

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

JUNIPER NETWORKS, INC.

Petitioner,

v.

ORCKIT CORPORATION

Patent Owner.

Case IPR2024-00034

U.S. Patent No. 8,830,821

**PETITION FOR *INTER PARTES* REVIEW OF
U.S. PATENT NO. 8,830,821**

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EXHIBIT LIST

Exhibit	Description
1001	U.S. Patent No. 8,830,821 to Cohn <i>et al.</i>
1002	Prosecution History of U.S. 8,830,821
1003	Declaration of Dr. Henry Houh under 37 C.F.R. § 1.68
1004	Curriculum Vitae of Dr. Houh
1005	U.S. Patent Publication No. 2004/0205239 to Doshi <i>et al.</i> (“Doshi”)
1006	“Definitive MPLS Network Designs,” by Guichard <i>et al.</i> , Cisco Press, 2005 (“Guichard”)
1007	U.S. Patent Publication No. 2003/0117950 to Huang (“Huang”)
1008	“MATE: MPLS Adaptive Traffic Engineering” by Elwalid <i>et al.</i> , IEEE, 2001
1009	“Traffic Engineering with MPLS,” by Osborne <i>et al.</i> , Cisco Press, 2003
1010	“Fast Network Re-optimization Schemes for MPLS and Optical Networks” by Bhatia <i>et al.</i> , 2006
1011	RFC3209
1012	Complaint, Orckit Corporation v. Cisco Systems, Inc., Civil Action No. 2:22-cv-276-JRG-RSP (E.D. Tex., Jul. 22, 2022)
1013	Federal Court Statistics

Exhibit	Description
1014	Proposed Docket Control Order, Orckit Corporation v. Cisco Systems, Inc., Civil Action No. 2:22-cv-276-JRG-RSP (E.D. Tex., Dec. 2, 2022)
1015	Infringement Contentions, Orckit Corporation v. Cisco Systems, Inc., Civil Action No. 2:22-cv-276-JRG-RSP (E.D. Tex., Nov. 3, 2022)
1016	U.S. Patent Publication No. 2008/0155257
1017	U.S. Patent No. 7,624,142
1018	U.S. Patent Publication No. 2006/0015781
1019	Definitive MPLS Network Designs Guichard, Copyright Public Record(s)
1020	Definitive MPLS Network Designs Guichard, Library of Congress Record(s)
1021	Internet Archive Affidavit, Definitive MPLS Network Designs (Guichard)
1022	RFC3272
1023	“Multiprotocol Label Switching (MPLS) Traffic Engineering,” Cisco IOS Release 12.0(5)
1024	IETF “Multiple Metrics for Traffic Engineering with IS-IS and OSPF,” Fedyk <i>et al.</i>
1025	U.S. Patent Publication No. 2011/0141877 to Xu <i>et al.</i> , (“Xu”)

Exhibit	Description
1026	U.S. Patent No. 5,699,403 to Ronnen (“Ronnen”)
1027	RFC2026
1028	U.S. Patent No. 8,102,774
1029	U.S. Patent Publication No. 2007/0201513
1030	RFC3469
1031	U.S. Patent No. 6,980,906
1032	U.S. Patent No. 7,502,884
1033	U.S. Patent No. 7,197,418
1034	U.S. Patent Publication No. 2006/0250948
1035	U.S. Patent Publication No. 2007/0047469
1036	U.S. Patent Publication No. 2006/0291391

CLAIM LISTING

Independent Claim 1	
1.0	An entity selection method performed by a network device, comprising the steps of:
1.1	providing a plurality of multi protocol label switching (MPLS) transport entities between a first endpoint and a second endpoint;
1.2	determining an overall cost for each entity pair of said plurality of entities;
1.3	selecting an entity pair from said plurality of transport entities based at least in part upon said overall cost; and
1.4	if an entity pair reselection event occurs, reselecting said entity pair from the group consisting of said entity pair and a replacement entity pair comprising at least one entity distinct from the entities of said entity pair,
1.5	wherein said entity pair reselection event is selected from a group consisting of adding an entity to said plurality of transport entities, removing an entity from said plurality of transport entities, an operational status change for one of said plurality of transport entities, and a change in overall cost for one of said plurality of transport entities.
2.1	The method of claim 1, wherein said step of selecting an entity pair further comprises: selecting a working entity from said entity pair; and selecting a protection entity from said entity pair.
3.1	The method of claim 2, further comprising the step of selecting an active entity from the set consisting of said working entity and said protection entity.
4.1	The method of claim 2, wherein selecting an entity pair further comprises minimizing an overall cost function.
5.1	The method of claim 4, wherein said overall cost function comprises substantially minimizing a probability of concurrent failure of said protection entity and said working entity.
6.1	The method of claim 4, wherein said overall cost function comprises a predefined entity cost metric.
7.1	The method of claim 6, wherein said predefined entity cost metric is selected from the group consisting of interior gateway protocol (IGP) and traffic engineering (TE).
8.1	The method of claim 4, further comprising the step of configuring said working entity as revertive.

9.1	The method of claim 4, wherein said overall cost function comprises: selecting a subset of entity pairs wherein each entity pair of said subset has substantially minimum probability of a concurrent failure of said protection entity and said working entity; and
9.2	if said subset comprises at least two entity pairs, selecting an entity pair from said subset that minimizes an entity cost function.
10.1	The method of claim 9, wherein said entity cost function comprises a predefined metric.
11.1	The method of claim 10, wherein said predefined metric is selected from the group consisting of interior gateway protocol (IGP) and traffic engineering (TE).
12.1	The method of claim 10, further comprising the step of configuring said working entity as revertive.
13.1	The method of claim 1, further comprising the step of: if said entity pair reselection results in both working and protection entities being replaced, sequentially replacing said working entity and said protection entity.
14.0	A system for selecting entities within an MPLS network, comprising:
14.1	a data structure comprising a plurality of transport entity descriptors;
14.2	an entity protection switch configured to switch between a working entity and a protection entity; and
14.3	digital logic configured to select said working entity and said protection entity from said plurality of transport entity descriptors, comprising:
14.4	logic configured to determine a probability of concurrent failure of said working entity and said protection entity;
14.5	logic configured to determine an entity cost of said plurality of transport entity descriptors: and
14.6	logic configured to reselect said working entity and said protection entity from said plurality of transport entity descriptors upon a reselection event,
14.7	wherein said reselection event is selected from a group consisting of adding an entity to said plurality of transport entities, removing an entity from said plurality of transport entities, an operational status change for one of said plurality of transport entities, and a change in overall cost for one of said plurality of transport entities.
15.1	The system of claim 14, wherein said entity protection switch comprises a 1:1 switch.
16.1	The system of claim 14, wherein said entity protection switch comprises a 1+1 switch.

17.0	Non-transitory computer readable media configured to perform a method comprising the steps of:
17.1	providing a plurality of MPLS transport entities between a first endpoint and a second endpoint;
17.2	determining an overall cost for each entity pair of said plurality of entities;
17.3	selecting an entity pair from said plurality of transport entities based at least in part upon said overall cost; and
17.4	if an entity pair reselection event occurs, reselecting said entity pair from the group consisting of said entity pair and a replacement entity pair comprising at least one entity distinct from the entities of said entity pair,
17.5	wherein said entity pair reselection event is selected from a group consisting of adding an entity to said plurality of transport entities, removing an entity from said plurality of transport entities, an operational status change for one of said plurality of transport entities, and a change in overall cost for one of said plurality of transport entities.
18.1	The non-transitory computer readable media of claim 17, wherein said step of selecting an entity pair further comprises: selecting a working entity from said plurality of transport entities; and selecting a protection entity from said plurality of transport entities; and
18.2	selecting an active entity from the set consisting of said working entity and said protection entity.
19.1	The non-transitory readable media of claim 18, wherein said step of selecting an entity pair further comprises minimizing an overall cost function.
20.1	The non-transitory readable media of claim 19, wherein said overall cost function comprises: minimizing a probability of concurrent failure of said protection entity and said working entity; and
20.2	a predefined metric selected from the group consisting of interior gateway protocol (IGP) and traffic engineering (TE).

MANDATORY NOTICES UNDER 37 C.F.R. § 42.8(a)(1)

- **§ 42.8(b)(1):** Juniper Networks, Inc. is the real party-in-interest.
- **§ 42.8(b)(2):** The '821 Patent is at issue in the following cases that may affect, or be affected by, a decision in this proceeding:

Orckit Corporation v. Cisco Systems, Inc., No. 2:22-cv-00276 (E.D. Tex.);

Orckit Corporation v. Arista Networks, Inc., No. 1:23-cv-00821 (D. Del.);

Orckit Corporation v. Juniper Networks, Inc., No. 1:23-cv-00822 (D. Del.); and

Cisco Systems, Inc. v. Orckit Corporation, IPR2023-000402 (P.T.A.B.).

- **§§ 42.8(b)(3), (4):** A Power of Attorney accompanies this Petition. Juniper consents to email service at ipr@fischllp.com.

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I. INTRODUCTION

U.S. Patent No. 8,830,821 (“the ’821 Patent”) relates to multiprotocol label switching (“MPLS”) transport entity recovery with multiple protection entities. The claims issued after the Applicant amended the claims “to clarify” the reselecting of the path pair.¹ But as shown below, and as Dr. Houh’s Declaration (Ex. 1003) confirms, this wasn’t new and would’ve been obvious to a POSITA.

Included with this Petition is a timely Motion for Joinder. Juniper Networks, Inc. (“Juniper,” “Petitioner”) respectfully requests *inter partes* review (“IPR”) of claims 1-20 (“the Challenged Claims”) of the ’821 Patent.

II. STANDING, IDENTIFICATION OF CHALLENGE, AND RELIEF REQUESTED

A. Grounds for Standing (§42.104(a))

Juniper certifies the ’821 Patent is available for IPR. Juniper isn’t barred or estopped from requesting IPR of the Challenged Claims on the asserted grounds.

B. Identification of Challenge and Relief Requested (§42.104(b))

A Motion for Joinder accompanies this Petition, which, in the interest of judicial economy, relies on copies of the exhibits filed in IPR2023-00402. Relying on this identical evidence challenging the same claims with substantially identical grounds, Juniper asks the Board to find the Challenged Claims unpatentable under

¹ Ex. 1002, 55, 63-64.

§103² based on the following patents and printed publications in view of the general knowledge of a person having ordinary skill in the art (“POSITA”) prior to the purported invention:

Ground	Proposed Challenges
1	Doshi ³ and Guichard ⁴ render obvious claims 1-7, 9-11, 13, and 17-20.
2	Doshi, Guichard, and Huang ⁵ render obvious claims 8 and 12.
3	Doshi, Guichard, and Xu render obvious claims 14-16.

Doshi published on October 14, 2004. Huang published on June 26, 2003.

And Xu published on June 16, 2011, before the June 22, 2011 earliest filing date of the ’821 Patent.

Further, Cisco Press published in 2005 the textbook “Definitive MPLS Network Designs” which bears a copyright date of 2005 and ISBN Number 1-58705-186-9.⁶ In addition, Guichard was registered as a publication with the Copyright Office in 2005, and the Library of Congress online catalog confirms the

² 35 U.S.C. §§102, 103 (pre-AIA) applies to the ’821 Patent.

³ U.S. Patent Publication No. 2004/0205239 (Ex. 1005) (“Doshi”).

⁴ Guichard *et al.* “Definitive MPLS Network Designs,” Cisco Press, 2005 (Ex. 1006) (“Guichard”).

⁵ U.S. Patent Publication No. 2003/0117950 (Ex. 1007) (“Huang”).

⁶ Guichard, 2; Ex.1021.

2005 publication of Guichard.⁷ Also, the Internet Archive, which is a well-known archiving website, captured on August 30, 2009 the website Amazon.com, showing that Guichard was available for purchase online and that two reviews were posted in 2005 and one review was posted in 2006, which further support public availability as of those dates.⁸ The totality of the evidence demonstrates that Guichard was publicly available to interested persons exercising reasonable diligence, and, therefore, was a printed publication as of 2005.⁹

Doshi, Guichard, and Huang qualify as prior art under 35 U.S.C. §102(b), and Xu qualifies as prior art under 35 U.S.C. §102(e).

Petitioner also appropriately cites additional prior art as background knowledge of a POSITA and to provide contemporaneous context to support Petitioner's assertions regarding what a POSITA would've understood from the

⁷ Guichard, 2; Ex.1019; Ex.1020.

⁸ Ex.1021, 1-5.

⁹ See *Hulu, LLC v. Sound View Innovations, LLC*, IPR2018-01039, Paper 29 at 17-18 (P.T.A.B. Dec. 20, 2018) (precedential); *CIM Maint. Inc. v. P&RO Sols. Grp., Inc.*, IPR2017-00516, Paper 8 at 18–20 (P.T.A.B. June 22, 2017) (Amazon.com reviews show public availability); *Ex parte Ghalili*, Appeal No. 2020-001741 (P.T.A.B. August 3, 2020) (affirming reference as prior art that was web-archived prior to the effective filing date of the application).

prior art in the grounds.¹⁰ For instance, Dr. Houh and this Petition cite to several “Request for Comments” (“RFC”) documents published by the Internet Engineering Task Force (“IETF”). To the extent the Board determines that these IETF documents must qualify as prior art “printed publications” for the purposes for which they are cited, the documents do so qualify.¹¹ The Board has repeatedly found IETF documents, including RFCs, to be “printed publications.”¹²

Exhibits 1011, 1022, and 1030 are documents published by the IETF describing MPLS networking standards and improvements, and a POSITA would’ve reasonably relied upon such documents.¹³ In fact, POSITAs frequently

¹⁰ See *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); see also *K/S HIMPP v. Hear-Wear Techs., LLC*, 751 F.3d 1362, 1365-66 (Fed. Cir. 2014); *Arendi S.A.R.L. v. Apple Inc.*, 832 F.3d 1355, 1363 (Fed. Cir. 2016).

¹¹ See, e.g., Ex.1027, 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); Houh, ¶¶46-47.

¹² 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).

¹³ Houh, ¶47.

cited these exact documents before the '821 priority date.¹⁴

III. SUMMARY OF THE '821 PATENT

A. Overview of the '821 Patent

The '821 Patent generally describes a “system and a method for selecting [Multiprotocol Label Switching] MPLS network transport entities between a first and a second endpoint.”¹⁵ According to the '821 Patent, the noted system and method provide “protection against multiple span or node failures” by utilizing transport entity pairs that are “fully or partially resource disjoint.”¹⁶ “[A]n overall cost for each pair of the plurality of transport entities is determined” and a pair, comprising a “working entity” and a “protection entity,” is “selected to minimize an overall cost.”¹⁷ For communication, “[a]n active entity may be selected from the working entity and the protection entity.”¹⁸

¹⁴ Doshi, [0056], [0265] (citing RFC3209); Ex.1035, [0013], [0040]-[0041] (citing RFC3209); Ex.1036, [0011], [0040]-[0041] (citing RFC3209); Ex.1028, 2:22-24 (citing RFC3469); Ex.1029, [0047] (citing RFC3272). Houh, ¶¶47-48.

¹⁵ '821 Patent, Abstract.

¹⁶ *Id.*, 3:15-18.

¹⁷ *Id.*, 4:13:16, 29:33.

¹⁸ *Id.*, 4:57-58; Houh, ¶34.

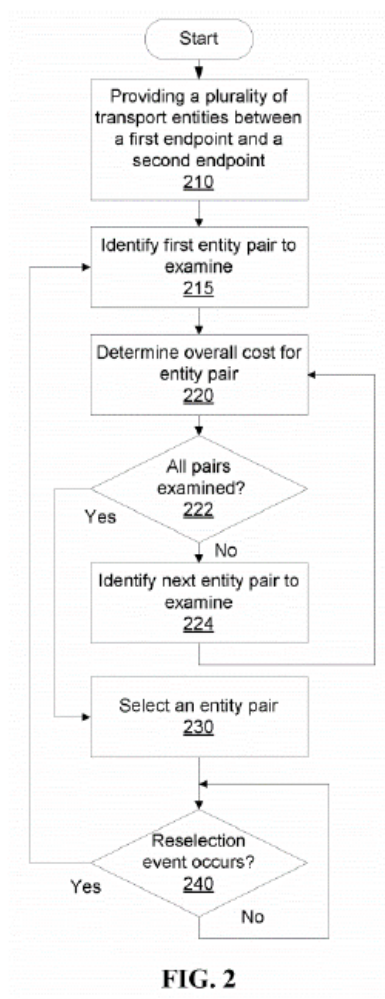
The '821 Patent also discloses that an “event” triggers “entity pair reselection.”¹⁹ The reselection may result in selecting new entity pair or selecting the same pair.²⁰ The event trigger may be: a network operational status change, adding an entity, removing an entity, or cost changes for an entity.²¹

Figures 2 and 3, reproduced below illustrate flow charts of the '821 Patent's methods.

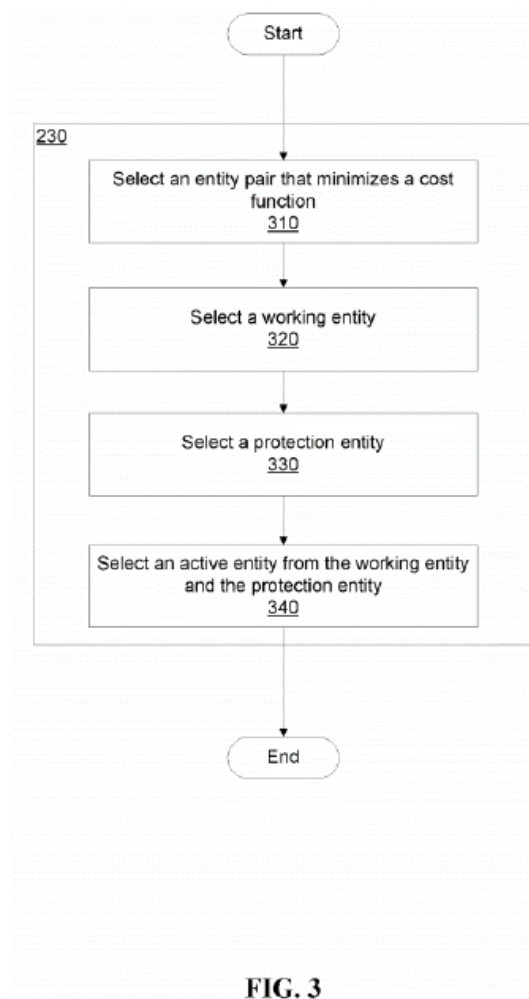
¹⁹ *Id.*, 4:34-35.

²⁰ *Id.*, 4:63-5:8.

²¹ *Id.*, 4:35-41; Houh, ¶35.



'821 Patent, Fig. 2



'821 Patent, Fig. 3

B. Prosecution History of the '821 Patent

The '821 Patent claims priority to U.S. Provisional Application No. 61/499,943 filed on 6/22/2011.

In response to an Office Action, the Applicant amended independent claim 1 “to clarify” the “reselecting said entity pair” limitation, as shown below:

if an entity pair reselection event occurs, reselecting said entity pair from the group consisting of said entity pair and a replacement entity pair comprising at least one entity distinct from the entities of said entity pair.

Ex.1002, 55, 64.

Applicants then argued that the prior art does not teach the amended claim (among other features) because the asserted art only addresses failovers and not reselecting the path pair apart from failover.²² The patent issued on September 9, 2014.²³

IV. LEVEL OF ORDINARY SKILL IN THE ART

A Person of Ordinary Skill in The Art (“POSITA”) on June 22, 2011, would’ve had a working knowledge of network communications and multiprotocol label switching (“MPLS”) techniques available at the time. A POSITA would’ve had a bachelor’s degree in computer science, computer engineering, electrical engineering, or equivalent training, and approximately two years of experience working in the field of network communications and been knowledgeable regarding MPLS techniques. Lack of professional experience can be remedied by additional education, and vice versa.²⁴

²² Ex.1002, 63.

²³ *Id.*, 30; Houh, ¶¶38-40.

²⁴ Houh, ¶¶27-29.

V. CLAIM CONSTRUCTION

Claim terms in IPR are construed according to their “ordinary and customary meaning” to those of skill in the art.²⁵ Petitioner submits that, for the purposes of this proceeding and the grounds presented herein, no claim term requires express construction.²⁶ For clarity, however, Petitioner notes below example embodiments in the specification.²⁷

A. “entity”

Each independent claim of the ’821 Patent recites an “entity.” The ’821 Patent discloses that exemplary “MPLS-TP transport entities” include “label switch paths (“LSPs”) or pseudo wires (“PWs”).”²⁸ Accordingly, the term “entity” includes an MPLS LSP or a PW.²⁹

VI. NO BASIS EXISTS FOR DISCRETIONARY DENIAL

Although institution is discretionary, the grounds for unpatentability presented in this Petition are neither cumulative or redundant to the prosecution of

²⁵ 37 C.F.R. § 42.100(b); *Phillips v. AWH Corp.*, 415 F.3d 1303 (Fed. Cir. 2005) (en banc).

²⁶ *Nidec Motor Corp. v. Zhongshan Broad Ocean Motor Co.*, 868 F.3d 1013, 1017 (Fed. Cir. 2017).

²⁷ Houh, ¶¶41-43.

²⁸ ’821 Patent, 3:22-29.

²⁹ Houh, ¶¶44-45.

the '821 Patent. The prior art here wasn't previously considered and isn't redundant to any combination of references previously considered. Nor do the *Fintiv* or *General Plastic* factors provide any basis for denial.

A. Discretionary Denial Under *Fintiv* Isn't Appropriate

The six *Fintiv* factors considered for §314 denial favor institution.³⁰ Factor 1 is neutral. Patent Owner filed its complaint against Juniper asserting infringement of the '821 Patent on July 31, 2023. Because the district court proceeding is in its early stages, no motion for stay has been filed. Due to the early stage of the district court proceeding, the parties have only minimally invested in the district court proceeding, no case schedule currently exists, and no overlap in prior art issues exist. Indeed, Juniper has yet to respond to the complaint. A final written decision will issue from this IPR well before the 27-month median time to trial in Delaware elapses. Factors 2-4 therefore weight in favor of institution. The parties are the same so factor 5 doesn't provide a basis for denying institution. And this Petition seeks joinder of already instituted proceedings. The institution of the original proceeding, IPR2023-00402, confirms the compelling evidence of unpatentability included in this petition which relies on the same evidence. Thus, factor 6 also

³⁰ See *Apple Inc. v. Fintiv, Inc.*, IPR2020-00019, Paper 11 (PTAB Mar. 20, 2020) (precedential).

weighs in favor of institution. And *Fintiv* offers no basis for denying institution here.

B. Discretionary Denial Under *General Plastic* Isn't Appropriate

Although the Board applies *General Plastic* to petitions seeking joinder, the factors don't support denying institution here.³¹ This Petition is Petitioner's first challenge to the '821 Patent. And as its Motion for Joinder details, Petitioner agrees to assume a passive understudy role so that its participation won't affect the schedule of IPR2023-00402 or impact the Board's finite resources. In doing so, Petitioner "effectively neutraliz[es] the *General Plastic* [discretionary denial] factors."³² *General Plastics* therefore offers no basis for discretionary denial.³³

³¹ *Cf. Apple Inc. v. Uniloc 2017 LLC*, IPR2020-00854, Paper 9 (P.T.A.B. Oct. 28, 2020) (precedential) (applying *General Plastic* factors where Petitioner previously filed unsuccessful IPR petitions).

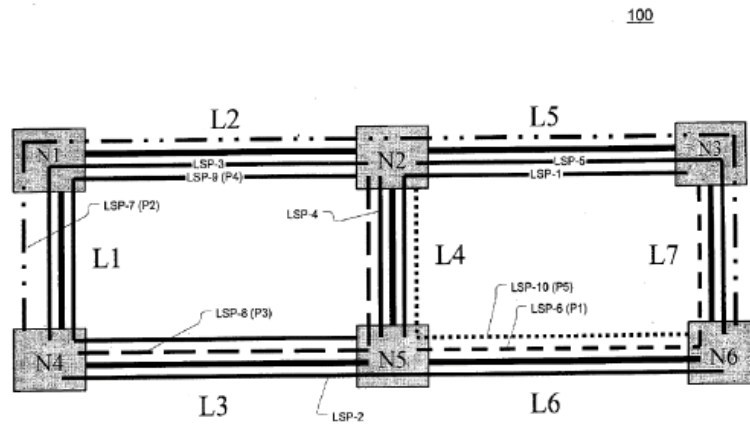
³² *Apple Inc. v. Uniloc 2017 LLC*, IPR2018-00580, Paper 13 at 10-11 (P.T.A.B. Aug. 21, 2018).

³³ *See General Plastic Industrial Co., Ltd. v. Canon Kabushiki Kaisha*, IPR2016-01357, Paper 19 at 9-10 (P.T.A.B. Sept. 6, 2017) (precedential) (listing factors considered when petitioners have previously filed petitions).

VII. GROUND 1: DOSHI AND GUICHARD RENDER OBVIOUS CLAIMS 1-7, 9-11, 13, AND 17-20.

A. Doshi Summary

Like the '821 Patent, Doshi (Ex. 1005) generally addresses path restoration and recovery.³⁴ Doshi, in the context of Fig. 1, discloses a shared mesh data network “SMDN 100” that supports an MPLS architecture.³⁵



Doshi, Fig. 1.

In the above figure, the MPLS architecture includes a plurality of Label Switched Path (“LSP”) pairs (*e.g.*, LSP-1 and LSP-6) between two nodes (*e.g.*, between N3 and N5). The LSP pair includes a “primary” (or a “working”) LSP and

³⁴ Doshi, [0008], Title, Abstract.

³⁵ *Id.*, [0048]-[0049]; Houh, ¶¶49-51.

a “protection” (or “restoration”) LSP.³⁶ The protection LSPs serve as a backup path if the primary LSP fails.³⁷

Doshi describes a selection method performed by a “network manager,” which determines the cost of each LSP pair and then selects the LSP pair with the overall-minimal cost.³⁸ The determination considers several factors, including “link utilization, utilization threshold, administrative weight, and sharing degree” and path disjointedness.³⁹ Doshi explains that the benefit of disjoint paths is that “a failure affecting one of them will not affect the other.”⁴⁰

Doshi’s Fig. 11, reproduced below, illustrates a logical flowchart for the selection method.⁴¹

³⁶ Doshi, [0046], [0052]-[0054], [0076].

³⁷ *Id.*, [0052]-[0054], [0266]-[0267]; Houh, ¶52.

³⁸ Doshi, [0014], [0142]-[0145], Figs. 10, 11.

³⁹ *Id.*, [0142]-[0144].

⁴⁰ *Id.*, [0040]; Houh, ¶¶50-53.

⁴¹ Houh, ¶¶52-54.

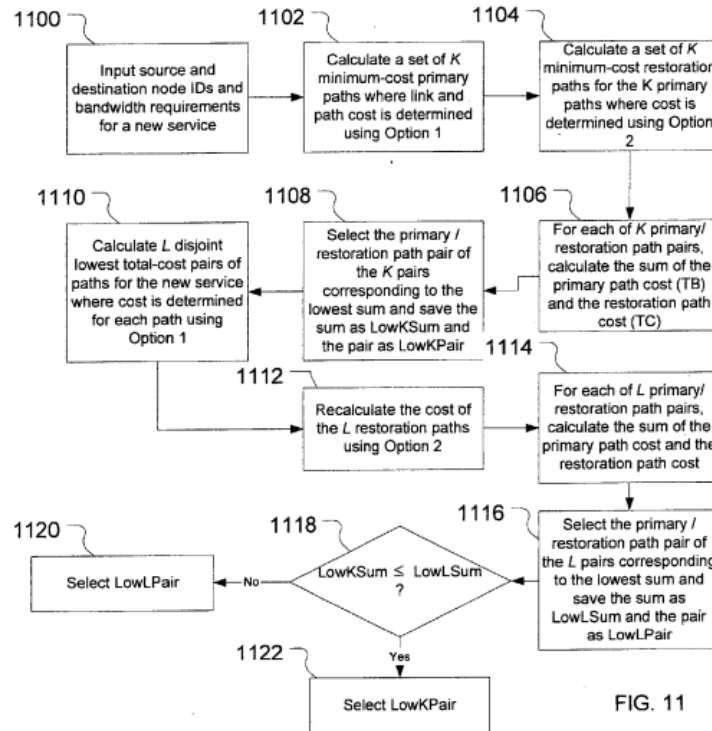


FIG. 11

Doshi, Fig. 11.

B. Guichard Summary

Guichard (Ex. 1006) similarly addresses MPLS LSP selection (or reselection), in the context of reoptimization.⁴² Guichard teaches that the network may change over time, including nodes and links failing and being restored and new LSPs being added or removed.⁴³ These changes present the opportunity to evaluate the available paths and, if warranted, reoptimize the selected LSP by selecting a different LSP if a better path is available.⁴⁴ Guichard provides several

⁴² Guichard, 79-81.

⁴³ *Id.*, 79.

⁴⁴ *Id.*

reoptimization schemes, including: manual reoptimization, timer-based reoptimization, and event-driven reoptimization.⁴⁵

C. Reasons to Combine Doshi and Guichard

A POSITA would've been motivated to combine the teachings of Doshi and Guichard. A POSITA would've found it obvious after selecting MPLS LSPs for communication between two nodes, as described by Doshi, to evaluate if the selection should be reoptimized such that a different LSP would be selected when the network changes. Guichard teaches such reoptimization of MPLS LSPs, which it characterizes as “highly desirable.”⁴⁶

First, Doshi and Guichard are analogous art to the '821 Patent since they generally pertain to MPLS networks and address the problem of selecting LSPs.⁴⁷ Thus, given the similar subject matter, a POSITA considering Doshi would've naturally considered the teachings of Guichard.⁴⁸

Second, a POSITA would've been motivated to combine the teachings of Doshi and Guichard to produce numerous predictable and beneficial results.⁴⁹

⁴⁵ *Id.*, 80-81; Houh, ¶¶55-56.

⁴⁶ Houh, ¶57.

⁴⁷ Doshi, [0014], [0049]; Guichard, 79-81.

⁴⁸ Houh, ¶58.

⁴⁹ *Id.*, ¶59.

Doshi teaches performing cost calculations and selecting an MPLS LSPs pair that has an overall minimum-cost.⁵⁰ Guichard complements Doshi by teaching how to reoptimize an LSP selection. According to Guichard, it is “highly desirable to detect the existence of [network changes] and reoptimize a TE LSP along a better path when it becomes available.”⁵¹ Guichard’s reoptimization evaluation may be manually triggered, time-based, or event-driven (e.g., change in the network such as LSP set up and tear down, etc.).⁵²

A POSITA would’ve been motivated to perform reoptimization evaluations, as taught by Guichard, when implementing Doshi’s pair calculation and selection techniques to identify a potentially better LSP (*e.g.*, for primary or protection LSP paths) with an even lower overall minimum-cost. Doshi’s initial LSP path selection identifies and selects the lowest cost pair of paths at a point in time; however, a POSITA would’ve recognized that it would be advantageous—indeed “highly desirable,” as Guichard puts it—to evaluate the potential for reoptimization to determine whether the selected LSP pair remains the overall minimum-cost pair or whether there is a better pair available for reoptimization. Performing repeated reoptimization evaluations (based on various triggers), as taught by Guichard,

⁵⁰ Doshi, [0014], [0049].

⁵¹ Guichard, 79.

⁵² *Id.*, 79-81; Houh, ¶60.

further Doshi's stated objective of using the optimal path.⁵³ For instance, reoptimization would allow for selecting a shorter path if one becomes available. Doshi describes attempting to identify the shortest primary and protection paths as part of optimization.⁵⁴

The combination represents the use of a known technique (Guichard's reoptimization evaluation in response to various triggers) to improve a similar system or device (Doshi's MPLS architecture) in the same way with predictable results (ongoing optimization). The combination represents what would've been common sense to a POSITA—that it is desirable to evaluate whether selected LSPs remain optimal and to reoptimize the selection if a better option is available.⁵⁵

The results would've been predictable and there would've been a reasonable expectation of success since Doshi and Guichard both address the same technology. Also, a POSITA would've had a reasonable expectation of success in reoptimizing Doshi's LSP pair selection because Guichard provides significant implementation details, including when to trigger reoptimization evaluations and

⁵³ Doshi, [0172] (“...path selection is a powerful tool that can be used...[for] optimization.”), [0200] (“...making an optimal restoration path choice...”).

⁵⁴ *Id.*, [0151], [0165], [0172]; Houh, ¶61.

⁵⁵ Houh, ¶62.

how to “avoid network instabilities.”⁵⁶ The reasonable expectation of success is also evidenced by other skilled artisans that had reoptimized similar systems.⁵⁷

Implementing the combination would be within a POSITA’s skillset since Doshi already sets forth the calculation and selection techniques that would be utilized during the reoptimization evaluation. Also, since Doshi is already “monitoring and updating...network topology,”⁵⁸ event-based reoptimization evaluation per Guichard, would be directly applicable. Doshi itself acknowledges that a POSITA would’ve had the necessary skill set to make “[v]arious modifications of the described embodiments.”⁵⁹

D. Claim 1

Regarding element [1.0], as analyzed in the Claim Construction section (V.A), the scope of the term “entity” includes an MPLS LSP. As shown below, Doshi discloses an MPLS LSP (“entity”) selection method performed by a network manager (“network device”).⁶⁰

⁵⁶ Guichard, 81.

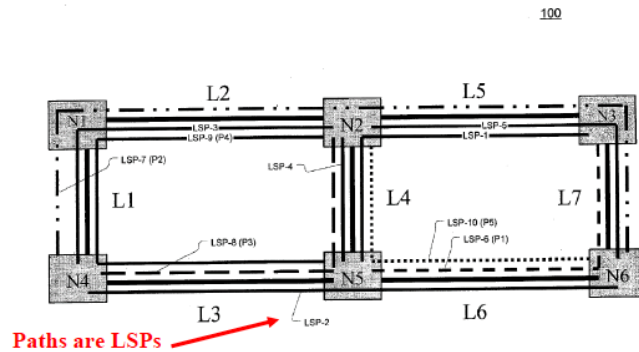
⁵⁷ Ex.1009, 136; Ex.1010, 1; Ex.1023, 34; Ex.1034, [0027]-[0033], claim 19; Ex.1035, [0024]; Houh, ¶¶63-65.

⁵⁸ Doshi, [0270]-[0281]

⁵⁹ *Id.*, [300]; Houh, ¶¶64-66.

⁶⁰ *Id.*, ¶67.

Doshi discloses a shared mesh data network “SMDN 100” configured to “support[] the multiprotocol label switching (MPLS) architecture standard” of “RFC3031.”⁶¹ Doshi’s Fig. 1, reproduced below, illustrates SMDN 100 that has MPLS LSPs (*e.g.*, LSP-1 to LSP-10) between nodes (*e.g.*, N1-N6).⁶²



Doshi, Fig. 1 (annotated); Houh, ¶70.

In the MPLS context, Doshi teaches a “method ...implemented by a network manager for the mesh network.”⁶³ The network manager is implemented in a network device, such as a server or distributed partially or fully to nodes.⁶⁴ The network manager performs the method, so that “primary and restoration paths ...

⁶¹ Doshi, [0049].

⁶² *Id.*, [0016], [0052]-[0054]; Houh, ¶70.

⁶³ Doshi, [0014]; [0049] (“The concepts of the present invention are discussed in the context of ...[a] mesh network (*e.g.*,... MPLS)”).

⁶⁴ *Id.*, [0271]; *see also id.*, [0082], claim 11.

are selected from the plurality of candidate path pairs based on the path cost of each candidate path pair.”⁶⁵

A POSITA would’ve found it obvious, because SMDN 100 supports MPLS, for the “paths” to correspond to LSPs, since those are the paths used for MPLS networks.⁶⁶

Thus, Doshi’s description of an MPLS LSP selection method performed by a network manager, renders obvious the preamble.⁶⁷

For element [1.1], as analyzed above, Doshi’s SMDN 100 is configured to support MPLS.⁶⁸ Doshi illustrates at Figure 1 that the MPLS network “has been provisioned” with a plurality of LSPs (*e.g.*, “LSP-1” to “LSP-10”) between nodes (*e.g.*, N1-N6), at Fig. 1.⁶⁹

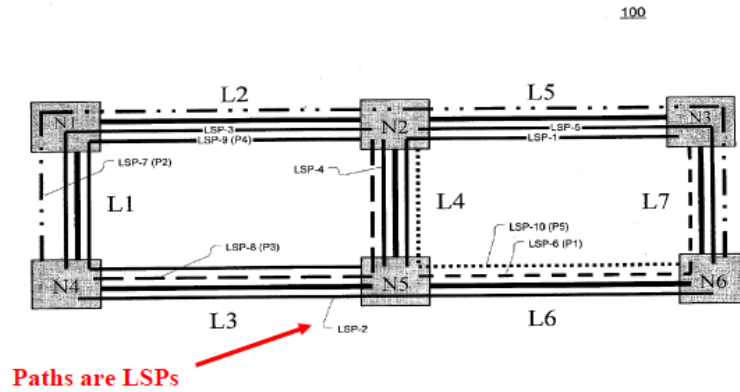
⁶⁵ *Id.*, [0014]; *see also id.*, [0142] (“In the first flow, illustrated by steps 1102, 1104, 1106, and 1106, one minimum-cost path pair is selected from K candidate pairs by a first method.”), claim 11, [0141]-[0145], [0156], [0270]-[0281], Abstract, Figs. 10, 11, 17, 18; Houh, ¶¶68-69.

⁶⁶ Houh, ¶71.

⁶⁷ *Id.*, ¶¶67-73.

⁶⁸ Doshi, [0049].

⁶⁹ *Id.*, [0016], [0050]-[0054]; Houh, ¶¶74-76.



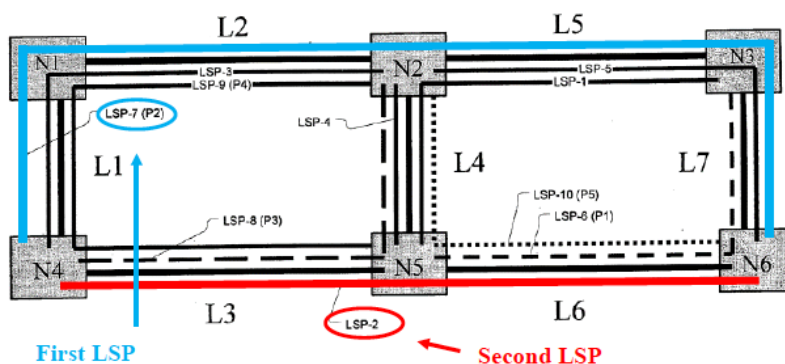
Doshi, Fig. 1 (annotated); Houh, ¶75.

The LSPs are provisioned “between two nodes” that correspond to “source and destination nodes” or “end nodes of an LSP.”⁷⁰ Since Doshi’s LSPs are provided “between” and terminate at two end nodes, a POSITA would’ve understood that one end node (*e.g.*, source node) corresponds to “a first endpoint” and that the other end node (*e.g.*, destination node) corresponds to “a second end point.” Any two (or more) LSPs provided between two end nodes correspond to “a plurality of multi protocol label switching (MPLS) transport entities.”⁷¹

⁷⁰ Doshi, [0050], [0154]-[0156], [0267]; *see also id.*, [0056], [0142], [0188], [0190], [0192], [0195], Figs. 5, 8, 11, 17, 18, 20.

⁷¹ Houh, ¶¶77-78.

Below is an example of providing LSP-2 (a “primary” path)⁷² and LSP-7 (a “protection” path)⁷³ between end node N4 and end node N6.⁷⁴



Doshi, Fig. 1 (annotated); Houh, ¶79.

Although Fig. 1 only illustrates two LSPs between N4 and N6, Doshi makes clear that this figure is merely “exemplary” and expressly teaches “two or more paths between” the end nodes.⁷⁵ Doshi also contemplates making “[v]arious modifications” to the exemplary embodiments.⁷⁶

Accordingly, POSITA would’ve found it obvious to provide additional LSPs between two nodes.⁷⁷ That is, it would’ve been obvious to a person of skill to provide enough LSPs between two nodes to meet bandwidth requirements for

⁷² Doshi, [0052]

⁷³ *Id.*, [0054]

⁷⁴ Houh, ¶79.

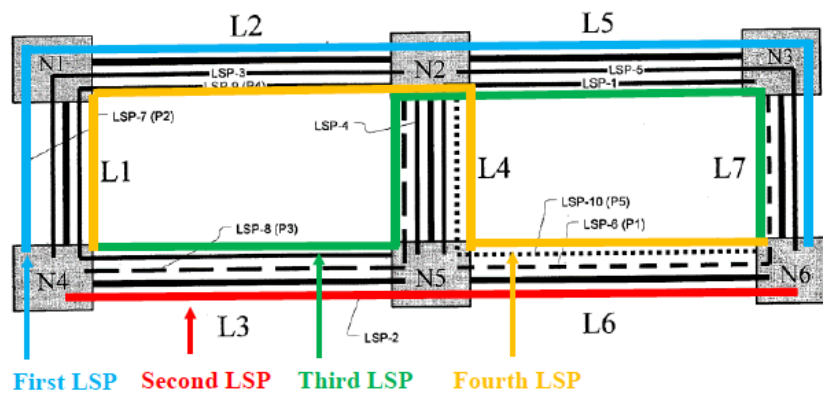
⁷⁵ Doshi, [0016], [0048]-[0055].

⁷⁶ *Id.*, [0300]; Houh, ¶80.

⁷⁷ Houh, ¶81.

communication between the nodes. Doshi itself contemplates more than two LSPs between two nodes by disclosing “two or more paths between” the end nodes and that there are a “plurality of candidate path pairs,” from which to select for communication.⁷⁸ This would mean that any two nodes would’ve at least two primary LSPs and two protection LSPs, with different primary and protection LSP combinations corresponding to candidate pairs.⁷⁹

Modified Fig. 1 below provides an example of providing two primary LSPs and two protection LSPs between nodes N4 and N6.⁸⁰



Doshi, Fig. 1 (modified and annotated); Houh, ¶82.

A POSITA would’ve recognized that providing more than two LSPs between each node pair (*e.g.*, at least two primary LSPs and two protection LSPs)

⁷⁸ Doshi, Abstract, [0014], [0048].

⁷⁹ *See Id.*, [0014], (“...each candidate path pair comprising a candidate primary path and a candidate restoration path...”); *see also* [1.2]-[1.5]; Houh, ¶81.

⁸⁰ Houh, ¶82.

would be beneficial since doing so facilitates path diversity to reduce the probability of service interruption between the nodes.⁸¹ For example, the illustrated Third and Fourth LSPs between N4 and N6 offers additional protection against failures along different paths, at least in part. A concurrent failure of, for example, L2 and L6 would cause both the First and Second LSP (the original two LSPs illustrated in Doshi) to go down; however, such a failure would not bring down the Third LSP. Having the Third LSP available would allow traffic to be switched over with minimal interruption of service as compared to if the First and Second LSPs were the only LSPs connecting N4 and N6. Having the Fourth LSP available in the event of concurrent failure of, for example, L3 and L7 (which would affect both the First and Second LSP without affecting the fourth LSP) would similarly allow traffic to be switched over to the Fourth LSP with minimal interruption of service.⁸²

Providing more than two LSPs between two end nodes is desirable because it facilitates reoptimization by providing more potential paths to select from over time. As analyzed below at [1.3]-[1.5], it was known in the art that it is “highly desirable” to reoptimize LSP selection over time.⁸³ When reoptimizing, a POSITA

⁸¹ *Id.*, ¶83.

⁸² *Id.*, ¶83.

⁸³ Guichard, 79-81.

would've understood to consider all available LSP paths and choose the optimal LSP pair (*e.g.*, primary and protection LSPs). The desirability of optimizing selection is recognized by Doshi, which recognizes the desirability of “optimization.”⁸⁴ If only one primary LSP and one protection LSP was provided between two end nodes, then reoptimization would not be possible in some failure situations. Thus, facilitating reoptimization is another benefit of providing more than two LSPs between each node pair in Doshi.⁸⁵

Another advantage of having is that it allows traffic with different quality of service (QoS) requirements to be allocated and aggregated on different LSPs.⁸⁶ For example, traffic with a high QoS requirement, *e.g.*, video traffic, would be assigned to an LSP configured to handle such high QoS traffic while traffic with a lower QoS requirement would be assigned to a different LSP.⁸⁷

Moreover, it would've been understood that additional nodes with corresponding LSPs not illustrated would be present or may be added over time, as

⁸⁴ Doshi, [0172]; *see also id.*, [0200].

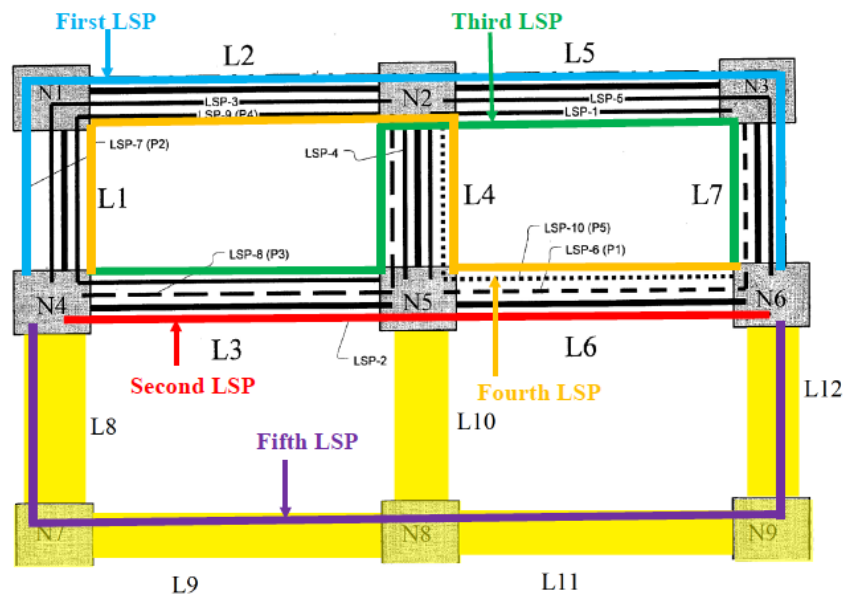
⁸⁵ Houh, ¶85.

⁸⁶ *See* Doshi, [0265],[0272].

⁸⁷ Houh, ¶84.

both Doshi and Guichard teach.⁸⁸ A POSITA would've been motivated to provide additional LSPs along new links between new nodes in Doshi, as the network changes, so that the paths between two given nodes are completely disjoint, thereby further reducing the probability of service interruption.⁸⁹

Modified Fig. 1 below illustrates additional nodes N7-N9 with new links L8-L12 that provide corresponding a new Fifth LSP between nodes N4 and N6:



Doshi, Fig. 1 (modified and annotated); Houh, ¶¶87.

⁸⁸ See, e.g., Doshi, [0055] (Describing that other paths and nodes may exist); Guichard, 79 (“Network state keeps changing. Links and nodes fail and recover...new TE LSPs are set up...”).

⁸⁹ See VII.C; Houh, ¶¶85-86.

As illustrated, the Fifth LSP is completely disjoint with respect to the First and Second LSPs.⁹⁰

Thus, Doshi in combination with Guichard discloses providing a plurality of MPLS LSPs (*e.g.*, at least two primary LSPs and at least two protection LSPs) between a first end node (*e.g.*, source node) and a second end node (*e.g.*, destination node), which renders obvious this limitation.⁹¹

For element [1.2], Doshi calculates the cost of each path (*e.g.*, each primary or protection path) as “the sum of the link costs.”⁹² Then, Doshi’s path cost is used to determine the cost of each path pair. “For each of a plurality of candidate path pairs...a path cost associated with said each candidate path pair is generated.”⁹³

Doshi’s cost determination takes into account whether path pair is “disjoint,” as well as other factors, such as the “link utilization, utilization threshold,

⁹⁰ Houh, ¶¶87-88.

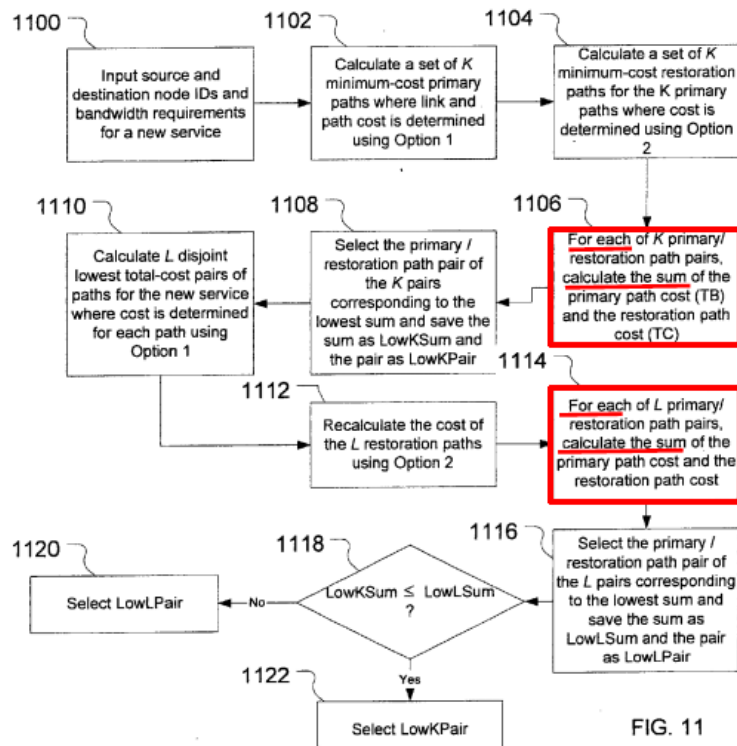
⁹¹ *Id.*, ¶¶74-89.

⁹² Doshi, [0125], Fig. 10.

⁹³ *Id.*, [0014]; *see also id.*, Abstract, [0026], [0046], [0050]-[0054], [0076], [0082], [0130], [0124]-[0181], Fig. 1, Fig. 10, Fig. 11, Fig. 12, and Fig. 13; Houh, ¶¶90-94.

administrative weight, and sharing degree.”⁹⁴ Based on these factors, Doshi identifies the path pair with an “overall-minimum cost.”⁹⁵

Doshi’s Fig. 11 (building upon Fig. 10’s example for determining individual path cost), shows that the cost of each candidate pair is determined by summing a primary path cost and a protection path cost.⁹⁶



Doshi, Fig. 11 (annotated); Houh, ¶¶95.

⁹⁴ Doshi, [0142], [0146]-[0156], Fig. 11.

⁹⁵ *Id.*, [0142]; Houh, ¶¶95-97.

⁹⁶ Houh, ¶95.

A POSITA would've understood that Doshi's cost determination—which considers a myriad of factors such as link utilization, sharing degree, and path disjointedness—represents the “overall cost” for each candidate path pair.⁹⁷

Consistent with the analysis at [1.0]-[1.1], it would've been obvious for the path to be implemented as LSPs, since Fig. 1 supports an MPLS architecture and provides a plurality of LSPs. Also, a POSITA would've found it obvious for the candidate path pairs to be from the provided plurality of MPLS LSPs (at least two primary and at least two protection LSPs) between the end nodes (*See* [1.1]), because these LSPs would've already been in existence and available for immediate use for the new service.⁹⁸

By determining the cost for the provided LSPs, assessment can be made whether the provided LSPs have sufficient resources for the new service—without having to allocate additional resources. Considering the provided LSPs for the new service would allow such LSPs to be more fully utilized.⁹⁹

Consistent with the analysis at [1.3]-[1.5] below, in view of Guichard's teaching of ongoing reoptimization efforts, it would've been an obvious aspect of

⁹⁷ *Id.*, ¶¶96-97.

⁹⁸ *Id.*, ¶98.

⁹⁹ Ex.1008, 1306 (describing the known problem of underutilized LSPs and solution of allocating traffic to such LSPs); Houh, ¶99.

path selection to perform Doshi's cost calculations repeatedly to attempt to determine whether the original LSP pair still has the overall minimum-cost or if there is another LSP pair that is more optimal. A POSITA would've understood that the cost calculations for such reoptimization efforts would consider existing paths, including, for example, an originally selected LSP pair that is currently being utilized.¹⁰⁰

Regarding element [1.3], first, Doshi discloses that “primary and protection paths...are selected from the plurality of candidate path pairs based on the path cost of each candidate path pair.”¹⁰¹ Consistent with the analysis at [1.1]-[1.2], it would've been obvious for the “plurality of candidate path pairs” (pairs of primary and protection LSPs) to correspond to the provided plurality of LSPs of the MPLS architecture.¹⁰²

Doshi further teaches that the selection is based on the overall cost, since “the lowest-cost pair...is selected as the overall minimum-cost pair.”¹⁰³ Doshi's Fig 11 illustrates selecting the overall minimum-cost pair.¹⁰⁴

¹⁰⁰ Houh, ¶¶100-101.

¹⁰¹ Doshi, [0014]; *see also id.*, Abstract, [0046], [0076], [0142]-[0145], claims 1, 11.

¹⁰² Houh, ¶¶102-103.

¹⁰³ Doshi, [0142]; *see also id.*, [0026], [0125]-[0139], [0143]-[0145].

¹⁰⁴ Houh, ¶104.

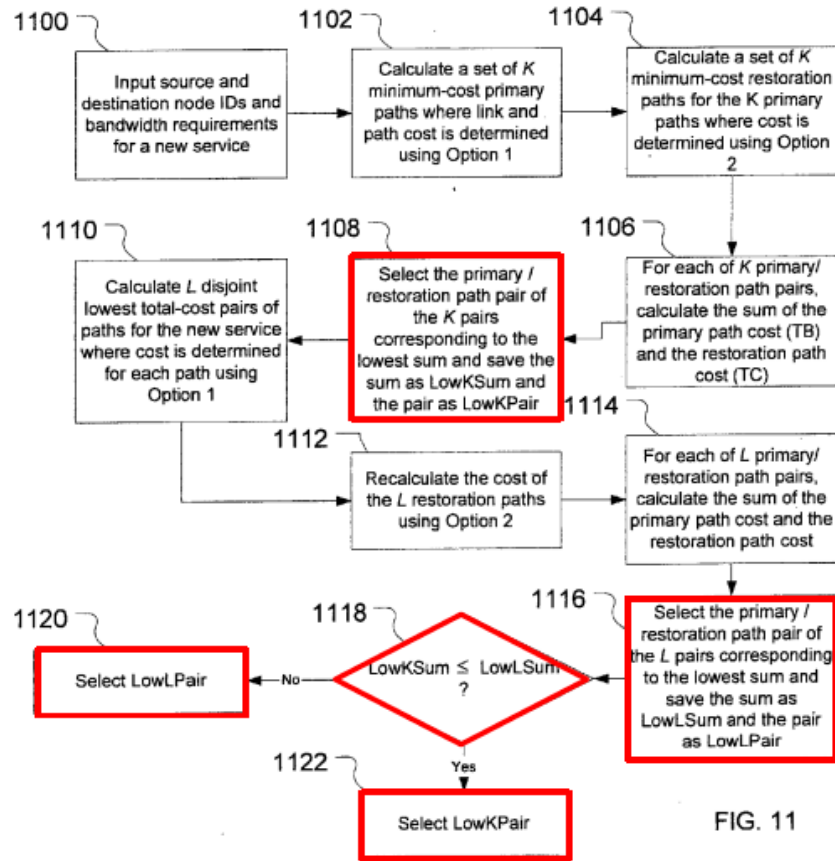


FIG. 11

Doshi, Fig. 11 (annotated); Houh, ¶104.

Therefore, Doshi discloses selecting an LSP pair from the plurality of MPLS LSP based on the selected pair having the overall minimum-cost.¹⁰⁵

Second, Guichard teaches that it is “highly desirable” evaluate the selected LSP and reoptimize the selection “[i]f a better path is found” or if a “more optimal (shortest) path exists.”¹⁰⁶ Guichard contemplates, for example, “Manual

¹⁰⁵ *Id.*, ¶¶102-105.

¹⁰⁶ Guichard, 79.

reoptimization” and “Timer-based reoptimization.”¹⁰⁷ Guichard merely describes what would’ve been common sense to a POSITA—reoptimizing a system to use the best available LSP. In other words, a POSITA would’ve understood that Guichard teaches that original path selections should be evaluated on an ongoing basis to determine whether better or more optimal paths exist.¹⁰⁸

In view of Guichard’s teachings, it would’ve been obvious to reoptimize Doshi’s LSP selection by performing cost calculations repeatedly over time (e.g., based on a manual trigger or timer-based) to determine whether the originally selected LSP pair still has the overall minimum-cost or if another LSP pair should be selected. A POSITA would’ve understood that the cost calculations for such reoptimization efforts would consider existing LSP paths, including, the originally selected LSP pair that had the overall minimum-cost. If the originally selected LSP pair still has the overall-minimum cost, a POSITA would’ve understood that Doshi’s selection techniques identified above would reselect the original pair. On the other hand, if another LSP pair is determined to have the overall-minimum cost, then that LSP pair would be selected. Each such selection is an example of “selecting,” as claimed.¹⁰⁹

¹⁰⁷ *Id.*, 81; *see also id.*, 79.

¹⁰⁸ Houh, ¶¶106-109.

¹⁰⁹ *Id.*, ¶110.

It would've been obvious to a POSITA, in view of Guichard, to perform ongoing reoptimization attempts, when implementing Doshi's MPLS architecture, so that an optimum LSP pair (*e.g.*, overall minimum-cost pair) is selected over time for communication between two end nodes. In implementing the combination, a POSITA would've evaluated all existing available LSPs (including previously selected LSPs) by repeating Doshi's candidate pair cost determination (*See* [1.2]) and selection techniques (discussed above) in response to a manual trigger or expiration of a timer to thereby select the LSP pair with an overall minimum-cost.¹¹⁰

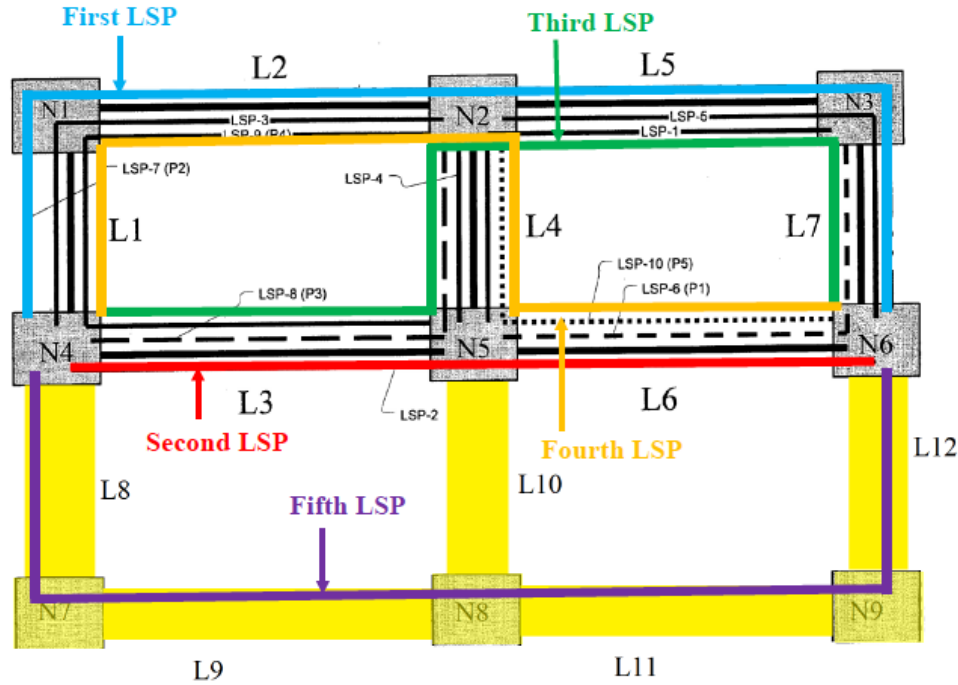
A POSITA would've been motivated to perform ongoing reoptimization to identify potentially better primary and protection LSP paths (for the LSP pair between two end nodes) that minimize the overall cost.¹¹¹

Below is an example of such a selection, per the combined teachings, in the context of Doshi's modified Fig. 1.¹¹²

¹¹⁰ *Id.*, ¶110.

¹¹¹ Guichard, 79 (“It is then highly desirable to detect...and reoptimize a TE LSP along a better path when it becomes available.”); Doshi, [0172] (“In general, path selection is a powerful tool that can be used to achieve...optimization.”) [0200] (“...making an optimal restoration path choice...”); *see also* VII.C; Houh, ¶111.

¹¹² Houh, ¶112.



Doshi, Fig. 1 (modified and annotated); Houh, ¶112.

Take, for instance, where an original LSP pair (*e.g.*, First LSP and Second LSP) was being utilized for communications between end nodes N4 and N6. In response to a manual trigger or expiration of a timer, as Guichard teaches, potential reoptimization of the LSPs would take place to determine if there is a better or more optimal LSP. All things being equal, for example, in the circumstance where the links of the First LSP are heavily utilized as compared to the links of the Fifth LSP, it would've been obvious for Doshi's cost determination to result in a new pair (*e.g.*, the Fifth LSP as the primary and the Second LSP as the protection) as having the overall minimum cost. In such a circumstance, these LSPs would be

selected for further communications between end nodes N4 and N6 while the First LSP would be replaced by the Fifth LSP.¹¹³

For element [1.4], first, Guichard teaches “Event-driven reoptimization” where “it may be desirable to trigger a reoptimization upon the occurrence of a particular event, such as the restoration of a link in the network.”¹¹⁴ Additionally, “the evaluation of any potential reoptimization” is triggered “each time a new link is advertised as newly operational.”¹¹⁵

A POSITA would’ve understood that Guichard generally teaches that the current LSP path selection should be evaluated following a trigger event (*e.g.*, LSP set up, LSP torn down, restoration of a link, or new link) to determine whether a more optimal LSP path is available. Also, a POSITA would’ve recognized that this evaluation may or may not result in a reoptimization.¹¹⁶ A person of skill would’ve understood that there is only a potential for reoptimization since if the evaluation

¹¹³ *Id.*, ¶¶113-114.

¹¹⁴ Guichard, 81.

¹¹⁵ *Id.*, 81; *see also id.*, 79-80 (triggering reoptimizing when links and nodes fail or recover and when new LSPs are set up or torn down and a better path is available). Houh, ¶¶115-116.

¹¹⁶ *See* Guichard, 81 (referring to “evaluation of any potential reoptimization.”); Ex.1035, [0057]-[0059] (recognizing that if “new cost exceeds the old cost ... no optimization of the TE-LSP is performed.”).

indicates that the currently utilized path is still the best option, then no reoptimization would occur and the previously utilized path is reselected.¹¹⁷

It would've been obvious to a POSITA, in view of Guichard, to perform event-driven reoptimization, when implementing Doshi's MPLS architecture, to determine if there are better LSP paths available or if the currently selected LSP pair represents the overall minimal cost.¹¹⁸

In implementing the combination with Doshi, a POSITA would've evaluated any restored and new LSPs along with all existing LSPs (including the currently utilized LSP pair) by repeating Doshi's candidate pair cost determination and selection techniques (See [1.2]-[1.3]) in response to a trigger event to potentially reoptimize the selection.¹¹⁹

It would've been obvious to a POSITA that repeating Doshi's candidate path pair cost determination and selection would—in certain instances—result in the reselection of the currently utilized LSP pair. This would be the case where the currently utilized LSP pair still provides the overall minimum-cost, despite an LSP path being restored, a new LSP path being set up, or some other change in the network. In the combination, Doshi's currently utilized LSP pair would be

¹¹⁷ Houh, ¶117.

¹¹⁸ See VII.C; Houh, ¶118.

¹¹⁹ *Id.*, ¶119.

technique, if it continues to have the overall-minimum cost per Doshi's cost determination (*See* [1.2]).¹²⁰

Thus, Doshi in combination with Guichard discloses an event triggering candidate pair cost determination and, if the cost determination indicates that the currently used LSP pair still has the overall-minimum cost, reselecting the LSP pair, which renders obvious "if an entity pair reselection event occurs, reselecting said entity pair."¹²¹

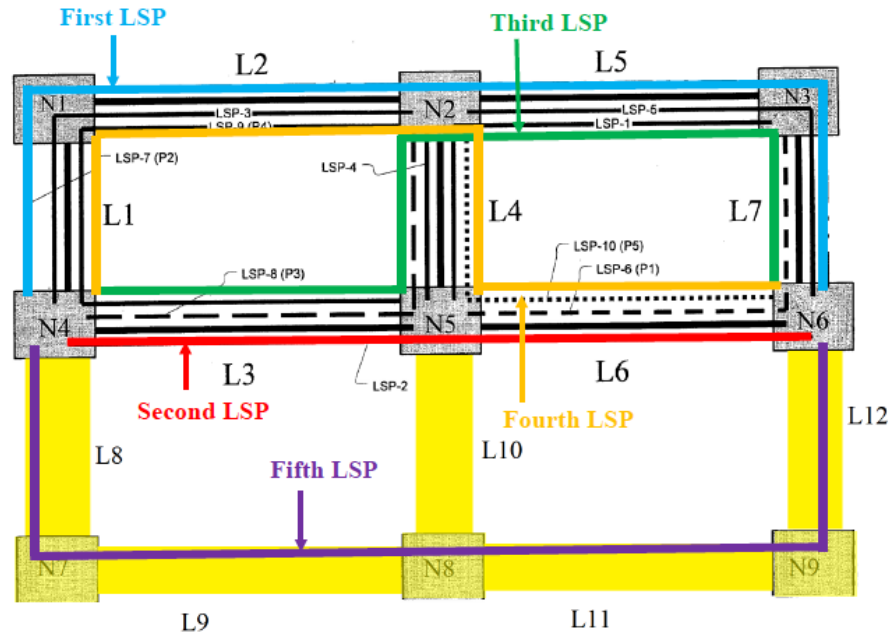
Second, as discussed above at [1.0]-[1.3], Doshi's plurality of candidate path pairs include a plurality of LSPs (*e.g.*, at least two primary and at least two protection LSPs) between a pair of end nodes. The currently used primary and protection LSP pair would be initially selected based on the overall minimum cost (*see* [1.3]) and the remaining LSPs would be available (with any restored or new LSPs in the network that generate the trigger event, per Guichard) as potential replacements during reoptimization. Thus, in the proposed combination, the reselection is "from the group consisting of said entity pair and a replacement entity pair comprising at least one entity distinct from the entities of said entity pair."¹²²

¹²⁰ *Id.*, ¶120.

¹²¹ *See also* [1.5], below, analyzing further the reselection event. Houh, ¶121.

¹²² Houh, ¶122.

As an example, consider the modified Fig. 1, per the combined teachings, discussed at [1.3], and reproduced below.¹²³



Doshi, Fig. 1 (modified and annotated); Houh, ¶123.

As noted at [1.3], the selection step selected the Fifth LSP as the primary path and the Second LSP as the protection path. When performing event-driven based reoptimization, per Guichard, an overall cost for each LSP pair permutation would be determined, per Doshi.¹²⁴ If the cost determination indicates that the

¹²³ *Id.*, ¶123.

¹²⁴ Doshi, [0014] (“...a path cost associated with said each candidate path pair is generated...”).

currently used LSP pair (*e.g.*, Fifth LSP and Second LSP) still has the overall-minimum cost, then the same LSP pair would be reselected.¹²⁵

Since Doshi’s cost determination is performed on each candidate path pair, it would’ve been obvious to a POSITA for the reselection to be from the group consisting of the currently used LSP pair (*e.g.*, Fifth LSP and Second LSP) and a replacement LSP pair comprising at least one LSP distinct from the currently used LSP pair.¹²⁶ In the present example, the reselected LSP pair (*e.g.*, Fifth LSP and Second LSP) would correspond to “said entity pair” while each remaining permutation of LSP pairs not reselected would correspond to “a replacement entity pair comprising at least one entity distinct from the entities of said entity pair.”¹²⁷

Third, to the extent argued that “reselecting said entity pair” requires selecting at least one different LSP as part of the pair instead of reselecting the same two LSPs, the proposed combination also renders that obvious. A POSITA would’ve found it obvious to select a different LSP pair, when the different LSP pair is determined to have a lower overall-minimum cost than the currently used LSP pair. To illustrate, in the present example, if the First LSP and Second LSP are

¹²⁵ *Id.*, [0142] (“...the lowest-cost pair...is selected as the overall minimum-cost pair...”); Houh, ¶124.

¹²⁶ Houh, ¶125.

¹²⁷ *Id.*, ¶125.

now determined to have the lowest overall-minimum cost, then that LSP pair would be reselected.¹²⁸

For element [1.5], Guichard teaches that reoptimization evaluation is triggered by various events (“entity pair reselection event”). For example, Guichard’s event-driven reoptimization is triggered “if a link is restored in the network” and “each time a new link is advertised as newly operational.”¹²⁹ A POSITA would’ve understood that restoring a link restores LSPs of the link, which may provide a more optimal path. As discussed above at [1.0]-[1.4], the plurality of MPLS LSPs between end nodes correspond to “said plurality of transport entities.” It follows that restoring a link that previously went down to “newly operational,” means that the operational status of the link’s LSPs has also changed to operational, which discloses “an operational status change for one of said plurality of transport entities.”¹³⁰

Another network change event contemplated by Guichard is when “new...LSPs are set up” and when “others may be torn down.”¹³¹ Because these events have the potential for “a more optimal path [to] appear in the network. It is

¹²⁸ *Id.*, ¶¶115-127.

¹²⁹ Guichard, 81.

¹³⁰ Houh, ¶¶128-130.

¹³¹ Guichard, 79.

then highly desirable to detect the existence of such a path and reoptimize a TE LSP along a better path when it becomes available.”¹³² It follows that a new LSP set up between end nodes would be added to the plurality of MPLS LSPs between the end nodes, which corresponds to “adding an entity to said plurality of transport entities.” Conversely, tearing down an LSP between the end nodes would remove the LSP from the plurality of MPLS LSPs between the end nodes, which corresponds to “removing an entity from said plurality of transport entities.”¹³³

E. Claim 2

As discussed above at [1.3], Doshi discloses selecting an LSP pair from the plurality of MPLS LSPs. The selection includes selecting a primary path (Doshi also refers to as a “working path”) and selecting a “protection path,” which corresponds to “selecting a working entity” and “selecting a protection entity.”¹³⁴

The ’821 Patent describes “switch[ing] between a working entity and a protection entity” after failure.¹³⁵ Doshi similarly describes “Switching Between Working and Protection LSPs” “after detecting a failure.”¹³⁶ Doshi’s working LSP

¹³² *Id.*, 79.

¹³³ Houh, ¶¶132-133.

¹³⁴ Doshi, [0014], [0046]; *see also id.*, Abstract, [0142]-[0145], claims 1, 11; Houh, ¶¶134-135.

¹³⁵ ’821 Patent, 1:51-43; 2:35-36.

¹³⁶ Doshi, [0266]-[0267].

corresponds to a “working entity” and its protection LSP corresponds to a “protection entity.” Since Doshi’s working and protection LSPs are part of the selected LSP pair, a POSITA would’ve understood that the selection of the working and protection LSPs are “from said entity pair.”¹³⁷

F. Claim 3

For element [3.1], as discussed at [2.1], Doshi describes selecting a working LSP (“working entity”) and a protection LSP (“protection entity”). Doshi further describes “Switching Between Working and Protection LSPs” and explains that “after detecting a failure, end nodes of an LSP switch traffic from a primary (*i.e.*, working) LSP to its corresponding protection LSP.”¹³⁸ Doshi’s working LSP is the path actively carrying traffic absent a failure while Doshi’s protection LSP becomes active when traffic is switched over following a failure. Thus, Doshi’s switching decisions, which select which of the working LSP and protection LSP is in use, render obvious this limitation.¹³⁹

G. Claim 4

For element [4.1], as discussed at [1.2]-[1.3], Doshi calculates the path cost of each path (*e.g.*, each primary and protection LSP) in a candidate path pair and

¹³⁷ Houh, ¶¶136-137.

¹³⁸ Doshi, [0266]-[0267].

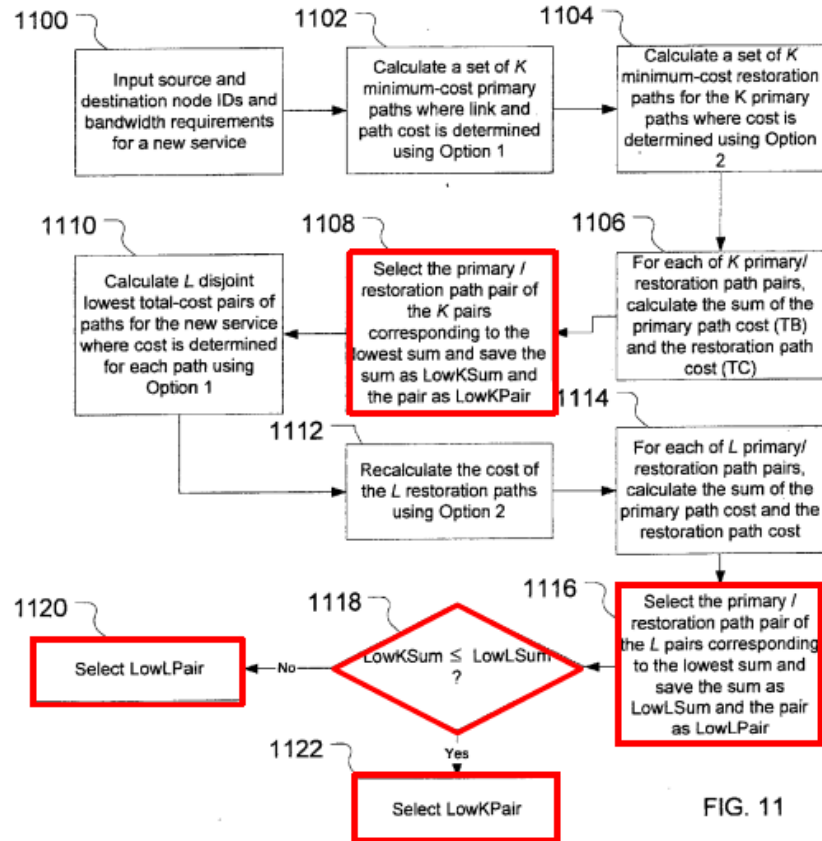
¹³⁹ Houh, ¶¶138-140.

sums the path costs to find the cost of the pair together. The cost calculation considers various factors, including link utilization, utilization threshold, administrative weight, sharing degree, and disjointedness, and which represent the “overall cost” for each candidate path pair. The calculation used to determine the “overall cost” corresponds to the claimed “overall cost function.”¹⁴⁰

Doshi’s Fig. 11 and accompanying description teach calculating and selecting an “overall minimum-cost” pair.¹⁴¹

¹⁴⁰ *Id.*, ¶142.

¹⁴¹ Doshi, [0142]; *see also id.*, [0026], [0125]-[0139], [0143]-[0145]. Houh, ¶¶143-144.



Doshi, Fig. 11 (annotated); Houh, ¶143.

A POSITA would’ve understood that the selected “overall minimum-cost” pair is the LSP pair having the lowest overall cost function in consideration of various factors, including link utilization, utilization threshold, administrative weight, sharing degree, and disjointedness. Thus, Doshi renders obvious this limitation.¹⁴²

¹⁴² Houh, ¶¶141-145.

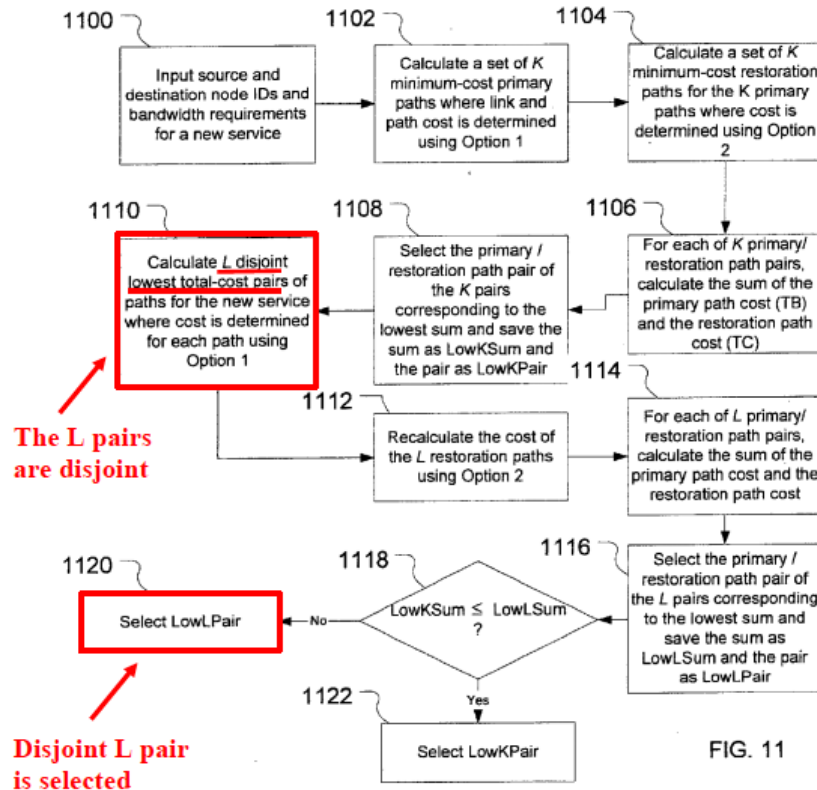
H. Claim 5

For element [5.1], as discussed at [1.2]-[1.3], and [4.1], Doshi calculates the path cost of each primary “working entity” and protection LSP “protection entity” in a candidate path pair and sums the path costs to find the cost of the pair together. The cost calculation considers a myriad of factors such as link utilization, sharing degree, and path disjointedness and which represent the “overall cost” for each candidate path pair. The calculation used to determine the “overall cost” corresponds to the claimed “overall cost function.”¹⁴³

Doshi describes selecting primary LSP and protection LSPs that are “strictly disjoint” from each other, having “no common links or nodes other than their common ingress and egress nodes.”¹⁴⁴

¹⁴³ *Id.*, ¶147.

¹⁴⁴ Doshi, [0053]; Houh, ¶¶148-150.



Doshi, Fig. 11 (annotated); Houh, ¶148.

When two paths are strictly disjoint, “then a failure affecting one of them will not affect the other.”¹⁴⁵ By considering path disjointedness in its cost calculation and selecting a pair of primary and protection paths that are node and link disjoint such that the failure of one does not affect the other, Doshi renders obvious this limitation.¹⁴⁶

¹⁴⁵ Doshi, [0040]; *see also id.*, [0155] (Failure “protection is made possible by selecting...disjoint [paths].”), [0056], [0062], [0080], [0131], [0142]-[0156], [0287], Fig. 1.

¹⁴⁶ Houh, ¶¶146-151.

I. Claim 6

Regarding element [6.1], as discussed at [1.2]-[1.3] and [4.1], Doshi calculates the path cost of each path (*e.g.*, each primary and protection LSP) in a candidate path pair and sums the path costs to find the cost of the pair together. The cost calculation considers various factors, including link utilization, utilization threshold, administrative weight, sharing degree, and disjointedness—which represent the “overall cost” for each candidate path pair. The calculation used to determine the “overall cost” corresponds to the claimed “overall cost function.”¹⁴⁷

Each of these factors, considered in the cost calculation, is predefined in the sense that the cost calculation is pre-configured to consider each factor. For example, before a calculation is performed, it is understood that the calculation will consider link utilization, sharing degree, and path disjointedness. Additionally, the “utilization threshold” (*e.g.*, nominally set to 80%) and “administrative weight” (*e.g.*, a coefficient for scaling) are predefined metrics.¹⁴⁸ Each of these metrics has an impact on the cost of the path being evaluated.¹⁴⁹ Thus, each of link utilization,

¹⁴⁷ *Id.*, ¶¶152-153.

¹⁴⁸ Doshi, [0128], [0141].

¹⁴⁹ *Id.*, [0142].

utilization threshold, administrative weight, sharing degree, and disjointedness correspond to “a predefined entity cost metric.”¹⁵⁰

Additionally, traffic engineering metrics correspond to “predefined entity cost metric” in the ’821 Patent.¹⁵¹ A POSITA would’ve understood that Doshi’s link utilization, utilization threshold, and administrative weight each correspond to traffic engineering data—it was well known that traffic engineering data includes such metrics.¹⁵²

Doshi’s disclosure is in the context of “multi-protocol label switched (MPLS) traffic engineering,” which would’ve further confirmed a POSITA’s understanding that Doshi’s link utilization, utilization threshold, and administrative weight each correspond to traffic engineering metrics.¹⁵³

¹⁵⁰ Houh, ¶154.

¹⁵¹ ’821 Patent, 5:49-51.

¹⁵² See Ex.1022 (using “administrative weights” to implement traffic engineering decisions.); Ex.1023 (setting an administrative weight with an “mpls traffic-eng administrative-weight” command, setting a bandwidth threshold level of reserved bandwidth with an “mpls traffic-eng flooding thresholds” command, and identifying traffic engineering output fields that include administrative weight, reservable bandwidth, and bandwidth thresholds.); Ex.1024 (Entitled “Multiple Metrics for Traffic Engineering with IS-IS and OSPF” describing the metrics “administrative weight” and “bandwidth available.”); Houh, ¶155.

¹⁵³ Doshi, [0298], [0010], [0093], [0191], [0257]; Houh, ¶¶152-157.

J. Claim 7

For the same reasons discussed above, element [7.1] is obvious over the prior art.¹⁵⁴

K. Claim 9

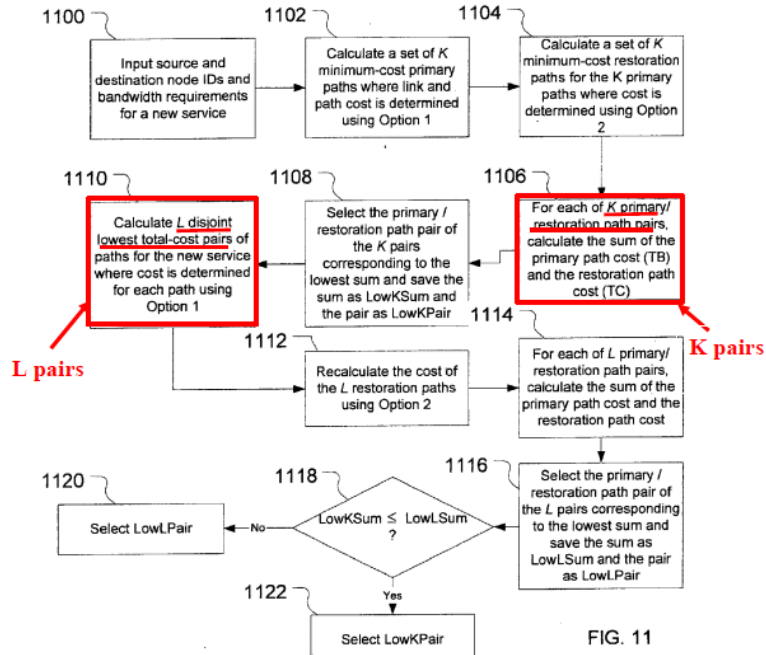
Regarding element [9.1], as discussed at [1.2]-[1.3], Doshi calculates the path cost of each path (e.g., each primary and protection LSP) in a candidate path pair and sums the path costs to find the cost of the pair together. The cost calculation considers various factors, including link utilization, utilization threshold, administrative weight, sharing degree, and disjointedness, and which represent the “overall cost” for each candidate path pair. The calculation used to determine the “overall cost” corresponds to the claimed “overall cost function.”¹⁵⁵

As shown at Doshi’s Fig. 11 and disclosed in the accompanying description, the cost calculation includes calculating and comparing two sets of candidate path pairs—“K candidate pairs” and “L candidate pairs,” where the L pairs are disjoint pairs.¹⁵⁶

¹⁵⁴ See claim 6; Houh, ¶¶158-159.

¹⁵⁵ Houh, ¶161.

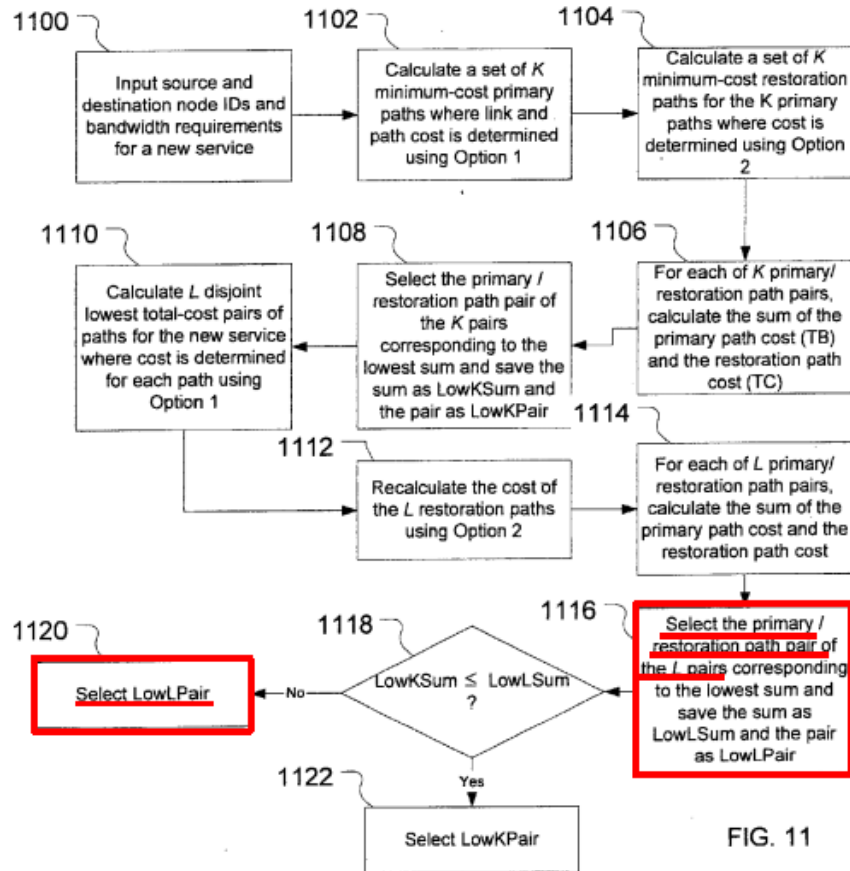
¹⁵⁶ Doshi, [0142]-[0145]; Houh, ¶162.



Doshi, Fig. 11 (annotated); Houh, ¶162.

The L candidate pairs and K candidate pairs are both subsets of the total number of candidate pairs available. In the case of the L candidate pairs, the subset consists of pairs that are disjoint. As discussed at [5.1], the pairs include both a working path (*e.g.*, working LSP) and a protection path (*e.g.*, protection LSP) that are disjoint from each other, which substantially minimizes the probability of concurrent failure. Thus, Doshi’s L candidate pairs correspond to “a subset of entity pairs.” A POSITA would’ve understood selecting the set of L candidate pairs for calculations corresponds to “selecting” as claimed.¹⁵⁷

¹⁵⁷ Houh, ¶¶160-165.



Doshi, Fig. 11 (annotated); Houh, ¶164.

For element [9.2], as discussed at [9.1], Doshi calculates L “disjoint lowest total-cost pairs,” plural. Thus, Doshi’s L candidate pairs include at least two pairs. Doshi goes on to explain that the L candidate pairs are assessed for cost, which as discussed at [1.2] includes assessing the cost of each path in the pair. As discussed at [1.2]-[1.3] and [4.1], Doshi calculates the path cost of each path (*e.g.*, each primary and protection LSP) in a candidate path pair. The cost calculation considers various factors, including link utilization, utilization threshold,

administrative weight, sharing degree, and disjointedness.¹⁵⁸ The calculation used to determine the path cost corresponds to the claimed “entity cost function.”¹⁵⁹

Doshi describes selecting the lowest cost pair of the L candidate pairs as the lowest cost pair out of all pairs, including K candidate pairs.¹⁶⁰

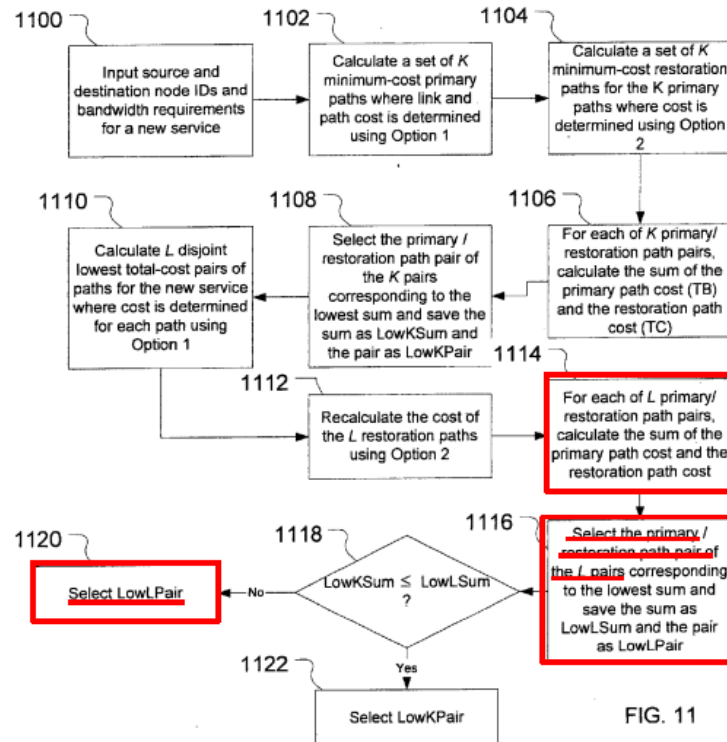


FIG. 11

Doshi, Fig. 11 (annotated); Houh, ¶167.

¹⁵⁸ Doshi, [0124]-[0141].

¹⁵⁹ *Id.*, [0144]-[0145], Fig. 10 (element 1022 “Return PathCost”); Houh, ¶166.

¹⁶⁰ Doshi, [0142]-[0145]; Houh, ¶167.

Accordingly, it would've been obvious to a POSITA that selection of the lowest cost L pair—the lowest cost pair out of all the pairs—“minimizes an entity cost function.”¹⁶¹

L. Claim 10

For element [10.1], as discussed at [9.2], Doshi's cost calculation considers various factors, including link utilization, utilization threshold, administrative weight, sharing degree, and disjointedness and corresponds to the claimed “entity cost function.” Further, as discussed at [6.1], these factors, along with traffic engineering, correspond to a “predefined entity cost metric,” which renders obvious “a predefined metric.”¹⁶²

M. Claim 11

For the same reasons discussed above, element [11.1] is obvious over the prior art.¹⁶³

N. Claim 13

For element [13.1], regarding replacement of the claimed “working entity” and “protection entity,” as discussed at [2.1] and [5.1], Doshi's “primary path” is also referred to as a “working path” (*e.g.*, working LSP), and its “restoration path”

¹⁶¹ Houh, ¶¶ 166-169.

¹⁶² *Id.*, ¶¶ 170-171.

¹⁶³ See claim 10; Houh, ¶¶ 172-173.

is also referred to as a “protection path” (*e.g.*, protection LSP).¹⁶⁴ Doshi’s primary path (aka working path) corresponds to the claimed “working entity” and Doshi’s restoration path (aka protection path) corresponds to the claimed and “protection entity.”¹⁶⁵

As discussed at [1.3]-[1.4], Doshi teaches that a primary and a protection pair (*e.g.*, LSP pair) are selected from the plurality of paths of the MPLS network and that, in view of Guichard’s teaching of ongoing reoptimization efforts, it would’ve been an obvious to perform Doshi’s cost calculations repeatedly to attempt to determine whether the originally selected LSP pair still has the overall minimum-cost or if another LSP pair should be selected.¹⁶⁶

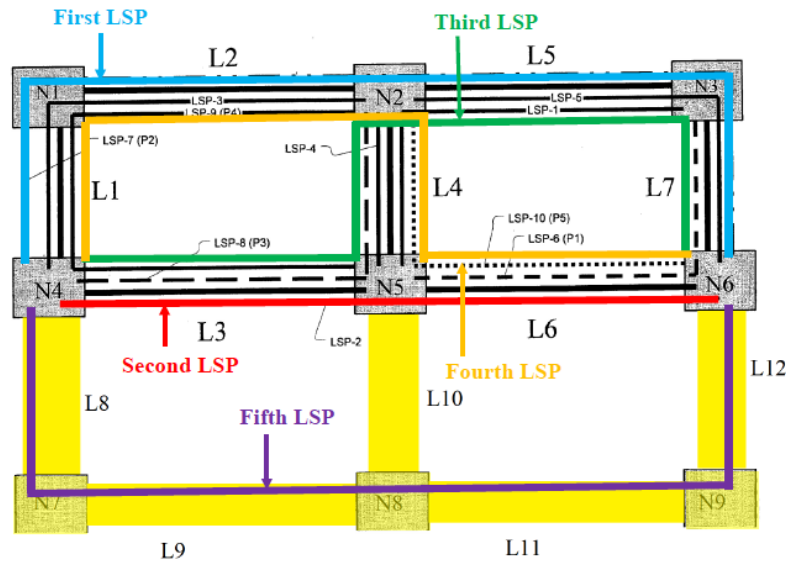
It would’ve been obvious for the LSPs of the originally selected pair (*e.g.*, a primary LSP and a protection LSP) to be sequentially replaced as the ongoing reoptimization efforts identify lower cost LSPs. To build upon an earlier example, consider Doshi’s modified and annotated Figure 1 below.¹⁶⁷

¹⁶⁴ Doshi, [0046].

¹⁶⁵ Houh, ¶175.

¹⁶⁶ *Id.*, ¶176.

¹⁶⁷ *Id.*, ¶177.



Doshi, Fig. 1 (modified and annotated); Houh, ¶177.

As previously discussed at [1.3]-[1.4], the Fifth LSP was selected as the primary path and the Second LSP was selected as the protection path. Upon an event trigger as taught by Guichard, attempted reoptimization of the LSPs would take place to determine if there is a better or more optimal LSP. If, for example, the reoptimization evaluation determined that the links of the Fifth LSP are heavily utilized as compared to the links of the First LSP, it would've been obvious for Doshi's cost determination to result in a new pair (*e.g.*, the First LSP as the primary while the Second LSP remains as the protection) as having the overall minimum cost. Thus, the Fifth LSP would be replaced. A subsequent such reoptimization evaluation would find that, for example, the Second LSP has become suboptimal as a protection path and replace the Second LSP with another LSP (*e.g.*, a newly added Sixth LSP (not shown)). Of course, this is just an

example, and given network status it would be understood that other LSPs may be selected as the overall minimum cost pair, but the LSPs have been replaced sequentially in this example—first the primary LSP followed by the protection LSP. It would’ve been obvious for the sequence of replacement to be reversed in other examples where the protection LSP becomes suboptimal before the primary LSP.¹⁶⁸

It would’ve been similarly obvious for a single event-triggered reoptimization evaluation to find that both the Fifth and Second LSPs are suboptimal. When both LSPs are determined to be suboptimal, a POSITA would’ve found it obvious to replace the LSPs sequentially to minimize interruption in service. In that regard, a POSITA would’ve appreciated the desirability of maintaining a working and protection path throughout the replacement process. In replacing the Fifth and Second LSPs with the First and Sixth LSPs, for example, a POSITA would’ve found it obvious to first designate the First LSP (determined to be the optimal primary LSP) as a new protection LSP temporarily, thereby replacing the Second LSP. Next, traffic on the Fifth LSP would be switched over to the First LSP with the Fifth LSP temporarily serving as a protection LSP. The First LSP would thus become the new primary LSP as was

¹⁶⁸ *Id.*, ¶178.

determined to be optimal. The Fifth LSP, now acting as a protection LSP, would then be replaced by the Sixth LSP, which was determined to be the optimal protection LSP. A POSITA would've recognized that such sequential replacement would advantageously maintain two LSPs (*e.g.*, one primary and one protection) throughout the replacement.¹⁶⁹

O. Claim 17

Claim 17 is substantially similar to claim 1 and therefore is obvious for the reasons stated above. The below analysis addresses the obviousness of the preamble's different recitations, to the extent limiting.¹⁷⁰

Regarding element [17.0]'s preamble, as discussed at [1.0], Doshi discloses that the claimed method steps are performed by a network manager, that may be a server or other computing device. It was common knowledge that computing devices, such as servers, would include a processor and memory.¹⁷¹ Indeed, Doshi expressly discloses storing, for example, protection information and information

¹⁶⁹ *Id.*, ¶¶174-180.

¹⁷⁰ *Id.*, ¶182.

¹⁷¹ *See* Ex.1025 [0092], Fig.10 (describing “exemplary computer system 1000 that can be used as ... a server” where the computer system 1000 includes “one or more processors,” “a main memory,” “and may also include a secondary memory”); *see also* Ex.1031; Ex.1032; Ex.1033.

about path pairs which would've informed a POSITA that Doshi's network manager includes a memory.¹⁷²

It was also known for memory to be non-volatile and computer readable by the processor (“[n]on-transitory computer readable media”).¹⁷³

Accordingly, a POSITA would've found it obvious for Doshi's network manager to include a memory that corresponds to a “non-transitory computer readable medium.” As discussed above at [1.0]-[1.5], Doshi's network manager performs the method steps. Since, as evidenced by the citations above, it was common knowledge to store executable instructions in memory, and since Doshi's network manager performs the method steps, a POSITA would've considered it obvious to store instructions to perform each step of the method in the memory of Doshi's network manager. Accordingly, a POSITA would've found it obvious for Doshi's network manager to include “[n]on-transitory computer readable media configured to perform a method.”¹⁷⁴

¹⁷² Doshi, [0143]-[0144], [0196], [0214]; Houh, ¶183.

¹⁷³ See Ex.1016 (describing “computer-readable” hard disk drives and flash memory cards “provide nonvolatile storage of data, data structures, computer-executable instructions, and so forth.”); see also Ex.1017; Ex.1018; Ex.1025, [0092]; see also Houh, ¶184.

¹⁷⁴ Houh, ¶¶183-186.

For the same reasons discussed above, elements [17.1]-[17.5] is obvious over the prior art.¹⁷⁵

P. Claim 18

For element [18.1], as discussed above at [1.3], Doshi discloses selecting an LSP pair comprising a primary LSP and a protection LSP from the plurality of MPLS LSPs. Doshi's "primary path" corresponds to a "working path."¹⁷⁶ Thus, Doshi's step of selecting an LSP pair comprises selecting a "working path" and a protection path from the MPLS LSPs, which renders obvious this limitation.¹⁷⁷

Element [18.2] is obvious over the prior art for the same reasons above.¹⁷⁸

Q. Claim 19

Element [19.1] is obvious over the prior art for the same reasons above.¹⁷⁹

R. Claim 20

Element [20.1] is obvious over the prior art for the same reasons above.¹⁸⁰

Element [20.2] is obvious over the prior art for the same reasons above.¹⁸¹

¹⁷⁵ See [1.1]-[1.5]; Houh, ¶¶187-191.

¹⁷⁶ Doshi, [0046].

¹⁷⁷ Houh, ¶¶192-194.

¹⁷⁸ See claim 3; Houh, ¶195.

¹⁷⁹ See claim 4; Houh, ¶¶196-197.

¹⁸⁰ See claim 5; Houh, ¶¶198-199.

¹⁸¹ See claims 6, 7; Houh, ¶200.

VIII. GROUND 2: CLAIMS 8 AND 12 ARE OBVIOUS OVER DOSHI IN VIEW OF GUICHARD AND HUANG.**A. Huang Summary**

Like the '821 Patent and Doshi, Huang describes LSP selection within an MPLS network.¹⁸² Huang's describes LSP selection in the context of "protection of connections formed through a mesh-type communication network."¹⁸³ In Huang, a request is received to set up an LSP segment between a head end node and a tail end node, where the request further identifies a backup route to the tail end node.¹⁸⁴ The backup routes are LSPs that "protect each of the working links" if failure occurs.¹⁸⁵ Huang's "working links" are also LSPs.¹⁸⁶ Huang further describes "revertive switching," where "the connection will be switched back from the backup LSP to the working link once the working link has cleared the failure that caused the switchover."¹⁸⁷

¹⁸² Huang, [0004], [0032], [0035], [0040].

¹⁸³ Huang, [0001].

¹⁸⁴ Huang, [0016].

¹⁸⁵ Huang, [0032].

¹⁸⁶ See Huang, [0030]-[0031].

¹⁸⁷ Huang, [0053]; Houh, ¶¶201-202.

B. Reasons to Combine Doshi and Huang

A POSITA would've been motivated to combine the teachings of Doshi and Huang, as discussed below.¹⁸⁸

First, Doshi and Huang are analogous art to the '821 Patent. For example, just like the '821 Patent, both references generally pertain to MPLS networks.¹⁸⁹ Additionally, both references address the problem of selecting a pair of MPLS paths from available paths.¹⁹⁰ Thus, given the similarities between the references and the fact that they address the problem of selecting LSPs, a POSITA considering Doshi would've naturally considered the teachings of Huang.¹⁹¹

Second, a POSITA would've been motivated to combine the teachings of Doshi and Huang to produce numerous predictable and beneficial results.¹⁹²

Doshi teaches “Switching Between Working and Protection LSPs” and explains that “after detecting a failure, end nodes of an LSP switch traffic from a primary (*i.e.*, working) LSP to its corresponding protection LSP.”¹⁹³ Huang

¹⁸⁸ Houh, ¶203.

¹⁸⁹ '821 Patent, 3:15-18, Abstract; Doshi, [0049]; Huang, [0004]-[0007].

¹⁹⁰ '821 Patent, 4:63-5:8; Doshi, [0014]; Huang, [0004], [0032], [0035], [0040], [0048].

¹⁹¹ Houh, ¶204.

¹⁹² *Id.*, ¶205.

¹⁹³ Doshi, [0266]-[0267].

complements Doshi by teaching what to do when the failure affecting the working LSP has been cleared. Huang teaches “revertive switching” where “the connection will be switched back from the backup LSP to the working link once the working link has cleared the failure that caused the switchover.”¹⁹⁴

A POSITA would’ve been motivated to configure Doshi’s working LSP as revertive, in view of Huang, to avoid the need to calculate and select a replacement working LSP, when the previously selected working LSP has been quickly restored. Reverting allows for the previously selected working LSP (which as discussed at [1.2]-[1.4] is part of the overall minimum-cost pair) to be utilized without any additional computations or selections. A POSITA would’ve recognized that in cases of quick restoration, *e.g.*, when a mistaken failure diagnosis is quickly resolved, it would be simpler to revert back to the working LSP instead of having the network manager calculate the costs for all LSPs to ultimately reach the same result of selecting the working LSP. Thus, Huang’s teachings obviate unnecessary efforts.¹⁹⁵

The combination is merely the use of a known technique (Huang’s technique of configuring the working LSP as revertive) to improve a similar method (Doshi’s method for selecting working and protection LSPs) in the same way with

¹⁹⁴ Huang, [0053]; Houh, ¶206.

¹⁹⁵ Houh, ¶¶207-208.

predictable results (reverting back to Doshi's working LSP once the failure has been cleared without performing needless calculations).¹⁹⁶

The results would've been predictable and there would've been a reasonable expectation of success in the combination. A POSITA would've had a reasonable expectation of success because Huang provides implementation details, such as waiting to revert back until the working LSP has been restored.¹⁹⁷ Also, the expectation of success is evidenced by the fact that revertive switching was in described in multiple RFCs discussing MPLS operation.¹⁹⁸

Implementing the combination would've been within a POSITA's skillset since Doshi already sets forth techniques for switching between working and protection LSPs.¹⁹⁹ Building upon Doshi to configure working LSPs as revertive, per Huang, would utilize already existing switching techniques. Doshi acknowledges that a skilled artisan would've had the necessary skill set to make "[v]arious modifications of the described embodiments."²⁰⁰ It would've been

¹⁹⁶ *Id.*, ¶209.

¹⁹⁷ Huang, [0053].

¹⁹⁸ Ex.1011, 12; Ex.1030, 16; Houh, ¶¶210-212.

¹⁹⁹ Doshi, [0266]-[0268].

²⁰⁰ *Id.*, [300].

obvious for such modifications to include reverting back to the working LSP after a failure of the working LSP has been cleared.²⁰¹

C. Claim 8

For element [8.1], first, as discussed at [2.1], Doshi describes “Switching Between Working and Protection LSPs” and explains that “after detecting a failure, end nodes of an LSP switch traffic from a primary (*i.e.*, working) LSP to its corresponding protection LSP.”²⁰² Doshi also incorporates by reference in its entirety RFC 3209,²⁰³ which describes returning to an “original path when the failed resource becomes re-activated.”²⁰⁴ Since Doshi describes switching from a working LSP to a protection LSP after a failure, and since Doshi incorporates RFC 3209’s disclosure of returning to an original path that is re-activated after a failure, it would’ve been obvious to a POSITA to configure the working LSPs as revertive. Thus, Doshi renders obvious “configuring said working entity as revertive.”²⁰⁵

Second, like RFC 3209, Huang also teaches “that, in the event of a failure” of a working link, traffic “may be switched to corresponding individual backup

²⁰¹ Houh, ¶¶211-213.

²⁰² Doshi, [0266]-[0267].

²⁰³ *Id.*, [0056].

²⁰⁴ Ex.1011, 12.

²⁰⁵ Houh, ¶¶214-215.

LSPs” (e.g., a “protection LSP” in terms of Doshi).²⁰⁶ The “working links” are LSPs.²⁰⁷ Huang also discloses “revertive switching,” such that the “the connection will be switched back from the backup LSP to the working link once the working link has cleared the failure that caused the switchover,” which corresponds to “configuring said working entity as revertive.”²⁰⁸

A POSITA would’ve found it obvious to utilize revertive switching in Doshi, as taught by Huang, such that the switch configures the working LSP to be used again once the fault is cleared. A POSITA would’ve recognized that in some instances, e.g., in the case of a quickly resolved mistaken failure diagnosis, it would be simpler to revert back to the working LSP instead of calculating the costs for all LSPs only to again select the working LSP.²⁰⁹

D. Claim 12

Element [12.1] is obvious over the prior art for the same reasons above.²¹⁰

²⁰⁶ Huang, [0032].

²⁰⁷ See *id.*, [0030]-[0031]; Houh, ¶¶216-217.

²⁰⁸ Huang, [0053]; Houh, ¶218.

²⁰⁹ See also VIII.B; Houh, ¶¶214-220.

²¹⁰ See claims 8, 10; Houh, ¶¶221-222.

IX. GROUND 3: CLAIMS 14-16 ARE OBVIOUS OVER DOSHI IN VIEW OF GUICHARD AND XU.**A. Xu Summary**

Like the '821 Patent and Doshi, Xu describes selecting paths to protect against failures in an MPLS network.²¹¹ Xu discloses “selecting the end-to-end paths” based on a “set of modeled failure states.” Ex.1025, [0006], [0043], [0049]. The states represent “link failures that occur simultaneously” with “a predetermined probability of occurrence.”²¹²

B. Reasons to Combine Doshi and Xu

A POSITA would've been motivated to combine the teachings of Doshi and Xu, as discussed below.²¹³

First, Doshi and Xu are analogous art to the '821 Patent. Just like the '821 Patent and Doshi, Xu generally describes MPLS networks.²¹⁴ Xu also addresses the problem of selecting paths within an MPLS network.²¹⁵ Given the similarities

²¹¹ Ex.1025, [0001], [0005]-[0006], [0030], [0035]-[0038], [0043].

²¹² *Id.*, [0006]-[0007], [0049], [0053], [0080]; Houh, ¶¶223-225.

²¹³ Houh, ¶226.

²¹⁴ '821 Patent, 3:15-18, Abstract; Doshi, [0049]; Ex.1025, [0036], [0038].

²¹⁵ '821 Patent, 4:63-5:8; Doshi, [0014]; Ex.1025, [0002], [0030], [0040], [0043], [0060].

between the references and their addressing the same problem of selecting paths, a POSITA considering Doshi would've naturally considered the teachings of Xu.²¹⁶

Second, a POSITA would've been motivated to combine the teachings of Doshi and Xu to produce numerous predictable and beneficial results.²¹⁷

Doshi teaches protecting services against link failures by considering disjointedness when selecting primary and protection paths.²¹⁸ Strictly disjoint paths share no common links or nodes other than their common ingress and egress nodes, so the failure of a single network element would not affect both paths.²¹⁹ Doshi recognizes, however, that there “will be some cases ... where no strictly disjoint path exists” or where “other factors...may lead to selection of a protection path, for a given primary path, that is not strictly disjoint from the primary path.”²²⁰ It would be obvious, in such instances, to at least minimize the likelihood of a concurrent failure. Xu complements Doshi by teaching that a probability of occurrence is determined for each of a set of failure states and that path selection decisions consider the probability of various failure states occurring.²²¹

²¹⁶ Houh, ¶227.

²¹⁷ *Id.*, ¶228.

²¹⁸ Doshi, [0155]-[0156].

²¹⁹ *Id.*, [0055], [0158].

²²⁰ Ex.1025, [0055].

²²¹ *Id.*, [0006], [0053]; Houh, ¶229.

A POSITA would've been motivated to determine a probability of occurrence of failure states, as taught by Xu, when implementing Doshi's path selection in order to further inform selection decisions and better protect services against link failures in circumstances where no strictly disjoint pair of paths exists or where other factors lead to selection of a partially disjoint pair as discussed above. Determining the probability of various failure states would further refine selection between pairs of paths that have the same disjointedness (*e.g.*, between pairs all having a primary path that shares one link in common with its protection path). Such pairs have the same disjointedness, but there may be differences in risk of failure for different links. A pair in which the link in common between primary and protection paths of the pair has a higher risk of failure would, everything else being equal, be more likely to concurrently fail than a pair in which the link in common has a lower risk of failure. A POSITA would've been motivated to apply Xu's probability determination to differentiate between such pairs to improve reliability by reducing the probability of concurrent failure of Doshi's selected pair.²²²

The combination is merely the use of a known technique (Xu's probability determination) to improve a similar method (Doshi's method for selecting paths) in

²²² Houh, ¶230.

the same way with predictable results—selecting paths with lower probability of failure. The results would’ve been predictable, and there would’ve been a reasonable expectation of success in the combination since Doshi and Xu are analogous art in the same field of endeavor.²²³

Implementing the combination would’ve been within a POSITA’s skillset because techniques for determining the probability of network failures were known in the art.²²⁴ Xu leaves implementation details of failure probability determination to a POSITA, recognizing that a POSITA would’ve had sufficient skills to configure the determination. Xu explains that “the present disclosure [is] not limited to any specific combination of hardware and software and the computer program code required to implement the foregoing can be developed by a person of ordinary skill in the art.”²²⁵ Xu’s techniques can be “practiced or carried out in a variety of applications.”²²⁶ Since Doshi is analogous art in the same field of endeavor, it would’ve been obvious to carry out Xu’s probability determination in the context of Doshi’s path selection with a reasonable expectation of success. Indeed, Doshi acknowledges that a POSITA would’ve had the necessary skill set to

²²³ *Id.*, ¶231.

²²⁴ *See* Ex.1026.

²²⁵ Ex.1025, [0094]-[0096].

²²⁶ *Id.*, [0029].

make “[v]arious modifications of the described embodiments.”²²⁷ It would’ve been obvious for such modifications to include Xu’s failure state probability determination.²²⁸

C. Claim 14

For element [14.0], as discussed at [1.0], Doshi discloses selecting LSPs within an MPLS network, which renders obvious “selecting entities within an MPLS network.” Doshi’s network components, *e.g.*, network manager, nodes, modules, switches, etc., and corresponding communication paths, that are involved in the selecting correspond to the claimed “system.”²²⁹

Regarding element [14.1], first, as discussed at [1.1], Doshi in combination with Guichard discloses providing a plurality of LSPs between two end nodes where the LSPs correspond to “a plurality of [] transport entit[ies].”²³⁰

Second, as discussed at [1.2]-[1.5], Doshi in combination with Guichard discloses calculating the cost of various LSP pairs and selecting the lowest cost pair. A POSITA would’ve found it obvious to store and reference “descriptors” of the LSPs at least temporarily to accomplish the cost calculation and selection

²²⁷ Doshi, [300].

²²⁸ Houh, ¶¶232-233.

²²⁹ See Doshi, [0014], [0035], [0081], [0214], [0271]; Houh, ¶¶234-235.

²³⁰ Houh, ¶236.

described above. Such storage would be in a memory, entries in which a POSITA would understand corresponds to a “data structure.”²³¹

Moreover, Doshi expressly describes saving information about a plurality of LSP pairs in a data structure during cost calculation.²³² Doshi also maintains “an extended link-state database” (referred to as “TE/Share database”) that include information used for “path computation.”²³³ “This database contains a data structure for each link L that the node owns. The data structure for each link contains information (e.g., bandwidth, link-id) about all the other links in the network for which link L provides restoration capacity.”²³⁴

Doshi also describes a functional architecture that includes a “Path Management” module that is “responsible for path setup, refresh, tear-down, and monitoring functions.”²³⁵ It would’ve been obvious to a POSITA to store “descriptors” of the monitored paths in a “data structure” to differentiate the paths

²³¹ *Id.*, ¶237.

²³² Doshi, [0143] (“[T]he minimum-cost pair is saved in the data structure LowKPair.”); *Id.*, [0144] (“[T]he lowest-cost pair is stored in the data structure LowLPair.”).

²³³ *Id.*, [0196].

²³⁴ *Id.*, [0197]; *see also id.*, [0082], [0091]-[0095], [0172]-[0176]; Houh, ¶¶238-239.

²³⁵ Doshi, [0273].

and to provide data entries for the paths such that changes can be tracked over time and saved in association with the relevant path.²³⁶

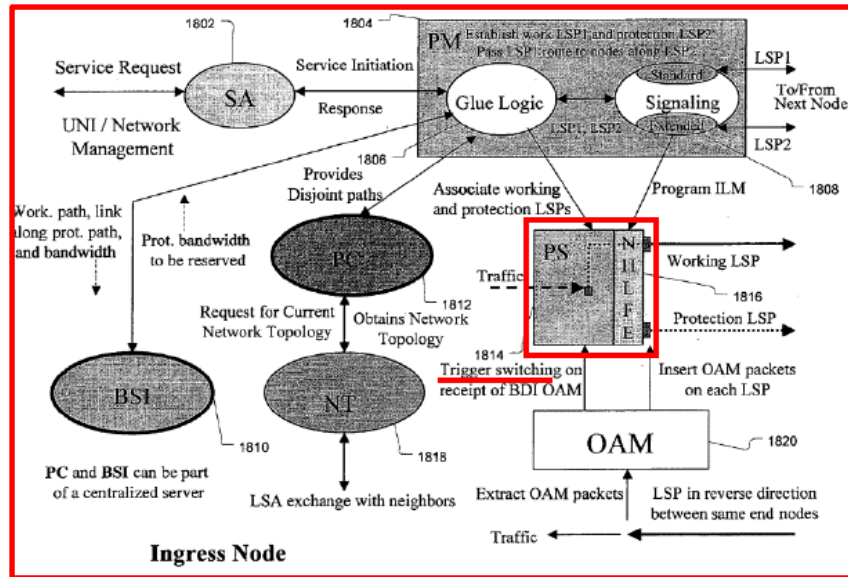
Regarding element [14.2], Doshi describes that “after detecting a failure, end nodes of an LSP switch traffic from a primary (i.e., working) LSP to its corresponding protection LSP.”²³⁷ Doshi further discloses a “Protection Switching (PS)” module that is “responsible for switching the affected traffic onto a protection LSP after detecting a failure or receiving failure notification.”²³⁸ Doshi’s exemplary Protection Switching module at Figure 18 illustrates its inclusion in a node of an LSP.²³⁹

²³⁶ Houh, ¶¶240-241.

²³⁷ Doshi, [0266]-[0267]; *see also id.*, [0266] (“Switching Between Working and Protection LSPs”).

²³⁸ *Id.*, [0278].

²³⁹ Houh, ¶242.



Doshi, Fig. 18 (annotated); Houh, ¶242.

Thus, Doshi’s node (including the Protection Switching module) or the Protection Switching module itself, which is configured to switch between the working LSP and the protection LSP, renders obvious this limitation.²⁴⁰

For element [14.3], first, as discussed at [1.0]-[1.5] and [2.1], Doshi in combination with Guichard discloses logical flowcharts (*e.g.*, at Figures 10 and 11) for selecting a working primary LSP (“working entity”) and a protection LSP (“protection entity”). As discussed at [14.1], a POSITA would’ve found it obvious to store and reference “descriptors” of the LSPs to accomplish cost calculation and

²⁴⁰ *Id.*, ¶¶242-244.

selection of the LSPs. Accordingly, selection of a working LSP and a protection LSP from the descriptors renders obvious “select[ing],” as claimed.²⁴¹

Second, a POSITA would’ve found it obvious to implement Doshi’s flowchart logic (*e.g.*, Figs. 10, 11) with software or a combination of software and hardware (“digital logic”) to perform the calculation and selection techniques. Doshi discloses a series of modules for performing its calculation and selection techniques.²⁴² A POSITA would’ve found it obvious to implement these modules in, for example, software or a combination of software and hardware (“digital logic”) since it was well known that such an implementation would allow for execution of instructions to control functionality (*e.g.*, performing calculations and making decisions).²⁴³ Software or a combination of software and hardware that executes instructions, for example to carry out the flowchart of Figs. 10, 11, to

²⁴¹ *Id.*, ¶245.

²⁴² Doshi, [0270]-[0281].

²⁴³ *See* Ex.1016 (describing “computer-executable instructions for performing the methods of the disclosed innovation.”); Ex.1017 (describing “software and/or firmware provided in a read only memory ... for execution” by a processor “to implement the various functions as detailed below.”); Ex.1018 (describing using “software instructions to implement the present invention.”).

calculate and select the lowest cost pair corresponds to “digital logic,” as claimed.²⁴⁴

A POSITA would’ve found it obvious to include such software or a combination of software and hardware, for example, in Doshi’s “network manager,” including the “Path Management” module that is “responsible for path setup, refresh, tear-down, and monitoring functions.”²⁴⁵

For element [14.4], first, as discussed at [1.2], [2.1], [5.1], Doshi’s path calculation considers disjointedness of the working LSP (“working entity”) and the protection LSP (“protection entity”). Further, as discussed at [14.3], a POSITA would’ve found it obvious to use “digital logic” to perform Doshi’s flowchart logic, including path calculation and selection techniques.²⁴⁶

Doshi recognizes that when two paths are disjoint, e.g., by being node- and link-disjoint, “then a failure affecting one of them will not affect the other.”²⁴⁷ A POSITA would’ve understood that probability of concurrent failure is inversely related to disjointedness—as paths become more disjoint, the likelihood they will fail concurrently goes down. Doshi recognizes that when two paths are disjoint,

²⁴⁴ Houh, ¶246.

²⁴⁵ See Doshi, [0271]-[0273]; Houh, ¶¶247-248.

²⁴⁶ Houh, ¶¶249-250.

²⁴⁷ Doshi, [0040].

e.g., by being node- and link-disjoint, “then a failure affecting one of them will not affect the other.”²⁴⁸ It would take two distinct failures (one affecting each path) for both paths to fail concurrently. Since Doshi explains that the “probability of occurrence” of two such failures is “very insignificant,” a POSITA would’ve understood that determining that two paths are disjoint with no nodes or links in common is also a determination that the paths have a “very insignificant” probability of failing concurrently.²⁴⁹ Accordingly, determining path disjointedness (as part of Doshi’s flowchart) corresponds to “determine[ing] a probability of concurrent failure” since knowledge of, e.g., strict disjointedness represents a determination that there is a “very insignificant” probability that the paths will fail at the same time.²⁵⁰

Second, Xu discloses a “network architecture [that] uses multiple paths between each ingress-egress router pair” in an MPLS network and provides techniques for “selecting the end-to-end paths” between the pair by “Network-Management Software (NMS).”²⁵¹ To inform path selection, Xu models failure

²⁴⁸ *Id.*, [0040].

²⁴⁹ *Id.*, [0040].

²⁵⁰ Houh, ¶¶250-251.

²⁵¹ Ex.1025, [0030]-[0038].

states that would cause at least one path to fail.²⁵² A POSITA would've understood that at least some of the modeled failure states would be states in which the failure affects two paths simultaneously—corresponding to a state of concurrent failure.²⁵³

Xu explains that each failure state has a “predetermined probability of occurrence.”²⁵⁴ A POSITA would've understood that a “predetermined” probability has been “determine[d].” When a failure state is one where the failure affects two paths simultaneously—a state of concurrent failure—Xu’s predetermining a probability of occurrence for that failure state corresponds to “determin[ing] a probability of concurrent failure.” Each failure state is assigned a weight in Xu’s selection function based on how common the state is (probability of occurrence).²⁵⁵

As discussed in more detail in IX.B, a POSITA would've found it obvious determine the probability of occurrence of failure states, as taught by Xu, when implementing Doshi’s calculation and selection techniques and would've been

²⁵² *Id.*, [0006], [0049], [0080], claims 1, 11.

²⁵³ Houh, ¶¶252-253.

²⁵⁴ Ex.1025, [0006].

²⁵⁵ *Id.*, [0010]; *see also* [0033], [0045], [0053], [0080]; Houh, ¶254.

motivated to determine the probability of various failure states to achieve a more refined selection between pairs of paths that have the same disjointedness.²⁵⁶

For element [14.5], first, as discussed at [1.2], Doshi's calculates the cost for each LSP path of candidate LSP pairs. This is done for all candidate LSP pairs, which means that a cost is calculated for each LSP path. As discussed at [14.1], a POSITA would've found it obvious to store and reference "descriptors" of the LSPs at least temporarily to accomplish cost calculation and selection of the LSPs. Further, as discussed at [14.3], a POSITA would've found it obvious to use "digital logic" to perform Doshi's flowchart logic, including path calculation and selection techniques.²⁵⁷

Regarding element [14.6], first, as discussed at [1.0]-[1.5] and [2.1], Doshi in combination with Guichard discloses reselecting an LSP pair from the plurality of MPLS LSPs in response to an event. The reselection includes reselecting a primary LSP and a protection LSP if they remain the lowest cost pair. Doshi's "primary" LSP is also referred to as a "working path" (*e.g.*, working LSP). Put differently, Doshi discloses reselecting a working LSP and a protection LSP. As discussed above at [2.1], these working and protection LSPs correspond to the claimed "working entity" and "protection entity," respectively. As discussed at

²⁵⁶ Houh, ¶¶255-257.

²⁵⁷ *Id.*, ¶¶258-260.

[14.1], a POSITA would've found it obvious to store and reference "descriptors" of the LSPs at least temporarily to accomplish cost calculation and selection of the LSPs. Further, as discussed at [14.3], a POSITA would've found it obvious to use "digital logic" to perform Doshi's flowchart logic, including path calculation and selection techniques.²⁵⁸

And element [14.7] is obvious over the prior art for the same reasons above.²⁵⁹

D. Claim 15

Regarding element [15.1], as discussed at [14.2], Doshi discloses the claimed "entity protection switch."²⁶⁰ Doshi further discloses that "[i]f the bandwidth were allocated in advance of a failure, this would correspond, in the parlance of the field of protection and restoration for optical transport networks, to a 1:1 protection scheme."²⁶¹ Doshi's protection switching module in the context of a 1:1 protection scheme renders obvious this limitation.²⁶²

²⁵⁸ *Id.*, ¶¶261-263.

²⁵⁹ *See* [1.5]; Houh, ¶264.

²⁶⁰ Houh, ¶¶265-267.

²⁶¹ Doshi, [0060].

²⁶² Houh, ¶¶265-268.

E. Claim 16

As discussed at [14.2], Doshi discloses the claimed “entity protection switch.”²⁶³ Doshi further discloses that “[i]f the bandwidth were not only allocated, but additionally if a copy of the service path's data were to be duplicated to the protection path, this would correspond to a 1+1 protection scheme.”²⁶⁴ In some circumstances, “a 1+1 restoration scheme is the best option available for restoration” and therefore are “popular.”²⁶⁵ Doshi’s protection switching module in the context of a 1+1 protection scheme renders obvious this limitation.²⁶⁶

X. CONCLUSION

For at least the above reasons, Juniper requests cancelation of claims 1-20 of the ’821 Patent.

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²⁶³ *Id.*, ¶271.

²⁶⁴ Doshi, [0060].

²⁶⁵ *Id.*, [0147], [0178].

²⁶⁶ Houh, ¶¶269-272.

CERTIFICATE OF COMPLIANCE

Per 37 C.F.R. §42.24(a) and (d), the undersigned hereby certifies that the
Petition complies with the type-volume limitation of 37 C.F.R. §42.24(a)(i)
because, exclusive of exempted portions, it contains 12,701 words as counted by
the word-processing program used to prepare it.

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CERTIFICATE OF SERVICE

The undersigned certifies service pursuant to 37 C.F.R. §§42.6(e) and 42.105(b) on the Patent Owner by Federal Express of a copy of this Petition for Inter Partes Review and supporting materials to the correspondence address of record for U.S. Patent No. 8,830,821:

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