

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

CISCO SYSTEMS, INC.,
Petitioner

IPR2020-01226
U.S. Patent No. 8,130,775

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

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Petitioner's Exhibit List

Ex.1001	U.S. Patent No. 8,130,775
Ex.1002	Prosecution History of U.S. Patent No. 8,130,775
Ex.1003	Declaration of Henry Houh under 37 C.F.R. § 1.68
Ex.1004	<i>Curriculum Vitae</i> of Henry Houh
Ex.1005	U.S. Patent No. 7,602,702 to Aggarwal
Ex.1006	Iftekhar Hussain, " <i>Fault-tolerant IP and MPLS Networks</i> " (1st ed. 2004).
Ex.1007	Reserved.
Ex.1008	Reserved.
Ex.1009	Reserved.
Ex.1010	S. Bryant & P. Pate, " <i>Pseudo Wire Emulation Edge-to-Edge (PWE3) Architecture</i> ," IETF Request for Comments 3985 (March 2005).
Ex.1011	Reserved.
Ex.1012	Andrew S. Tanenbaum, " <i>Computer Networks</i> " (3rd ed. 1996).
Ex.1013	Ina Minei et al., " <i>MPLS-Enabled Applications: Emerging Developments and New Technologies</i> " (2d ed. 2008).
Ex.1014	Declaration of Dr. Ingrid Hsieh-Yee
Ex.1015	Yasukawa et al., " <i>Requirement for Multipoint Traffic Engineered MPLS LSPs</i> ," IETF draft, September 2004.
Ex.1016	Haiyan Zhang, " <i>Pseudowire for Supporting Multicast Traffic</i> ," IETF draft, February 21, 2006.
Ex.1017	<i>Monarch Networking Solutions LLC v. Cisco Systems, Inc.</i> , No. 2:20-cv-00015 (E.D. Tex.), Complaint.

Ex.1018	<i>Monarch Networking Solutions LLC v. Cisco Systems, Inc.</i> , No. 2:20-cv-00015 (E.D. Tex.), Docket Control Order.
Ex.1019	S. Bradner, “ <i>The Internet Standards Process – Revision 3</i> ,” IETF Request for Comments 2026 (Oct. 1996).
Ex.1020	Internet Archive Wayback Machine’s archive of the IETF’s Internet-Drafts Database Interface webpage, https://web.archive.org/web/20061008141657/https://datatracker.ietf.org/public/idindex.cgi (Oct. 8, 2006).
Ex.1021- Ex.1025	Reserved.
Ex.1026	<i>Snik LLC v. Samsung Electronics Co., Ltd. et al.</i> , No. 2:19-cv-00387 (E.D. Tex.), Docket Control Order
Ex.1027	<i>TriOptima AB v. Quantile Technologies Limited</i> , No. 2:19-cv-00390 (E.D. Tex.), Docket Control Order
Ex.1028	<i>GREE, INC. v. SUPERCELL OY</i> , No. 2:19-cv-00413 (E.D. Tex.), Docket Control Order
Ex.1029	<i>SpaceTime3D, Inc. v. Samsung Electronics Co., Ltd. et al.</i> , No. 2:19-cv-00372 (E.D. Tex.), Docket Control Order
Ex.1030	<i>Blitzsafe Texas, LLC v. PACCAR Inc.</i> , No. 2:19-cv-00393 (E.D. Tex.), Docket Control Order
Ex.1031	<i>Blitzsafe Texas LLC v. Navistar, Inc. et al.</i> , No. 2:19-cv-00403 (E.D. Tex.), Docket Control Order
Ex.1032	<i>Luminati Networks Ltd. v. Teso, UAB et al.</i> , No. 2:19-cv-00395 (E.D. Tex.), Docket Control Order
Ex.1033	<i>Toussaint et al v. Smelling et al.</i> , No. 2:20-cv-00013 (E.D. Tex.), Docket Control Order
Ex.1034	U.S. Patent No. 7,369,556 to Rekhter, et al.

Ex.1035	Rekhter, et al., “Cisco Systems’ Tag Switching Architecture Overview,” IETF Request for Comments 2105 (Feb. 1997).
Ex.1036	Rosen, et al., “Multiprotocol Label Switching Architecture Overview,” IETF Request for Comments 3031 (Jan. 2001).
Ex.1037	Thomas Nadeau and Rahul Aggarwal, “Pseudo Wire (PW) Virtual Circuit Connection Verification (VCCV),” draft-ietf-pwe3-vccv-02.txt, IETF Internet Draft (Feb. 2004).
Ex.1038	Stewart Bryant and Prayson Pate, “PWE3 Architecture,” draft-ietf-pwe3-arch-06.txt, IETF Internet Draft (Oct. 2003).

I. INTRODUCTION

Pursuant to 35 U.S.C. §§ 311, 314(a), and 37 C.F.R. § 42.100, Cisco Systems, Inc. (“Petitioner”) respectfully requests that the Board review and cancel as unpatentable under (pre-AIA) 35 U.S.C. §103(a) claims 1 and 6 (hereinafter, the “Challenged Claims”) of U.S. 8,130,775 (the “’775 Patent,” Ex.1001).

The ’775 Patent describes packet-based networking technology in which pseudo-wires are set up between an input router and two output routers. Ex.1001, Abstract. As shown below and confirmed in the Declaration of Henry Houh (Ex.1003), these concepts were well known. The references presented in this Petition teach and render obvious the Challenged Claims.

II. MANDATORY NOTICES

A. Real Party-in-Interest

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

B. Related Matters

Pursuant to 37 C.F.R. § 42.8(b)(2), to the best knowledge of the Petitioner, the ’775 Patent is involved in the following case:

Case Heading	Number	Court	Filed
<i>Monarch Networking Solutions LLC v. Cisco Systems, Inc.; Charter Communications, Inc.</i>	2-20-cv-00015	E.D. Tex.	Jan. 21, 2020

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Please address all correspondence in this proceeding to lead and back-up counsel. Petitioner consents to service in this proceeding by email at the addresses above.

III. GROUNDS FOR STANDING

Petitioner certifies that the '775 Patent is eligible for IPR and that Petitioner is not barred or estopped from requesting IPR challenging the patent claims. 37 C.F.R. § 42.104(a).

IV. NOTE

Petitioner cites to exhibits' original page numbers where possible. Emphasis in quoted material has been added throughout, unless otherwise noted.

V. BACKGROUND

The '775 Patent is directed to “packet-switched networks.” Ex.1001, 1:25. As stated in the background section of the '775 patent, “[i]n a packet switched network, data is transmitted in the form of packets by routers of the network until they reach their destination.” Ex.1001, 1:30-32. Routers maintain “routing information that describe routes through a network.” Ex.1005, 1:14-15. In particular, routers make routing decisions based on the destination Internet Protocol (IP) address of every packet arriving at the router to determine an output port through which to forward the packet. Ex.1006, 23–24. Ex.1003, ¶ 27.

In the 1990s, engineers working at Cisco Systems, Inc. created tag switching as a technology to improve router performance. *See* Ex.1034; Ex.1035. Tag switching evolved and was subsequently standardized through the Internet Engineering Task Force under the name Multiprotocol Label Switching (MPLS). *See* Ex.1036. MPLS is used to engineer traffic patterns within IP networks. *See* Ex.1005, 1:31-34. In particular, MPLS allows a source device to request a specific path through a network. *See* Ex.1005, 34-37. Such path is referred to as a Label Switched Path (LSP). Ex.1003, ¶ 28; Ex.1005, 1:32-35.

LSPs may be established in a variety of manners. For example, an LSP may be implemented as a pseudo-wire. Ex.1006, 46, 274. A pseudo-wire defines the path through the MPLS network over which packets will flow. Ex.1006, 197, 274–75. Because IP packets are encapsulated at the input to the pseudo-wire and extracted at the output, they appear to “tunnel” through the MPLS network over the pseudo-wire. Tunnels are not limited to MPLS networks; traditional networks can perform tunneling by similarly encapsulating packets with headers that contain addressing information. Ex.1012, 757–58; Ex.1003, ¶¶ 29-30.

LSPs and pseudo-wires may be hierarchical. For example, it is possible to nest one tunnel within another. This is done by adding an additional layer of encapsulation. *See* Ex.1006, 255. Such encapsulation can be done through label stacking. *See* Ex.1005, 9:8-10:3. An LSP that is established within another LSP is referred to as a nested LSP. This allows multiple LSPs to be established through a particular tunnel. Ex.1003, ¶ 31.

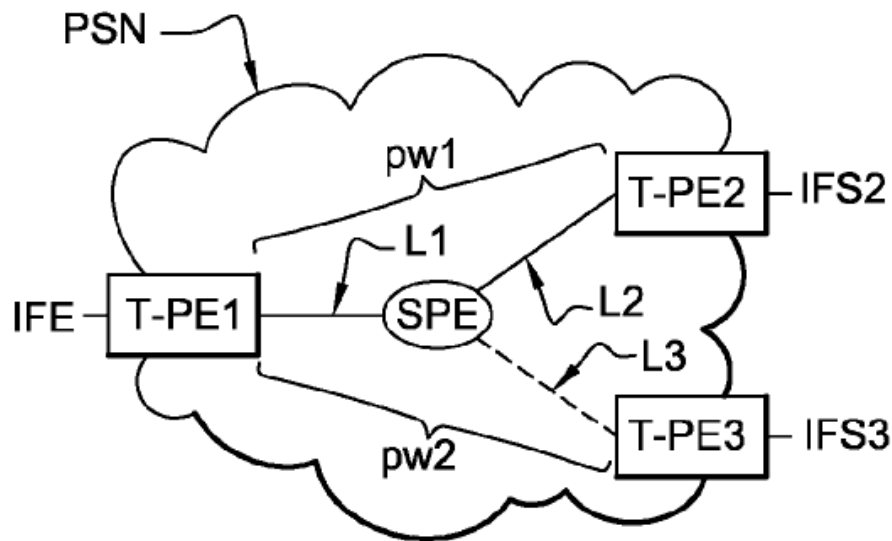
LSPs may also be point-to-point (P2P) or point-to-multipoint (P2MP). When an LSP has exactly one ingress and one egress, it is also known as a P2P LSP. Ex.1013, 485. When an LSP has exactly one ingress and multiple egresses, it is also known as a P2MP LSP. *Id.* For example, a multicast network allows for one computer to transmit to multiple computers simultaneously by sending only one stream—much like a television station transmits a single broadcast stream that any

receiver can tune into—rather than sending a different P2P stream to each receiver. Such multicast packet transmissions are used by some IP-based cable television systems. Ex.1003, ¶¶ 32-33.

As will be shown below, the '775 Patent describes and claims no more than what were already known-techniques related to pseudo-wires.

VI. SUMMARY OF THE '775 PATENT

The '775 patent relates to packet-switched networking, and more specifically, to “a method of setting up at least two pseudo-wires able to broadcast a data stream.” Ex.1001, 1:24-25 & 2:54-55. The '775 patent admits that the prior art included techniques for setting up two pseudo-wires within a network. *See, e.g.*, Ex.1001, 1:45-2:39 & Figs. 1-2. The purported advancement claimed in the '775 patent is for two pseudo-wires (pw1 and pw2) to share a common link (L1) between an input router (T-PE1) and an intermediate router (SPE). Ex.1001, 6:44-48, 2:65-67, 3:15-18. This concept is illustrated in Figure 3 below. Ex.1001, 5:45-57; Ex.1003, ¶¶ 43-44.



Ex.1001, Fig. 3

Aside from the shared link L1, the remainder of Figure 3 is identical to the admitted prior art technique shown in Figure 2. Ex.1003, ¶ 45.

Claim 1 is representative of the challenged subject matter:

1. A method of setting up at least two pseudo-wires able to broadcast a data stream, comprising:

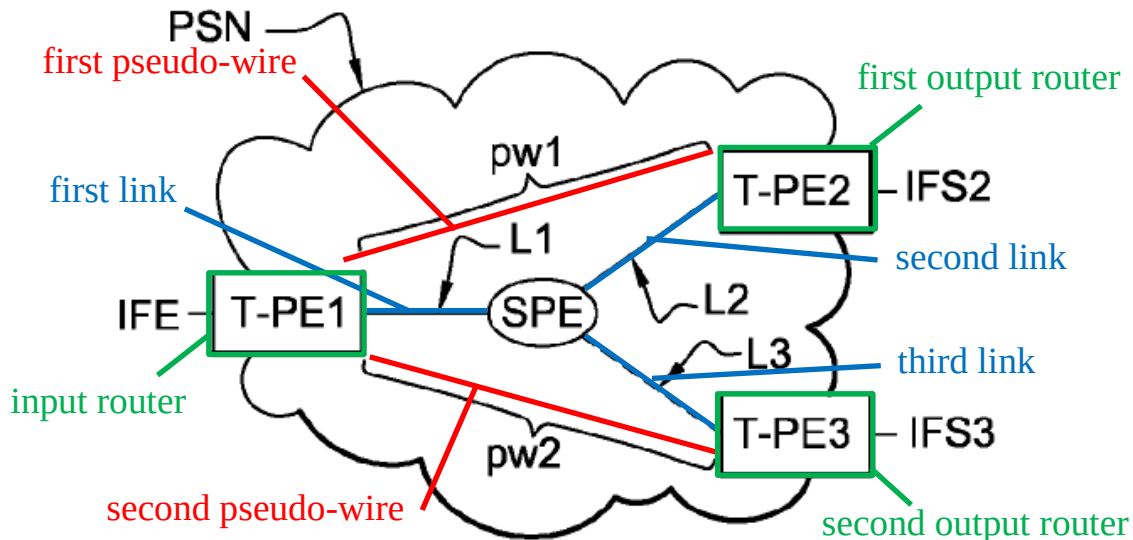
setting up a first pseudo-wire comprising a first link set up between an input router of a packet-switched network and an intermediate router of the packet-switched network and a second link set up between said intermediate router and a first output router of the packet-switched network; and

setting up a second pseudo-wire between said input router and a second output router of the packet-switched network, wherein the second pseudo-wire comprises said first link and a third link set up

between said intermediate router and said second output router, said first link being shared by the first and second pseudo-wires.

Ex.1001, 12:14-27.

Annotated Fig. 3 shows the elements of claim 1.



Ex.1001, Fig. 3 (annotated); Ex.1003, ¶¶ 46-47

However, the concept of having pseudo-wires share links was already known to POSITAs, as will be shown in detail below. Ex.1003, ¶ 48.

VII. PROSECUTION HISTORY

The '775 patent is based on a PCT application filed February 26, 2008 and claims priority to a patent application filed in France on February 26, 2007. The national phase filing of the '775 patent was on November 25, 2009. Determining whether the '775 patent is entitled to an earlier priority date is unnecessary in this proceeding, however, as all of the cited and relied-upon prior art predates February

2007. Accordingly, Petitioner has not undertaken a priority date analysis. Petitioner does not waive any right or opportunity it may have to dispute the priority date of the '775 patent in this or another forum where the issue is relevant.

In a first and only office action dated June 17, 2011, the USPTO rejected the claims as being anticipated by U.S. Patent Publication No. 2008/017234 to Li. Ex.1002, 50. Without amending, the Applicant challenged the rejection by arguing that “Li does not teach a method wherein a first link is shared by the first pseudowire and the second pseudowire.” Ex.1002, 38. Thereafter, the USPTO issued a notice of allowance, stating the reasons for allowance as: “setting up a second pseudo-wire between said input router and a second output router of the packet-switched network, wherein the second pseudo-wire comprises said first link and a third link set up between said intermediate router and said second output router, said first link being shared by the first and second pseudo-wires.” Ex.1002, 14. However, the concept of pseudo-wires sharing links was already known, as shown below.

VIII. LEVEL OF ORDINARY SKILL IN THE ART

A Person of Ordinary Skill in The Art (“POSITA”) in February 2007 would have had a working knowledge of the packet switching art that is pertinent to the '775 Patent, including computer networking, multi-protocol label switch (MPLS) networking, packet encapsulation, packet routing, pseudo-wires, and multicast

transmission. A POSITA would have had a bachelor's degree in computer science, computer engineering, or an equivalent, and three years of professional experience relating to computer networking. Lack of professional experience can be remedied by additional education, and vice versa. Ex.1003, ¶¶ 34-36.

IX. CLAIM CONSTRUCTION

The Challenged Claims are construed “using the same claim construction standard that would be used to construe the claim in a civil action under 35 U.S.C. § 282(b).” 37 C.F.R. § 42.100(b). The claim terms are thus construed “in accordance with the ordinary and customary meaning of such claim as understood by one of ordinary skill in the art and the prosecution history pertaining to the patent.” *Id.* Petitioner believes that, for purposes of this proceeding and the analysis presented herein, no claim term requires express construction. *Vivid Techs., Inc. v. Am. Sci. & Eng’g, Inc.*, 200 F.3d 795, 803 (Fed. Cir. 1999). Ex.1003, ¶ 49.

X. RELIEF REQUESTED AND THE REASONS FOR THE REQUESTED RELIEF

Petitioner asks that the Board institute a trial for *inter partes* review and cancel the Challenged Claims in view of the analysis below.

XI. IDENTIFICATION OF HOW THE CLAIMS ARE UNPATENTABLE

A. Challenged Claims and Statutory Grounds for Challenges

Ground	Claims	Basis
#1	1 and 6	35 U.S.C. § 103 (Pre-AIA) over Aggarwal and Hussain

U.S. Patent No. 7,602,702 to Aggarwal (“**Aggarwal**”) was filed February 10, 2005. It issued and published on October 13, 2009. Ex. 1005. Aggarwal is thus prior art to the ’775 patent under 35 U.S.C. 102(e).

FAULT-TOLERANT IP AND MPLS NETWORKS by Iftekhhar Hussain (“**Hussain**”) was published by Cisco Press in 2004 and is prior art under 35 U.S.C. § 102(b). As testified by Dr. Ingrid Hshieh-Yee (Ex.1014, ¶¶ 1-52), Hussain was made searchable by the Library of Congress since at least October 25, 2002 and was thus available to the public at that time. Ex.1014, ¶¶ 21-26. The copyright registration record (dated November 23, 2004) states the book published on November 19, 2004. *Id.*, ¶¶ 27-29; *see* 17 U.S.C. § 410(c) (copyright registration is prima facie evidence of facts stated therein). Other libraries indicate the book was available before the priority date of the ’775 Patent. *Id.*, ¶¶ 30-43. Furthermore, Amazon.com shows at least three posted reviews of Hussain before May 1, 2005. *Id.*, ¶¶ 44-45. This indicates that the book was publicly available and viewed by interested persons. Hussain was also cited by other documents in 2005. *Id.*, ¶ 46.

Hussain is thus prior art under 35 U.S.C. § 102(b).

Dr. Houh and this Petition cite to a number of documents published by the Internet Engineering Task Force (IETF) as further evidence that a POSITA would have found it obvious to combine the teachings of Aggarwal and Hussain, in addition to the evidence within Aggarwal and Hussain. 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. *See, e.g.*, Ex.1019, 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); Ex.1003, ¶ 71, n. 1. Notably, the ’775 patent itself acknowledges that IETF documents—including draft documents—were accessible, available, and known to the public. *See, e.g.*, Ex.1001, 1:40-42 (citing Request for Comments (RFC) 3031), 1:50 (citing RFC 3985), 1:66-2:2 (citing IETF draft document draft-ietf-pwe3-ms-pw-arch-02.txt); *see also* Ex.1006, 296-97 (citing various IETF RFCs and draft documents). The Board has repeatedly found that IETF documents, including RFCs, are “printed publications.” *See, e.g., Apple, Inc. v. VirnetX, Inc.*, IPR2017-00337, Paper 31 at 46-47 (Requests for Comments are “precisely the type of documents whose main purpose is for public disclosure”); *Riot Games, Inc. v. Paltalk Holdings, Inc.*, IPR2018-00130, Paper 11 at 30-33

(PTAB May 15, 2018) (finding multiple RFCs to be printed publications).

Exhibit 1015 is a September 2004 document published by the IETF describing “a set of requirements for Point-to-Multipoint (P2MP) Traffic Engineered (TE) Multiprotocol Label Switching (MPLS) Label Switched Paths (LSPs).” Ex.1015, 1; *see also* Ex.1003, ¶ 71, n.1; Ex.1019, 8 (IETF draft documents are “readily available to a wide audience”); Ex.1020. A POSITA in the field of packet-switched networking would have reasonably relied upon such documents. Ex.1003, ¶ 71.

Exhibit 1016 is a February 21, 2006 document published by the IETF describing “the efficient transport of multicast-based services and the corresponding Label Distribution Protocol (LDP) protocol extensions and procedures.” Ex.1016, 1; *see also* Ex.1003, ¶ 71, n.2; Ex.1019, 8 (IETF draft documents are “readily available to a wide audience”); Ex.1020. A POSITA in the field of packet-switched networking would have reasonably relied upon such documents. Ex.1003, ¶ 71.

That IETF publications like Exhibits 1015 and 1016 were publicly available is also demonstrated by the ’775 Patent applicants’ references to similar documents, both within the specification (Ex.1001, 1:40-2:2) and in an Information Disclosure Statement (IDS) (Ex.1002, 208).

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

Aggarwal and Hussein were not considered or cited during prosecution of the '775 Patent. Accordingly, discretionary denial under 35 U.S.C. § 325(d) is not appropriate.

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

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

1. Whether evidence exists that a stay may be granted if a proceeding is instituted

A stay pending the outcome of an IPR in the co-pending district court litigation has not been requested. If an IPR is instituted, a stay would be appropriate under the legal standard in the Eastern District of Texas. *See Cypress Lake Software, Inc. v. Samsung Elecs. Am., Inc.*, No. 6:18-cv-00030 (E.D. Tex. Aug. 28, 2019) (order granting stay). Patent Owner waited for years after the '775 Patent issued on March 6, 2012, before filing its litigation Complaint on January 21, 2020. Ex.1001; Ex.1017. Further, Petitioner diligently reviewed prior art and prepared this Petition upon being informed on May 4, 2020 of the claims of the '775 Patent asserted by Patent Owner against Petitioner. Ex.1018, 5. Petitioner worked diligently to prepare and file this Petition in about two months, and in less

than half the time from the Complaint allowed under statute. *Cf.* 35 U.S.C.

§ 315(b). As such, the litigation is still in its early stages, and a stay pending IPR would be appropriate.

However, given that a motion to stay has not yet been filed, the Board should not infer the outcome of that motion. *Intel Corp. v. VLSI Tech. LLC*, IPR2020-00158, Paper 16, at 7 (PTAB May 20, 2020); *Apple Inc. v. Fintiv, Inc.*, IPR2020-00019, Paper 15, at 12 (PTAB May 13, 2020). Thus, this factor is neutral on discretionary denial.

2. Proximity of the Court’s trial date to the Board’s projected statutory deadline for a final written decision

Fintiv states that this factor does not implicate the decision whether to institute “if the court’s trial date is at or around the same time as the projected statutory deadline.” IPR2020-00019, Paper 11, at 9. A Final Written Decision in this proceeding is likely to issue in or around December 2021. The district court’s schedule currently calls for a claim construction hearing before Judge Gilstrap to be held on November 20, 2020 and for jury selection for trial to begin May 3, 2021. *See* Ex.1018. However, this date is uncertain, as the district court currently has eight other cases scheduled for jury selection on the same day. *See* Ex.1026, 1 (trial date scheduled for May 3, 2021); Ex.1027, 1 (same); Ex.1028, 1 (same); Ex.1029, 1 (same); Ex.1030, 1 (same); Ex.1031, 1 (same); Ex.1032, 1 (same);

Ex.1033, 1 (same). It is thus a fair possibility that the trial date will be moved back closer to the time of the expected Final Written Decision. Because of the uncertainty of the current trial date, this factor weighs against discretionary denial. *See Sand Revolution II, LLC v. Continental Intermodal Grp.—Trucking LLC*, IPR2020-01393, Paper 24 (June 16, 2020) (panel granting institution on rehearing based on finding that uncertainty over district court’s trial date weighed against discretionary denial)

3. Investment in the parallel proceeding by the Court and the parties

Again, the litigation is in its early stages, and the investment in it has been minimal. As mentioned above, the claim construction hearing has been set for November 20, 2020. *See* Ex.1018. The early stage of the litigation weighs against discretionary denial.

4. Overlap between issues raised in the petition and in the parallel proceeding

The prior art addressed in the Petition is also part of Petitioner’s invalidity contentions in the litigation. Instituting a proceeding will allow the Board to address the art, and the issues will be narrowed in the litigation due to the estoppel provisions of 35 U.S.C. § 315(e)(2). To reduce overlap further, if the Board institutes trial, Petitioner will cease asserting in the district court litigation the combination of references on which trial is instituted for the claims on which trial

is instituted, while trial is instituted. The most efficient course is for the Board to address the issues before it, and the district court to address only the issues that would remain. Accordingly, this factor weighs against discretionary denial.

5. Whether the petitioner and the defendant in the parallel proceeding are the same party

Petitioner is a defendant in the litigation. Ex.1017. That is true of most Petitioners in IPR proceedings. While the *Fintiv* case indicates that a difference between the district court defendant and the petitioner may weigh against discretionary denial, nothing within the *Fintiv* case suggests that the same party between the proceedings weighs in favor of discretionary denial. Accordingly, this factor should not be a basis for denying institution.

6. Other circumstances that impact the Board's exercise of discretion, including the merits

As discussed in detail below in Section XI.E.3, the combination of Aggarwal and Hussain demonstrates that Claims 1 and 6 are unpatentable as obvious. The merits of Petitioner's argument are strong, and this factor weighs against discretionary denial.

As such, because the *Fintiv* factors are either neutral or weigh against discretionary denial, and because this Petition was filed more than six months before the statutory bar date, institution should not be denied on discretionary factors.

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

The Board should not exercise its discretion under 35 U.S.C. § 314(a) to deny this Petition. Among other factors, the '775 Patent has not been challenged in any prior IPR petition. None of discretionary institution factors 1-5 in *General Plastic* apply to this Petition. See *General Plastic Indus. Co., Ltd. v. Canon Kabushiki Kaisha*, IPR2016-01357, Paper 19 at 16 (PTAB Sept. 6, 2017) (Section II.B.4.i. precedential).

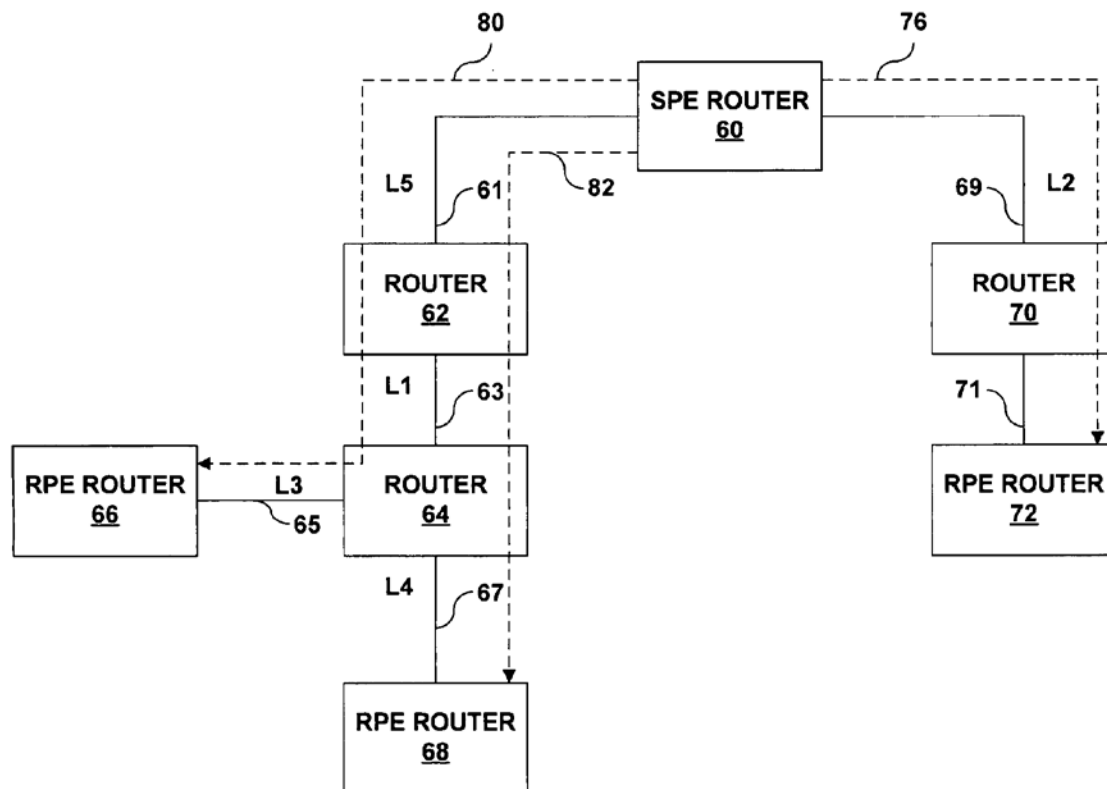
E. Ground 1: Claims 1 and 6 are obvious under 35 U.S.C. § 103(a) over Aggarwal and Hussain

1. Summary of Aggarwal

Like the '775 Patent, Aggarwal is generally directed to routing traffic “associated with a **point to multi-point (P2MP) tunnel**.” Ex.1005, 1:63-64. In particular, Aggarwal describes techniques for extending a resource reservation protocol “to be used for establishing P2MP TE [traffic engineering] tunnels.” Ex.1005, 3:22-24. “[T]he extensions may be used to setup [point-to-point] P2P TE LSPs between source and receiver provider edge routers.” Ex.1005, 3:27-28. “The P2P LSPs that are merged to form the P2MP LSPs are referred to as branch LSPs.” Ex.1005, 4:13-15. Aggarwal further describes how the branch LSPs may be nested within the P2MP tunnel using label stacking. See Ex.1005, 9:17-39, 9:61-10-3. Importantly, like the '775 Patent, to accomplish using P2P tunnels to establish

P2MP tunnels, “the P2P TE LSPs are appropriately **merged** by the network.”

Ex.1005, 3:29-31. As an example, these techniques are illustrated in Fig. 5, shown below. Ex.1003, ¶¶ 50-54.



Ex.1005, Fig. 5

Fig. 5 illustrates how “SPE [source provider edge] router 12 establishes a P2MP LSP between SPE router 12 and RPE [receiver provider edge] routers 66, 68, and 72.” Ex.1005, 6:31-32. To do this, the SPE router 60 establishes a branch LSP 80 between the SPE router 60 and a first RPE router 66. See Ex.1005, 6:44-47. LSP 80 includes links 61 and 63 between the SPE router and intermediate

router 64, as well as link 65 between the intermediate router 64 and the first RPE router 66. Ex.1005, Fig. 5. Ex.1003, ¶ 55.

Additionally, the SPE router 60 establishes a branch LSP 82 between the SPE router 60 and a second RPE router 68. *See* Ex.1005, 6:44-47. LSP 82 includes links 61 and 63 between the SPE router 60 and intermediate router 64, as well as link 67 between the intermediate router 64 and the second RPE router 68. Ex.1005, Fig. 5. Ex.1003, ¶ 56.

Notably, “[t]hese branch LSPs are computed to **share the same links where possible** as they belong to the same session.” Ex.1005, 6:40-42. As such, “Branch LSPs 80 and 82 **share links 63 and 61** between router 64 and SPE router 60.” Ex.1005, 6:47-49. In other words, Aggarwal’s technique “merges individual branch LSPs to form a P2MP LSP.” Ex.1005, 7:4-5; Ex.1003, ¶ 57.

Aggarwal describes an application for this technology in “transmission of multicast traffic without run[ning] a multicast routing protocol on routers.” Ex.1005, 4:32–34. Aggarwal shows an example of setting up a “P2MP LSP associated with” a particular “multicast group.” Ex. 1005, 6:34–35. In the example, multiple “branch LSPs” are established in “P2MP RSVP [resource reservation protocol] TE tunnels.” Ex. 1005, 6:26–43; Ex.1003, ¶ 58.

Aggarwal is analogous art to the ’775 Patent because it is both in the same field of endeavor and is directed to the same technical problem as the ’775 Patent.

Both Aggarwal and the '775 Patent are in the field of MPLS network traffic management. *See* Ex.1005, 1:7-9, 3:29-39; Ex.1001, 1:25-26, 1:34-36. And, Aggarwal is directed to the same technical problem as the '775 patent. Like the '775 Patent, which describes “setting up ... a single link common to the two pseudo-wires,” Aggarwal teaches that “Branch LSPS 80 and 82 share links 63 and 61.” Ex.1001, 3:3-4; Ex.1005, 6:47-49; Ex.1003, ¶ 59.

2. Summary of Hussain

Like Aggarwal and the '775 Patent, Hussain relates to MPLS networks. In particular, Hussain is a book that provides additional implementation details and options for setting up LSPs within packet-switched networks such as those described by Aggarwal. In one example, Hussain describes setting up a tunnel between Provider Edge (PE) routers. Ex.1006, 267. This tunnel is referred to as a PE-to-PE tunnel. *See id.* Hussain further teaches that several LSPs can be “nested” within the PE-to-PE tunnel. In particular, Hussain states that “PWs [pseudo-wires] correspond to nested LSPs in the PE-to-PE tunnel in which an individual PW is identified based on the MPLS label.” Ex.1006, 273. Furthermore, Hussain teaches that such LSPs are applicable to a “point-to-multipoint L2VPN [Layer 2 Virtual Private Network].” Ex.1006, 272. Ex.1003, ¶ 60.

Hussain also describes a Virtual Private LAN Service (VPLS) in which multiple “point-to-point PWs [pseudo-wires]” are set up using Label Distribution

Protocol (LDP). Ex.1006, 276. This set up can be performed by “hardware and software components” of routers in a network. Hussain, 6. In particular, Hussain explains that “IP/MPLS control-plane software, the brain of a router, resides in the control processor card.” Ex.1006, 8; Ex.1003, ¶ 61.

After a pseudo-wire is set up, data packets can be sent along the pseudo-wire. Hussain explains that “a Layer 2 frame” is encapsulated “in a pseudowire (PW) protocol data unit.” Ex.1006, 272. The frame is then transported in the pseudo-wire “over a tunnel across the PSN [packet-switched network]” from one provider edge (PE) router to another. Ex.1006, 272; Ex.1003, ¶ 62.

Hussain also describes a Virtual Private LAN Service (VPLS), which provides “a point-to-multipoint service” across a packet-switched network that “emulates the performance of a LAN.” Hussain, 275. A business using VPLS to interconnect multiple geographically distributed sites can take advantage of the features and benefits a conventional local-area network provides, such as “broadcast and unicast services.” Hussain, 277; Ex.1003, ¶ 63.

3. Reasons to Combine Aggarwal and Hussain

A POSITA would have found it obvious to combine the teachings of Aggarwal and Hussain because the combination is merely use of a known technique to improve similar methods in the same way. Specifically, it would have been obvious to a POSITA to apply Hussain’s known technique of establishing

implementing LSPs as pseudo-wires to Aggarwal's similar LSPs within an MPLS network. Ex.1003, ¶¶ 64-65.

As mentioned above, Aggarwal describes establishing label switched paths (LSPs): “By utilizing MPLS, a source device can request a path through a network, i.e., a Label Switched Path (LSP).” Ex.1005, 1:34-35. Aggarwal further notes that a “variety of protocols exist for establishing LSPs.” Ex.1005, 1:45. Aggarwal describes both Resource Reservation Protocol with Traffic Engineering (RSVP-TE) and Label Distribution Protocol (LDP). *See* Ex.1005, 1:45-55. Aggarwal further teaches using RSVP-TE to establish point-to-multipoint (P2MP) LSP tunnels. *See* Ex.1005, 1:62-2:14; Ex.1003, ¶ 66.

A POSITA would have recognized that Aggarwal gives a general overview of LSPs. And, a POSITA would have looked to other resources that provide further implementation details for such LSPs. Hussain provides a POSITA with just such details. Specifically, Hussain is directed to the design and deployment of high availability IP and MPLS network architectures. *See* Ex.1006, title page. A POSITA looking to implement Aggarwal's method would naturally refer to literature describing similar technology. Therefore, a POSITA would have looked to other references—like Hussain—that further discuss establishing LSPs within an MPLS network. Moreover, Hussain would have been an attractive option, as it describes implementing LSPs in the context of providing high availability and

fault-tolerance. Indeed, the title of Hussain is “Fault-tolerant IP and MPLS Networks.” Thus, when implementing an MPLS network as taught by Aggarwal, a POSITA would have looked to a comprehensive guide for implementing such networks with fault-tolerance and high availability. Ex.1003, ¶ 67.

Hussain notes that “[i]n MPLS, a tunnel corresponds to a *label-switched path* (LSP).” Ex.1006, 255. Hussain further describes “PE-to-PE tunnels [that] can be established using LDP or RSVP-TE.” Ex.1006, 273. As explained above, a PE is a Provider Edge router. Further, like Aggarwal, Hussain describes point-to-multipoint services. *See* Ex.1006, 272-73. Accordingly, like Aggarwal, Hussain describes establishing LSPs between routers. Ex.1003, ¶ 68.

Hussain further describes a particular type of LSP that may be implemented, that is, implementing LSPs as pseudo-wires. Specifically, Hussain describes encapsulating a “frame in a *pseudowire* (PW) protocol data unit.” Ex.1006, 272. Hussain notes that a “PW is a mechanism that emulates the essential attributes of a service, such as FR, ATM, Ethernet, Time Division Multiplexing [TDM], and SONET/SDH over **IP and/or MPLS network**.” Ex.1006, 272. Hussain teaches that “PWs correspond to nested LSPs in the PE-to-PE tunnel in which an individual PW is identified based on the MPLS label.” Ex.1006, 272. “In the MPLS backbone, PEs are connected via PWs, which correspond to PE-to-PE LSPs that are established using LDP. In turn, PWs are multiplexed (nested) and

transported over PE-to-PE tunnels.” Ex.1006, 274. Accordingly, Hussain shows that implementing LSPs, such as Aggarwal’s branch LSPs, with pseudo-wires was well-known. Thus, a POSITA implementing the teachings of Aggarwal would have been motivated to implement the teachings of Hussain to improve Aggarwal’s LSPs with pseudo-wires that connect routers over an IP/MPLS backbone. Ex.1003, ¶ 69.

Furthermore, Hussain provides additional details to help support Aggarwal’s teaching of sharing links. Specifically, as described above, Aggarwal is directed to merging point-to-point LSPs to form point-to-multipoint LSPs. Aggarwal teaches that an objective of such techniques is to “optimize packet replication and minimize state and intelligence in the core of the network, while performing P2MP TE.” Ex.1005, 3:40-43. Aggarwal’s techniques also seek to “reduce complexity.” Ex.1005, 7:9-11. Ex.1003, ¶ 70.

A POSITA would have understood that implementing the LSPs of Aggarwal as pseudo-wires, as taught by Hussain, would improve network efficiency in line with Aggarwal’s goals. Ex.1003, ¶ 71. The advantages of implementing an LSP as a pseudo-wire were obvious and commonly known in the art before 2007. Hussain describes how with “the migration of legacy Layer 2 infrastructure over a converged packet-switched network,” services such as Frame Relay (FR) and Asynchronous Transfer Mode (ATM) “are predominantly offered over an

IP/MPLS backbone.” Ex.1006, 254. For example, “[a] PW [pseudo-wire] is a mechanism that emulates the essential attributes of a service, such a FR, ATM, Ethernet, Time Division Multiplexing [TDM], and SONET/SDH over IP and/or MPLS network.” Ex.1006, 272.

Contemporaneous documents confirm that network engineers were creating technology combinations like that suggested by the combination of Aggarwal’s and Hussein’s teachings. A prior art IETF document discusses “[a]n Ethernet multipoint Layer2 VPN service provided by MPLS” (e.g., similar to Hussein’s VPLS) and explains that “if existing P2P TE LSPs are used as tunnels between PEs, any ingress PE must duplicate the frames and send them to the corresponding PEs,” which would “waste the provider’s network resources.” Ex.1015, 15-16. Therefore, the IETF draft provides a potential solution, noting that “it might be desirable that P2MP MPLS TE LSPs are used for data transmission with an appropriate layer 2 encapsulation technique (**for example, pseudo wire**) instead of P2P MPLS TE LSPs, contributing in turn to savings of network resources.” Ex.1015, 16. Further, pseudo-wires permit broadcasting services. Therefore, a POSITA would have been motivated to implement Aggarwal’s LSPs as pseudo-wires. Ex.1003, ¶ 71.

The results of applying Hussain’s teachings of pseudo-wires to Aggarwal’s branch LSPs would have been predictable because Hussain explicitly teaches

establishing LSPs such as the ones described by Aggarwal as pseudo-wires. The combination of Aggarwal and Hussain would have yielded predictable results because, as discussed above, implementing LSPs as pseudo-wires was well known to successfully provide Layer 2 services over an MPLS network. A prior art IETF document explains that “multicast-based services such as IP TV, DVB etc.,” were becoming more popular, so IETF “Working Groups, such as MPLS and L2VPN, [had] begun to discuss the requirements and solutions for multicast.” Ex.1016, 2. The IETF draft acknowledged that the same “solutions are needed to support the multicast traffic over PW.” Ex.1016, 2. Therefore, the IETF draft proposed “procedures to transmit the multicast traffic using the unidirectional Pseudowires (PWs), and describe the corresponding extensions to Label Distribution Protocol (LDP).” Ex.1016, 2–3. A solution discussed was that “the PSN [packet-switched network] tunnel used to carry the point-to-multipoint PW (P2MP PW) may consist of a P2MP LSP, or multiple P2P and P2MP LSPs.” Ex.1016, 4. Therefore, a POSITA would have found it predictable to implement Aggarwal’s LSPs as pseudo-wires. Ex.1003, ¶ 72.

A POSITA would have had a reasonable expectation of success implementing the branch LSPs of Aggarwal as pseudo-wires because pseudo-wires were a known type of LSP. Ex.1003, ¶ 73. Hussain describes how pseudo-wires correspond to LSPs nested in a PE-to-PE tunnel. Ex.1006, 274. And, like

Aggarwal's branch LSPs which are nested within Aggarwal's P2MP tunnels, Hussain's pseudo-wires are nested within a PE-to-PE tunnel. Therefore, a POSITA would have expected pseudo-wires to work well within Aggarwal's P2MP tunnel as they work in Hussain's PE-to-PE tunnel. Ex.1003, ¶ 73.

Furthermore, because, pseudo-wires are a type of LSP, they operate in a similar manner. For example, Hussain teaches that pseudo-wires participate in data broadcasting by delivering Layer 2 data in a P2MP service. Ex.1006, 277.

Aggarwal also teaches that branch LSPs deliver multicast packets in a P2MP LSP tunnel. See Ex.1005, 3:31–35, 3:42–47, 6:26–35, Fig. 5. Additionally, Hussain teaches that pseudo-wires are created in packet-switched networks, such as MPLS. Ex.1006, 275. Aggarwal also teaches that branch LSPs are created in MPLS networks that perform label-switching on data packets. See Ex.1005, 3:32–35, 6:60–7:3. Finally, because both pseudo-wires and LSPs are created in MPLS networks, the same network routers and links may be used. Thus, there was a reasonable expectation of success in implementing the combination of Aggarwal and Hussain. Accordingly, a POSITA would have found it obvious to combine the teachings of Aggarwal and Hussain because doing so is merely use of a known technique (pseudo-wires) to improve similar methods (establishing branch LSPs) in the same way (to improve network efficiency). See *KSR Int'l Co. v. Teleflex Inc.*, 550 U.S. 398, 415-421 (2007); Ex.1003, ¶ 74.

Alternatively, a POSITA would have found it obvious to implement pseudo-wires *within* Aggarwal's branch LSPs. In particular, Hussain teaches implementing pseudo-wires *within* a PE-to-PE tunnel: "PWs [pseudo-wires] correspond to nested LSPs in the PE-to-PE tunnel in which an individual PW is identified based on the MPLS label." Ex.1006, 273. Like Hussain's PE-to-PE tunnel, Aggarwal's Branch LSPs are tunnels between edge routers: Aggarwal describes techniques "for extending RSVP-TE to allow RSVP-TE to be used for establishing P2MP TE tunnels." Ex.1005, 3:22-24. Accordingly, it would have been obvious to implement pseudo-wires within Aggarwal's branch LSPs (tunnels), similar to how they are implemented in Hussain's PE-to-PE tunnels. As such, the pseudo-wires would be implemented as nested pseudo-wires within Aggarwal's LSPs (e.g., Branch LSPs 80 and 82). A POSITA would have had a reasonable expectation of success and would have had predictable results for the same reasons mentioned above. Ex.1003, ¶ 75.

Additionally, a POSITA would have found it obvious to combine the teachings of Aggarwal and Hussain because the combination merely applies a known technique to a known method ready for improvement to yield predictable results. As discussed above, a POSITA, when considering the teachings of Aggarwal, would have also considered the teachings of Hussain because both are generally directed toward provision of P2MP services over MPLS networks.

Moreover, Hussain provides additional implementation details for improving survivability and optimizing network resources. Therefore, a POSITA would have found the teachings of Hussain relevant. Ex.1003, ¶ 76.

A POSITA would have been motivated to incorporate a particular technique into the method Aggarwal: implementing a branch LSP as a pseudo-wire. Ex.1003, ¶ 77. Alternatively, a POSITA would have found it obvious to implement pseudo-wires within Aggarwal's branch LSPs as nested pseudo-wires. In either way, doing so would have improved the method of Aggarwal in the same way as using the technique improved Hussain. Ex.1003, ¶ 77. And, as discussed above, the advantages of implementing an LSP as a pseudo-wire were commonly known in the art before 2007. And, as also discussed above, the combination of Aggarwal and Hussain would have yielded predictable results because implementing an LSP as a pseudo-wire was well known to successfully provide Layer 2 services over an MPLS network. And, a POSITA would have had a reasonable expectation of success using pseudo-wires as the branch LSPs because pseudo-wires are a type of LSP. Therefore, a POSITA would have been motivated to implement the branch LSPs as pseudo-wires. Ex.1003, ¶ 77.

The combination of Aggarwal and Hussain represents applying a known technique (implementation of pseudo-wires) to a known method (implementing

point-to-multipoint LSPs) ready for improvement to yield predictable results (pseudo-wires with shared links). Ex.1003, ¶ 78.

Petitioner’s proposed combinations permit but do not require physical incorporation of elements from Hussain into Aggarwal. *See In re Mouttet*, 686 F.3d 1322, 1332 (Fed. Cir. 2012); Ex.1003, ¶ 79.

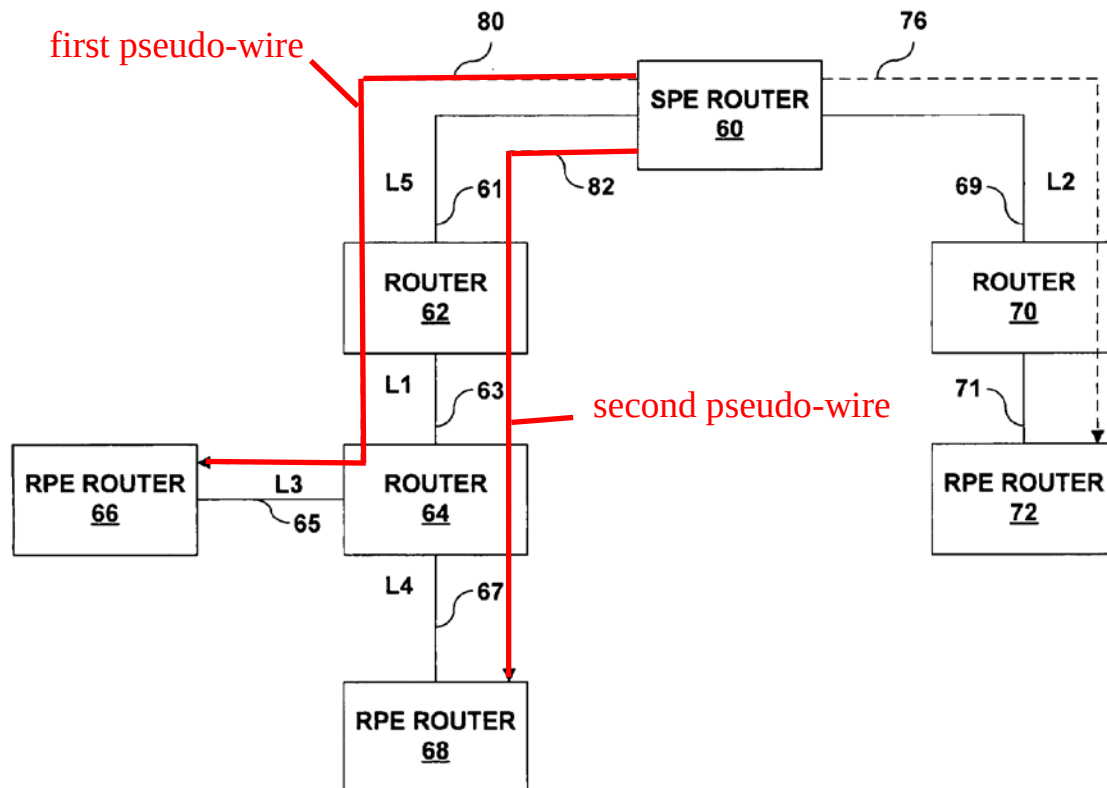
4. Claim 1

[1.0] A method of setting up at least two pseudo-wires able to broadcast a data stream, comprising:

Aggarwal and Hussain render this limitation obvious.

First, Aggarwal teaches setting up branch Label Switched Paths (LSPs) 80 and 82 (“*at least two pseudo-wires*”):¹ “SPE router 60 also establishes branch LSPs 80 and 82 with RPE routers 66 and 68, respectively, via router 62 and router 64.” Ex. 1005, 6:44-47. Aggarwal’s Figure 5, below, illustrates the branch LSPs 80 and 82. Ex.1003, ¶¶ 80-83.

¹ For the reasons explained above at XI.E.3, and as elaborated below, a POSITA would have found it obvious to implement Aggarwal’s LSPs as pseudo-wires. Ex. 1003, ¶ 81.

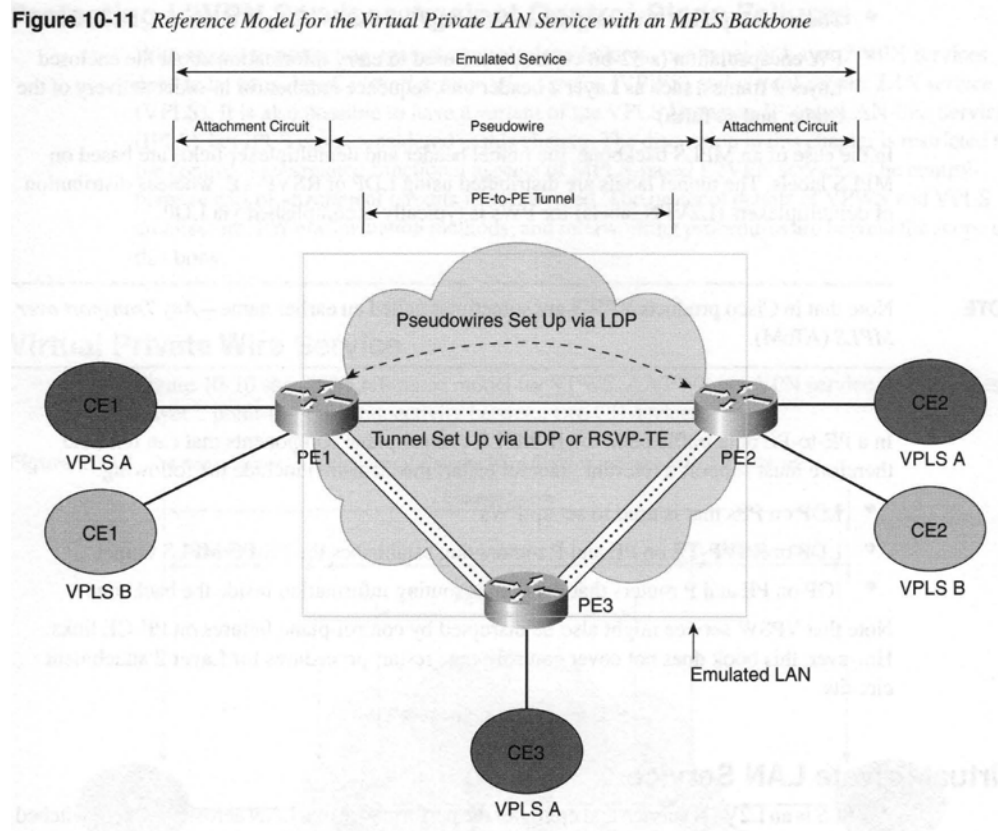


Ex. 1005, Fig. 5, (annotated); Ex.1003, ¶ 81

Second, a POSITA would have found it obvious to implement Aggarwal’s branch LSPs as pseudo-wires, as evidenced by Hussain. Hussain explicitly teaches setting up LSPs as pseudo-wires via LDP. See Ex.1006, 276; Ex.1003, ¶ 84.

In particular, Hussain teaches how “[t]o set up a full mesh of point-to-point PWs [pseudo-wires]” between “all PEs [provide edges] in a VPLS [virtual private LAN service]” using label distribution protocol (LDP). Ex.1006, 276–77. Thus, setting up point-to-point pseudo-wires in a VPLS is a “*method of setting up at least two pseudo-wires*” as claimed. Ex.1003, ¶ 85.

Figure 10-11 of Hussain illustrates that pseudo-wires are established as LSPs, since they are set up using label distribution protocol (LDP):



Ex.1006, Fig. 10-11 at 276.

A POSITA would have found it obvious to implement Aggarwal's branch LSP's as pseudo-wires to improve network efficiency, consistent with Aggarwal's objective to "optimize packet replication and minimize state and intelligence in the core of the network." Ex.1005, 3:40-42; *see also infra* XI.E.3; Ex.1003, ¶ 88. By implementing the branch LSPs 80 and 82 as pseudo-wires, such LSPs teach the pseudo-wires as claimed. Ex.1003, ¶ 86-88.

Alternatively, a POSITA would have found it obvious to implement pseudo-wires *within* Aggarwal's branch LSPs. As explained above at XI.E.3, Hussain teaches implementing pseudo-wires *within* a PE-to-PE tunnel. Aggarwal's Branch LSPs are a type of tunnel between edge routers. Thus, a POSITA also would have found it obvious to implement pseudo-wires as nested pseudo-wires within Aggarwal's LSPs (e.g., Branch LSPs 80 and 82). Ex.1003, ¶ 89.

Third, a POSITA would have found it obvious that Aggarwal's branch LSPs implemented as pseudo-wires as taught by Hussain would provide broadcast services. For example, Hussain explains that a VPLS "emulates the performance of a LAN." Ex.1006, 275. Additionally, Hussain explains that a "LAN provides broadcast and unicast services." Ex.1006, 277. Additionally, Hussain teaches that L2VPNs, including VPLS, "transport Layer 2 frames." Ex.1006, 273. A POSITA, therefore, would have understood that Layer 2 frames are a type of traffic that can be broadcast in a VPLS. Accordingly, a POSITA would have recognized that the branch LSPs 80 and 82 implemented as pseudo-wires can broadcast data streams. Ex.1003, ¶ 90.

To the extent that Patent Owner would seek a narrower definition of "pseudo-wire" to include a specific definition, as described in RFC 3985 (Ex.1001, 1:50; Ex.1010), a POSITA would have found it obvious that Hussain's reference to a pseudo-wire would refer to the same thing. Specifically, Hussain discussed

pseudo-wires in the context of, and with citations to, IETF draft documents and RFCs discussing pseudo-wires. *See e.g.*, Ex.1006, 296-97 (citing, *inter alia*, Aggarwal² et al., “Pseudo Wire (PW) Virtual Circuit Connection Verification (VCCV),” IETF Draft dated February 2004 (Ex.1037), which at 13 cites Bryant, *et al.*, “PWE3 Architecture,” draft-ietf-pwe3-arch-06.txt (Oct. 2003) (Ex.1038) which is an earlier draft of RFC 3985 (Ex.1010)). Accordingly, a POSITA would have expected Hussain’s discussions of pseudo-wires to use that term as it is used in the IETF’s RFC documents. Ex.1003, ¶ 91.

Hussain teaches that L2VPNs, including VPLS, “transport Layer 2 frames.” Ex. 1006, 273. A POSITA, therefore, would have understood that Layer 2 frames are a type of traffic that can be broadcast in a VPLS. Thus, the Layer 2 frames are “*a data stream.*” Ex.1003, ¶ 92.

Thus, because Aggarwal teaches establishing branch LSPs, which can be implemented as pseudo-wires and provide broadcast services as taught by Hussain, the combination of Aggarwal and Hussain renders obvious “[a] *method of setting*

² Rahul Aggarwal, co-author of Ex.1037, appears to be the same individual who is the sole named inventor of the Aggarwal reference, Ex.1005, which further confirms the relevance of Hussain’s disclosure to Aggarwal’s teachings and supports the obviousness of their combination.

up at least two pseudo-wires able to broadcast a data stream,” as claimed.

Ex.1003, ¶ 93.

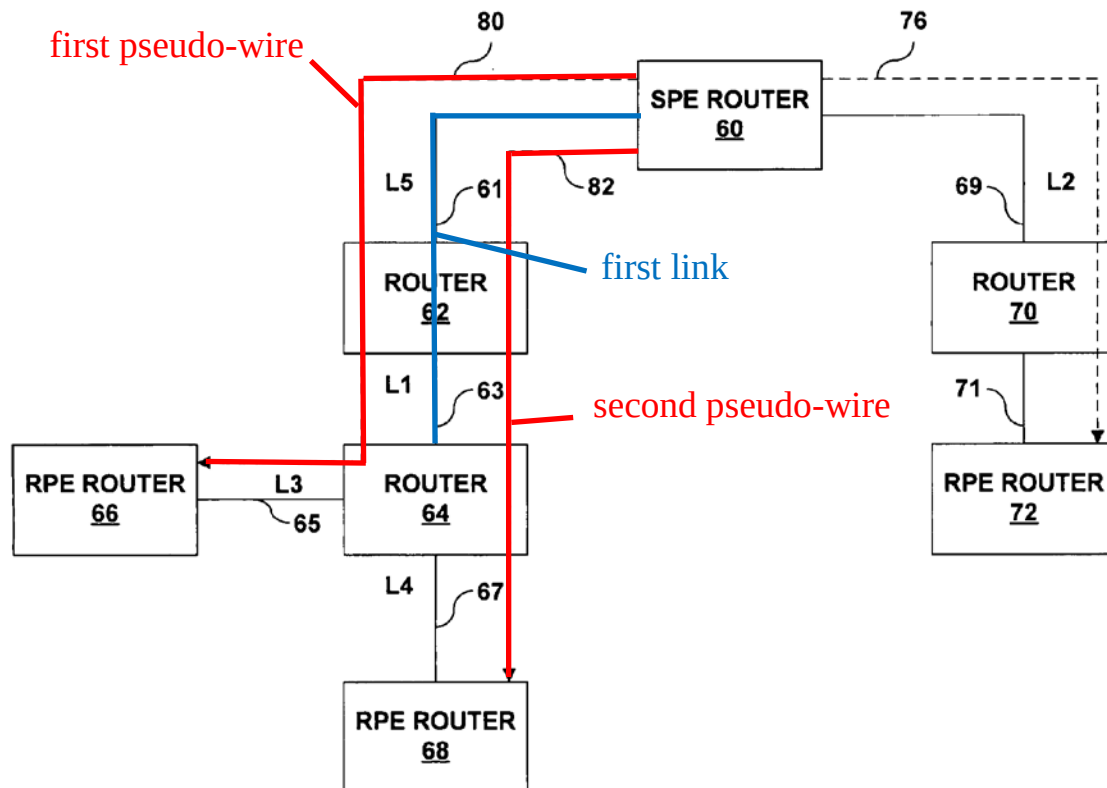
[1.1] setting up a first pseudo-wire comprising a first link

Aggarwal and Hussain render this limitation obvious.

First, Aggarwal teaches setting up a first branch LSP 80 (corresponding to a “*first pseudo-wire*”): “SPE router 60 also establishes **branch LSPs 80 and 82** with RPE routers 66 and 68, respectively, via router 62 and router 64.” Ex.1005, 6:45-47; *see also* 7:43-44 (“router 60 sets up branch LSP 80 to RPE router 66.”). And, for the reasons described above at [1.0], Hussain shows that it would have been obvious to a POSITA to implement Aggarwal’s branch LSP 80 as a pseudo-wire. Ex.1003, ¶ 94-97; *see also supra*, § XI.E.3.

Second, Aggarwal teaches that the first branch LSP includes links 61 and 63 (“*first link*”)³: “As shown in FIG. 5, **Branch LSPs 80 and 82 share links 63 and 61** between router 64 and SPE router 60.” Annotated Fig. 5 is shown below. Ex.1003, ¶ 98.

³ Petitioner notes that links 61 and 63 either individually or together teach the claimed “first link.”



Ex. 1005, Fig. 5, (annotated); Ex.1003, ¶ 98.

Aggarwal explains that “[t]he term ‘link’ is often used to refer to the connection between two devices on a network.” Ex. 1005, 1:22. The term includes “‘virtual’ or ‘logical links.’” Ex. 1005, 1:25–27; Ex1003, ¶ 99.

A POSITA implementing the method of setting up the first pseudo-wire would have understood that a link may consist of multiple hops. Therefore, a POSITA would have found it obvious that “a *first link*” would extend from SPE router 60 to intermediate router 64. As illustrated in Figure 5 above, the first pseudo-wire comprises the first link. Ex.1003, ¶ 100.

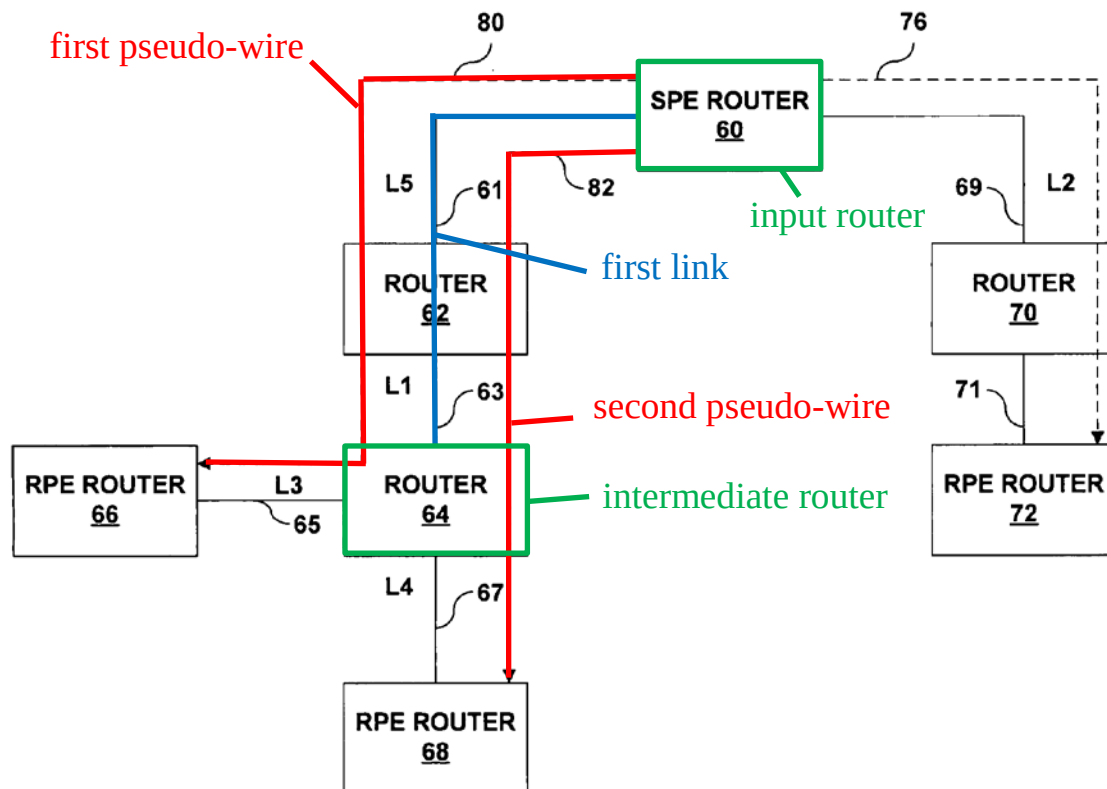
To the extent that a link is found to be the connection between pairs of routers that do not include intermediate routers, a POSITA would understand that router 62 could be removed (and labels L5 and L1 consolidated into a single label) in the example network in Figure 5 above. Ex.1003, ¶ 101. A POSITA would have found it obvious to remove router 62 from the network of Figure 5, recognizing that there are no other routers other than router 60 and router 64 to which router 62 is connected, and that the system would perform better (no delays incurred in router 62), would be simpler to manage (fewer routers to configure and manage), and be cheaper to implement (no cost for installing and managing router 62). Ex.1003, ¶ 101. Aggarwal illustrates this possibility by showing that in the path from source router 60 to receiver router 72, there is just one intermediate router 70. Ex.1005, Fig. 5; Ex.1003, ¶ 101.

Thus, because Aggarwal teaches a branch LSP 80 with links 61 and 63 between the router 64 and the SPE router 60, and a POSITA would have found it obvious to implement Aggarwal's branch LSP as a pseudo-wire as taught by Hussain, Aggarwal and Hussain render obvious "*setting up a first pseudo-wire comprising a first link*" as recited in the claim. Ex.1003, ¶ 102.

[1.2] *[a first link] set up between an input router of a packet-switched network and an intermediate router of the packet-switched network and*

Aggarwal and Hussain render this limitation obvious.

First, as discussed in [1.1], Aggarwal teaches that links 61 and 63 (“*first link*”) are between SPE router 60 (“*input router*”) and router 64 (“*intermediate router*”), as shown in annotated Fig. 5 below. Ex.1003, ¶¶ 103-14.



Ex.1005, Fig. 5, (annotated); Ex.1003, ¶ 104

SPE router 60 is an “*input router*” because it is described as a source provider edge router. In a different embodiment (Fig. 1), Aggarwal describes the roles of the SPE routers and the RPE routers: “a source provider edge (SPE) router 12 (also referred to as a source network device) uses RSVP-TE to establish P2P LSPs to carry traffic between source network 10 and subscriber networks 18.” Aggarwal, 3:58-61. “A P2P LSP 20A is established between SPE router 12 of

source network 10 and a receiver provider edge (RPE) router 16A (destination network device) of subscriber network 18A.” Ex.1005, 3:61-65. In other words, traffic enters the P2MP network at the source (SPE router) and exits at the receiver (RPE router). A POSITA would have recognized that the description of SPE routers and RPE routers in the embodiment of Fig. 1 would have applied to the SPE routers and RPE routers in the embodiment of Fig. 5. Ex.1003, ¶ 105.

Accordingly, because the SPE receives traffic from a source network to be passed to a subscriber network, it is an input router. Ex.1003, ¶ 105.

Furthermore, router 64 is an “*intermediate router*” because Aggarwal explicitly states that “[c]omputer network 58 also includes **intermediate routers** 62, **64**, 68, and 70.” Ex.1005, 6:30-31. Router 64 is positioned between the Source Provider Edge router 60 and Receiver Provider Edge (RPE) routers 66 and 68, and is thus situated at an *intermediate* position. Ex.1003, ¶ 106.

Second, both the SPE router 60 and the intermediate router 64 are in a “*packet-switched network*.” Regarding the SPE routers, Aggarwal states that “[u]pon receiving an incoming packet, the router examines information within the packet and **forwards the packet** in accordance with the routing information.” Ex.1005, 1:15-18. And Aggarwal notes that the P2MP LSPs are part of a LAN. See Ex.1005, 6:60-7:3. A POSITA would have found it obvious for a LAN to be a packet-switched network. Ex.1003, ¶¶ 107-09.

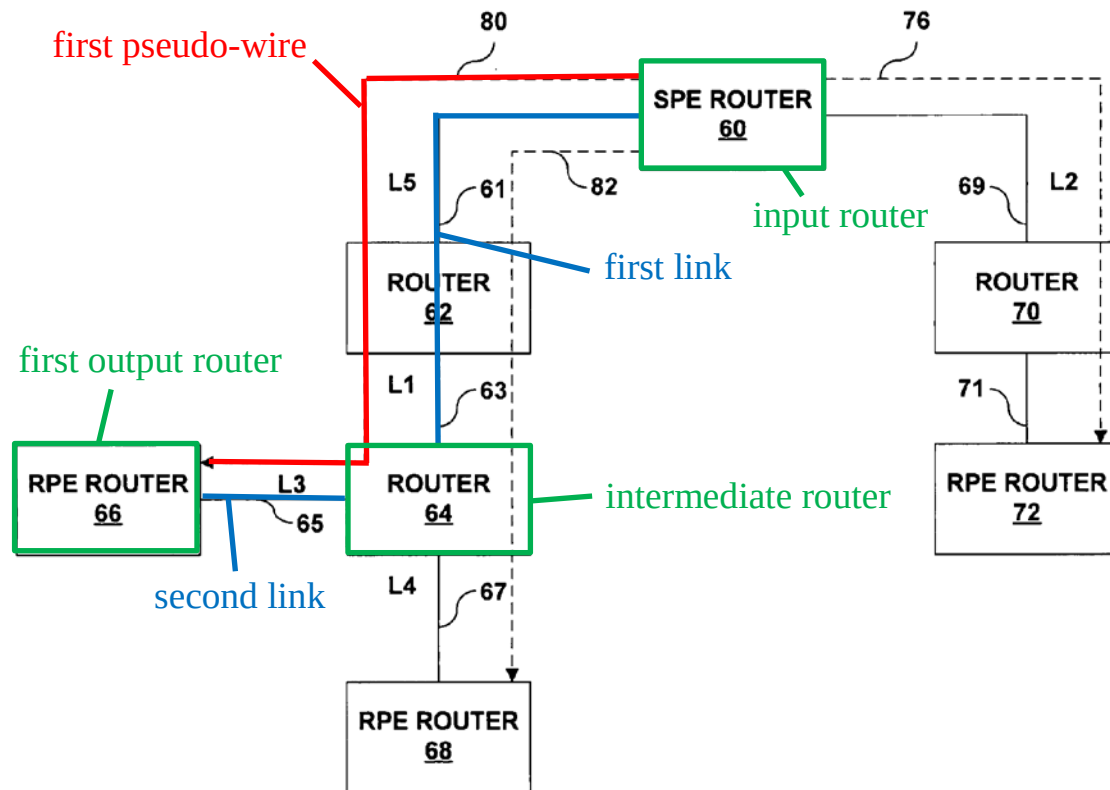
Thus, because Aggarwal teaches links 61 and 63 between SPE router 60 and intermediate router 64, Aggarwal renders obvious “[a first link] set up between an input router of a packet-switched network and an intermediate router of the packet-switched network” as recited in the claim. Ex.1003, ¶ 110.

[1.3] [a first pseudo-wire comprising . . .] a second link set up between said intermediate router and a first output router of the packet-switched network; and

Aggarwal and Hussain render this limitation obvious.

First, Aggarwal’s branch LSP 80 traverses a path from SPE router 60 to RPE router 66. Additionally, Figure 5 illustrates that the branch LSP 80 includes a link 65 (“second link”) from the intermediate router 64 to the RPE router 66.

Ex.1003, ¶¶ 111-12.



Ex.1005, Fig. 5, (annotated); Ex.1003, ¶ 112

The RPE Router 66 is an *output router* because it is described as a Receiver Provider Edge router. In a different embodiment (Fig. 1), Aggarwal describes the roles of the SPE routers and the RPE routers: “a source provider edge (SPE) router 12 (also referred to as a source network device) uses RSVP-TE to establish P2P LSPs to carry traffic between source network 10 and subscriber networks 18.” Aggarwal, 3:58-61. “A P2P LSP 20A is established between SPE router 12 of source network 10 and a **receiver provider edge (RPE) router 16A (destination network device)** of subscriber network 18A.” Ex.1005, 3:61-64. In other words,

traffic enters the P2MP network at the source (SPE router) and exits at the receiver (RPE router). A POSITA would have recognized that the description of SPE routers and RPE routers in the embodiment of Fig. 1 would have applied to the SPE routers and RPE routers in the embodiment of Fig. 5. Ex.1003, ¶ 114. Accordingly, because the RPE provides traffic from a source network to a subscriber network, it is an “*output router*.” Ex.1003, ¶¶ 113-14.

Third, for the same reasons that the SPE router 60 and the intermediate router 64 are part of a packet-switched network as described above at [1.2], the RPE router 66 is also part of a packet-switched network. Ex.1003, ¶ 115.

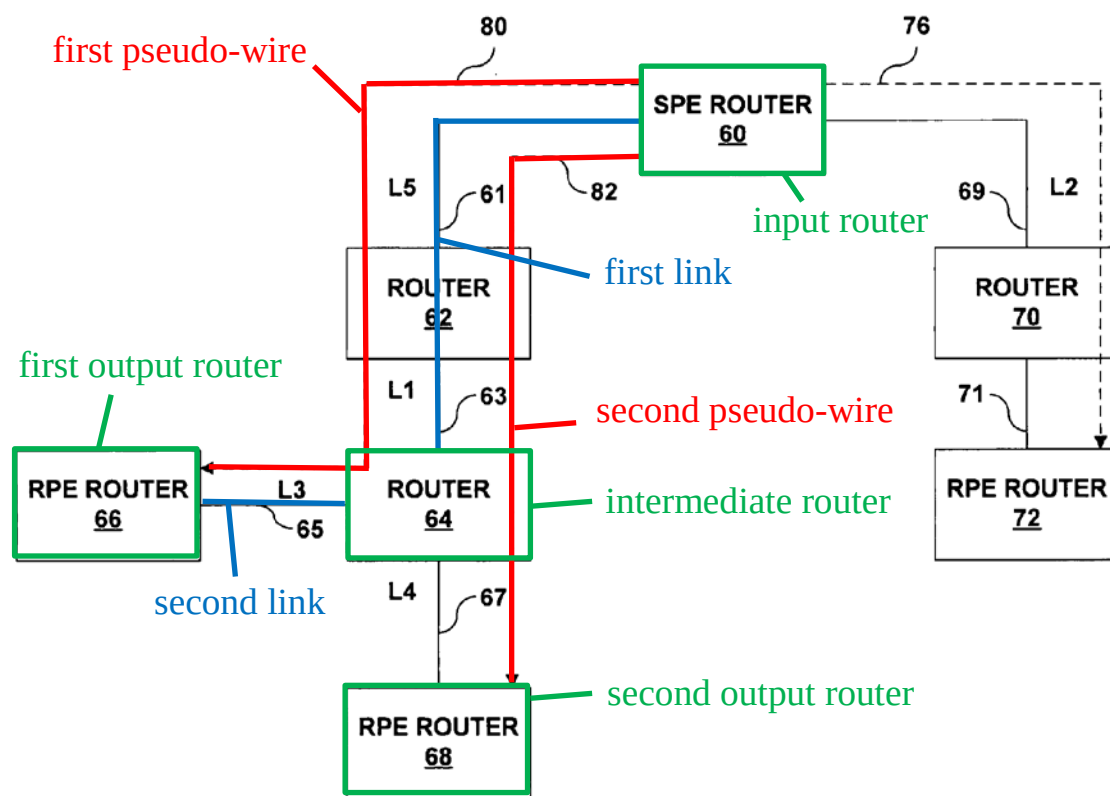
Thus, because Aggarwal teaches that branch LSP 80 includes a link 65 between the intermediate router 64 and RPE router 66, Aggarwal renders obvious “[a first pseudo-wire comprising . . .] a second link set up between said intermediate router and a first output router of the packet-switched network,” as claimed. Ex.1003, ¶ 116.

[1.4] setting up a second pseudo-wire between said input router and a second output router of the packet-switched network,

Aggarwal and Hussain render this limitation obvious.

First, Aggarwal teaches a branch LSP 82 (corresponding to a “second pseudo-wire”) that extends between SPE router 60 and RPE router 68 (“second output router”). “SPE router 60 also establishes **branch LSPs 80 and 82** with RPE

routers 66 and 68, respectively, via router 62 and router 64.” Ex.1005, 6:45-47; see also 7:43-45 (“SPE router 60 sets up ... **branch LSP 82 to RPE router 68**”). And, for the reasons described above at [1.0], Hussain shows that it would have been obvious to a POSITA to implement Aggarwal’s branch LSP 82 as a pseudo-wire as taught by Hussain. Ex.1003, ¶¶ 117-21; see also *supra*, § XI.E.3.



Ex.1005, Fig. 5, (annotated); Ex.1003, ¶ 121

RPE router 68 is an *output router* for the same reasons that RPE 66 is an output router as described above at [1.3]. Furthermore, for the same reasons that the SPE router 60 and the intermediate router 64 are part of a *packet-switched*

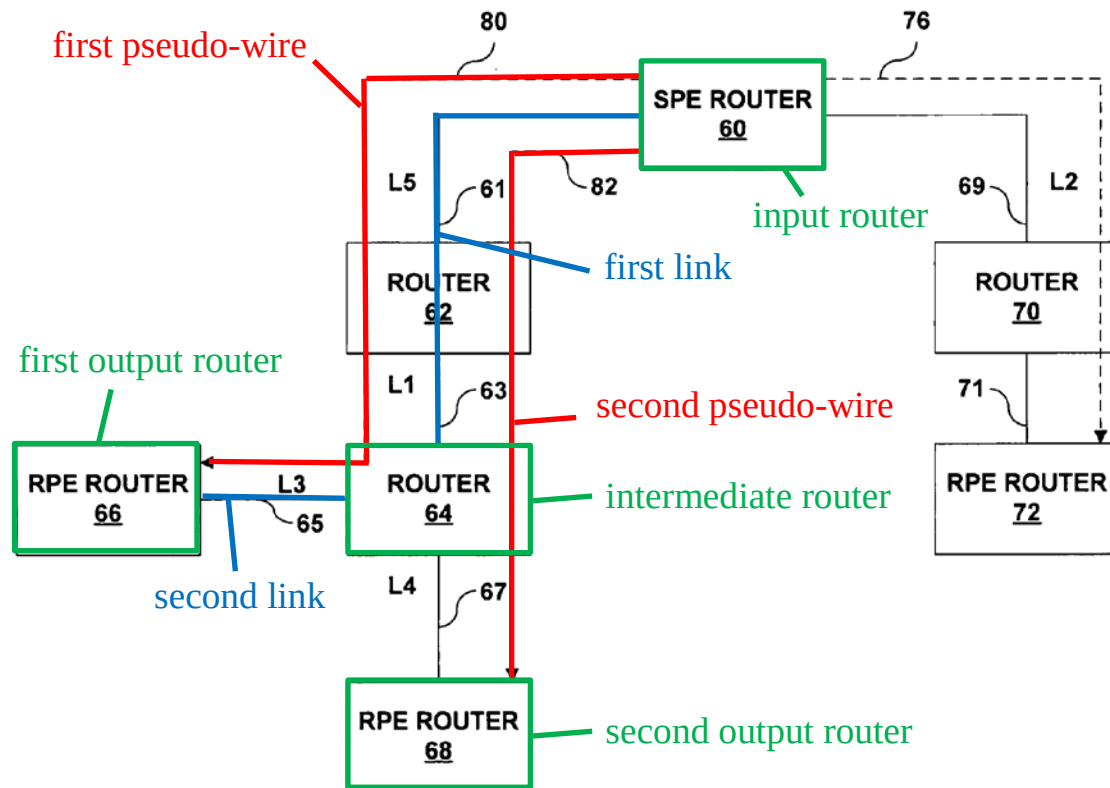
network as described above at [1.2], the RPE router 68 is also part of a *packet-switched network*. Ex.1003, ¶¶ 122-25.

Thus, because Aggarwal teaches branch LSP 82 between SPE router 60 and RPE router 68, Aggarwal and Hussain render obvious “*setting up a second pseudo-wire between said input router and a second output router of the packet-switched network*,” as claimed. Ex.1003, ¶ 126.

[1.5] wherein the second pseudo-wire comprises said first link and

Aggarwal and Hussain render this limitation obvious.

As discussed above at [1.1] Aggarwal teaches that the branch LSP 82 (corresponding to the “*second pseudo-wire*”) includes links 61 and 63 (“*first link*”): “As shown in FIG. 5, **Branch LSPs 80 and 82 share links 63 and 61** between router 64 and SPE router 60.” Annotated Fig. 5 is shown below. Ex.1003, ¶ 127-29.



Ex.1005, Fig. 5, (annotated); Ex.1003, ¶ 129

Thus, because Aggarwal teaches that branch LSP 82 includes links 61 and 63, Aggarwal and Hussain render obvious “*wherein the second pseudo-wire comprises said first link,*” as claimed. Ex.1003, ¶¶ 130-32.

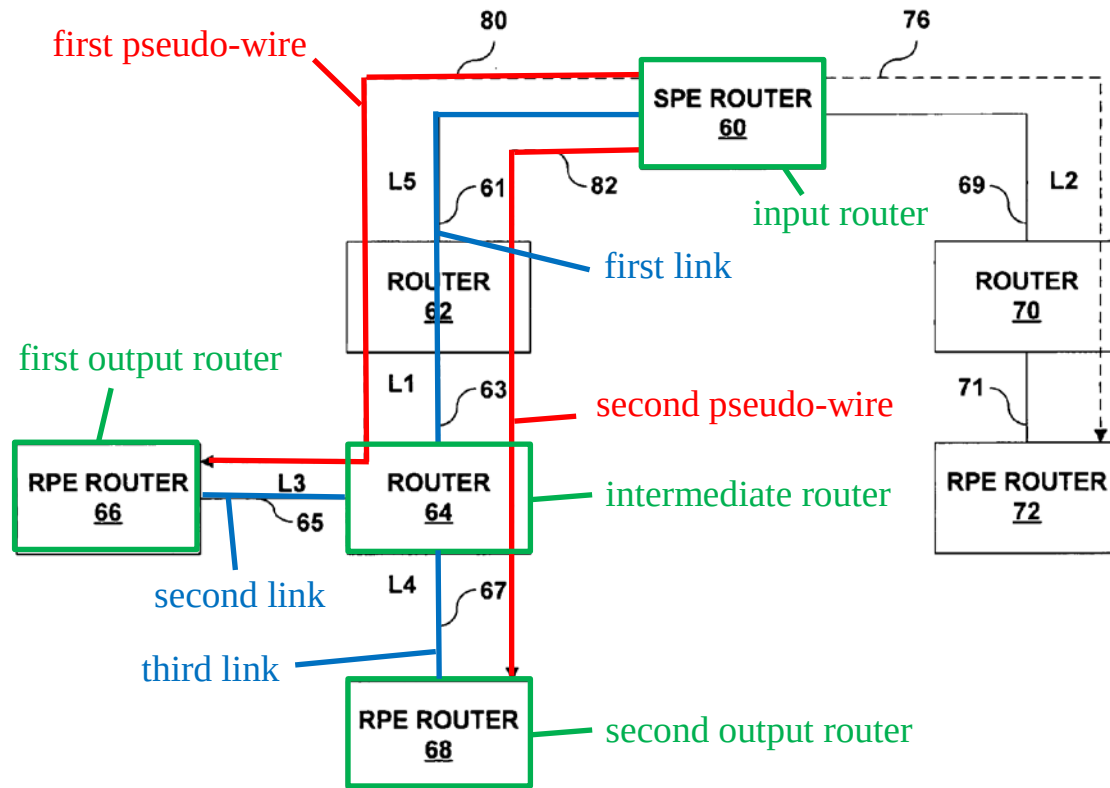
[1.6] [wherein the second pseudo-wire comprises . . .] a third link set up between said intermediate router and said second output router,

Aggarwal and Hussain render this limitation obvious.

First, Aggarwal’s branch LSP 82 traverses a path from SPE router 60 to RPE router 68. Additionally, Figure 5 illustrates that the branch LSP 82 includes a

link 67 (“third link”) from the intermediate router 64 to the RPE router 68.

Ex.1003, ¶¶ 133-34. Annotated Fig. 5 illustrates the third link:



Ex.1005, Fig. 5, (annotated); Ex.1003, ¶ 134

As illustrated in Figure 5 above, the second pseudo-wire comprises the third link. As discussed in [1.2], intermediate router 64 is “an intermediate router.” As discussed in [1.4], RPE router 68 is a “second output router.” Ex.1003, ¶ 135,

Thus, because Aggarwal teaches a link 67 between intermediate router 64 and RPE router 68, Aggarwal and Hussain render obvious “[wherein the second

pseudo-wire comprises . . .] a third link set up between said intermediate router and said second output router,” as claimed. Ex.1003, ¶ 136.

[1.7] *said first link being shared by the first and second pseudo-wires.*

Aggarwal and Hussain render this limitation obvious.

As explained above at [1.1], the links 61 and 63 (“*first link*”) are shared by Branch LSP 80 (corresponding to the “*first pseudo-wire*”) and Branch LSP 82 (corresponding to the “*second pseudo-wire*”). “**Branch LSPs 80 and 82 share links 63 and 61** between router 64 and SPE router 60.” Aggarwal teaches that this sharing occurs by “merging the individual P2P LSPs and relying on MPLS label multicast.” Ex.1005, 4:12-13; Ex.1003, ¶¶ 137-38.

Furthermore, as explained above at [1.0], Hussain shows that it would have been obvious to implement Aggarwal’s branch LSPs as pseudo-wires as described by Hussain. Hussain also teaches that “tunnels are set up using LDP or RSVP-TE” and that “[m]ultiple PWs can be carried inside a single tunnel.” Hussain, 276; Ex.1003, ¶¶ 139-142.

Thus, because Branch LSPs 80 and 82 share links 61 and 63, Aggarwal and Hussain render obvious “*said first link being shared by the first and second pseudo-wires,*” as claimed. Ex.1003, ¶ 143.

5. Claim 6

[6.0] *A computer program product stored on a non-transitory computer-readable*

medium and comprising program code instructions for implementing a method of setting up at least two pseudo-wires able to broadcast a data stream when said program is executed by a computer, the program code instructions comprising instructions for:

First, as discussed at [1.0], the combination of Aggarwal and Hussain renders obvious a “*a method of setting up at least two pseudo-wires able to broadcast a data stream,*” as claimed. Ex.1003, ¶ 144.

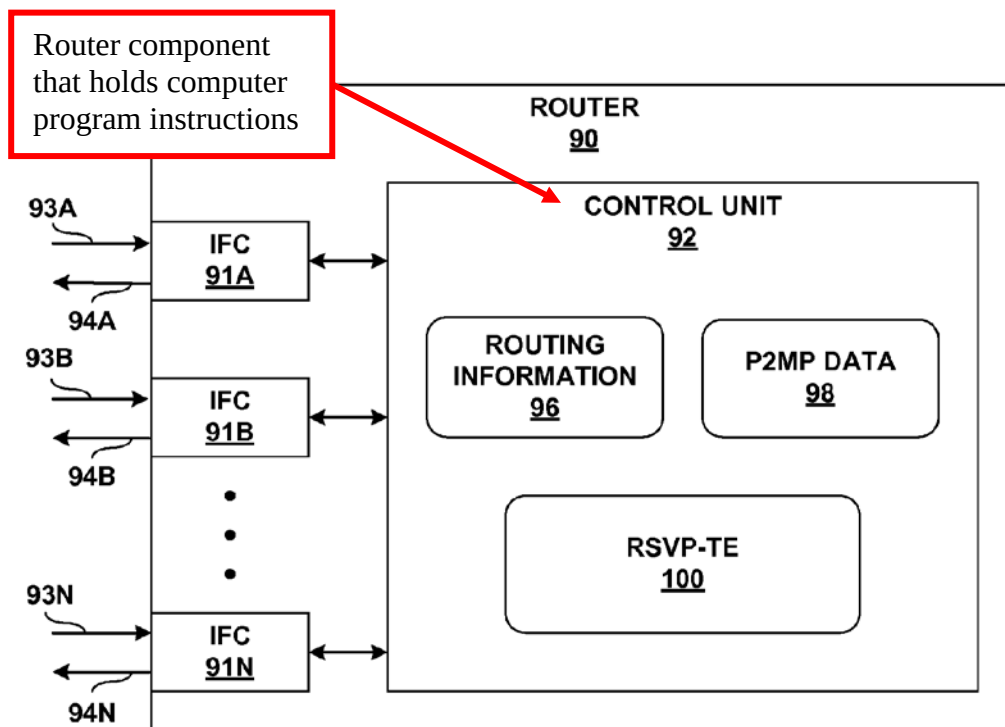
Second, a POSITA would have found it obvious for such method to be implemented by a computer program product stored on a computer-readable medium. Ex.1003, ¶ 145. Aggarwal teaches that “[r]outing devices within a network, often referred to as routers, maintain routing information that describes available routes through the network.” Ex.1005, 1:13–15. Aggarwal provides additional details regarding Router 90, which it describes as representative of the other routers described. See Ex.1005, 7:59–61. Aggarwal explains that “[r]outer 90 further comprises a control unit 92 that maintains routing information 96.” Ex.1005, 8:7–8. Regarding the control unit 92, Aggarwal states:

Control unit 92 may be implemented solely in software, or hardware, or may be implemented as a combination of software, hardware, or firmware. For example, control unit 92 may include one or more processors which execute software instructions. In that case, the various software modules of control unit 92, such as RSVP-TE protocol 100, may comprise executable instructions

stored on a computer-readable medium, such as computer memory or hard disk.

Ex.1005, 9:1–8; Ex.1003, ¶ 145.

Figure 6 of Aggarwal illustrates a network router containing computer program instructions for setting up label switched paths:



Ex.1005, Fig. 6 (annotated); Ex.1003, ¶ 146.

A POSITA, therefore, would have found it obvious that SPE router 60, intermediate router 64, RPE router 66, and RPE router 68, which correspond to the claimed *input router*, *intermediate router*, *first output router*, and *second output router*, respectively, each contain “computer code instructions.” Ex.1003, ¶ 147.

Thus, Aggarwal and Hussain render obvious “[a] computer program product stored on a non-transitory computer-readable medium and comprising program code instructions for implementing a method of setting up at least two pseudo-wires able to broadcast a data stream when said program is executed by a computer,” as claimed. Ex.1003, ¶ 148.

[6.1] setting up a first pseudo-wire comprising a first link

Aggarwal and Hussain render this limitation obvious for the reasons discussed in [1.1]. Ex.1003, ¶ 149.

[6.2] [a first link] set up between an input router of a packet-switched network and an intermediate router of the packet-switched network and

Aggarwal and Hussain render this limitation obvious for the reasons discussed in [1.2]. Ex.1003, ¶ 150.

[6.3] [a first pseudo-wire comprising . . .] a second link set up between said intermediate router and a first output router of the packet-switched network; and

Aggarwal and Hussain render this limitation obvious for the reasons discussed in [1.3]. Ex.1003, ¶ 151.

[6.4] setting up a second pseudo-wire between said input router and a second output router of the packet-switched network,

Aggarwal and Hussain render this limitation obvious for the reasons discussed in [1.4]. Ex.1003, ¶ 152.

[6.5] wherein the second pseudo-wire comprises said first link and

Aggarwal and Hussain render this limitation obvious for the reasons discussed in [1.5]. Ex.1003, ¶ 153.

[6.6] *[wherein the second pseudo-wire comprises . . .] a third link set up between said intermediate router and said second output router,*

Aggarwal and Hussain render this limitation obvious for the reasons discussed in [1.6]. Ex.1003, ¶ 154.

[6.7] *said first link being shared by the first and second pseudo-wires.*

Aggarwal and Hussain render this limitation obvious for the reasons discussed in [1.7]. Ex.1003, ¶ 155.

XII. CONCLUSION

Accordingly, Petitioner has established a reasonable likelihood that claims 1 and 6 are unpatentable. Ex.1003, ¶ 156.

Respectfully submitted,

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CERTIFICATE OF WORD COUNT

Pursuant to 37 C.F.R. § 42.24(d), Petitioner hereby certifies, in accordance with and reliance on the word count provided by the word-processing system used to prepare this Petition, that the number of words in this paper is 9285. Pursuant to 37 C.F.R. § 42.24(d), this word count excludes the table of contents, table of authorities, mandatory notices under § 42.8, certificate of service, certificate of word count, appendix of exhibits, and any claim listing.

Dated: July 6, 2020

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CERTIFICATE OF SERVICE

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

Date of service July 6, 2020

Manner of service FEDERAL EXPRESS

Documents served Petition for *Inter Partes* Review Under 35 U.S.C. § 312 and 37 C.F.R. § 42.104 of U.S. 8,130,775; Petitioner's Exhibit List; Exhibits 1001-1006, 1010, 1012-1020, 1026-1038; Power of Attorney.

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