein the instructions cause the computer to allocate the maximum of the requested bandwidth and of the bandwidths of the at least one of the other connections in the at least one common segment to the new connection and to the existing connection.

See analysis of [4.0]-[4.1]. Ex.1003, ¶¶244-245.

F. Ground 2

1. Jensen

Jensen describes “path selection (i.e. routing) algorithms to evenly load traffic onto the network, preventing network hotspots that degrade performance.”

Ex.1007, [0001]. Like Dziong and Sathyanath, Jensen describes its technology in the general context of “[r]ing and mesh networks.” Ex.1007, [0007].

Jensen explains how load-balancing can improve a network’s performance:

Load-balancing algorithms can improve the traffic distribution in the network. Using a simple load[]-balancing algorithm (to break ties on equal length routes, find the resource with the highest utilisation, choose the route with the lowest of the two) for both node and links showed that traffic could be balanced across the most highly utilised nodes or link.

Ex.1007, [0041].

Jensen is in the same field of endeavor as the '088 patent, namely, communication networks. Ex.1001, 1:6-9; Ex.1007, title (“Communications Networks”). Jensen is also reasonably pertinent to a problem addressed by the '088 patent, namely, improving the establishment of network connections. Ex.1001, 2:13-17; Ex.1007, [0001] (“Below is shown a type of network that overcomes many of the problems associated with conventional network designs.... Even route distribution allows path selection (i.e. routing) algorithms to evenly load traffic onto the network, preventing network hotspots that degrade performance; an even load distribution improves the networks response to failure.”).

2. Claim 7

[7.0] *The method according to claim 1, wherein selecting the preferred route comprises reverting to a lower priority route selection method when the calculated cumulative additional bandwidth reservation is equal for all of the two or more candidate routes.*

As discussed at [1.5], Dziong and Sathyanath describe—and provide

illustrative examples of—“*selecting a preferred route.*”

Sathyanath describes a route-selection process in Fig. 15. When there are multiple candidate routes having the same overall cost, Sathyanath’s Fig. 15 will implicitly choose one of them, specifically, whichever candidate route is listed first in the set of candidate routes. Ex.1003, ¶¶250-251. Since the set of candidate routes is not sorted into any particular order, Sathyanath effectively chooses one of the candidate routes at random. Ex.1003, ¶252. Selecting one route at random was a known technique for balancing traffic loads across multiple alternative routes. *See* Ex.1011, 9:17-25, 9:63-65 (“load balancing is provided by choosing a random number between all equal-cost paths for a particular connection”), 12:9-13 (“randomly select one of a number of equal-cost routes when more than one route having the same cost... is found”); Ex.1010, [0063] (“A pseudo-random number generator may be used to break ties in the case of equal cost links.”); Ex.1041, [0201] (“If there is still a tie, prefer the route being advertised...with the lowest ID.... (This is an almost random final tie breaker.)”); *see* Ex.1003, ¶253.

It would have been obvious to a POSITA to improve Dziong’s and Sathyanath’s route-selection process by performing load balancing in a more strategic manner. Ex.1003, ¶254. To that end, Jensen describes a “simple load[]-balancing algorithm”: “to break ties on equal length routes, find the resource with the highest utilisation, choose the route with the lowest of the two.” Ex.1007,

[0041]. Jensen explains that using such an algorithm “can improve network balance.” Ex.1007, [0041]. Jensen’s simple load-balancing algorithm is a “*lower priority route selection method*.” It would have been obvious to employ Jensen’s simple load-balancing algorithm when the route-selection process of Dziong and Sathyanath (discussed above at [1.4]-[1.5]) results in two or more equal-cost candidate routes (“*when the calculated cumulative additional bandwidth reservation is equal for all of the two or more candidate routes*”). Ex.1003, ¶255.

The combination of Dziong, Sathyanath, and Jensen is merely the simple substitution of one known element (Jensen’s simple load-balancing algorithm) for another (Dziong’s and Sathyanath’s random selection among equal cost routes) to obtain predictable results (improved network balance). Ex.1003, ¶255.

Alternatively, the combination represents the use of known technique (Jensen’s simple load-balancing algorithm) to improve a similar method (Dziong’s and Sathyanath’s route-selection process) in the same way (by improving the balance of traffic across alternative paths through a network). Ex.1003, ¶255.

The combination also would have been obvious even without any identifiable benefit. There is no need for a combination to provide “an ‘improvement’ in a categorical sense.” *Intel Corp. v. PACT XPP Schweiz AG*, 61 F.4th 1373, 1381 (Fed. Cir. 2023). It is enough that load balancing was a known problem for network route selection processes, that Jensen’s simple load-balancing

algorithm helped address the problem, and that the simple algorithm was not beyond the ordinary level of skill. Ex.1003, ¶256; *see* Ex.1036, [0003] (“problems may occur if traffic managers (also referred to as load balancers) become inoperative”); Ex.1037, [0006] (“communication problems, such as improper load balance”); Ex.1038, [0006] (“conventional Ethernet networks do not have support for network-wide load balancing, suffer from resiliency problems and cannot support traffic engineering”).

3. Claim 14

[14.0] *The node according to claim 8, wherein the processor is arranged to revert to a lower priority route selection method when the calculated cumulative additional bandwidth reservation is equal for all of the two or more candidate routes.*

See analysis of [7.0]. Ex.1003, ¶258.

XI. DISCRETIONARY DENIAL IS INAPPROPRIATE

A. Discretionary denial under 35 U.S.C. § 325(d) is not appropriate.

Denial under § 325(d) is not warranted because the challenges presented in this petition are neither cumulative nor redundant to the prosecution of the '088 Patent. The Examiner did not consider Dziong, Sathyanath, or Jensen during prosecution, making § 325(d) denial inappropriate.

B. Discretionary denial under the *Fintiv* factors is not appropriate.

The Board balances six factors in considering denial under § 314. *Apple Inc. v. Fintiv, Inc.*, IPR2020-00019, Paper 11 (Mar. 20, 2020) (precedential). These

factors strongly favor institution.

1. Potential for stay

The '088 patent has been withdrawn from the copending litigation. *Compare* Ex.1008, 1 *to* Ex.1009, 1. The question of whether the litigation might be stayed is moot, and this factor is at least neutral. The withdrawal of the '088 patent from the litigation is functionally equivalent to a stay, however, and thus this factor weighs against discretionary denial.

2. Proximity of the court's trial date

The '088 patent has been withdrawn from the copending litigation, so there is no estimated district court trial date. This factor weighs against discretionary denial.

3. Investment in the parallel proceeding

The '088 patent was withdrawn from the copending litigation before any Markman hearing or summary judgment motion. Thus, there has not been any significant investment in evaluating the '088 patent's invalidity, and this factor weighs against discretionary denial.

4. Overlap of issues

There is no overlap of issues. The '088 patent was withdrawn from the copending litigation, so there is no risk of potential conflict between decisions of the district court and this Board. This factor weighs against discretionary denial.

5. Whether the petitioner is a defendant

Petitioner is a defendant in the litigation, however, the '088 patent is no longer asserted against defendant. Ex.1009, 1. Accordingly, this factor is neutral.

6. Other circumstances

As discussed above, the prior art presented in this Petition renders the Challenged Claims unpatentable as obvious. The merits of Petitioner's arguments are compelling because they lead to a strong conclusion that one or more claims are unpatentable by a preponderance of the evidence. This factor weighs against discretionary denial.

As such, the *Fintiv* factors are either neutral or weigh against discretionary denial. Institution should not be denied on discretionary factors.

C. Discretionary denial under *General Plastic* is not appropriate.

The '088 patent has not been challenged in any prior IPR petition, so none of *General Plastic* discretionary institution factors apply. *See General Plastic Indus. Co., Ltd. v. Canon Kabushiki Kaisha*, IPR2016-01357, Paper 19 at 16 (Sept. 6, 2016) (Section II.B.4.i. precedential).

XII. CONCLUSION

Petitioner has established a reasonable likelihood that the Challenged Claims are unpatentable.

XIII. MANDATORY NOTICES

A. Real party-in-interest

Pursuant to 37 C.F.R. § 42.8(b)(1), Petitioner certifies that the real party-in-interest is Cisco Systems, Inc.

B. Related matters

Pursuant to 37 C.F.R. § 42.8(b)(2), to the best knowledge of the Petitioner, the '088 Patent is or was involved in the following cases:

Case Heading	Number	Court	Filed
<i>Portsmouth Network Corp. v. Cisco Systems, Inc.</i>	2:23-cv-441	E.D. Tex.	Sept. 26, 2023

C. Lead and back-up counsel and service information

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CERTIFICATE OF WORD COUNT

Pursuant to 37 C.F.R. § 42.24(d), Petitioner hereby certifies, in accordance with and reliance on the word count provided by the word-processing system used to prepare this Petition, that the number of words in this paper is 13,246. Pursuant to 37 C.F.R. § 42.24(d), this word count excludes the table of contents, table of authorities, mandatory notices under § 42.8, certificate of service, certificate of word count, appendix of exhibits, and any claim listing.

Dated: September 23, 2024

/Theodore M. Foster/

Theodore M. Foster
Lead Counsel for Petitioner
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CERTIFICATE OF SERVICE

The undersigned certifies that, in accordance with 37 C.F.R. § 42.6(e) and 37 C.F.R. § 42.105, service was made on Patent Owner as detailed below.

Date of service September 23, 2024

Manner of service Priority Mail Express International

Documents served Petition for *Inter Partes* Review Under 35 U.S.C. § 312
and 37 C.F.R. § 42.104 of U.S. 7,596,088;
Petitioner's Power of Attorney;
Petitioner's Exhibit List;
Exhibits 1001-1042.

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