

Filed on Behalf of: Arista Networks, Inc.

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

ARISTA NETWORKS, INC.,

Petitioner,

- vs. -

CORRIGENT CORPORATION,

Patent Owner.

PETITION FOR INTER PARTES REVIEW

OF U.S. PATENT NO. 9,118,602

Case No.: IPR2023-00839

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PETITIONER’S EXHIBIT LIST

Exhibit No.	Description
1001	U.S. Patent No. 9,118,602 (the '602 Patent)
1002	Prosecution History of the '602 Patent
1003	Expert Declaration of Dr. Paul Min
1004	Curriculum Vitae for Dr. Paul Min
1005	RESERVED
1006	U.S. Patent No. 7,466,697 (“Raz”)
1007	U.S. Patent No. 7,277,386 (“Ferguson”)
1008	Request for Comments 3031, <i>Multiprotocol Label Switching Architecture</i> , Rosen, E. et al., January 2001 (“RFC 3031”)
1009	Nadeau, Thomas D., <i>Multi-Protocol Label Switching, MPLS Network Management</i> , 2003
1010	Request for Comments 3209, <i>RSVP-TE: Extensions to RSVP for LSP Tunnels</i> , Awduche, D. et al., December 2001 (“RFC 3209”)
1011	RESERVED
1012	RESERVED
1013	RESERVED
1014	RESERVED
1015	Complaint, Docket No. 1 in <i>Corrigent Corp. v. Arista Networks, Inc.</i> , Case No. 1:22-cv-497 (D. Del.)
1016	Docket Report for <i>Corrigent Corp. v. Arista Networks, Inc.</i> , Case No. 1:22-cv-497 (D. Del.)
1017	RESERVED
1018	U.S. Patent No. 6,499,061 (“Benayoun”)
1019	U.S. Patent No. 7,606,235 (“Ayyangar”)
1020	Request for Comments 1583, <i>OSPF Version 2</i> , Moy, J. et al., March 1994 (“RFC 1583”)
1021	U.S. Patent No. 8,312,145 (“Rabie”)

Exhibit No.	Description
1022	Docket Report for <i>Corrigent Corp. v. Dell Technologies et al.</i> , No. 1:22-cv-00496 (D. Del.)
1023	Docket Report for <i>Corrigent Corp. v. Cisco Systems, Inc.</i> , No. 6:22-cv-00396 (W.D. Tex.)
1024	<i>Cisco Systems, Inc. v. Corrigent Corp.</i> , IPR2023-00447, Paper 1 (Jan. 10, 2023)
1025	Yan, Peter Y., Soo Kim, Kyeong, and Min, Paul S., <i>Multi-Channel Deflection Crossbar (MCDC): A VLSI Optimized Architecture for Multi-Channel ATM Switching</i> , 1997
1026	U.S. Patent No. 5,440,549 (“Min”)
1027	U.S. Patent No. 6,128,292 (“Kim”)
1028	Declaration of Dr. Samrat Bhattacharjee, dated January 9, 2023
1029	Claim Construction Order, Docket No. 69 in <i>Corrigent Corp. v. Cisco Systems, Inc.</i> , Case No. 6:22-cv-396 (W.D. Tex.)
1030	District of Delaware Statistics (Docket Navigator)
1031	Western District of Texas Statistics (Docket Navigator)

I. INTRODUCTION

Arista Networks, Inc. (“Petitioner”) hereby petitions for *inter partes* review of U.S. 9,118,602 (“the ’602 Patent,” EX1001¹) and seeks cancellation of Claims 1-26 (the “Challenged Claims”) as unpatentable under 35 U.S.C. §103.

II. GROUNDS FOR STANDING

Petitioner certifies that the ’602 Patent is available for *inter partes* review and that Petitioner is not barred or estopped from requesting *inter partes* review challenging the patent claims on the grounds identified in this Petition.

III. REQUESTED RELIEF AND REASONS FOR REQUESTED RELIEF

Petitioner asks that the Board institute a trial for an *inter partes* review of the Challenged Claims, and that the Director cancel them as unpatentable. The Challenged Claims would have been obvious to a POSITA and are therefore unpatentable. The analysis demonstrating the obviousness of the Challenged Claims is set forth in the sections below and supported by the declaration of Petitioner’s expert, Dr. Paul Min. EX1003, ¶¶1-13; EX1004.

IV. OVERVIEW OF THE ’602 PATENT

A. Summary of the ’602 Patent

The ’602 Patent relates “generally to communication networks, and particularly to methods and systems for performing link aggregation [“LAG”] in

¹ Emphasis added unless otherwise stated.

tunneled networks”. EX1001, 1:19-21. The background of the patent explains that LAG is a well-known “technique by which a group of parallel physical links between two endpoints in a data network can be joined together into a single logical link.” EX1001, 2:2-4. These groups of physical links are commonly referred to as “LAG groups.” EX1001, 2:4-5. “Traffic transmitted between the endpoints is distributed among the physical links in a manner that is transparent to the clients that send and receive the traffic.” *Id.*, 2:5-7.

One embodiment of the '602 Patent describes a “method for assigning and utilizing an Ethernet physical data port in an Ethernet Link Aggregation Group (LAG) in a Multi-Protocol Label Switching (“MPLS”) network.” EX1001, 2:30-34. The background of the patent explains that MPLS was a well-known technique in which information packets flow along a label-switched path (“LSP”) as they pass through a network. *Id.*, 1:34-56. “The flow of packets along a label-switched path (LSP) under MPLS is completely specified by the label applied at the ingress node of the path.” EX1001, 1:40-43. As such, “an LSP can be viewed as a tunnel through the network.” *Id.* Figure 1A of the '602 Patent (reproduced and annotated below) schematically illustrates an MPLS communication network such as the one disclosed in the '602 Patent:

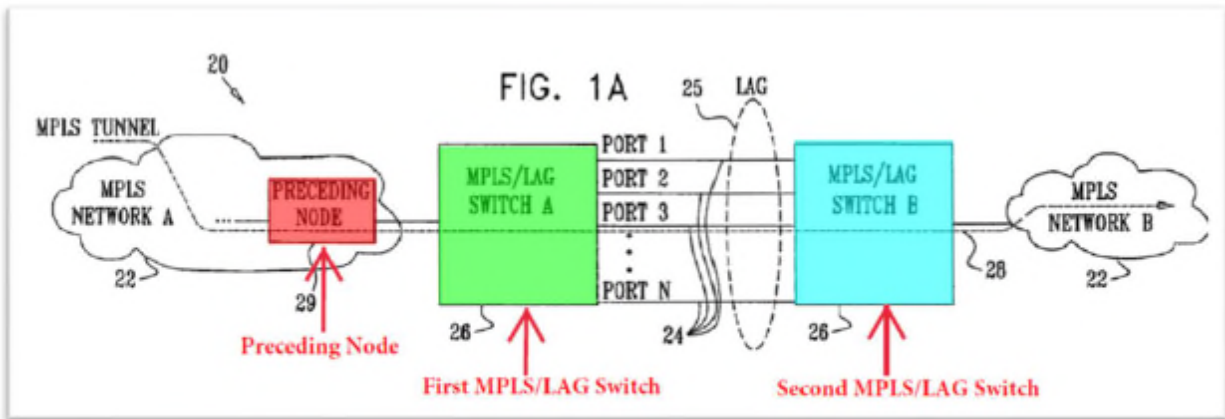


Figure 1A of the '602 Patent (Annotated)

EX1001,1A.

B. Priority Date

For the purposes of this Petition, Petitioner assumes that the priority date for the '602 Patent is May 6, 2005.

V. STATUTORY GROUNDS FOR CHALLENGES

Ground	'602 Patent Claims	Basis for Rejection ²
1	1-26	RFC 3209 in view of Raz
2	1-26	RFC 3209 in view of Raz and Ferguson

RFC 3209 was published in December 2001. EX1010. Thus, RFC 3209 qualifies as prior art at least under pre-AIA 35 U.S.C. § 102(b).

Raz was filed on July 23, 2002, and issued on December 16, 2008. EX1006. Thus, Raz qualifies as prior art under at least pre-AIA 35 U.S.C. § 102(e)(2).

² All obviousness grounds include the knowledge of a POSITA.

Ferguson was filed on November 12, 2002, and issued on October 2, 2007.

EX1007. Thus, Ferguson qualifies as prior art under at least pre-AIA 35 U.S.C. § 102(e)(2).

VI. LEVEL OF ORDINARY SKILL IN THE ART

As of May 6, 2005, a POSITA would have had a bachelor's degree in electrical engineering, computer science, computer engineering or an equivalent, as well as at least two years of professional experience with computer networking, and a POSITA would have had a working knowledge of hardware and software for packet-switched networking, MPLS and LAG. EX1003, ¶60. Additional work experience could substitute for educational experience and vice versa.

VII. CLAIM CONSTRUCTION

In *inter partes* review, claim terms must be given their ordinary and customary meaning as understood by a POSITA at the time of the invention in light of the specification and the prosecution history pertaining to the patent. See 37 C.F.R. §42.100(b); *Phillips v. AWH Corp.*, 415 F.3d 1303, 1312-13 (Fed. Cir. 2015) (en banc). Terms not specifically construed have their plain and ordinary meaning as understood by a POSITA. Here, Petitioner asserts that the claim terms in the Challenged Claims do not require construction for the purpose of evaluating the prior art in this Petition. EX1003, ¶82. The claims are invalid under the constructions adopted by the district court in the *Cisco* litigation. EX1029.

VIII. THE ART PRIOR TO THE '602 PATENT

A. RFC 3209

RFC 3209 teaches prior art Internet standards relating to “RSVP (Resource Reservation Protocol)...to establish label-switched paths (LSPs) in MPLS (Multi-Protocol Label Switching).” EX1010, Abstract. RFC 3209 discloses the “establishment of explicitly routed label switched paths using RSVP as a signaling protocol. The result is the instantiation of label-switched tunnels which can be automatically routed away from network failures, congestion, and bottlenecks.” EX1010, Abstract. RFC 3209 discloses that “routers that support both RSVP [1] and Multi-Protocol Label Switching [2] can associate labels with RSVP flows.” EX1010,§1.1. “The set of packets that are assigned the same label value by a specific node...effectively define the ‘RSVP flow.’ When traffic is mapped onto a label-switched path in this way, we call the LSP an ‘LSP Tunnel.’” EX1010,§1.1. RFC 3209 explains that “[w]hen labels are associated with traffic flows, it becomes possible for a router to identify the appropriate reservation state for a packet based on the packet’s label value.” EX1010,§1.1. For tunnel setup, “[a] request to bind labels to a specific LSP tunnel is initiated by an ingress node through the RSVP Path message [which is] augmented with a LABEL_REQUEST object.” EX1010,§1.1. The Path message is propagated downstream from the ingress node to the tunnel’s endpoint, and “[r]outers along the path may use the setup to hold priorities....For

instance, in the traffic engineering application, it is very useful to use the Path message as a means of verifying that bandwidth exists...along an entire path.” EX1010,§2.2.

B. Raz

Raz discloses “[a] subport forwarding and provisioning mechanism whereby a plurality of subports [within an LSR] implemented using slower speed processors are used.” EX1006, Abstract, 1:66-2:3, 2:41-51, 6:24-27, 2:9-10, 6:34-35, 2:10-11, 6:35-36. “The output of all the subports is aggregated and combined into a single high speed packet stream and transmitted over the link.” *Id.*, 2:11-13, 6:36-38.

“[T]he example LSR shown [in Figure 1] comprises a 10G interface that is composed of ten individual 1G packet streams.” EX1006, 7:7-9. “The ten subports [highlighted in yellow] are provided wherein each is adapted to handle a 1G packet stream.” EX1006, 7:9-10. “The overall aggregate speed, however, is 10G.” *Id.*, 7:10-11.

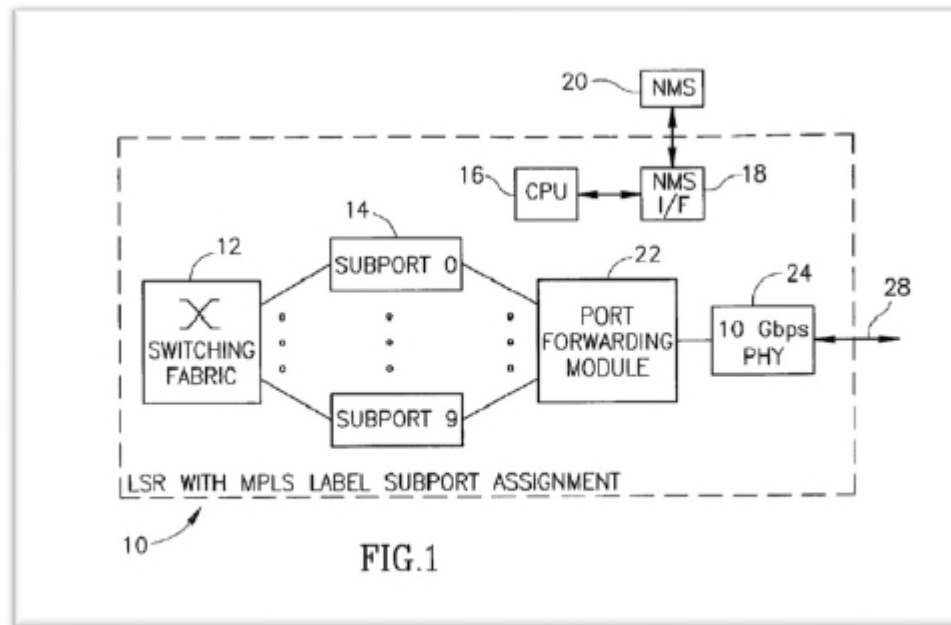


Figure 1 of Raz

Raz explains that its methods and systems are designed to “handle wide connections” that “require a relatively large amount of CIR [Committed Information Rate] bandwidth.” EX1006, 10:60-63. “The invention provides a scheme for allocating LSP bandwidth to subports that...provides a tradeoff between leaving subports empty for wide LSPs and spreading traffic between subports for best utilizing the bandwidth of the link (e.g., for EIR traffic).” EX1006, 11:3-8. “The central idea is to leave one or more subports empty (i.e. no bandwidth used) in the event a wide connection is to be allocated.” *Id.*, 11:8-10, 11:10-12.

C. Ferguson

Ferguson is a prior art system relating to “distribution of traffic within computer networks.” EX1007, 1:6-7. “The invention is directed to techniques for distributing label switched packets, such as multiprotocol label switched (MPLS)

packets, associated with a common label switched path (LSP).” EX1007, 1:57-60.

“The techniques may...be used to load balance label switched packets of an LSP across an aggregated link having two or more logically associated physical interconnects. ” *Id.*, 1:60-63. “In addition, the techniques may be used to distribute label switched packets of a common LSP across multiple data paths within a network device, such as a router.” *Id.*, 1:63-66; *see id.*, 1:67-2:3, 5:63-6:6, 8:61-67.

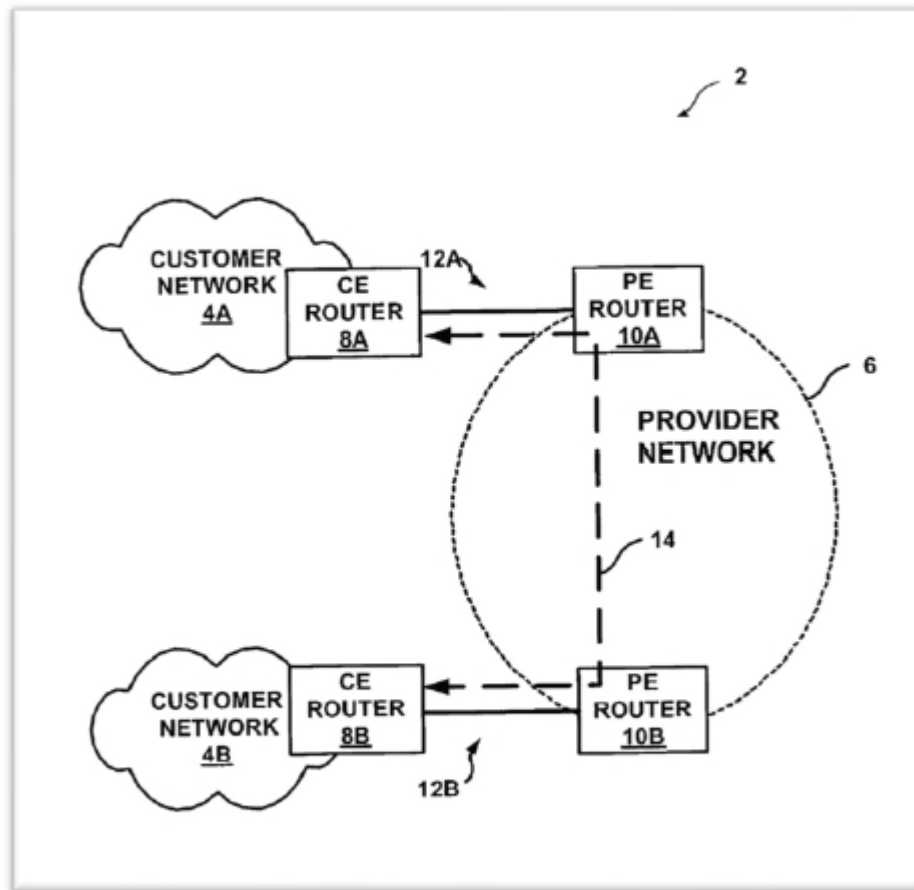


Figure 1 of Ferguson

IX. GROUND 1: CLAIMS 1-26 ARE UNPATENTABLE AS OBVIOUS OVER RFC 3209 IN VIEW OF RAZ.

RFC 3209 and Raz in combination with the knowledge of a POSITA renders Claims 1-26 obvious.

A. Motivation to Combine RFC 3209 and Raz

A POSITA would have been motivated to apply various techniques and implementation details disclosed in Raz to the Multi-Protocol Label Switching (MPLS) network disclosed and suggested by RFC 3209 at least because (1) both references deal with the same purposes of preserving resources for setting up a label-switched path (LSP), and ensuring appropriate allocation of bandwidth to the path, as well as assisting the reroute of the path in the event of a failure, and (2) both references teach the same solution—using well known label signaling protocols to perform downstream-on-demand label allocation after the downstream, intermediate node along the requested path assigns an interface (port) to the LSP. EX1003, ¶¶84-91.

Both RFC 3209 and Raz are directed to a system for setup and use of label-switched paths as network tunnels in an MPLS network. EX1010, Abstract (“This document describes the use of RSVP (Resource Reservation Protocol), including all the necessary extensions, to establish label-switched paths (LSPs) in MPLS (Multi-Protocol Label Switching). Since the flow along an LSP is completely identified by the label applied at the ingress node of the path, these paths may be treated as

tunnels.”). Raz situates its functionality in the context of “Multiprotocol Label Switching (MPLS) based networks [which] are becoming increasingly popular especially in traffic engineering IP networks. MPLS uses a label switching model to switch data over a Label Switched Path (LSP).” EX1006, 1:22-25, 2:41-43. Both RFC 3209 and Raz discuss the advantages of using traffic engineering applications of the underlying MPLS and label signaling in order to “allow the implementation of a variety of policies related to network performance optimization. For example, LSP tunnels can be automatically or manually routed away from network failures.” EX1010, §1.1, Abstract (“[r]outers along the path may use the setup to **hold priorities**. ... For instance, in the traffic engineering application, it is very useful to use the Path message as a means of **verifying that bandwidth exists** at a particular priority **along an entire path**”); EX1006, 1:56-60, 11:3-12 (“**allocating LSP bandwidth** to subports”), 8:1-5 (as part of LSP setup, the LSR “executes a bandwidth allocation algorithm, described in more detail infra, that controls the allocation of bandwidth of each subport.”). A POSITA would have been motivated to combine RFC 3209 with Raz because in addition to being directed at the same problem and using the same solution, they analogously describe devices assigning network components to label-switched paths (LSPs) as network tunnels and allocating MPLS labels to advertise the assigned components. RFC 3209 explains how “each node that receives a Resv message” “allocates a new label...which it

sends upstream” and in doing so, “a label-switched path is effectively established.”

EX1010, §2.2. Raz describes a similar system in which an “LSR” (which is a type of node within MPLS network typology, also called a “switch”) provisions a label-switched path (LSP) and assigns a subport to the LSP: “The CPU 16 in the LSR performs the conventional LSR functionality including the provisioning of LSPs. In particular, the CPU functions to perform the assignment of subports to LSPs in response to LSP setup requests.” EX1006, 7:65-8:1. EX1003, ¶¶84-87.

Raz discloses several techniques that a POSITA would recognize to improve RFC 3209’s MPLS network framework. EX1003, ¶88. First, Raz teaches that an LSP may be set up to pass through an aggregated set of links (e.g., a LAG), where one of the subports of the aggregated stream is assigned to the LSP during LSP setup to ensure that the bandwidth of all subports is efficiently allocated. EX1006, 7:65-8:5. Second, Raz teaches that the ports used by the path may be Ethernet ports allowing interconnection with standardized Ethernet equipment. EX1006, 14:42-44. Third, Raz teaches a beneficial implementation of MPLS labels such that the labels have dedicated a subset of bits to encode a serial number of the assigned subports of the LAG into the label—ensuring that when the LSR reads the label on incoming data packets, it knows which subport to send it to. EX1006, 9:41-48, 8:35-39. A POSITA would recognize this efficient approach to labeling would similarly be an efficient way to implement label creation in RFC 3209. EX1010, §4.1; EX1003, ¶88.

Fourth, Raz teaches that the assigned subport meets the service property requirements needed to set up the LSP, such as the bandwidth requirement of the LSP, in order to properly set up the LSP and ensure that bandwidth is reserved. EX1006, 7:7-16, 10:60-12:9. Fifth, Raz teaches dynamic rerouting of the LSP from the working path subport to a different, backup or protection path subport in the event of a network failure, and of returning to the working path if the fault is corrected, to ensure that the service on the established LSP through a LAG is not interrupted or otherwise dropped. EX1006, 5:20-28, 5:33-62. A POSITA would understand this technique would similarly improve the RFC 3209 disclosure.

RFC 3209 discloses or renders obvious the assignment of a physical interface to a network tunnel (i.e., a LSP operating as a network tunnel) in an MPLS network by an MPLS switch (i.e., an LSR) operating as the claimed “first” switch, where the physical interface is an outgoing interface connecting the LSR with another node on the next hop of the LSP. EX1010, §§1.1, 1.2, 2.2, 4.3.4.1. Applying Raz’s technique would disclose or renders obvious the assignment of a physical Ethernet LAG subport to a network tunnel (i.e., an LSP operating as a network tunnel) in an MPLS network by an MPLS/LAG switch (i.e., an LSR) operating as the claimed “first” switch, where the subport meets a bandwidth requirement of the network tunnel and has a port serial number. EX1006, 7:65-8:13, 8:22-29, 7:7-29. It would have been obvious to a POSITA for the outgoing interface of the LSR—which connects the

LSR to another LSR—as rendered obvious by RFC 3209 to be a subport of a LAG (i.e., claimed “single physical tunnel port of a LAG”) as taught by Raz. EX1003, ¶89.

A POSITA would have understood that RFC 3209’s system could have been improved by incorporating these aspects of Raz to ensure that LSPs, when they are set up, (1) can pass through aggregated links (such as LAG) and still employ traffic engineering functions of reserving bandwidth of the aggregated link to the LSP, and (2) support traffic engineering so that LSPs can handle high speed packet streams and wide connections. EX1003, ¶90. RFC 3209 emphasizes that “[a]n advantage of using RSVP to establish LSP tunnels is that it enables the allocation of resources along the path. For example, bandwidth can be allocated to an LSP tunnel.” EX1010, §1.1. Raz similarly teaches “a method for allocating subport bandwidth to subports.” EX1006, Abstract. Raz teaches “a mechanism to improve the ability to handle wide connections, [specifically] a scheme for allocating LSP bandwidth to subports.” EX1006, 10:60-11:8, Figure 5. As Raz describes, without bandwidth allocation between subports, “it may become difficult to allocate bandwidth for wide connections even though a sufficient amount of bandwidth is available [among the subports as a whole].” EX1006, 11:65-12:2. EX1003, ¶¶89-90.

Importantly, RFC 3209 discloses a framework for a type of signaling protocol to be utilized in MPLS network applications. RFC 3209 itself states: “Although

traffic engineering (that is, performance optimization of operational networks) is expected to be an important application of this specification, the extended RSVP protocol can be used in a much wider context.” EX1010, §1. Raz exemplifies one such traffic engineering application of that framework. EX1006, 1:22-39, 6:51-54 (“It is intended that the mechanism of the present invention be implemented in network devices such as routers (e.g., LSRs in MPLS networks) making up the nodes in a network and include edge nodes and intermediate nodes.”). Raz describes itself as an improvement to “link multiplexing mechanism utilizing path oriented forwarding” (EX1006, 1:6-8) which “are described in the context of an MPLS based network **employing any suitable routing** such as OSPF-TE and signaling **such as RSVP-TE signaling.**” EX1006, 6:46-50. Raz explicitly states that its described functionality is compatible with RSVP signaling protocol. EX1006, 5:10, 6:46-50. RFC 3209 is the Internet standards defining document which describes this signaling protocol and is titled “RSVP-TE: **Extensions to RSVP for LSP Tunnels.**” EX1010, Title. As such, a POSITA would have been motivated to employ RFC 3209’s teachings of RSVP-TE functionality in conjunction with Raz’s subport assignment functionality and related teachings. EX1003, ¶91.

Each of the components described by RFC 3209 and Raz would be operating as described in their respective references and the references themselves demonstrate that a POSITA would have been able to combine the features of the systems and

would have expected success in doing so. *See Intel Corp. v. PACT XPP Schweiz AG*, 61 F.4th 1373, 1380-81 (Fed. Cir. 2023) (“There is a motivation to combine when a known technique has been used to improve one device, and a person of ordinary skill in the art would recognize that it would improve similar devices in the same way using the “prior art elements according to their established functions”) (internal citations omitted); EX1003, ¶91. This combination would have been within the level of skill in the art because Raz explicitly suggests implementation of RFC 3209’s RSVP-TE functionality in a similar system, and the modification to RFC 3209 would have been minor and required simply adding further specificity to its teachings that would be well within the POSITA’s abilities including as taught and suggested in Raz. EX1003, ¶91.

B. Claim 1

[1.0]³

RFC 3209 discloses or renders obvious a method for assigning and utilizing a physical data port in an MPLS network. RFC 3209 discloses the communication of data packets in an MPLS network using label switched paths (LSPs), necessarily involves the use of physical data ports for transmission of packets along the LSP: “Section 2.9 of the MPLS architecture [2] defines a label distribution protocol as a set of procedures by which one Label Switched Router (LSR) informs another of the

³ Corresponding claim language can be found in APPENDIX A – CLAIM LISTING.

meaning of labels used to forward traffic between and through them....This document is a specification of extensions to RSVP for establishing label switched paths (LSPs) in MPLS networks.” EX1010,§1. RFC 3209 discloses that an LSP is “the path created by the concatenation of one or more label switched hops, **allowing a packet to be forwarded by swapping labels from an MPLS node to another MPLS node.**” EX1010,§1.2. A POSITA would have known that physical interfaces (i.e., physical ports) connect nodes in an MPLS network, and that when a packet is forwarded from node to node, it must travel through physical interfaces (i.e., physical interfaces must be utilized) which connect each physical node. See EX1010,§1.1 (disclosing that a node (i.e., LSR) in the MPLS network may be a “physical node.”); EX1003, ¶¶93-94.

RFC 3209 discloses or renders obvious that physical interfaces are assigned as part of LSP setup as well as utilized—the path of a label-switched path (LSP) is assigned before the traffic is routed through it, and “the flow along an LSP is **completely identified by the label** applied [to the traffic] at the ingress node of the path.” EX1010, Abstract,§1.1 (“the traffic that flows along a label-switched path is defined by the label applied at the ingress node of the LSP.”). A POSITA would have known that because the label defines the path to be taken by the traffic to which the label is applied, the entire route (including nodes and in particular links between those nodes) is *assigned* prior to traffic forwarding. A POSITA would have known

further that ports—i.e., the path that a data packet takes from one node to another—may be assigned to LSPs and utilized when traffic traverses the “pre-determined” LSP, in order for each node to know which interface to use (i.e., which interface connects it to the specified next node along the LSP). EX1003, ¶94. RFC 3209 discloses that “**the paths** taken by label-switched RSVP-MPLS flows **can be pre-determined.**” EX1010,§1.1. EX1010,§1. *See also infra*, IX.B.[1.1] (discussing “next hop” assignment); EX1003, ¶¶92-99, 100-13.

In addition to the disclosures and suggestions of RFC 3209, Raz discloses implementation of a link aggregation group (LAG) in an MPLS network using Ethernet ports which a POSITA would have understood to implement into the system of RFC 3209. EX1006, 14:42-44. Specifically, Raz discloses the use of link aggregation to transport high speed Ethernet network traffic within an LSR in an MPLS network. EX1006, 2:41-51. Packets from a high-speed Ethernet data stream are assigned to one of a plurality of subports for transportation through the LSR and then re-aggregated into the high-speed Ethernet data stream to be forwarded to the next node (next LSR) in the MPLS network:

“[A] method of forwarding a high speed packet stream to a plurality of subports of lesser speed in a label switching network, the method comprising the steps of assigning outbound packets to one of a plurality of subports in accordance with the label associated with each outbound packet, forwarding

each outbound packet to its assigned subport, aggregating the output of a plurality of subports into a high speed packet stream.”

EX1006, 2:41-51, 2:52-67, 6:34-45. Figure 1 of Raz provides an example of ten subports (Subport 0-Subport 9) used to implement link aggregation within an LSR in an MPLS network:

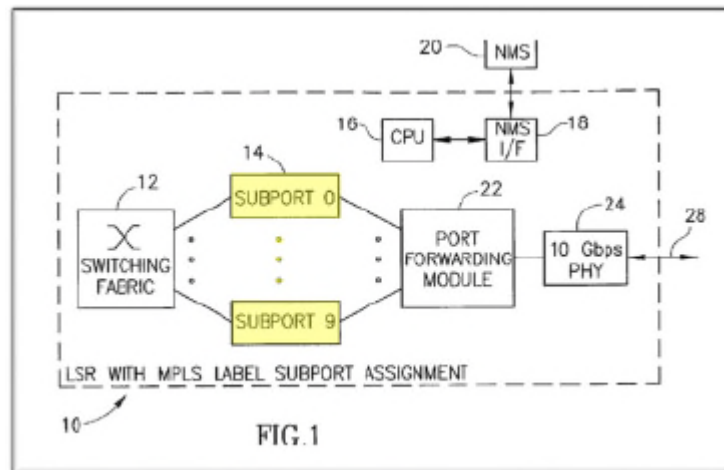


Figure 1 of Raz (Annotated)

Raz explains that link aggregation is used to transport the high-speed packet stream: “the high speed interface (e.g., 10G) may be trunked into any number of individual subports.” EX1006, 7:7-16, 9:9-12 (“some commercially available layer 2 switches can determine the destination port for a packet destined to a LAG (Link Aggregation Group) based on a CRC of the source MAC modulo (sic) the number of ports in the LAG. This can be used for spreading the packets to the subports by using the layer-2 switch as the port-forwarding module and **defining its ports**

leading to the different subports as a single LAG.”), 14:19-22, 15:32-35, 16:41-53. EX1003, ¶96.

A POSITA would have found it obvious to implement the combination of RFC 3209 and Raz using Ethernet physical data ports of a LAG. The concept of using aggregation to communicate individual packets of a high-speed Ethernet packet stream through LAG subports in an LSR, as taught by Raz, also applies to communicating individual packets through interfaces operating as links between LSRs in an MPLS network, as taught by RFC 3209. A POSITA would have found it obvious to apply Raz’s teaching of assigning a subport of an Ethernet LAG interface to the outgoing LSR interface which RFC 3209 renders obvious, because Ethernet was in widespread usage as of the priority date for the ’602 Patent, and a POSITA would have found it desirable to use well-known and commercially accepted Ethernet link aggregation technology in implementing the inter-LSR link techniques in RFC 3209 and Raz. EX1003, ¶¶97-99. Further, Raz discloses that its invention could be implemented in Ethernet networks, and it identifies transmission speeds used by Ethernet networks (e.g., 1G and 10G). *Id.*, 1:16-19, 2:28-31, 4:52, 13:16-19, 14:42-44, 15:56-58. Thus, a POSITA would have understood that Raz discloses and suggests Ethernet subports in an Ethernet LAG. EX1003, ¶¶97-99, 84-91.

[1.1]

Regarding tunnel creation, RFC 3209 discloses the setup of tunnels in an MPLS switch: “the use of RSVP (Resource Reservation Protocol), including all the necessary extensions, to establish label-switched paths (LSPs) in MPLS (Multi-Protocol Label Switching). Since the flow along an LSP is completely identified by the label applied at the ingress node of the path, these **paths may be treated as tunnels**. A key application of LSP tunnels is traffic engineering with MPLS as specified in RFC 2702.” EX1010, Abstract. “Hosts and routers that support both RSVP [1] and Multi-Protocol Label Switching [2] can associate labels with RSVP flows. When MPLS and RSVP are combined, the definition of a flow can be made more flexible. Once a **label switched path (LSP) is established**, the traffic through the path is defined by the label applied at the ingress node of the LSP. ... When traffic is mapped onto a label-switched path in this way, we call the LSP an ‘**LSP Tunnel**’. When labels are associated with traffic flows, it becomes possible for a router to identify the appropriate reservation state for a packet based on the packet’s label value.” EX1010,§1.1.

Regarding assigning of tunnels by a first MPLS switch, RFC 3209 discloses MPLS network tunnels are set up *by* MPLS switches. EX1010,§2.2 (“To create an LSP tunnel, the **first MPLS node** on the path...”). RFC 3209 discloses “**routers** that support both RSVP [1] and Multi-Protocol Label **Switching** [2] can **associate labels with RSVP flows**.” EX1010,§1.1. RFC 3209 alternates between the terms

“node,” “router,” and “LSR,” which all refer to devices capable of performing MPLS and as such are MPLS switches. EX1010,§1 (“Label **Switched** Router (LSR)”),§4.2.2 (using the term “switch”). EX1003, ¶¶100-01.

Additionally, RFC 3209 discloses or renders obvious assigning, by a node, the node’s outgoing interface to a requested LSP tunnel. RFC 3209 describes LSP setup using the RSVP signaling protocol to establish explicitly routed paths through the MPLS network. EX1010, Abstract (“several additional objects...extend RSVP, allowing the **establishment of explicitly routed label switched paths** using RSVP as a signaling protocol. **The result is** the instantiation of **label-switched tunnels**.”). Explicitly routed paths involve propagation of a path request—that is, “[a] request to bind labels to a specific LSP tunnel is initiated by an ingress node”—that is supplemented with an Explicit Route Object (ERO). EX1010,§1.1. The path request with the ERO is forwarded from the LSP ingress node to the LSP destination by traversing one or more intermediate nodes along the route. EX1010,§1.1 Because the “EXPLICIT_ROUTE object specifies the route as a sequence of abstract nodes” (EX1010,§2.2)—where an “abstract node” is “a group of nodes whose internal topology is opaque to the ingress node of the LSP” (EX1010,§1.1), each intermediate node along the route may make an independent forwarding decision (i.e., an independent assignment of network topology to the requested LSP): “**A node** receiving a Path message containing an EXPLICIT_ROUTE object **must**

determine the next hop for this path. ... [S]election of this next hop may involve a decision from a set of feasible alternatives.” EX1010,§4.3.4.1. EX1003, ¶102.

A POSITA would have understood and found it obvious from this disclosure that when a given node (i.e., a given LSR, claimed “first” MPLS switch) assigns the “next hop” to the requested LSP, this refers to the assignment of the next path segment along the LSP from the given node to an assigned next node that traffic belonging to that LSP will traverse. EX1003, ¶¶103-105. Such an assignment of the “next hop” to an LSP necessarily refers to the assignment of the outgoing physical interface (i.e., a physical port) that connects the given node to the next node in the path. EX1003, ¶¶103-105. RFC 1583 confirms that a “Next hop” is “The **outgoing router interface to use when forwarding traffic** to the destination.” EX1020,§11. RFC 3209 discloses that “this label [created by the node] serves as shorthand for the Filter Spec. The node can now update its “**Incoming Label Map**” (ILM), which is used to **map incoming labeled packets to a “Next Hop Label Forwarding Entry” (NHLFE)**, see [2].” As disclosed by RFC 3031⁴, “[t]he ‘Next Hop Label Forwarding Entry’ (NHLFE) is used when forwarding a labeled packet. It contains the following information: 1. the packet’s next hop [and] and any other information needed to properly dispose of the packet.” EX1008,§3.10. A POSITA would have understood that in order to forward a packet, the node must be able to identify the outgoing

⁴ Reference [2] identified in RFC 3209.

physical port/interface that it must use to forward the packet to the packet's "next hop". EX1003, ¶¶103-105.

In view of the foregoing, RFC 3209 discloses or renders obvious the assignment of a physical interface to a network tunnel (i.e., an LSP operating as a network tunnel) in an MPLS network by an MPLS switch (i.e., a node, or LSR) operating as the claimed "first" switch. EX1003, ¶¶103-106.

In addition to the disclosures and suggestions of RFC 3209, Raz discloses that the particular interface assigned to the network tunnel may be a port (Raz uses the term "subport") of a LAG. Raz discloses the assignment of one subport of a LAG to a network tunnel to communicate individual packets within a high-speed packet stream: "The CPU 16 in the LSR performs the **conventional LSR functionality** including the provisioning of LSPs. **In particular, the CPU functions to perform the assignment of subports to LSPs** in response to LSP setup requests. The CPU executes a bandwidth allocation algorithm, described in more detail infra, that controls the allocation of bandwidth of each subport. Once a **subport is assigned**, a label is generated so as to indicate the subport assignment." EX1006, 7:65-8:13, 7:30-38 (example in which the assignment of subport 3 of a LAG to a network tunnel is performed by LSR B, which in this example corresponds to the claimed first MPLS/LAG switch), 7:11-14, 9:41-48. Further, Raz states that "[a] diagram illustrating an **example LSR with label based subport assignment** constructed in

accordance with a first embodiment of the present invention is shown in [Figure] 1,” reproduced below. EX1006, 6:65-67, 7:17-19, 9:4-15. EX1003, ¶¶106-108, 92-100, 101-113; *see also supra* IX.B.[1.0] (describing that the subports may be part of a LAG).

Raz discloses that the LAG subports are Ethernet subports: “Each of the one GE links make up the **subports of the aggregate 10GE link**,” where Raz defines GE as “Gigabit Ethernet.” EX1006, 8:22-29, 4:52.

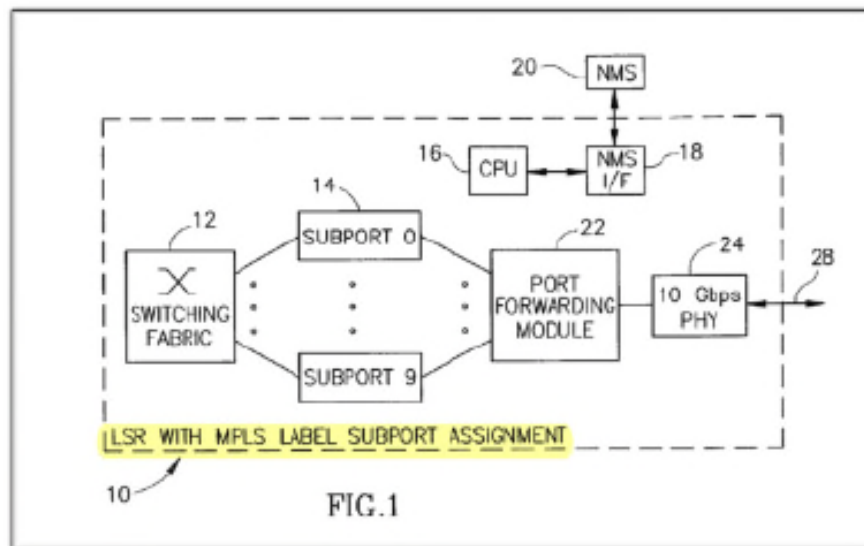


Figure 1 of Raz (Annotated)

Raz also discloses the use of LAG by MPLS switches (Raz uses the term “LSR” which was also used by RFC 3209 to describe the same device), rendering obvious that RFC’s disclosure of MPLS network tunnel setup by MPLS switches could be performed by “MPLS/LAG switches.” EX1006, 7:7-16; *see also* EX1009 at 7 (“A label switching router is any router or switch that supports the forwarding

of MPLS-encapsulated packets based solely on the incoming interface and the information in the shim header.”).

As to the bandwidth, RFC 3209 and Raz render obvious that the assigned port meets a bandwidth requirement. RFC 3209 discloses that its RSVP signaling can be used to ensure the LSP tunnel meets the bandwidth required to support the LSP’s traffic: “An advantage of using RSVP to establish LSP tunnels is that it enables the **allocation of resources** along the path. **For example, bandwidth can be allocated to an LSP tunnel** using standard RSVP reservations and Integrated Services service classes [4].” EX1010, §1.1, §2.2 (“in the traffic engineering application, it is very useful to **use the Path message as a means of verifying that bandwidth exists** at a particular priority along an entire path.”). A POSITA would have understood that a LSP tunnel’s “entire path” includes the nodes that the LSP traverses as well as the links between nodes and interfaces (i.e., ports) on each end of the links. EX1003, ¶¶109-110.

To the extent not disclosed in RFC 3209, Raz also explains that the assigned subport meets a bandwidth requirement of the LSP (i.e., the claimed network tunnel). EX1006, 11:3-12, 2:23-25 (“In addition, the invention comprises an algorithm for **allocating subport bandwidth to LSPs.**”), 7:22-26 (“it may be the case that a different **subport is the only subport (or the subport best suited) that can accept the LSP with the required bandwidth.**”), 7:7-16, 11:13-12:9 (explaining that in

bandwidth allocation, each subport is checked to see if the “requested bandwidth” for an LSP is lower than the bandwidth capacity of each subport), Figure 5, 14:33-41, 15:47-55, 16:65-17:6. The bandwidth allocation to subports of a LAG as taught by Raz would be used with the teachings of RFC 3209 in order to ensure that an LSP tunnel can support the requested traffic capacity. EX1003, ¶¶109-110.

Regarding the port serial number, RFC 3209 and Raz render obvious that the port has a serial number. Raz discloses that the assigned subport has a serial number: Raz explains that the MPLS label contains bits that “indicate the subport,” which a POSITA would have understood to mean that the subport has a serial number that is indicated by the bits: “Consider an LSP to be setup through LSR A to LSR C. When the LSP is signaled, the CAC in LSR C decides to provision the LSP on subport 1 and therefore assigns the label 0x22003. With reference to [Figure] 4, each label 140 comprises 20 bits or 5 nibbles where the first three bits indicate 1 of 8 line interface cards, **bits 16 to 13 indicate the subport** and bits 12 to 0 indicate the actual label. In this example, the label 0x22003 indicates line interface card 1, subport 1 and label 3.” EX1006, 9:41-48, Figure 4, Figure 1 (identifying subports serially numbered 0-9), 8:35-39 (“the LSR network device 48 comprises ... a plurality of subports 34, labeled subport 0 through subport 9”). EX1003, ¶111.

In particular, RFC 3209 discloses or renders obvious the assignment of a physical interface to a network tunnel (i.e., an LSP operating as a network tunnel) in

an MPLS network by an MPLS switch (i.e., an LSR) operating as the claimed “first” switch, where the physical interface is an outgoing interface connecting the LSR with another node on the next hop of the LSP. Raz discloses or renders obvious the assignment of a physical Ethernet LAG subport to a network tunnel (i.e., a LSP operating as a network tunnel) in an MPLS network by an MPLS/LAG switch (i.e., an LSR) operating as the claimed “first” switch, where the subport meets a bandwidth requirement of the network tunnel and has a port serial number. While Raz discloses a method of assigning a LAG subport within an LSR to the network tunnel, a POSITA would have understood that the same principles would also have been applied to the physical/outgoing interface of the LSR operating as the claimed “first” MPLS switch, as taught by RFC 3209. As discussed above, Raz teaches that a switching fabric within the LSR has an interface comprised of subports, and one of the subports with sufficient bandwidth to meet the requirements of an LSP (i.e., the network tunnel) is assigned to communicate packets from a high-speed data stream through the LSR’s switching fabric along the LSP passing through the LSR. The same principles would have applied to forwarding packets between MPLS/LAG switches in an MPLS network, as taught by RFC 3209.

A POSITA would have understood from the disclosures of RFC 3209 and Raz, and would have been motivated, to assign a single physical tunnel port of the MPLS/LAG switch to a network tunnel in order to provide a tunnel pathway from

the switch to the LSP's next hop that can meet the bandwidth requirements, for example "in the event a wide connection is to be allocated" for forwarding packets in a high-speed packet stream. EX1006, 11:3-12, 2:23-25, 7:7-16, 7:22-26, 11:13-12:9, Figure 5; EX1003, ¶112. A POSITA would have been motivated to employ this same concept between nodes in an MPLS network as taught by RFC 3209 in order to improve the ability to communicate high speed packet streams that require increased bandwidth. At the time of the '602 Patent's priority date, a POSITA would have understood that bundled links may connect LSRs together and that an LSP path to be provisioned might involve the choice of one of the component links in the bundle. *See, e.g.*, EX1021, 6:58-63 ("**As is typical, each router includes** a processor, some memory and a number of **ports for connecting the links that allow communication between the routers** 102. Five **parallel links** connect a router D 102D and a router E 102E and **may be configured as a bundled link** 106."), Abstract ("Traffic engineering and bandwidth management of bundled links may, at times, require the **selection of one of a plurality of component links in a bundled link.**"). It thus would have been obvious to a POSITA, given the teachings of RFC 3209 and Raz, for an LSR (i.e., claimed "first MPLS/LAG switch") to assign to an LSP tunnel (claimed "network tunnel") an outgoing interface (i.e., claimed "physical tunnel port") which is a subport of a LAG (i.e., claimed "single physical tunnel port of a LAG") connecting the LSR to another LSR. EX1003, ¶¶100-113, 84-91.

[1.2]

RFC 3209 discloses or renders obvious the preparation of a data packet label by the LSR having assigned its outgoing interface to the LSP tunnel to encode an identifier for the interface into the data packet label. As previously explained, RFC 3209 discloses the use of RSVP signaling protocol to establish “explicitly routed label switched paths using RSVP as a signaling protocol. The result is the instantiation of label-switched tunnels” through the MPLS network. EX1010, Abstract. RFC 3209 explains that during LSP tunnel setup, a path request is propagated from an ingress node downstream (along the LSP data path) to a destination node, and it is in response to this request that each intermediate node assigns the path’s “next hop” and creates a label which it will use to identify traffic belonging to this LSP and determine where to forward such traffic: “The signaling protocol model uses downstream-on-demand label distribution. ... Labels are allocated downstream and distributed (propagated upstream) by means of the RSVP Resv message. For this purpose, the RSVP Resv message is extended with a special LABEL object.” EX1010,§1.1. “The destination node of a label-switched path responds to a LABEL_REQUEST by including a LABEL object in its response RSVP Resv message. ... **Each node** that receives a Resv message containing a LABEL object uses that label for outgoing traffic associated with this LSP tunnel. If the node is not the sender, it **allocates a new label and places that label in the**

corresponding LABEL object of the Resv message which it sends upstream to the PHOP [previous hop]. The label sent upstream in the LABEL object is the label which this node will use to identify incoming traffic associated with this LSP tunnel. This label also serves as shorthand for the Filter Spec. The node can now update its “Incoming Label Map” (ILM), which is used to map incoming labeled packets to a “Next Hop Label Forwarding Entry” (NHLFE), see [2]. When the Resv message propagates upstream to the sender node, a label-switched path is effectively established.” EX1010,§2.2 (Operation of LSP Tunnels). RFC 3209 further discloses that labels contain bits which encode information. EX1010,§4.1 (“The contents of a LABEL is a single label, **encoded** in 4 octets. Each generic MPLS label is an unsigned **integer** in the range 0 through 1048575.”). RFC 3209 further discloses that the label must contain information sufficient for the LSR to identify the LSP to which a data packet having that label belongs, because “[t]he label sent upstream in the LABEL object is the label which **this node will use to identify incoming traffic associated with this LSP tunnel.**” EX1010,§1.1. POSITA would have understood from disclosure that “traffic belonging to the LSP tunnel is identified solely on the basis of packets arriving from the PHOP or ‘previous hop’ (see [1]) with the particular label value(s) assigned by this node to upstream senders to the session,” where “the label effectively defines the ‘flow’ through the LSP,” that the label must contain information sufficient for the node to

identify the pre-assigned next hop and corresponding outgoing interface (the physical tunnel port which was assigned in Element [1.1]). EX1010, §2.1. EX1003, ¶¶114-115.

To the extent not disclosed or rendered obvious by RFC 3209, Raz discloses that the data packet label has dedicated a subset of bits to encode the subport serial number of a physical subport of the LAG into the label. For example, LSR C (which corresponds to the claimed “first MPLS/LAG switch” in the following example) dedicates “bits 16 to 13 [to] indicate the subport” (which is subport with serial number 1) of a LAG through which a packet should be sent from LSR B to LSR C in Figure 3 of Raz: “Consider an LSP to be setup through LSR A to LSR C. When the LSP is signaled, the CAC in **LSR C decides to provision the LSP on subport 1 and therefore assigns the label 0x22003. With reference to [Figure 4], each label 140 comprises 20 bits** or 5 nibbles where the first three bits indicate 1 of 8 line interface cards, **bits 16 to 13 indicate the subport** and bits 12 to 0 indicate the actual label. In this example, the label 0x22003 indicates line interface card 1, subport 1 and label 3.” EX1006, 9:41-58, Figures 3-4. A POSITA would have understood that the inclusion of the bits in a data packet label by the LSR to indicate the subport through which a packet should be sent constitutes encoding the subport serial number into the label. As discussed above for Element [1.1], a serial number is a numerical identifier for the subport, and the series of bits in the label is a serial

number that is encoded because it has been put into the label in a format in which it can be used to identify the subport. EX1003, ¶¶100-113. EX1003, ¶¶114-118, 84-91.

[1.3]

RFC 3209 discloses that the MPLS node (i.e., the LSR which corresponds to the claimed “first MPLS/LAG switch”) responsible for label creation sends the label that it allocated upstream to a preceding node. EX1010, §4.1.1.1 (“Once a label is allocated, **the node formats a new LABEL object. The node then sends the new LABEL object as part of the Resv message to the previous hop.**”). RFC 3209 describes this process as “downstream-on-demand label distribution. ... Labels are allocated downstream and distributed (propagated upstream) by means of the RSVP Resv message.” EX1010, §1.1. As discussed above for Element [1.2], the serial number for the physical tunnel subport is encoded within the data packet label as taught by Raz. EX1003, ¶¶114-118. EX1003, ¶¶119-123.

[1.4]

The combination of RFC 3209 and Raz involves receiving from the preceding node, by the LSR, a data packet comprising said data packet label. Specifically, RFC 3209 discloses data packets arriving from the previous hop of the LSP tunnel with the label value which was assigned by this LSR: “The semantics of these objects, from the perspective of a node along the label switched path, is that traffic belonging

to the LSP tunnel is identified solely on the basis of **packets arriving from the PHOP or “previous hop” (see [1]) with the particular label value(s) assigned by this node** to upstream senders to the session.” EX1010,§2.1,§2.2 (“The label sent upstream in the LABEL object is **the label which this node will use to identify incoming traffic** associated with this LSP tunnel. This label also serves as shorthand for the Filter Spec. The node can now update its “Incoming Label Map” (ILM), which is used to map incoming labeled packets to a “Next Hop Label Forwarding Entry” (NHLFE), see [2].” As discussed above for Element [1.2], the serial number for the physical tunnel subport is encoded within the data packet label as taught by Raz. EX1003, ¶¶114-118.

Raz’s technique is similar insofar as the LSR receives a packet from a previous node in the LSP, wherein the packet has a data packet label indicating the physical tunnel subport over which the packet should be communicated: “When a packet for the provisioned LSP is received over a link connected to LSR A, it is **forwarded** to subport 3 and subsequently out over the 10G link **to LSR B with the previously assigned label indicating subport 3**. The port forwarding module in **LSR B examines the label in the received packet** and in response thereto forwards the packet to subport 3 for packet processing.” EX1006, 7:39-45, 9:29-58, Figures 3-4. Thus, the combination renders this element obvious. EX1003, ¶¶124-128.

[1.5]

RFC 3209 discloses or renders obvious sending said data packet from said LSR (i.e., the claimed “first” MPLS switch) to a second LSR via the outgoing interface which was assigned by said LSR in Element [1.1] (i.e., the claimed “single physical tunnel port”). As previously explained, RFC 3209 discloses that each intermediate node (LSR, or MPLS switch) assigns the “next hop” of a LSP tunnel during LSP setup, and a POSITA would have found it obvious that this assignment includes the assignment of the LSR’s outgoing interface (i.e., claimed “physical tunnel port”) which connects the LSR to the next LSR in the LSP. *Supra* §IX.B.[1.1]; EX1003, ¶¶100-113. The assignment of a *subport of a LAG* to a network tunnel is further disclosed or rendered obvious by Raz, and the combination of these teachings would lead a POSITA to implement Raz’s LAG subport assignment disclosure to the LSR’s outgoing interface which connects an LSR to another LSR, as taught or suggested by RFC 3209. *See supra* §§IX.B.[1.0]-[1.1]; EX1003, ¶¶92-99, 100-113, ¶¶. It thus would have been obvious to a POSITA, given the teachings of RFC 3209 and Raz, for an LSR (i.e., claimed “first MPLS/LAG switch”) to assign to an LSP tunnel (claimed “network tunnel”) an outgoing interface (i.e., claimed “physical tunnel port”) which is specifically a subport of a LAG (i.e., claimed “single physical tunnel port of a LAG”) connecting the LSR to another LSR. EX1003, ¶¶129-130.

In view of the foregoing, RFC 3209 discloses forwarding a data packet received from the preceding node to another node (i.e., the LSR connected to it and

the claimed “second” MPLS switch) via said previously assigned outgoing interface (i.e., said previously assigned LAG subport which is the claimed “physical tunnel port”). The LSR which does the forwarding function is also the LSR which performed the “assigning” of its outgoing interface and the allocation of the label. EX1010,§4.1.1.1. Specifically, RFC 3209 discloses that a “Label Switched Path” is **“The path created by the concatenation of one or more label switched hops, allowing a packet to be forwarded by swapping labels from an MPLS node to another MPLS node,”** EX1010,§1.2. Furthermore, “[t]he node [which assigns the next hop and prepares the label] SHOULD be prepared to **forward packets carrying the assigned label** prior to sending the Resv message,” EX1010,§4.1.1.1. RFC 3209 is disclosing that when the MPLS node receives a data packet containing the label which the MPLS node allocated to this LSP tunnel, the MPLS node “forward[s] packets carrying the assigned label” to another MPLS node (the claimed “second MPL/LAG switch”).

RFC 3209 in view of Raz further renders obvious that the forwarding of the data packet is performed “via” assigned outgoing interface (i.e., the assigned LAG subport which was selected according to the teachings of Raz, and the claimed “single physical tunnel port”), because it is the LAG subport which Raz discloses is indicated in the data packet label. EX1003, ¶¶131-132.

To the extent not explicitly disclosed or rendered obvious by RFC 3209, given the teachings of Raz, a POSITA would have understood that the data packet received from the previous LSR would be sent to another LSR (which corresponds to the claimed second MPLS/LAG switch) *via* the physical tunnel subport having the port serial number encoded in the data packet label. EX1006, 7:17-29, 9:29-58, Figures 3-4. Claim 1 of Raz recites “forwarding inbound packets transmitted by said upstream node and received over said communications link by said downstream node to a subport in accordance with the label associated with said inbound packet.” EX1006, 14:23-26. EX1003, ¶¶129-134, 84-91.

C. Claim 2

RFC 3209 discloses that using RSVP signaling to set up the LSP tunnel involves propagation of a path request message downstream from ingress node to destination. Each intermediate node receives the forwarded path request from the previous node, the request message specifically including a request for a data packet label. EX1010, §2.2 (“To create an LSP tunnel, the **first MPLS node on the path - that is, the sender node with respect to the path -- creates an RSVP Path message and inserts a LABEL_REQUEST object into the Path message. The LABEL_REQUEST object indicates that a label binding for this path is requested** and also provides an indication of the network layer protocol that is to be carried over this path.”), §2.2 (“The LABEL_REQUEST object **requests**

intermediate routers and receiver nodes to provide a label binding for the session.”)

§4.2.4 (discussing the common use of a LABEL_REQUEST object to establish a LSP tunnel when using RSVP-TE). EX1003, ¶¶135-138, 84-91.

D. Claim 3

RFC 3209 discloses that using RSVP signaling to set up the LSP tunnel involves the propagation of a path request message downstream from ingress node to destination. Each intermediate node receives the forwarded path request from the previous node, the request message including a *request* for a data packet label. EX1010, §2.2 (“To create an LSP tunnel, the first MPLS node on the path **creates an RSVP Path message and inserts a LABEL_REQUEST object into the Path message. The LABEL_REQUEST object indicates that a label binding for this path is requested** and also provides an indication of the network layer protocol that is to be carried over this path.”), §2.2 (“The LABEL_REQUEST object requests intermediate routers and receiver nodes to provide a label binding for the session.”), §4.2.4 (discussing the common use of a LABEL_REQUEST object to establish a LSP tunnel when using RSVP-TE). Raz’s functionality would have been able to integrate with this type of RSVP Path message, as Raz discloses that its system is compatible with RSVP-TE. EX1006, 6:46-50, 1:36-39 (“LSPs may be setup using any suitable signaling protocol such as RSVP-TE.”), 5:10, 6:46-50. EX1003, ¶¶139-142, 84-91.

E. Claims 4 and 16⁵

RFC 3209 discloses that a path setup request may include an indication of a service property, in particular a class of service in the form of an Integrated Services object and a bandwidth needed for the tunnel, both of which a POSITA would have considered service properties, below: “An advantage of using RSVP to establish LSP tunnels is that it enables the **allocation of resources** along the path. For example, **bandwidth can be allocated to an LSP tunnel using standard RSVP reservations and Integrated Services service classes** [4].” EX1010, §1.1, §2.3 (“Service Classes – This document does not restrict the type of Integrated Service requests for reservations.”), §2.6; EX1003, ¶143.

To the extent not disclosed by RFC 3209, a POSITA would have understood that it would have been obvious to include an indication of a service property in the request message received from the node preceding the MPLS/LAG switch. EX1003, ¶¶143-146. For example, Raz explains that its “invention provides a scheme for allocating LSP bandwidth to subports that helps in solving the problem described above in a way that provides a tradeoff between leaving subports empty for wide LSPs and spreading traffic between subports for best utilizing the bandwidth of the

⁵ The references to “said selecting” or “said selection” in Claims 4-7 and 16, 18-19, respectively, do not have an antecedent basis, and thus the claims may not be definite. Petitioner has applied what it understands to be Patent Owner’s constructions.

link (e.g., for [Excess Information Rate] traffic).” EX1006, 11:3-8. “The central idea is to leave one or more subports empty (i.e., no bandwidth used) in the event a wide connection is to be allocated.” *Id.*, 11:8-10. A POSITA would have understood that Raz’s focus on allocation of bandwidth to accommodate “a wide connection” is another way of saying that the request message has an indication of a service property (i.e., the amount of bandwidth needed to accommodate the wide connection). Further, Raz provides an example of its system being used to provide a network tunnel for traffic requiring a Committed Information Rate (“CIR”), which a POSITA would have understood to be a service property. EX1006, 10:60-11:2, 1:59-61, 4:40, 11:55-59, Figure 5.

Moreover, a POSITA would have understood from these disclosures that the outgoing interface which is obvious to select according to RFC 3209 (corresponding to the physical port of the MPLS/LAG switch and the “subport” in Raz’s disclosures) is selected based on whether it can comply with the required service property. EX1006, 10:60-11:12, 11:55-59. Raz explains that its system identifies and assigns a subport (or port) that has the bandwidth available to meet the required CIR service property, which a POSITA would understand and be motivated to incorporate into the RSVP system of RFC 3209 so that the appropriate bandwidth is actually reserved for the tunnel’s function. EX1010, §1.1; EX1006, 10:60-11:12; EX1003, ¶¶143-146, 209-210, 84-91; *infra* §§IX.P.[15.0]-[15.8] (with respect to [16]).

F. Claims 5 and 17

As discussed above for Claim 4, RFC 3209 discloses that a path setup request message may include an indication of a service property, in particular a class of service in the form of an Integrated Services object and a bandwidth needed for the tunnel: “An advantage of using RSVP to establish LSP tunnels is that it enables the **allocation of resources along the path**. For example, **bandwidth can be allocated to an LSP tunnel** using standard RSVP reservations and **Integrated Services service classes** [4].” EX1010, §1.1, §2.3 (“Service Classes – This document does not restrict the type of Integrated Service requests for reservations.”), §2.6. A POSITA would have understood from this disclosure that the LSP tunnel setup using RSVP includes reserving a bandwidth needed by the tunnel (i.e., a “guaranteed bandwidth” for the tunnel).

To the extent not disclosed by RFC 3209, Raz discloses accommodation of “wide connections” that have a certain Committed Information Rate or CIR. EX1006, 10:60-11:2, 1:59-61, 4:40, 11:55-59, Figure 5. A POSITA would have understood that the CIR is a service property, and CIR is effectively a guaranteed bandwidth. Further, it would have been within the knowledge of a POSITA, in view of the discussion of bandwidth allocation in Raz, that the service property could also include a peak bandwidth and a class of service (i.e., the priority of processing the packets). EX1006, 1:59-61, 4:40, 10:60-11:12, 11:55-59, Figure 5. It would have

been commonly understood by a POSITA that the service property may include the peak bandwidth and class of service required to efficiently forward high-speed packet streams. EX1003, ¶¶147-149, 211-212, 84-91; *infra* §§IX.P.[15.0]-[15.8] (with respect to [17]).

G. Claims 6 and 18

Raz teaches the selection of a single physical tunnel subport (claimed selected “port”) having the maximum available bandwidth from among the plurality of available physical data subports (or ports) of the MPLS/LAG switch. EX1006, 11:13-59 (discussing method in Figure 5 and stating “the subport having the **most free bandwidth is used**”), 11:3-10 (also describing leaving a subport “empty (i.e. no bandwidth used) in the event a wide connection is to be allocated.”) EX1003, ¶¶150-151, 213-214, 84-91; *infra* §§IX.P.[15.0]-[15.8] (with respect to [18]).

H. Claims 7 and 19

A POSITA would have understood from disclosures in Raz that certain subports are available and provide the bandwidth needed to forward packets in a high-speed data stream. A POSITA would have understood that Raz discusses a situation where the minimum available bandwidth of each of its subports needs to be sufficient to handle the bandwidth of a wide connection. EX1006, 10:60-11:12. Raz then discloses that its system is arranged to address this situation: the system in Raz may “leave one or more of the subports empty (i.e. no bandwidth used) in the

event a wide connection is to be allocated,” which may involve selecting for the LSP a different subport having a minimum bandwidth available. EX1006, 11:8-10. Further, Raz explains its “bandwidth allocation method” in connection with Figure 5 to demonstrate how a subport is selected that has a minimum available bandwidth that is not less than the bandwidth required by the network tunnel (i.e., the LSP). EX1006, 11:13-59. A POSITA would have understood from this disclosure in Raz to select a port of the MPLS/LAG switch that has a minimum available bandwidth that is not less than the bandwidth required by a network tunnel handling a high-speed packet stream. This functionality would have been carried over into the combination of RFC 3209 with Raz. EX1003, ¶¶152-153, 215-216, 84-91; *infra* §§IX.P.[15.0]-[15.8] (with respect to [19]).

I. Claim 8⁶

RFC 3209 discloses that “traffic is **mapped** onto a label-switched path,” and that “when labels are associated with traffic flows, it becomes possible for a router to identify the appropriate reservation state for a packet **based on the packet’s label value.**” EX1010, §1.1. A POSITA would have understood this to mean that the label value is used by a router to identify the appropriate forward equivalence class (FEC) and corresponding routing instructions for that data packet according to a mapping

⁶ The reference to “said switching” in Claim 8 does not have an antecedent basis, and thus the claim may not be definite. Petitioner has applied what it understands to be Patent Owner’s construction.

of label to data flow. RFC 3209 further explains that the label, once assigned, is used by the router (node, or claimed “MPLS/LAG switch”) in order to map incoming traffic to the appropriate next hop, or forwarding path, of the packet. EX1010,§2.2 (“The label sent upstream...is the label which this node will use to identify incoming traffic associated with this LSP tunnel. This label also serves as shorthand for the Filter Spec. The **node can now update its “Incoming Label Map” (ILM), which is used to map incoming labeled packets to a “Next Hop Label Forwarding Entry” (NHLFE)**, see [2].”),§1.2 (“Label Switched Path” is “The path created by the concatenation of one or more label switched hops, allowing a packet to be **forwarded** by swapping labels from an MPLS node to another MPLS node.”). RFC 3209’s disclosure of a node (i.e., claimed “MPLS/LAG switch”) using the label “to map incoming labeled packets to a ‘Next Hop Label Forwarding Entry’” is a mapping function which is used to switch the data packet to its next hop. EX1010,§2.2; EX1003, ¶¶154-157, 84-91.

J. Claims 9⁷ and 20

As explained above for Element [1.2], Raz discloses dedicating a sub-set of bits in MPLS label 140 (i.e., a data packet label) that identify a physical subport of the LAG. EX1006, 9:41-58, Figure 4. This is the same as inserting the bits into the

⁷ The references to “said preparing” and “said switching” in Claim 9 do not have an antecedent basis, and thus the claim may not be definite. Petitioner has applied what it understands to be Patent Owner’s construction.

data packet label. EX1003, ¶160. Further, a POSITA would have understood from Raz to extract the bits from the data packet label to identify the physical tunnel subport onto which to switch the data packets. EX1003, ¶161. Raz explains that its system “examines the label in the received packet” to determine the physical tunnel subport over which the packet should be forwarded. EX1006, 7:39-45, 7:17-29, 9:29-58, Figures 3-4. Further, Claim 1 of Raz recites “forwarding inbound packets transmitted by said upstream node and received over said communications link by said downstream node to a subport in accordance with the label associated with said inbound packet.” *Id.*, 14:23-26. A POSITA would have understood from these disclosures that the bits within the data packet label are extracted to determine the identity of the single physical subport to use for transmission of the high-speed packet stream, and that this functionality would be used with the system of RFC 3209 to determine the identity of the outgoing interface of RFC 3209’s disclosed LSR. EX1003, ¶¶158-163, 217-218, 84-91; *infra* §§IX.P.[15.0]-[15.8] (with respect to [20]).

K. Claims 10 and 21

RFC 3209 discloses “traffic is mapped onto a label-switched path,” and “when labels are associated with traffic flows, it becomes possible for a router to **identify** the appropriate reservation state for a packet based on the packet’s label value.” EX1010, §1.1. RFC 3209 explains that the label, once assigned, is used by the router

(node, LSR, or claimed “MPLS/LAG switch”) in order to map incoming traffic to its next hop, or forwarding path. EX1010, §2.2 (“The label sent upstream in the LABEL object is the label which this node will use to identify incoming traffic associated with this LSP tunnel. This label also serves as shorthand for the Filter Spec. The node can now update its “Incoming Label Map” (ILM), which is used to **map incoming labeled packets to a “Next Hop Label Forwarding Entry” (NHLFE)**, see [2].”). A POSITA would have understood, to the extent not explicitly disclosed, that the node’s ILM comprises a storage of the label value along with the corresponding FEC and any information needed to forward the data packet to the next hop, which necessarily includes the identification of the outgoing interface on which the node will forward the data packet. EX1003, ¶164. A POSITA would have known to store the data packet label along with an identifier of the assigned physical tunnel subport in order for the node to efficiently identify the LSP and next hop based solely on the label. Based on RFC 3209’s disclosures, it would have been understood that on receipt of a data packet label, the identifier would be retrieved from memory so that it could be used to forward that data packet to the identified physical tunnel subport. EX1003, ¶165.

To the extent not disclosed or suggested by RFC 3209, Raz states that its network device includes a memory. EX1006, 3:16-32, 12:30-41, 13:36-55. A POSITA would have found it obvious and desirable to store the data packet label

along with an identifier of the physical tunnel subport and would have understood it to be obvious that, when a data packet label was received, the stored identifier would be retrieved from memory and used to forward that data packet to the identified subport. EX1003, ¶¶164-167, 219-220, 84-91; *infra* §§IX.P.[15.0]-[15.8] (with respect to [21]).

L. Claims 11 and 22

RFC 3209 discloses that “the extended RSVP protocol [disclosed herein]... supports smooth **rerouting** of LSPs.” EX1010,§1. RFC 3209 further discloses “[o]ne of the requirements for Traffic Engineering is the capability to reroute an established TE tunnel under a number of conditions, [one condition being] when TE tunnel reroute is usually required is upon failure of a resource along the TE tunnel’s established path.” EX1010,§2.5. A POSITA would understand that in this context, a “failure” of a “resource” may include failure of any working component of the path (i.e., an interface assigned to the LSP), and that the “reroute” of the tunnel involves switching the data packets flowing through the tunnel to a different route (i.e., a different interface). EX1003, ¶168.

Raz discloses selection of a subport for a backup route from among the plurality of LAG subports. EX1006, 5:20-59, 2:21-25, 10:12-56. First, a POSITA would have understood to select a backup subport from the plurality of available physical data subports that can be used to transmit the high-speed packet stream if

the previously selected physical data subport suffers a fault. EX1006, 5:20-59, 10:12-56; EX1003, ¶¶168-170. Second, a POSITA would have known that the backup subport is different from the primary physical tunnel subport because the purpose of rerouting is to have the ability to send packets along an alternate path if the primary physical tunnel subport suffers a fault. EX1006, 5:20-28, 5:51-63, 10:12-56; EX1003, ¶170. Finally, a POSITA would have implemented the techniques in Raz to the rerouting functionality in RFC 3209 to perform a “switchover” of packets in the high-speed packet stream to the selected backup port in order to send the packets along an “alternate path” to the second MPLS/LAG switch. EX1006, 5:20-62. EX1003, ¶¶168-171, 221-222, 84-91; *infra* §§IX.P.[15.0]-[15.8] (with respect to [22]).

M. Claim 12

RFC 3209 discloses “TE tunnel reroute is usually required is upon failure of a resource along the TE tunnel’s established path. **Under some policies, it may also be necessary to return the TE tunnel to its original path when the failed resource becomes re-activated.**” EX1010,§2.5. A POSITA would have understood that a “failure of a resource along the TE tunnel’s established path” is an interruption of service, and that the “return” of the tunnel to its “original path” involves switching the data packets flowing through the tunnel back to the original path (i.e., the original interface, specifically the original “subport”, i.e., the assigned claimed “single

physical tunnel port”). EX1010,§2.5; *supra* §IX.L (discussing the use of subports on backup routes); EX1003, ¶¶172.

A POSITA would have understood from these disclosures that, upon the elimination of a fault condition (i.e., the restoral of a service interruption), the LSP tunnel according to RFC 3209’s system framework would revert to using the LSP through the primary physical data subport (or port) to forward data packets to the second MPLS/LAG switch, as discussed above for Element [1.5]. *Supra* §IX.B.[1.5]; EX1003, ¶¶172-174, 84-91.

N. Claims 13 and 23

RFC 3209 discloses “a label distribution protocol as a set of procedures by which one **Label Switched Router (LSR)** informs another of labels used to forward traffic between and through them.” EX1010,§1.1. RFC 3209 alternatively refers to the LSR as a “node,” “switch,” or “router” operating in an MPLS network and which is capable of performing the steps recited in Claim 1. EX1010,§1.1 (“Hosts and routers that support both RSVP [1] and Multi-Protocol Label Switching [2] can associate labels with RSVP flows.”); see EX1006, 6:9-20, Figure 1. EX1003, ¶¶175-176, 223-224, 84-91; *infra* §§IX.P.[15.0]-[15.8] (with respect to [23]).

O. Claims 14 and 25

Raz discloses the use of link aggregation groups (LAG), which a POSITA would understand to be a single logical port. EX1003, ¶178. Raz discloses a high-

speed physical link composed of the aggregate of a plurality of subports. EX1006, Abstract, 7:7-16. In particular, Raz discloses that “some commercially available layer 2 switches can determine the destination port for a packet destined to a LAG (Link Aggregation Group)...This can be used for spreading the packets to the subports[...] and **defining its ports leading to the different subports as a single LAG.**” EX1006, 9:9-15, 8:25-29 (“[e]ach of the one GE links make up the subports of the aggregate 10GE link”). A POSITA would have understood from these disclosures that a conventional switch (i.e., a conventional LSR such as the LSR taught by RFC 3209) could implement the multiple subports that Raz discloses to lead to a composite link as a link aggregation group (i.e., claimed “logical port”). EX1003, ¶¶177-179, 84-91; *infra* §§IX.P.[15.0]-[15.8] (with respect to [25]).

P. Claim 15

The analysis for Claim 1 is incorporated in the discussion of Claim 15. EX1003, ¶¶83-91, 92-134.

[15.0]

To the extent the preamble is limiting, this element is taught or obvious over RFC 3209 and Raz for the same reasons as those discussed in Element [1.0]. EX1003, ¶¶92-99.

Additionally, RFC 3209 and Raz renders obvious the use of Ethernet physical data ports of an Ethernet LAG to communicate high speed packet streams between

LSRs (i.e., claimed “MPLS/LAG switch[es]”) in an MPLS network. *Supra* §IX.B.[1.0]; EX1003, ¶¶92-99. First, a POSITA would have understood that when a LAG is used to communicate data packets from one MPLS switch to another MPLS switch, the LAG is connected to both MPLS switches via ports at either end of the LAG’s links, which renders obvious “the LAG having a first MPLS/LAG switch and a second MPLS/LAG switch.” Second, the node (LSR) as described by RFC 3209 and Raz—which assigns the outgoing interface and corresponds to the claimed “first” switch—is located downstream from a preceding node along the LSP tunnel. *Supra* §IX.B.[1.3] (explaining that the instant node (LSR) sends the data packet label to the “preceding node” with respect to the instant node in both RFC 3209 and Raz’s systems and in their combination). Consequently, Raz’s LAG—which would have been obvious as a link connecting the instant node (LSR, and claimed “first” MPLS switch) to another node further downstream—as implemented in the combination with RFC 3209 is also located “downstream” from the “preceding node.” EX1010, §§1.1 (describing “downstream-on-demand” label allocation), 4.1.1.1. EX1003, ¶¶100-113. Third, RFC 3209 itself is an Internet standards defining document for the implementation of “RSVP-TE: Extensions to RSVP for LSP Tunnels,” thus disclosing employ of RSVP signaling protocol to set up LSP tunneling. EX1010, Abstract, §1.1; EX1003, ¶¶180-183, 84-91.

[15.1]

Raz discloses that “a network **processor** [is] adapted to implement the mechanism of the present invention” EX1006, 2:33-36, 2:36-40, 3:39, 7:54-8:13, 12:25-30, 12:57-13:1, 13:56-61; EX1003, ¶¶184-186, 84-91.

[15.2]

See §IX.B.[1.1]; EX1003, ¶¶187-189, 84-91.

[15.3]

See §IX.B.[1.2]; EX1003, ¶¶190-192, 84-91.

[15.4]

See §IX.B.[1.3]. EX1003, ¶¶193-195, 84-91.

[15.5]

RFC 3209 discloses that its intermediate node (LSR) which corresponds to the claimed “first” switch performs the functions of the claimed “mapper,” i.e., receiving a data packet from an upstream node, detecting a data packet label, and determining how to forward the packet in accordance with the label. EX1010, §2.2, §4.1.1.1. RFC 3209 therefore renders obvious that this node (an LSR) comprises the claimed “mapper” which performs these functions. See EX1010, §2.2 (discussing a node updating its “map” of incoming labels to next hop label forwarding entries for evaluating incoming labels on data packets). A POSITA would have understood that intermediate nodes comprise a component which performs these functions and therefore corresponds to the claimed “mapper.” EX1003, ¶¶196-198, 84-91.

[15.6]

See §IX.B.[1.4]; EX1003, ¶¶199-201, 84-91.

[15.7]

RFC 3209 explains that “[o]nce a label is allocated, the node formats a new LABEL object. **The node SHOULD be prepared to forward packets carrying the assigned label.**” EX1010,§4.1.1.1,§2.2 (“The label sent upstream in the LABEL object is the label which **this node will use to identify incoming traffic** associated with this LSP tunnel.”). A POSITA would understand from these teachings that in order for the node (specifically the LSR’s mapper) to use the label of an incoming packet to identify the traffic belonging to this LSP and to forward the traffic, the node must detect the label in the data packet. EX1010,§2.2. EX1003, ¶¶202-205, 84-91.

[15.8]

See §§IX.B.[1.5],[15.5]; EX1003, ¶¶206-208, 84-91.

Q. Claim 24

Raz discloses implementation on a “network processor.” EX1006, 1:65-2:8, 2:33-40, 6:24-33, 7:54-62; EX1003, ¶¶225, 84-91.

R. Claim 26

Supra §§IX.B.[1.0]-[1.5]; EX1003, ¶¶92-134, 84-91.

[26.0]

See §IX.B.[1.0]; EX1003, ¶¶228-229.

[26.1]

See §§IX.C;IX.B.[1.1]; EX1003, ¶¶230-231.

[26.2]

See §IX.B.[1.1]; EX1003, ¶¶232-233.

[26.3]

See §IX.B.[1.2]; EX1003, ¶¶234-235.

[26.4]

See §IX.B.[1.3]; EX1003, ¶¶236-237.

[26.5]

See §IX.B.[1.4]; EX1003, ¶¶238-239.

[26.6]

See §IX.B.[1.5]; EX1003, ¶¶240-241.

X. GROUND 2: CLAIMS 1-26 ARE UNPATENTABLE AS OBVIOUS OVER THE COMBINATION OF RFC 3209, RAZ, FERGUSON AND THE KNOWLEDGE OF A POSITA.

The combination of RFC 3209, Raz, and Ferguson, along with the knowledge of a POSITA, renders Claims 1-26 obvious. The analysis of the obviousness of Claims 1-26 set forth in Ground 1 are incorporated by reference. See §IX; EX1003, ¶¶83-241.

A. Motivation to Combine RFC 3209, Raz, and Ferguson

A POSITA would have been motivated to apply the teachings of Ferguson to the combination of RFC 3209 with Raz because this increases the availability of

bandwidth needed to efficiently communicate high-speed packet streams via a LAG in an MPLS network. RFC 3209, Raz, and Ferguson are analogous art references that focus on solving the same problem. Each of RFC 3209, Raz, and Ferguson relate to the use of an MPLS network to communicate data packets. EX1006, 1:65-2:8, 2:26-31, 6:24-33, Figures 1 and 3-4; EX1007, 1:57-2:3, 2:22-26, 3:36-67, 8:10-12, Figures 2A-8. Both Raz and Ferguson extensively discuss the use of a LAG in an MPLS network to communicate the data packets. EX1006, 2:41-67, 6:34-45, 7:7-16, 14:19-22, Figure 1; EX1007, 1:21-26, 1:43-53, 3:36-4:19, 6:10-31, Figures 2A-2C. Ferguson discloses the utilization of an Ethernet physical data port in a LAG to communicate MPLS packets between routers or switches in an MPLS network, which is the same subject matter as Raz. EX1007, 1:21-26, 1:43-53, 3:36-4:19, 6:10-31, Figures 2A-2C; EX1006, 1:65-2:8, 2:41-67, 6:34-45, 7:7-16, 14:6-26, 14:50-52, Figure 1.

Moreover, each of RFC 3209, Raz, and Ferguson are directed to solving the problem of ensuring enough bandwidth is available to communicate high-speed packet streams through an MPLS network. EX1010, §§1.1, 2.2; EX1006, 10:60-11:12, 14:33-41, 15:47-55, Figure 5; EX1007, 1:28-42, 2:54-57, 4:55-60; EX1003, ¶244. Raz discusses allocating the bandwidth of subports within an LSR in order to handle high-speed packet streams transiting the LSR. Raz explains that its “invention also comprises a mechanism to improve the ability to handle wide

connections that require a relatively large amount of CIR bandwidth.” EX1006, 10:60-63. Raz states that “a connection of 500 Mbps, 700 Mbps or even a connection of 1 Gbps may need to be supported.” *Id.*, 10:63-65. Raz also discusses “the problem of fragmentation,” and it provides an example where “300 Mbps of CIR bandwidth [is] already allocated on each of the ten subports of a 10G port.” *Id.*, 10:65-67. “In this case, a connection of 800 Mbps cannot be allocated on it even though the 10G port has 5600M of free bandwidth.” *Id.*, 11:1-2.

Like RFC 3209 and Raz, Ferguson addresses the need to have bandwidth available for highspeed packet streams when implementing LAG to communicate data packets in an MPLS network. EX1007, 1:28-42, 2:54-57, 4:55-60. Ferguson explains that load balancing of MPLS packets in conventional systems “may not be able to achieve substantial distribution of the traffic among the paths, which may result in congestion on one data path and unused bandwidth on another.” EX1007, 4:55-60. Ferguson, like RFC 3209 and Raz, focuses on improving the use of bandwidth in an MPLS network. *Id.*, 1:28-42, 2:54-57, 4:55-60, 8:10-12. A POSITA thus would consider RFC 3209, Raz, and Ferguson to be analogous art references that address similar problems. EX1003, ¶¶244-246.

A POSITA would have understood from the disclosures in Ferguson that techniques for utilizing an Ethernet physical data port in a LAG to communicate data packets between routers or switches in an MPLS network are also applicable to the

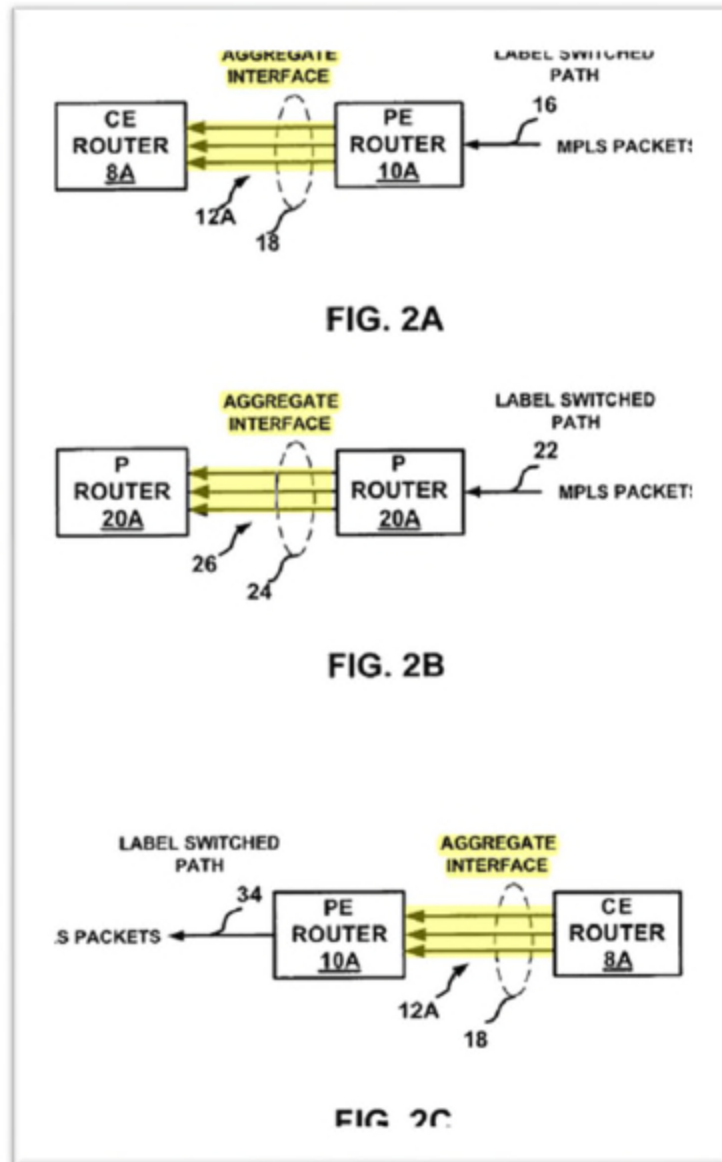
use of subports transmitting the data packets within the routers or switches, and vice versa. EX1003, ¶246; EX1007, 5:61-6:6. Armed with this understanding, a POSITA would have understood that the techniques disclosed in Raz for using subports to transmit data packets within a router or switch would also have been applicable to an Ethernet physical data port in a LAG that communicates data packets between routers or switches in an MPLS network. EX1003, ¶246. As such, the efficient use of bandwidth realized inside the LSR would also have been realized using the same techniques for communications between LSRs. *Id.* EX1003, ¶¶243-246.

B. Claims 1, 15, and 26

Ferguson builds on the previous analysis of RFC 3209 and Raz by disclosing a system for communicating packets between switches and routers in an MPLS network that addresses the same concerns about allocating the bandwidth of physical data ports in a LAG to deal with the demands of communicating high-speed packet streams as are addressed by RFC 3209 and Raz. EX1003, ¶¶249-250. Ferguson teaches a POSITA that the method of assigning a subport with appropriate bandwidth that is disclosed in Raz could also be implemented *between* MPLS/LAG switches in an MPLS network. EX1003, ¶¶250-251. That is, to the extent that it was not already obvious from the combination of RFC 3209 and Raz, a POSITA reviewing Ferguson would have understood that it would be desirable to implement

the techniques in Raz for assigning a physical tunnel subport to assign a physical tunnel port to communicate packets along “physical interconnects” between “two switches” in an MPLS network according to the framework provided by RFC 3209. EX1007, 1:22-27, 1:57-66; EX1003, ¶250. The teachings of Ferguson are compatible with and readily implementable in the RFC 3209 combination with Raz. EX1003, ¶¶243-246. A POSITA would have been motivated to combine the teachings of RFC 3209, Raz, and Ferguson. *Id.*

Ferguson discloses the utilization of an Ethernet physical data port in a LAG in an MPLS network for the purpose of communicating high-speed packet streams. EX1007, 1:21-26, 1:43-53, 3:36-4:19, 6:10-31, Figures 2A-2C. As shown below in Figures 2A-2C of Ferguson, MPLS packets are communicated along a physical interconnect that is part of an “aggregate interface” (i.e., a LAG) between ports on two routers:



Figures 2A-2C of Ferguson (Annotated)

Further, Ferguson states that “the physical interconnects may couple other devices, e.g., two switches” *Id.*, 1:24-26, 8:61-64.

Ferguson would have taught a POSITA that Raz’s method of assigning a subport with appropriate bandwidth within the LSR could also be implemented, in the framework of RFC 3209, between network devices (such as MPLS/LAG

switches) in an MPLS network. EX1003, ¶¶251, 255-256. Ferguson discloses that its techniques can be implemented to communicate packets along “physical interconnects” between “two switches” in an MPLS network. EX1007, 1:22-27, 1:57-66. In addition, Ferguson discloses that physical interconnects between network devices (such as switches or routers) can be used as part of a LAG. *Id.*, 1:28-53, 2:44-47.

Ferguson states that the techniques used to communicate highspeed data streams *within* a router or switch in an MPLS network can also be applied to communicating high-speed data streams *between* two routers or *between* two switches in an MPLS network. EX1007, 5:61-6:6. Ferguson states that “[a]lthough [its] techniques have been described in reference to distribution of MPLS packets across parallel physical interconnects of an aggregated link, the techniques may be applied in a variety of environments.” EX1007, 5:63-67. “For example, the techniques may be readily applied to internal parallel data paths within a device.” *Id.*, 5:67-6:2. “For example, the techniques may be used by a router [or switch] to distribute packets across internal data paths that begin at the same input interface of the router [or switch] and end at the same output interface of the router [or switch], but traverse through different internal, high-speed switch fabrics.” *Id.*, 6:2-6.

These disclosures in Ferguson demonstrate that the techniques used to reserve the bandwidth needed to communicate packets within a network device can also be

applied to reserve the bandwidth needed to communicate packets between network devices in an MPLS network. Indeed, packets are communicated the same way within a device as between devices. *Id.* Thus, a POSITA would have understood that the techniques disclosed in Raz for assigning physical LAG subports to a network tunnel in an MPLS network could also be applied when communicating packets from a physical port on one MPLS/LAG switch to a physical port on another MPLS/LAG switch and operate within the framework disclosed by RFC 3209. EX1003, ¶¶247-264, 281-302, 314-327, 243-246.

C. Claims 2-13 and 16-24

Supra §§IX.C-N,Q; EX1003, ¶¶265-276, 303-311, 243-246.

D. Claims 14 and 25

To the extent not disclosed or obvious over RFC 3209 and Raz, these elements are taught by Ferguson. Ferguson explains that “[t]he term ‘link aggregation’ refers to a technique by which the multiple physical interconnects are logically associated and treated as a single, aggregated link.” EX1007, 1:28-30; *see id.*, 1:60-63, 2:44-47, 3:42-44, 4:1-7. A POSITA would have understood from these disclosures in Ferguson that the plurality of physical data ports of an MPLS/LAG switch would be designated and treated as a single logical port. EX1003, ¶¶277-280, 312-313, 243-246.

XI. DISCRETIONARY DENIAL UNDER § 325(D) OR § 314 IS NOT WARRANTED

A. PTAB should not exercise its discretion to deny institution under *Becton and Advanced Bionics*

Furthermore, institution should not be denied under the framework set forth in *Becton, Dickinson & Co. v. B. Braun Melsungen AG*, IPR2017-01586, Paper 8 (PTAB Dec. 15, 2017) (precedential as to §III.C.5, first paragraph) and *Advanced Bionics LLC v. MED-EL Elektromedizinische Gerate GmbH*, IPR2019-01469, Paper 6 (PTAB Feb. 13, 2020) (precedential). The PTO has not previously considered RFC 3209, Raz, or Ferguson in connection with the claims of the '602 Patent. Additionally, the instant Petition provides the analysis of Dr. Min, an expert in the field of computer science and network communications. EX1003, ¶¶1-13, 61. Dr. Min's analysis of the prior art has not been presented to the PTO. In view of the new information presented in this Petition, the Board has ample discretion to institute an IPR on the grounds presented. Discretionary denial under 35 U.S.C. §325(d) is not warranted here.

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

1. Factor 1: Institution will increase the likelihood of stay

The Delaware District Court is likely to find a motion to stay prior to institution of an IPR premature but is very likely to stay a case post-institution of this IPR. Notwithstanding, the Board has repeatedly stated it will not speculate on how a district court will treat a motion to stay. *See, e.g., VMware Inc. v. Intellectual Ventures II LLC*,

IPR2020-00859, Paper No. 13, at 12 (PTAB Nov. 5, 2020) (informative) (“We agree with Petitioner. In the absence of any evidence specific to this case, we decline to speculate about the presiding judge’s inclinations.”); *Apple Inc. v. Fintiv, Inc.*, IPR2020-00019, Paper 15 at 12 (PTAB May 13, 2020) (informative) (“We decline to infer, based on actions taken in different cases with different facts, how the District Court would rule should a stay be requested by the parties in the parallel case here.”). As such, this factor at best favors institution and is at worst neutral.

2. Factor 2: District Court schedule

There is no scheduling order in the *Arista* litigation. The current average time to trial for the Delaware District Court, where the *Arista* and *Dell* litigations were filed, is over 3 years. EX1030 (median time to trial of 39 months). Claim construction in the *Cisco* litigation has been completed. EX1029. No date has been set for trial. The average time-to-trial for cases in the Western District of Texas where the *Cisco* litigation is pending is over 2 years. EX1031 (showing W.D. Texas median time to trial of 28.3 months); *In re Apple Inc.*, 979 F.3d 1332, 1350 (Fed. Cir. 2020). A Final Written Decision (“FWD”) would be expected in July 2024. However, Petitioner notes that “a court’s general ability to set a fast-paced schedule is not particularly relevant ... where, like here, the forum itself has not historically resolved cases so quickly.” *Id.* at 1344.

Accordingly, this factor weighs against discretionary denial. *See Sand Revolution II, LLC v. Continental Intermodal Grp.*, IPR2019-01393, Paper 24 (PTAB June 16, 2020) (granting institution on rehearing based on finding that uncertainty over district court’s trial date weighed against discretionary denial).

3. Factor 3: Petitioner’s investment in IPR outweighs forced investment in litigation to date

The *Arista* litigation is in its early stages, and the investment has been minimal. As such this factor weighs against denial.

4. Factor 4: The Petition raises unique issues

Invalidity contentions have not been served in the *Arista* litigation. Invalidity contentions in the *Cisco* litigation were served on Patent Owner on September 28, 2022. Instituting this proceeding will allow the Board to address the asserted prior art, narrowing the issues in the co-pending litigations due to the estoppel provisions of 35 U.S.C. § 315(e)(2). This factor therefore weighs against denial.

5. Factor 5: Whether the Petitioner and Defendant in the parallel litigation are the same party

Petitioner is a defendant in a co-pending litigation. While the *Fintiv* case indicates that a difference between the district court defendant and the petitioner may weigh against discretionary denial, nothing in *Fintiv* suggests that having the same party between the proceedings weighs in favor of discretionary denial. *See HP Inc. v. Slingshot Printing LLC*, IPR2020-01084, Paper 13, at 9 (PTAB Jan. 14, 2021)

(having the “same parties as parallel proceeding” makes factor 5 “neutral”). Accordingly, this factor is neutral and should not be a basis for denying institution.

6. Factor 6: Other circumstances support institution

The prior art presented in this Petition renders the Challenged Claims unpatentable as obvious. The merits of Petitioner’s arguments are compelling because they lead to a strong conclusion that one or more claims are unpatentable by a preponderance of the evidence. This factor therefore weighs against discretionary denial. *Fintiv* factors are either neutral or weigh against discretionary denial. Because this Petition was filed before the statutory bar date, institution should not be denied on discretionary factors.

XII. MANDATORY NOTICES UNDER 37 C.F.R. § 42.8

C. Real Party-in-Interest

The real party-in-interest is Arista Networks, Inc. (“Petitioner”). No unnamed entity is funding, controlling, or directing this Petition, or otherwise has had an opportunity to control or direct this Petition.

D. Related Matters

The ’602 Patent is the subject of this IPR Petition, is also asserted in the following patent litigation suits brought by Patent Owner Corrigent Corporation, against parties, including against Petitioner, and is the subject of an existing IPR:

- *Corrigent Corp. v. Dell Technologies et al.*, No. 1:22-cv-00496 (D. Del.)
(EX1022) (“*Dell* litigation”);

- *Corrigent Corp. v. Arista Networks, Inc.*, No. 1:22-cv-00497 (D. Del.)
(EX1015-1016) (“Arista litigation” or “co-pending litigation”);
- *Corrigent Corp. v. Cisco Systems, Inc.*, No. 6:22-cv-00396 (W.D. Tex.)
(EX1023) (“Cisco litigation”); and
- *Cisco Systems, Inc. v. Corrigent Corp.*, IPR2023-00447, Jan. 11, 2023
(EX1024) (“Cisco petition”).

E. Lead and Backup Counsel

Pursuant to 37 C.F.R. §§42.8(b)(3), 42.8(b)(4), and 42.10(a), Petitioner provides the following designation of counsel:

Lead Counsel	Back-up Counsel
Eliot D. Williams (Reg. No. 50,822) Baker Botts L.L.P. 700 K Street, N.W. Washington, D.C., 20001-5692 Tel: 202-639-1334 Eliot.Williams@BakerBotts.com	Kurt Pankratz (Reg. No. 46,977) Baker Botts L.L.P. 2001 Ross Avenue, Suite 900 Dallas, TX 75201-2980 Tel: 214-953-6500 Kurt.Pankratz@BakerBotts.com Jeremy J. Taylor (Reg. No. 73,912) Baker Botts L.L.P. 101 California Street, Suite 3200 San Francisco, CA 94111 Tel: 415-291-6200 Jeremy.Taylor@BakerBotts.com

Pursuant to 37 C.F.R. §42.10(b), a power of attorney accompanies this Petition.

F. Service Information

Service may be made at the addresses of the lead and back-up counsel above. Petitioner hereby consents to service via electronic mail at the email addresses provided for the lead and back-up counsel.

XIII. CONCLUSION

For the reasons above, Petitioner requests that the Board order an *inter partes* review trial for Claims 1-26, and that the Director cancel these claims as unpatentable.

Respectfully submitted,

Date: April 18, 2023

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CERTIFICATE OF WORD COUNT

Pursuant to 37 C.F.R. § 42.24, the undersigned attorney for the Petitioner, Arista Networks, Inc., declares that the argument § of this Petition has 13,996 words, according to the word count tool in Microsoft Word™.

/s/ Eliot D. William

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APPENDIX A – CLAIM LISTING

U.S. Patent No. 10,292,602

Claim or Element #	Claim Language
Claim 1	
[1.0]	A method for assigning and utilizing an Ethernet physical data port in an Ethernet Link Aggregation Group (LAG) in a Multi-Protocol Label Switching (MPLS) network, the method comprising the steps of:
[1.1]	assigning, by a first MPLS/LAG switch, a single physical tunnel port of a LAG to a network tunnel, wherein the single physical tunnel port of the LAG meets a bandwidth requirement of the network tunnel, and wherein said single physical tunnel port of the LAG has a port serial number;
[1.2]	dedicating a sub-set of bits in a data packet label prepared by the first MPLS/LAG switch to encode said port serial number of said single physical tunnel port of the LAG into the data packet label;
[1.3]	sending, by said first MPLS/LAG switch, the data packet label, in which said port serial number of said single physical tunnel port is encoded, to a preceding node;
[1.4]	receiving from the preceding node, by said first MPLS/LAG switch, a data packet comprising said data packet label, in which said port serial number of said single physical tunnel port is encoded; and
[1.5]	sending said data packet from said first MPLS/LAG switch to a second MSPLS/LAG switch via said single physical tunnel port having the port serial number encoded in the data packet label.
Claim 2	
	The method of claim 1, further comprising the step of receiving from a preceding node located upstream from said first MPLS/LAG switch, by said first MPLS/LAG switch, a request message requesting configuration of said network tunnel, the message further requesting said data packet label associated with said network tunnel.
Claim 3	
	The method of claim 2, wherein said request message comprises an RSVP-TE PATH message augmented with a LABEL_REQUEST object.

Claim or Element #	Claim Language
Claim 4	
	The method according to claim 3, wherein said request comprises an indication of a service property, and wherein said selecting comprises identifying a physical port in compliance with said service property.
Claim 5	
	The method according to claim 4, wherein said service property comprises at least one of: a guaranteed bandwidth; a peak bandwidth; and a class of service.
Claim 6	
	The method according to claim 1, wherein said selecting comprises selecting a single physical tunnel port having a maximum available bandwidth of said plurality of physical data ports.
Claim 7	
	The method according to claim 1, wherein said selecting comprises selecting a port having a minimum available bandwidth of said plurality of physical data ports which is not less than said bandwidth requirement of the network tunnel.
Claim 8	
	The method according to claim 1, wherein said switching said data packet is according to a mapping function.
Claim 9	
	The method according to claim 1, wherein said preparing comprises inserting into said data packet label a set of bits that identify said single physical tunnel port; and wherein said switching said data packet comprises extracting said set of bits to determine an identity of said single physical tunnel port.
Claim 10	
	The method according to claim 1, wherein said preparing comprises storing said data packet label along with an identifier of said single physical tunnel port in a memory, and wherein said switching said data packet comprises retrieving said identifier from said memory responsively to said data packet label
Claim 11	
	The method according to claim 1, further comprising the steps of: selecting a backup port from among the plurality of physical data ports, different from said single physical tunnel port; and

Claim or Element #	Claim Language
	responsively to a service interruption of said single physical tunnel port, switching said data packet to said backup port and sending said data packet to said second MPLS/LAG switch via said backup port.
Claim 12	
	The method according to claim 11, further comprising the step of responsive to a restoral of said service interruption of said single physical tunnel port, reverting switching of said data packet from said backup port and sending said data packet to said second MPLS/LAG switch via said single physical tunnel port.
Claim 13	
	The method according to claim 1, wherein said first MPLS/LAG switch comprises a Label Switched Router (LSR).
Claim 14	
	The method of claim 1, further comprising the step of designating by said first MPLS/LAG switch, the plurality of physical data ports in said first MPLS/LAG switch as a single logical port.
Claim 15	
[15.0]	An apparatus for assigning and utilizing an Ethernet physical data port in an Ethernet Link Aggregation Group (LAG) located downstream from a preceding node in a Multi-Protocol Label Switching (MPLS) network tunnel employing Resource Reservation Protocol Traffic Engineering (RSVP-TE) tunnel provisioning, the LAG having a first MPLS/LAG switch and a second MPLS/LAG switch, the apparatus comprising:
[15.1]	a processor, which is configured to:
[15.2]	assign a single physical tunnel port of a LAG to a network tunnel, wherein said single physical tunnel port meets a bandwidth requirement of the network tunnel, and wherein said single physical tunnel port has a port serial number;
[15.3]	dedicate a sub-set of bits in a data packet label to encode said port serial number of said single physical tunnel port of the LAG into the data packet label;
[15.4]	publish said packet label upstream; and
[15.5]	a mapper, which is configured to:
[15.6]	receive a data packet from an upstream node;
[15.7]	detect said data packet label in said data packet; and

Claim or Element #	Claim Language
[15.8]	if said data packet contains said data packet label, send said data packet to the second MPLS/LAG switch via said single physical tunnel port.
Claim 16	
	The apparatus according to claim 15, wherein the processor is configured to make said selection in compliance with a service property.
Claim 17	
	The apparatus according to claim 16, wherein said service property comprises at least one of the group consisting of a guaranteed bandwidth, a peak bandwidth, and a class of service.
Claim 18	
	The apparatus according to claim 17, wherein said processor is configured to make said selection of a port having a maximum available bandwidth of the plurality of ports.
Claim 19	
	The apparatus according to claim 17, wherein said processor is configured to make said selection of a port having a minimum available bandwidth of the plurality of ports which is not less than said bandwidth requirement of the network tunnel.
Claim 20	
	The apparatus according to claim 15, wherein said processor is configured to insert into said data packet label a set of bits which identify said single physical tunnel port; and wherein said mapper is configured to extract said set of bits to determine an identity of said single physical tunnel port.
Claim 21	
	The apparatus according to claim 15, further comprising a memory, and wherein said processor is configured to store said data packet label along with an identifier of said single physical tunnel port in said memory, and wherein said mapper is configured to retrieve said identifier from said memory responsively to said data packet label.
Claim 22	
	The apparatus according to claim 15, wherein said processor is further configured to select a backup port from among the plurality of physical data ports, different from said single physical tunnel

Claim or Element #	Claim Language
	port, and wherein said mapper is further configured, responsively to a service interruption of said single physical tunnel port, to direct the first MPLS/LAG switch to switch said data packet to said backup port, and send said data packet to the second MPLS/LAG switch via said backup port.
Claim 23	
	The apparatus according to claim 15, wherein said first MPLS/LAG switch comprises a Label Switched Router (LSR).
Claim 24	
	The apparatus according to claim 15, wherein said processor comprises a network processor.
Claim 25	
	The apparatus according to claim 15, wherein said plurality of physical data ports are selected from a single logical port.
Claim 26	
[26.0]	A method for assigning and utilizing an Ethernet physical data port in an Ethernet Link Aggregation Group (LAG) in a Multi-Protocol Label Switching (MPLS) network, the method comprising the steps of:
[26.1]	receiving from a preceding node located upstream from a first MPLS/LAG switch, at said first MPLS/LAG switch, a request message requesting configuration of a network tunnel, the message further requesting a data packet label associated with said network tunnel, said request message specifying a bandwidth requirement;
[26.2]	assigning, at the first MPLS/LAG switch, a single physical tunnel port of a LAG to the network tunnel wherein the single physical tunnel port of the LAG, which meets the specified bandwidth requirement, wherein said single physical tunnel port of said LAG has a port serial number;
[26.3]	dedicating a sub-set of bits in a data packet label prepared by said first MPLS/LAG switch to encode said port serial number of said single physical tunnel port of the LAG into the data packet label;
[26.4]	sending, by said first MPLS/LAG switch, said data packet label, in which said port serial number of said single physical tunnel port is encoded, to the preceding node;

Claim or Element #	Claim Language
[26.5]	receiving from the preceding node, at said first MPLS/LAG switch, a data packet that includes said data packet label, in which said port serial number of said single physical tunnel port is encoded; and
[26.6]	sending said data packet from said first MPLS/LAG switch to a second MSPLS/LAG switch via said single physical tunnel port having the port serial number encoded in the data packet label.

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Arista Networks, Inc.	§	Petition for Inter Partes Review
	§	U.S. Patent No. 10,292,602
Petitioner	§	
	§	
	§	

CERTIFICATE OF SERVICE

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

Date of service April 18, 2023

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