

**IN THE UNITED STATES DISTRICT COURT
FOR THE WESTERN DISTRICT OF TEXAS
WACO DIVISION**

CORRIGENT CORPORATION

Corrigent,

v.

CISCO SYSTEMS, INC.

Cisco.

Case No. 6:22-cv-00396-ADA

JURY TRIAL DEMANDED

CISCO'S PRELIMINARY INVALIDITY CONTENTIONS

CONTENTS

I.	INTRODUCTION	1
A.	Priority Date	2
B.	Claim Construction	3
C.	Ongoing Discovery and Supplementation	5
D.	Prior Art Identification and Citations Thereto	7
E.	No Patentable Weight.....	8
II.	INVALIDITY UNDER 35 U.S.C. §§ 102 AND 103.....	9
A.	State of the Art.....	10
1.	U.S. Patent No. 6,957,369.....	11
2.	U.S. Patent No. 7,113,485.....	13
3.	U.S. Patent No. 7,330,431.....	14
4.	U.S. Patent No. 7,593,400.....	15
5.	U.S. Patent No. 9,118,602.....	15
B.	Identification of Prior Art	16
1.	U.S. Patent No. 6,957,369.....	18
2.	U.S. Patent No. 7,113,485.....	20
3.	U.S. Patent No. 7,330,431.....	21
4.	U.S. Patent No. 7,593,400.....	23
5.	U.S. Patent No. 9,118,602.....	25
C.	Claim Charts.....	27
D.	Motivations to Combine Prior Art	28
1.	U.S. Patent No. 6,957,369.....	31
2.	U.S. Patent No. 7,113,485.....	43
3.	U.S. Patent No. 7,330,431.....	48
4.	U.S. Patent No. 7,593,400.....	56
5.	U.S. Patent No. 9,118,602.....	66
III.	INVALIDITY UNDER 35 U.S.C. § 112.....	80
A.	INVALIDITY UNDER 35 U.S.C. § 112, ¶ 1	81
1.	U.S. Patent No. 6,957,369.....	82
2.	U.S. Patent No. 7,113,485.....	82
3.	U.S. Patent No. 7,330,431.....	82
4.	U.S. Patent No. 7,593,400.....	83
5.	U.S. Patent No. 9,118,602.....	84
B.	INVALIDITY UNDER 35 U.S.C. § 112, ¶ 2	84
1.	U.S. Patent No. 6,957,369.....	85
2.	U.S. Patent No. 7,113,485.....	85
3.	U.S. Patent No. 7,330,431.....	86
4.	U.S. Patent No. 7,593,400.....	86
5.	U.S. Patent No. 9,118,602.....	88
IV.	INVALIDITY UNDER 35 U.S.C. § 101.....	88
1.	U.S. Patent No. 6,957,369.....	89
2.	U.S. Patent No. 7,113,485.....	90
3.	U.S. Patent No. 7,330,431.....	90

4.	U.S. Patent No. 7,593,400.....	91
5.	U.S. Patent No. 9,118,602.....	92
V.	ACCOMPANYING DOCUMENT PRODUCTION	93

Pursuant to the Court’s Scheduling Order (Case No. 6:22-cv-00369-ADA, D.I. 37), Cisco Systems, Inc. (“Cisco”) hereby provides its Preliminary Invalidity Contentions.

I. INTRODUCTION

On August 4, 2022, Corrigent Corporation (“Corrigent”) served its Preliminary Infringement Contentions (“Infringement Contentions”) and alleged the following claims:

- U.S. Patent No. 6,957,369 (“’369 patent”): Claims 1–26
- U.S. Patent No. 7,113,485 (“’485 patent”): Claims 1–20
- U.S. Patent No. 7,330,431 (“’431 patent”): Claims 1–30
- U.S. Patent No. 7,593,400 (“’400 patent”): Claims 1–20
- U.S. Patent No. 9,118,602 (“’602 patent”): Claims 1–26

(collectively, the “Asserted Patents” and the “Asserted Claims”). Cisco contends that certain of the Asserted Claims cover subject matter not eligible for patenting under 35 U.S.C. § 101, and that each of the Asserted Claims is invalid under at least 35 U.S.C. §§ 102, 103, and/or 112.¹

These Preliminary Invalidity Contentions address the claims identified in Corrigent’s Infringement Contentions. Cisco reserves the right to modify, amend, or supplement these Preliminary Invalidity Contentions to the extent the Court permits Corrigent to amend, supplement, or otherwise modify its Infringement Contentions, including by modifying the claims asserted.

In addition, Corrigent’s Preliminary Infringement Contentions are entirely deficient, and fail to provide allegations as to how the Accused Products infringe each and every claim limitation; rather, they simply parrot the claim language and then cite various documents—and in many

¹ Cisco applies the version of Sections 102, 103, and 112 in effect prior to the effective date of the America Invents Act (“AIA”) for the Asserted Patents.

circumstances, point to no evidence at all. Corrigent therefore has prejudiced Cisco's ability to understand, for purposes of preparing these Preliminary Invalidity Contentions, what Corrigent alleges to be the scope of the Asserted Claims. Cisco reserves the right to amend these Preliminary Invalidity Contentions if and when Corrigent provides proper infringement contentions as to each Asserted Claim.

A. Priority Date

These Preliminary Contentions are based on the earliest priority dates as identified by Corrigent in its Preliminary Infringement Contentions. In its Preliminary Infringement Contentions and Final Infringement Contentions, Corrigent did not produce any documents evidencing conception and reduction to practice. Nothing in these Preliminary Invalidity Contentions shall be understood as an agreement that any Asserted Patent is entitled to claim priority to the dates identified by Corrigent, or to any continuation-in-part, provisional, or foreign priority document. Cisco reserves the right to amend these Preliminary Invalidity Contentions and identify additional prior art references if Corrigent is permitted by the Court to later assert an earlier priority date, or is permitted by the Court to later produce documents purporting to evidence earlier conception and reduction to practice.

Any reference to an "asserted priority date" in these Preliminary Invalidity Contentions refers to the priority dates identified in Corrigent's Infringement Contentions. Reference to a "priority date" or an "asserted priority date" should not be construed to mean that Cisco agrees that any of the Asserted Patents are in fact entitled to such priority date, or that Corrigent has provided proper notice as to its contentions for a priority date.² To the extent Corrigent alleges

² Cisco reserves the right to rely on additional documents, evidence, and expert testimony, including, without limitation, the documents cited in Corrigent's Infringement Contentions, in the
(*Cont'd on next page*)

that any prior art relied on in these Preliminary Invalidity Contentions does not actually qualify as prior art to an Asserted Patent, Cisco reserves the right to rebut those allegations (e.g., by demonstrating an earlier critical date for the challenged prior art and/or a later priority date for a particular Asserted Patent and/or Asserted Claim).³ Likewise, to the extent Corrigent successfully establishes an invention date before any of the prior art references relied on by Cisco, then those references serve as evidence of secondary considerations of obviousness, particularly, contemporaneous invention by others.

Asserted Patent	Asserted Priority Date
'369 Patent	May 30, 2002
'485 Patent	September 4, 2001
'431 Patent	September 3, 2004
'400 Patent	May 19, 2006
'602 Patent	May 6, 2005

B. Claim Construction

Cisco's Preliminary Invalidity Contentions are based on (1) Cisco's present understanding of the Asserted Claims, and (2) the claim constructions Corrigent appears to be using based on the Preliminary Infringement Contentions, all without regard to whether Cisco agrees with Corrigent's apparent or expressed claim constructions. Cisco reserves the right to supplement or otherwise amend these Preliminary Invalidity Contentions in response to any court-ordered clarifications on claim constructions, any report from any expert witness for Corrigent regarding the scope of the

event that Corrigent fails to establish that any Asserted Claim of any Asserted Patent is entitled to its Asserted Priority Date.

³ Cisco reserves the right to rely on additional documents and evidence to rebut any efforts by Corrigent to allege any reference was not publicly available or otherwise available as prior art.

claims, any briefing filed by Corrigent relating to the scope of the claims, and any position taken by Corrigent concerning claim scope, infringement, or invalidity.

Cisco takes no position on any matter of claim construction in these Preliminary Invalidity Contentions, including whether any particular claim element should be construed according to 35 U.S.C. § 112, ¶ 6. If Cisco's disclosures herein are consistent with any explicit, apparent, or implied claim constructions in Corrigent's Infringement Contentions, no inference is intended and no inference should be drawn that Cisco agrees with any of Corrigent's claim constructions. Any statement herein describing or tending to describe any claim element is provided solely for the purpose of understanding and/or applying the cited prior art. In addition, to the extent that these Preliminary Invalidity Contentions rely on or otherwise embody a particular order in which the steps of method claims are performed, Cisco do not necessarily propose that the method claims must be limited to such order, although Cisco may later propose such an order.

Nothing herein should be read to suggest that Cisco agrees that any particular claim term is sufficiently definite, enabled or supported by the written description to meet the requirements of 35 U.S.C. § 112. Likewise, nothing herein should be read to suggest that Cisco agrees that the preamble of any claim is or is not limiting.

Because any positions taken in these disclosures are based on the claim scope apparently asserted by Corrigent in its Preliminary Infringement Contentions, with which Cisco may disagree, Cisco may take positions with respect to claim construction issues that are inconsistent with, or even contradictory to, positions expressed or implied in these Preliminary Invalidity Contentions.

Prior art not included in these Preliminary Invalidity Contentions, whether or not now known to Cisco, might become relevant depending on the claim constructions proposed by Cisco and/or the Court's claim construction rulings. Cisco reserves all rights to supplement or modify

the positions and information in these Preliminary Invalidity Contentions, including, without limitation, the prior art and grounds of invalidity set forth herein, after the Court has construed any term of the Asserted Claims.

C. Ongoing Discovery and Supplementation

Cisco bases these Preliminary Invalidity Contentions on its current knowledge and understanding of the Asserted Patents, Corrigent's Preliminary Infringement Contentions, and other facts and information available as of the date of these contentions. Cisco's investigation into prior art—including prior art identified in these disclosures, third-party prior art (including system art and related evidence), documents, and knowledgeable witnesses—is ongoing.⁴ Furthermore, pursuant to the Court's Order Governing Proceedings, discovery does not begin until after the *Markman* hearing. Cisco anticipates seeking and obtaining discovery, including third-party discovery, that further evidences and supports the invalidity of the Asserted Claims. Thus, Cisco expects to present additional information and evidence in support of its Preliminary Invalidity Contentions, and to revise, amend, and/or supplement these Preliminary Invalidity Contentions accordingly in a manner consistent with the Federal Rules of Civil Procedure and the Court's rules and applicable orders.

Furthermore, Cisco is investigating and pursuing information from additional sources of discovery that may bear on prior art and other invalidity bases, and may serve discovery requests

⁴ Cisco's future efforts include but are not limited to: serving subpoenas on prior artists and inventors regarding prior art, seeking additional information related to the references and systems disclosed in these Invalidity Contentions, and seeking additional information related to available prior art systems, as well as Corrigent's Preliminary Infringement Contentions and the products accused of infringing therein. No depositions have been taken as of this time, including, without limitation, depositions of any inventors, authors, or entities listed on any references or systems identified in these Invalidity Contentions. Further, Cisco reserves the right to review and supplement these Preliminary Invalidity Contentions with respect to any additional prior art that becomes apparent as discovery proceeds.

on those sources if necessary. Cisco reserves the right to revise, amend, and/or supplement these Preliminary Invalidity Contentions with any relevant information obtained from those additional sources.

Cisco further reserves the right to rely on statements or admissions from those owing a duty of candor, such as named inventors, prosecution counsel, and others involved in the prosecution of the patent applications or related applications, concerning the scope of the prior art relevant to the Asserted Patents found in, *inter alia*, the following: the respective prosecution histories of the Asserted Patents and related patent applications; any deposition testimony of the named inventors; and the papers filed and any evidence submitted by Corrigent in connection with this litigation.

Cisco reserves the right to modify and/or supplement these Preliminary Invalidity Contentions with an explanation of why the Asserted Claims are invalid under 35 U.S.C. § 102(f)-(g) in the event Cisco obtains additional evidence that the named inventors did not invent (either alone or in conjunction with others) the subject matter claimed or that the claimed subject matter was invented by others. Should Cisco obtain such evidence, they will provide the name of the person(s) from whom and the circumstances under which the invention or any part of it was derived or the name of the person(s) that invented such subject matter and the circumstances of such invention.

Prior art not identified in this disclosure, whether known or not known to Cisco, may become relevant, including prior art concerning the state of the art at the time of invention, as well as simultaneous or near-simultaneous independent invention by others. For instance, Cisco currently is unaware of the extent, if any, to which Corrigent will contend that limitations of the Asserted Claims are not disclosed in the prior art identified by Cisco. To the extent that such an

issue arises, Cisco reserves the right to identify other references that would disclose, practice, or render obvious the allegedly missing limitation(s) of the disclosed subject matter.

D. Prior Art Identification and Citations Thereto

In these Preliminary Invalidity Contentions, Cisco identifies specific portions of prior art references that disclose the elements of the Asserted Claims. While Cisco has identified exemplary prior art references for each element, they do not necessarily identify every disclosure of the same element in each prior art reference. A person of ordinary skill in the art would read a prior art reference as a whole and in the context of other publications, literature, and general knowledge in the field and would rely upon other information including other publications and general scientific or engineering knowledge. Cisco therefore reserves the right to rely upon other unidentified portions of the prior art references and on other publications and prior art products and expert testimony to provide context and to aid understanding and interpretation of the identified portions of the prior art.

Cisco also reserves the right to rely upon (1) other portions of the cited prior art references, other publications, prior art products, and the testimony of experts to establish that the alleged inventions would have been obvious to a person of ordinary skill in the art, including on the basis of modifying or combining certain cited references; (2) admissions relating to prior art in the Asserted Patents or related patents, the prosecution history of the Asserted Patents or related patents, or other admissions obtained during discovery; (3) foreign counterparts of any U.S. patents identified in Cisco's Preliminary Invalidity Contentions; and (4) any prior art references, other publications, prior art products, and the testimony of experts to establish that the alleged inventions would have been obvious to a person of ordinary skill in the art used during any reexamination, *inter partes* review, post-grant review, or any other proceeding at the Patent Office involving the

Asserted Patents. Where a prior art reference includes citations to other references, those other references are considered incorporated by reference for context.

The references discussed in the claim charts may disclose the elements of the Asserted Claims explicitly and/or inherently, and/or they may be relied upon to show the state of the art in the relevant time frame. The suggested obviousness combinations are provided in the alternative to Cisco's anticipation contentions and are not to be construed to suggest that any reference included in the combinations is not by itself anticipatory.

Where Cisco identifies in the claim charts a particular figure in a prior art reference, the identification should be understood to encompass the caption and description of the figure as well as any text relating to the figure in the specification and prosecution history in addition to the figure itself. Similarly, where an identified portion of text refers to a figure or other material, the identification should be understood to include the referenced figure or other material as well.

E. No Patentable Weight

Cisco reserves the right to argue that various portions of the Asserted Claims, such as an intended use or result, non-functional descriptive material, and certain preamble language, are entitled to no patentable weight. Mapping of a portion of an Asserted Claim to a prior art reference does not represent that such portion of the claim is entitled to patentable weight when comparing the claimed subject matter to the prior art.

* * *

Nothing herein should be read to suggest that Cisco agrees that any particular claim term is sufficiently definite, enabled or supported by the written description to meet the requirements of 35 U.S.C. § 112. In addition, nothing herein admits in any way that any of Cisco's accused products or services infringe any of the Asserted Claims. Cisco reserves the right to amend and supplement these Preliminary Invalidity Contentions, including in response to any amendments

to, and revisions of, Corrigent's Infringement Contentions or application of the Asserted Claims. Cisco further reserves the right to supplement its corresponding document production should they later find additional, responsive documents.

II. INVALIDITY UNDER 35 U.S.C. §§ 102 AND 103

Cisco contends that the Asserted Claims are invalid as anticipated by the prior art under 35 U.S.C. § 102 and/or as obvious in view of the prior art, the knowledge of a person having ordinary skill in the art, and/or secondary factors of obviousness under 35 U.S.C. § 103.

The obviousness combinations of references provided in Cisco's invalidity claim charts under 35 U.S.C. § 103 are exemplary and are not intended to be exhaustive. In particular, Cisco is currently unaware of the extent, if any, to which Corrigent will contend that limitations of the Asserted Claims are not disclosed in the art identified by Cisco as anticipatory. To the extent an issue arises with any such limitation, Cisco will identify other obviousness combinations and/or other references that would have made obvious the addition of the allegedly missing limitation to the disclosed device, system, or method of operation.

Pursuant to the Order Governing Proceedings, discovery does not begin until after the *Markman* Hearing. Cisco's prior art investigation and third-party discovery is therefore not yet complete. Cisco reserves the right to present additional items of prior art under 35 U.S.C. § 102 and/or 35 U.S.C. § 103 located during the course of discovery or further investigation. For example, Cisco expects to issue subpoenas to third parties believed to have knowledge, documentation, and/or corroborating evidence concerning some of the prior art listed below and/or additional prior art. These third parties include without limitation the authors, inventors, or assignees of the references listed in these disclosures. In addition, Cisco reserves the right to assert invalidity under other subsections of 35 U.S.C. § 102 to the extent that discovery or further investigation yields information forming the basis for such invalidity.

A patentee bears the burden of production with respect to evidence of secondary considerations of non-obviousness. *ZUP, LLC v. Nash Mfg., Inc.*, 896 F.3d 1365, 1373 (Fed. Cir. 2018). As of the date of these Preliminary Invalidity Contentions, Corrigent has not identified any evidence of secondary considerations, nor does Corrigent offer any evidence or explanation to support its allegations. As shown in these Preliminary Invalidity Contentions, other companies and individuals described, built, and/or patented the exact same concepts in the Asserted Patents before Corrigent ever did—often many years before. Even where others’ invention(s) occurred around the same time as the Asserted Patents, such simultaneous invention demonstrates the obviousness of the Asserted Patents.

Potentially relevant evidence includes any prior art reference cited herein that was publicly known or available before or around the alleged inventions claimed in the Asserted Patents. This also includes any prior art asserted in these Preliminary Invalidity Contentions that Corrigent is able to pre-date based on its asserted priority dates by proving, *inter alia*, corroborated conception and diligent reduction to practice.

Cisco reserves all rights to further respond to any secondary considerations of nonobviousness raised by Corrigent, including by updating, modifying, and/or adding to these Preliminary Invalidity Contentions. Cisco is not aware of any unexpected results (none is mentioned in the Asserted Patents or their file histories), long-felt need, commercial success (or any nexus to any allegedly successful commercial embodiment), or awards for the alleged inventions of the Asserted Patents.

A. State of the Art

The subject matter of the Asserted Claims was well understood to those of skill in the art as of the respective priority dates of the Asserted Patents. To describe the state of the art at the time of the alleged inventions, in addition to the references listed on the face of the Asserted Patents

and those references listed in Section B and charted in Exhibits A-1 to E-7, Cisco may rely on at least the references listed below and any admitted prior art discussed in the Asserted Patent and file histories:

1. U.S. Patent No. 6,957,369

- Deering, S., “Host extensions for IP multicasting”, STD 5, RFC 1112, DOI 10.17487/RFC1112, August 1989, <<https://www.rfc-editor.org/info/rfc1112>> (“RFC 1112”)
- JP 2003/304264 to Nakamura (“Nakamura”)
- Kessler, G., “A Primer On Internet and TCP/IP Tools”, STD 5, RFC 1739, December 1994, <<https://datatracker.ietf.org/doc/html/rfc1739/>> (“Kessler”)
- KR 100279930 to Lee (“Lee”)
- KR 100310241 to Han (“Han”)
- PCT Publication WO 01/93499 to Fainguelernt (“Fainguelernt”)
- Postel, J., “Internet Control Message Protocol”, STD 5, RFC 792, DOI 10.17487/RFC0792, September 1981, <https://www.rfc-editor.org/info/rfc792> (“RFC 792”)
- KR20000005711 to Hyung-cheol (“Hyung-cheol”)
- U.S. Patent No. 6,499,061 to Benayoun et al. (“Benayoun”)
- U.S. H1,860 to Asthana et al. (“Asthana”)
- U.S. Patent No. 4,074,352 to Cook et al. (“Cook”)
- U.S. Patent No. 4,149,038 to Pitroda et al. (“Pitroda”)
- U.S. Patent No. 4,393,491 to Ashlock et al. (“Ashlock”)
- U.S. Patent No. 4,510,594 to Johnson, Jr. (“Johnson, Jr.”)
- U.S. Patent No. 4,685,102 to Lewis (“Lewis”)
- U.S. Patent No. 4,881,230 to Clark (“Clark”)
- U.S. Patent No. 4,970,726 to Carn et al. (“Carn”)

- U.S. Patent No. 5,132,635 to Kennedy (“Kennedy”)
- U.S. Patent No. 5,187,705 to Mano (“Mano”)
- U.S. Patent No. 5,327,435 to Warchol (“Warchol”)
- U.S. Patent No. 5,321,393 to Carlton et al. (“Carlton”)
- U.S. Patent No. 5,420,985 to Cantrell et al. (“Cantrell”)
- U.S. Patent No. 5,541,862 to Bright et al. (“Bright”)
- U.S. Patent No. 5,453,992 to Whetsel (“Whetsel”)
- U.S. Patent No. 5,574,730 to End, III et al. (“End, III”)
- U.S. Patent No. 5,627,842 to Brown et al. (“Brown”)
- U.S. Patent No. 5,710,760 to Moll (“Moll”)
- U.S. Patent No. 5,841,788 to Ke (“Ke”)
- U.S. Patent No. 5,938,899 to Leavitt et al. (“Leavitt”)
- U.S. Patent No. 6,028,845 to Serikawa et al. (“Serikawa”)
- U.S. Patent No. 6,052,362 to Somer et al. (“Somer”)
- U.S. Patent No. 6,122,756 to Baxter et al. (“Baxter”)
- U.S. Patent No. 6,233,073 to Bowers et al. (“Bowers”)
- U.S. Patent No. 6,275,864 to Mancusi et al. (“Mancusi”)
- U.S. Patent No. 6,308,282 to Huang et al. (“Huang”)
- U.S. Patent No. 6,366,556 to Ballintine et al. (“Ballintine”)
- U.S. Patent No. 6,385,739 to Barton et al. (“Barton”)
- U.S. Patent No. 6,456,587 to Taniguchi (“Taniguchi”)
- U.S. Patent No. 6,516,442 to Wang et al. (“Wang”)
- U.S. Patent No. 6,782,336 to Shah (“Shah”)
- U.S. Patent No. 7,079,555 to Baydar et al. (“Baydar”)

- U.S. Patent No. 8,411,576 to Takasaki (“Takasaki”)
- U.S. Patent Publication No. 2001/0019553 to Orsatti (“Orsatti”)
- U.S. Patent Publication No. 2002/0107952 to Mancusi et al. (“Mancusi II”)
- U.S. Patent Publication No. 2004/0208501 to Saunders et al. (“Saunders”)

2. **U.S. Patent No. 7,113,485**

- Postel, J., “Internet Control Message Protocol: STD 5, RFC 792, DOI 10.17487/RFC0792, September 1981, <https://www.rfc-editor.org/info/rfc792> (“RFC 792”)
- NetBIOS Working Group in the Defense Advanced Research Projects Agency, Internet Activities Board, and End-to-End Services Task Force, “Protocol standard for a NetBIOS service on a TCP/UDP transport: Detailed specifications”, STD 19, RFC 1002, DOI 10.17487/RFC1002, March 1987, <https://www.rfc-editor.org/info/rfc1002> (“RFC 1002”)
- Dommety, G., “Key and Sequence Number Extensions to GRE”, RFC 2890, DOI 10.17487/RFC2890, September 2000, <https://www.rfc-editor.org/info/rfc2890> (“RFC 2890”)
- WO01/61409 (“Kryskow”)
- U.S. Patent No. 4,703,477 (“Adelmann”)
- U.S. Patent No. 6,868,094 (“Bordonaro”)
- U.S. Patent No. 5,442,623 (“Wu”)
- U.S. Patent No. 6,226,111 (“Chang”)
- U.S. Patent No. 5,903,371 (“Arecco”)
- U.S. Patent No. 6,728,207 (“Askingier”)
- U.S. Patent No. 5,179,548 (“Sandesara”)
- U.S. Patent No. 5,923,646 (“Mandhyan”)
- U.S. Patent No. 5,742,905 (“Pepe”)
- U.S. Patent No. 5,481,538 (“Yang”)
- U.S. Patent No. 5,235,593 (“Grow”)

- Andrew S. Tanenbaum, Computer Networks, Third Edition (1996)
- Vern Paxson, End-to-End Internet Packet Dynamics, IEEE/ACM Transactions on Networking, Vol. 7, No. 3 (June 1999)

3. **U.S. Patent No. 7,330,431**

- Houh, Henry H., “Designing Networks for Tomorrow’s Traffic,” Thesis for the degree of Doctor of Philosophy at the Massachusetts Institute of Technology, February 1998 (“Houh”)
- Margalit, N., “Star versus ring topologies in metropolitan area network applications,” Lightwave (Sept. 1, 1999), <https://www.lightwaveonline.com/network-design/article/16648659/star-versus-ring-topologies-in-metropolitannetwork-applications> (“Margalit”)
- U.S. Patent App. Pub. No. 2002/0103924 (“Nomura”)
- U.S. Patent App. Pub. No. 2002/0118646 (“Saint Etienne”)
- U.S. Patent App. Pub. No. 2003/0128706 (“Mark”)
- U.S. Patent App. Pub. No. 2003/0147400 (“Devi 400”)
- U.S. Patent App. Pub. No. 2004/0095946 (“Baker 946”)
- U.S. Patent App. Pub. No. 2004/0174884 (“Wright 884”)
- U.S. Patent App. Pub. No. 2004/0193724 (“Dziong”)
- U.S. Patent Appl. Pub. No. 2007/0038753 (“Jorgensen”)
- U.S. Patent No. 5,583,860 (“Iwakawa”)
- U.S. Patent No. 5,768,271 (“Seid”)
- U.S. Patent No. 6,104,699 (“Holender”)
- U.S. Patent No. 6,331,986 (“Mitra”)
- U.S. Patent No. 6,430,150 (“Azuma”)
- U.S. Patent No. 6,757,247 (“Zheng”)
- U.S. Patent No. 6,976,087 (“Westfall”)
- U.S. Patent No. 7,155,120 (“Ofek”)

- U.S. Patent No. 7,173,936 (“Semaan”)
- U.S. Patent No. 7,269,177 (“Baker 177”)
- U.S. Patent No. 7,308,198 (“Chudak”)
- U.S. Patent No. 7,382,801 (“Wright 801”)
- U.S. Patent No. 7,450,598 (“Chen”)
- U.S. Patent No. 7,675,926 (“Olsen”)
- U.S. Patent No. 7,953,888 (“Ricciulli”)

4. U.S. Patent No. 7,593,400

- U.S. Patent No. 7,616,653 to Droux et al. (“Droux”)
- U.S. Patent No. 7,539,750 to Parker et al. (“Parker”)

5. U.S. Patent No. 9,118,602

- Awduche, D., Berger, L., Gan, D., Li, T., Srinivasan, V., and G. Swallow, “RSVP-TE: Extensions to RSVP for LSP Tunnels”, RFC 3209, DOI 10.17487/RFC3209, December 2001, <https://www.rfc-editor.org/info/rfc3209> (“RFC 3209”)
- Braden, R., Ed., Zhang, L., Berson, S., Herzog, S., and S. Jamin, “Resource ReSerVation Protocol (RSVP) -- Version 1 Functional Specification”, RFC 2205, DOI 10.17487/RFC2205, September 1997, <https://www.rfc-editor.org/info/rfc2205> (“RFC 2205”)
- “IEEE Standard for Information Technology - Local and Metropolitan Area Networks - Part 3: Carrier Sense Multiple Access with Collision Detection (CSMA/CD) Access Method and Physical Layer Specifications-Aggregation of Multiple Link Segments,” in IEEE Std 802.3ad-2000, vol., no., pp.1-184, 28 June 2000, doi: 10.1109/IEEESTD.2000.91610 (“IEEE Standard”)
- Kireeti Kompella, “Internet Draft: Link Bundling in MPLS Traffic Engineering” Dec. 2004, Internet Engineering Task Force, <tools.ietf.org/id/draft-ietf-mpls-bundle-06.txt> (“Kompella”)
- Retana, A., White, R., Fuller, V., and D. McPherson, “Using 31-Bit Prefixes on IPv4 Point-to-Point Links”, RFC 3021, DOI 10.17487/RFC3021, December 2000, <https://www.rfc-editor.org/info/rfc3021> (“RFC 3021”).

- Rosen, E., Viswanathan, A., and R. Callon, “Multiprotocol Label Switching Architecture”, RFC 3031, DOI 10.17487/RFC3031, January 2001, <https://www.rfc-editor.org/info/rfc3031> (“RFC 3031”)
- U.S. Patent No. 6,977,932 to Hauck (“Hauk”)
- U.S. Patent No. 7,260,097 to Casey (“Casey”)
- U.S. Patent No. 7,277,386 to Ferguson et al. (“Ferguson”)
- U.S. Patent No. 7,203,762 to Yamada et al. (“Yamada”)
- U.S. Patent No. 7,466,697 to Raz et al. (“Raz”)
- U.S. Patent No. 7,477,657 to Murphy et al. (“Murphy”)
- U.S. Patent No. 7,519,056 to Ishwar et al. (“Ishwar”)
- U.S. Patent No. 7,606,235 to Ayyangar et al. (“Ayyangar”)
- U.S. Patent No. 7,974,284 to Chen et al. (“Chen”)
- U.S. Patent No. 7,983,286 to Rekhter (“Rekhter”)
- U.S. Patent No. 8,005,096 to Hardy et al. (“Hardy”)
- U.S. Patent No. 8,312,145 to Rabie et al. (“Rabie”)
- U.S. Patent No. 8,693,323 to McDysan (“McDysan”)
- U.S. Patent Publication No. 2002/101868 to Clear et al. (“Clear”)
- U.S. Patent Publication No. 2003/0152024 to Yang et al. (“Yang”)
- U.S. Patent Publication No. 2003/0020976 to Krishnaswamy et al (“Krishnaswamy”)
- U.S. Patent Publication No. 2003/0174706 to Shankar et al. (“Shankar”)
- U.S. Patent Publication No. 2004/0107285 to Larson et al. (“Larson”)

B. Identification of Prior Art

Cisco identifies the following prior art now known to Cisco that anticipates or renders obvious one or more of the Asserted Claims. Each of the following patents, publications, systems, and products is prior art under at least one or more of 35 U.S.C. § 102(a), (b), (e), (f), or (g) (pre-

AIA) or § 102(a) (post-AIA), as applicable. Cisco's reliance on each prior art reference identified throughout these Preliminary Invalidity Contentions includes the reference itself, anything incorporated by the reference, and any testimony by those with knowledge of the reference, such as named authors and inventors. On information and belief, each listed document or item became prior art at least as early as the dates specified.

To the extent any limitation of any of the Asserted Claims is construed to have a similar meaning, or to encompass similar feature(s) and/or function(s), with any other claim limitation, and to the extent at least one claim chart in Exhibits A-1 to E-7 hereto identifies any prior art reference as disclosing or teaching such similarly construed claim limitation, such identified prior art reference and Cisco's contentions with respect to same are incorporated by reference. Priority dates identified for the prior art references are based on information currently available to Cisco, and Cisco will amend this disclosure to the extent additional information becomes available.

To the extent that they are prior art, Cisco reserves the right to rely upon (1) foreign counterparts of the U.S. Patents identified in Cisco's Preliminary Invalidity Contentions, (2) U.S. counterparts of foreign patents and foreign patent applications identified in Cisco's Preliminary Invalidity Contentions, and (3) U.S. and foreign patents and patent applications corresponding to articles and publications identified in Cisco's Preliminary Invalidity Contentions.

The prior art identified below is exemplary; the claimed features are similarly described or disclosed in additional prior art. Thus, Cisco reserves the right to rely on other evidence of the prior art beyond the example references identified, including the prior art identified in Section III.A.

The primary references identified below, and as further described in Exhibits A-1 to E-7, each discloses, either expressly or inherently, every element of the Asserted Claims, thereby

anticipating those claims. To the extent Corrigent contends that any primary reference does not anticipate the Asserted Claims, it would have been obvious to combine or modify the primary references with concepts from other prior art, as explained herein and in Appendices A-E.

In particular, for each limitation of the Asserted Claims that Corrigent contends is not met by a particular primary reference, Cisco contends that the limitation (and claim as a whole) is obvious based on a combination of that particular primary reference with (1) any other primary reference disclosing that limitation, (2) any admitted prior art, as explained in the background of each patent or discussed in the file history, (3) any reference identified in Appendices A-E as disclosing that limitation, and/or (4) the knowledge of a person of ordinary skill in the art and/or any of the references and concepts discussed herein regarding the relevant background and state of the art. The specific combinations of prior art that Cisco contends render the Asserted Claims obvious are readily determinable as described herein, which is the most efficient manner of identifying the combinations in light of the fact that Corrigent has asserted 122 claims across five patents. Cisco's obviousness grounds for each dependent claim incorporate the obviousness grounds for the claim(s) from which the dependent claim depends in addition to any obviousness grounds identified in the charts for the dependent claim.

Cisco does not yet have the benefit of Corrigent's positions on the prior art, including what (if any) elements it contends are missing in each prior art reference, whether Corrigent agrees that a reference is in fact prior art, and whether Corrigent agrees that a person of ordinary skill in the art would be motivated to combine specific references. Cisco reserves the right to supplement these obviousness positions (including identifying additional prior art combinations and the associated reasons to combine) as discovery in the case progresses, including expert discovery.

1. U.S. Patent No. 6,957,369

• **Prior Art Patents / Patent Publications**

- KR 100279930 to Lee (“Lee”)
- U.S. H1,860 to Asthana et al. (“Asthana”)
- U.S. Patent No. 4,074,352 to Cook et al. (“Cook”)
- U.S. Patent No. 4,149,038 to Pitroda et al. (“Pitroda”)
- U.S. Patent No. 4,393,491 to Ashlock et al. (“Ashlock”)
- U.S. Patent No. 4,510,594 to Johnson, Jr. (“Johnson, Jr.”)
- U.S. Patent No. 4,881,230 to Clark (“Clark”)
- U.S. Patent No. 5,710,760 to Moll (“Moll”)
- U.S. Patent No. 6,052,362 to Somer (“Somer”)
- **Prior Invention Under § 102(g)**

For any of the prior art that Cisco has identified, Cisco may argue that the authors or inventors of that prior art invented the subject matter claimed in the ’369 patent prior to the filing date of the ’369 patent. Discovery has not started and Cisco will supplement as discovery begins.

- **Obviousness and Secondary References**

Cisco identifies each of the references listed above as primary references that render this patent anticipated, or at least obvious in view of the knowledge of a person of ordinary skill in the art. In addition, these primary references may be combined with each other or with the secondary references listed below to render this patent obvious under 35 U.S.C. § 103. One of ordinary skill in the art would be motivated to combine these references as explained in Section III.D:

- U.S. Patent No. 4,685,102 to Lewis (“Lewis”)
- U.S. Patent No. 5,321,393 to Carlton et al. (“Carlton”)
- Postel, J., “Internet Control Message Protocol”, STD 5, RFC 792, DOI 10.17487/RFC0792, September 1981, <https://www.rfc-editor.org/info/rfc792> (“RFC 792”).

- Deering, S., “Host extensions for IP multicasting”, STD 5, RFC 1112, DOI 10.17487/RFC1112, August 1989, <https://www.rfc-editor.org/info/rfc1112> (“RFC 1112”).
- Kessler, G., "A Primer On Internet and TCP/IP Tools", STD 5, RFC 1739, December 1994, <<https://datatracker.ietf.org/doc/html/rfc1739>>.

2. **U.S. Patent No. 7,113,485**

• **Prior Art Patents / Patent Publications**

- U.S. Patent No. 5,450,394 (“Gruber”)
- U.S. Patent No. 6,012,096 (“Link”)
- U.S. Patent No. 6,052,726 (“Fontenot”)
- U.S. Patent No. 6,212,171 (“LaFollette”)
- U.S. Patent No. 6,363,053 (“Schuster”)
- U.S. Patent No. 6,366,563 (“Weldon”)
- U.S. Patent No. 6,445,681 (“Pogrebinsky”)
- U.S. Patent No. 6,545,979 (“Poulin”)
- U.S. Patent No. 6,711,137 (“Klassen”)
- U.S. Patent No. 6,717,917 (“Weissberger”)
- U.S. Patent No. 6,975,656 (“Madhavapeddi”)
- U.S. Patent No. 7,154,858 (“Zhang”)
- U.S. Patent No. 7,212,490 (“Kao”)
- U.S. Patent Application Publication No. 2003/0016627 (“MeLampy”)

• **Prior Art Systems**

Cisco identifies the following systems—including constituent software, hardware, methods, and processes—as prior art that anticipate or render obvious the Asserted Claims of this

patent. Each system (1) was known or used in this country before the alleged invention of the claimed subject matter of the patent-in-suit; (2) was in public use and/or on sale in this country more than one year before the filing date of the application for the patent-in-suit; and/or (3) was invented and not abandoned, suppressed, or concealed prior to the alleged invention of the patent-in-suit. Discovery is ongoing and Cisco will supplement as discovery continues.

- **Prior Invention Under § 102(g)**

For any of the prior art that Cisco has identified, Cisco may argue that the authors or inventors of that prior art invented the subject matter claimed in the '485 patent prior to the filing date of the '485 patent. Discovery is ongoing and Cisco will supplement as discovery continues.

- **Obviousness and Secondary References**

Cisco identifies each of the references listed above as primary references that render this patent anticipated, or at least obvious in view of the knowledge of a person of ordinary skill in the art. In addition, these primary references may be combined with each other or with the secondary references listed below to render this patent obvious under 35 U.S.C. § 103. One of ordinary skill in the art would be motivated to combine these references as explained in Section III.D:

- Postel, J., "Internet Control Message Protocol", STD 5, RFC 792, DOI 10.17487/RFC0792, September 1981, <https://www.rfc-editor.org/info/rfc792> ("RFC 792")
- U.S. Patent No. 5,701,302 ("Geiger")
- U.S. Patent No. 6,252,891 ("Perches")

3. U.S. Patent No. 7,330,431

- **Prior Art Patents / Patent Publications**

- U.S. Patent App. Pub. No. 2002/0118646 ("Saint Etienne")
- U.S. Patent App. Pub. No. 2003/0147400 ("Devi 400")

- U.S. Patent App. Pub. No. 2004/0095946 (“Baker 946”)
- U.S. Patent App. Pub. No. 2004/0174884 (“Wright 884”)
- U.S. Patent App. Pub. No. 2004/0193724 (“Dziong”)
- U.S. Patent No. 5,768,271 (“Seid”)
- U.S. Patent No. 6,104,699 (“Holender”)
- U.S. Patent No. 6,331,986 (“Mitra”)
- U.S. Patent No. 6,757,247 (“Zheng”)
- U.S. Patent No. 6,976,087 (“Westfall”)
- U.S. Patent No. 7,173,936 (“Semaan”)
- U.S. Patent No. 7,269,177 (“Baker 177”)
- U.S. Patent No. 7,382,801 (“Wright 801”)

- **Prior Art Systems**

Cisco identifies the following systems—including constituent software, hardware, methods, and processes—as prior art that anticipate or render obvious the Asserted Claims of this patent. Each system (1) was known or used in this country before the alleged invention of the claimed subject matter of the patent-in-suit; (2) was in public use and/or on sale in this country more than one year before the filing date of the application for the patent-in-suit; and/or (3) was invented and not abandoned, suppressed, or concealed prior to the alleged invention of the patent-in-suit. Discovery is ongoing and Cisco will supplement as discovery continues.

- **Prior Invention Under § 102(g)**

For any of the prior art that Cisco has identified, Cisco may argue that the authors or inventors of that prior art invented the subject matter claimed in the ’431 patent prior to the filing date of the ’431 patent. Discovery is ongoing and Cisco will supplement as discovery continues.

- **Obviousness and Secondary References**

Cisco identifies each of the references listed above as primary references that render this patent anticipated, or at least obvious in view of the knowledge of a person of ordinary skill in the art. In addition, these primary references may be combined with each other or with the secondary references listed below to render this patent obvious under 35 U.S.C. § 103. One of ordinary skill in the art would be motivated to combine these references as explained in Section III.D:

- Margalit, N., “Star versus ring topologies in metropolitan area network applications,” Lightwave (Sept. 1, 1999), <https://www.lightwaveonline.com/network-design/article/16648659/star-versus-ring-topologies-in-metropolitannetwork-applications> (“Margalit”)
- U.S. Patent App. Pub. No. 2002/0103924 (“Nomura”)
- U.S. Patent App. Pub. No. 2003/0128706 (“Mark”)
- U.S. Patent No. 5,583,860 (“Iwakawa”)
- U.S. Patent No. 6,430,150 (“Azuma”)
- U.S. Patent No. 7,155,120 (“Ofek”)
- U.S. Patent No. 7,308,198 (“Chudak”)

4. U.S. Patent No. 7,593,400

- **Prior Art Patents / Patent Publications**

- U.S. Patent Pub. No. 2005/0198371 to Smith et al. (“Smith”)
- U.S. Patent Pub. No. 2005/0163115 to Dontu et al. (“Dontu”)
- JP2005/086668 to Ishimori et al. (“Ishimori”)
- U.S. Patent No. 7,877,483 to Finn (“Finn”)
- U.S. Patent No. 6,735,198 to Edsall et al. (“Edsall”)
- U.S. Patent No. 7,483,999 to Weyman (“Weyman”)

- **Prior Art Systems**

Cisco identifies the following systems—including constituent software, hardware, methods, and processes—as prior art that anticipate or render obvious the Asserted Claims of this patent. Each system (1) was known or used in this country before the alleged invention of the claimed subject matter of the patent-in-suit; (2) was in public use and/or on sale in this country more than one year before the filing date of the application for the patent-in-suit; and/or (3) was invented and not abandoned, suppressed, or concealed prior to the alleged invention of the patent-in-suit. Cisco reserves the right to rely on the below systems themselves as prior art, as well as any of the references describing these systems individually or in any combination, as well as testimony from any inventor or developer of these systems. Discovery is ongoing and Cisco will supplement as discovery continues.

- Cisco Catalyst 6000 Series
- Cisco Catalyst 6500 Series
- Cisco GSR Router Family
- Cisco CSR Router Family
- Cisco ONS 15454 ML Series Ethernet Line Cards

- **Prior Invention Under § 102(g)**

For any of the prior art that Cisco has identified, Cisco may argue that the authors or inventors of that prior art invented the subject matter claimed in the '400 patent prior to the filing date of the '400 patent. Discovery is ongoing and Cisco will supplement as discovery continues.

- **Obviousness and Secondary References**

Cisco identifies each of the references listed above as primary references that render this patent anticipated, or at least obvious in view of the knowledge of a person of ordinary skill in the

art. In addition, these primary references may be combined with each other or with the secondary references listed below to render this patent obvious under 35 U.S.C. § 103. One of ordinary skill in the art would be motivated to combine these references as explained in Section III.D:

- U.S. Patent Pub. No. 2006/0109802 to Zelig et al. (“Zelig”)
- U.S. Patent No. 7,120,834 to Bishara (“Bishara”)
- U.S. Patent Pub. No. 2003/0147387 to Devi et al. (“Devi 1”)
- U.S. Patent Pub. No. 2005/0286537 to Shimada (“Shimada”)
- U.S. Patent No. 7,551,616 to Devi (“Devi 2”)
- U.S. Patent No. 6,829,651 to Bass et al. (“Bass”)
- U.S. Patent No. 7,778,250 to Pang et al. (“Pang”)
- U.S. Patent No. 7,715,310 to Sajassi et al. (“Sajassi”)
- U.S. Patent No. 7,619,966 to Lee (“Lee”)
- U.S. Patent Pub. No. 2003/0208631 to Matters et al. (“Matters”)

5. U.S. Patent No. 9,118,602

• **Prior Art Patents / Patent Publications**

- U.S. Patent No. 6,977,932 to Hauk (“Hauk”)
- U.S. Patent No. 7,277,386 to Ferguson et al. (“Ferguson”)
- U.S. Patent No. 7,447,657 to Murphy et al. (“Murphy”)
- U.S. Patent No. 7,466,657 to Raz (“Raz”)
- U.S. Patent No. 7,519,056 to Ishwar et al. (“Ishwar”)
- U.S. Patent No. 7,606,235 to Ayyanger et al. (“Ayyanger”)
- U.S. Patent No. 8,005,096 to Hardy et al. (“Hardy”)

• **Prior Art Publications**

- Awduche, D., Berger, L., Gan, D., Li, T., Srinivasan, V., and G. Swallow, "RSVP-TE: Extensions to RSVP for LSP Tunnels", RFC 3209, DOI 10.17487/RFC3209, December 2001, <https://www.rfc-editor.org/info/rfc3209> ("RFC 3209")
- Braden, R., Ed., Zhang, L., Berson, S., Herzog, S., and S. Jamin, "Resource ReSerVation Protocol (RSVP) -- Version 1 Functional Specification", RFC 2205, DOI 10.17487/RFC2205, September 1997, <https://www.rfc-editor.org/info/rfc2205> ("RFC 2205")
- Kireeti Kompella, "Internet Draft: Link Bundling in MPLS Traffic Engineering" Dec. 2004, Internet Engineering Task Force, <tools.ietf.org/id/draft-ietf-mpls-bundle-06.txt> ("Kompella")
- Retana, A., White, R., Fuller, V., and D. McPherson, "Using 31-Bit Prefixes on IPv4 Point-to-Point Links", RFC 3021, DOI 10.17487/RFC3021, December 2000, <https://www.rfc-editor.org/info/rfc3021> "RFC 3021")
- Rosen, E., Viswanathan, A., and R. Callon, "Multiprotocol Label Switching Architecture", RFC 3031, DOI 10.17487/RFC3031, January 2001, <https://www.rfc-editor.org/info/rfc3031> ("RFC 3031")
- "IEEE Standard for Information Technology - Local and Metropolitan Area Networks - Part 3: Carrier Sense Multiple Access with Collision Detection (CSMA/CD) Access Method and Physical Layer Specifications-Aggregation of Multiple Link Segments," in IEEE Std 802.3ad-2000, vol., no., pp.1-184, 28 June 2000, doi: 10.1109/IEEESTD.2000.91610 ("IEEE Standard")

- **Prior Art Systems**

Cisco identifies the following systems—including constituent software, hardware, methods, and processes—as prior art that anticipate or render obvious the Asserted Claims of this patent. Each system (1) was known or used in this country before the alleged invention of the claimed subject matter of the patent-in-suit; (2) was in public use and/or on sale in this country more than one year before the filing date of the application for the patent-in-suit; and/or (3) was invented and not abandoned, suppressed, or concealed prior to the alleged invention of the patent-in-suit. Discovery is ongoing and Cisco will supplement as discovery continues.

- **Prior Invention Under § 102(g)**

For any of the prior art that Cisco has identified, Cisco may argue that the authors or inventors of that prior art invented the subject matter claimed in the '144 patent prior to the filing date of the '144 patent. Discovery is ongoing and Cisco will supplement as discovery continues.

- **Obviousness and Secondary References**

Cisco identifies each of the references listed above as primary references that render this patent anticipated, or at least obvious in view of the knowledge of a person of ordinary skill in the art. In addition, these primary references may be combined with each other or with the secondary references listed below to render this patent obvious under 35 U.S.C. § 103. One of ordinary skill in the art would be motivated to combine these references as explained in Section III.D:

- U.S. Patent No. 6,499,061 to Benayoun et al. (“Benayoun”)
- U.S. Patent No. 7,203,762 to Yamada et al. (“Yamada”)
- U.S. Patent Publication No. 2002/101868 to Clear et al. (“Clear”)
- U.S. Patent Publication No. 2003/0152024 to Yang et al. (“Yang”)

C. Claim Charts

Charts specifically identifying where each element of each Asserted Claim is found in the prior art, either expressly or inherently, are found in Exhibits A-1–E-7. However, this prior art is exemplary; the claimed features are similarly described or disclosed in other prior art.

In the claim charts included in this disclosure, Cisco identifies specific portions of prior art references that disclose or render obvious the elements of the Asserted Claims. Although Cisco has identified at least one citation per element, each and every disclosure of the same element in a given reference is not necessarily identified. That Cisco did not identify each similar disclosure should not be construed as a concession by Cisco that such disclosure is not relevant. It should be recognized that a person of ordinary skill in the art would generally read a prior art reference as a whole and in the context of other publications, literature, and general knowledge in the field. To

understand and interpret any specific statement or disclosure in a prior art reference, a person of ordinary skill in the art would rely upon other information including other publications and general scientific or engineering knowledge.

Where Cisco identifies a particular figure in a prior art reference, the identification should be understood to encompass the caption and description of the figure as well as any text relating to the figure in the specification and prosecution history in addition to the figure itself. Similarly, where an identified portion of text refers to a figure or other material, the identification should be understood to include the referenced figure or other material as well.

Certain pieces of identified prior art disclose features of the Asserted Claims inherently. Cisco may rely on any evidence, including expert testimony, to establish the inherency of certain features of the prior art to invalidate the Asserted Claims.

D. Motivations to Combine Prior Art

Cisco believes that no showing of a specific motivation to combine prior art is required to combine the references disclosed in the attached charts; there was a reason to make each combination, each combination of art would have produced no unexpected results, and each combination at most would simply represent a known alternative to one of ordinary skill in the art. *See KSR Int'l Co. v. Teleflex, Inc.*, 550 U.S. 398, 414–18 (2007) (rejecting the Federal Circuit’s “rigid” application of the teaching, suggestion, or motivation to combine test instead espousing an “expansive and flexible” approach). Indeed, the Supreme Court held that a person of ordinary skill in the art is “a person of ordinary creativity, not an automaton” and “in many cases a person of ordinary skill in the art will be able to fit the teachings of multiple patents together like a pieces of a puzzle.” *Id.* at 420–21.

In view of *KSR*, the PTO issued a set of new Examination Guidelines. *See* Examination Guidelines for Determining Obviousness Under 35 U.S.C. § 103 in View of the Supreme Court

Decision in *KSR International Co. v. Teleflex Inc.*, 72 Fed. Reg. 57,526 (Oct. 10, 2007). Those Guidelines identified various rationales for finding a claim obvious, including:

- a) Combining prior art elements according to known methods to yield predictable results;
- b) Simple substitution of one known element for another to obtain predictable results;
- c) Use of known technique to improve similar devices (methods, or products) in the same way;
- d) Applying a known technique to a known device (method, or product) ready for improvement to yield predictable results;
- e) “Obvious to try”—choosing from a finite number of identified, predictable solutions, with a reasonable expectation of success;
- f) Known work in one field of endeavor may prompt variations of it for use in either the same field or a different one based on design incentives or other market forces if the variations would have been predictable to one of ordinary skill in the art;
- g) Some teaching, suggestion, or motivation in the prior art that would have led one of ordinary skill to modify the prior art reference or to combine prior art reference teachings to arrive at the claimed invention.

Id. at 57,529.

In addition, the motivation to combine or modify prior art references is significantly stronger when, as here, the references seek to solve the same problem, come from the same field, and correspond well. *In re Inland Steel Co.*, 265 F.3d 1354, 1362 (Fed. Cir. 2001) (allowing two references to be combined as invalidating art under similar circumstances where the art “focus[ed] on the same problem . . . [,] c[a]me from the same field of art [and] . . . the identified problem found in the two references correspond[ed] well”).

Cisco has identified several exemplary motivations and reasons to combine the various references cited herein, and those motivations would have been supported, in part, by a reasonable expectation of success. The various teachings, suggestions, and/or reasons to modify any of the references and/or to combine any two or more of the references in Exhibits A-1 to E-7 come from

various sources, including the prior art (specific and as a whole), common knowledge, common sense, predictability, expectations, industry trends, design incentives or need, market demand or pressure, market forces, the nature of the problem faced, and/or the knowledge possessed by one of ordinary skill in the art. In addition, it would have been obvious to try combining the prior art references identified above.

These exemplary combinations demonstrate that there were only a finite number of predictable solutions to known problems addressed by the Asserted Patents. Furthermore, known work in one field or endeavor prompted variations based on predictable design incentives and/or market forces either in the same field or a different one. The combination of features found in the prior art references identified in these contentions would have been obvious because the claimed combinations represent the known potential options, with each such option having a reasonable expectation of success. Additionally, one of ordinary skill in the art would have been motivated to create combinations identified in these contentions using: known methods to yield predictable results; known techniques in the same way; a simple substitution of one known, equivalent element for another to obtain predictable results; and/or teaching, suggestion, or motivation in the prior art generally. Also, market forces in the industry, and the desire to improve features and performance, would motivate the addition of features to systems as they become available, become less expensive, become more commonly used, provide better performance and reliability, reduce costs, or predictably achieve other clearly desirable results.

To the extent Corrigent alleges that any other claimed limitation or limitations are not disclosed in any primary reference, it would have been obvious to combine the teachings of the reference with the background knowledge of a person of ordinary skill in the art and/or it would have been obvious to incorporate the missing limitation(s), including as disclosed in Exhibits A-1

to E-7, into the primary reference for the reasons disclosed herein. For example, one of ordinary skill in the art would have found substantial motivation to combine one or more of the primary references with one more of each other or the secondary references in order to disclose the alleged inventions recited in the Asserted Claims. Each of the references disclosed herein as invalidating an Asserted Patent was directed at the same or similar field of technology and the same or similar problem as that Asserted Patent. To the extent Corrigent alleges that any particular claim limitation is alleged to not be disclosed or inherent in the charted references, it would have been obvious to combine the charted reference with one or more of the references identified herein for the particular claim limitations. Also, as Cisco is currently unaware of the extent, if any, to which Corrigent will contend that limitations of the Asserted Claims are not disclosed in the art identified herein as anticipatory, Cisco reserves the right to identify other references and combinations that may render an allegedly missing limitation obvious. In addition, if and to the extent that Corrigent challenges the relevance of any of these references with respect to particular limitations of the Asserted Claims of the Asserted Patents, Cisco reserves its right to identify further motivation to combine particular references with additional particularity.

1. U.S. Patent No. 6,957,369

• Background State of the Art

The background state of the art includes that which is set forth in the patent, the file history, and the prior art references disclosed herein. For example, the '369 patent refers to backplane configurations being well-known prior to the patent. '369 patent, 1:25-26. The '369 patent further explains that it was well-known to use a backplane to connect a main module with subsidiary modules. *Id.* at 1:26-36. The '369 patent also explains that main and subsidiary modules had processors which could be used for self-test. *Id.* Further, the '369 patent explains that functionalities such as serializer/deserializer (SERDES) interfaces, and Simple Network

Management Protocol (SNMP) were known in the art. According to the patent, other techniques to self-test backplane-based equipment like dedicated self-test circuits and test vectors were known in the art. *Id.* at 1:37-46.

- **Exemplary Motivation to Combine**

Cisco has identified several exemplary motivations and reasons to combine the various references cited herein. For any reference for which there is a claim element that does not have a corresponding citation in that reference, it would be obvious to combine with the knowledge or a person of skill and/or any other reference in the primary or secondary charts for which there is a citation for that element. These combinations would have been obvious to try given that there were a finite number of identified, predictable solutions in the prior art, and there would have been a reasonable expectation of success to simply implement one prior art solution with concepts from prior art in the same field.

- For the Asserted Claims of the '369 patent, to the extent the references charted in any of Exhibits A-1 to A-9 do not disclose “an electronic system that includes a main module and at least first and second subsidiary modules, each of said at least first and second subsidiary modules connected to the main module by one or more lines for carrying data, at least some of which lines are sometimes idle, the main module including a switch having ports connected to the lines, a method for self-testing the system,” it would have been obvious to combine any of these charted references with any of the other charted references or those detailed in Appendix A, including at least Lewis, Carlton, RFC 792, and RFC 1739. A person of skill in the art would be motivated to combine these references because they each disclose computer networking systems. It is the nature of the computer networking companies to monitor developments in competing products and combine relevant features and functionalities. Furthermore, because networking systems need to interact with third party devices, many features and functionalities were standardized by different standard organizations, e.g., IEEE. For example, a person of skill in the art would look to RFC 792 and RFC 1739 in order to comply with industry standards. A person of skill would have been motivated to look at how other products and systems routed network traffic and mimic that behavior or at least be able to interoperate with those products. These combinations would have also been obvious to try given that there were a finite number of identified, predictable solutions in the prior art, and there would have been a reasonable expectation of success to simply implement one prior art solution with concepts from prior art in the same field. Moreover, these combinations would have been the result of applying known

techniques to a known method—that was ready for improvement—to yield predictable results.

- For the Asserted Claims of the '369 patent, to the extent the references charted in any of Exhibits A-1 to A-9 do not disclose “selecting a first idle line among idle lines connecting the first subsidiary module to a first port of the switch on the main module to serve as an aid line,” an electronic system that includes a main module and at least first and second subsidiary modules, each of said at least first and second subsidiary modules connected to the main module by one or more lines for carrying data, at least some of which lines are sometimes idle, the main module including a switch having ports connected to the lines, a method for self-testing the system,” it would have been obvious to combine any of these charted references with any of the other charted references or those detailed in Appendix A, including at least Lewis, Carlton, RFC 792, and RFC 1739. A person of skill in the art would be motivated to combine these references because they each disclose computer networking systems. It is the nature of the computer networking companies to monitor developments in competing products and combine relevant features and functionalities. Furthermore, because networking systems need to interact with third party devices, many features and functionalities were standardized by different standard organizations, e.g., IEEE. For example, a person of skill in the art would look to RFC 792 and RFC 1739 in order to comply with industry standards. A person of skill would have been motivated to look at how other products and systems routed network traffic and mimic that behavior or at least be able to interoperate with those products. These combinations would have also been obvious to try given that there were a finite number of identified, predictable solutions in the prior art, and there would have been a reasonable expectation of success to simply implement one prior art solution with concepts from prior art in the same field. Moreover, these combinations would have been the result of applying known techniques to a known method—that was ready for improvement—to yield predictable results.
- For the Asserted Claims of the '369 patent, to the extent the references charted in any of Exhibits A-1 to A-9 do not disclose “instructing the first subsidiary module to loop back traffic reaching the first subsidiary module via the aid line,” it would have been obvious to combine any of these charted references with any of the other charted references or those detailed in Appendix A, including at least Lewis, Carlton, RFC 792, and RFC 1739. A person of skill in the art would be motivated to combine these references because they each disclose computer networking systems. It is the nature of the computer networking companies to monitor developments in competing products and combine relevant features and functionalities. Furthermore, because networking systems need to interact with third party devices, many features and functionalities were standardized by different standard organizations, e.g., IEEE. For example, a person of skill in the art would look to RFC 792 and RFC 1739 in order to comply with industry standards. A person of skill would have been motivated to look at how other products and systems routed network traffic and mimic that behavior or at least be able to interoperate with those products. These combinations would have also been obvious to try given that there were a finite number of identified, predictable solutions in the prior art, and there would have been a reasonable expectation of success to simply implement one prior art solution with concepts from prior art in the same field. Moreover, these combinations would have been the result of applying known

techniques to a known method—that was ready for improvement—to yield predictable results.

- For the Asserted Claims of the '369 patent, to the extent the references charted in any of Exhibits A-1 to A-9 do not disclose “selecting for testing a second idle line among the idle lines connecting the second subsidiary module to a second port of the switch on the main module,” it would have been obvious to combine any of these charted references with any of the other charted references or those detailed in Appendix A, including at least Lewis, Carlton, RFC 792, and RFC 1739. A person of skill in the art would be motivated to combine these references because they each disclose computer networking systems. It is the nature of the computer networking companies to monitor developments in competing products and combine relevant features and functionalities. Furthermore, because networking systems need to interact with third party devices, many features and functionalities were standardized by different standard organizations, e.g., IEEE. For example, a person of skill in the art would look to RFC 792 and RFC 1739 in order to comply with industry standards. A person of skill would have been motivated to look at how other products and systems routed network traffic and mimic that behavior or at least be able to interoperate with those products. These combinations would have also been obvious to try given that there were a finite number of identified, predictable solutions in the prior art, and there would have been a reasonable expectation of success to simply implement one prior art solution with concepts from prior art in the same field. Moreover, these combinations would have been the result of applying known techniques to a known method—that was ready for improvement—to yield predictable results.
- For the Asserted Claims of the '369 patent, to the extent the references charted in any of Exhibits A-1 to A-9 do not disclose “configuring the switch to link the first and second ports,” it would have been obvious to combine any of these charted references with any of the other charted references or those detailed in Appendix A, including at least Lewis, Carlton, RFC 792, and RFC 1739. A person of skill in the art would be motivated to combine these references because they each disclose computer networking systems. It is the nature of the computer networking companies to monitor developments in competing products and combine relevant features and functionalities. Furthermore, because networking systems need to interact with third party devices, many features and functionalities were standardized by different standard organizations, e.g., IEEE. For example, a person of skill in the art would look to RFC 792 and RFC 1739 in order to comply with industry standards. A person of skill would have been motivated to look at how other products and systems routed network traffic and mimic that behavior or at least be able to interoperate with those products. These combinations would have also been obvious to try given that there were a finite number of identified, predictable solutions in the prior art, and there would have been a reasonable expectation of success to simply implement one prior art solution with concepts from prior art in the same field. Moreover, these combinations would have been the result of applying known techniques to a known method—that was ready for improvement—to yield predictable results.
- For the Asserted Claims of the '369 patent, to the extent the references charted in any of Exhibits A-1 to A-9 do not disclose “transmitting test traffic over the second idle line from the second subsidiary module to the main module, wherein 20 the test traffic is conveyed

via the switch to the aid line connecting to the first subsidiary module,” it would have been obvious to combine any of these charted references with any of the other charted references or those detailed in Appendix A, including at least Lewis, Carlton, RFC 792, and RFC 1739. A person of skill in the art would be motivated to combine these references because they each disclose computer networking systems. It is the nature of the computer networking companies to monitor developments in competing products and combine relevant features and functionalities. Furthermore, because networking systems need to interact with third party devices, many features and functionalities were standardized by different standard organizations, e.g., IEEE. For example, a person of skill in the art would look to RFC 792 and RFC 1739 in order to comply with industry standards. A person of skill would have been motivated to look at how other products and systems routed network traffic and mimic that behavior or at least be able to interoperate with those products. These combinations would have also been obvious to try given that there were a finite number of identified, predictable solutions in the prior art, and there would have been a reasonable expectation of success to simply implement one prior art solution with concepts from prior art in the same field. Moreover, these combinations would have been the result of applying known techniques to a known method—that was ready for improvement—to yield predictable results.

- For the Asserted Claims of the '369 patent, to the extent the references charted in any of Exhibits A-1 to A-9 do not disclose “reporting that a failure has occurred if the test traffic does not return to the second subsidiary module within a predetermined period of time,” it would have been obvious to combine any of these charted references with any of the other charted references or those detailed in Appendix A, including at least Lewis, Carlton, RFC 792, and RFC 1739. A person of skill in the art would be motivated to combine these references because they each disclose computer networking systems. It is the nature of the computer networking companies to monitor developments in competing products and combine relevant features and functionalities. Furthermore, because networking systems need to interact with third party devices, many features and functionalities were standardized by different standard organizations, e.g., IEEE. For example, a person of skill in the art would look to RFC 792 and RFC 1739 in order to comply with industry standards. A person of skill would have been motivated to look at how other products and systems routed network traffic and mimic that behavior or at least be able to interoperate with those products. These combinations would have also been obvious to try given that there were a finite number of identified, predictable solutions in the prior art, and there would have been a reasonable expectation of success to simply implement one prior art solution with concepts from prior art in the same field. Moreover, these combinations would have been the result of applying known techniques to a known method—that was ready for improvement—to yield predictable results.
- For the Asserted Claims of the '369 patent, to the extent the references charted in any of Exhibits A-1 to A-9 do not disclose “instructing the first subsidiary module comprises configuring the first subsidiary module to loop back the traffic to the main module substantially without processing data comprised in the test traffic,” it would have been obvious to combine any of these charted references with any of the other charted references or those detailed in Appendix A, including at least Lewis, Carlton, RFC 792, and RFC 1739. A person of skill in the art would be motivated to combine these references because

they each disclose computer networking systems. It is the nature of the computer networking companies to monitor developments in competing products and combine relevant features and functionalities. Furthermore, because networking systems need to interact with third party devices, many features and functionalities were standardized by different standard organizations, e.g., IEEE. For example, a person of skill in the art would look to RFC 792 and RFC 1739 in order to comply with industry standards. A person of skill would have been motivated to look at how other products and systems routed network traffic and mimic that behavior or at least be able to interoperate with those products. These combinations would have also been obvious to try given that there were a finite number of identified, predictable solutions in the prior art, and there would have been a reasonable expectation of success to simply implement one prior art solution with concepts from prior art in the same field. Moreover, these combinations would have been the result of applying known techniques to a known method—that was ready for improvement—to yield predictable results.

- For the Asserted Claims of the '369 patent, to the extent the references charted in any of Exhibits A-1 to A-9 do not disclose “the first and second subsidiary modules are configured to transmit and receive data in different, respective first and second formats, and wherein the test traffic transmitted from the second subsidiary module and looped back by the first subsidiary module is in the second format,” it would have been obvious to combine any of these charted references with any of the other charted references or those detailed in Appendix A, including at least Lewis, Carlton, RFC 792, and RFC 1739. A person of skill in the art would be motivated to combine these references because they each disclose computer networking systems. It is the nature of the computer networking companies to monitor developments in competing products and combine relevant features and functionalities. Furthermore, because networking systems need to interact with third party devices, many features and functionalities were standardized by different standard organizations, e.g., IEEE. For example, a person of skill in the art would look to RFC 792 and RFC 1739 in order to comply with industry standards. A person of skill would have been motivated to look at how other products and systems routed network traffic and mimic that behavior or at least be able to interoperate with those products. These combinations would have also been obvious to try given that there were a finite number of identified, predictable solutions in the prior art, and there would have been a reasonable expectation of success to simply implement one prior art solution with concepts from prior art in the same field. Moreover, these combinations would have been the result of applying known techniques to a known method—that was ready for improvement—to yield predictable results.
- For the Asserted Claims of the '369 patent, to the extent the references charted in any of Exhibits A-1 to A-9 do not disclose “selecting one or more further idle lines for testing among the idle lines in the system, wherein the further idle lines connect to further ports of the switch on the main module; and repeating the configuring the switch, transmitting the test traffic, and reporting that the failure has occurred with respect to the further idle lines until all the idle lines have been tested,” it would have been obvious to combine any of these charted references with any of the other charted references or those detailed in Appendix A, including at least Lewis, Carlton, RFC 792, and RFC 1739. A person of skill in the art would be motivated to combine these references because they each disclose

computer networking systems. It is the nature of the computer networking companies to monitor developments in competing products and combine relevant features and functionalities. Furthermore, because networking systems need to interact with third party devices, many features and functionalities were standardized by different standard organizations, e.g., IEEE. For example, a person of skill in the art would look to RFC 792 and RFC 1739 in order to comply with industry standards. A person of skill would have been motivated to look at how other products and systems routed network traffic and mimic that behavior or at least be able to interoperate with those products. These combinations would have also been obvious to try given that there were a finite number of identified, predictable solutions in the prior art, and there would have been a reasonable expectation of success to simply implement one prior art solution with concepts from prior art in the same field. Moreover, these combinations would have been the result of applying known techniques to a known method—that was ready for improvement—to yield predictable results.

- For the Asserted Claims of the '369 patent, to the extent the references charted in any of Exhibits A-1 to A-9 do not disclose “the main module and said at least first and second subsidiary modules comprise cards, which are plugged into a backplane, and wherein the lines comprise traces on the backplane,” it would have been obvious to combine any of these charted references with any of the other charted references or those detailed in Appendix A, including at least Lewis, Carlton, RFC 792, and RFC 1739. A person of skill in the art would be motivated to combine these references because they each disclose computer networking systems. It is the nature of the computer networking companies to monitor developments in competing products and combine relevant features and functionalities. Furthermore, because networking systems need to interact with third party devices, many features and functionalities were standardized by different standard organizations, e.g., IEEE. For example, a person of skill in the art would look to RFC 792 and RFC 1739 in order to comply with industry standards. A person of skill would have been motivated to look at how other products and systems routed network traffic and mimic that behavior or at least be able to interoperate with those products. These combinations would have also been obvious to try given that there were a finite number of identified, predictable solutions in the prior art, and there would have been a reasonable expectation of success to simply implement one prior art solution with concepts from prior art in the same field. Moreover, these combinations would have been the result of applying known techniques to a known method—that was ready for improvement—to yield predictable results.
- For the Asserted Claims of the '369 patent, to the extent the references charted in any of Exhibits A-1 to A-9 do not disclose “sending the message comprises transmitting a synchronization packet from the first line card via a switching core of the network node to at least the second line card,” it would have been obvious to combine any of these charted references with any of the other charted references or those detailed in Appendix A, including at least Lewis, Carlton, RFC 792, and RFC 1739. A person of skill in the art would be motivated to combine these references because they each disclose computer networking systems. It is the nature of the computer networking companies to monitor developments in competing products and combine relevant features and functionalities. Furthermore, because networking systems need to interact with third party devices, many

features and functionalities were standardized by different standard organizations, e.g., IEEE. For example, a person of skill in the art would look to RFC 792 and RFC 1739 in order to comply with industry standards. A person of skill would have been motivated to look at how other products and systems routed network traffic and mimic that behavior or at least be able to interoperate with those products. These combinations would have also been obvious to try given that there were a finite number of identified, predictable solutions in the prior art, and there would have been a reasonable expectation of success to simply implement one prior art solution with concepts from prior art in the same field. Moreover, these combinations would have been the result of applying known techniques to a known method—that was ready for improvement—to yield predictable results.

- For the Asserted Claims of the '369 patent, to the extent the references charted in any of Exhibits A-1 to A-9 do not disclose “wherein transmitting the test traffic comprises testing the second idle line while continuing to use the lines that are not idle for carrying the data to the network communication trunk,” it would have been obvious to combine any of these charted references with any of the other charted references or those detailed in Appendix A, including at least Lewis, Carlton, RFC 792, and RFC 1739. A person of skill in the art would be motivated to combine these references because they each disclose computer networking systems. It is the nature of the computer networking companies to monitor developments in competing products and combine relevant features and functionalities. Furthermore, because networking systems need to interact with third party devices, many features and functionalities were standardized by different standard organizations, e.g., IEEE. For example, a person of skill in the art would look to RFC 792 and RFC 1739 in order to comply with industry standards. A person of skill would have been motivated to look at how other products and systems routed network traffic and mimic that behavior or at least be able to interoperate with those products. These combinations would have also been obvious to try given that there were a finite number of identified, predictable solutions in the prior art, and there would have been a reasonable expectation of success to simply implement one prior art solution with concepts from prior art in the same field. Moreover, these combinations would have been the result of applying known techniques to a known method—that was ready for improvement—to yield predictable results.
- For the Asserted Claims of the '369 patent, to the extent the references charted in any of Exhibits A-1 to A-9 do not disclose “modular electronic apparatus,” it would have been obvious to combine any of these charted references with any of the other charted references or those detailed in Appendix A, including at least Lewis, Carlton, RFC 792, and RFC 1739. A person of skill in the art would be motivated to combine these references because they each disclose computer networking systems. It is the nature of the computer networking companies to monitor developments in competing products and combine relevant features and functionalities. Furthermore, because networking systems need to interact with third party devices, many features and functionalities were standardized by different standard organizations, e.g., IEEE. For example, a person of skill in the art would look to RFC 792 and RFC 1739 in order to comply with industry standards. A person of skill would have been motivated to look at how other products and systems routed network traffic and mimic that behavior or at least be able to interoperate with those products. These combinations would have also been obvious to try given that there were a finite number of identified, predictable solutions in the prior art, and there would have been a reasonable

expectation of success to simply implement one prior art solution with concepts from prior art in the same field. Moreover, these combinations would have been the result of applying known techniques to a known method—that was ready for improvement—to yield predictable results.

- For the Asserted Claims of the '369 patent, to the extent the references charted in any of Exhibits A-1 to A-9 do not disclose “a backplane, which comprises traces for carrying data between modules that are plugged into the backplane,” it would have been obvious to combine any of these charted references with any of the other charted references or those detailed in Appendix A, including at least Lewis, Carlton, RFC 792, and RFC 1739. A person of skill in the art would be motivated to combine these references because they each disclose computer networking systems. It is the nature of the computer networking companies to monitor developments in competing products and combine relevant features and functionalities. Furthermore, because networking systems need to interact with third party devices, many features and functionalities were standardized by different standard organizations, e.g., IEEE. For example, a person of skill in the art would look to RFC 792 and RFC 1739 in order to comply with industry standards. A person of skill would have been motivated to look at how other products and systems routed network traffic and mimic that behavior or at least be able to interoperate with those products. These combinations would have also been obvious to try given that there were a finite number of identified, predictable solutions in the prior art, and there would have been a reasonable expectation of success to simply implement one prior art solution with concepts from prior art in the same field. Moreover, these combinations would have been the result of applying known techniques to a known method—that was ready for improvement—to yield predictable results.
- For the Asserted Claims of the '369 patent, to the extent the references charted in any of Exhibits A-1 to A-9 do not disclose “a main module, plugged into the backplane, the main module comprising a switch having ports for connection to the traces of the backplane,” it would have been obvious to combine any of these charted references with any of the other charted references or those detailed in Appendix A, including at least Lewis, Carlton, RFC 792, and RFC 1739. A person of skill in the art would be motivated to combine these references because they each disclose computer networking systems. It is the nature of the computer networking companies to monitor developments in competing products and combine relevant features and functionalities. Furthermore, because networking systems need to interact with third party devices, many features and functionalities were standardized by different standard organizations, e.g., IEEE. For example, a person of skill in the art would look to RFC 792 and RFC 1739 in order to comply with industry standards. A person of skill would have been motivated to look at how other products and systems routed network traffic and mimic that behavior or at least be able to interoperate with those products. These combinations would have also been obvious to try given that there were a finite number of identified, predictable solutions in the prior art, and there would have been a reasonable expectation of success to simply implement one prior art solution with concepts from prior art in the same field. Moreover, these combinations would have been the result of applying known techniques to a known method—that was ready for improvement—to yield predictable results.

- For the Asserted Claims of the '369 patent, to the extent the references charted in any of Exhibits A-1 to A-9 do not disclose “at least first and second subsidiary modules, plugged into the backplane so as to be connected to the main module by the traces, at least some of which traces are sometimes idle,” it would have been obvious to combine any of these charted references with any of the other charted references or those detailed in Appendix A, including at least Lewis, Carlton, RFC 792, and RFC 1739. A person of skill in the art would be motivated to combine these references because they each disclose computer networking systems. It is the nature of the computer networking companies to monitor developments in competing products and combine relevant features and functionalities. Furthermore, because networking systems need to interact with third party devices, many features and functionalities were standardized by different standard organizations, e.g., IEEE. For example, a person of skill in the art would look to RFC 792 and RFC 1739 in order to comply with industry standards. A person of skill would have been motivated to look at how other products and systems routed network traffic and mimic that behavior or at least be able to interoperate with those products. These combinations would have also been obvious to try given that there were a finite number of identified, predictable solutions in the prior art, and there would have been a reasonable expectation of success to simply implement one prior art solution with concepts from prior art in the same field. Moreover, these combinations would have been the result of applying known techniques to a known method—that was ready for improvement—to yield predictable results.
- For the Asserted Claims of the '369 patent, to the extent the references charted in any of Exhibits A-1 to A-9 do not disclose “a system control processor, which is operative to select a first idle trace among idle traces connecting the first subsidiary module to a first port of the switch on the main module to serve as an aid trace,” it would have been obvious to combine any of these charted references with any of the other charted references or those detailed in Appendix A, including at least Lewis, Carlton, RFC 792, and RFC 1739. A person of skill in the art would be motivated to combine these references because they each disclose computer networking systems. It is the nature of the computer networking companies to monitor developments in competing products and combine relevant features and functionalities. Furthermore, because networking systems need to interact with third party devices, many features and functionalities were standardized by different standard organizations, e.g., IEEE. For example, a person of skill in the art would look to RFC 792 and RFC 1739 in order to comply with industry standards. A person of skill would have been motivated to look at how other products and systems routed network traffic and mimic that behavior or at least be able to interoperate with those products. These combinations would have also been obvious to try given that there were a finite number of identified, predictable solutions in the prior art, and there would have been a reasonable expectation of success to simply implement one prior art solution with concepts from prior art in the same field. Moreover, these combinations would have been the result of applying known techniques to a known method—that was ready for improvement—to yield predictable results.
- For the Asserted Claims of the '369 patent, to the extent the references charted in any of Exhibits A-1 to A-9 do not disclose “to select for testing a second idle trace among the idle traces connecting the second subsidiary module to a second port of the switch on the main module,” it would have been obvious to combine any of these charted references with any

of the other charted references or those detailed in Appendix A, including at least Lewis, Carlton, RFC 792, and RFC 1739. A person of skill in the art would be motivated to combine these references because they each disclose computer networking systems. It is the nature of the computer networking companies to monitor developments in competing products and combine relevant features and functionalities. Furthermore, because networking systems need to interact with third party devices, many features and functionalities were standardized by different standard organizations, e.g., IEEE. For example, a person of skill in the art would look to RFC 792 and RFC 1739 in order to comply with industry standards. A person of skill would have been motivated to look at how other products and systems routed network traffic and mimic that behavior or at least be able to interoperate with those products. These combinations would have also been obvious to try given that there were a finite number of identified, predictable solutions in the prior art, and there would have been a reasonable expectation of success to simply implement one prior art solution with concepts from prior art in the same field. Moreover, these combinations would have been the result of applying known techniques to a known method—that was ready for improvement—to yield predictable results.

- For the Asserted Claims of the '369 patent, to the extent the references charted in any of Exhibits A-1 to A-9 do not disclose “to select for testing a second idle trace among the idle traces connecting the second subsidiary module to a second port of the switch on the main module,” it would have been obvious to combine any of these charted references with any of the other charted references or those detailed in Appendix A, including at least Lewis, Carlton, RFC 792, and RFC 1739. A person of skill in the art would be motivated to combine these references because they each disclose computer networking systems. It is the nature of the computer networking companies to monitor developments in competing products and combine relevant features and functionalities. Furthermore, because networking systems need to interact with third party devices, many features and functionalities were standardized by different standard organizations, e.g., IEEE. For example, a person of skill in the art would look to RFC 792 and RFC 1739 in order to comply with industry standards. A person of skill would have been motivated to look at how other products and systems routed network traffic and mimic that behavior or at least be able to interoperate with those products. These combinations would have also been obvious to try given that there were a finite number of identified, predictable solutions in the prior art, and there would have been a reasonable expectation of success to simply implement one prior art solution with concepts from prior art in the same field. Moreover, these combinations would have been the result of applying known techniques to a known method—that was ready for improvement—to yield predictable results.
- For the Asserted Claims of the '369 patent, to the extent the references charted in any of Exhibits A-1 to A-9 do not disclose “to configure the switch to link the first and second ports,” it would have been obvious to combine any of these charted references with any of the other charted references or those detailed in Appendix A, including at least Lewis, Carlton, RFC 792, and RFC 1739. A person of skill in the art would be motivated to combine these references because they each disclose computer networking systems. It is the nature of the computer networking companies to monitor developments in competing products and combine relevant features and functionalities. Furthermore, because networking systems need to interact with third party devices, many features and

functionalities were standardized by different standard organizations, e.g., IEEE. For example, a person of skill in the art would look to RFC 792 and RFC 1739 in order to comply with industry standards. A person of skill would have been motivated to look at how other products and systems routed network traffic and mimic that behavior or at least be able to interoperate with those products. These combinations would have also been obvious to try given that there were a finite number of identified, predictable solutions in the prior art, and there would have been a reasonable expectation of success to simply implement one prior art solution with concepts from prior art in the same field. Moreover, these combinations would have been the result of applying known techniques to a known method—that was ready for improvement—to yield predictable results.

- For the Asserted Claims of the '369 patent, to the extent the references charted in any of Exhibits A-1 to A-9 do not disclose “the system control processor being further operative to cause test traffic to be transmitted over the second idle trace from the second subsidiary module to the main module, wherein the test traffic is conveyed via the switch to the aid trace connecting to the first subsidiary module, and to report that a failure has occurred if the test traffic does not return to the second subsidiary module within a predetermined period of time,” it would have been obvious to combine any of these charted references with any of the other charted references or those detailed in Appendix A, including at least Lewis, Carlton, RFC 792, and RFC 1739. A person of skill in the art would be motivated to combine these references because they each disclose computer networking systems. It is the nature of the computer networking companies to monitor developments in competing products and combine relevant features and functionalities. Furthermore, because networking systems need to interact with third party devices, many features and functionalities were standardized by different standard organizations, e.g., IEEE. For example, a person of skill in the art would look to RFC 792 and RFC 1739 in order to comply with industry standards. A person of skill would have been motivated to look at how other products and systems routed network traffic and mimic that behavior or at least be able to interoperate with those products. These combinations would have also been obvious to try given that there were a finite number of identified, predictable solutions in the prior art, and there would have been a reasonable expectation of success to simply implement one prior art solution with concepts from prior art in the same field. Moreover, these combinations would have been the result of applying known techniques to a known method—that was ready for improvement—to yield predictable results.
- For the Asserted Claims of the '369 patent, to the extent the references charted in any of Exhibits A-1 to A-9 do not disclose “the first subsidiary module is configured, under control of the system control processor, to loop back the traffic on the aid trace to the main module substantially without processing data comprised in the test traffic,” it would have been obvious to combine any of these charted references with any of the other charted references or those detailed in Appendix A, including at least Lewis, Carlton, RFC 792, and RFC 1739. A person of skill in the art would be motivated to combine these references because they each disclose computer networking systems. It is the nature of the computer networking companies to monitor developments in competing products and combine relevant features and functionalities. Furthermore, because networking systems need to interact with third party devices, many features and functionalities were standardized by different standard organizations, e.g., IEEE. For example, a person of skill in the art would

look to RFC 792 and RFC 1739 in order to comply with industry standards. A person of skill would have been motivated to look at how other products and systems routed network traffic and mimic that behavior or at least be able to interoperate with those products. These combinations would have also been obvious to try given that there were a finite number of identified, predictable solutions in the prior art, and there would have been a reasonable expectation of success to simply implement one prior art solution with concepts from prior art in the same field. Moreover, these combinations would have been the result of applying known techniques to a known method—that was ready for improvement—to yield predictable results.

2. U.S. Patent No. 7,113,485

- **Background State of the Art**

The background state of the art includes that which is set forth in the patent, the file history, and the prior art references disclosed herein. For example, the '485 patent, which is entitled “Latency Evaluation in a Ring Network,” generally relates to measuring latency in a bi-directional ring network. *See* '485 patent, Abstract. Latency is the difference between the time of transmission and the time of receipt of a data packet. *See id.* at 7:17–9:65. The patent also describes how data packets commonly are classified into various classes of service, which determine the quality of service (QoS) the user is entitled to receive, including mean latency of packet delivery. *See id.* at 1:56–63. According to the patent, latency is particularly important for real time services like voice and video. *Id.* at 1:63–64.

The patent acknowledges that “[m]ethods of network latency measurement are known in the art.” *Id.* at 2:1–4 (citing U.S. Patent No. 5,235,593 (“Grow”)). The patent purports to improve upon “methods and devices for measuring network latency, particularly in ring topologies.” *Id.* at 2:59–61. Specifically, the patent identifies a drawback in the prior art where the latency measurement includes processing time of the packet at the destination node. *See id.* at 2:41–45. To obtain a round-trip latency that is more accurate, the patent simply “subtracts out the measured turnaround time.” *Id.* at 3:48–52. The claims recite measuring latency by sending

a packet in a particular class of service and subtracting the time it was sent from the time it returned. *See id.* at 9:54–64.

- **Exemplary Motivation to Combine**

Cisco has identified several exemplary motivations and reasons to combine the various references cited herein. For any reference for which there is a claim element that does not have a corresponding citation in that reference, it would be obvious to combine with the knowledge or a person of skill and/or any other reference in the primary or secondary charts for which there is a citation for that element. These combinations would have been obvious to try given that there were a finite number of identified, predictable solutions in the prior art, and there would have been a reasonable expectation of success to simply implement one prior art solution with concepts from prior art in the same field.

- For the Asserted Claims of the '485 patent, to the extent the references charted in any of Exhibits B-1 to B-14 do not disclose “transmitting a latency measurement packet from an originating node to a peer node in the first direction in the network,” it would have been obvious to combine any of these charted references with any of the other charted references or those detailed in Appendix B, including at least Madhavapeddi, MeLampy, Link, and Fortenot. A person of skill in the art would be motivated to combine these references because they each disclose measuring latency. It is the nature of the computer networking companies to monitor latency in order to assess network performance. A person of skill would have been motivated to look at how other products and systems measured latency and adopt similar solutions. These combinations would have also been obvious to try given that there were a finite number of identified, predictable solutions in the prior art, and there would have been a reasonable expectation of success to simply implement one prior art solution with concepts from prior art in the same field. Moreover, these combinations would have been the result of applying known techniques to a known method—that was ready for improvement—to yield predictable results.
- For the Asserted Claims of the '485 patent, to the extent the references charted in any of Exhibits B-1 to B-14 do not disclose “noting a time of receipt of the packet at the peer node,” it would have been obvious to combine any of these charted references with any of the other charted references or those detailed in Appendix B, including at least Madhavapeddi, MeLampy, Link, and Perches. A person of skill in the art would be motivated to combine these references because they each disclose measuring latency. It is the nature of the computer networking companies to monitor latency in order to assess network performance by noting a time in the packet. A person of skill would have been motivated to look at how other products and systems measured latency and adopt similar

solutions. These combinations would have also been obvious to try given that there were a finite number of identified, predictable solutions in the prior art, and there would have been a reasonable expectation of success to simply implement one prior art solution with concepts from prior art in the same field. Moreover, these combinations would have been the result of applying known techniques to a known method—that was ready for improvement—to yield predictable results.

- For the Asserted Claims of the '485 patent, to the extent the references charted in any of Exhibits B-1 to B-14 do not disclose “noting a time of return of the packet to the originating node, so as to determine an originating node difference between a time of transmission of the packet from the originating node to the peer node and the time of return of the packet to the originating node,” it would have been obvious to combine any of these charted references with any of the other charted references or those detailed in Appendix B, including at least Madhavapeddi, MeLampy, Link, and Perches. A person of skill in the art would be motivated to combine these references because they each disclose measuring latency. It is the nature of the computer networking companies to monitor latency in order to assess network performance by noting a time in the packet. A person of skill would have been motivated to look at how other products and systems measured latency and adopt similar solutions. These combinations would have also been obvious to try given that there were a finite number of identified, predictable solutions in the prior art, and there would have been a reasonable expectation of success to simply implement one prior art solution with concepts from prior art in the same field. Moreover, these combinations would have been the result of applying known techniques to a known method—that was ready for improvement—to yield predictable results.
- For the Asserted Claims of the '485 patent, to the extent the references charted in any of Exhibits B-1 to B-14 do not disclose “calculating the latency by taking a difference between the originating node difference and the peer node difference,” it would have been obvious to combine any of these charted references with any of the other charted references or those detailed in Appendix B, including at least Madhavapeddi, MeLampy, Link, and Porgrebinsky. A person of skill in the art would be motivated to combine these references because they each disclose computer networking systems. It is the nature of the computer networking companies to monitor latency in order to assess network performance. Furthermore, because networking systems need to interact with third party devices, many features and functionalities were standardized in RFCs. A person of skill would have been motivated to look at how other products and systems measured latency and adopt similar solutions. These combinations would have also been obvious to try given that there were a finite number of identified, predictable solutions in the prior art, and there would have been a reasonable expectation of success to simply implement one prior art solution with concepts from prior art in the same field. Moreover, these combinations would have been the result of applying known techniques to a known method—that was ready for improvement—to yield predictable results.
- For the Asserted Claims of the '485 patent, to the extent the references charted in any of Exhibits B-1 to B-14 do not disclose “wherein transmitting the latency measurement packet comprises recording in the packet an indication of a class of service on the network, and transmitting the packet at a level of service accorded to the class, and wherein calculating

the latency comprises determining the latency specific to the class of service,” it would have been obvious to combine any of these charted references with any of the other charted references or those detailed in Appendix B, including at least Madhavapeddi, MeLampy, Kao, and Klassen. A person of skill in the art would be motivated to combine these references because they each disclose computer networking systems. It is the nature of the computer networking companies to monitor latency in order to assess network performance according to a class of service. A person of skill would have been motivated to look at how other products and systems measured latency and adopt similar solutions. These combinations would have also been obvious to try given that there were a finite number of identified, predictable solutions in the prior art, and there would have been a reasonable expectation of success to simply implement one prior art solution with concepts from prior art in the same field. Moreover, these combinations would have been the result of applying known techniques to a known method—that was ready for improvement—to yield predictable results.

- For the Asserted Claims of the ’485 patent, to the extent the references charted in any of Exhibits B-1 to B-14 do not disclose “wherein recording the indication of the peer node difference comprises recording in the packet the time of transmission of the packet from the peer node to the originating node and the time of receipt of the packet at the peer node, both measured with respect to a peer clock maintained at the peer node,” it would have been obvious to combine any of these charted references with any of the other charted references or those detailed in Appendix B, including at least Madhavapeddi, MeLampy, Kao, and Schuster. A person of skill in the art would be motivated to combine these references because they each disclose measuring latency. It is the nature of the computer networking companies to monitor latency in order to assess network performance by measuring the time with respect to a peer clock. A person of skill would have been motivated to look at how other products and systems measured latency and adopt similar solutions. These combinations would have also been obvious to try given that there were a finite number of identified, predictable solutions in the prior art, and there would have been a reasonable expectation of success to simply implement one prior art solution with concepts from prior art in the same field. Moreover, these combinations would have been the result of applying known techniques to a known method—that was ready for improvement—to yield predictable results.
- For the Asserted Claims of the ’485 patent, to the extent the references charted in any of Exhibits B-1 to B-14 do not disclose “comprising recording in the packet the time of transmission of the packet from the originating node to the peer node measured with respect to an originating clock maintained at the originating node, and wherein noting the time of return of the packet comprises recording the time of return with respect to the originating clock,” it would have been obvious to combine any of these charted references with any of the other charted references or those detailed in Appendix B, including at least Madhavapeddi, MeLampy, Porgrebinsky, and Perches. A person of skill in the art would be motivated to combine these references because they each disclose measuring latency. It is the nature of the computer networking companies to monitor latency in order to assess network performance by measuring the time with respect to an originating clock. A person of skill would have been motivated to look at how other products and systems measured latency and adopt similar solutions. These combinations would have also been obvious to

try given that there were a finite number of identified, predictable solutions in the prior art, and there would have been a reasonable expectation of success to simply implement one prior art solution with concepts from prior art in the same field. Moreover, these combinations would have been the result of applying known techniques to a known method—that was ready for improvement—to yield predictable results.

- For the Asserted Claims of the '485 patent, to the extent the references charted in any of Exhibits B-1 to B-14 do not disclose “wherein transmitting the latency measurement packet comprises transmitting a plurality of latency measurement packets in sequence at given intervals, and wherein calculating the latency comprises calculating respective latencies of the packets returned to the originating node, so as to monitor a variation in the latencies,” it would have been obvious to combine any of these charted references with any of the other charted references or those detailed in Appendix B, including at least Madhavapeddi, MeLampy, Kao, and Perches. A person of skill in the art would be motivated to combine these references because they each disclose measuring latency. It is the nature of the computer networking companies to monitor latency in order to assess network performance by using a plurality of latency measurement packets in sequence. A person of skill would have been motivated to look at how other products and systems measured latency and adopt similar solutions. These combinations would have also been obvious to try given that there were a finite number of identified, predictable solutions in the prior art, and there would have been a reasonable expectation of success to simply implement one prior art solution with concepts from prior art in the same field. Moreover, these combinations would have been the result of applying known techniques to a known method—that was ready for improvement—to yield predictable results.
- For the Asserted Claims of the '485 patent, to the extent the references charted in any of Exhibits B-1 to B-14 do not disclose “wherein transmitting the plurality of the latency measurement packets comprises recording respective serial numbers in the packets in the sequence, and wherein calculating the respective latencies comprises disregarding the latencies of the packets returned to the originating node out of the sequence, as indicated by the serial numbers,” it would have been obvious to combine any of these charted references with any of the other charted references or those detailed in Appendix B, including at least Madhavapeddi, MeLampy, Kao, and Perches. A person of skill in the art would be motivated to combine these references because they each disclose measuring latency. It is the nature of the computer networking companies to monitor latency in order to assess network performance by recording serial numbers in the packets in the sequence. A person of skill would have been motivated to look at how other products and systems measured latency and adopt similar solutions. These combinations would have also been obvious to try given that there were a finite number of identified, predictable solutions in the prior art, and there would have been a reasonable expectation of success to simply implement one prior art solution with concepts from prior art in the same field. Moreover, these combinations would have been the result of applying known techniques to a known method—that was ready for improvement—to yield predictable results.
- For the Asserted Claims of the '485 patent, to the extent the references charted in any of Exhibits B-1 to B-14 do not disclose “wherein generating the latency measurement packet comprises generating a plurality of latency measurement packets, containing respective

indications that the packets belong respectively to the plurality of the classes of services, and wherein calculating the latency comprises determining the latency for each of the classes of service respectively,” it would have been obvious to combine any of these charted references with any of the other charted references or those detailed in Appendix B, including at least Madhavapeddi, MeLampy, Kao, and Schuster. A person of skill in the art would be motivated to combine these references because they each disclose measuring latency. It is the nature of the computer networking companies to monitor latency in order to assess network performance by indicating that the packets belong to a plurality of a classes of services. A person of skill would have been motivated to look at how other products and systems measured latency and adopt similar solutions. These combinations would have also been obvious to try given that there were a finite number of identified, predictable solutions in the prior art, and there would have been a reasonable expectation of success to simply implement one prior art solution with concepts from prior art in the same field. Moreover, these combinations would have been the result of applying known techniques to a known method—that was ready for improvement—to yield predictable results.

- For the Asserted Claims of the ’485 patent, to the extent the references charted in any of Exhibits B-1 to B-14 do not disclose “wherein the network comprises a ring network, and wherein transmitting the latency measurement packet comprises transmitting the packet around the ring network so that the destination node of the latency measurement packet is the source node, and wherein calculating the latency comprises determining the latency for the selected one of the classes of service for a full circuit of the ring network,” it would have been obvious to combine any of these charted references with any of the other charted references or those detailed in Appendix B, including at least Madhavapeddi, MeLampy, Kao, and Schuster. A person of skill in the art would be motivated to combine these references because they each disclose measuring latency. It is the nature of the computer networking companies to monitor latency in order to assess network performance where the latency measurement packet is transmitted around the ring network. A person of skill would have been motivated to look at how other products and systems measured latency and adopt similar solutions. These combinations would have also been obvious to try given that there were a finite number of identified, predictable solutions in the prior art, and there would have been a reasonable expectation of success to simply implement one prior art solution with concepts from prior art in the same field. Moreover, these combinations would have been the result of applying known techniques to a known method—that was ready for improvement—to yield predictable results.

3. U.S. Patent No. 7,330,431

- **Background State of the Art**

The background state of the art includes that which is set forth in the patent, the file history, and the prior art references disclosed herein. For example, the ’431 patent indicates that packet ring, complex mesh, and irregular network topologies were all known in the art prior to

the patent. '431 patent, 1:13-17. The '431 patent further notes a then-existing “leading bi-directional protocol for high speed packet rings” entitled the “Resilient Packet Ring (RPR) protocol, defined by IEEE Standard 802.17.” *Id.* at 1:17-19. Likewise, the '431 patent states that “guaranteed bandwidth” services and methods for bandwidth allocation in an IEEE 802.17 RPR network were also well-known. *Id.* at 1:20-46.

The '431 patent describes an embodiment of the invention as “built around a high-speed ring network . . . such as a SONET or SDH network,” having “data nodes” in pairs “connected by a physical network link . . . , which typically comprises a pair of wired, fiberoptic, and/or wireless links . . . that are configured to carry data traffic in clockwise and counterclockwise directions around the ring.” *Id.* at 6:38-47. All of these aspects of SONET or SDH networks were known prior to the '431 patent. Likewise, the '431 patent notes that its system “may be configured to support traffic of other types, in accordance with other protocols that are known in the art,” in addition to then-existing virtual private LAN and Ethernet networks. *Id.* at 6:66-7:7. And, the “network” of the embodiments in the '431 patent are “assumed to be configured as a bi-directional Resilient Packet Ring (RPR) network, as defined by the [existing] IEEE standard 802.17.” *Id.* at 7:7-11.

- **Exemplary Motivation to Combine**

Cisco has identified several exemplary motivations and reasons to combine the various references cited herein. For any reference for which there is a claim element that does not have a corresponding citation in that reference, it would be obvious to combine with the knowledge or a person of skill and/or any other reference in the primary or secondary charts for which there is a citation for that element. These combinations would have been obvious to try given that there were a finite number of identified, predictable solutions in the prior art, and there would have been a

reasonable expectation of success to simply implement one prior art solution with concepts from prior art in the same field.

- For the Asserted Claims of the '431 patent, to the extent the references charted in any of Exhibits C-1 to C-13 do not disclose “defining between the nodes logical connections associated with a data transmission service to be provided over the network, the logical connections having a connection topology different from the physical topology,” it would have been obvious to combine any of these charted references with any of the other charted references or those detailed in Appendix C, including at least Margalit, Nomura, Mark, Iwakawa, Azuma, Ofek, and Chudak. A person of skill in the art would be motivated to combine these references because they each disclose the allocation of resources of an underlying physical topology for overlaid logical topologies. Resource allocation in an underlying physical network is essential to support logical networks having disparate classes of service and bandwidth requirements. A person of skill would have been motivated to look at how other products and systems allocated bandwidth in systems having different logical connection topologies and physical topologies, and adopt similar solutions. These combinations would have also been obvious to try given that there were a finite number of identified, predictable solutions in the prior art, and there would have been a reasonable expectation of success to simply implement one prior art solution with concepts from prior art in the same field. Moreover, these combinations would have been the result of applying known techniques to a known method—that was ready for improvement—to yield predictable results.
- For the Asserted Claims of the '431 patent, to the extent the references charted in any of Exhibits C-1 to C-13 do not disclose “determining respective bandwidth requirements for the logical connections based on parameters of the service,” it would have been obvious to combine any of these charted references with any of the other charted references or those detailed in Appendix C, including at least Margalit, Nomura, Mark, Iwakawa, Azuma, Ofek, and Chudak. A person of skill in the art would be motivated to combine these references because they each disclose the allocation of resources of an underlying physical topology for overlaid logical topologies. Resource allocation in an underlying physical network is essential to support logical networks having disparate classes of service and bandwidth requirements. A person of skill would have been motivated to look at how other products and systems determined bandwidth requirements for logical connections based on the parameters of a data transmission service, and adopt similar solutions. These combinations would have also been obvious to try given that there were a finite number of identified, predictable solutions in the prior art, and there would have been a reasonable expectation of success to simply implement one prior art solution with concepts from prior art in the same field. Moreover, these combinations would have been the result of applying known techniques to a known method—that was ready for improvement—to yield predictable results.

- For the Asserted Claims of the '431 patent, to the extent the references charted in any of Exhibits C-1 to C-13 do not disclose “mapping the connection topology to the physical topology, so that each of the logical connections is associated with one or more links of the physical topology,” it would have been obvious to combine any of these charted references with any of the other charted references or those detailed in Appendix C, including at least Margalit, Nomura, Mark, Iwakawa, Azuma, Ofek, and Chudak. A person of skill in the art would be motivated to combine these references because they each disclose the allocation of resources of an underlying physical topology for overlaid logical topologies. Resource allocation in an underlying physical network is essential to support logical networks having disparate classes of service and bandwidth requirements. A person of skill would have been motivated to look at how other products and systems mapped a logical connection topology to a physical topology, and adopt similar solutions. These combinations would have also been obvious to try given that there were a finite number of identified, predictable solutions in the prior art, and there would have been a reasonable expectation of success to simply implement one prior art solution with concepts from prior art in the same field. Moreover, these combinations would have been the result of applying known techniques to a known method—that was ready for improvement—to yield predictable results.
- For the Asserted Claims of the '431 patent, to the extent the references charted in any of Exhibits C-1 to C-13 do not disclose “allocating a bandwidth for the service on each of the links in response to the bandwidth requirements of the logical connections and to the mapping,” it would have been obvious to combine any of these charted references with any of the other charted references or those detailed in Appendix C, including at least Margalit, Nomura, Mark, Iwakawa, Azuma, Ofek, and Chudak. A person of skill in the art would be motivated to combine these references because they each disclose the allocation of resources of an underlying physical topology for overlaid logical topologies. Resource allocation in an underlying physical network is essential to support logical networks having disparate classes of service and bandwidth requirements. A person of skill would have been motivated to look at how other products and systems allocated bandwidth to links of a physical topology in light of bandwidth requirements of logical connections and their mappings to the physical links, and adopt similar solutions. These combinations would have also been obvious to try given that there were a finite number of identified, predictable solutions in the prior art, and there would have been a reasonable expectation of success to simply implement one prior art solution with concepts from prior art in the same field. Moreover, these combinations would have been the result of applying known techniques to a known method—that was ready for improvement—to yield predictable results.
- For the Asserted Claims of the '431 patent, to the extent the references charted in any of Exhibits C-1 to C-13 do not disclose “a ring network” or “a ring topology,” it would have been obvious to combine any of these charted references with any of the other charted references or those detailed in Appendix C, including at least Margalit, Nomura, Mark, Iwakawa, Azuma, Ofek, and Chudak. A person of skill in the art would

be motivated to combine these references because they each disclose the allocation of resources of an underlying physical topology for overlaid logical topologies. Resource allocation in an underlying physical network is essential to support logical networks having disparate classes of service and bandwidth requirements. A person of skill would have been motivated to look at how other products and systems allocated bandwidth in networks having various physical topologies, and adopt similar solutions. These combinations would have also been obvious to try given that there were a finite number of identified, predictable solutions in the prior art, and there would have been a reasonable expectation of success to simply implement one prior art solution with concepts from prior art in the same field. Moreover, these combinations would have been the result of applying known techniques to a known method—that was ready for improvement—to yield predictable results.

- For the Asserted Claims of the '431 patent, to the extent the references charted in any of Exhibits C-1 to C-13 do not disclose “a hub-and-spoke topology” or “a full mesh topology,” it would have been obvious to combine any of these charted references with any of the other charted references or those detailed in Appendix C, including at least Margalit, Nomura, Mark, Iwakawa, Azuma, Ofek, and Chudak. A person of skill in the art would be motivated to combine these references because they each disclose the allocation of resources of an underlying physical topology for overlaid logical topologies. Resource allocation in an underlying physical network is essential to support logical networks having disparate classes of service and bandwidth requirements. A person of skill would have been motivated to look at how other products and systems allocated bandwidth in networks having various logical connection topologies, and adopt similar solutions. These combinations would have also been obvious to try given that there were a finite number of identified, predictable solutions in the prior art, and there would have been a reasonable expectation of success to simply implement one prior art solution with concepts from prior art in the same field. Moreover, these combinations would have been the result of applying known techniques to a known method—that was ready for improvement—to yield predictable results.
- For the Asserted Claims of the '431 patent, to the extent the references charted in any of Exhibits C-1 to C-13 do not disclose “a guaranteed bandwidth service,” it would have been obvious to combine any of these charted references with any of the other charted references or those detailed in Appendix C, including at least Margalit, Nomura, Mark, Iwakawa, Azuma, Ofek, and Chudak. A person of skill in the art would be motivated to combine these references because they each disclose the allocation of resources of an underlying physical topology for overlaid logical topologies. Resource allocation in an underlying physical network is essential to support logical networks having disparate classes of service and bandwidth requirements. A person of skill would have been motivated to look at how other products and systems allocated bandwidth for various data transmission services, such as a guaranteed bandwidth service, and adopt similar solutions. These combinations would have also been obvious to try given that there were a finite number of identified, predictable solutions in the prior art, and there would have been a reasonable expectation of success to simply

implement one prior art solution with concepts from prior art in the same field. Moreover, these combinations would have been the result of applying known techniques to a known method—that was ready for improvement—to yield predictable results.

- For the Asserted Claims of the '431 patent, to the extent the references charted in any of Exhibits C-1 to C-13 do not disclose “a class of service defined by a protocol under which the network operates,” it would have been obvious to combine any of these charted references with any of the other charted references or those detailed in Appendix C, including at least Margalit, Nomura, Mark, Iwakawa, Azuma, Ofek, and Chudak. A person of skill in the art would be motivated to combine these references because they each disclose the allocation of resources of an underlying physical topology for overlaid logical topologies. Resource allocation in an underlying physical network is essential to support logical networks having disparate classes of service and bandwidth requirements. A person of skill would have been motivated to look at how other products and systems allocated bandwidth for various classes of service defined under then-existing network protocols, and adopt similar solutions. These combinations would have also been obvious to try given that there were a finite number of identified, predictable solutions in the prior art, and there would have been a reasonable expectation of success to simply implement one prior art solution with concepts from prior art in the same field. Moreover, these combinations would have been the result of applying known techniques to a known method—that was ready for improvement—to yield predictable results.
- For the Asserted Claims of the '431 patent, to the extent the references charted in any of Exhibits C-1 to C-13 do not disclose “multiplying the bandwidth by a correction factor to determine an actual bandwidth,” it would have been obvious to combine any of these charted references with any of the other charted references or those detailed in Appendix C, including at least Margalit, Nomura, Mark, Iwakawa, Azuma, Ofek, and Chudak. A person of skill in the art would be motivated to combine these references because they each disclose the allocation of resources of an underlying physical topology for overlaid logical topologies. Resource allocation in an underlying physical network is essential to support logical networks having disparate classes of service and bandwidth requirements. A person of skill would have been motivated to look at how other products and systems adjusted allocated bandwidths, and adopt similar solutions. These combinations would have also been obvious to try given that there were a finite number of identified, predictable solutions in the prior art, and there would have been a reasonable expectation of success to simply implement one prior art solution with concepts from prior art in the same field. Moreover, these combinations would have been the result of applying known techniques to a known method—that was ready for improvement—to yield predictable results.
- For the Asserted Claims of the '431 patent, to the extent the references charted in any of Exhibits C-1 to C-13 do not disclose “generating a bandwidth requirement for each of the links,” it would have been obvious to combine any of these charted references with any of the other charted references or those detailed in Appendix C, including at

least Margalit, Nomura, Mark, Iwakawa, Azuma, Ofek, and Chudak. A person of skill in the art would be motivated to combine these references because they each disclose the allocation of resources of an underlying physical topology for overlaid logical topologies. Resource allocation in an underlying physical network is essential to support logical networks having disparate classes of service and bandwidth requirements. A person of skill would have been motivated to look at how other products and systems generated bandwidth requirements for physical links, and adopt similar solutions. These combinations would have also been obvious to try given that there were a finite number of identified, predictable solutions in the prior art, and there would have been a reasonable expectation of success to simply implement one prior art solution with concepts from prior art in the same field. Moreover, these combinations would have been the result of applying known techniques to a known method—that was ready for improvement—to yield predictable results.

- For the Asserted Claims of the '431 patent, to the extent the references charted in any of Exhibits C-1 to C-13 do not disclose “parameters of the service comprise respective node-bandwidths required by each of the nodes to provide the service,” it would have been obvious to combine any of these charted references with any of the other charted references or those detailed in Appendix C, including at least Margalit, Nomura, Mark, Iwakawa, Azuma, Ofek, and Chudak. A person of skill in the art would be motivated to combine these references because they each disclose the allocation of resources of an underlying physical topology for overlaid logical topologies. Resource allocation in an underlying physical network is essential to support logical networks having disparate classes of service and bandwidth requirements. A person of skill would have been motivated to look at how other products and systems determined bandwidth requirements for logical connections based on various parameters of a data transmission service, such as the node-bandwidths required by each node to provide a service, and adopt similar solutions. These combinations would have also been obvious to try given that there were a finite number of identified, predictable solutions in the prior art, and there would have been a reasonable expectation of success to simply implement one prior art solution with concepts from prior art in the same field. Moreover, these combinations would have been the result of applying known techniques to a known method—that was ready for improvement—to yield predictable results.
- For the Asserted Claims of the '431 patent, to the extent the references charted in any of Exhibits C-1 to C-13 do not disclose “monitoring traffic generated in the network by the data transmission service, and adjusting the bandwidth in response to the traffic,” it would have been obvious to combine any of these charted references with any of the other charted references or those detailed in Appendix C, including at least Margalit, Nomura, Mark, Iwakawa, Azuma, Ofek, and Chudak. A person of skill in the art would be motivated to combine these references because they each disclose the allocation of resources of an underlying physical topology for overlaid logical topologies. Resource allocation in an underlying physical network is essential to support logical networks having disparate classes of service and bandwidth requirements. A person of skill would have been motivated to look at how other products and systems adjusted

bandwidth in response to network traffic conditions, and adopt similar solutions. These combinations would have also been obvious to try given that there were a finite number of identified, predictable solutions in the prior art, and there would have been a reasonable expectation of success to simply implement one prior art solution with concepts from prior art in the same field. Moreover, these combinations would have been the result of applying known techniques to a known method—that was ready for improvement—to yield predictable results.

- For the Asserted Claims of the '431 patent, to the extent the references charted in any of Exhibits C-1 to C-13 do not disclose that “the data transmission service comprises a plurality of subclasses of traffic, and wherein allocating the bandwidth comprises allocating a reserved bandwidth to one of the subclasses,” it would have been obvious to combine any of these charted references with any of the other charted references or those detailed in Appendix C, including at least Margalit, Nomura, Mark, Iwakawa, Azuma, Ofek, and Chudak. A person of skill in the art would be motivated to combine these references because they each disclose the allocation of resources of an underlying physical topology for overlaid logical topologies. Resource allocation in an underlying physical network is essential to support logical networks having disparate classes of service and bandwidth requirements. A person of skill would have been motivated to look at how other products and systems allocated and reserved bandwidth for subclasses of various data transmission services, and adopt similar solutions. These combinations would have also been obvious to try given that there were a finite number of identified, predictable solutions in the prior art, and there would have been a reasonable expectation of success to simply implement one prior art solution with concepts from prior art in the same field. Moreover, these combinations would have been the result of applying known techniques to a known method—that was ready for improvement—to yield predictable results.
- For the Asserted Claims of the '431 patent, to the extent the references charted in any of Exhibits C-1 to C-13 do not disclose that “comparing a mapping bandwidth determined in response to the bandwidth requirements of the logical connections and to the mapping with a full bandwidth determined by assuming all possible logical connections in the network are provided for,” it would have been obvious to combine any of these charted references with any of the other charted references or those detailed in Appendix C, including at least Margalit, Nomura, Mark, Iwakawa, Azuma, Ofek, and Chudak. A person of skill in the art would be motivated to combine these references because they each disclose the allocation of resources of an underlying physical topology for overlaid logical topologies. Resource allocation in an underlying physical network is essential to support logical networks having disparate classes of service and bandwidth requirements. A person of skill would have been motivated to look at how other products and systems handled bandwidth allocation for multiple logical connections that utilize the same underlying physical network, and adopt similar solutions. These combinations would have also been obvious to try given that there were a finite number of identified, predictable solutions in the prior art, and there would have been a reasonable expectation of success to simply implement one prior art solution with concepts from prior art in the same field. Moreover, these combinations

would have been the result of applying known techniques to a known method—that was ready for improvement—to yield predictable results.

- For the Asserted Claims of the '431 patent, to the extent the references charted in any of Exhibits C-1 to C-13 do not disclose that “summing the first and the second bandwidths to determine a total allocation for each of the links,” it would have been obvious to combine any of these charted references with any of the other charted references or those detailed in Appendix C, including at least Margalit, Nomura, Mark, Iwakawa, Azuma, Ofek, and Chudak. A person of skill in the art would be motivated to combine these references because they each disclose the allocation of resources of an underlying physical topology for overlaid logical topologies. Resource allocation in an underlying physical network is essential to support logical networks having disparate classes of service and bandwidth requirements. A person of skill would have been motivated to look at how other products and systems handled bandwidth allocation for multiple logical connections that utilize the same underlying physical network, and adopt similar solutions. These combinations would have also been obvious to try given that there were a finite number of identified, predictable solutions in the prior art, and there would have been a reasonable expectation of success to simply implement one prior art solution with concepts from prior art in the same field. Moreover, these combinations would have been the result of applying known techniques to a known method—that was ready for improvement—to yield predictable results.

4. U.S. Patent No. 7,593,400

- **Background State of the Art**

The background state of the art includes that which is set forth in the patent, the file history, and the prior art references disclosed herein. For example, the '400 patent discloses MAC bridges with forwarding databases (FDBs) were well-known prior to the patent. '400 patent, 1:33-46. The '400 patent further explains that flooding was a known way to determine where to send an incoming message if the packet is intended for an unknown destination. The '400 patent also acknowledges a number of standards that define certain functionality and features in these bridges, e.g., layer 2 functionality. *Id.*, 1:13-32. According to the patent, moreover, other techniques like virtual LANs, VPLS, and link aggregation groups were likewise well-known. *Id.*, 1:62-2:56.

- **Exemplary Motivation to Combine**

Cisco has identified several exemplary motivations and reasons to combine the various references cited herein. For any reference for which there is a claim element that does not have a corresponding citation in that reference, it would be obvious to combine with the knowledge or a person of skill and/or any other reference in the primary or secondary charts for which there is a citation for that element. These combinations would have been obvious to try given that there were a finite number of identified, predictable solutions in the prior art, and there would have been a reasonable expectation of success to simply implement one prior art solution with concepts from prior art in the same field.

- For the Asserted Claims of the '400 patent, to the extent the references charted in any of Exhibits D-1 to D-6 do not disclose “configuring a network node having a plurality of ports, and at least first and second line cards with respective first and second ports, to operate as a distributed media access control (MAC) bridge in a Layer 2 data network,” it would have been obvious to combine any of these charted references with any of the other charted references or those detailed in Appendix D, including at least Smith, Dontu, Ishimori, Finn, Edsall, Weyman, Shimada, Zelig, and Devi 1. A person of skill in the art would be motivated to combine these references because they each disclose computer networking systems. It is the nature of the computer networking companies to monitor developments in competing products and combine relevant features and functionalities. Furthermore, because networking systems need to interact with third party devices, many features and functionalities were standardized by different standard organizations, e.g., IEEE. A person of skill would have been motivated to look at how other products and systems routed network traffic and mimic that behavior or at least be able to interoperate with those products. For example, it would have been obvious to a person of skill to look at how line cards were used to operate as a MAC bridge in a layer 2 network and MAC bridges were well known layer 2 devices at the time. These combinations would have also been obvious to try given that there were a finite number of identified, predictable solutions in the prior art, and there would have been a reasonable expectation of success to simply implement one prior art solution with concepts from prior art in the same field. Moreover, these combinations would have been the result of applying known techniques to a known method—that was ready for improvement—to yield predictable results.
- For the Asserted Claims of the '400 patent, to the extent the references charted in any of Exhibits D-1 to D-6 do not disclose “configuring a link aggregation (LAG) group of parallel physical links between two endpoints in said Layer 2 data network joined together into a single logical link, said LAG group having a plurality of LAG ports and a plurality of conjoined member line cards,” it would have been obvious to combine any of these charted references with any of the other charted references or those detailed in Appendix D, including at least Smith, Dontu, Ishimori, Weyman, Shimada, Sajassi, Bishara, and Devi

1. A person of skill in the art would be motivated to combine these references because they each disclose computer networking systems. It is the nature of the computer networking companies to monitor developments in competing products and combine relevant features and functionalities. Furthermore, because networking systems need to interact with third party devices, many features and functionalities were standardized by different standard organizations, e.g., IEEE. A person of skill would have been motivated to look at how other products and systems routed network traffic and mimic that behavior or at least be able to interoperate with those products. For example, LAGs were well-known at the time and it would have been obvious to a person of skill that MAC bridges could utilize LAGs to provide redundancy and higher throughput. These combinations would have also been obvious to try given that there were a finite number of identified, predictable solutions in the prior art, and there would have been a reasonable expectation of success to simply implement one prior art solution with concepts from prior art in the same field. Moreover, these combinations would have been the result of applying known techniques to a known method—that was ready for improvement—to yield predictable results.

- For the Asserted Claims of the '400 patent, to the extent the references charted in any of Exhibits D-1 to D-6 do not disclose “providing for each of said member line cards a respective forwarding database (FDB) to hold records associating MAC addresses with ports of said plurality of ports of said network node,” it would have been obvious to combine any of these charted references with any of the other charted references or those detailed in Appendix D, including at least Smith, Dontu, Ishimori, Finn, Edsall, Weyman, Shimada, Zelig, Bass, Bishara, and Devi 1. A person of skill in the art would be motivated to combine these references because they each disclose computer networking systems. It is the nature of the computer networking companies to monitor developments in competing products and combine relevant features and functionalities. Furthermore, because networking systems need to interact with third party devices, many features and functionalities were standardized by different standard organizations, e.g., IEEE. A person of skill would have been motivated to look at how other products and systems routed network traffic and mimic that behavior or at least be able to interoperate with those products. For example, it would have been obvious to a person of skill to use an FDB per line card since the line cards at the time often had routing ASICs or other processing units that controlled routing and storing the FDB on the line card would prevent latency associated with reading the FDB not located on the line card. These combinations would have also been obvious to try given that there were a finite number of identified, predictable solutions in the prior art, and there would have been a reasonable expectation of success to simply implement one prior art solution with concepts from prior art in the same field. Moreover, these combinations would have been the result of applying known techniques to a known method—that was ready for improvement—to yield predictable results.
- For the Asserted Claims of the '400 patent, to the extent the references charted in any of Exhibits D-1 to D-6 do not disclose “receiving a data packet on an ingress port of said network node from a MAC source address, said data packet specifying a MAC destination address on said Layer 2 data network,” it would have been obvious to combine any of these charted references with any of the other charted references or those detailed in Appendix D, including at least Smith, Dontu, Ishimori, Finn, Edsall, Weyman, Shimada, Pang, Bass,

Bishara, and Devi 1. A person of skill in the art would be motivated to combine these references because they each disclose computer networking systems. It is the nature of the computer networking companies to monitor developments in competing products and combine relevant features and functionalities. Furthermore, because networking systems need to interact with third party devices, many features and functionalities were standardized by different standard organizations, e.g., IEEE. A person of skill would have been motivated to look at how other products and systems routed network traffic and mimic that behavior or at least be able to interoperate with those products. For example, it was well-known to learn the MAC address of the source port to avoid needing to flood the network to learn a MAC address the device already had a chance to learn. These combinations would have also been obvious to try given that there were a finite number of identified, predictable solutions in the prior art, and there would have been a reasonable expectation of success to simply implement one prior art solution with concepts from prior art in the same field. Moreover, these combinations would have been the result of applying known techniques to a known method—that was ready for improvement—to yield predictable results.

- For the Asserted Claims of the '400 patent, to the extent the references charted in any of Exhibits D-1 to D-6 do not disclose “conveying, by transmitting said data packet to said MAC destination address via said first port, said received data packet in said network node to at least said first line card for transmission to said MAC destination address, if said MAC destination address does not appear in said FDB, flooding said data packet via one and only one LAG port of said plurality of LAG ports,” it would have been obvious to combine any of these charted references with any of the other charted references or those detailed in Appendix D, including at least Smith, Dontu, Ishimori, Finn, Edsall, Weyman, Shimada, Zelig, Matters, Lee, Pang, Bass, Devi 1, Devi 2. A person of skill in the art would be motivated to combine these references because they each disclose computer networking systems. It is the nature of the computer networking companies to monitor developments in competing products and combine relevant features and functionalities. Furthermore, because networking systems need to interact with third party devices, many features and functionalities were standardized by different standard organizations, e.g., IEEE. A person of skill would have been motivated to look at how other products and systems routed network traffic and mimic that behavior or at least be able to interoperate with those products. For example, this was a well-known way to learn MAC addresses or use the MAC addresses in the FDB. If a MAC address was in the FDB, the device knows where to send the packet. If not, flooding was a well-known way to learn the MAC address. And it would have been obvious to a person of skill to only via one LAG port since the LAG ports form one logical port. These combinations would have also been obvious to try given that there were a finite number of identified, predictable solutions in the prior art, and there would have been a reasonable expectation of success to simply implement one prior art solution with concepts from prior art in the same field. Moreover, these combinations would have been the result of applying known techniques to a known method—that was ready for improvement—to yield predictable results.
- For the Asserted Claims of the '400 patent, to the extent the references charted in any of Exhibits D-1 to D-6 do not disclose “checking said MAC source address of the data packet against records in said FDB of said first line card; and if said FDB of said first line card

does not contain a record of an association of said MAC source address with said ingress port, creating a new record of said association, adding said new record to the FDB of said first line card, and sending a message of the association to each member line card of said plurality of member line cards,” it would have been obvious to combine any of these charted references with any of the other charted references or those detailed in Appendix D, including at least Smith, Dontu, Ishimori, Finn, Edsall, Weyman, Bishara, and Devi 1, Devi 2. A person of skill in the art would be motivated to combine these references because they each disclose computer networking systems. It is the nature of the computer networking companies to monitor developments in competing products and combine relevant features and functionalities. Furthermore, because networking systems need to interact with third party devices, many features and functionalities were standardized by different standard organizations, e.g., IEEE. A person of skill would have been motivated to look at how other products and systems routed network traffic and mimic that behavior or at least be able to interoperate with those products. For example, it was well-known to learn the MAC address of the source port to avoid needing to flood the network to learn a MAC address the device already had a chance to learn. Given that each line card has its own FDB, it would have been obvious to a person of skill to share information between the different line cards to avoid flooding when the MAC address is already known. These combinations would have also been obvious to try given that there were a finite number of identified, predictable solutions in the prior art, and there would have been a reasonable expectation of success to simply implement one prior art solution with concepts from prior art in the same field. Moreover, these combinations would have been the result of applying known techniques to a known method—that was ready for improvement—to yield predictable results.

- For the Asserted Claims of the ’400 patent, to the extent the references charted in any of Exhibits D-1 to D-6 do not disclose “sending the message comprises sending messages periodically at predefined times to inform at least the second line card of new associations between the MAC addresses and the respective ports,” it would have been obvious to combine any of these charted references with any of the other charted references or those detailed in Appendix D, including at least Smith, Dontu, Ishimori, Finn, Edsall, Weyman. A person of skill in the art would be motivated to combine these references because they each disclose computer networking systems. It is the nature of the computer networking companies to monitor developments in competing products and combine relevant features and functionalities. Furthermore, because networking systems need to interact with third party devices, many features and functionalities were standardized by different standard organizations, e.g., IEEE. A person of skill would have been motivated to look at how other products and systems routed network traffic and mimic that behavior or at least be able to interoperate with those products. For example, it was well-known to learn the MAC address of the source port to avoid needing to flood the network to learn a MAC address the device already had a chance to learn. Given that each line card has its own FDB, it would have been obvious to a person of skill to share information between the different line cards to avoid flooding when the MAC address is already known, such as on a periodic basis. These combinations would have also been obvious to try given that there were a finite number of identified, predictable solutions in the prior art, and there would have been a reasonable expectation of success to simply implement one prior art solution with concepts from prior art in the same field. Moreover, these combinations would have been

the result of applying known techniques to a known method—that was ready for improvement—to yield predictable results.

- For the Asserted Claims of the '400 patent, to the extent the references charted in any of Exhibits D-1 to D-6 do not disclose “receiving the message at the second line card, and responsively to the message, adding the record of the association to the FDB of the second line card if the record does not already exist in the FDB of the second line card,” it would have been obvious to combine any of these charted references with any of the other charted references or those detailed in Appendix D, including at least Smith, Dontu, Ishimori, Finn, Edsall, Weyman. A person of skill in the art would be motivated to combine these references because they each disclose computer networking systems. It is the nature of the computer networking companies to monitor developments in competing products and combine relevant features and functionalities. Furthermore, because networking systems need to interact with third party devices, many features and functionalities were standardized by different standard organizations, e.g., IEEE. A person of skill would have been motivated to look at how other products and systems routed network traffic and mimic that behavior or at least be able to interoperate with those products. For example, it was well-known to learn the MAC address from incoming packets to avoid needing to flood the network to learn a MAC address the device already had a chance to learn. These combinations would have also been obvious to try given that there were a finite number of identified, predictable solutions in the prior art, and there would have been a reasonable expectation of success to simply implement one prior art solution with concepts from prior art in the same field. Moreover, these combinations would have been the result of applying known techniques to a known method—that was ready for improvement—to yield predictable results.
- For the Asserted Claims of the '400 patent, to the extent the references charted in any of Exhibits D-1 to D-6 do not disclose “marking the records in the respective FDB of each line card to distinguish a first type of the records, which are added in response to data packets transmitted via a port of the line card, from a second type of the records, which are added in response to messages received from another of the line cards,” it would have been obvious to combine any of these charted references with any of the other charted references or those detailed in Appendix D, including at least Smith, Dontu, Ishimori, Finn, Edsall, Weyman. A person of skill in the art would be motivated to combine these references because they each disclose computer networking systems. It is the nature of the computer networking companies to monitor developments in competing products and combine relevant features and functionalities. Furthermore, because networking systems need to interact with third party devices, many features and functionalities were standardized by different standard organizations, e.g., IEEE. A person of skill would have been motivated to look at how other products and systems routed network traffic and mimic that behavior or at least be able to interoperate with those products. For example, given that each line card has its own FDB, it would have been obvious to a person of skill to share information between the different line cards to avoid flooding when the MAC address is already known. It also would have been obvious that tracking where the MAC addresses were learned from would be helpful in case there are any inconsistencies or issues with connectivity. These combinations would have also been obvious to try given that there were a finite number of identified, predictable solutions in the prior art, and there would have been a reasonable

expectation of success to simply implement one prior art solution with concepts from prior art in the same field. Moreover, these combinations would have been the result of applying known techniques to a known method—that was ready for improvement—to yield predictable results.

- For the Asserted Claims of the '400 patent, to the extent the references charted in any of Exhibits D-1 to D-6 do not disclose “associating a respective aging time with each of the records; refreshing the records in the FDB responsively to further packets transmitted by the line cards; and removing the records from the respective FDB if the records are not refreshed within the respective aging time,” it would have been obvious to combine any of these charted references with any of the other charted references or those detailed in Appendix D, including at least Smith, Dontu, Ishimori, Finn, Edsall, Weyman, Bass, . A person of skill in the art would be motivated to combine these references because they each disclose computer networking systems. It is the nature of the computer networking companies to monitor developments in competing products and combine relevant features and functionalities. Furthermore, because networking systems need to interact with third party devices, many features and functionalities were standardized by different standard organizations, e.g., IEEE. A person of skill would have been motivated to look at how other products and systems routed network traffic and mimic that behavior or at least be able to interoperate with those products. For example, given that each line card has its own FDB, it would have been obvious to a person of skill to share information between the different line cards to avoid flooding when the MAC address is already known. It also would have been obvious that tracking where the MAC addresses were learned from and making sure the entries were not stale would be helpful in case there are any inconsistencies or issues with connectivity. These combinations would have also been obvious to try given that there were a finite number of identified, predictable solutions in the prior art, and there would have been a reasonable expectation of success to simply implement one prior art solution with concepts from prior art in the same field. Moreover, these combinations would have been the result of applying known techniques to a known method—that was ready for improvement—to yield predictable results.
- For the Asserted Claims of the '400 patent, to the extent the references charted in any of Exhibits D-1 to D-6 do not disclose “sending the message comprises transmitting a synchronization packet from the first line card via a switching core of the network node to at least the second line card,” it would have been obvious to combine any of these charted references with any of the other charted references or those detailed in Appendix D, including at least Smith, Dontu, Ishimori, Finn, Edsall, Weyman. A person of skill in the art would be motivated to combine these references because they each disclose computer networking systems. It is the nature of the computer networking companies to monitor developments in competing products and combine relevant features and functionalities. Furthermore, because networking systems need to interact with third party devices, many features and functionalities were standardized by different standard organizations, e.g., IEEE. A person of skill would have been motivated to look at how other products and systems routed network traffic and mimic that behavior or at least be able to interoperate with those products. For example, it was well-known to learn the MAC address from incoming packets to avoid needing to flood the network to learn a MAC address the device already had a chance to learn. These combinations would have also been obvious to try

given that there were a finite number of identified, predictable solutions in the prior art, and there would have been a reasonable expectation of success to simply implement one prior art solution with concepts from prior art in the same field. Moreover, these combinations would have been the result of applying known techniques to a known method—that was ready for improvement—to yield predictable results.

- For the Asserted Claims of the '400 patent, to the extent the references charted in any of Exhibits D-1 to D-6 do not disclose “sending the synchronization packet comprises, if the record in the FDB associates the MAC source address with a port different from the one of the ports on which the data packet was received, changing the record in the FDB of the first line card and sending a synchronization update packet to at least the second line card to indicate that the record has been changed,” it would have been obvious to combine any of these charted references with any of the other charted references or those detailed in Appendix D, including at least Smith, Dontu, Ishimori, Finn, Edsall, Weyman, Zelig. A person of skill in the art would be motivated to combine these references because they each disclose computer networking systems. It is the nature of the computer networking companies to monitor developments in competing products and combine relevant features and functionalities. Furthermore, because networking systems need to interact with third party devices, many features and functionalities were standardized by different standard organizations, e.g., IEEE. A person of skill would have been motivated to look at how other products and systems routed network traffic and mimic that behavior or at least be able to interoperate with those products. For example, it was well-known to learn the MAC address of the source port to avoid needing to flood the network to learn a MAC address the device already had a chance to learn. Given that each line card has its own FDB, it would have been obvious to a person of skill to share information between the different line cards to avoid flooding when the MAC address is already known, such as by sending a synchronization packet when information is learned or changed. A person of skill would have been motivated to look at how other products and systems routed network traffic and mimic that behavior or at least be able to interoperate with those products. These combinations would have also been obvious to try given that there were a finite number of identified, predictable solutions in the prior art, and there would have been a reasonable expectation of success to simply implement one prior art solution with concepts from prior art in the same field. Moreover, these combinations would have been the result of applying known techniques to a known method—that was ready for improvement—to yield predictable results.
- For the Asserted Claims of the '400 patent, to the extent the references charted in any of Exhibits D-1 to D-6 do not disclose “the network node is configured to operate as multiple virtual MAC bridges in a Layer 2 virtual private network (VPN), wherein each virtual MAC bridge is configured to serve a respective VPN instance, and wherein the records associating the MAC addresses with the respective ports are maintained independently for each of the VPN instances,” it would have been obvious to combine any of these charted references with any of the other charted references or those detailed in Appendix D, including at least Smith, Dontu, Ishimori, Finn, Edsall, Weyman, Zelig. A person of skill in the art would be motivated to combine these references because they each disclose computer networking systems. It is the nature of the computer networking companies to monitor developments in competing products and combine relevant features and

functionalities. Furthermore, because networking systems need to interact with third party devices, many features and functionalities were standardized by different standard organizations, e.g., IEEE. A person of skill would have been motivated to look at how other products and systems routed network traffic and mimic that behavior or at least be able to interoperate with those products. A person of skill would have been motivated to look at how other products and systems routed network traffic and mimic that behavior or at least be able to interoperate with those products. For example, VPNs were well known at the time and a person of ordinary skill would have known that bridges supported VPNs. These combinations would have also been obvious to try given that there were a finite number of identified, predictable solutions in the prior art, and there would have been a reasonable expectation of success to simply implement one prior art solution with concepts from prior art in the same field. Moreover, these combinations would have been the result of applying known techniques to a known method—that was ready for improvement—to yield predictable results.

- For the Asserted Claims of the '400 patent, to the extent the references charted in any of Exhibits D-1 to D-6 do not disclose “the VPN instance is a VPLS instance among multiple VPLS instances served by the network node, and wherein sending the message comprises identifying the VPLS instance in the message so as to inform all the line cards that serve the VPLS instance,” it would have been obvious to combine any of these charted references with any of the other charted references or those detailed in Appendix D, including at least Smith, Dontu, Ishimori, Finn, Edsall, Weyman, Zelig. A person of skill in the art would be motivated to combine these references because they each disclose computer networking systems. It is the nature of the computer networking companies to monitor developments in competing products and combine relevant features and functionalities. Furthermore, because networking systems need to interact with third party devices, many features and functionalities were standardized by different standard organizations, e.g., IEEE. A person of skill would have been motivated to look at how other products and systems routed network traffic and mimic that behavior or at least be able to interoperate with those products. For example, VPLS and VPNs were well known at the time and a person of ordinary skill would have known that bridges supported VPLS and VPNs. These combinations would have also been obvious to try given that there were a finite number of identified, predictable solutions in the prior art, and there would have been a reasonable expectation of success to simply implement one prior art solution with concepts from prior art in the same field. Moreover, these combinations would have been the result of applying known techniques to a known method—that was ready for improvement—to yield predictable results.
- For the Asserted Claims of the '400 patent, to the extent the references charted in any of Exhibits D-1 to D-6 do not disclose “conveying a further data packet, received from a further MAC source address, to the second line card for transmission over the network; checking the further MAC source address against the records in the FDB of the second line card; and responsively to the further data packet, adding a further record with respect to the MAC source address to the FDB of the second line card and sending a further message to inform at least the first line card of the further record,” it would have been obvious to combine any of these charted references with any of the other charted references or those detailed in Appendix D, including at least Smith, Dontu, Ishimori, Finn, Edsall, Weyman.

A person of skill in the art would be motivated to combine these references because they each disclose computer networking systems. It is the nature of the computer networking companies to monitor developments in competing products and combine relevant features and functionalities. Furthermore, because networking systems need to interact with third party devices, many features and functionalities were standardized by different standard organizations, e.g., IEEE. For example, it was well-known to learn the MAC address of the source port to avoid needing to flood the network to learn a MAC address the device already had a chance to learn. Given that each line card has its own FDB, it would have been obvious to a person of skill to share information between the different line cards to avoid flooding when the MAC address is already known, such as by sending a synchronization packet when information is learned or changed. A person of skill would have been motivated to look at how other products and systems routed network traffic and mimic that behavior or at least be able to interoperate with those products. These combinations would have also been obvious to try given that there were a finite number of identified, predictable solutions in the prior art, and there would have been a reasonable expectation of success to simply implement one prior art solution with concepts from prior art in the same field. Moreover, these combinations would have been the result of applying known techniques to a known method—that was ready for improvement—to yield predictable results.

- For the Asserted Claims of the '400 patent, to the extent the references charted in any of Exhibits D-1 to D-6 do not disclose “a plurality of member line cards conjoined in a link aggregation (LAG) group of parallel physical links between two endpoints in a Layer 2 data network joined together into a single logical link, having a plurality of LAG ports to forward packets through said switching core so that the node operates as a virtual media access control (MAC) bridge in said Layer 2 data network, said plurality of member line cards including at least first and second line cards, each line card having respective ports and having a respective forwarding database (FDB) to hold records associating MAC addresses with said respective ports of said line cards,” it would have been obvious to combine any of these charted references with any of the other charted references or those detailed in Appendix D, including at least Smith, Dontu, Ishimori, Finn, Edsall, Weyman. A person of skill in the art would be motivated to combine these references because they each disclose computer networking systems. It is the nature of the computer networking companies to monitor developments in competing products and combine relevant features and functionalities. Furthermore, because networking systems need to interact with third party devices, many features and functionalities were standardized by different standard organizations, e.g., IEEE. For example, LAGs were well-known at the time and it would have been obvious to a person of skill that MAC bridges could utilize LAGs to provide redundancy and higher throughput. A person of skill would have been motivated to look at how other products and systems routed network traffic and mimic that behavior or at least be able to interoperate with those products. These combinations would have also been obvious to try given that there were a finite number of identified, predictable solutions in the prior art, and there would have been a reasonable expectation of success to simply implement one prior art solution with concepts from prior art in the same field. Moreover, these combinations would have been the result of applying known techniques to a known method—that was ready for improvement—to yield predictable results.

- For the Asserted Claims of the '400 patent, to the extent the references charted in any of Exhibits D-1 to D-6 do not disclose “wherein said line cards are arranged so that upon receiving a data packet on an ingress line card from a MAC source address, said data packet specifying a MAC destination address, said ingress line card conveys said data packet via said switching core to at least said first line card for transmission to said MAC destination address, whereupon said first line card checks said MAC source address of said data packet against records in said FDB of said first line card, and if said FDB database of said first line card does not contain a record of an association of said MAC source address with said ingress port, adds said record to the FDB of said first line card and sends a message to at least said second line card informing said second line card of said association, and arranged, when said MAC destination address does not appear in said FDB, to flood said data packet via one and only one of said LAG ports,” it would have been obvious to combine any of these charted references with any of the other charted references or those detailed in Appendix D, including at least Smith, Dontu, Ishimori, Finn, Edsall, Weyman. A person of skill in the art would be motivated to combine these references because they each disclose computer networking systems. It is the nature of the computer networking companies to monitor developments in competing products and combine relevant features and functionalities. Furthermore, because networking systems need to interact with third party devices, many features and functionalities were standardized by different standard organizations, e.g., IEEE. For example, it was well-known to learn the MAC address of the source port to avoid needing to flood the network to learn a MAC address the device already had a chance to learn. Given that each line card has its own FDB, it would have been obvious to a person of skill to share information between the different line cards to avoid flooding when the MAC address is already known, such as by sending a synchronization packet when information is learned or changed. A person of skill would have been motivated to look at how other products and systems routed network traffic and mimic that behavior or at least be able to interoperate with those products. These combinations would have also been obvious to try given that there were a finite number of identified, predictable solutions in the prior art, and there would have been a reasonable expectation of success to simply implement one prior art solution with concepts from prior art in the same field. Moreover, these combinations would have been the result of applying known techniques to a known method—that was ready for improvement—to yield predictable results.

5. **U.S. Patent No. 9,118,602**

• **Background State of the Art**

The background state of the art includes that which is set forth in the patent, the file history, and the prior art references disclosed herein. For example, the '602 patent explains Multiprotocol Label Switching (MPLS), Internet Protocol, and Resource ReSerVation Protocol (RSVP) were well-known in the art. '602 patent, 1:25-56. The '602 patent also discloses that Ethernet Link Aggregation Group (LAG) and “other tunneling and link aggregation protocols” were well-known

in the art. *Id.* at 2:35-41. The '602 patent also discloses that hashing functions were known in the art. *Id.* at 7:47-52.

- **Exemplary Motivation to Combine**

Cisco has identified several exemplary motivations and reasons to combine the various references cited herein. For any reference for which there is a claim element that does not have a corresponding citation in that reference, it would be obvious to combine with the knowledge or a person of skill and/or any other reference in the primary or secondary charts for which there is a citation for that element. These combinations would have been obvious to try given that there were a finite number of identified, predictable solutions in the prior art, and there would have been a reasonable expectation of success to simply implement one prior art solution with concepts from prior art in the same field.

- For the Asserted Claims of the '602 patent, to the extent the references charted in any of Exhibits E-1 to E-7 do not disclose “assigning and utilizing an Ethernet physical data port in an Ethernet Link Aggregation Group (LAG) in a Multi-Protocol Label Switching (MPLS) network,” it would have been obvious to combine any of these charted references with any of the other charted references or those detailed in Appendix E, including at least Benayoun, Yamada, Clear, or Yang. A person of skill in the art would be motivated to combine these references because they each disclose improvements to Multiprotocol Label Switching. It is the nature of the computer networking companies to monitor developments in competing products and combine relevant features and functionalities. Furthermore, because networking systems need to interact with third party devices, many features and functionalities were standardized by different standard organizations, e.g., IETF. In fact, the '602 patent refers to several standards. A person of skill would have been motivated to look at how other products and systems routed network traffic and mimic that behavior or at least be able to interoperate with those products. Specifically, a person of skill in the art would look to see how other products allocated bandwidth and delivered packets most efficiently. These combinations would have also been obvious to try given that there were a finite number of identified, predictable solutions in the prior art, and there would have been a reasonable expectation of success to simply implement one prior art solution with concepts from prior art in the same field. Moreover, these combinations would have been the result of applying known techniques to a known method—that was ready for improvement—to yield predictable results.
- For the Asserted Claims of the '602 patent, to the extent the references charted in any of Exhibits E-1 to E-7 do not disclose “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,” it would have been obvious to combine any of these charted references with any of the other charted references or those detailed in Appendix E, including at least Benayoun, Yamada, Clear, or Yang. A person of skill in the art would be motivated to combine these references because they each disclose improvements to Multiprotocol Label Switching. It is the nature of the computer networking companies to monitor developments in competing products and combine relevant features and functionalities. Furthermore, because networking systems need to interact with third party devices, many features and functionalities were standardized by different standard organizations, e.g., IETF. In fact, the ’602 patent refers to several standards. A person of skill would have been motivated to look at how other products and systems routed network traffic and mimic that behavior or at least be able to interoperate with those products. Specifically, a person of skill in the art would look to see how other products allocated bandwidth and delivered packets most efficiently. These combinations would have also been obvious to try given that there were a finite number of identified, predictable solutions in the prior art, and there would have been a reasonable expectation of success to simply implement one prior art solution with concepts from prior art in the same field. Moreover, these combinations would have been the result of applying known techniques to a known method—that was ready for improvement—to yield predictable results.

- For the Asserted Claims of the ’602 patent, to the extent the references charted in any of Exhibits E-1 to E-7 do not disclose “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,” it would have been obvious to combine any of these charted references with any of the other charted references or those detailed in Appendix E, including at least Benayoun, Yamada, Clear, or Yang. A person of skill in the art would be motivated to combine these references because they each disclose improvements to Multiprotocol Label Switching. It is the nature of the computer networking companies to monitor developments in competing products and combine relevant features and functionalities. Furthermore, because networking systems need to interact with third party devices, many features and functionalities were standardized by different standard organizations, e.g., IETF. In fact, the ’602 patent refers to several standards. A person of skill would have been motivated to look at how other products and systems routed network traffic and mimic that behavior or at least be able to interoperate with those products. Specifically, a person of skill in the art would look to see how other products allocated bandwidth and delivered packets most efficiently. These combinations would have also been obvious to try given that there were a finite number of identified, predictable solutions in the prior art, and there would have been a reasonable expectation of success to simply implement one prior art solution with concepts from prior art in the same field. Moreover, these combinations would have been the result of applying known techniques to a known method—that was ready for improvement—to yield predictable results.
- For the Asserted Claims of the ’602 patent, to the extent the references charted in any of Exhibits E-1 to E-7 do not disclose “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,” it would have been obvious to combine any of these charted references with any of the other charted references or those detailed in Appendix E, including at least Benayoun, Yamada, Clear, or Yang. A person of skill in the art would be motivated to combine these references because they each disclose improvements to Multiprotocol Label Switching. It is the nature of the computer networking companies to monitor developments in competing products and combine relevant features and functionalities. Furthermore, because networking systems need to interact with third party devices, many features and functionalities were standardized by different standard organizations, e.g., IETF. In fact, the ’602 patent refers to several standards. A person of skill would have been motivated to look at how other products and systems routed network traffic and mimic that behavior or at least be able to interoperate with those products. Specifically, a person of skill in the art would look to see how other products allocated bandwidth and delivered packets most efficiently. These combinations would have also been obvious to try given that there were a finite number of identified, predictable solutions in the prior art, and there would have been a reasonable expectation of success to simply implement one prior art solution with concepts from prior art in the same field. Moreover, these combinations would have been the result of applying known techniques to a known method—that was ready for improvement—to yield predictable results.

- For the Asserted Claims of the ’602 patent, to the extent the references charted in any of Exhibits E-1 to E-7 do not disclose “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,” it would have been obvious to combine any of these charted references with any of the other charted references or those detailed in Appendix E, including at least Benayoun, Yamada, Clear, or Yang. A person of skill in the art would be motivated to combine these references because they each disclose improvements to Multiprotocol Label Switching. It is the nature of the computer networking companies to monitor developments in competing products and combine relevant features and functionalities. Furthermore, because networking systems need to interact with third party devices, many features and functionalities were standardized by different standard organizations, e.g., IETF. In fact, the ’602 patent refers to several standards. A person of skill would have been motivated to look at how other products and systems routed network traffic and mimic that behavior or at least be able to interoperate with those products. Specifically, a person of skill in the art would look to see how other products allocated bandwidth and delivered packets most efficiently. These combinations would have also been obvious to try given that there were a finite number of identified, predictable solutions in the prior art, and there would have been a reasonable expectation of success to simply implement one prior art solution with concepts from prior art in the same field. Moreover, these combinations would have been the result of applying known techniques to a known method—that was ready for improvement—to yield predictable results.
- For the Asserted Claims of the ’602 patent, to the extent the references charted in any of Exhibits E-1 to E-7 do not disclose “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,” it would have been obvious to combine any of these charted references with any of the other charted references or those detailed

in Appendix E, including at least Benayoun, Yamada, Clear, or Yang. A person of skill in the art would be motivated to combine these references because they each disclose improvements to Multiprotocol Label Switching. It is the nature of the computer networking companies to monitor developments in competing products and combine relevant features and functionalities. Furthermore, because networking systems need to interact with third party devices, many features and functionalities were standardized by different standard organizations, e.g., IETF. In fact, the '602 patent refers to several standards. A person of skill would have been motivated to look at how other products and systems routed network traffic and mimic that behavior or at least be able to interoperate with those products. Specifically, a person of skill in the art would look to see how other products allocated bandwidth and delivered packets most efficiently. These combinations would have also been obvious to try given that there were a finite number of identified, predictable solutions in the prior art, and there would have been a reasonable expectation of success to simply implement one prior art solution with concepts from prior art in the same field. Moreover, these combinations would have been the result of applying known techniques to a known method—that was ready for improvement—to yield predictable results.

- For the Asserted Claims of the '602 patent, to the extent the references charted in any of Exhibits E-1 to E-7 do not disclose “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,” it would have been obvious to combine any of these charted references with any of the other charted references or those detailed in Appendix E, including at least Benayoun, Yamada, Clear, or Yang. A person of skill in the art would be motivated to combine these references because they each disclose improvements to Multiprotocol Label Switching. It is the nature of the computer networking companies to monitor developments in competing products and combine relevant features and functionalities. Furthermore, because networking systems need to interact with third party devices, many features and functionalities were standardized by different standard organizations, e.g., IETF. In fact, the '602 patent refers to several standards. A person of skill would have been motivated to look at how other products and systems routed network traffic and mimic that behavior or at least be able to interoperate with those products. Specifically, a person of skill in the art would look to see how other products allocated bandwidth and delivered packets most efficiently. These combinations would have also been obvious to try given that there were a finite number of identified, predictable solutions in the prior art, and there would have been a reasonable expectation of success to simply implement one prior art solution with concepts from prior art in the same field. Moreover, these combinations would have been the result of applying known techniques to a known method—that was ready for improvement—to yield predictable results.
- For the Asserted Claims of the '602 patent, to the extent the references charted in any of Exhibits E-1 to E-7 do not disclose “request message comprises an RSVP-TE PATH message augmented with a LABEL_REQUEST object,” it would have been obvious to combine any of these charted references with any of the other charted references or those detailed in Appendix E, including at least Benayoun, Yamada, Clear, or Yang. A person

of skill in the art would be motivated to combine these references because they each disclose improvements to Multiprotocol Label Switching. It is the nature of the computer networking companies to monitor developments in competing products and combine relevant features and functionalities. Furthermore, because networking systems need to interact with third party devices, many features and functionalities were standardized by different standard organizations, e.g., IETF. In fact, the '602 patent refers to several standards. A person of skill would have been motivated to look at how other products and systems routed network traffic and mimic that behavior or at least be able to interoperate with those products. Specifically, a person of skill in the art would look to see how other products allocated bandwidth and delivered packets most efficiently. These combinations would have also been obvious to try given that there were a finite number of identified, predictable solutions in the prior art, and there would have been a reasonable expectation of success to simply implement one prior art solution with concepts from prior art in the same field. Moreover, these combinations would have been the result of applying known techniques to a known method—that was ready for improvement—to yield predictable results.

- For the Asserted Claims of the '602 patent, to the extent the references charted in any of Exhibits E-1 to E-7 do not disclose “request comprises an indication of a service property, and wherein said selecting comprises identifying a physical port in compliance with said service property,” it would have been obvious to combine any of these charted references with any of the other charted references or those detailed in Appendix E, including at least Benayoun, Yamada, Clear, or Yang. A person of skill in the art would be motivated to combine these references because they each disclose improvements to Multiprotocol Label Switching. It is the nature of the computer networking companies to monitor developments in competing products and combine relevant features and functionalities. Furthermore, because networking systems need to interact with third party devices, many features and functionalities were standardized by different standard organizations, e.g., IETF. In fact, the '602 patent refers to several standards. A person of skill would have been motivated to look at how other products and systems routed network traffic and mimic that behavior or at least be able to interoperate with those products. Specifically, a person of skill in the art would look to see how other products allocated bandwidth and delivered packets most efficiently. These combinations would have also been obvious to try given that there were a finite number of identified, predictable solutions in the prior art, and there would have been a reasonable expectation of success to simply implement one prior art solution with concepts from prior art in the same field. Moreover, these combinations would have been the result of applying known techniques to a known method—that was ready for improvement—to yield predictable results.
- For the Asserted Claims of the '602 patent, to the extent the references charted in any of Exhibits E-1 to E-7 do not disclose “service property comprises at least one of: a guaranteed bandwidth; a peak bandwidth; and a class of service,” it would have been obvious to combine any of these charted references with any of the other charted references or those detailed in Appendix E, including at least Benayoun, Yamada, Clear, or Yang. A person of skill in the art would be motivated to combine these references because they each disclose improvements to Multiprotocol Label Switching. It is the nature of the computer networking companies to monitor developments in competing products and combine

relevant features and functionalities. Furthermore, because networking systems need to interact with third party devices, many features and functionalities were standardized by different standard organizations, e.g., IETF. In fact, the '602 patent refers to several standards. A person of skill would have been motivated to look at how other products and systems routed network traffic and mimic that behavior or at least be able to interoperate with those products. Specifically, a person of skill in the art would look to see how other products allocated bandwidth and delivered packets most efficiently. These combinations would have also been obvious to try given that there were a finite number of identified, predictable solutions in the prior art, and there would have been a reasonable expectation of success to simply implement one prior art solution with concepts from prior art in the same field. Moreover, these combinations would have been the result of applying known techniques to a known method—that was ready for improvement—to yield predictable results.

- For the Asserted Claims of the '602 patent, to the extent the references charted in any of Exhibits E-1 to E-7 do not disclose “selecting comprises selecting a single physical tunnel port having a maximum available bandwidth of said plurality of physical data ports,” it would have been obvious to combine any of these charted references with any of the other charted references or those detailed in Appendix E, including at least Benayoun, Yamada, Clear, or Yang. A person of skill in the art would be motivated to combine these references because they each disclose improvements to Multiprotocol Label Switching. It is the nature of the computer networking companies to monitor developments in competing products and combine relevant features and functionalities. Furthermore, because networking systems need to interact with third party devices, many features and functionalities were standardized by different standard organizations, e.g., IETF. In fact, the '602 patent refers to several standards. A person of skill would have been motivated to look at how other products and systems routed network traffic and mimic that behavior or at least be able to interoperate with those products. Specifically, a person of skill in the art would look to see how other products allocated bandwidth and delivered packets most efficiently. These combinations would have also been obvious to try given that there were a finite number of identified, predictable solutions in the prior art, and there would have been a reasonable expectation of success to simply implement one prior art solution with concepts from prior art in the same field. Moreover, these combinations would have been the result of applying known techniques to a known method—that was ready for improvement—to yield predictable results.
- For the Asserted Claims of the '602 patent, to the extent the references charted in any of Exhibits E-1 to E-7 do not disclose “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,” it would have been obvious to combine any of these charted references with any of the other charted references or those detailed in Appendix E, including at least Benayoun, Yamada, Clear, or Yang. A person of skill in the art would be motivated to combine these references because they each disclose improvements to Multiprotocol Label Switching. It is the nature of the computer networking companies to monitor developments in competing products and combine relevant features and functionalities. Furthermore, because networking systems need to interact with third party devices, many features and functionalities were standardized by

different standard organizations, e.g., IETF. In fact, the '602 patent refers to several standards. A person of skill would have been motivated to look at how other products and systems routed network traffic and mimic that behavior or at least be able to interoperate with those products. Specifically, a person of skill in the art would look to see how other products allocated bandwidth and delivered packets most efficiently. These combinations would have also been obvious to try given that there were a finite number of identified, predictable solutions in the prior art, and there would have been a reasonable expectation of success to simply implement one prior art solution with concepts from prior art in the same field. Moreover, these combinations would have been the result of applying known techniques to a known method—that was ready for improvement—to yield predictable results.

- For the Asserted Claims of the '602 patent, to the extent the references charted in any of Exhibits E-1 to E-7 do not disclose “switching said data packet is according to a mapping function,” it would have been obvious to combine any of these charted references with any of the other charted references or those detailed in Appendix E, including at least Benayoun, Yamada, Clear, or Yang. A person of skill in the art would be motivated to combine these references because they each disclose improvements to Multiprotocol Label Switching. It is the nature of the computer networking companies to monitor developments in competing products and combine relevant features and functionalities. Furthermore, because networking systems need to interact with third party devices, many features and functionalities were standardized by different standard organizations, e.g., IETF. In fact, the '602 patent refers to several standards. A person of skill would have been motivated to look at how other products and systems routed network traffic and mimic that behavior or at least be able to interoperate with those products. Specifically, a person of skill in the art would look to see how other products allocated bandwidth and delivered packets most efficiently. These combinations would have also been obvious to try given that there were a finite number of identified, predictable solutions in the prior art, and there would have been a reasonable expectation of success to simply implement one prior art solution with concepts from prior art in the same field. Moreover, these combinations would have been the result of applying known techniques to a known method—that was ready for improvement—to yield predictable results.
- For the Asserted Claims of the '602 patent, to the extent the references charted in any of Exhibits E-1 to E-7 do not disclose “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,” it would have been obvious to combine any of these charted references with any of the other charted references or those detailed in Appendix E, including at least Benayoun, Yamada, Clear, or Yang. A person of skill in the art would be motivated to combine these references because they each disclose improvements to Multiprotocol Label Switching. It is the nature of the computer networking companies to monitor developments in competing products and combine relevant features and functionalities. Furthermore, because networking systems need to interact with third party devices, many features and functionalities were standardized by different standard organizations, e.g., IETF. In fact, the '602 patent refers to several standards. A person of skill would have been motivated to look at how other products and systems routed network

traffic and mimic that behavior or at least be able to interoperate with those products. Specifically, a person of skill in the art would look to see how other products allocated bandwidth and delivered packets most efficiently. These combinations would have also been obvious to try given that there were a finite number of identified, predictable solutions in the prior art, and there would have been a reasonable expectation of success to simply implement one prior art solution with concepts from prior art in the same field. Moreover, these combinations would have been the result of applying known techniques to a known method—that was ready for improvement—to yield predictable results.

- For the Asserted Claims of the '602 patent, to the extent the references charted in any of Exhibits E-1 to E-7 do not disclose “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,” it would have been obvious to combine any of these charted references with any of the other charted references or those detailed in Appendix E, including at least Benayoun, Yamada, Clear, or Yang. A person of skill in the art would be motivated to combine these references because they each disclose improvements to Multiprotocol Label Switching. It is the nature of the computer networking companies to monitor developments in competing products and combine relevant features and functionalities. Furthermore, because networking systems need to interact with third party devices, many features and functionalities were standardized by different standard organizations, e.g., IETF. In fact, the '602 patent refers to several standards. A person of skill would have been motivated to look at how other products and systems routed network traffic and mimic that behavior or at least be able to interoperate with those products. Specifically, a person of skill in the art would look to see how other products allocated bandwidth and delivered packets most efficiently. These combinations would have also been obvious to try given that there were a finite number of identified, predictable solutions in the prior art, and there would have been a reasonable expectation of success to simply implement one prior art solution with concepts from prior art in the same field. Moreover, these combinations would have been the result of applying known techniques to a known method—that was ready for improvement—to yield predictable results.
- For the Asserted Claims of the '602 patent, to the extent the references charted in any of Exhibits E-1 to E-7 do not disclose “selecting a backup port from among the plurality of physical data ports, different from said single physical tunnel port; and 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,” it would have been obvious to combine any of these charted references with any of the other charted references or those detailed in Appendix E, including at least Benayoun, Yamada, Clear, or Yang. A person of skill in the art would be motivated to combine these references because they each disclose improvements to Multiprotocol Label Switching. It is the nature of the computer networking companies to monitor developments in competing products and combine relevant features and functionalities. Furthermore, because networking systems need to interact with third party devices, many features and functionalities were standardized by different standard organizations, e.g., IETF. In fact, the '602 patent refers to several standards. A person of skill would have been motivated to look at how other products and systems routed network traffic and mimic that behavior

or at least be able to interoperate with those products. Specifically, a person of skill in the art would look to see how other products allocated bandwidth and delivered packets most efficiently. These combinations would have also been obvious to try given that there were a finite number of identified, predictable solutions in the prior art, and there would have been a reasonable expectation of success to simply implement one prior art solution with concepts from prior art in the same field. Moreover, these combinations would have been the result of applying known techniques to a known method—that was ready for improvement—to yield predictable results.

- For the Asserted Claims of the '602 patent, to the extent the references charted in any of Exhibits E-1 to E-7 do not disclose “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,” it would have been obvious to combine any of these charted references with any of the other charted references or those detailed in Appendix E, including at least Benayoun, Yamada, Clear, or Yang. A person of skill in the art would be motivated to combine these references because they each disclose improvements to Multiprotocol Label Switching. It is the nature of the computer networking companies to monitor developments in competing products and combine relevant features and functionalities. Furthermore, because networking systems need to interact with third party devices, many features and functionalities were standardized by different standard organizations, e.g., IETF. In fact, the '602 patent refers to several standards. A person of skill would have been motivated to look at how other products and systems routed network traffic and mimic that behavior or at least be able to interoperate with those products. Specifically, a person of skill in the art would look to see how other products allocated bandwidth and delivered packets most efficiently. These combinations would have also been obvious to try given that there were a finite number of identified, predictable solutions in the prior art, and there would have been a reasonable expectation of success to simply implement one prior art solution with concepts from prior art in the same field. Moreover, these combinations would have been the result of applying known techniques to a known method—that was ready for improvement—to yield predictable results.
- For the Asserted Claims of the '602 patent, to the extent the references charted in any of Exhibits E-1 to E-7 do not disclose “first MPLS/LAG switch comprises a Label Switched Router (LSR),” it would have been obvious to combine any of these charted references with any of the other charted references or those detailed in Appendix E, including at least Benayoun, Yamada, Clear, or Yang. A person of skill in the art would be motivated to combine these references because they each disclose improvements to Multiprotocol Label Switching. It is the nature of the computer networking companies to monitor developments in competing products and combine relevant features and functionalities. Furthermore, because networking systems need to interact with third party devices, many features and functionalities were standardized by different standard organizations, e.g., IETF. In fact, the '602 patent refers to several standards. A person of skill would have been motivated to look at how other products and systems routed network traffic and mimic that behavior or at least be able to interoperate with those products. Specifically, a person of skill in the art would look to see how other products allocated bandwidth and delivered packets most efficiently. These combinations would have also been obvious to try given that there were

a finite number of identified, predictable solutions in the prior art, and there would have been a reasonable expectation of success to simply implement one prior art solution with concepts from prior art in the same field. Moreover, these combinations would have been the result of applying known techniques to a known method—that was ready for improvement—to yield predictable results.

- For the Asserted Claims of the '602 patent, to the extent the references charted in any of Exhibits E-1 to E-7 do not disclose “designating by said first MPLS/LAG switch, the plurality of physical data ports in said first MPLS/LAG switch as a single logical port,” it would have been obvious to combine any of these charted references with any of the other charted references or those detailed in Appendix E, including at least Benayoun, Yamada, Clear, or Yang. A person of skill in the art would be motivated to combine these references because they each disclose improvements to Multiprotocol Label Switching. It is the nature of the computer networking companies to monitor developments in competing products and combine relevant features and functionalities. Furthermore, because networking systems need to interact with third party devices, many features and functionalities were standardized by different standard organizations, e.g., IETF. In fact, the '602 patent refers to several standards. A person of skill would have been motivated to look at how other products and systems routed network traffic and mimic that behavior or at least be able to interoperate with those products. Specifically, a person of skill in the art would look to see how other products allocated bandwidth and delivered packets most efficiently. These combinations would have also been obvious to try given that there were a finite number of identified, predictable solutions in the prior art, and there would have been a reasonable expectation of success to simply implement one prior art solution with concepts from prior art in the same field. Moreover, these combinations would have been the result of applying known techniques to a known method—that was ready for improvement—to yield predictable results.
- For the Asserted Claims of the '602 patent, to the extent the references charted in any of Exhibits E-1 to E-7 do not disclose “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,” it would have been obvious to combine any of these charted references with any of the other charted references or those detailed in Appendix E, including at least Benayoun, Yamada, Clear, or Yang. A person of skill in the art would be motivated to combine these references because they each disclose improvements to Multiprotocol Label Switching. It is the nature of the computer networking companies to monitor developments in competing products and combine relevant features and functionalities. Furthermore, because networking systems need to interact with third party devices, many features and functionalities were standardized by different standard organizations, e.g., IETF. In fact, the '602 patent refers to several standards. A person of skill would have been motivated to look at how other products and systems routed network traffic and mimic that behavior or at least be able to interoperate with those products. Specifically, a person of skill in the art would look to see how other products allocated bandwidth and delivered packets most efficiently. These combinations would have also been obvious to try given that there were

a finite number of identified, predictable solutions in the prior art, and there would have been a reasonable expectation of success to simply implement one prior art solution with concepts from prior art in the same field. Moreover, these combinations would have been the result of applying known techniques to a known method—that was ready for improvement—to yield predictable results.

- For the Asserted Claims of the '602 patent, to the extent the references charted in any of Exhibits E-1 to E-7 do not disclose “a processor,” it would have been obvious to combine any of these charted references with any of the other charted references or those detailed in Appendix E, including at least Benayoun, Yamada, Clear, or Yang. A person of skill in the art would be motivated to combine these references because they each disclose improvements to Multiprotocol Label Switching. It is the nature of the computer networking companies to monitor developments in competing products and combine relevant features and functionalities. Furthermore, because networking systems need to interact with third party devices, many features and functionalities were standardized by different standard organizations, e.g., IETF. In fact, the '602 patent refers to several standards. A person of skill would have been motivated to look at how other products and systems routed network traffic and mimic that behavior or at least be able to interoperate with those products. Specifically, a person of skill in the art would look to see how other products allocated bandwidth and delivered packets most efficiently. These combinations would have also been obvious to try given that there were a finite number of identified, predictable solutions in the prior art, and there would have been a reasonable expectation of success to simply implement one prior art solution with concepts from prior art in the same field. Moreover, these combinations would have been the result of applying known techniques to a known method—that was ready for improvement—to yield predictable results.
- For the Asserted Claims of the '602 patent, to the extent the references charted in any of Exhibits E-1 to E-7 do not disclose “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,” it would have been obvious to combine any of these charted references with any of the other charted references or those detailed in Appendix E, including at least Benayoun, Yamada, Clear, or Yang. A person of skill in the art would be motivated to combine these references because they each disclose improvements to Multiprotocol Label Switching. It is the nature of the computer networking companies to monitor developments in competing products and combine relevant features and functionalities. Furthermore, because networking systems need to interact with third party devices, many features and functionalities were standardized by different standard organizations, e.g., IETF. In fact, the '602 patent refers to several standards. A person of skill would have been motivated to look at how other products and systems routed network traffic and mimic that behavior or at least be able to interoperate with those products. Specifically, a person of skill in the art would look to see how other products allocated bandwidth and delivered packets most efficiently. These combinations would have also been obvious to try given that there were a finite number of identified, predictable solutions in the prior art, and there would have been a reasonable expectation of success to simply implement one prior art solution with concepts from prior art in the same field. Moreover, these combinations would have been

the result of applying known techniques to a known method—that was ready for improvement—to yield predictable results.

- For the Asserted Claims of the '602 patent, to the extent the references charted in any of Exhibits E-1 to E-7 do not disclose “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,” it would have been obvious to combine any of these charted references with any of the other charted references or those detailed in Appendix E, including at least Benayoun, Yamada, Clear, or Yang. A person of skill in the art would be motivated to combine these references because they each disclose improvements to Multiprotocol Label Switching. It is the nature of the computer networking companies to monitor developments in competing products and combine relevant features and functionalities. Furthermore, because networking systems need to interact with third party devices, many features and functionalities were standardized by different standard organizations, e.g., IETF. In fact, the '602 patent refers to several standards. A person of skill would have been motivated to look at how other products and systems routed network traffic and mimic that behavior or at least be able to interoperate with those products. Specifically, a person of skill in the art would look to see how other products allocated bandwidth and delivered packets most efficiently. These combinations would have also been obvious to try given that there were a finite number of identified, predictable solutions in the prior art, and there would have been a reasonable expectation of success to simply implement one prior art solution with concepts from prior art in the same field. Moreover, these combinations would have been the result of applying known techniques to a known method—that was ready for improvement—to yield predictable results.
- For the Asserted Claims of the '602 patent, to the extent the references charted in any of Exhibits E-1 to E-7 do not disclose “publish said packet label upstream,” it would have been obvious to combine any of these charted references with any of the other charted references or those detailed in Appendix E, including at least Benayoun, Yamada, Clear, or Yang. A person of skill in the art would be motivated to combine these references because they each disclose improvements to Multiprotocol Label Switching. It is the nature of the computer networking companies to monitor developments in competing products and combine relevant features and functionalities. Furthermore, because networking systems need to interact with third party devices, many features and functionalities were standardized by different standard organizations, e.g., IETF. In fact, the '602 patent refers to several standards. A person of skill would have been motivated to look at how other products and systems routed network traffic and mimic that behavior or at least be able to interoperate with those products. Specifically, a person of skill in the art would look to see how other products allocated bandwidth and delivered packets most efficiently. These combinations would have also been obvious to try given that there were a finite number of identified, predictable solutions in the prior art, and there would have been a reasonable expectation of success to simply implement one prior art solution with concepts from prior art in the same field. Moreover, these combinations would have been the result of applying known techniques to a known method—that was ready for improvement—to yield predictable results.

- For the Asserted Claims of the '602 patent, to the extent the references charted in any of Exhibits E-1 to E-7 do not disclose “a mapper,” it would have been obvious to combine any of these charted references with any of the other charted references or those detailed in Appendix E, including at least Benayoun, Yamada, Clear, or Yang. A person of skill in the art would be motivated to combine these references because they each disclose improvements to Multiprotocol Label Switching. It is the nature of the computer networking companies to monitor developments in competing products and combine relevant features and functionalities. Furthermore, because networking systems need to interact with third party devices, many features and functionalities were standardized by different standard organizations, e.g., IETF. In fact, the '602 patent refers to several standards. A person of skill would have been motivated to look at how other products and systems routed network traffic and mimic that behavior or at least be able to interoperate with those products. Specifically, a person of skill in the art would look to see how other products allocated bandwidth and delivered packets most efficiently. These combinations would have also been obvious to try given that there were a finite number of identified, predictable solutions in the prior art, and there would have been a reasonable expectation of success to simply implement one prior art solution with concepts from prior art in the same field. Moreover, these combinations would have been the result of applying known techniques to a known method—that was ready for improvement—to yield predictable results.
- For the Asserted Claims of the '602 patent, to the extent the references charted in any of Exhibits E-1 to E-7 do not disclose “receive a data packet from an upstream node,” it would have been obvious to combine any of these charted references with any of the other charted references or those detailed in Appendix E, including at least Benayoun, Yamada, Clear, or Yang. A person of skill in the art would be motivated to combine these references because they each disclose improvements to Multiprotocol Label Switching. It is the nature of the computer networking companies to monitor developments in competing products and combine relevant features and functionalities. Furthermore, because networking systems need to interact with third party devices, many features and functionalities were standardized by different standard organizations, e.g., IETF. In fact, the '602 patent refers to several standards. A person of skill would have been motivated to look at how other products and systems routed network traffic and mimic that behavior or at least be able to interoperate with those products. Specifically, a person of skill in the art would look to see how other products allocated bandwidth and delivered packets most efficiently. These combinations would have also been obvious to try given that there were a finite number of identified, predictable solutions in the prior art, and there would have been a reasonable expectation of success to simply implement one prior art solution with concepts from prior art in the same field. Moreover, these combinations would have been the result of applying known techniques to a known method—that was ready for improvement—to yield predictable results.
- For the Asserted Claims of the '602 patent, to the extent the references charted in any of Exhibits E-1 to E-7 do not disclose “detect said data packet label in said data packet; and 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,” it would have been obvious to combine any of these charted references with any of the other charted references or those

detailed in Appendix E, including at least Benayoun, Yamada, Clear, or Yang. A person of skill in the art would be motivated to combine these references because they each disclose improvements to Multiprotocol Label Switching. It is the nature of the computer networking companies to monitor developments in competing products and combine relevant features and functionalities. Furthermore, because networking systems need to interact with third party devices, many features and functionalities were standardized by different standard organizations, e.g., IETF. In fact, the '602 patent refers to several standards. A person of skill would have been motivated to look at how other products and systems routed network traffic and mimic that behavior or at least be able to interoperate with those products. Specifically, a person of skill in the art would look to see how other products allocated bandwidth and delivered packets most efficiently. These combinations would have also been obvious to try given that there were a finite number of identified, predictable solutions in the prior art, and there would have been a reasonable expectation of success to simply implement one prior art solution with concepts from prior art in the same field. Moreover, these combinations would have been the result of applying known techniques to a known method—that was ready for improvement—to yield predictable results.

III. INVALIDITY UNDER 35 U.S.C. § 112

Cisco alleges that the Asserted Claims are invalid under 35 U.S.C. § 112 as indefinite (Section 112, ¶ 2) and for failing to satisfy the written description and enablement requirements (Section 112, ¶ 1). Cisco reserves all rights to amend its Preliminary Invalidity Contentions under 35 U.S.C. § 112, including after the Asserted Claims are ultimately construed by the Court, in response to any interpretation of the Asserted Claims embodied in Corrigent's infringement positions, and/or to account for any changes in the law concerning invalidity under 35 U.S.C. § 112. Cisco also reserves the right to provide additional explanation and/or argument for its Preliminary Invalidity Contentions under Section 112, including, for example, based on expert testimony. Cisco's contentions that the Asserted Claims are invalid under Section 112 are not admissions regarding the construction or scope of the claims of the Asserted Patents, or that any of the claims of the Asserted Patents are not anticipated or rendered obvious by any prior art. All of the below statements are by way of example only. Any item disclosed below with respect to

any patent or claim may, as appropriate, be asserted as a defense against any other patent or claim that has a similar claim limitation and patent disclosure.

A. INVALIDITY UNDER 35 U.S.C. § 112, ¶ 1

35 U.S.C. § 112, ¶ 1 requires that the specification contain a written description of the invention. “[T]he hallmark of written description is disclosure.” *Boston Scientific Corp. v. Johnson & Johnson*, 647 F.3d 1353, 1361–62 (Fed. Cir. 2011) (citation omitted). The test for whether a specification adequately describes an invention is “whether the disclosure of the application relied upon reasonably conveys to those skilled in the art that the inventor had possession of the claimed subject matter as of the filing date. . . . [T]he test requires an objective inquiry into the four corners of the specification from the perspective of a person of ordinary skill in the art [It] is a question of fact.” *Ariad Pharms., Inc. v. Eli Lilly and Co.*, 598 F.3d 1336, 1351 (Fed. Cir. 2010) (en banc); *Boston Scientific*, 647 F.3d at 1362.

The enablement requirement of Section 112 demands that the patent specification enable “those skilled in the art to make and use the full scope of the claimed invention without ‘undue experimentation.’” *Genentech, Inc. v. Novo Nordisk A/S*, 108 F.3d 1361, 1365 (Fed. Cir. 1997) (quoting *In re Wright*, 999 F.2d 1557, 1561 (Fed. Cir. 1993)). “[T]he scope of the claims must be less than or equal to the scope of the enablement.” *Nat’l Recovery Tech., Inc. v. Magnetic Separation Sys., Inc.*, 166 F.3d 1190, 1196 (Fed. Cir. 1999). In other words, the claims must be enabled over their entire claimed range. *See id.* (finding lack of enablement because the “claim [] [was] broader than the enablement as taught in the specification”).

Cisco contends that the following Asserted Claims are invalid under 35 U.S.C. § 112, ¶ 1. Each Asserted Claim identified below (and each Asserted Claim that depends therefrom) is invalid under Section 112, ¶ 1 because the specification of the Asserted Patent fails to provide a sufficient written description, enabling disclosure. For each listed term or phrase, Cisco believes the term

or phrase is invalid under Section 112, ¶ 1, as is any limitation including such terms or phrases, for the same reason(s).

1. U.S. Patent No. 6,957,369

- “idle line” (claim 1, 3, 7)
- “idle trace” (claim 15, 18, 20)
- “line” (claim 1, 4, 5, 6, 7, 8, 10, 11, 12, 18, 23)
- “loop back” (claim 1, 2, 3, 9, 15, 16, 17, 21, 22)
- “main module” (claim 1, 2, 4, 5, 8, 9, 10, 11, 15, 16, 18, 21, 22, 23)
- “selecting a first idle line” (claim 1)
- “select a first idle trace” (claim 15)
- “selecting for testing a second idle line” (claim 1)
- “select for testing a second idle trace” (claim 15)
- “trace” (claim 5, 10, 15, 16, 18, 19, 20, 21, 23, 24)

2. U.S. Patent No. 7,113,485

- “latency measurement packet” (all claims)
- “originating node” (claims 1–5)
- “peer node” (claims 1–3)
- “indication” (claims 1–2, 6–7, 11–12, 16–17)
- “class of service” (all claims)
- “serial numbers” (claims 5, 9, 15, 19)

3. U.S. Patent No. 7,330,431

- “class of service” (claims 5, 16)

- “determin[ing/e] . . . bandwidth requirements for . . . logical connections” (1, 12, 24, 25, 28)
- “correction factor” (claims 6, 17)
- “receive a definition of logical connections between the nodes” (claims 25, 28)
- “data transmission service” (1, 4–5, 9–10, 12, 15–16, 20–21, 24–25, 28)

4. U.S. Patent No. 7,593,400

- “distributed media access control (MAC) bridge” (claim 1)
- “virtual media access control (MAC) bridge” (claim 8, 11, 18)
- “layer 2 data network” (claims 1, 11)
- “said FDB” (claims 1, 11)
- “conjoined member line cards” (claim 1)
- “member line cards conjoined in a link aggregation (LAG) group” (claim 11)
- “configuring a link aggregation (LAG) group of parallel physical links between two endpoints in said Layer 2 data network joined together into a single logical link, said LAG group having a plurality of LAG ports and a plurality of conjoined member line cards” (claim 1)
- “a plurality of member line cards conjoined in a link aggregation (LAG) group of parallel physical links between two endpoints in a Layer 2 data network joined together into a single logical link” (claim 11)
- “having a plurality of LAG ports to forward packets through said switching core so that the node operates as a virtual media access control (MAC) bridge in said Layer 2 data network” (claim 11)
- “network node” (claims 1, 11)

- “the network node is configured to operate as multiple virtual MAC bridges in a Layer 2 virtual private network (VPN), wherein each virtual MAC bridge is configured to serve a respective VPN instance, and wherein the records associating the MAC addresses with the respective ports are maintained independently for each of the VPN instances” (claims 8, 18)
- “wherein the VPN instance is a VPLS instance among multiple VPLS instances served by the network node, and wherein sending the message comprises identifying the VPLS instance in the message so as to inform all the line cards that serve the VPLS instance” (claims 9, 19)

5. U.S. Patent No. 9,118,602

- “preceding node” (claim 1, 2, 15, 26)
- “request message” (claim 2, 3, 26)

B. INVALIDITY UNDER 35 U.S.C. § 112, ¶ 2

Claims are indefinite under 35 U.S.C. § 112, ¶ 2 when they “fail to inform, with reasonable certainty, those skilled in the art about the scope of the invention.” *Nautilus, Inc. v. Biosig Instruments, Inc.*, 134 S. Ct. 2120, 2124 (2014). For example, to the extent an asserted apparatus claim includes both apparatus and method limitations, that claim is invalid for indefiniteness under Section 112, ¶ 2 because it fails to identify or notify the public of what constitutes direct infringement. *See IPXL Holdings, L.L.C. v. Amazon.com, Inc.*, 430 F.3d 1377 (Fed. Cir. 2005). Similarly, a claim that uses means-plus function claiming is indefinite “[i]f the patentee fails to disclose adequate corresponding structure.” *Williamson v. Citrix Online, LLC*, 792 F. 3d 1339, 1352 (Fed. Cir. 2015). A claim can also be found indefinite if it uses terms of degree. *See Interval Licensing LLC v. AOL, Inc.*, 766 F.3d 1364, 1371 (Fed. Cir. 2014). As the Federal Circuit has

“explained, a term of degree fails to provide sufficient notice of its scope if it depends ‘on the unpredictable vagaries of any one person’s opinion.’” *Id.* (citation omitted). In addition, “a claim term that lacks an antecedent basis may . . . render a claim indefinite.” *In re Downing*, 754 F. App’x 988, 996 (Fed. Cir. 2018).

Cisco contends that the following Asserted Claims are invalid under Section 112, ¶ 2. Each Asserted Claim identified below (and each Asserted Claim that depends therefrom) is invalid under Section 112, ¶ 2 because they fail to inform, with reasonable certainty, those skilled in the art about the scope of the claimed invention. For each listed term or phrase, Cisco believes the term or phrase is invalid under Section 112, ¶ 2, and any limitation including such term or phrase is also indefinite.

1. U.S. Patent No. 6,957,369

- “idle line” (claim 1, 3, 7)
- “idle trace” (claim 15, 18, 20)
- “line” (claim 1, 4, 5, 6, 7, 8, 10, 11, 12, 18, 23)
- “loop back” (claim 1, 2, 3, 9, 15, 16, 17, 21, 22)
- “main module” (claim 1, 2, 4, 5, 8, 9, 10, 11, 15, 16, 18, 21, 22, 23)
- “selecting a first idle line” (claim 1)
- “select a first idle trace” (claim 15)
- “selecting for testing a second idle line” (claim 1)
- “select for testing a second idle trace” (claim 15)
- “trace” (claim 5, 10, 15, 16, 18, 19, 20, 21, 23, 24)

2. U.S. Patent No. 7,113,485

- “noting a time of receipt of the packet” (claims 1, 2, 6, 11, 12, 16)

- “noting a time of return of the packet” (claims 1, 3, 11)
- “originating node difference” (claim 1)
- “peer node difference” (claims 1, 2)
- “transmitting a sequence of latency measurement packets at given intervals”
(claims 9, 14, 19)

3. U.S. Patent No. 7,330,431

- “determin[ing/e] . . . bandwidth requirements for . . . logical connections” (1, 12, 24, 25, 28)
- “receive a definition of logical connections between the nodes” (claims 25, 28)
- “network” (claims 1–2, 5, 9, 11, 12–13, 16, 20, 23–25, 27, 28, 30)
- “controller” (claims 25–30)
- “nodes” (claims 1, 8, 12, 19, 24–26, 28–29)
- “links” (claims 1, 7, 12, 18, 23–25, 28)

4. U.S. Patent No. 7,593,400

- “distributed media access control (MAC) bridge” (claim 1)
- “virtual media access control (MAC) bridge” (claim 8, 11, 18)
- “said FDB” (claims 1, 11)
- “layer 2 data network” (claims 1, 11)
- “conjoined member line cards” (claim 1)
- “member line cards conjoined in a link aggregation (LAG) group” (claim 11)
- “configuring a link aggregation (LAG) group of parallel physical links between two endpoints in said Layer 2 data network joined together into a single logical link, said

LAG group having a plurality of LAG ports and a plurality of conjoined member line cards” (claim 1)

- “a plurality of member line cards conjoined in a link aggregation (LAG) group of parallel physical links between two endpoints in a Layer 2 data network joined together into a single logical link” (claim 11)
- “having a plurality of LAG ports to forward packets through said switching core so that the node operates as a virtual media access control (MAC) bridge in said Layer 2 data network” (claim 11)
- “network node” (claims 1, 11)
- “the network node is configured to operate as multiple virtual MAC bridges in a Layer 2 virtual private network (VPN), wherein each virtual MAC bridge is configured to serve a respective VPN instance, and wherein the records associating the MAC addresses with the respective ports are maintained independently for each of the VPN instances” (claims 8, 18)
- “wherein the VPN instance is a VPLS instance among multiple VPLS instances served by the network node, and wherein sending the message comprises identifying the VPLS instance in the message so as to inform all the line cards that serve the VPLS instance” (claims 9, 19)
- “the MAC addresses and the respective ports” (claims 2, 12)
- “the record of the association to the FDB of the second line card” (claims 3, 4, 5, 7, 8, 13, 14, 15, 17, 18)
- “the line card” (claims 4, 14)
- “said member line cards” (claim 1)

5. U.S. Patent No. 9,118,602

- “preceding node” (claim 1, 2, 15, 26)
- “request message” (claim 2, 3, 26)

IV. INVALIDITY UNDER 35 U.S.C. § 101

The Asserted Claims of the patents identified below are not patent-eligible under 35 U.S.C. § 101. Cisco reserves all rights to amend its Preliminary Invalidity Contentions under 35 U.S.C. § 101, including after the Asserted Claims are ultimately construed by the Court, in response to any interpretation of the Asserted Claims embodied in Corrigent’s infringement positions, and/or to account for any changes in the law concerning ineligibility under 35 U.S.C. § 101. Cisco also reserves the right to provide additional explanation and/or argument for its Preliminary Invalidity Contentions under 35 U.S.C. § 101, including, for example, based on expert testimony. In particular, the abstract ideas set forth below are exemplary and based on Cisco’s current understanding of the patents.

The law regarding patent-eligible subject matter under 35 U.S.C. § 101 has changed significantly since the issuance of several of the Asserted Patents. The Supreme Court has articulated a two-step framework for determining patent eligibility. *Alice Corp. v. CLS Bank Int’l*, 134 S. Ct. 2347, 2355 (2014). At Step One, the court determines “whether the claims at issue are directed to” a “patent-ineligible concept[,]” such as “laws of nature, natural phenomena, and abstract ideas.” *Id.* This first step of the inquiry has been “described . . . as looking at the ‘focus’ of the claims,” or “their ‘character as a whole.’” *Elec. Power Grp., LLC v. Alstom S.A.*, 830 F.3d 1350, 1353 (Fed. Cir. 2016).

If the claims are directed to one of those ineligible concepts, the Step Two inquiry asks whether the claims contain an “inventive concept,” or “an element or combination of elements that is sufficient to ensure that the patent in practice amounts to significantly more than a patent upon

the [ineligible concept] itself.” *Alice*, 134 S. Ct. at 2355 (quoting *Mayo Collaborative Servs. v. Prometheus Labs., Inc.*, 132 S. Ct. 1289, 1294 (2012)) (internal quotation marks omitted). At Step Two, “well-understood, routine, conventional activit[ies]” are insufficient to confer an inventive concept. *Mayo*, 132 S. Ct. at 1294. In the realm of computer-implemented inventions, merely adding “purely functional and generic” components does not “transform an abstract idea into a patent-eligible invention” because “[n]early every computer will include [such components] capable of performing the basic . . . functions required by the . . . claims.” *Alice*, 134 S. Ct. at 2360. The Asserted Claims fail to meet that standard.

1. U.S. Patent No. 6,957,369

Step One. The claims are directed towards an abstract idea, e.g., transmitting a test communication and reporting whether the communication is received—i.e., transmitting and reporting information about a communication path. See *Corrigent v. Dell Techs. Inc.*, No. 1:22-cv-00496, Dkt. 11 (D. Del. June 24, 2022). This same basic idea has been repeatedly held to be abstract by the courts. See e.g., *Elec. Power Grp., LLC v. Alstom S.A.*, 830 F.3d 1350, 1354 (Fed. Cir. 2016) (“presenting the results of abstract processes of collecting and analyzing information”); *Two-Way Media Ltd. v. Comcast Cable Communications LLC*, 874 F.3d 1329 (Fed. Cir. 2017) (“1) sending information, 2) directing the sent information, 3) monitoring the receipt of the sent information, and 4) accumulating records about receipt of that sent information”).

Step Two. There is no inventive concept recited in the claims that would transform the claims away from the abstract idea. The claims merely require conventional computer components operating with their basic functions (e.g., backplane, modules and lines). This is nothing more than an abstract idea. *Berkheimer v. HP Inc.*, 881 F.3d 1360, 1370 (Fed. Cir. 2018) (“The limitations amount to no more than performing the abstract idea . . . with conventional computer components.”).

2. U.S. Patent No. 7,113,485

Step One. All of the claims of the '485 patent are directed towards the abstract idea of measuring latency of communications in a particular class of service. Measuring latency is not a technological improvement; it is nothing more than a measurement of time. *See* Grow at 3:58–59. It is also something humans have done throughout history. For example, one may measure the latency of communications sent via the U.S. Postal Service by calculating the difference between the time a letter was sent and the time the letter was received. Moreover, specifying that the calculation be done for communications in a particular class of service does nothing to make the idea non-abstract. Different shipping speeds, for example, Express Mail, Priority Mail, or First-Class Mail, determine how quickly mail will be sent through the post office network, and can all be measured the same way. These are akin to the classes of service that the data packet experiences in a data network, which may have different latency tolerances.

Step Two. The claims do not contain an inventive concept. The claims do not recite “significantly more” than the abstract idea itself. *Alice*, 573 U.S. at 217–18. None of the limitations, whether considered individually or as an ordered combination, adds inventive concept. The patent itself acknowledges that classifying packets based on a class of service was well-known in the art. *See* '485 patent at 1:56–58. The patent also acknowledges that measuring latency was known in the art. *See id.* at 2:1–4.

3. U.S. Patent No. 7,330,431

Step One. The claims are directed towards an abstract idea, e.g., bandwidth allocation. This is a basic and abstract idea in both the technical context and non-technical context. For example, shipping couriers such as USPS, FedEx, and UPS operate multimodal transport networks through which they provide various classes of shipping services (e.g., next-day, second-day, and day-definite). These services have different “parameters” specifically, urgent next-day packages

are guaranteed to be delivered the day after shipping, second-day packages within two days after shipping, and less urgent day-definite packages within a set number of days (*e.g.*, 3–5) from the shipping date. Shipping carriers define “logical connections” for each of these services by designating particular routes/modes of transport for each class of shipping service. For example, a package shipped via next-day service from Washington, DC to Waco would likely be transported by air to Dallas, and then by ground on to Waco. By contrast, a package shipped via day-definite service from Washington, DC to Waco may be routed using ground transport, for example, from: Washington, DC -> Charlotte, NC -> Atlanta, GA -> Dallas, TX -> Waco, TX. And, because both routes share the same final link from Dallas to Waco, the shipping carrier must “allocate” bandwidth on that particular route to ensure that there is room on the truck for all next-day packages, whereas less urgent day-definite packages can be held in Dallas until sufficient “bandwidth” is available to transport the package on to Waco.

Step Two. There is no inventive concept recited in the claims that would transform the claims away from an abstract idea. The claims merely require conventional computer components operating with their basic functions (*e.g.*, a network, nodes, links, and a nondescript “controller”). This is nothing more than an abstract idea. *Berkheimer*, 881 F.3d at 1370 (Fed. Cir. 2018) (“The limitations amount to no more than performing the abstract idea . . . with conventional computer components.”).

4. U.S. Patent No. 7,593,400

Step One. The claims are directed to an abstract idea, *e.g.*, collecting information (*e.g.*, source MAC address), analyzing information (*e.g.*, whether the destination MAC address is known), and sending information (*e.g.*, updated MAC address information to another line card). This is a basic and abstract idea in both the technical context and non-technical context. This same basic idea has been held over and over to be an abstract idea. *See, e.g., Electric Power Group*,

LLC v. Alstom S.A., 830 F.3d 1350 (Fed. Cir. 2016) (collecting cases); *see also Digitech Image Techs., LLC v. Elecs. for Imaging, Inc.*, 758 F.3d 1344, 1351 (Fed. Cir. 2014) (“[A] process that employs mathematical algorithms to manipulate existing information to generate additional information is not patent eligible.”); *Parker v. Flook*, 437 U.S. 584, 595 (1978) (“If a claim is directed essentially to a method of calculating, using a mathematical formula, even if the solution is for a specific purpose, the claimed method is nonstatutory.”); *cf. SAP Am., Inc. v. InvestPic, LLC*, 898 F.3d 1161, 1165 (Fed. Cir. 2018) (finding as abstract, claims covering a statistical analysis of investment data).

Step Two. The claims do not recite any inventive concept. The claims do not identify any specific hardware that is required to perform the claim, other than what was already in the prior art (e.g., bridges, line cards, ports). This is nothing more than an abstract idea. “[A] claimed invention’s use of the ineligible concept to which it is directed cannot supply the inventive concept that renders the invention significantly more than that ineligible concept.” *BSG Tech LLC v. Buyseasons, Inc.*, 899 F.3d 1281, 1290 (Fed. Cir. 2018); *see also Trading Techs. Int’l, Inc. v. IBG LLC*, 921 F.3d 1378, 1385 (Fed. Cir. 2019) (“The abstract idea itself cannot supply the inventive concept, no matter how groundbreaking the advance.”).

5. U.S. Patent No. 9,118,602

Step One. The claims are directed towards the abstract idea of analyzing information (bandwidth requirements), assigning information (encoding the port serial number), sending information (transmitting the data packet), directing the information (the packet is sent to the assigned port) and receiving information (receiving the data packet from the preceding node). This is a basic and abstract idea in both the technical context and non-technical context. *See, e.g., Two-Way Media Ltd. v. Comcast Cable Communications LLC*, 874 F.3d 1329 (Fed. Cir. 2017) (“1) sending information, 2) directing the sent information, 3) monitoring the receipt of the sent

information, and 4) accumulating records about receipt of that sent information”); *see also Digitech Image Techs., LLC v. Elecs. for Imaging, Inc.*, 758 F.3d 1344, 1351 (Fed. Cir. 2014) (“[A] process that employs mathematical algorithms to manipulate existing information to generate additional information is not patent eligible.”); *Parker v. Flook*, 437 U.S. 584, 595 (1978) (“If a claim is directed essentially to a method of calculating, using a mathematical formula, even if the solution is for a specific purpose, the claimed method is nonstatutory.”).

Step Two. The claims do not contain an inventive concept. The claims do not identify any specific hardware that is required to perform the claim, other than what was already in the prior art (e.g., switches, ports, nodes). This is nothing more than an abstract idea. “[A] claimed invention’s use of the ineligible concept to which it is directed cannot supply the inventive concept that renders the invention significantly more than that ineligible concept.” *BSG Tech LLC v. Buyseasons, Inc.*, 899 F.3d 1281, 1290 (Fed. Cir. 2018); *see also Trading Techs. Int’l, Inc. v. IBG LLC*, 921 F.3d 1378, 1385 (Fed. Cir. 2019) (“The abstract idea itself cannot supply the inventive concept, no matter how groundbreaking the advance.”).

V. ACCOMPANYING DOCUMENT PRODUCTION

Pursuant to the Scheduling Order (D.I. 37), Cisco has produced all prior art referenced in its Preliminary Invalidity Contentions (*see* documents with the prefix “CISCO-CORRIGENT-PA” produced herewith). *See* documents with the prefix “CISCO-CORRIGENT-PA” produced herewith. Cisco will promptly produce any documents uncovered during discovery, including through third-party subpoenas.

Dated: September 28, 2022

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EXHIBIT E-2

Exhibit E-2 – Invalidity of U.S. Patent No. 9,118,602 in view of Ferguson

INVALIDITY CLAIM CHART

Invalidity of U.S. Patent No. 9,118,602 in view of Ferguson – U.S. Patent No. 7,277,386

According to its cover page, U.S. Patent No. 7,277,386 (“Ferguson”) issued on Oct. 2, 2007, from an application filed on Nov. 12, 2002. Ferguson therefore constitutes prior art under at least 35 U.S.C. § 102(e). Ferguson anticipates and/or renders obvious the Asserted Claims of the U.S. Patent No. 9,118,602 (at least as Defendants understand Plaintiff’s application of the Asserted Claims in an effort to show infringement).

To the extent Plaintiff argues that any element below is not disclosed by Ferguson, a person of ordinary skill in the art would have found it obvious to combine the teachings of Ferguson with the background knowledge of a person of ordinary skill in the art and/or the additional references, and exemplary teachings, set forth in Appendix E.

The chart below provides representative examples of where each element of each claim is found within Ferguson. Citations are meant to be exemplary, not exhaustive, and Defendants the right to identify and discuss additional portions of the reference in support of its contentions and/or to rebut arguments made by Plaintiff. Citations to figures, drawings, tables, and the like include reference to any accompanying or related text. All internal cross references are meant to incorporate the cross-referenced material as if fully set forth therein.

It is Defendants’ position that Plaintiff’s Preliminary Infringement Contentions have not established that any accused product or service infringes any valid claim. Thus, Defendants’ statements below should not be treated as an admission, implication, or suggestion that Defendants agree with Plaintiff regarding either the scope, construction, or interpretation of any of the Asserted Claims or the infringement theories advanced by Plaintiff in its Preliminary Infringement Contentions, including whether any Asserted Claim satisfies 35 U.S.C. §§ 101 or 112. In certain cases, Defendants specified non-limiting examples of where its application of the prior art is based on Plaintiff’s apparent application of the claim element. These statements are not intended to suggest that Defendants agree with Plaintiff’s application of any claim term, suggest a proposed construction at this stage of the case, or suggest that construction is needed, as the parties are not required to exchange terms for construction or proposed constructions until a later date.

Plaintiff has yet to identify any limitation of the Asserted Claims that it contends is not anticipated and/or rendered obvious by Ferguson. Defendants therefore expressly reserve the right to respond to any such contention, including by identifying additional obviousness combinations, if Plaintiff makes any such contention.

Where Defendants state that Ferguson “discloses” a limitation, that disclosure may be express, implicit, and/or inherent.

Exhibit E-2 – Invalidity of U.S. Patent No. 9,118,602 in view of Ferguson

Claim 1, U.S. Patent No. 9,118,602

Claim Limitation	Disclosure
1[pre] 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:	<p>To the extent the preamble is limiting Ferguson discloses, expressly or inherently, 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.</p> <p>Ferguson, Abstract: “Techniques are described for distribution of label switched packets, such as multiprotocol label switched (MPLS) packets, across multiple physical data paths. The techniques may, for example, be used to load balance the label switched packets across an aggregated link having two or more logically associated physical interconnects. A network device, for example, includes an interface card to receive packets associated with a common label switched path (LSP), and a control unit to distribute the packets across multiple paths. The network device may include label data that maps ranges of labels, such as MPLS labels, to types of payloads carried by the label switched packets. In accordance with the label data, the control unit extracts flow information from the label switched packets and distributes the label switched packets across the paths based on the flow information. The control unit may generate hash values from the flow information, the labels, or combinations thereof, to control distribution of the label switched packets.”</p> <p>Ferguson, 1:21–53: “In some environments, two network devices may be connected by multiple physical interconnects. For example, two network routers may be connected by multiple Ethernet links. Similarly, multiple physical interconnects may couple other devices, e.g., two switches, a switch and a server, two routers, a switch and an end user station, and the like.</p> <p>The term ‘link aggregation’ refers to a technique by which the multiple physical interconnects are logically associated and treated as a single, aggregated link. In particular, the IEEE 802.3ad Working Group recently developed a Link Aggregation specification. This approach may provide for increased link availability and bandwidth between the two devices. For example, bandwidth can be increased in linear increments, e.g., by adding individual interconnects to increase the bandwidth between the two devices. In addition, the multiple physical interconnects provide a degree of redundancy in that a failure in a single physical interconnect no longer inhibits direct traffic flow between the two devices. With link aggregation, traffic on a failed physical interconnect can be redirected to one of the other physical interconnects in the aggregated link.</p> <p>In general, link aggregation operates by inserting a layer within the networking stack between the second and third layers. For Ethernet, for example, a new Link Aggregation Layer functions</p>

Exhibit E-2 – Invalidity of U.S. Patent No. 9,118,602 in view of Ferguson

Claim Limitation	Disclosure
	<p>between the Ethernet Media Access Control (MAC) layer, and the higher layer protocols. Each of the underlying Ethernet ports in an aggregated link transmits and receives frames with its own unique MAC address. As frames pass through the Link Aggregation layer, addresses are manipulated so the aggregated ports appear as a single link with one MAC address. This allows link aggregation to be completely transparent to higher layer protocols.”</p> <p>Ferguson, 1:57–2:3: “In general, 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). The techniques may, for example, be used to load balance label switched packets of an LSP across an aggregated link having two or more logically associated physical interconnects. 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. As used herein, the term path refers to any physical path for communicating data. In this manner, the term encompasses both external physical interconnects between network devices, and internal data paths within an individual network device.”</p> <p>Ferguson, 2:44–65: “As one example, the network device may apply the techniques to distribute label switched packets, such as MPLS packets, across the logically associated physical interconnects of an aggregated network link. As another example, the techniques may be used to distribute MPLS traffic across internal data paths within a network device, e.g., across multiple data paths between an input interface card and an output interface card, across internal high-speed switching components, or across multiple forwarding engines within the network device.</p> <p>By distributing the MPLS packets across multiple data paths load balancing may be achieved, and the techniques may decrease packet latency through the network and the various communication devices. In addition, the techniques allow for the distribution of the MPLS traffic, while maintaining in-sequence delivery of packets of common data flows. In other words, those MPLS packets having common flow characteristics, such as MPLS packets having common source and destination addresses and ports, as well as the same communication protocol, may be distributed to the same physical interconnect in accordance with the techniques.”</p>
<p>1[a] 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</p>	<p>Ferguson discloses, either expressly or inherently, 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.</p>

Exhibit E-2 – Invalidity of U.S. Patent No. 9,118,602 in view of Ferguson

Claim Limitation	Disclosure
<p>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;</p>	<p>Ferguson, 1:27–41: “The term ‘link aggregation’ refers to a technique by which the multiple physical interconnects are logically associated and treated as a single, aggregated link. In particular, the IEEE 802.3ad Working Group recently developed a Link Aggregation specification. This approach may provide for increased link availability and bandwidth between the two devices. For example, bandwidth can be increased in linear increments, e.g., by adding individual interconnects to increase the bandwidth between the two devices. In addition, the multiple physical interconnects provide a degree of redundancy in that a failure in a single physical interconnect no longer inhibits direct traffic flow between the two devices. With link aggregation, traffic on a failed physical interconnect can be redirected to one of the other physical interconnects in the aggregated link.”</p> <p>Ferguson, 3:36–67: “FIG. 1 is a block diagram illustrating an example system 2 in which customer networks 4A, 4B (“customer networks 4”) are communicatively coupled via an intermediate provider network 6. Specifically, customer network 4A includes a customer edge (“CE”) router 8A that is connected to a provider edge (“PE”) router 10A via an aggregated link 12A. In other words, CE router 8A and PE router 10A communicate via two or more physical interconnects that are logically associated as an aggregated link. For example, CE router 8A and PE router 10A may communicate via two or more Ethernet links, Sonet links, or other physical interconnects. Similarly, customer network 4B includes a CE router 8B that is connected to a PE router 10B via an aggregated link 12B. PE routers 10 communicate network traffic from and to customer networks 4 in accordance with a label switching protocol, such as the Multiprotocol Label Switching (MPLS) protocol, via one or more label switched paths (LSPs) 14. For example, CE router 8A receives network traffic originating from devices within customer network 4A, and pre-pends MPLS labels to the network traffic to form outbound MPLS packets. CE router 8A communicates the outbound MPLS packets to PE router 10A via aggregated link 12A.</p> <p>PE router 10A receives the MPLS packets, and forwards the MPLS packets to one or more intermediate routers (not shown) within provider network 6 for communication to PE router 10A via one of LSPs 14. PE router 10A may, for example, pre-pend additional MPLS labels to the traffic to form MPLS packets having multiple MPLS labels. In this manner, each MPLS packet traversing provider network 6 via LSPs 14 may be guaranteed to carry two or more MPLS labels.”</p> <p>Ferguson, Fig. 1 and corresponding text:</p>

Exhibit E-2 – Invalidity of U.S. Patent No. 9,118,602 in view of Ferguson

Claim Limitation	Disclosure
	<p>The diagram illustrates a network architecture where two customer networks, 4A and 4B, are connected to a central provider network, 6. Customer network 4A is connected to CE router 8A, which is in turn connected to PE router 10A. Customer network 4B is connected to CE router 8B, which is connected to PE router 10B. The PE routers 10A and 10B are connected to each other via a dashed line labeled 14, representing the provider network 6. Arrows labeled 12A and 12B indicate connections from the CE routers to the PE routers. The entire system is labeled 2.</p>

Exhibit E-2 – Invalidity of U.S. Patent No. 9,118,602 in view of Ferguson

Claim Limitation	Disclosure
	<p>Ferguson, 4:9–6:9:</p> <p>“In general, the devices of system 2, i.e., CE routers 8, PE routers 10, and intermediate routers (not shown) within provider network 6, utilize MPLS labels within pre-allocated ranges to convey protocol information for the payloads of the MPLS packets. In other words, the devices assign MPLS labels of the pre-allocated ranges to the MPLS packets based on the type of payloads carried by the MPLS packets. The devices may make use of this protocol information to facilitate distribution of the MPLS packets across multiple paths, e.g., multiple physical interconnects of an aggregated link.</p> <p>For purposes of example, the techniques are described in reference to the MPLS protocol and MPLS packets. However, the techniques may readily be applied to any type of label switching protocol in which each packet carries a switching ‘label’ that is associated with a defined network path, referred to herein as a ‘label switched path.’ Accordingly, the techniques are not limited to MPLS, and may [b]e applied to other protocols that make use of switching labels, including but not limited to ATM, Frame Relay, and the like. The term label switched path, as used herein, generally refers to any defined path of switching nodes within a network, and includes MPLS LSPs, ATM virtual circuits, and the like.</p> <p>Generally, the label typically carries an index into a forwarding table, e.g., a forwarding table maintained by each of CE routers 8 and PE routers 10, which specifies the next hop for the packet. In this manner, these devices do not need to examine the label switched packets and perform next-hop routing tasks. In other words, the label associates the packet with an LSP, and carries the information that determines which path a packet should take. Forwarding decisions can be made based on a field in the packet or cell, i.e., the label, and the incoming interface, without requiring a route lookup.</p> <p>One difficulty in distributing or otherwise load balancing MPLS packets across multiple physical data paths, e.g., the multiple interconnects of an aggregated link, is that an MPLS label is typically an arbitrary label unrelated to the payload. As a result, conventional mechanisms for distributing network traffic cannot identify packets belonging to a common data flow and, as a result, may distribute packets of a common data flow across separate paths. Consequently, the MPLS packets may arrive at the destination out of order, which can be problematic for the MPLS protocol, which requires in-sequence delivery. Further, the distribution mechanism 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. This may decrease the efficiency of the network and increase packet latency.</p>

Exhibit E-2 – Invalidity of U.S. Patent No. 9,118,602 in view of Ferguson

Claim Limitation	Disclosure												
	<p>In accordance with the principles of the invention, network devices of system 2 utilize the protocol information conveyed by the pre-allocated ranges of MPLS labels to control the distribution mechanism, thereby leading to improved distribution while ensuring in-sequence delivery of the packets. The devices may, for example, map the ranges of MPLS labels to respective communication protocols associated with the payloads of the MPLS packets, as illustrated in the following table:</p> <p align="center">TABLE 1</p> <table border="1"> <thead> <tr> <th>MPLS LABEL RANGE</th><th>PAYLOAD TYPE</th></tr> </thead> <tbody> <tr> <td>100000-110000</td><td>TUNNELED ETHERNET</td></tr> <tr> <td>111001-120000</td><td>IPv4</td></tr> <tr> <td>120001-130000</td><td>IPv6</td></tr> <tr> <td>130001-140000</td><td>ATM</td></tr> <tr> <td>140001-150000</td><td>MULTIPLE MPLS LABELS</td></tr> </tbody> </table> <p>As illustrated in Table 1, the devices may allocate range 100000-110000, which represents an exemplary range, for MPLS packets carrying tunneled Ethernet payloads. Similarly, the devices allocate ranges of MPLS packets for carrying payloads of other types, such as Internet Protocol version 4 (IPv4), IPv6, and Asynchronous Transfer Mode (ATM) payloads. Based on the range of the MPLS label, the devices can extract a “key” from the payload that identifies the data flow of the payload carried by the MPLS packet. Using this key, the devices can readily distribute the MPLS packets across multiple paths, e.g., multiple physical links of an aggregated link.</p> <p>The key extracted from the payload may include flow information, such as the source and destination IP address. The ‘granularity’ of distribution of the MPLS packets across the paths, i.e., the extent to which MPLS packets of a common flow are distributed to a common interconnect, directly correlates with the amount of flow information included in the key. For example, application of a hashing function to a key that includes a source and destination address will result in a less granular distribution than application to a key that includes additional flow information, such as the protocol type, the source and destination port, the type of service (ToS), as well as any other information that remains constant for any one flow of data from source to destination. For payloads conforming to protocols such as ATM, the key may include information such as the ATM Virtual Channel Identifier (VCI), Virtual Path Identifier (VPI). In addition, the key may include the MPLS labels carrying the payloads, as well as other fields that may be encapsulated in</p>	MPLS LABEL RANGE	PAYLOAD TYPE	100000-110000	TUNNELED ETHERNET	111001-120000	IPv4	120001-130000	IPv6	130001-140000	ATM	140001-150000	MULTIPLE MPLS LABELS
MPLS LABEL RANGE	PAYLOAD TYPE												
100000-110000	TUNNELED ETHERNET												
111001-120000	IPv4												
120001-130000	IPv6												
130001-140000	ATM												
140001-150000	MULTIPLE MPLS LABELS												

Exhibit E-2 – Invalidity of U.S. Patent No. 9,118,602 in view of Ferguson

Claim Limitation	Disclosure
	<p>an MPLS header.</p> <p>In addition to defining ranges for various types of protocols, the devices may define a range of labels to indicate that the MPLS packet carries two or more MPLS labels. In Table 1 illustrated above, for example, the range 140001-150000 has been allocated for MPLS packets having multiple MPLS labels. As described in detail below, the devices may utilize the labels for distribution of the MPLS packets across multiple paths instead of extracting key data from the payloads. Because two or more MPLS labels can be used for the distribution, e.g., as inputs to a hash function, a reasonable balance of distribution may be achieved without relying on key data from the payload. This approach may be used by provider routers (not shown) within provider network 10 for internal traffic having multiple MPLS labels. This technique may offer the advantage of reduction in computing resources consumed by the distribution task, as the devices need not extract the key data from each packet.</p> <p>In this manner, the devices of system 2 make use of the allocated ranges of MPLS labels to control the distribution of MPLS packets across multiple physical paths. Although the 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. For example, the techniques may be readily applied to internal parallel data paths within a device. For example, the techniques may be used by a router to distribute packets across internal data paths that begin at the same input interface of the router and end at the same output interface of the router, but traverse through different internal, high-speed switch fabrics. A control unit for the router, for example, may implement the techniques to distribute received MPLS packets across multiple internal forwarding engines.”</p> <p>Ferguson, 6:24–31: “In FIG. 2C, CE router 8A may distribute outbound MPLS packets across the multiple physical interconnects 18 of aggregated link 12A, for forwarding by PE router 10A as MPLS packets 34. In particular, CE router 8A receives packets from devices within customer network 4A, formulates MPLS packets by pre-pending MPLS labels based on the type of protocol of the received packets, and distributes the packets across aggregated link 12A.”</p> <p>Ferguson, Fig. 2C and corresponding text:</p>

Exhibit E-2 – Invalidity of U.S. Patent No. 9,118,602 in view of Ferguson

Claim Limitation	Disclosure
	<div><p>FIG. 2C</p></div> <p>Ferguson, 8:28–57:</p> <p>“FIG. 8 is a flowchart illustrating example operation of an LSP-enabled router, such as CE router 8A of FIG. 1, when formulating MPLS packets and distributing the packets across multiple paths in accordance with the principles of the invention. Initially, the router receives a non-MPLS packet from a local device (100). For example, CE router 8A may receive a packet from a device within customer network 4A.</p> <p>Next, the device accesses the packet header to determine the communication protocol for the packet, e.g., IPv4, IPv6, ATM, or the like (102). Based on the type of protocol, the device selects an appropriate MPLS label within one of the defined ranges (103), and pre-pends the label to the packet to form an MPLS packet (104).</p> <p>In addition, the device extracts flow information, i.e., a key, from the payload based on the protocol type (106), and stores the extracted key in the hash buffer (108). The device generates a hash value by applying a hash function to the contents of the hash buffer, i.e., the flow information (110). After generating the hash value, the device selects one of the parallel paths, e.g., different physical interconnects of an aggregated link, based on the hash value (112).</p>

Exhibit E-2 – Invalidity of U.S. Patent No. 9,118,602 in view of Ferguson

Claim Limitation	Disclosure
	<p>Finally, the device forwards the MPLS packet along the selected path (114). In this manner, a router, such as CE router 8A, may generate MPLS packets at an egress for an LSP that carry labels in accordance with pre-allocated ranges. Other devices, such as PE routers 10, may make use of the labels to distribute the MPLS packets across parallel paths.”</p> <p>Ferguson, Fig. 8 and corresponding text:</p>

Exhibit E-2 – Invalidity of U.S. Patent No. 9,118,602 in view of Ferguson

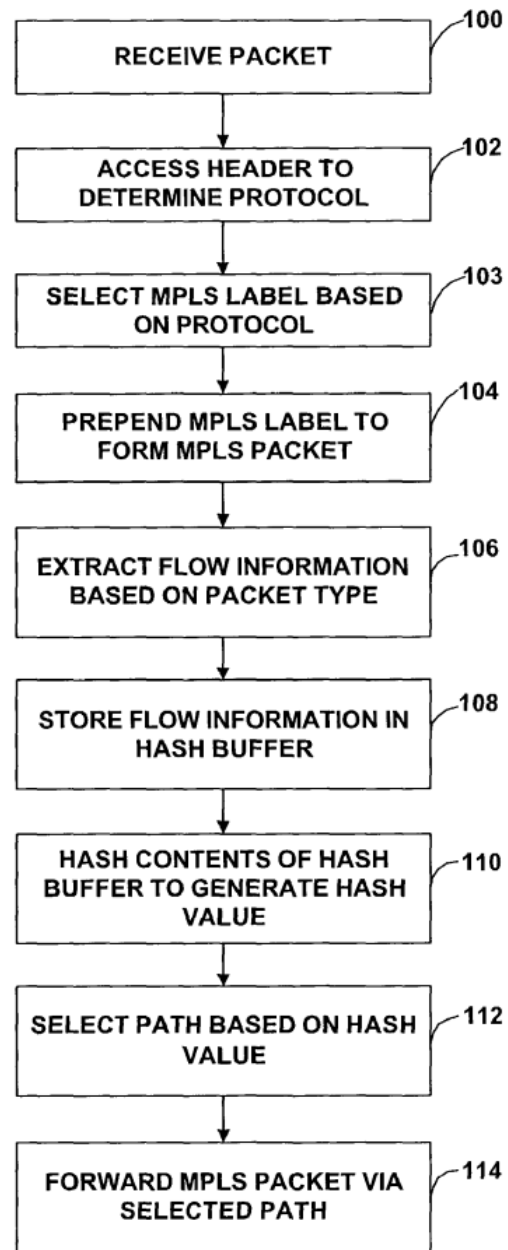


FIG. 8

Exhibit E-2 – Invalidity of U.S. Patent No. 9,118,602 in view of Ferguson

Claim Limitation	Disclosure
<p>1[b] 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;</p>	<p>Ferguson discloses, either expressly or inherently, 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.</p> <p>Ferguson, 8:16–27: “FIG. 7 is a block diagram illustrating an example MPLS label 86. As illustrated, MPLS label 86 includes a 20-bit numeric label 88. In addition, MPLS label 86 includes 3 EXP bits 90 that may identify a service associated with MPLS label 86. MPLS label 86 further includes a single bottom-of-stack (BOS) bit 92 that indicates whether the label is the last label within the label stack of the respective packet. Finally, MPLS label 86 includes an 8-bit time-to-live value (TTL) 94. When using MPLS label 86 as an input to a hash function, a device may utilize combinations of these fields, such as a portion or all of numeric label 88 and EXP bits 90.”</p> <p>Ferguson, Fig. 7 and corresponding text:</p> <div> </div> <p align="center">FIG. 7</p>
<p>1[c] 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;</p>	<p>Ferguson discloses, either expressly or inherently, 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.</p> <p>Ferguson, 3:36–4:8: “FIG. 1 is a block diagram illustrating an example system 2 in which customer networks 4A, 4B</p>

Exhibit E-2 – Invalidity of U.S. Patent No. 9,118,602 in view of Ferguson

Claim Limitation	Disclosure
	<p>(“customer networks 4”) are communicatively coupled via an intermediate provider network 6. Specifically, customer network 4A includes a customer edge (“CE”) router 8A that is connected to a provider edge (“PE”) router 10A via an aggregated link 12A. In other words, CE router 8A and PE router 10A communicate via two or more physical interconnects that are logically associated as an aggregated link. For example, CE router 8A and PE router 10A may communicate via two or more Ethernet links, Sonet links, or other physical interconnects. Similarly, customer network 4B includes a CE router 8B that is connected to a PE router 10B via an aggregated link 12B. PE routers 10 communicate network traffic from and to customer networks 4 in accordance with a label switching protocol, such as the Multiprotocol Label Switching (MPLS) protocol, via one or more label switched paths (LSPs) 14. For example, CE router 8A receives network traffic originating from devices within customer network 4A, and pre-pends MPLS labels to the network traffic to form outbound MPLS packets. CE router 8A communicates the outbound MPLS packets to PE router 10A via aggregated link 12A.</p> <p>PE router 10A receives the MPLS packets, and forwards the MPLS packets to one or more intermediate routers (not shown) within provider network 6 for communication to PE router 10A via one of LSPs 14. PE router 10A may, for example, pre-pend additional MPLS labels to the traffic to form MPLS packets having multiple MPLS labels. In this manner, each MPLS packet traversing provider network 6 via LSPs 14 may be guaranteed to carry two or more MPLS labels.</p> <p>PE router 10B receives the MPLS packets from provider network 6, and forwards the MPLS packets to CE router 8B via aggregated link 12B. PE router 10B may, for example, remove one or more MPLS labels from each of the inbound packets, and distribute the packets across the physical interconnects that are logically associated to form aggregated link 12B. Network traffic flows from customer network 4B to customer network 4A in similar manner.”</p>

Exhibit E-2 – Invalidity of U.S. Patent No. 9,118,602 in view of Ferguson

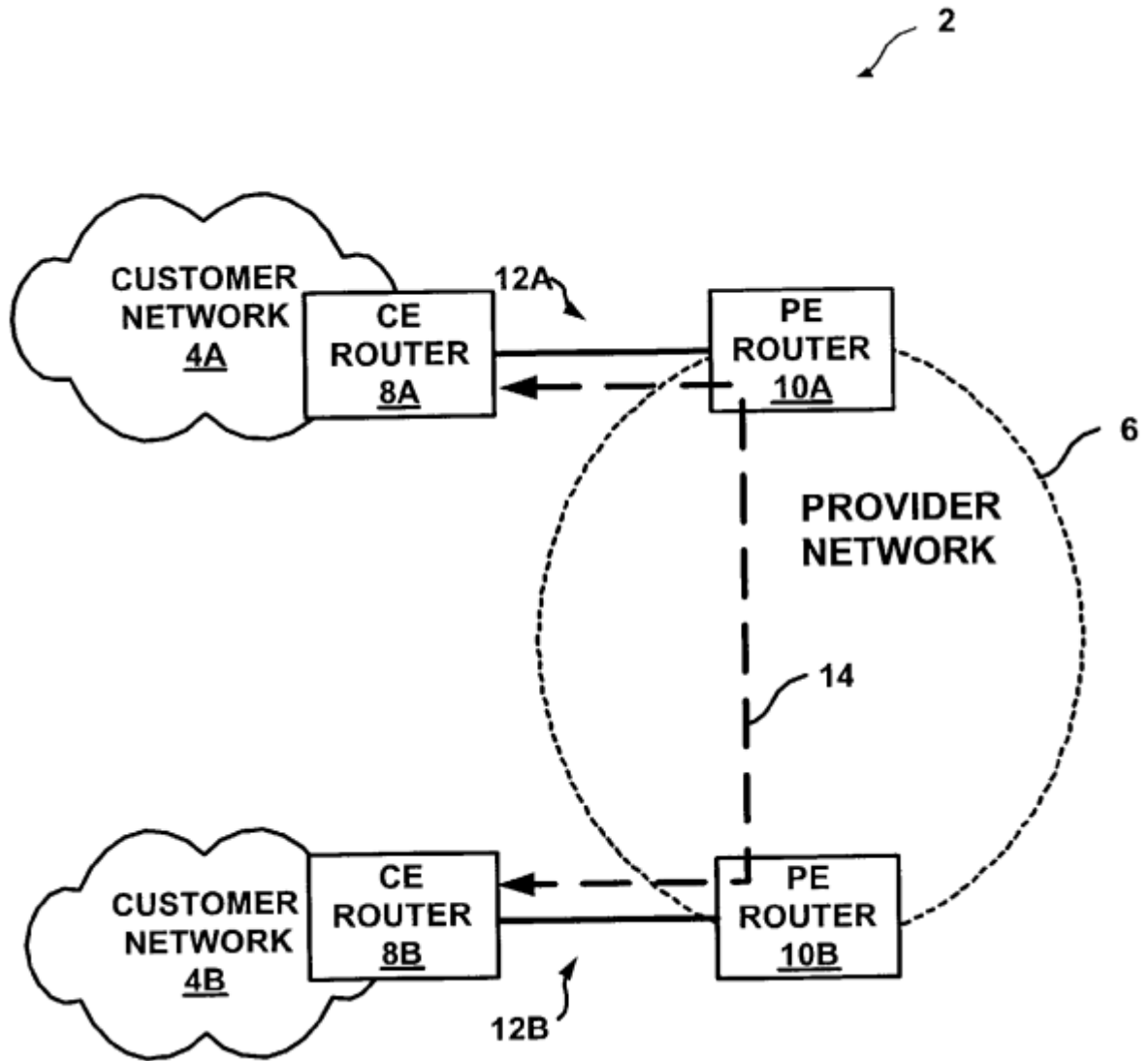
Claim Limitation	Disclosure
	<p>Ferguson, Fig. 1 and corresponding text:</p>  <p>Ferguson, 6:24–31: “In FIG. 2C, CE router 8A may distribute outbound MPLS packets across the multiple physical</p>

Exhibit E-2 – Invalidity of U.S. Patent No. 9,118,602 in view of Ferguson

Claim Limitation	Disclosure
	<p>interconnects 18 of aggregated link 12A, for forwarding by PE router 10A as MPLS packets 34. In particular, CE router 8A receives packets from devices within customer network 4A, formulates MPLS packets by pre-pending MPLS labels based on the type of protocol of the received packets, and distributes the packets across aggregated link 12A.”</p> <p>Ferguson, Fig. 2C and corresponding text:</p> <div> </div> <p align="center">FIG. 2C</p> <p>Ferguson, 8:28–57: “FIG. 8 is a flowchart illustrating example operation of an LSP-enabled router, such as CE router 8A of FIG. 1, when formulating MPLS packets and distributing the packets across multiple paths in accordance with the principles of the invention. Initially, the router receives a non-MPLS packet from a local device (100). For example, CE router 8A may receive a packet from a device within customer network 4A.</p> <p>Next, the device accesses the packet header to determine the communication protocol for the packet, e.g., IPv4, IPv6, ATM, or the like (102). Based on the type of protocol, the device selects an appropriate MPLS label within one of the defined ranges (103), and pre-pends the label to the packet to form an MPLS packet (104).</p> <p>In addition, the device extracts flow information, i.e., a key, from the payload based on the</p>

Exhibit E-2 – Invalidity of U.S. Patent No. 9,118,602 in view of Ferguson

Claim Limitation	Disclosure
	<p>protocol type (106), and stores the extracted key in the hash buffer (108). The device generates a hash value by applying a hash function to the contents of the hash buffer, i.e., the flow information (110). After generating the hash value, the device selects one of the parallel paths, e.g., different physical interconnects of an aggregated link, based on the hash value (112).</p> <p>Finally, the device forwards the MPLS packet along the selected path (114). In this manner, a router, such as CE router 8A, may generate MPLS packets at an egress for an LSP that carry labels in accordance with pre-allocated ranges. Other devices, such as PE routers 10, may make use of the labels to distribute the MPLS packets across parallel paths.”</p> <p>Ferguson, Fig. 8 and corresponding text:</p>

Exhibit E-2 – Invalidity of U.S. Patent No. 9,118,602 in view of Ferguson

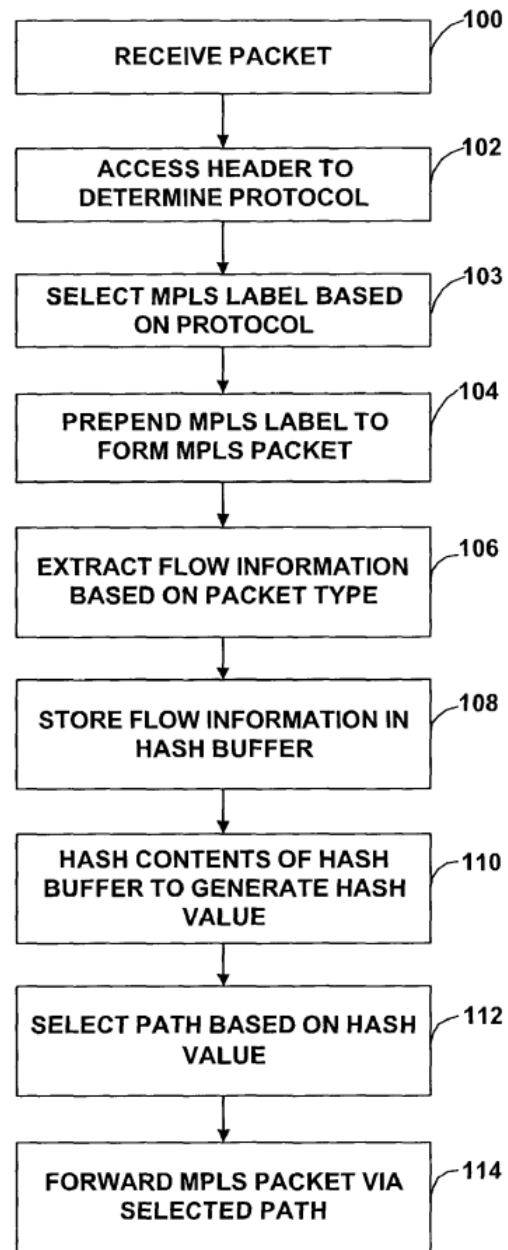


FIG. 8

Exhibit E-2 – Invalidity of U.S. Patent No. 9,118,602 in view of Ferguson

Claim Limitation	Disclosure
	<p>Ferguson, 8:58–10:18: “FIG. 9 is a block diagram illustrating an exemplary router 120 that distributes MPLS packets across parallel physical paths in accordance with the principles of the invention. Although the techniques are illustrated in reference to a router, the techniques may be readily applied to other network devices, such as switches, hubs, firewalls, gateways, proxy servers, and the like. In addition, the techniques may be applied to “edge” devices that provide access to a large network, such as the Internet, or to high-speed “core” devices within the network.</p> <p>Router 120 includes a control unit 128 that directs inbound packets received from inbound links 124 to appropriate outbound links 126. In particular, the functionality of control unit 128 can be divided between a routing engine 136 and a packet-forwarding engine 130.</p> <p>Routing engine 136 is primarily responsible for maintaining routing information 138 to reflect the current network topology. In order to maintain an accurate representation of the network, router 120 supports a number of protocols for exchanging routing information with other routers. For example, router 120 may support the Border Gateway Protocol (BGP), for exchanging routing information with routers of other autonomous systems. Similarly, router 120 may support the Intermediate System to Intermediate System protocol (IS-IS), which is an interior gateway routing protocol for communicating link-state information within an autonomous system. Other examples of interior routing protocols include the Open Shortest Path First (OSPF), and the Routing Information Protocol (RIP).</p> <p>Routing engine 136 directs packet-forwarding engine 130 to maintain forwarding information 132 in accordance with routing information 138. Forwarding information 132 may, therefore, be thought of as derived from the information contained within routing information 138. In particular, forwarding information 132 associates packet information, e.g., a “key” as described above, with specific forwarding next hops (FNH). A FNH generally refers to a neighboring router physically coupled to router 120 along a given route. For example, the FNH for a route may specify a physical interface and media access control (MAC) address for the interface associated with the neighboring router.</p> <p>Packet-forwarding engine 130 controls the flow of packets through router 120, and distributes MPLS traffic across parallel paths, as described herein. In particular, router 120 includes a plurality of interface cards (IFCs) 122 for sending and receiving packets via inbound links 124 and outbound links 126. IFCs 122 may include a number of interface ports (not shown) for coupling to network links 124 and 126.</p>

Exhibit E-2 – Invalidity of U.S. Patent No. 9,118,602 in view of Ferguson

Claim Limitation	Disclosure
	<p>Specifically, upon receiving an inbound packet via an input port of one of IFCs 122, packet-forwarding engine 130 selects an appropriate FNH for the packet based on forwarding information 132. Packet forwarding engine 130 maps the selected FNH to an output interface for IFCs 122, and relays the packet to the selected output interface for transmission.</p> <p>For MPLS packets, packet-forwarding engine 130 distributes the MPLS packets in accordance with the techniques described herein. For example, for MPLS packets destined for an aggregated link, packet-forwarding engine 130 distributes the packets across the output interfaces associated with the multiple physical interconnects of the aggregated link. In particular, packet-forwarding engine 130 makes use of label data 140 to control distribution of the MPLS packets. For example, label data 140 may map a label of the inbound MPLS packet to a protocol type, or may designate the MPLS packet as having multiple labels, as illustrated in Table 1 above.</p> <p>Packet-forwarding engine 130 includes hash buffer 124 to store an extracted key and one or more MPLS labels of the packet. Packet-forwarding engine 130 applies a hash function to the contents of hash buffer 134 to generate a hash value. Based on the generated hash value, packet-forwarding engine 130 relays the MPLS packet to one of the physical interfaces of IFCs 22 for transmission. Packet-forwarding engine 130 may arrange label data 140 in the form of a variety of data structures, such as a number of tables, link lists, radix trees, databases, flat files, or other data structures. Furthermore, packet-forwarding engine 130 may store the data structures on one or more computer-readable media, such as a magnetic medium, optical medium, non-volatile random access memory (NVRAM), dynamic random access memory (DRAM), FLASH memory, or the like.</p> <p>Each of packet-forwarding engine 130 and routing engine 136 may comprise one or more dedicated processors, discrete hardware circuitry, and the like, and may operate according to executable instructions fetched from a computer-readable medium. Examples of such media include random access memory (RAM), read-only memory (ROM), non-volatile random access memory (NVRAM), electrically erasable programmable read-only memory (EEPROM), flash memory, and the like. Furthermore, although the functionality has been described in reference to a central control unit of a network device, e.g., control unit 128 of router 120, the functionality may be distributed within the network device, e.g., within IFCs 122.”</p> <p>Ferguson, Fig. 9 and corresponding text:</p>

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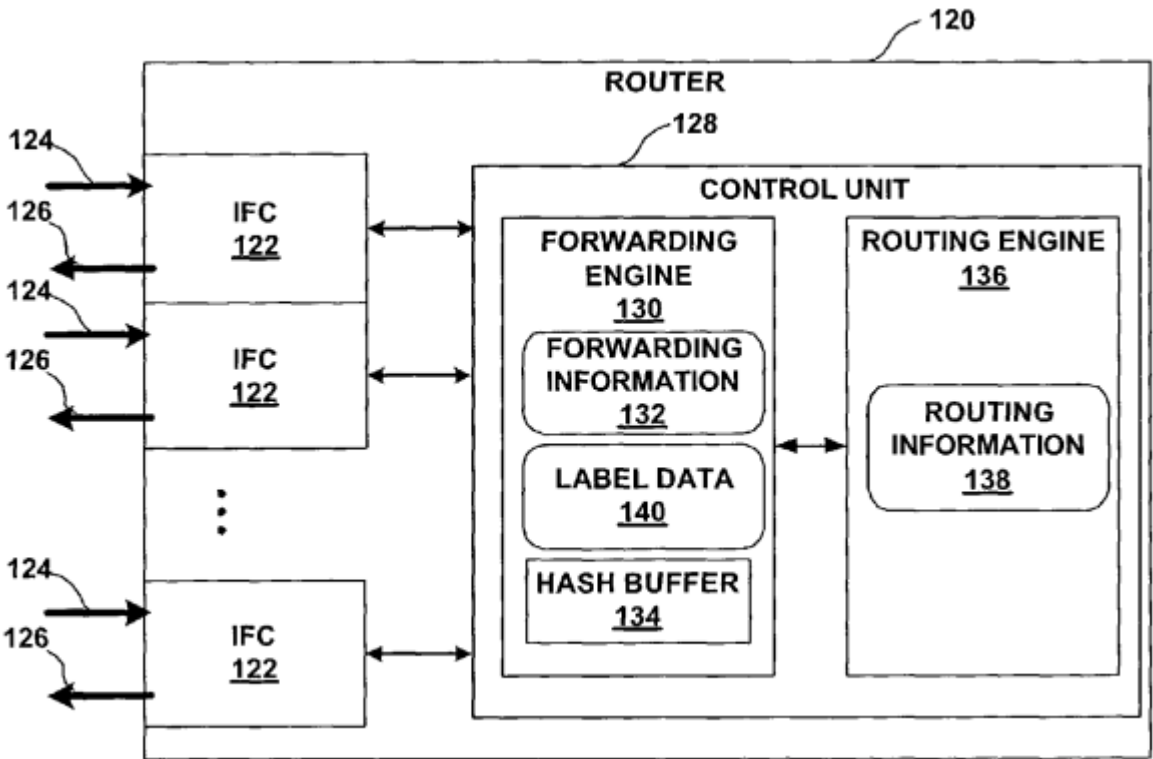
Claim Limitation	Disclosure
	
<p>1[d] receiving from the preceding node, by said first MPLS/LAG switch, a data packet comprising said data packet label, in which said port serial number of said single physical tunnel port is encoded; and</p>	<p>Ferguson discloses, either expressly or inherently, receiving 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.</p> <p>Ferguson, 3:59–4:8: “PE router 10A receives the MPLS packets, and forwards the MPLS packets to one or more intermediate routers (not shown) within provider network 6 for communication to PE router 10A via one of LSPs 14. PE router 10A may, for example, pre-pend additional MPLS labels to the traffic to form MPLS packets having multiple MPLS labels. In this manner, each MPLS packet traversing provider network 6 via LSPs 14 may be guaranteed to carry two or more MPLS labels.</p> <p>PE router 10B receives the MPLS packets from provider network 6, and forwards the MPLS</p>

Exhibit E-2 – Invalidity of U.S. Patent No. 9,118,602 in view of Ferguson

Claim Limitation	Disclosure
	<p>packets to CE router 8B via aggregated link 12B. PE router 10B may, for example, remove one or more MPLS labels from each of the inbound packets, and distribute the packets across the physical interconnects that are logically associated to form aggregated link 12B. Network traffic flows from customer network 4B to customer network 4A in similar manner.”</p> <p>Ferguson, Fig. 1 and corresponding text:</p>

Exhibit E-2 – Invalidity of U.S. Patent No. 9,118,602 in view of Ferguson

Claim Limitation	Disclosure
	<div><p>The diagram illustrates a network architecture with two customer networks, 4A and 4B, each connected to a CE router (8A and 8B respectively). These CE routers are connected to PE routers (10A and 10B respectively) within a provider network (6). PE router 10A receives inbound MPLS packets 16 from the provider network. The diagram is labeled with 2 in the top right corner.</p></div> <p>Ferguson, 6:15–23: “In FIG. 2A, PE router 10A receives inbound MPLS packets 16 from provider network 6, and</p>

Exhibit E-2 – Invalidity of U.S. Patent No. 9,118,602 in view of Ferguson

Claim Limitation	Disclosure
	<p>distributes the inbound MPLS packets across physical interconnects 18 of aggregated link 12A. In FIG. 2B, intermediate provider (P) routers 20A, 20B within provider network 6 utilize the techniques to distribute transit MPLS packets 22 across physical interconnects 24 of aggregated link 26. In other words, aggregated link 26 represents an aggregated link within network 6.”</p> <p>Ferguson, Figs. 2A, 2B and corresponding text:</p>

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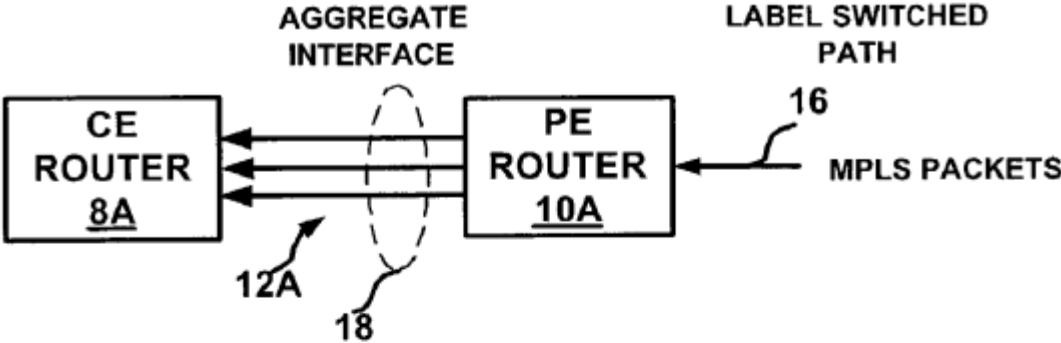
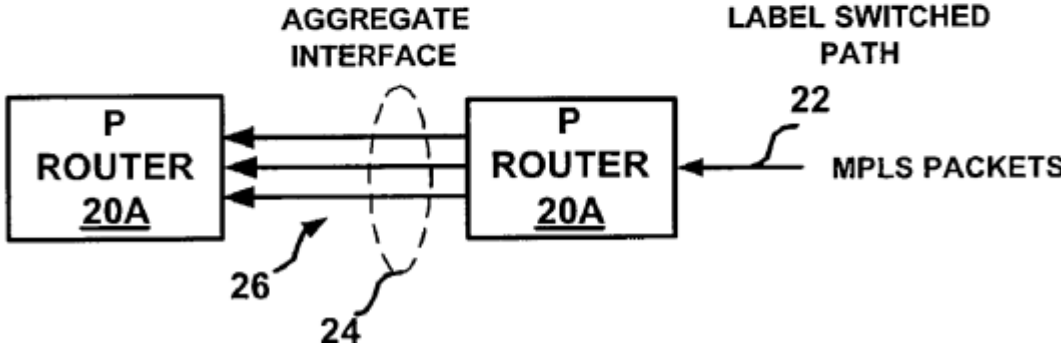
Claim Limitation	Disclosure
	<div><p>FIG. 2A</p><p>FIG. 2B</p></div> <p>Ferguson, 6:32–61: “FIG. 3 is a flowchart illustrating operation of a network device for distribution of MPLS packets in accordance with the principles of the invention. In particular, the flowchart illustrates</p>

Exhibit E-2 – Invalidity of U.S. Patent No. 9,118,602 in view of Ferguson

Claim Limitation	Disclosure
	<p>distribution of MPLS packets based on pre-allocated ranges of MPLS labels.</p> <p>Initially, the network device receives an MPLS packet (32). For example, PE router 10A may receive an MPLS packet from provider network 6 destined for CE router 8A. The device examines the first MPLS label of the packet (34). The device determines whether the label falls within one of the pre-allocated ranges of labels (36). If the value for the label falls outside the defined ranges, the device forwards the MPLS packet across one of the available multiple paths (38) without regard to load balancing of the paths.</p> <p>If the label falls within one of the defined ranges, the device performs additional processing based on the range within which the label falls. For example, if the range is mapped to a specific type of payload (40), then the device may apply a hash function using a key extracted from the payload of the MPLS packet based on the particular protocol type of the payload (42). The device then forwards the MPLS packet along one of the paths, e.g., one of the physical interconnects of an aggregated link based on the hash value (44).</p> <p>If the label indicates that distribution should be applied based on multiple MPLS labels carried by the packet, the device may perform additional processing. For example, the device may apply a hash function to an MPLS label stack within the MPLS header of the packet (46), and forwards the MPLS packet based on the hash value (44).”</p> <p>Ferguson, Fig. 3 and corresponding text:</p>

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Claim Limitation	Disclosure
	<div><pre>graph TD; 32[RECEIVE MPLS PACKET] --> 34[EXAMINE FIRST MPLS LABEL]; 34 --> 36{WITHIN A DEFINED RANGE?}; 36 -- NO --> 38[FORWARD MPLS PACKET]; 36 -- YES --> 40{DEFINED TYPE?}; 40 -- YES --> 42[APPLY HASH BASED ON EXTRACTED KEY]; 40 -- NO --> 46[APPLY HASH BASED ON LABEL STACK]; 42 --> 44[FORWARD MPLS PACKET BASED ON HASH VALUE]; 46 --> 44; 38 --> 32; 44 --> 32;</pre><p>The flowchart, labeled FIG. 3, illustrates a process for handling an MPLS packet. It begins with a rectangular box labeled 'RECEIVE MPLS PACKET' (32). An arrow points down to another rectangular box 'EXAMINE FIRST MPLS LABEL' (34). From there, an arrow points down to a diamond-shaped decision box 'WITHIN A DEFINED RANGE?' (36). If the answer is 'NO', an arrow points right to a rectangular box 'FORWARD MPLS PACKET' (38). If the answer is 'YES', an arrow points down to another diamond-shaped decision box 'DEFINED TYPE?' (40). From 'DEFINED TYPE?', a 'YES' path leads right to 'APPLY HASH BASED ON EXTRACTED KEY' (42), and a 'NO' path leads down to 'APPLY HASH BASED ON LABEL STACK' (46). Both 42 and 46 have arrows pointing down to a final rectangular box 'FORWARD MPLS PACKET BASED ON HASH VALUE' (44). Arrows from both the 'FORWARD MPLS PACKET' (38) and 'FORWARD MPLS PACKET BASED ON HASH VALUE' (44) boxes point up and left, merging into a single arrow that loops back to the 'RECEIVE MPLS PACKET' (32) box.</p></div> <p>FIG. 3</p>

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Claim Limitation	Disclosure
	<p>Ferguson, 8:58–10:18: “FIG. 9 is a block diagram illustrating an exemplary router 120 that distributes MPLS packets across parallel physical paths in accordance with the principles of the invention. Although the techniques are illustrated in reference to a router, the techniques may be readily applied to other network devices, such as switches, hubs, firewalls, gateways, proxy servers, and the like. In addition, the techniques may be applied to “edge” devices that provide access to a large network, such as the Internet, or to high-speed “core” devices within the network.</p> <p>Router 120 includes a control unit 128 that directs inbound packets received from inbound links 124 to appropriate outbound links 126. In particular, the functionality of control unit 128 can be divided between a routing engine 136 and a packet-forwarding engine 130.</p> <p>Routing engine 136 is primarily responsible for maintaining routing information 138 to reflect the current network topology. In order to maintain an accurate representation of the network, router 120 supports a number of protocols for exchanging routing information with other routers. For example, router 120 may support the Border Gateway Protocol (BGP), for exchanging routing information with routers of other autonomous systems. Similarly, router 120 may support the Intermediate System to Intermediate System protocol (IS-IS), which is an interior gateway routing protocol for communicating link-state information within an autonomous system. Other examples of interior routing protocols include the Open Shortest Path First (OSPF), and the Routing Information Protocol (RIP).</p> <p>Routing engine 136 directs packet-forwarding engine 130 to maintain forwarding information 132 in accordance with routing information 138. Forwarding information 132 may, therefore, be thought of as derived from the information contained within routing information 138. In particular, forwarding information 132 associates packet information, e.g., a “key” as described above, with specific forwarding next hops (FNH). A FNH generally refers to a neighboring router physically coupled to router 120 along a given route. For example, the FNH for a route may specify a physical interface and media access control (MAC) address for the interface associated with the neighboring router.</p> <p>Packet-forwarding engine 130 controls the flow of packets through router 120, and distributes MPLS traffic across parallel paths, as described herein. In particular, router 120 includes a plurality of interface cards (IFCs) 122 for sending and receiving packets via inbound links 124 and outbound links 126. IFCs 122 may include a number of interface ports (not shown) for coupling to network links 124 and 126.</p>

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Claim Limitation	Disclosure
	<p>Specifically, upon receiving an inbound packet via an input port of one of IFCs 122, packet-forwarding engine 130 selects an appropriate FNH for the packet based on forwarding information 132. Packet forwarding engine 130 maps the selected FNH to an output interface for IFCs 122, and relays the packet to the selected output interface for transmission.</p> <p>For MPLS packets, packet-forwarding engine 130 distributes the MPLS packets in accordance with the techniques described herein. For example, for MPLS packets destined for an aggregated link, packet-forwarding engine 130 distributes the packets across the output interfaces associated with the multiple physical interconnects of the aggregated link. In particular, packet-forwarding engine 130 makes use of label data 140 to control distribution of the MPLS packets. For example, label data 140 may map a label of the inbound MPLS packet to a protocol type, or may designate the MPLS packet as having multiple labels, as illustrated in Table 1 above.</p> <p>Packet-forwarding engine 130 includes hash buffer 124 to store an extracted key and one or more MPLS labels of the packet. Packet-forwarding engine 130 applies a hash function to the contents of hash buffer 134 to generate a hash value. Based on the generated hash value, packet-forwarding engine 130 relays the MPLS packet to one of the physical interfaces of IFCs 22 for transmission. Packet-forwarding engine 130 may arrange label data 140 in the form of a variety of data structures, such as a number of tables, link lists, radix trees, databases, flat files, or other data structures. Furthermore, packet-forwarding engine 130 may store the data structures on one or more computer-readable media, such as a magnetic medium, optical medium, non-volatile random access memory (NVRAM), dynamic random access memory (DRAM), FLASH memory, or the like.</p> <p>Each of packet-forwarding engine 130 and routing engine 136 may comprise one or more dedicated processors, discrete hardware circuitry, and the like, and may operate according to executable instructions fetched from a computer-readable medium. Examples of such media include random access memory (RAM), read-only memory (ROM), non-volatile random access memory (NVRAM), electrically erasable programmable read-only memory (EEPROM), flash memory, and the like. Furthermore, although the functionality has been described in reference to a central control unit of a network device, e.g., control unit 128 of router 120, the functionality may be distributed within the network device, e.g., within IFCs 122.”</p> <p>Ferguson, Fig. 9 and corresponding text:</p>

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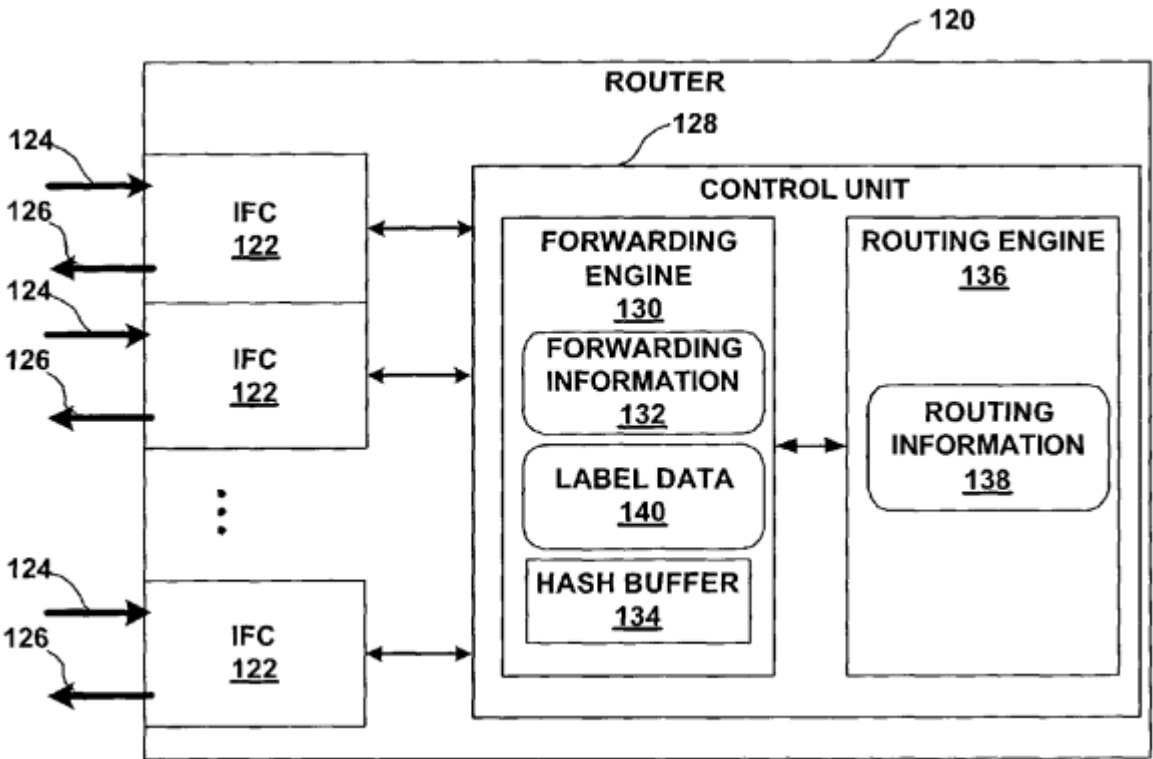
Claim Limitation	Disclosure
	
<p>1[e] sending said data packet from said first MPLS/LAG switch to a second MSPLS/LAG switch via said single physical tunnel port having the port serial number encoded in the data packet label.</p>	<p>Ferguson discloses, either expressly or inherently, sending said data 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.</p> <p>Ferguson, 3:59–4:8: “PE router 10A receives the MPLS packets, and forwards the MPLS packets to one or more intermediate routers (not shown) within provider network 6 for communication to PE router 10A via one of LSPs 14. PE router 10A may, for example, pre-pend additional MPLS labels to the traffic to form MPLS packets having multiple MPLS labels. In this manner, each MPLS packet traversing provider network 6 via LSPs 14 may be guaranteed to carry two or more MPLS labels.</p>

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Claim Limitation	Disclosure
	<p>PE router 10B receives the MPLS packets from provider network 6, and forwards the MPLS packets to CE router 8B via aggregated link 12B. PE router 10B may, for example, remove one or more MPLS labels from each of the inbound packets, and distribute the packets across the physical interconnects that are logically associated to form aggregated link 12B. Network traffic flows from customer network 4B to customer network 4A in similar manner.”</p> <p>Ferguson, Fig. 1 and corresponding text:</p>

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	<div><p>The diagram illustrates a network architecture. At the top left, a cloud labeled 'CUSTOMER NETWORK 4A' is connected to a box labeled 'CE ROUTER 8A'. A solid line connects CE ROUTER 8A to a box labeled 'PE ROUTER 10A'. A dashed line connects PE ROUTER 10A to another box labeled 'PE ROUTER 10B'. A dashed line connects PE ROUTER 10B to a box labeled 'CE ROUTER 8B'. A solid line connects CE ROUTER 8B back to CUSTOMER NETWORK 4A. A large dashed oval encircles the two PE routers and the connection between them, labeled 'PROVIDER NETWORK 6'. A dashed line labeled '14' connects the two PE routers. Arrows labeled '12A' and '12B' point to the connections between the CE routers and the PE routers. A reference numeral '2' points to the overall system.</p></div> <p>Ferguson, 6:15–23:</p>

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Claim Limitation	Disclosure
	<p>“In FIG. 2A, PE router 10A receives inbound MPLS packets 16 from provider network 6, and distributes the inbound MPLS packets across physical interconnects 18 of aggregated link 12A. In FIG. 2B, intermediate provider (P) routers 20A, 20B within provider network 6 utilize the techniques to distribute transit MPLS packets 22 across physical interconnects 24 of aggregated link 26. In other words, aggregated link 26 represents an aggregated link within network 6.”</p> <p>Ferguson, Figs. 2A, 2B:</p>

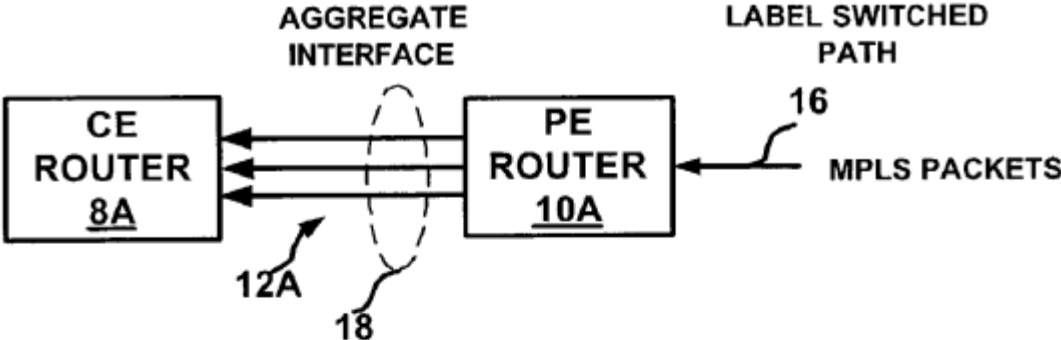
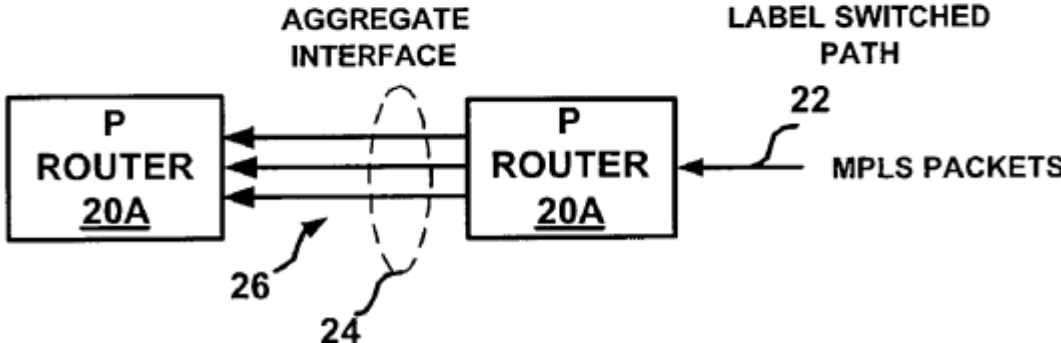
Claim Limitation	Disclosure
	<div><p>FIG. 2A</p></div> <div><p>FIG. 2B</p></div> <p>Ferguson, 6:32–61: “FIG. 3 is a flowchart illustrating operation of a network device for distribution of MPLS packets</p>

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	<p>in accordance with the principles of the invention. In particular, the flowchart illustrates distribution of MPLS packets based on pre-allocated ranges of MPLS labels.</p> <p>Initially, the network device receives an MPLS packet (32). For example, PE router 10A may receive an MPLS packet from provider network 6 destined for CE router 8A. The device examines the first MPLS label of the packet (34). The device determines whether the label falls within one of the pre-allocated ranges of labels (36). If the value for the label falls outside the defined ranges, the device forwards the MPLS packet across one of the available multiple paths (38) without regard to load balancing of the paths.</p> <p>If the label falls within one of the defined ranges, the device performs additional processing based on the range within which the label falls. For example, if the range is mapped to a specific type of payload (40), then the device may apply a hash function using a key extracted from the payload of the MPLS packet based on the particular protocol type of the payload (42). The device then forwards the MPLS packet along one of the paths, e.g., one of the physical interconnects of an aggregated link based on the hash value (44).</p> <p>If the label indicates that distribution should be applied based on multiple MPLS labels carried by the packet, the device may perform additional processing. For example, the device may apply a hash function to an MPLS label stack within the MPLS header of the packet (46), and forwards the MPLS packet based on the hash value (44).”</p> <p>Ferguson, Fig. 3 and corresponding text:</p>

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	<div><pre>graph TD; 32[RECEIVE MPLS PACKET] --> 34[EXAMINE FIRST MPLS LABEL]; 34 --> 36{WITHIN A DEFINED RANGE?}; 36 -- NO --> 38[FORWARD MPLS PACKET]; 36 -- YES --> 40{DEFINED TYPE?}; 40 -- YES --> 42[APPLY HASH BASED ON EXTRACTED KEY]; 40 -- NO --> 46[APPLY HASH BASED ON LABEL STACK]; 42 --> 44[FORWARD MPLS PACKET BASED ON HASH VALUE]; 46 --> 44; 38 --> 32; 44 --> 32;</pre><p>The flowchart, labeled FIG. 3, illustrates a process for handling an MPLS packet. It begins with a rectangular box labeled 'RECEIVE MPLS PACKET' (32). An arrow points down to another rectangular box 'EXAMINE FIRST MPLS LABEL' (34). From there, an arrow points down to a diamond-shaped decision box 'WITHIN A DEFINED RANGE?' (36). If the answer is 'NO', an arrow points right to a rectangular box 'FORWARD MPLS PACKET' (38). If the answer is 'YES', an arrow points down to another diamond-shaped decision box 'DEFINED TYPE?' (40). From 'DEFINED TYPE?', a 'YES' path leads right to a rectangular box 'APPLY HASH BASED ON EXTRACTED KEY' (42), while a 'NO' path leads down to a rectangular box 'APPLY HASH BASED ON LABEL STACK' (46). Both '42' and '46' have arrows pointing down to a final rectangular box 'FORWARD MPLS PACKET BASED ON HASH VALUE' (44). Arrows from both '38' and '44' point back up to the 'RECEIVE MPLS PACKET' (32) box, creating a loop.</p></div> <p>FIG. 3</p>

Exhibit E-2 – Invalidity of U.S. Patent No. 9,118,602 in view of Ferguson

Claim Limitation	Disclosure
	<p>Ferguson, 8:58–10:18:</p> <p>“FIG. 9 is a block diagram illustrating an exemplary router 120 that distributes MPLS packets across parallel physical paths in accordance with the principles of the invention. Although the techniques are illustrated in reference to a router, the techniques may be readily applied to other network devices, such as switches, hubs, firewalls, gateways, proxy servers, and the like. In addition, the techniques may be applied to “edge” devices that provide access to a large network, such as the Internet, or to high-speed “core” devices within the network.</p> <p>Router 120 includes a control unit 128 that directs inbound packets received from inbound links 124 to appropriate outbound links 126. In particular, the functionality of control unit 128 can be divided between a routing engine 136 and a packet-forwarding engine 130.</p> <p>Routing engine 136 is primarily responsible for maintaining routing information 138 to reflect the current network topology. In order to maintain an accurate representation of the network, router 120 supports a number of protocols for exchanging routing information with other routers. For example, router 120 may support the Border Gateway Protocol (BGP), for exchanging routing information with routers of other autonomous systems. Similarly, router 120 may support the Intermediate System to Intermediate System protocol (IS-IS), which is an interior gateway routing protocol for communicating link-state information within an autonomous system. Other examples of interior routing protocols include the Open Shortest Path First (OSPF), and the Routing Information Protocol (RIP).</p> <p>Routing engine 136 directs packet-forwarding engine 130 to maintain forwarding information 132 in accordance with routing information 138. Forwarding information 132 may, therefore, be thought of as derived from the information contained within routing information 138. In particular, forwarding information 132 associates packet information, e.g., a “key” as described above, with specific forwarding next hops (FNH). A FNH generally refers to a neighboring router physically coupled to router 120 along a given route. For example, the FNH for a route may specify a physical interface and media access control (MAC) address for the interface associated with the neighboring router.</p> <p>Packet-forwarding engine 130 controls the flow of packets through router 120, and distributes MPLS traffic across parallel paths, as described herein. In particular, router 120 includes a plurality of interface cards (IFCs) 122 for sending and receiving packets via inbound links 124 and outbound links 126. IFCs 122 may include a number of interface ports (not shown) for coupling to network links 124 and 126.</p> <p>Specifically, upon receiving an inbound packet via an input port of one of IFCs 122, packet-</p>

Exhibit E-2 – Invalidity of U.S. Patent No. 9,118,602 in view of Ferguson

Claim Limitation	Disclosure
	<p>forwarding engine 130 selects an appropriate FNH for the packet based on forwarding information 132. Packet forwarding engine 130 maps the selected FNH to an output interface for IFCs 122, and relays the packet to the selected output interface for transmission.</p> <p>For MPLS packets, packet-forwarding engine 130 distributes the MPLS packets in accordance with the techniques described herein. For example, for MPLS packets destined for an aggregated link, packet-forwarding engine 130 distributes the packets across the output interfaces associated with the multiple physical interconnects of the aggregated link. In particular, packet-forwarding engine 130 makes use of label data 140 to control distribution of the MPLS packets. For example, label data 140 may map a label of the inbound MPLS packet to a protocol type, or may designate the MPLS packet as having multiple labels, as illustrated in Table 1 above.</p> <p>Packet-forwarding engine 130 includes hash buffer 124 to store an extracted key and one or more MPLS labels of the packet. Packet-forwarding engine 130 applies a hash function to the contents of hash buffer 134 to generate a hash value. Based on the generated hash value, packet-forwarding engine 130 relays the MPLS packet to one of the physical interfaces of IFCs 22 for transmission. Packet-forwarding engine 130 may arrange label data 140 in the form of a variety of data structures, such as a number of tables, link lists, radix trees, databases, flat files, or other data structures. Furthermore, packet-forwarding engine 130 may store the data structures on one or more computer-readable media, such as a magnetic medium, optical medium, non-volatile random access memory (NVRAM), dynamic random access memory (DRAM), FLASH memory, or the like.</p> <p>Each of packet-forwarding engine 130 and routing engine 136 may comprise one or more dedicated processors, discrete hardware circuitry, and the like, and may operate according to executable instructions fetched from a computer-readable medium. Examples of such media include random access memory (RAM), read-only memory (ROM), non-volatile random access memory (NVRAM), electrically erasable programmable read-only memory (EEPROM), flash memory, and the like. Furthermore, although the functionality has been described in reference to a central control unit of a network device, e.g., control unit 128 of router 120, the functionality may be distributed within the network device, e.g., within IFCs 122.”</p> <p>Ferguson, Fig. 9 and corresponding text:</p>

Exhibit E-2 – Invalidity of U.S. Patent No. 9,118,602 in view of Ferguson

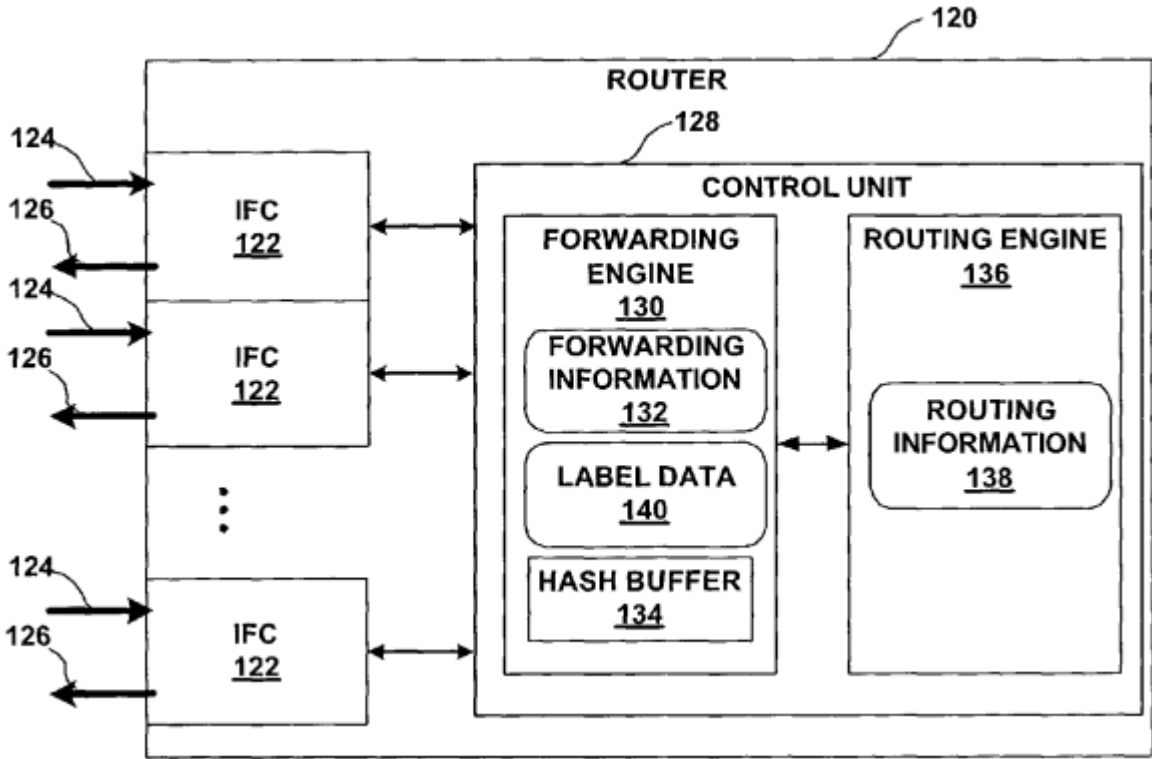
Claim Limitation	Disclosure
	
<p>2 The method of claim 1, further comprising the step of receiving from a preceding node located upstream from said first MPLS/LAG switch, by said first MPLS/LAG switch, a request message requesting configuration of said network tunnel, the message further requesting said data packet label associated with said network tunnel</p>	<p>Ferguson discloses, either expressly or inherently, performing methods 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.</p> <p>Ferguson, 8:58–10:18: “FIG. 9 is a block diagram illustrating an exemplary router 120 that distributes MPLS packets across parallel physical paths in accordance with the principles of the invention. Although the techniques are illustrated in reference to a router, the techniques may be readily applied to other network devices, such as switches, hubs, firewalls, gateways, proxy servers, and the like. In</p>

Exhibit E-2 – Invalidity of U.S. Patent No. 9,118,602 in view of Ferguson

Claim Limitation	Disclosure
<p>packet label associated with said network tunnel.</p>	<p>addition, the techniques may be applied to “edge” devices that provide access to a large network, such as the Internet, or to high-speed “core” devices within the network.</p> <p>Router 120 includes a control unit 128 that directs inbound packets received from inbound links 124 to appropriate outbound links 126. In particular, the functionality of control unit 128 can be divided between a routing engine 136 and a packet-forwarding engine 130.</p> <p>Routing engine 136 is primarily responsible for maintaining routing information 138 to reflect the current network topology. In order to maintain an accurate representation of the network, router 120 supports a number of protocols for exchanging routing information with other routers. For example, router 120 may support the Border Gateway Protocol (BGP), for exchanging routing information with routers of other autonomous systems. Similarly, router 120 may support the Intermediate System to Intermediate System protocol (IS-IS), which is an interior gateway routing protocol for communicating link-state information within an autonomous system. Other examples of interior routing protocols include the Open Shortest Path First (OSPF), and the Routing Information Protocol (RIP).</p> <p>Routing engine 136 directs packet-forwarding engine 130 to maintain forwarding information 132 in accordance with routing information 138. Forwarding information 132 may, therefore, be thought of as derived from the information contained within routing information 138. In particular, forwarding information 132 associates packet information, e.g., a “key” as described above, with specific forwarding next hops (FNH). A FNH generally refers to a neighboring router physically coupled to router 120 along a given route. For example, the FNH for a route may specify a physical interface and media access control (MAC) address for the interface associated with the neighboring router.</p> <p>Packet-forwarding engine 130 controls the flow of packets through router 120, and distributes MPLS traffic across parallel paths, as described herein. In particular, router 120 includes a plurality of interface cards (IFCs) 122 for sending and receiving packets via inbound links 124 and outbound links 126. IFCs 122 may include a number of interface ports (not shown) for coupling to network links 124 and 126.</p> <p>Specifically, upon receiving an inbound packet via an input port of one of IFCs 122, packet-forwarding engine 130 selects an appropriate FNH for the packet based on forwarding information 132. Packet forwarding engine 130 maps the selected FNH to an output interface for IFCs 122, and relays the packet to the selected output interface for transmission.</p> <p>For MPLS packets, packet-forwarding engine 130 distributes the MPLS packets in accordance</p>

Exhibit E-2 – Invalidity of U.S. Patent No. 9,118,602 in view of Ferguson

Claim Limitation	Disclosure
	<p>with the techniques described herein. For example, for MPLS packets destined for an aggregated link, packet-forwarding engine 130 distributes the packets across the output interfaces associated with the multiple physical interconnects of the aggregated link. In particular, packet-forwarding engine 130 makes use of label data 140 to control distribution of the MPLS packets. For example, label data 140 may map a label of the inbound MPLS packet to a protocol type, or may designate the MPLS packet as having multiple labels, as illustrated in Table 1 above.</p> <p>Packet-forwarding engine 130 includes hash buffer 124 to store an extracted key and one or more MPLS labels of the packet. Packet-forwarding engine 130 applies a hash function to the contents of hash buffer 134 to generate a hash value. Based on the generated hash value, packet-forwarding engine 130 relays the MPLS packet to one of the physical interfaces of IFCs 22 for transmission. Packet-forwarding engine 130 may arrange label data 140 in the form of a variety of data structures, such as a number of tables, link lists, radix trees, databases, flat files, or other data structures. Furthermore, packet-forwarding engine 130 may store the data structures on one or more computer-readable media, such as a magnetic medium, optical medium, non-volatile random access memory (NVRAM), dynamic random access memory (DRAM), FLASH memory, or the like.</p> <p>Each of packet-forwarding engine 130 and routing engine 136 may comprise one or more dedicated processors, discrete hardware circuitry, and the like, and may operate according to executable instructions fetched from a computer-readable medium. Examples of such media include random access memory (RAM), read-only memory (ROM), non-volatile random access memory (NVRAM), electrically erasable programmable read-only memory (EEPROM), flash memory, and the like. Furthermore, although the functionality has been described in reference to a central control unit of a network device, e.g., control unit 128 of router 120, the functionality may be distributed within the network device, e.g., within IFCs 122.”</p> <p>Ferguson, Fig. 9 and corresponding text:</p>

Exhibit E-2 – Invalidity of U.S. Patent No. 9,118,602 in view of Ferguson

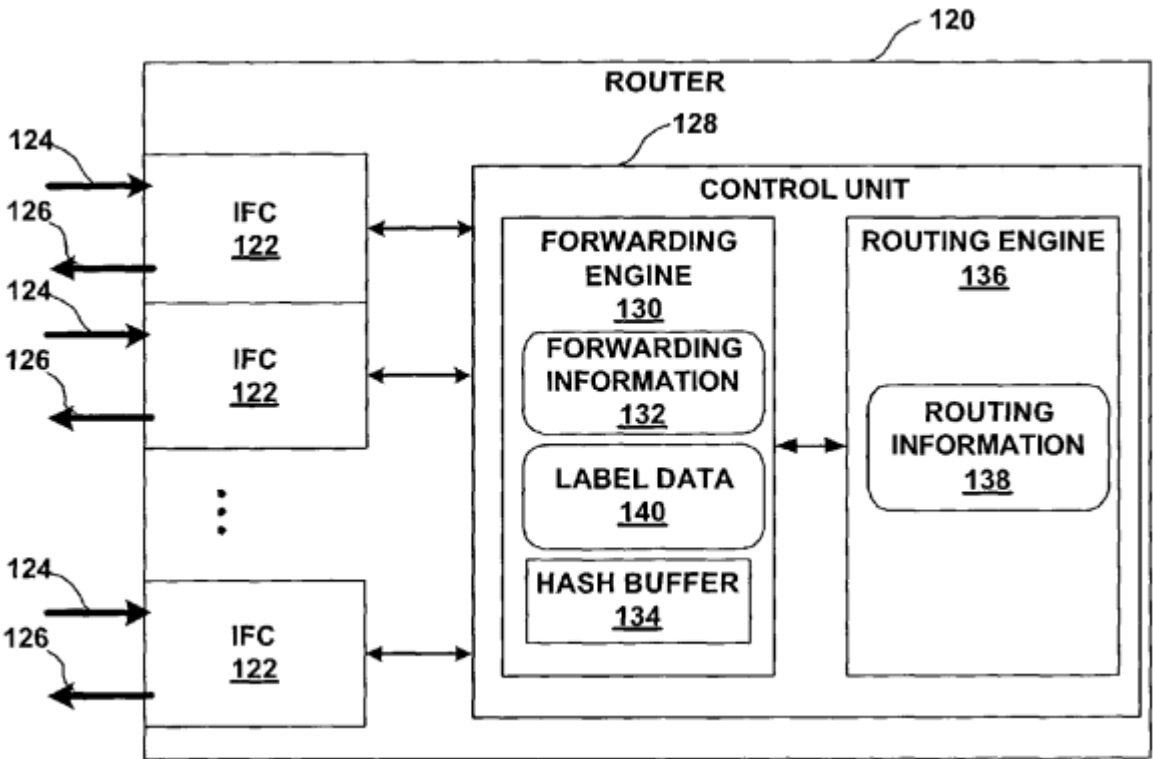
Claim Limitation	Disclosure
	
<p>3 The method of claim 2, wherein said request message comprises an RSVP-TE PATH message augmented with a LABEL_REQUEST object.</p>	<p>Ferguson discloses, either expressly or inherently, performing methods wherein said request message comprises an RSVP-TE PATH message augmented with a LABEL_REQUEST object.</p> <p>See Claim 2.</p>
<p>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</p>	<p>Ferguson discloses, either expressly or inherently, performing methods 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.</p> <p>See Claim 3. See also, e.g.:</p>

Exhibit E-2 – Invalidity of U.S. Patent No. 9,118,602 in view of Ferguson

Claim Limitation	Disclosure
<p>compliance with said service property.</p>	<p>Ferguson, 5:25–43: “The key extracted from the payload may include flow information, such as the source and destination IP address. The ‘granularity’ of distribution of the MPLS packets across the paths, i.e., the extent to which MPLS packets of a common flow are distributed to a common interconnect, directly correlates with the amount of flow information included in the key. For example, application of a hashing function to a key that includes a source and destination address will result in a less granular distribution than application to a key that includes additional flow information, such as the protocol type, the source and destination port, the type of service (ToS), as well as any other information that remains constant for any one flow of data from source to destination. For payloads conforming to protocols such as ATM, the key may include information such as the ATM Virtual Channel Identifier (VCI), Virtual Path Identifier (VPI). In addition, the key may include the MPLS labels carrying the payloads, as well as other fields that may be encapsulated in an MPLS header.”</p> <p>Ferguson, 6:62–7:27: “FIG. 4 is a flowchart illustrating the distribution of an MPLS packet based on a payload type, as indicated by an MPLS label of the packet. In particular, the device reads the MPLS label from the MPLS packet (50), and stores the label within a hash buffer (52). Next, the device accesses stored label data, such as the exemplary label data of Table 1, to determine the type of payload carried by the MPLS packet (54). In particular, the device may determine the protocol type of the carried payload.</p> <p>Next, the device extracts flow information from the payload based on the protocol type, such as a payload conforming to IPv4, IPv6, Tunneled Ethernet, ATM, and other protocols (56). The device may develop a key based on the flow information. As described above, the key may contain source and destination addresses, source and destination ports, type of service (ToS), and other information specific to the data flow of the payload. The device stores the extracted key in the hash buffer (58).</p> <p>After extracting the key, the device may generate a hash value by applying a hash function to the contents of the hash buffer, i.e., the key information as well as the stored MPLS label (60). After generating the hash value, the device selects one of the parallel paths, e.g., different physical interconnects of an aggregated link, based on the hash value (62). Finally, the device forwards the MPLS packet along the selected path (64). In this manner, the techniques may generate hash values having substantial distribution for different data flows associated with a common LSP, and for data flows associated with different LSPs. In addition, because MPLS packets of a common data flow have identical MPLS labels and keys, the hashing function will generate identical hash values for the MPLS packets, thereby maintaining the sequence of the MPLS packets.”</p>

Exhibit E-2 – Invalidity of U.S. Patent No. 9,118,602 in view of Ferguson

Claim Limitation	Disclosure
	<p>Ferguson, Fig. 4:</p> <pre>graph TD; 50[READ MPLS LABEL] --> 52[STORE LABEL IN HASH BUFFER]; 52 --> 54[ACCESS LABEL DATA TO DETERMINE PACKET TYPE BASED ON LABEL]; 54 --> 56[EXTRACT FLOW INFORMATION BASED ON DETERMINED PAYLOAD TYPE]; 56 --> 58[STORE FLOW INFORMATION IN HASH BUFFER]; 58 --> 60[HASH CONTENTS OF HASH BUFFER TO GENERATE HASH VALUE]; 60 --> 62[SELECT PATH BASED ON HASH VALUE]; 62 --> 64[FORWARD PACKET VIA SELECTED PATH];</pre> <p>FIG. 4</p>

Exhibit E-2 – Invalidity of U.S. Patent No. 9,118,602 in view of Ferguson

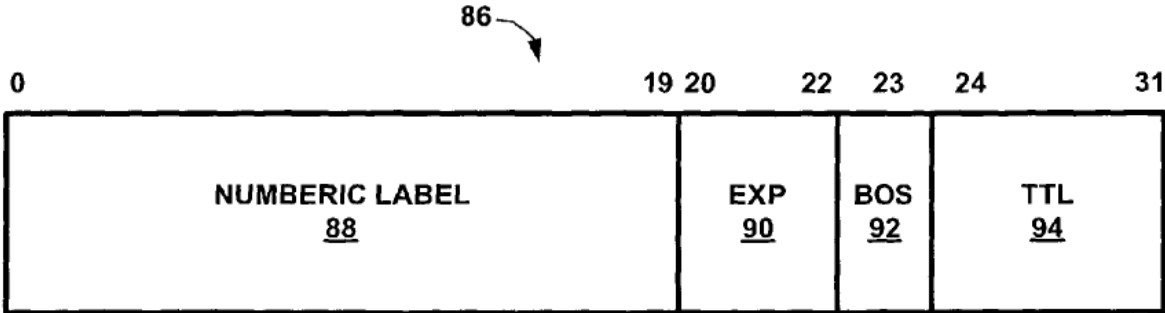
Claim Limitation	Disclosure
	<p>Ferguson, 8:16–27: “FIG. 7 is a block diagram illustrating an example MPLS label 86. As illustrated, MPLS label 86 includes a 20-bit numeric label 88. In addition, MPLS label 86 includes 3 EXP bits 90 that may identify a service associated with MPLS label 86. MPLS label 86 further includes a single bottom-of-stack (BOS) bit 92 that indicates whether the label is the last label within the label stack of the respective packet. Finally, MPLS label 86 includes an 8-bit time-to-live value (TTL) 94. When using MPLS label 86 as an input to a hash function, a device may utilize combinations of these fields, such as a portion or all of numeric label 88 and EXP bits 90.”</p> <p>Ferguson, Fig. 7 and corresponding text:</p> <div style="text-align: center;">  <p>FIG. 7</p> </div>
<p>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.</p>	<p>Ferguson discloses, either expressly or inherently, performing methods wherein said service property comprises at least one of: a guaranteed bandwidth; a peak bandwidth; and a class of service.</p> <p><i>See Claim 4. See also, e.g.:</i></p> <p>Ferguson, 1:27–41: “The term ‘link aggregation’ refers to a technique by which the multiple physical interconnects are logically associated and treated as a single, aggregated link. In particular, the IEEE 802.3ad Working Group recently developed a Link Aggregation specification. This approach may provide for increased link availability and bandwidth between the two devices. For example, bandwidth</p>

Exhibit E-2 – Invalidity of U.S. Patent No. 9,118,602 in view of Ferguson

Claim Limitation	Disclosure
	<p>can be increased in linear increments, e.g., by adding individual interconnects to increase the bandwidth between the two devices. In addition, the multiple physical interconnects provide a degree of redundancy in that a failure in a single physical interconnect no longer inhibits direct traffic flow between the two devices. With link aggregation, traffic on a failed physical interconnect can be redirected to one of the other physical interconnects in the aggregated link.”</p> <p>Ferguson, 4:45–60: “One difficulty in distributing or otherwise load balancing MPLS packets across multiple physical data paths, e.g., the multiple interconnects of an aggregated link, is that an MPLS label is typically an arbitrary label unrelated to the payload. As a result, conventional mechanisms for distributing network traffic cannot identify packets belonging to a common data flow and, as a result, may distribute packets of a common data flow across separate paths. Consequently, the MPLS packets may arrive at the destination out of order, which can be problematic for the MPLS protocol, which requires in-sequence delivery. Further, the distribution mechanism 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. This may decrease the efficiency of the network and increase packet latency.”</p>
<p>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.</p>	<p>Ferguson discloses, either expressly or inherently, performing methods wherein said selecting comprises selecting a single physical tunnel port having a maximum available bandwidth of said plurality of physical data ports.</p> <p><i>See Claim 1[a].</i></p>
<p>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.</p>	<p>Ferguson discloses, either expressly or inherently, performing methods 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.</p> <p><i>See Claim 1[a].</i></p>
<p>8 The method according to claim 1, wherein said switching said data packet is according to</p>	<p>Ferguson discloses, either expressly or inherently, perform methods wherein said switching said data packet is according to a mapping function.</p>

Exhibit E-2 – Invalidity of U.S. Patent No. 9,118,602 in view of Ferguson

Claim Limitation	Disclosure
a mapping function.	<p>Ferguson, 6:46–55: “If the label falls within one of the defined ranges, the device performs additional processing based on the range within which the label falls. For example, if the range is mapped to a specific type of payload (40), then the device may apply a hash function using a key extracted from the payload of the MPLS packet based on the particular protocol type of the payload (42). The device then forwards the MPLS packet along one of the paths, e.g., one of the physical interconnects of an aggregated link based on the hash value (44).”</p> <p>Ferguson, 8:58–10:18: “FIG. 9 is a block diagram illustrating an exemplary router 120 that distributes MPLS packets across parallel physical paths in accordance with the principles of the invention. Although the techniques are illustrated in reference to a router, the techniques may be readily applied to other network devices, such as switches, hubs, firewalls, gateways, proxy servers, and the like. In addition, the techniques may be applied to “edge” devices that provide access to a large network, such as the Internet, or to high-speed “core” devices within the network.</p> <p>Router 120 includes a control unit 128 that directs inbound packets received from inbound links 124 to appropriate outbound links 126. In particular, the functionality of control unit 128 can be divided between a routing engine 136 and a packet-forwarding engine 130.</p> <p>Routing engine 136 is primarily responsible for maintaining routing information 138 to reflect the current network topology. In order to maintain an accurate representation of the network, router 120 supports a number of protocols for exchanging routing information with other routers. For example, router 120 may support the Border Gateway Protocol (BGP), for exchanging routing information with routers of other autonomous systems. Similarly, router 120 may support the Intermediate System to Intermediate System protocol (IS-IS), which is an interior gateway routing protocol for communicating link-state information within an autonomous system. Other examples of interior routing protocols include the Open Shortest Path First (OSPF), and the Routing Information Protocol (RIP).</p> <p>Routing engine 136 directs packet-forwarding engine 130 to maintain forwarding information 132 in accordance with routing information 138. Forwarding information 132 may, therefore, be thought of as derived from the information contained within routing information 138. In particular, forwarding information 132 associates packet information, e.g., a “key” as described above, with specific forwarding next hops (FNH). A FNH generally refers to a neighboring router physically coupled to router 120 along a given route. For example, the FNH for a route may specify a physical interface and media access control (MAC) address for the interface associated with the neighboring router.</p>

Exhibit E-2 – Invalidity of U.S. Patent No. 9,118,602 in view of Ferguson

Claim Limitation	Disclosure
	<p>Packet-forwarding engine 130 controls the flow of packets through router 120, and distributes MPLS traffic across parallel paths, as described herein. In particular, router 120 includes a plurality of interface cards (IFCs) 122 for sending and receiving packets via inbound links 124 and outbound links 126. IFCs 122 may include a number of interface ports (not shown) for coupling to network links 124 and 126.</p> <p>Specifically, upon receiving an inbound packet via an input port of one of IFCs 122, packet-forwarding engine 130 selects an appropriate FNH for the packet based on forwarding information 132. Packet forwarding engine 130 maps the selected FNH to an output interface for IFCs 122, and relays the packet to the selected output interface for transmission.</p> <p>For MPLS packets, packet-forwarding engine 130 distributes the MPLS packets in accordance with the techniques described herein. For example, for MPLS packets destined for an aggregated link, packet-forwarding engine 130 distributes the packets across the output interfaces associated with the multiple physical interconnects of the aggregated link. In particular, packet-forwarding engine 130 makes use of label data 140 to control distribution of the MPLS packets. For example, label data 140 may map a label of the inbound MPLS packet to a protocol type, or may designate the MPLS packet as having multiple labels, as illustrated in Table 1 above.</p> <p>Packet-forwarding engine 130 includes hash buffer 124 to store an extracted key and one or more MPLS labels of the packet. Packet-forwarding engine 130 applies a hash function to the contents of hash buffer 134 to generate a hash value. Based on the generated hash value, packet-forwarding engine 130 relays the MPLS packet to one of the physical interfaces of IFCs 22 for transmission. Packet-forwarding engine 130 may arrange label data 140 in the form of a variety of data structures, such as a number of tables, link lists, radix trees, databases, flat files, or other data structures. Furthermore, packet-forwarding engine 130 may store the data structures on one or more computer-readable media, such as a magnetic medium, optical medium, non-volatile random access memory (NVRAM), dynamic random access memory (DRAM), FLASH memory, or the like.</p> <p>Each of packet-forwarding engine 130 and routing engine 136 may comprise one or more dedicated processors, discrete hardware circuitry, and the like, and may operate according to executable instructions fetched from a computer-readable medium. Examples of such media include random access memory (RAM), read-only memory (ROM), non-volatile random access memory (NVRAM), electrically erasable programmable read-only memory (EEPROM), flash memory, and the like. Furthermore, although the functionality has been described in reference to a central control unit of a network device, e.g., control unit 128 of router 120, the functionality may</p>

Exhibit E-2 – Invalidity of U.S. Patent No. 9,118,602 in view of Ferguson

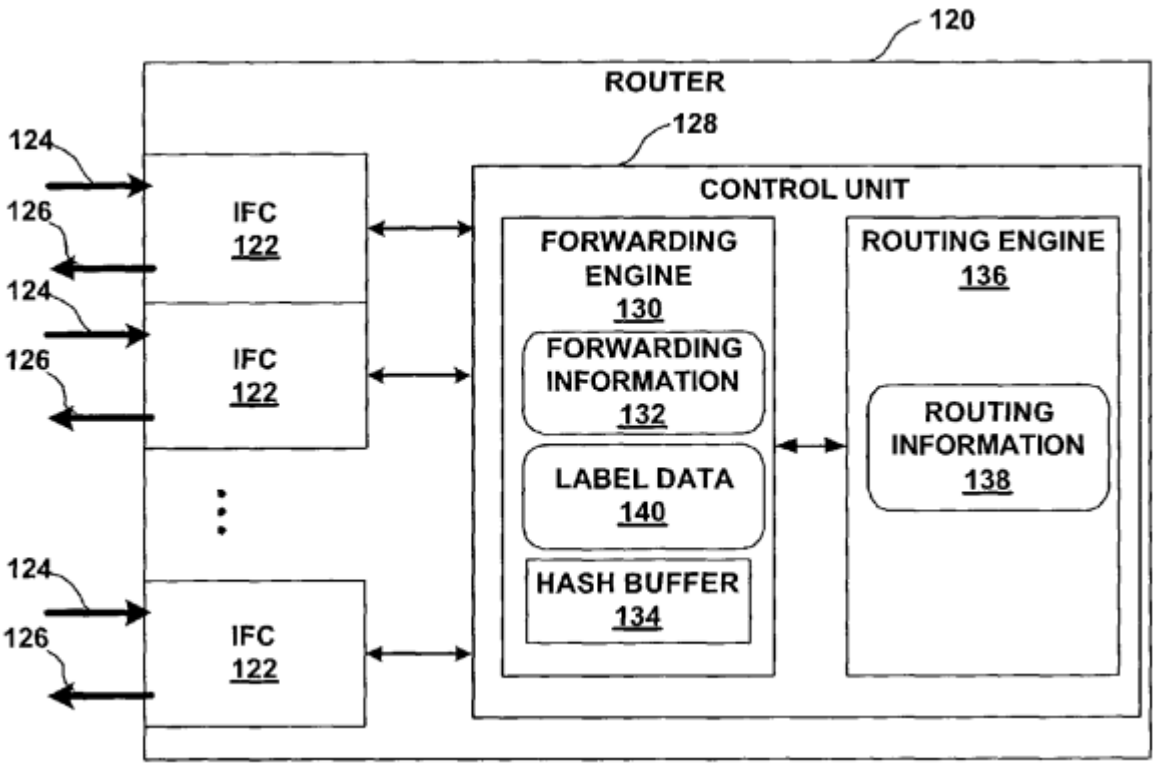
Claim Limitation	Disclosure
	<p>be distributed within the network device, e.g., within IFCs 122.”</p> <p>Ferguson, Fig. 9 and corresponding text:</p> 
<p>9 The method according to claim 1, wherein said preparing comprises inserting into said data packet label a set of bits that identify said single physical tunnel port; and wherein said switching said data packet comprises</p>	<p>Ferguson discloses, either expressly or inherently, performing methods 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.</p> <p>See Claims 1[b], 1[e].</p>

Exhibit E-2 – Invalidity of U.S. Patent No. 9,118,602 in view of Ferguson

Claim Limitation	Disclosure
extracting said set of bits to determine an identity of said single physical tunnel port.	
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.	<p>Ferguson discloses, either expressly or inherently, performing methods 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.</p> <p><i>See Claims 1[b], 1[e].</i></p>
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 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.	<p>Ferguson discloses, either expressly or inherently, performing methods 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 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.</p> <p><i>See Claim 1[a].</i></p>
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	<p>Ferguson discloses, either expressly or inherently, performing methods 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.</p> <p><i>See Claim 11.</i></p>

Exhibit E-2 – Invalidity of U.S. Patent No. 9,118,602 in view of Ferguson

Claim Limitation	Disclosure
said single physical tunnel port.	
13 The method according to claim 1, wherein said first MPLS/LAG switch comprises a Label Switched Router (LSR).	Ferguson discloses, either expressly or inherently, performing methods wherein said first MPLS/LAG switch comprises a Label Switched Router (LSR). <i>See Claim 1[c].</i>
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.	Ferguson discloses, either expressly or inherently, performing methods 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. <i>See Claims 1[pre], 1[c]–1[e].</i>
15[pre] 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:	To the extent the preamble is limiting, Ferguson discloses, either expressly or inherently, 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 second MPLS/LAG switch. <i>See Claims 1[pre], 1[c]–1[e].</i>
15[a.i] a processor, which is configured to:	Ferguson discloses, either expressly or inherently, a processor. Ferguson, 2:31–34: “In another embodiment, a computer-readable medium comprises instructions that cause a processor to receive packets associated with a common label switched path (LSP), and distribute the packets across multiple paths.” Ferguson, 10:6–18: “Each of packet-forwarding engine 130 and routing engine 136 may comprise one or more

Exhibit E-2 – Invalidity of U.S. Patent No. 9,118,602 in view of Ferguson

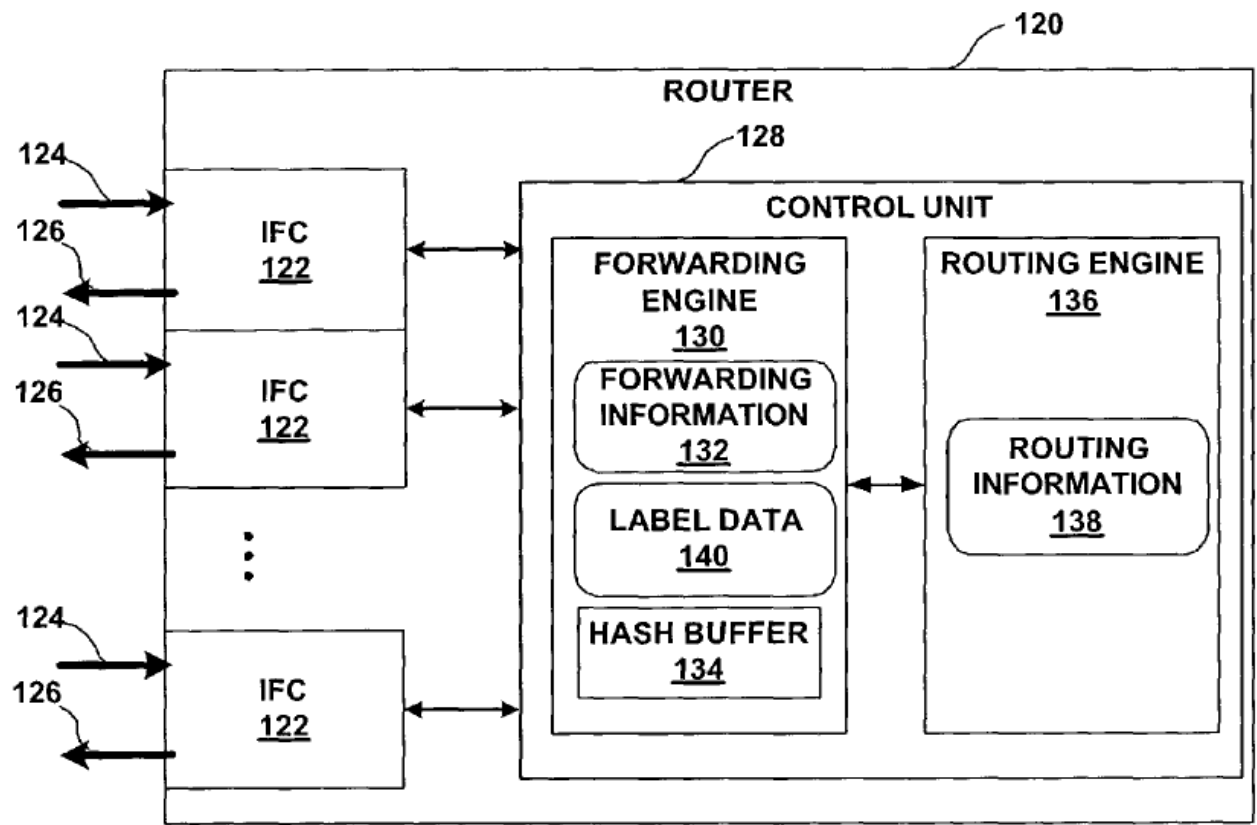
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	<p>dedicated processors, discrete hardware circuitry, and the like, and may operate according to executable instructions fetched from a computer-readable medium. Examples of such media include random access memory (RAM), read-only memory (ROM), non-volatile random access memory (NVRAM), electrically erasable programmable read-only memory (EEPROM), flash memory, and the like. Furthermore, although the functionality has been described in reference to a central control unit of a network device, e.g., control unit 128 of router 120, the functionality may be distributed within the network device, e.g., within IFCs 122.”</p> <p>Ferguson, Fig. 9 and corresponding text:</p> 
15[a.ii] assign a single physical	Ferguson discloses, either expressly or inherently, a processor, which is configured to assign a

Exhibit E-2 – Invalidity of U.S. Patent No. 9,118,602 in view of Ferguson

Claim Limitation	Disclosure
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;	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. <i>See Claims 1[a], 5–7.</i>
15[a.iii] 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;	Ferguson discloses, either expressly or inherently, a processor, which is configured to 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. <i>See Claim 1[b].</i>
15[a.iv] publish said packet label upstream; and	Ferguson discloses, either expressly or inherently, publish said packet label upstream. <i>See Claim 1[c].</i>
15[b.1] a mapper, which is configured to:	Ferguson discloses, either expressly or inherently, a mapper. <i>See Claim 8.</i>
15[b.ii] receive a data packet from an upstream node;	Ferguson discloses, either expressly or inherently, receiving a data packet from an upstream node. <i>See Claim 1[d].</i>
15[b.iii] detect said data packet label in said data packet; and 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.	Ferguson discloses, either expressly or inherently, a mapper, which is configured to detect said data packet label in said data packet; and 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. <i>See Claim 1[e].</i>
16 The apparatus according to claim 15, wherein the processor is configured to make said selection in	Ferguson discloses, either expressly or inherently, a processor that is configured to make said selection in compliance with a service property. <i>See Claim 4.</i>

Exhibit E-2 – Invalidity of U.S. Patent No. 9,118,602 in view of Ferguson

Claim Limitation	Disclosure
compliance with a service property.	
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.	Ferguson discloses, either expressly or inherently, a service property comprises at least one of the group consisting of a guaranteed bandwidth, a peak bandwidth, and a class of service. <i>See Claim 5.</i>
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.	Ferguson discloses, either expressly or inherently, a processor that is configured to make said selection of a port having a maximum available bandwidth of the plurality of ports. <i>See Claim 6.</i>
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.	Ferguson discloses, either expressly or inherently, a processor that 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. <i>See Claim 6.</i>
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.	Ferguson discloses, either expressly or inherently, a processor that 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. <i>See Claim 9.</i>
21 The apparatus according to claim 15, further comprising a memory, and wherein said	Ferguson discloses, either expressly or inherently, a memory and a processor that 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

Exhibit E-2 – Invalidity of U.S. Patent No. 9,118,602 in view of Ferguson

Claim Limitation	Disclosure
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.	responsively to said data packet label. <i>See Claim 10.</i>
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 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.	Ferguson discloses, either expressly or inherently, a processor that is configured to select a backup port from among the plurality of physical data ports, different from said single physical tunnel 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. <i>See Claim 11.</i>
23 The apparatus according to claim 15, wherein said first MPLS/LAG switch comprises a Label Switched Router (LSR).	Ferguson discloses, either expressly or inherently, a first MPLS/LAG switch that comprises a Label Switched Router (LSR). <i>See Claim 13.</i>
24 The apparatus according to claim 15, wherein said processor comprises a network processor.	Ferguson discloses, either expressly or inherently, a processor that comprises a network processor. <i>See Claim 15[a.i].</i>
25 The apparatus according to claim 15, wherein said	Ferguson discloses, either expressly or inherently, an apparatus wherein said plurality of physical data ports are selected from a single logical port.

Exhibit E-2 – Invalidity of U.S. Patent No. 9,118,602 in view of Ferguson

Claim Limitation	Disclosure
plurality of physical data ports are selected from a single logical port.	<i>See Claim 14.</i>
26[pre] 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:	Ferguson discloses, either expressly or inherently, 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. <i>See Claim 1[pre].</i>
26[a] 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;	Ferguson discloses, either expressly or inherently, 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. <i>See Claims 1[d], 5–7.</i>
26[b] 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;	Ferguson discloses, either expressly or inherently, 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. <i>See Claim 1[a].</i>
26[c] dedicating a sub-set of bits in a data packet label	Ferguson discloses, either expressly or inherently, 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

Exhibit E-2 – Invalidity of U.S. Patent No. 9,118,602 in view of Ferguson

Claim Limitation	Disclosure
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;	physical tunnel port of the LAG into the data packet label. <i>See Claim 1[b].</i>
26[d] 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;	Ferguson discloses, either expressly or inherently, 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. <i>See Claim 1[c].</i>
26[e] 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	Ferguson discloses, either expressly or inherently, 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. <i>See Claim 1[d].</i>
26[f] 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.	Ferguson discloses, either expressly or inherently, 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. <i>See Claim 1[e].</i>

EXHIBIT E-4

Exhibit E-4 – Invalidity of U.S. Patent No. 9,118,602 in view of Raz

INVALIDITY CLAIM CHART

Invalidity of U.S. Patent No. 9,118,602 in view of Raz– U.S. Patent No. 4,510,594

According to its cover page, U.S. Patent No. 4,510,594 (“Raz”) issued on December 16, 2008, from an application filed on July 23, 2002. Raz therefore constitutes prior art under at least 35 U.S.C. § 102(a), (b), and (e). Raz anticipates and/or renders obvious the Asserted Claims of the U.S. Patent No. 9,118,602 (at least as Defendants understand Plaintiff’s application of the Asserted Claims in an effort to show infringement).

To the extent Plaintiff argues that any element below is not disclosed by Raz, a person of ordinary skill in the art would have found it obvious to combine the teachings of Raz with the background knowledge of a person of ordinary skill in the art and/or the additional references, and exemplary teachings, set forth in Appendix E.

The chart below provides representative examples of where each element of each claim is found within Raz. Citations are meant to be exemplary, not exhaustive, and Defendants the right to identify and discuss additional portions of the reference in support of its contentions and/or to rebut arguments made by Plaintiff. Citations to figures, drawings, tables, and the like include reference to any accompanying or related text. All internal cross references are meant to incorporate the cross-referenced material as if fully set forth therein.

It is Defendants’ position that Plaintiff’s Preliminary Infringement Contentions have not established that any accused product or service infringes any valid claim. Thus, Defendants’ statements below should not be treated as an admission, implication, or suggestion that Defendants agree with Plaintiff regarding either the scope, construction, or interpretation of any of the Asserted Claims or the infringement theories advanced by Plaintiff in its Preliminary Infringement Contentions, including whether any Asserted Claim satisfies 35 U.S.C. §§ 101 or 112. In certain cases, Defendants specified non-limiting examples of where its application of the prior art is based on Plaintiff’s apparent application of the claim element. These statements are not intended to suggest that Defendants agree with Plaintiff’s application of any claim term, suggest a proposed construction at this stage of the case, or suggest that construction is needed, as the parties are not required to exchange terms for construction or proposed constructions until a later date.

Plaintiff has yet to identify any limitation of the Asserted Claims that it contends is not anticipated and/or rendered obvious by Raz. Defendants therefore expressly reserve the right to respond to any such contention, including by identifying additional obviousness combinations, if Plaintiff makes any such contention.

Where Defendants state that Raz “discloses” a limitation, that disclosure may be express, implicit, and/or inherent.

Exhibit E-4 – Invalidity of U.S. Patent No. 9,118,602 in view of Raz

Claim 1, U.S. Patent No. 9,118,602

Claim Limitation	Disclosure
1[pre] 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:	<p>To the extent the preamble is limiting Raz discloses, expressly or inherently, an Ethernet Link Aggregation Group (LAG) in a Multi-Protocol Label Switching (MPLS) network.</p> <p>Raz, Abstract: “A subport forwarding and provisioning mechanism whereby a plurality of subports implemented using slower speed processors are used to perform the packet processing for a higher speed packet stream. Outbound packets are assigned a subport based on their MPLS labels. Once assigned, the packets are forwarded to a particular subport. The output of all the subports is aggregated and combined into a single high speed packet stream and transmitted over the link. Inbound packets are received by the high speed PHY and forwarded to one of a plurality of subports. The subport chosen is the one having the same subport index as the one through which the packet was sent out over at the transmitting node. Conventional layer 2 switches can also be used whereby reserved source MAC addresses are assigned to subports. The switch forwards the inbound packets to one of the subports in accordance with the packet's source MAC address. The invention also comprises a mechanism for provisioning protection tunnels and a method for allocating subport bandwidth to subports.”</p> <p>Raz, Figs. 1–2 and corresponding text:</p>

Exhibit E-4 – Invalidity of U.S. Patent No. 9,118,602 in view of Raz

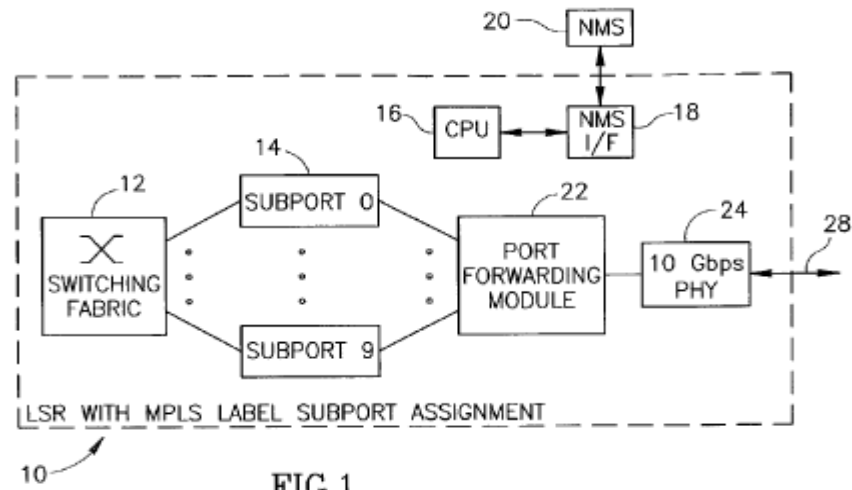


FIG.1

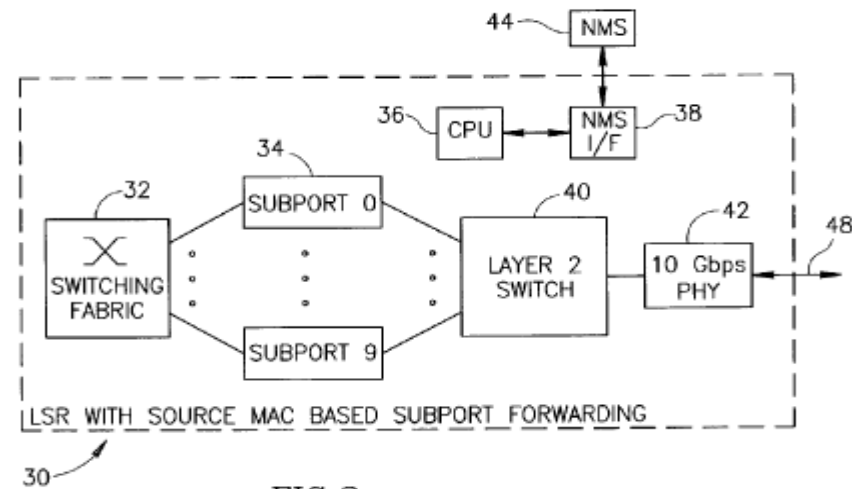


FIG.2

Exhibit E-4 – Invalidity of U.S. Patent No. 9,118,602 in view of Raz

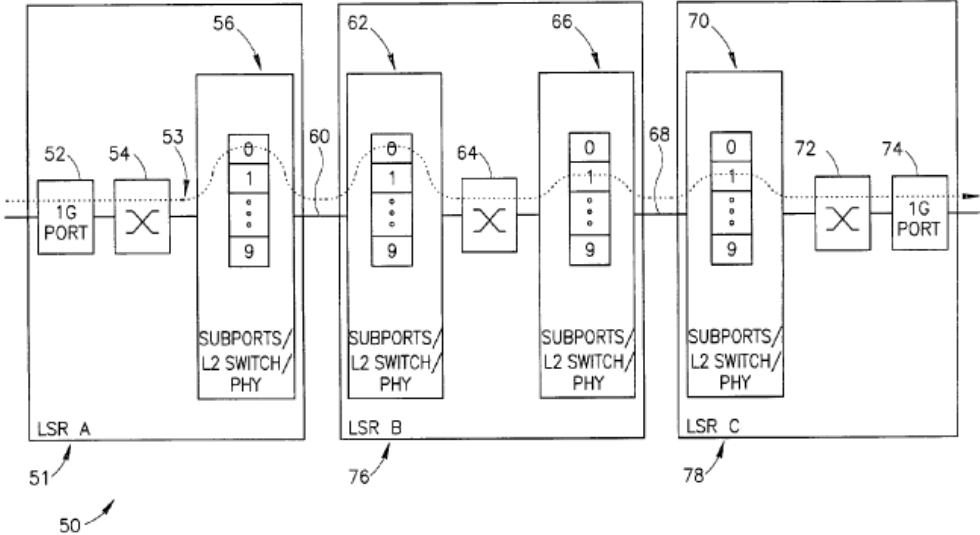
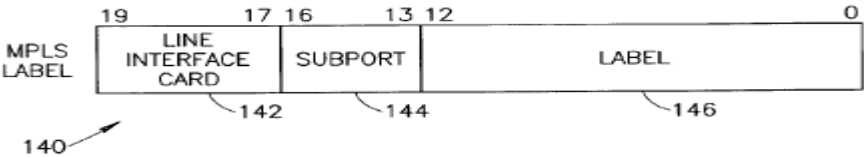
Claim Limitation	Disclosure
	<p>Raz, Fig. 3 and corresponding text:</p>  <p style="text-align: center;">FIG.3</p> <p>Raz, Fig. 4 and corresponding text:</p>  <p style="text-align: center;">FIG.4</p>

Exhibit E-4 – Invalidity of U.S. Patent No. 9,118,602 in view of Raz

Claim Limitation	Disclosure
	<p>Raz, Fig. 6 and corresponding text:</p> <div> <p>FIG. 6</p> </div> <p>Raz, 1:11–39:</p> <p>“Currently, the number of data networks and the volume of traffic these networks carry are increasing at an ever increasing rate. The network devices making up these networks generally consist of specialized hardware designed to move data at very high speeds. Typical asynchronous packet based networks, such as Ethernet or MPLS based networks, are mainly comprised of end stations, hubs, switches, routers, bridges and gateways. A network management system (NMS) is typically employed to provision, administer and maintain the network.</p> <p>Multiprotocol Label Switching (MPLS) based networks 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). The route of an LSP is determined by the network layer routing function or by a centralized entity (e.g., a Network Management System) from the topology of the network, the status of its resources and the demands of the user. Any suitable link state routing protocol may be used such as Open Shortest Path First (OSPF) or Intermediate System to Intermediate System (ISIS) routing protocol to provide the link state topology information needed by the network layer routing to engineer data traffic. It is also possible to use a local neighbor-</p>

Exhibit E-4 – Invalidity of U.S. Patent No. 9,118,602 in view of Raz

Claim Limitation	Disclosure
	<p>discovery protocol and have a centralized management entity maintain the topology view. LSPs may be setup using any suitable signaling protocol such as RSVP-TE or CR-LDP or using the management plane (e.g., NMS setting the relevant MIB items that create the LSPs).”</p> <p>Raz, 2:3–8: “To provide the flexibility required for protocols such as MPLS, a network processor or FPGA is used to implement the subport. A network processor is a device optimized for packet processing while a FPGA can be programmed with any desired custom circuit to implement the required algorithms and processing.”</p> <p>Raz, 2:9–20: “Outbound packets are assigned a subport based on their MPLS labels. Once assigned, the packets are forwarded to a particular subport. The outputs of all the subports are aggregated and combined into a single high-speed packet stream and transmitted over the link. Inbound packets are received by the high speed PHY and forwarded to one of a plurality of subports. The subport chosen is the same subport as the one the packet was sent out from at the transmitting node. The subport is determined in accordance with the label within the packet itself. The subports used on both sides of the next hop, however, are independent. Thus, the subports may be different for each hop of the connection.”</p> <p>Raz, 2:41–51: “There is thus provided in accordance with the invention 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 and forwarding inbound packets from the high speed packet stream to a subport corresponding to the subport the inbound packet was originally sent out on.”</p> <p>Raz, 3:1–33: “There is further provided in accordance with the invention an apparatus for forwarding a high speed packet stream to a plurality of subports of lesser speed in a label switching network, comprising assignment means for assigning outbound packets to one of a plurality of subports in accordance with the label associated with each outbound packet, a line interface adapted to transmit and receive a high speed packet stream, a plurality of subports, each subport of lesser speed than the line interface, a subport forwarding module in communication with the line interface and the plurality of subports, the subport forwarding module adapted to forward each outbound packet from its assigned subport to the line-interface and to forward inbound packets</p>

Exhibit E-4 – Invalidity of U.S. Patent No. 9,118,602 in view of Raz

Claim Limitation	Disclosure
	<p>from the line interface to one of the plurality of subports in accordance with the label of each inbound packet.</p> <p>There is also provided in accordance with the invention a network device for use in a label switching network comprising a switching fabric, a line interface adapted to interface to one or more data links, a plurality of subports, each subport of lesser speed than the speed of the line interface, a memory having at least one region for storing executable program code, a programmed central processor for executing the program code stored in the memory, wherein the program code further comprises code to assign outbound packets to one of a plurality of subports in accordance with the label associated with each outbound packet and a subport forwarding module in communication with the line interface and the plurality of subports, the subport forwarding module further comprises means for forwarding outbound packets from the subports to the line-interface and for forwarding inbound packets from the line interface to one of the plurality of subports in accordance with the label of each inbound packet.”</p> <p>Raz, 3:55–4:2:</p> <p>“There is also provided in accordance with the invention a computer program product for use in a network device, the computer program product comprising a computer useable medium having computer readable program code means embodied in the medium for performing forwarding of packets to a plurality of subports, the computer program product comprising computer readable program code means for assigning outbound packets to one of a plurality of subports in accordance with the label associated with each outbound packet, computer readable program code means for forwarding each outbound packet to its assigned subport and computer readable program code means for forwarding inbound packets from a high speed packet stream to a subport corresponding to the subport having the same index as the one the inbound packet was originally sent out on.”</p> <p>Raz, 6:24–33:</p> <p>“The present invention provides a subport forwarding and provisioning mechanism whereby a plurality of subports comprising slower speed processors are used to perform the packet processing for a higher speed packet stream. To provide the flexibility required for protocols such as MPLS, a network processor or FPGA is used to implement the subport. A network processor is a device optimized for packet processing while a FPGA can be programmed with any desired custom circuit to implement the required algorithms and processing.”</p> <p>Raz, 6:34–45:</p> <p>“Outbound packets are assigned a subport based on their MPLS labels. Once assigned, the packets are forwarded to a particular subport. The output of all the subports is aggregated and combined into a single high-speed packet stream and transmitted over the link. Inbound packets are received by the high speed PHY and forwarded to one of a plurality of subports. The subport chosen is the</p>

Exhibit E-4 – Invalidity of U.S. Patent No. 9,118,602 in view of Raz

Claim Limitation	Disclosure
	<p>same subport that the packet was sent out over at the transmitting node. The subport is determined in accordance with the label within the packet itself. The subports used on both sides of the next hop, however, are independent of the current hop. Thus, the subports may be different for each hop of the connection.”</p> <p>Raz, 6:65–7:6: “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 FIG. 1. The LSR network device, generally referenced 10, comprises a 10G PHY 24 coupled to a 10G link 28, a port forwarding module 22, a plurality of subports 14, labeled subport 0 through subport 9, switching fabric 12, CPU 16 and NMS interface 18. Note that the network device may comprise additional ports which are not shown for clarity.”</p>
<p>1[a] 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;</p>	<p>Raz discloses, either expressly or inherently, 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.</p> <p>Raz, Abstract: “A subport forwarding and provisioning mechanism whereby a plurality of subports implemented using slower speed processors are used to perform the packet processing for a higher speed packet stream. Outbound packets are assigned a subport based on their MPLS labels. Once assigned, the packets are forwarded to a particular subport. The output of all the subports is aggregated and combined into a single high speed packet stream and transmitted over the link. Inbound packets are received by the high speed PHY and forwarded to one of a plurality of subports. The subport chosen is the one having the same subport index as the one through which the packet was sent out over at the transmitting node. Conventional layer 2 switches can also be used whereby reserved source MAC addresses are assigned to subports. The switch forwards the inbound packets to one of the subports in accordance with the packet's source MAC address. The invention also comprises a mechanism for provisioning protection tunnels and a method for allocating subport bandwidth to subports.”</p> <p>Raz, Figs. 1–2 and corresponding text:</p>

Exhibit E-4 – Invalidity of U.S. Patent No. 9,118,602 in view of Raz

Claim Limitation	Disclosure
	<div> <p>FIG. 1</p> </div> <div> <p>FIG. 2</p> </div> <p>Raz, Fig. 3 and corresponding text:</p>

Exhibit E-4 – Invalidity of U.S. Patent No. 9,118,602 in view of Raz

Claim Limitation	Disclosure
	<div><p>FIG.3</p><p>Raz, Fig. 5 and corresponding text:</p></div>

Exhibit E-4 – Invalidity of U.S. Patent No. 9,118,602 in view of Raz

Claim Limitation	Disclosure
	<pre> graph TD 80([SUPPORT BANDWIDTH ALLOCATION METHOD]) --> 81{{REQUESTED BANDWIDTH > FIRST PHASE BANDWIDTH THRESHOLD?}} 81 -- YES --> 90[USE SUPPORT HAVING THE MAXIMUM FREE BANDWIDTH] 81 -- NO --> 82[BEGIN FILLING FIRST PHASE PORTION OF SUBPORTS SO AS TO MAINTAIN BALANCED BANDWIDTH BETWEEN SUBPORTS] 82 --> 84{{CAN LSP BE PROVISIONED WITHOUT OVERFLOWING THE FIRST PHASE BANDWIDTH THRESHOLD?}} 84 -- YES --> 92[USE ONE OF THE FIRST PHASE SUBPORTS] 84 -- NO --> 86{{NEXT SUBPORT CAN ACCOMMODATE THIS LSP WITHOUT BW OVERFLOWING BEYOND FIRST PHASE BANDWIDTH THRESHOLD?}} 92 --> 90 86 -- YES --> 88[USE THIS SUBPORT] 86 -- NO --> 89{{ALL SUBPORTS CHECKED?}} 88 --> 94[ALLOCATE BANDWIDTH AMONG ALL SUBPORTS SO AS TO SPREAD CIR TRAFFIC EVENLY BETWEEN THEM] 89 -- YES --> 94 89 -- NO --> 86 94 --> END([END]) </pre> <p>FIG.5</p> <p>Raz, Fig. 6 and corresponding text:</p>

Exhibit E-4 – Invalidity of U.S. Patent No. 9,118,602 in view of Raz

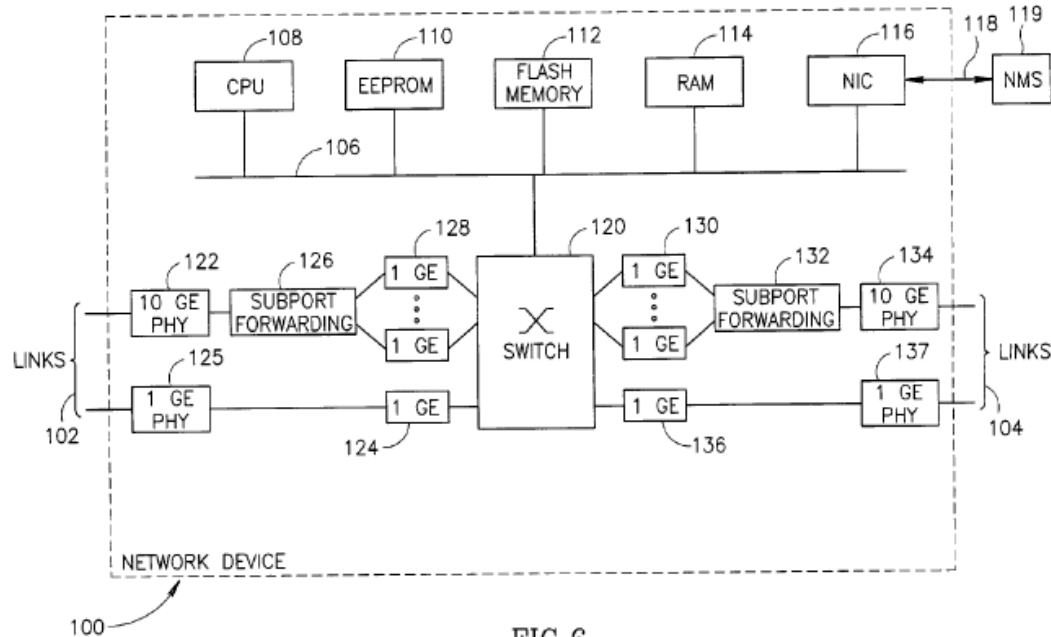
Claim Limitation	Disclosure
	 <p style="text-align: center;">FIG. 6</p> <p>Raz, 1:11–39: “Currently, the number of data networks and the volume of traffic these networks carry are increasing at an ever increasing rate. The network devices making up these networks generally consist of specialized hardware designed to move data at very high speeds. Typical asynchronous packet based networks, such as Ethernet or MPLS based networks, are mainly comprised of end stations, hubs, switches, routers, bridges and gateways. A network management system (NMS) is typically employed to provision, administer and maintain the network. Multiprotocol Label Switching (MPLS) based networks 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). The route of an LSP is determined by the network layer routing function or by a centralized entity (e.g., a Network Management System) from the topology of the network, the status of its resources and the demands of the user. Any suitable link state routing protocol may be used such as Open Shortest Path First (OSPF) or Intermediate System to</p>

Exhibit E-4 – Invalidity of U.S. Patent No. 9,118,602 in view of Raz

Claim Limitation	Disclosure
	<p>Intermediate System (ISIS) routing protocol to provide the link state topology information needed by the network layer routing to engineer data traffic. It is also possible to use a local neighbor-discovery protocol and have a centralized management entity maintain the topology view. LSPs may be setup using any suitable signaling protocol such as RSVP-TE or CR-LDP or using the management plane (e.g., NMS setting the relevant MIB items that create the LSPs).”</p> <p>Raz, 2:3–8: “To provide the flexibility required for protocols such as MPLS, a network processor or FPGA is used to implement the subport. A network processor is a device optimized for packet processing while a FPGA can be programmed with any desired custom circuit to implement the required algorithms and processing.”</p> <p>Raz, 2:41–51: “There is thus provided in accordance with the invention 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 and forwarding inbound packets from the high speed packet stream to a subport corresponding to the subport the inbound packet was originally sent out on.”</p> <p>Raz, 3:1–33: “There is further provided in accordance with the invention an apparatus for forwarding a high speed packet stream to a plurality of subports of lesser speed in a label switching network, comprising assignment means for assigning outbound packets to one of a plurality of subports in accordance with the label associated with each outbound packet, a line interface adapted to transmit and receive a high speed packet stream, a plurality of subports, each subport of lesser speed than the line interface, a subport forwarding module in communication with the line interface and the plurality of subports, the subport forwarding module adapted to forward each outbound packet from its assigned subport to the line-interface and to forward inbound packets from the line interface to one of the plurality of subports in accordance with the label of each inbound packet. There is also provided in accordance with the invention a network device for use in a label switching network comprising a switching fabric, a line interface adapted to interface to one or more data links, a plurality of subports, each subport of lesser speed than the speed of the line interface, a memory having at least one region for storing executable program code, a programmed central processor for executing the program code stored in the memory, wherein the program code further comprises code to assign outbound packets to one of a plurality of subports in accordance</p>

Exhibit E-4 – Invalidity of U.S. Patent No. 9,118,602 in view of Raz

Claim Limitation	Disclosure
	<p>with the label associated with each outbound packet and a subport forwarding module in communication with the line interface and the plurality of subports, the subport forwarding module further comprises means for forwarding outbound packets from the subports to the line-interface and for forwarding inbound packets from the line interface to one of the plurality of subports in accordance with the label of each inbound packet.”</p> <p>Raz, 3:55–4:2: “There is also provided in accordance with the invention a computer program product for use in a network device, the computer program product comprising a computer useable medium having computer readable program code means embodied in the medium for performing forwarding of packets to a plurality of subports, the computer program product comprising computer readable program code means for assigning outbound packets to one of a plurality of subports in accordance with the label associated with each outbound packet, computer readable program code means for forwarding each outbound packet to its assigned subport and computer readable program code means for forwarding inbound packets from a high speed packet stream to a subport corresponding to the subport having the same index as the one the inbound packet was originally sent out on.”</p> <p>Raz, 6:24–33: “The present invention provides a subport forwarding and provisioning mechanism whereby a plurality of subports comprising slower speed processors are used to perform the packet processing for a higher speed packet stream. To provide the flexibility required for protocols such as MPLS, a network processor or FPGA is used to implement the subport. A network processor is a device optimized for packet processing while a FPGA can be programmed with any desired custom circuit to implement the required algorithms and processing.”</p> <p>Raz, 6:34–45: “Outbound packets are assigned a subport based on their MPLS labels. Once assigned, the packets are forwarded to a particular subport. The output of all the subports is aggregated and combined into a single high-speed packet stream and transmitted over the link. Inbound packets are received by the high speed PHY and forwarded to one of a plurality of subports. The subport chosen is the same subport that the packet was sent out over at the transmitting node. The subport is determined in accordance with the label within the packet itself. The subports used on both sides of the next hop, however, are independent of the current hop. Thus, the subports may be different for each hop of the connection.”</p> <p>Raz, 6:65–7:6: “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 FIG. 1. The LSR network</p>

Exhibit E-4 – Invalidity of U.S. Patent No. 9,118,602 in view of Raz

Claim Limitation	Disclosure
	<p>device, generally referenced 10, comprises a 10G PHY 24 coupled to a 10G link 28, a port forwarding module 22, a plurality of subports 14, labeled subport 0 through subport 9, switching fabric 12, CPU 16 and NMS interface 18. Note that the network device may comprise additional ports which are not shown for clarity.”</p> <p>Raz, 7:17–38: “In accordance with the invention, the assignment of traffic to 1G subports is based on LSPs. Thus, the MPLS label is used in order to assign an incoming packet to one of the subports. The selected subport is the same for both sides of a 10G link. In the next link on the path, however, the subport may be different. This is because the next link may have other connections in addition to the 10G link and therefore 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. Note that it is the downstream (i.e. receiving) node that determines the subport it wants to receive the LSP on. This decision is communicated to the upstream (i.e. sending) node via the label that is assigned to the LSP. As an example, consider two LSRS, LSR A and LSR B, each with 10 subports wherein each subport is mapped to an 8K range of labels. An LSP is to be provisioned from LSR A to LSR B. When the LSP is signaled or provisioned through management, the CAC in LSR B decides to accept the LSP on subport 3 and thus assigns a label comprising an indication that subport 3 was selected. The label is communicated to LSR A which now knows that the output subport should be subport 3 (i.e. the same subport is provisioned).”</p> <p>Raz, 10:14–24: “The invention also comprises a mechanism for provisioning protection tunnels for links. In order to protect a link, a tunnel is created which connects the two sides of the link. When a high speed line such as 10G link fails, it is preferable if the packets travel along the protection tunnel associated with the link using the same subport mapping along the entire path of the tunnel. A single tunnel is used for protecting a single link. Thus, after inserting the protection tunnel label, a single label is used for the protection tunnel by all subport network-processors of the same 10G port. This occurs for each port that is along the path of the protection tunnel LSP.”</p>
<p>1[b] 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</p>	<p>Raz discloses, either expressly or inherently, 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.</p> <p>Raz, Abstract: “A subport forwarding and provisioning mechanism whereby a plurality of subports implemented using slower speed processors are used to perform the packet processing for a higher speed packet</p>

Exhibit E-4 – Invalidity of U.S. Patent No. 9,118,602 in view of Raz

Claim Limitation	Disclosure
label;	<p>stream. Outbound packets are assigned a subport based on their MPLS labels. Once assigned, the packets are forwarded to a particular subport. The output of all the subports is aggregated and combined into a single high speed packet stream and transmitted over the link. Inbound packets are received by the high speed PHY and forwarded to one of a plurality of subports. The subport chosen is the one having the same subport index as the one through which the packet was sent out over at the transmitting node. Conventional layer 2 switches can also be used whereby reserved source MAC addresses are assigned to subports. The switch forwards the inbound packets to one of the subports in accordance with the packet's source MAC address. The invention also comprises a mechanism for provisioning protection tunnels and a method for allocating subport bandwidth to subports.”</p> <p>Raz, Figs. 1–2 and corresponding text:</p>

Exhibit E-4 – Invalidity of U.S. Patent No. 9,118,602 in view of Raz

Claim Limitation	Disclosure
	<div> <p>FIG. 1</p> </div> <div> <p>FIG. 2</p> </div>

Exhibit E-4 – Invalidity of U.S. Patent No. 9,118,602 in view of Raz

Claim Limitation	Disclosure
	<p>Raz, Fig. 4 and corresponding text:</p> <p>The diagram illustrates the structure of an MPLS label. It is a horizontal rectangle divided into three sections. The top edge is labeled with bit positions: 19, 17, 16, 13, 12, and 0. The first section, spanning bits 19 to 16, is labeled 'LINE INTERFACE CARD' and is pointed to by reference numeral 142. The second section, spanning bits 13 to 12, is labeled 'SUBPORT' and is pointed to by reference numeral 144. The third section, spanning bits 11 to 0, is labeled 'LABEL' and is pointed to by reference numeral 146. The entire structure is pointed to by reference numeral 140. The text 'MPLS LABEL' is written vertically to the left of the structure.</p> <p>FIG.4</p> <p>Raz, Fig. 6 and corresponding text:</p>

Exhibit E-4 – Invalidity of U.S. Patent No. 9,118,602 in view of Raz

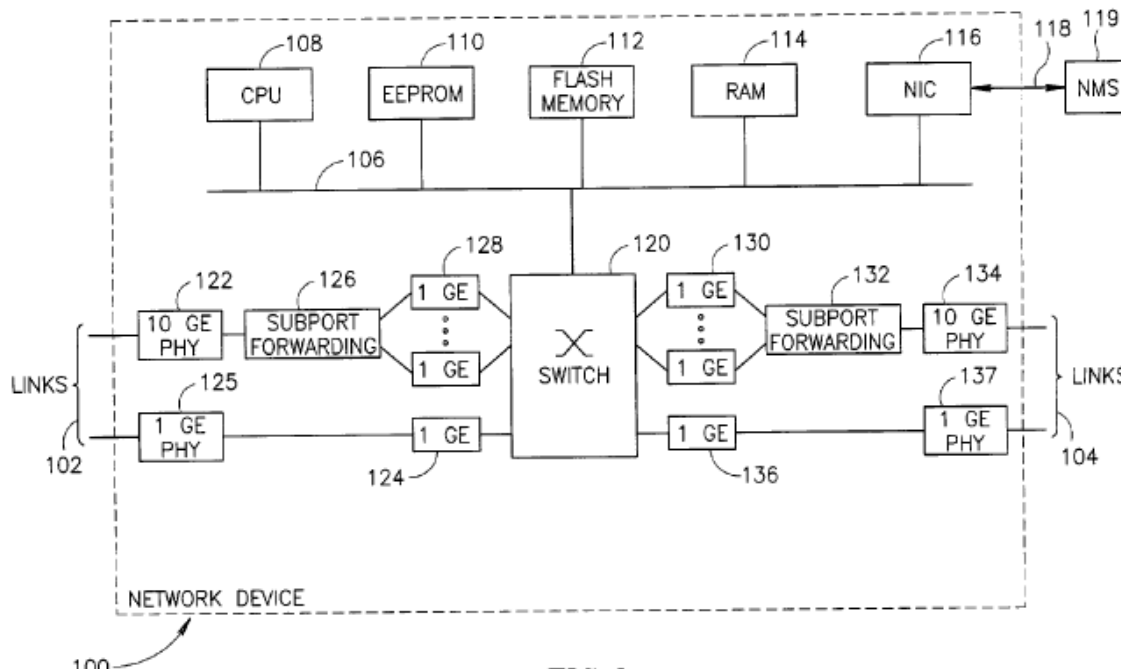
Claim Limitation	Disclosure
	 <p style="text-align: center;">FIG. 6</p> <p>Raz, 1:11–39: “Currently, the number of data networks and the volume of traffic these networks carry are increasing at an ever increasing rate. The network devices making up these networks generally consist of specialized hardware designed to move data at very high speeds. Typical asynchronous packet based networks, such as Ethernet or MPLS based networks, are mainly comprised of end stations, hubs, switches, routers, bridges and gateways. A network management system (NMS) is typically employed to provision, administer and maintain the network. Multiprotocol Label Switching (MPLS) based networks 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). The route of an LSP is determined by the network layer routing function or by a centralized entity (e.g., a Network Management System) from the topology of the</p>

Exhibit E-4 – Invalidity of U.S. Patent No. 9,118,602 in view of Raz

Claim Limitation	Disclosure
	<p>network, the status of its resources and the demands of the user. Any suitable link state routing protocol may be used such as Open Shortest Path First (OSPF) or Intermediate System to Intermediate System (ISIS) routing protocol to provide the link state topology information needed by the network layer routing to engineer data traffic. It is also possible to use a local neighbor-discovery protocol and have a centralized management entity maintain the topology view. LSPs may be setup using any suitable signaling protocol such as RSVP-TE or CR-LDP or using the management plane (e.g., NMS setting the relevant MIB items that create the LSPs).”</p> <p>Raz, 2:3–8: “To provide the flexibility required for protocols such as MPLS, a network processor or FPGA is used to implement the subport. A network processor is a device optimized for packet processing while a FPGA can be programmed with any desired custom circuit to implement the required algorithms and processing.”</p> <p>Raz, 2:9–20: “Outbound packets are assigned a subport based on their MPLS labels. Once assigned, the packets are forwarded to a particular subport. The outputs of all the subports are aggregated and combined into a single high-speed packet stream and transmitted over the link. Inbound packets are received by the high speed PHY and forwarded to one of a plurality of subports. The subport chosen is the same subport as the one the packet was sent out from at the transmitting node. The subport is determined in accordance with the label within the packet itself. The subports used on both sides of the next hop, however, are independent. Thus, the subports may be different for each hop of the connection.”</p> <p>Raz, 2:41–51: “There is thus provided in accordance with the invention 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 and forwarding inbound packets from the high speed packet stream to a subport corresponding to the subport the inbound packet was originally sent out on.”</p> <p>Raz, 3:1–33: “There is further provided in accordance with the invention an apparatus for forwarding a high speed packet stream to a plurality of subports of lesser speed in a label switching network, comprising assignment means for assigning outbound packets to one of a plurality of subports in accordance with the label associated with each outbound packet, a line interface adapted to</p>

Exhibit E-4 – Invalidity of U.S. Patent No. 9,118,602 in view of Raz

Claim Limitation	Disclosure
	<p>transmit and receive a high speed packet stream, a plurality of subports, each subport of lesser speed than the line interface, a subport forwarding module in communication with the line interface and the plurality of subports, the subport forwarding module adapted to forward each outbound packet from its assigned subport to the line-interface and to forward inbound packets from the line interface to one of the plurality of subports in accordance with the label of each inbound packet.</p> <p>There is also provided in accordance with the invention a network device for use in a label switching network comprising a switching fabric, a line interface adapted to interface to one or more data links, a plurality of subports, each subport of lesser speed than the speed of the line interface, a memory having at least one region for storing executable program code, a programmed central processor for executing the program code stored in the memory, wherein the program code further comprises code to assign outbound packets to one of a plurality of subports in accordance with the label associated with each outbound packet and a subport forwarding module in communication with the line interface and the plurality of subports, the subport forwarding module further comprises means for forwarding outbound packets from the subports to the line-interface and for forwarding inbound packets from the line interface to one of the plurality of subports in accordance with the label of each inbound packet.”</p> <p>Raz, 3:55–4:2:</p> <p>“There is also provided in accordance with the invention a computer program product for use in a network device, the computer program product comprising a computer useable medium having computer readable program code means embodied in the medium for performing forwarding of packets to a plurality of subports, the computer program product comprising computer readable program code means for assigning outbound packets to one of a plurality of subports in accordance with the label associated with each outbound packet, computer readable program code means for forwarding each outbound packet to its assigned subport and computer readable program code means for forwarding inbound packets from a high speed packet stream to a subport corresponding to the subport having the same index as the one the inbound packet was originally sent out on.”</p> <p>Raz, 6:65–7:6:</p> <p>“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 FIG. 1. The LSR network device, generally referenced 10, comprises a 10G PHY 24 coupled to a 10G link 28, a port forwarding module 22, a plurality of subports 14, labeled subport 0 through subport 9, switching fabric 12, CPU 16 and NMS interface 18. Note that the network device may comprise additional ports which are not shown for clarity.”</p> <p>Raz, 7:17–38:</p>

Exhibit E-4 – Invalidity of U.S. Patent No. 9,118,602 in view of Raz

Claim Limitation	Disclosure
	<p>“In accordance with the invention, the assignment of traffic to 1G subports is based on LSPs. Thus, the MPLS label is used in order to assign an incoming packet to one of the subports. The selected subport is the same for both sides of a 10G link. In the next link on the path, however, the subport may be different. This is because the next link may have other connections in addition to the 10G link and therefore 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. Note that it is the downstream (i.e. receiving) node that determines the subport it wants to receive the LSP on. This decision is communicated to the upstream (i.e. sending) node via the label that is assigned to the LSP. As an example, consider two LSRS, LSR A and LSR B, each with 10 subports wherein each subport is mapped to an 8K range of labels. An LSP is to be provisioned from LSR A to LSR B. When the LSP is signaled or provisioned through management, the CAC in LSR B decides to accept the LSP on subport 3 and thus assigns a label comprising an indication that subport 3 was selected. The label is communicated to LSR A which now knows that the output subport should be subport 3 (i.e. the same subport is provisioned).”</p>
<p>1[c] 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;</p>	<p>Raz discloses, either expressly or inherently, 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.</p> <p>Raz, Abstract: “A subport forwarding and provisioning mechanism whereby a plurality of subports implemented using slower speed processors are used to perform the packet processing for a higher speed packet stream. Outbound packets are assigned a subport based on their MPLS labels. Once assigned, the packets are forwarded to a particular subport. The output of all the subports is aggregated and combined into a single high speed packet stream and transmitted over the link. Inbound packets are received by the high speed PHY and forwarded to one of a plurality of subports. The subport chosen is the one having the same subport index as the one through which the packet was sent out over at the transmitting node. Conventional layer 2 switches can also be used whereby reserved source MAC addresses are assigned to subports. The switch forwards the inbound packets to one of the subports in accordance with the packet's source MAC address. The invention also comprises a mechanism for provisioning protection tunnels and a method for allocating subport bandwidth to subports.”</p> <p>Raz, Figs. 1–2 and corresponding text:</p>

Exhibit E-4 – Invalidity of U.S. Patent No. 9,118,602 in view of Raz

Claim Limitation	Disclosure
	<div> <p>FIG. 1</p> </div> <div> <p>FIG. 2</p> </div> <p>Raz, Fig. 3 and corresponding text:</p>

Exhibit E-4 – Invalidity of U.S. Patent No. 9,118,602 in view of Raz

Claim Limitation	Disclosure
	<div><p>FIG. 3</p><p>Raz, Fig. 4 and corresponding text:</p></div>

Exhibit E-4 – Invalidity of U.S. Patent No. 9,118,602 in view of Raz

Claim Limitation	Disclosure
	<div> </div> <p>FIG. 4</p> <p>Raz, Fig. 6 and corresponding text:</p> <div> </div> <p>FIG. 6</p>

Exhibit E-4 – Invalidity of U.S. Patent No. 9,118,602 in view of Raz

Claim Limitation	Disclosure
	<p>Raz, 1:11–39: “Currently, the number of data networks and the volume of traffic these networks carry are increasing at an ever increasing rate. The network devices making up these networks generally consist of specialized hardware designed to move data at very high speeds. Typical asynchronous packet based networks, such as Ethernet or MPLS based networks, are mainly comprised of end stations, hubs, switches, routers, bridges and gateways. A network management system (NMS) is typically employed to provision, administer and maintain the network. Multiprotocol Label Switching (MPLS) based networks 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). The route of an LSP is determined by the network layer routing function or by a centralized entity (e.g., a Network Management System) from the topology of the network, the status of its resources and the demands of the user. Any suitable link state routing protocol may be used such as Open Shortest Path First (OSPF) or Intermediate System to Intermediate System (ISIS) routing protocol to provide the link state topology information needed by the network layer routing to engineer data traffic. It is also possible to use a local neighbor-discovery protocol and have a centralized management entity maintain the topology view. LSPs may be setup using any suitable signaling protocol such as RSVP-TE or CR-LDP or using the management plane (e.g., NMS setting the relevant MIB items that create the LSPs).”</p> <p>Raz, 2:3–8: “To provide the flexibility required for protocols such as MPLS, a network processor or FPGA is used to implement the subport. A network processor is a device optimized for packet processing while a FPGA can be programmed with any desired custom circuit to implement the required algorithms and processing.”</p> <p>Raz, 2:9–20: “Outbound packets are assigned a subport based on their MPLS labels. Once assigned, the packets are forwarded to a particular subport. The outputs of all the subports are aggregated and combined into a single high-speed packet stream and transmitted over the link. Inbound packets are received by the high speed PHY and forwarded to one of a plurality of subports. The subport chosen is the same subport as the one the packet was sent out from at the transmitting node. The subport is determined in accordance with the label within the packet itself. The subports used on both sides of the next hop, however, are independent. Thus, the subports may be different for each hop of the connection.”</p> <p>Raz, 2:41–51: “‘There is thus provided in accordance with the invention a method of forwarding a high speed</p>

Exhibit E-4 – Invalidity of U.S. Patent No. 9,118,602 in view of Raz

Claim Limitation	Disclosure
	<p>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 and forwarding inbound packets from the high speed packet stream to a subport corresponding to the subport the inbound packet was originally sent out on.”</p> <p>Raz, 3:1–33: “There is further provided in accordance with the invention an apparatus for forwarding a high speed packet stream to a plurality of subports of lesser speed in a label switching network, comprising assignment means for assigning outbound packets to one of a plurality of subports in accordance with the label associated with each outbound packet, a line interface adapted to transmit and receive a high speed packet stream, a plurality of subports, each subport of lesser speed than the line interface, a subport forwarding module in communication with the line interface and the plurality of subports, the subport forwarding module adapted to forward each outbound packet from its assigned subport to the line-interface and to forward inbound packets from the line interface to one of the plurality of subports in accordance with the label of each inbound packet.</p> <p>There is also provided in accordance with the invention a network device for use in a label switching network comprising a switching fabric, a line interface adapted to interface to one or more data links, a plurality of subports, each subport of lesser speed than the speed of the line interface, a memory having at least one region for storing executable program code, a programmed central processor for executing the program code stored in the memory, wherein the program code further comprises code to assign outbound packets to one of a plurality of subports in accordance with the label associated with each outbound packet and a subport forwarding module in communication with the line interface and the plurality of subports, the subport forwarding module further comprises means for forwarding outbound packets from the subports to the line-interface and for forwarding inbound packets from the line interface to one of the plurality of subports in accordance with the label of each inbound packet.”</p> <p>Raz, 3:55–4:2: “There is also provided in accordance with the invention a computer program product for use in a network device, the computer program product comprising a computer useable medium having computer readable program code means embodied in the medium for performing forwarding of packets to a plurality of subports, the computer program product comprising computer readable program code means for assigning outbound packets to one of a plurality of subports in accordance with the label associated with each outbound packet, computer readable program code means for forwarding each outbound packet to its assigned subport and computer readable program code</p>

Exhibit E-4 – Invalidity of U.S. Patent No. 9,118,602 in view of Raz

Claim Limitation	Disclosure
	<p>means for forwarding inbound packets from a high speed packet stream to a subport corresponding to the subport having the same index as the one the inbound packet was originally sent out on.”</p> <p>Raz, 6:34–45: “Outbound packets are assigned a subport based on their MPLS labels. Once assigned, the packets are forwarded to a particular subport. The output of all the subports is aggregated and combined into a single high-speed packet stream and transmitted over the link. Inbound packets are received by the high speed PHY and forwarded to one of a plurality of subports. The subport chosen is the same subport that the packet was sent out over at the transmitting node. The subport is determined in accordance with the label within the packet itself. The subports used on both sides of the next hop, however, are independent of the current hop. Thus, the subports may be different for each hop of the connection.”</p> <p>Raz, 6:51–54: “Further, 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”</p> <p>Raz, 7:17–38: “In accordance with the invention, the assignment of traffic to 1G subports is based on LSPs. Thus, the MPLS label is used in order to assign an incoming packet to one of the subports. The selected subport is the same for both sides of a 10G link. In the next link on the path, however, the subport may be different. This is because the next link may have other connections in addition to the 10G link and therefore 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. Note that it is the downstream (i.e. receiving) node that determines the subport it wants to receive the LSP on. This decision is communicated to the upstream (i.e. sending) node via the label that is assigned to the LSP. As an example, consider two LSRS, LSR A and LSR B, each with 10 subports wherein each subport is mapped to an 8K range of labels. An LSP is to be provisioned from LSR A to LSR B. When the LSP is signaled or provisioned through management, the CAC in LSR B decides to accept the LSP on subport 3 and thus assigns a label comprising an indication that subport 3 was selected. The label is communicated to LSR A which now knows that the output subport should be subport 3 (i.e. the same subport is provisioned).”</p>
<p>1[d] receiving from the preceding node, by said first MPLS/LAG switch, a data packet comprising said data packet label, in which said port</p>	<p>Raz discloses, either expressly or inherently, 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.</p> <p>Raz, Abstract:</p>

Exhibit E-4 – Invalidity of U.S. Patent No. 9,118,602 in view of Raz

Claim Limitation	Disclosure
serial number of said single physical tunnel port is encoded; and	<p>“A subport forwarding and provisioning mechanism whereby a plurality of subports implemented using slower speed processors are used to perform the packet processing for a higher speed packet stream. Outbound packets are assigned a subport based on their MPLS labels. Once assigned, the packets are forwarded to a particular subport. The output of all the subports is aggregated and combined into a single high speed packet stream and transmitted over the link. Inbound packets are received by the high speed PHY and forwarded to one of a plurality of subports. The subport chosen is the one having the same subport index as the one through which the packet was sent out over at the transmitting node. Conventional layer 2 switches can also be used whereby reserved source MAC addresses are assigned to subports. The switch forwards the inbound packets to one of the subports in accordance with the packet's source MAC address. The invention also comprises a mechanism for provisioning protection tunnels and a method for allocating subport bandwidth to subports.”</p> <p>Raz, Figs. 1–2 and corresponding text:</p>

Exhibit E-4 – Invalidity of U.S. Patent No. 9,118,602 in view of Raz

Claim Limitation	Disclosure
	<div><p>FIG. 1</p></div> <div><p>FIG. 2</p></div>

Exhibit E-4 – Invalidity of U.S. Patent No. 9,118,602 in view of Raz

Claim Limitation	Disclosure
	<p>Raz, Fig. 3 and corresponding text:</p> <p>FIG.3</p> <p>Raz, Fig. 4 and corresponding text:</p>

Exhibit E-4 – Invalidity of U.S. Patent No. 9,118,602 in view of Raz

Claim Limitation	Disclosure
	<div><p>The diagram illustrates the structure of an MPLS label. It is a horizontal rectangle divided into three sections. The first section on the left is labeled 'LINE INTERFACE CARD' and is associated with bit positions 19 and 17. The middle section is labeled 'SUBPORT' and is associated with bit positions 16 and 13. The third section on the right is labeled 'LABEL' and is associated with bit positions 12 and 0. The entire structure is indicated by a bracket and the reference numeral 140. The text 'MPLS LABEL' is written to the left of the structure.</p></div> <p>FIG.4</p> <p>Raz, Fig. 6 and corresponding text:</p>

Exhibit E-4 – Invalidity of U.S. Patent No. 9,118,602 in view of Raz

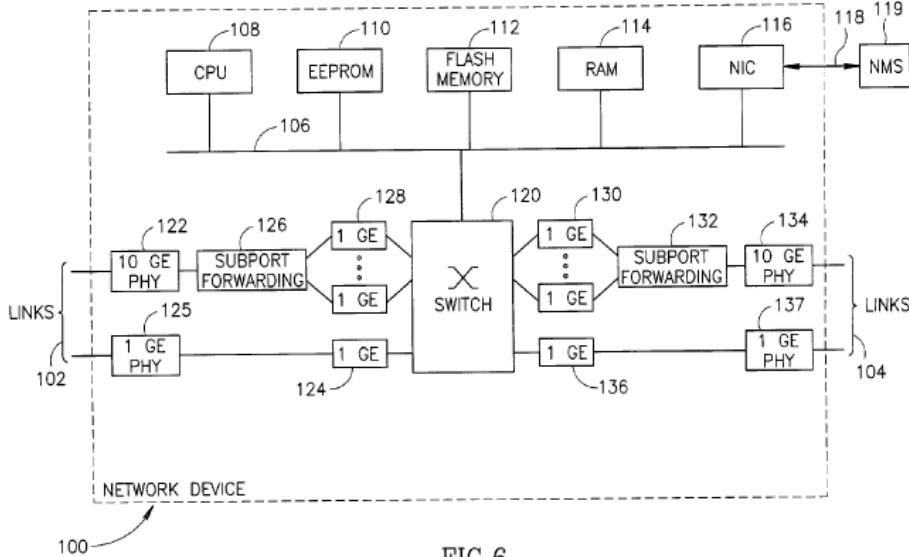
Claim Limitation	Disclosure
	 <p style="text-align: center;">FIG. 6</p> <p>Raz, 1:11–39: “Currently, the number of data networks and the volume of traffic these networks carry are increasing at an ever increasing rate. The network devices making up these networks generally consist of specialized hardware designed to move data at very high speeds. Typical asynchronous packet based networks, such as Ethernet or MPLS based networks, are mainly comprised of end stations, hubs, switches, routers, bridges and gateways. A network management system (NMS) is typically employed to provision, administer and maintain the network. Multiprotocol Label Switching (MPLS) based networks 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). The route of an LSP is determined by the network layer routing function or by a centralized entity (e.g., a Network Management System) from the topology of the network, the status of its resources and the demands of the user. Any suitable link state routing</p>

Exhibit E-4 – Invalidity of U.S. Patent No. 9,118,602 in view of Raz

Claim Limitation	Disclosure
	<p>protocol may be used such as Open Shortest Path First (OSPF) or Intermediate System to Intermediate System (ISIS) routing protocol to provide the link state topology information needed by the network layer routing to engineer data traffic. It is also possible to use a local neighbor-discovery protocol and have a centralized management entity maintain the topology view. LSPs may be setup using any suitable signaling protocol such as RSVP-TE or CR-LDP or using the management plane (e.g., NMS setting the relevant MIB items that create the LSPs).”</p> <p>Raz, 2:3–8: “To provide the flexibility required for protocols such as MPLS, a network processor or FPGA is used to implement the subport. A network processor is a device optimized for packet processing while a FPGA can be programmed with any desired custom circuit to implement the required algorithms and processing.”</p> <p>Raz, 2:9–20: “Outbound packets are assigned a subport based on their MPLS labels. Once assigned, the packets are forwarded to a particular subport. The outputs of all the subports are aggregated and combined into a single high-speed packet stream and transmitted over the link. Inbound packets are received by the high speed PHY and forwarded to one of a plurality of subports. The subport chosen is the same subport as the one the packet was sent out from at the transmitting node. The subport is determined in accordance with the label within the packet itself. The subports used on both sides of the next hop, however, are independent. Thus, the subports may be different for each hop of the connection.”</p> <p>Raz, 2:41–51: “There is thus provided in accordance with the invention 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 and forwarding inbound packets from the high speed packet stream to a subport corresponding to the subport the inbound packet was originally sent out on.”</p> <p>Raz, 3:1–33: “There is further provided in accordance with the invention an apparatus for forwarding a high speed packet stream to a plurality of subports of lesser speed in a label switching network, comprising assignment means for assigning outbound packets to one of a plurality of subports in accordance with the label associated with each outbound packet, a line interface adapted to transmit and receive a high speed packet stream, a plurality of subports, each subport of lesser</p>

Exhibit E-4 – Invalidity of U.S. Patent No. 9,118,602 in view of Raz

Claim Limitation	Disclosure
	<p>speed than the line interface, a subport forwarding module in communication with the line interface and the plurality of subports, the subport forwarding module adapted to forward each outbound packet from its assigned subport to the line-interface and to forward inbound packets from the line interface to one of the plurality of subports in accordance with the label of each inbound packet.</p> <p>There is also provided in accordance with the invention a network device for use in a label switching network comprising a switching fabric, a line interface adapted to interface to one or more data links, a plurality of subports, each subport of lesser speed than the speed of the line interface, a memory having at least one region for storing executable program code, a programmed central processor for executing the program code stored in the memory, wherein the program code further comprises code to assign outbound packets to one of a plurality of subports in accordance with the label associated with each outbound packet and a subport forwarding module in communication with the line interface and the plurality of subports, the subport forwarding module further comprises means for forwarding outbound packets from the subports to the line-interface and for forwarding inbound packets from the line interface to one of the plurality of subports in accordance with the label of each inbound packet.”</p> <p>Raz, 3:55–4:2:</p> <p>“There is also provided in accordance with the invention a computer program product for use in a network device, the computer program product comprising a computer useable medium having computer readable program code means embodied in the medium for performing forwarding of packets to a plurality of subports, the computer program product comprising computer readable program code means for assigning outbound packets to one of a plurality of subports in accordance with the label associated with each outbound packet, computer readable program code means for forwarding each outbound packet to its assigned subport and computer readable program code means for forwarding inbound packets from a high speed packet stream to a subport corresponding to the subport having the same index as the one the inbound packet was originally sent out on.”</p> <p>Raz, 6:34–45:</p> <p>“Outbound packets are assigned a subport based on their MPLS labels. Once assigned, the packets are forwarded to a particular subport. The output of all the subports is aggregated and combined into a single high-speed packet stream and transmitted over the link. Inbound packets are received by the high speed PHY and forwarded to one of a plurality of subports. The subport chosen is the same subport that the packet was sent out over at the transmitting node. The subport is determined in accordance with the label within the packet itself. The subports used on both sides of the next hop, however, are independent of the current hop. Thus, the subports may be different for each hop of the connection.”</p>

Exhibit E-4 – Invalidity of U.S. Patent No. 9,118,602 in view of Raz

Claim Limitation	Disclosure
	<p>Raz, 6:51–54: “Further, 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</p> <p>Raz, 7:17–38: “In accordance with the invention, the assignment of traffic to 1G subports is based on LSPs. Thus, the MPLS label is used in order to assign an incoming packet to one of the subports. The selected subport is the same for both sides of a 10G link. In the next link on the path, however, the subport may be different. This is because the next link may have other connections in addition to the 10G link and therefore 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. Note that it is the downstream (i.e. receiving) node that determines the subport it wants to receive the LSP on. This decision is communicated to the upstream (i.e. sending) node via the label that is assigned to the LSP. As an example, consider two LSRS, LSR A and LSR B, each with 10 subports wherein each subport is mapped to an 8K range of labels. An LSP is to be provisioned from LSR A to LSR B. When the LSP is signaled or provisioned through management, the CAC in LSR B decides to accept the LSP on subport 3 and thus assigns a label comprising an indication that subport 3 was selected. The label is communicated to LSR A which now knows that the output subport should be subport 3 (i.e. the same subport is provisioned).”</p> <p>Raz, 7:39–48: “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. Unlabeled packets do not belong to any LSP. Usually these comprise control packets so there are not many of them. These unlabeled packets will always use a specific subport, for example, subport 8.”</p>
<p>1[e] 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.</p>	<p>Raz discloses, either expressly or inherently, 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.</p> <p>Raz, Abstract: “A subport forwarding and provisioning mechanism whereby a plurality of subports implemented using slower speed processors are used to perform the packet processing for a higher speed packet stream. Outbound packets are assigned a subport based on their MPLS labels. Once assigned, the</p>

Exhibit E-4 – Invalidity of U.S. Patent No. 9,118,602 in view of Raz

Claim Limitation	Disclosure
	<p>packets are forwarded to a particular subport. The output of all the subports is aggregated and combined into a single high speed packet stream and transmitted over the link. Inbound packets are received by the high speed PHY and forwarded to one of a plurality of subports. The subport chosen is the one having the same subport index as the one through which the packet was sent out over at the transmitting node. Conventional layer 2 switches can also be used whereby reserved source MAC addresses are assigned to subports. The switch forwards the inbound packets to one of the subports in accordance with the packet's source MAC address. The invention also comprises a mechanism for provisioning protection tunnels and a method for allocating subport bandwidth to subports.”</p> <p>Raz, Figs. 1–2 and corresponding text:</p>

Exhibit E-4 – Invalidity of U.S. Patent No. 9,118,602 in view of Raz

Claim Limitation	Disclosure
	<div> <p>FIG. 1</p> </div> <div> <p>FIG. 2</p> </div>

Exhibit E-4 – Invalidity of U.S. Patent No. 9,118,602 in view of Raz

Claim Limitation	Disclosure
	<p>Raz, Fig. 4 and corresponding text:</p> <p>FIG. 4</p> <p>Raz, Fig. 6 and corresponding text:</p>

Exhibit E-4 – Invalidity of U.S. Patent No. 9,118,602 in view of Raz

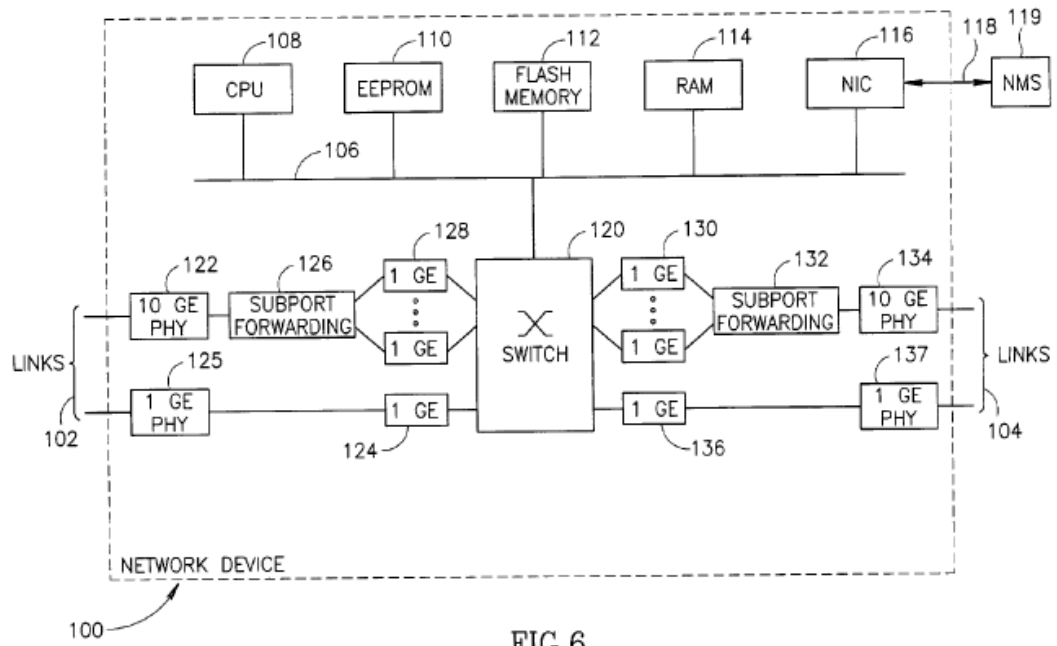
Claim Limitation	Disclosure
	 <p style="text-align: center;">FIG. 6</p> <p>Raz, 1:11–39: “Currently, the number of data networks and the volume of traffic these networks carry are increasing at an ever increasing rate. The network devices making up these networks generally consist of specialized hardware designed to move data at very high speeds. Typical asynchronous packet based networks, such as Ethernet or MPLS based networks, are mainly comprised of end stations, hubs, switches, routers, bridges and gateways. A network management system (NMS) is typically employed to provision, administer and maintain the network. Multiprotocol Label Switching (MPLS) based networks 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). The route of an LSP is determined by the network layer routing function or by a centralized entity (e.g., a Network Management System) from the topology of the network, the status of its resources and the demands of the user. Any suitable link state routing protocol may be used such as Open Shortest Path First (OSPF) or Intermediate System to</p>

Exhibit E-4 – Invalidity of U.S. Patent No. 9,118,602 in view of Raz

Claim Limitation	Disclosure
	<p>Intermediate System (ISIS) routing protocol to provide the link state topology information needed by the network layer routing to engineer data traffic. It is also possible to use a local neighbor-discovery protocol and have a centralized management entity maintain the topology view. LSPs may be setup using any suitable signaling protocol such as RSVP-TE or CR-LDP or using the management plane (e.g., NMS setting the relevant MIB items that create the LSPs).”</p> <p>Raz, 2:3–8: “To provide the flexibility required for protocols such as MPLS, a network processor or FPGA is used to implement the subport. A network processor is a device optimized for packet processing while a FPGA can be programmed with any desired custom circuit to implement the required algorithms and processing.”</p> <p>Raz, 2:9–20: “Outbound packets are assigned a subport based on their MPLS labels. Once assigned, the packets are forwarded to a particular subport. The outputs of all the subports are aggregated and combined into a single high-speed packet stream and transmitted over the link. Inbound packets are received by the high speed PHY and forwarded to one of a plurality of subports. The subport chosen is the same subport as the one the packet was sent out from at the transmitting node. The subport is determined in accordance with the label within the packet itself. The subports used on both sides of the next hop, however, are independent. Thus, the subports may be different for each hop of the connection.”</p> <p>Raz, 2:41–51: “There is thus provided in accordance with the invention 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 and forwarding inbound packets from the high speed packet stream to a subport corresponding to the subport the inbound packet was originally sent out on.”</p> <p>Raz, 3:1–33: “There is further provided in accordance with the invention an apparatus for forwarding a high speed packet stream to a plurality of subports of lesser speed in a label switching network, comprising assignment means for assigning outbound packets to one of a plurality of subports in accordance with the label associated with each outbound packet, a line interface adapted to transmit and receive a high speed packet stream, a plurality of subports, each subport of lesser speed than the line interface, a subport forwarding module in communication with the line</p>

Exhibit E-4 – Invalidity of U.S. Patent No. 9,118,602 in view of Raz

Claim Limitation	Disclosure
	<p>interface and the plurality of subports, the subport forwarding module adapted to forward each outbound packet from its assigned subport to the line-interface and to forward inbound packets from the line interface to one of the plurality of subports in accordance with the label of each inbound packet.</p> <p>There is also provided in accordance with the invention a network device for use in a label switching network comprising a switching fabric, a line interface adapted to interface to one or more data links, a plurality of subports, each subport of lesser speed than the speed of the line interface, a memory having at least one region for storing executable program code, a programmed central processor for executing the program code stored in the memory, wherein the program code further comprises code to assign outbound packets to one of a plurality of subports in accordance with the label associated with each outbound packet and a subport forwarding module in communication with the line interface and the plurality of subports, the subport forwarding module further comprises means for forwarding outbound packets from the subports to the line-interface and for forwarding inbound packets from the line interface to one of the plurality of subports in accordance with the label of each inbound packet.”</p> <p>Raz, 3:55–4:2:</p> <p>“There is also provided in accordance with the invention a computer program product for use in a network device, the computer program product comprising a computer useable medium having computer readable program code means embodied in the medium for performing forwarding of packets to a plurality of subports, the computer program product comprising computer readable program code means for assigning outbound packets to one of a plurality of subports in accordance with the label associated with each outbound packet, computer readable program code means for forwarding each outbound packet to its assigned subport and computer readable program code means for forwarding inbound packets from a high speed packet stream to a subport corresponding to the subport having the same index as the one the inbound packet was originally sent out on.”</p> <p>Raz, 6:34–45:</p> <p>“Outbound packets are assigned a subport based on their MPLS labels. Once assigned, the packets are forwarded to a particular subport. The output of all the subports is aggregated and combined into a single high-speed packet stream and transmitted over the link. Inbound packets are received by the high speed PHY and forwarded to one of a plurality of subports. The subport chosen is the same subport that the packet was sent out over at the transmitting node. The subport is determined in accordance with the label within the packet itself. The subports used on both sides of the next hop, however, are independent of the current hop. Thus, the subports may be different for each hop of the connection.”</p> <p>Raz, 7:17–38:</p>

Exhibit E-4 – Invalidity of U.S. Patent No. 9,118,602 in view of Raz

Claim Limitation	Disclosure
	<p>“In accordance with the invention, the assignment of traffic to 1G subports is based on LSPs. Thus, the MPLS label is used in order to assign an incoming packet to one of the subports. The selected subport is the same for both sides of a 10G link. In the next link on the path, however, the subport may be different. This is because the next link may have other connections in addition to the 10G link and therefore 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. Note that it is the downstream (i.e. receiving) node that determines the subport it wants to receive the LSP on. This decision is communicated to the upstream (i.e. sending) node via the label that is assigned to the LSP. As an example, consider two LSRS, LSR A and LSR B, each with 10 subports wherein each subport is mapped to an 8K range of labels. An LSP is to be provisioned from LSR A to LSR B. When the LSP is signaled or provisioned through management, the CAC in LSR B decides to accept the LSP on subport 3 and thus assigns a label comprising an indication that subport 3 was selected. The label is communicated to LSR A which now knows that the output subport should be subport 3 (i.e. the same subport is provisioned).”</p>
<p>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.</p>	<p>Raz discloses, either expressly or inherently, performing methods 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.</p> <p>Raz, Abstract: “A subport forwarding and provisioning mechanism whereby a plurality of subports implemented using slower speed processors are used to perform the packet processing for a higher speed packet stream. Outbound packets are assigned a subport based on their MPLS labels. Once assigned, the packets are forwarded to a particular subport. The output of all the subports is aggregated and combined into a single high speed packet stream and transmitted over the link. Inbound packets are received by the high speed PHY and forwarded to one of a plurality of subports. The subport chosen is the one having the same subport index as the one through which the packet was sent out over at the transmitting node. Conventional layer 2 switches can also be used whereby reserved source MAC addresses are assigned to subports. The switch forwards the inbound packets to one of the subports in accordance with the packet's source MAC address. The invention also comprises a mechanism for provisioning protection tunnels and a method for allocating subport bandwidth to subports.”</p> <p>Raz, Figs. 1–2 and corresponding text:</p>

Exhibit E-4 – Invalidity of U.S. Patent No. 9,118,602 in view of Raz

Claim Limitation	Disclosure
	<div> <p>FIG. 1</p> </div> <div> <p>FIG. 2</p> </div> <p>Raz, Fig. 3 and corresponding text:</p>

Exhibit E-4 – Invalidity of U.S. Patent No. 9,118,602 in view of Raz

Claim Limitation	Disclosure
	<div><p>FIG.3</p><p>Raz, Fig. 4 and corresponding text:</p><p>FIG.4</p></div>

Exhibit E-4 – Invalidity of U.S. Patent No. 9,118,602 in view of Raz

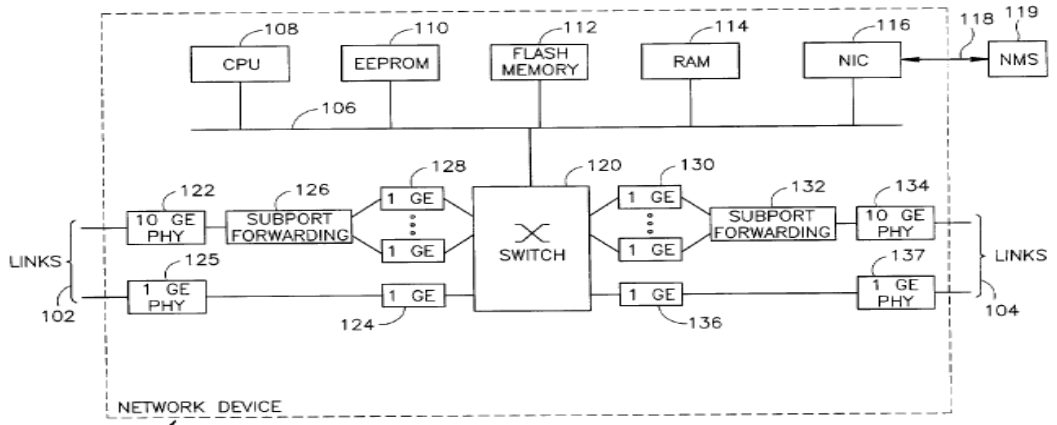
Claim Limitation	Disclosure
	<p>Raz, Fig. 6 and corresponding text:</p>  <p style="text-align: center;">FIG. 6</p> <p>Raz, 1:11–39: “Currently, the number of data networks and the volume of traffic these networks carry are increasing at an ever increasing rate. The network devices making up these networks generally consist of specialized hardware designed to move data at very high speeds. Typical asynchronous packet based networks, such as Ethernet or MPLS based networks, are mainly comprised of end stations, hubs, switches, routers, bridges and gateways. A network management system (NMS) is typically employed to provision, administer and maintain the network. Multiprotocol Label Switching (MPLS) based networks 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). The route of an LSP is determined by the network layer routing function or by a centralized entity (e.g., a Network Management System) from the topology of the network, the status of its resources and the demands of the user. Any suitable link state routing protocol may be used such as Open Shortest Path First (OSPF) or Intermediate System to Intermediate System (ISIS) routing protocol to provide the link state topology information needed by the network layer routing to engineer data traffic. It is also possible to use a local neighbor-discovery protocol and have a centralized management entity maintain the topology view. LSPs may be setup using any suitable signaling protocol such as RSVP-TE or CR-LDP or using the management plane (e.g., NMS setting the relevant MIB items that create the LSPs).”</p>

Exhibit E-4 – Invalidity of U.S. Patent No. 9,118,602 in view of Raz

Claim Limitation	Disclosure
	<p>Raz, 2:3–8: “To provide the flexibility required for protocols such as MPLS, a network processor or FPGA is used to implement the subport. A network processor is a device optimized for packet processing while a FPGA can be programmed with any desired custom circuit to implement the required algorithms and processing.”</p> <p>Raz, 2:9–20: “Outbound packets are assigned a subport based on their MPLS labels. Once assigned, the packets are forwarded to a particular subport. The outputs of all the subports are aggregated and combined into a single high-speed packet stream and transmitted over the link. Inbound packets are received by the high speed PHY and forwarded to one of a plurality of subports. The subport chosen is the same subport as the one the packet was sent out from at the transmitting node. The subport is determined in accordance with the label within the packet itself. The subports used on both sides of the next hop, however, are independent. Thus, the subports may be different for each hop of the connection.”</p> <p>Raz, 2:41–51: “There is thus provided in accordance with the invention 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 and forwarding inbound packets from the high speed packet stream to a subport corresponding to the subport the inbound packet was originally sent out on.”</p> <p>Raz, 3:1–33: “There is further provided in accordance with the invention an apparatus for forwarding a high speed packet stream to a plurality of subports of lesser speed in a label switching network, comprising assignment means for assigning outbound packets to one of a plurality of subports in accordance with the label associated with each outbound packet, a line interface adapted to transmit and receive a high speed packet stream, a plurality of subports, each subport of lesser speed than the line interface, a subport forwarding module in communication with the line interface and the plurality of subports, the subport forwarding module adapted to forward each outbound packet from its assigned subport to the line-interface and to forward inbound packets from the line interface to one of the plurality of subports in accordance with the label of each inbound packet. There is also provided in accordance with the invention a network device for use in a label</p>

Exhibit E-4 – Invalidity of U.S. Patent No. 9,118,602 in view of Raz

Claim Limitation	Disclosure
	<p>switching network comprising a switching fabric, a line interface adapted to interface to one or more data links, a plurality of subports, each subport of lesser speed than the speed of the line interface, a memory having at least one region for storing executable program code, a programmed central processor for executing the program code stored in the memory, wherein the program code further comprises code to assign outbound packets to one of a plurality of subports in accordance with the label associated with each outbound packet and a subport forwarding module in communication with the line interface and the plurality of subports, the subport forwarding module further comprises means for forwarding outbound packets from the subports to the line-interface and for forwarding inbound packets from the line interface to one of the plurality of subports in accordance with the label of each inbound packet.”</p> <p>Raz, 3:55–4:2: “There is also provided in accordance with the invention a computer program product for use in a network device, the computer program product comprising a computer useable medium having computer readable program code means embodied in the medium for performing forwarding of packets to a plurality of subports, the computer program product comprising computer readable program code means for assigning outbound packets to one of a plurality of subports in accordance with the label associated with each outbound packet, computer readable program code means for forwarding each outbound packet to its assigned subport and computer readable program code means for forwarding inbound packets from a high speed packet stream to a subport corresponding to the subport having the same index as the one the inbound packet was originally sent out on.”</p> <p>Raz, 6:24–33: “The present invention provides a subport forwarding and provisioning mechanism whereby a plurality of subports comprising slower speed processors are used to perform the packet processing for a higher speed packet stream. To provide the flexibility required for protocols such as MPLS, a network processor or FPGA is used to implement the subport. A network processor is a device optimized for packet processing while a FPGA can be programmed with any desired custom circuit to implement the required algorithms and processing.”</p> <p>Raz, 6:34–45: “Outbound packets are assigned a subport based on their MPLS labels. Once assigned, the packets are forwarded to a particular subport. The output of all the subports is aggregated and combined into a single high-speed packet stream and transmitted over the link. Inbound packets are received by the high speed PHY and forwarded to one of a plurality of subports. The subport chosen is the same subport that the packet was sent out over at the transmitting node. The subport is determined in accordance with the label within the packet itself. The subports used on both sides of the next hop, however, are independent of the current hop. Thus, the subports may be different for each hop</p>

Exhibit E-4 – Invalidity of U.S. Patent No. 9,118,602 in view of Raz

Claim Limitation	Disclosure
	<p>of the connection.”</p> <p>Raz, 6:51–54: “Further, 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</p> <p>Raz, 7:17–38: “In accordance with the invention, the assignment of traffic to 1G subports is based on LSPs. Thus, the MPLS label is used in order to assign an incoming packet to one of the subports. The selected subport is the same for both sides of a 10G link. In the next link on the path, however, the subport may be different. This is because the next link may have other connections in addition to the 10G link and therefore 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. Note that it is the downstream (i.e. receiving) node that determines the subport it wants to receive the LSP on. This decision is communicated to the upstream (i.e. sending) node via the label that is assigned to the LSP. As an example, consider two LSRS, LSR A and LSR B, each with 10 subports wherein each subport is mapped to an 8K range of labels. An LSP is to be provisioned from LSR A to LSR B. When the LSP is signaled or provisioned through management, the CAC in LSR B decides to accept the LSP on subport 3 and thus assigns a label comprising an indication that subport 3 was selected. The label is communicated to LSR A which now knows that the output subport should be subport 3 (i.e. the same subport is provisioned).”</p> <p>Raz, 7:39–48: “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. Unlabeled packets do not belong to any LSP. Usually these comprise control packets so there are not many of them. These unlabeled packets will always use a specific subport, for example, subport 8.”</p>
<p>3 The method of claim 2, wherein said request message comprises an RSVP-TE PATH message augmented with a LABEL_REQUEST object.</p>	<p>Raz discloses, either expressly or inherently, perform methods wherein said request message comprises an RSVP-TE PATH message augmented with a LABEL_REQUEST object.</p> <p>Raz, Abstract: “A subport forwarding and provisioning mechanism whereby a plurality of subports implemented using slower speed processors are used to perform the packet processing for a higher speed packet</p>

Exhibit E-4 – Invalidity of U.S. Patent No. 9,118,602 in view of Raz

Claim Limitation	Disclosure
	<p>stream. Outbound packets are assigned a subport based on their MPLS labels. Once assigned, the packets are forwarded to a particular subport. The output of all the subports is aggregated and combined into a single high speed packet stream and transmitted over the link. Inbound packets are received by the high speed PHY and forwarded to one of a plurality of subports. The subport chosen is the one having the same subport index as the one through which the packet was sent out over at the transmitting node. Conventional layer 2 switches can also be used whereby reserved source MAC addresses are assigned to subports. The switch forwards the inbound packets to one of the subports in accordance with the packet's source MAC address. The invention also comprises a mechanism for provisioning protection tunnels and a method for allocating subport bandwidth to subports.”</p> <p>Raz, Fig. 4 and corresponding text:</p> <p>The diagram illustrates the structure of an MPLS label. It is a horizontal rectangle divided into three sections. The first section is labeled 'LINE INTERFACE CARD' and spans bits 19 to 17. The second section is labeled 'SUBPORT' and spans bits 16 to 13. The third section is labeled 'LABEL' and spans bits 12 to 0. An arrow labeled 140 points to the entire structure. Below the first section is the label 142, below the second is 144, and below the third is 146.</p> <p>FIG.4</p>

Exhibit E-4 – Invalidity of U.S. Patent No. 9,118,602 in view of Raz

Raz, Fig. 6 and corresponding text:

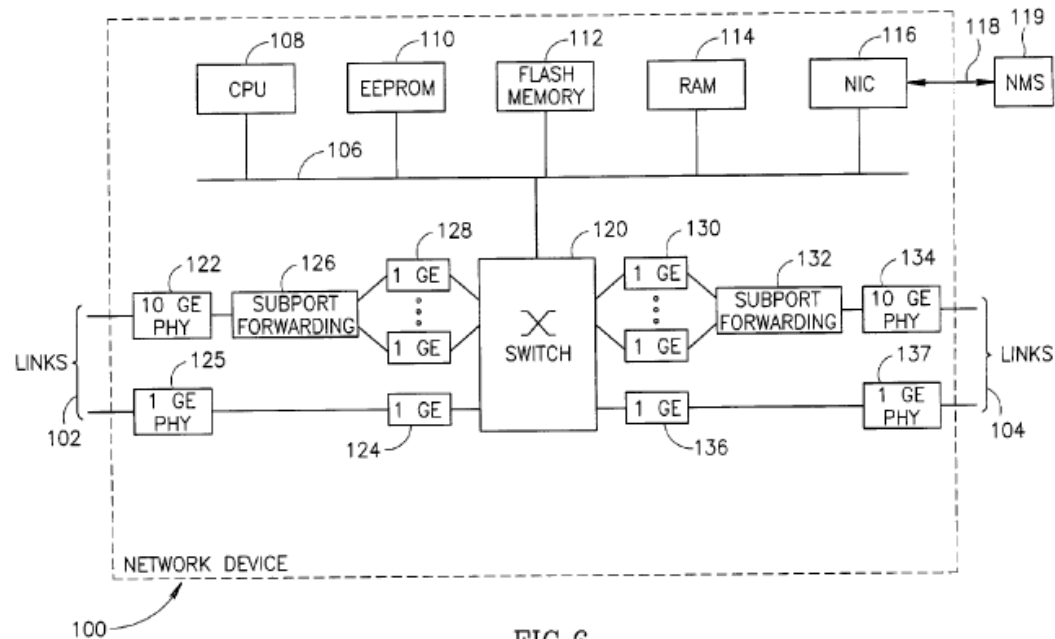


FIG.6

Raz, 2:3–8:

“To provide the flexibility required for protocols such as MPLS, a network processor or FPGA is used to implement the subport. A network processor is a device optimized for packet processing while a FPGA can be programmed with any desired custom circuit to implement the required algorithms and processing.”

Raz, 2:9–20:

“Outbound packets are assigned a subport based on their MPLS labels. Once assigned, the packets are forwarded to a particular subport. The outputs of all the subports are aggregated and combined into a single high-speed packet stream and transmitted over the link. Inbound packets are received by the high speed PHY and forwarded to one of a plurality of subports. The subport chosen is the same subport as the one the packet was sent out from at the transmitting node. The subport is determined in accordance with the label within the packet itself. The subports used on both sides of the next hop, however, are independent. Thus, the subports may be different for each hop of the

Exhibit E-4 – Invalidity of U.S. Patent No. 9,118,602 in view of Raz

Claim Limitation	Disclosure
	<p>connection.”</p> <p>Raz, 6:46–50: “For illustration purposes, the principles of the present invention 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 or uses management-plane based provisioning instead or in addition thereto.”</p>
<p>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.</p>	<p>Raz discloses, either expressly or inherently, performing methods 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. For example, a “Session-Attribute” object can be used to indicate a service-property in connection with an identified physical port.</p> <p>Raz, Abstract: “A subport forwarding and provisioning mechanism whereby a plurality of subports implemented using slower speed processors are used to perform the packet processing for a higher speed packet stream. Outbound packets are assigned a subport based on their MPLS labels. Once assigned, the packets are forwarded to a particular subport. The output of all the subports is aggregated and combined into a single high speed packet stream and transmitted over the link. Inbound packets are received by the high speed PHY and forwarded to one of a plurality of subports. The subport chosen is the one having the same subport index as the one through which the packet was sent out over at the transmitting node. Conventional layer 2 switches can also be used whereby reserved source MAC addresses are assigned to subports. The switch forwards the inbound packets to one of the subports in accordance with the packet's source MAC address. The invention also comprises a mechanism for provisioning protection tunnels and a method for allocating subport bandwidth to subports.”</p> <p>Raz, Fig. 6 and corresponding text:</p>

Exhibit E-4 – Invalidity of U.S. Patent No. 9,118,602 in view of Raz

Claim Limitation	Disclosure
	<p align="center">FIG.6</p> <p>Raz, 6:65–7:6: “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 FIG. 1. The LSR network device, generally referenced 10, comprises a 10G PHY 24 coupled to a 10G link 28, a port forwarding module 22, a plurality of subports 14, labeled subport 0 through subport 9, switching fabric 12, CPU 16 and NMS interface 18. Note that the network device may comprise additional ports which are not shown for clarity.”</p>
<p>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.</p>	<p>Raz discloses, either expressly or inherently, performing methods wherein said service property comprises at least one of: a guaranteed bandwidth; a peak bandwidth; and a class of service.</p> <p>Raz, Abstract: “A subport forwarding and provisioning mechanism whereby a plurality of subports implemented using slower speed processors are used to perform the packet processing for a higher speed packet</p>

Exhibit E-4 – Invalidity of U.S. Patent No. 9,118,602 in view of Raz

Claim Limitation	Disclosure
	<p>stream. Outbound packets are assigned a subport based on their MPLS labels. Once assigned, the packets are forwarded to a particular subport. The output of all the subports is aggregated and combined into a single high speed packet stream and transmitted over the link. Inbound packets are received by the high speed PHY and forwarded to one of a plurality of subports. The subport chosen is the one having the same subport index as the one through which the packet was sent out over at the transmitting node. Conventional layer 2 switches can also be used whereby reserved source MAC addresses are assigned to subports. The switch forwards the inbound packets to one of the subports in accordance with the packet's source MAC address. The invention also comprises a mechanism for provisioning protection tunnels and a method for allocating subport bandwidth to subports.”</p> <p>Raz, Fig. 5 and corresponding text:</p>

Exhibit E-4 – Invalidity of U.S. Patent No. 9,118,602 in view of Raz

Claim Limitation	Disclosure
	<pre> graph TD 80([SUPPORT BANDWIDTH ALLOCATION METHOD]) --> 82{{REQUESTED BANDWIDTH > FIRST PHASE BANDWIDTH THRESHOLD?}} 82 -- YES --> 90[USE SUPPORT HAVING THE MAXIMUM FREE BANDWIDTH] 82 -- NO --> 84[BEGIN FILLING FIRST PHASE PORTION OF SUBPORTS SO AS TO MAINTAIN BALANCED BANDWIDTH BETWEEN SUBPORTS] 84 --> 86{{CAN LSP BE PROVISIONED WITHOUT OVERFLOWING THE FIRST PHASE BANDWIDTH THRESHOLD?}} 86 -- YES --> 92[USE ONE OF THE FIRST PHASE SUBPORTS] 92 --> 90 86 -- NO --> 88{{NEXT SUBPORT CAN ACCOMMODATE THIS LSP WITHOUT BW OVERFLOWING BEYOND FIRST PHASE BANDWIDTH THRESHOLD?}} 88 -- YES --> 88[USE THIS SUBPORT] 88 -- NO --> 89{{ALL SUBPORTS CHECKED?}} 89 -- YES --> 94[ALLOCATE BANDWIDTH AMONG ALL SUBPORTS SO AS TO SPREAD CIR TRAFFIC EVENLY BETWEEN THEM] 89 -- NO --> 88 88[USE THIS SUBPORT] --> 94 94 --> END([END]) </pre> <p>FIG.5</p>

Exhibit E-4 – Invalidity of U.S. Patent No. 9,118,602 in view of Raz

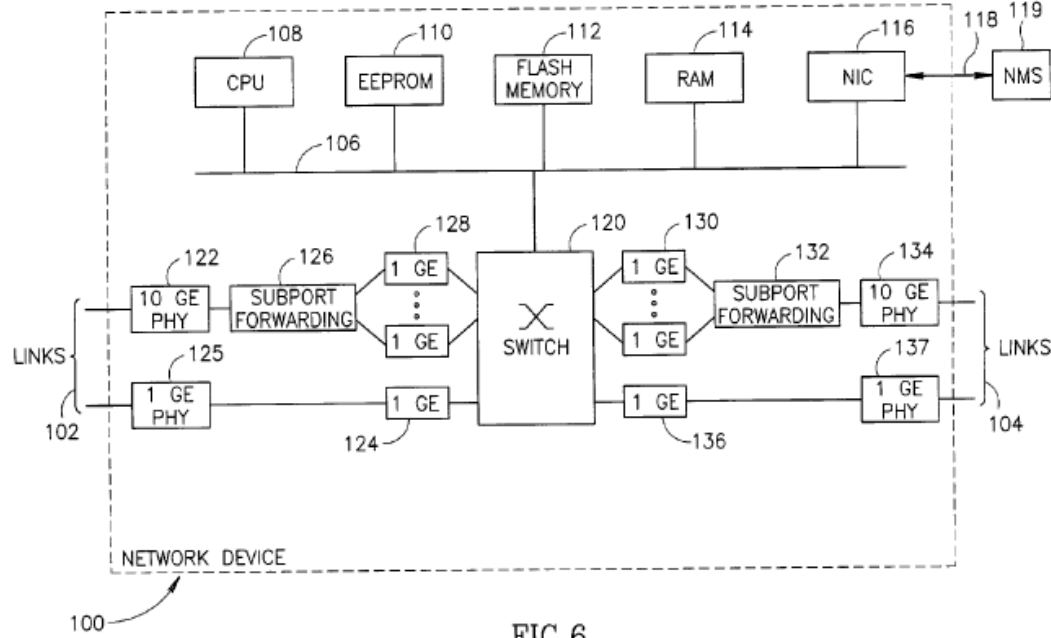
Claim Limitation	Disclosure
	<p>Raz, Fig. 6 and corresponding text:</p>  <p align="center">FIG.6</p>
<p>6 The method according to claim 1, wherein said selecting comprises selecting a single physical tunnel port having a maximum available bandwidth of said plurality of physical data ports.</p>	<p>Raz discloses, either expressly or inherently, performing methods wherein said selecting comprises selecting a single physical tunnel port having a maximum available bandwidth of said plurality of physical data ports.</p> <p>Raz, Abstract: “A subport forwarding and provisioning mechanism whereby a plurality of subports implemented using slower speed processors are used to perform the packet processing for a higher speed packet stream. Outbound packets are assigned a subport based on their MPLS labels. Once assigned, the packets are forwarded to a particular subport. The output of all the subports is aggregated and combined into a single high speed packet stream and transmitted over the link. Inbound packets are received by the high speed PHY and forwarded to one of a plurality of subports. The subport chosen is the one having the same subport index as the one through which the packet was sent out</p>

Exhibit E-4 – Invalidity of U.S. Patent No. 9,118,602 in view of Raz

Claim Limitation	Disclosure
	<p>over at the transmitting node. Conventional layer 2 switches can also be used whereby reserved source MAC addresses are assigned to subports. The switch forwards the inbound packets to one of the subports in accordance with the packet's source MAC address. The invention also comprises a mechanism for provisioning protection tunnels and a method for allocating subport bandwidth to subports.”</p> <p>Raz, Fig. 5 and corresponding text:</p>

Exhibit E-4 – Invalidity of U.S. Patent No. 9,118,602 in view of Raz

Claim Limitation	Disclosure
	<pre> graph TD Start([START]) --> 80{REQUESTED BANDWIDTH > FIRST PHASE BANDWIDTH THRESHOLD ?} 80 -- YES --> 90[USE SUBPORT HAVING THE MAXIMUM FREE BANDWIDTH] 80 -- NO --> 82[BEGIN FILLING FIRST PHASE PORTION OF SUBPORTS SO AS TO MAINTAIN BALANCED BANDWIDTH BETWEEN SUBPORTS] 82 --> 84{CAN LSP BE PROVISIONED WITHOUT OVERFLOWING THE FIRST PHASE BANDWIDTH THRESHOLD ?} 84 -- YES --> 92[USE ONE OF THE FIRST PHASE SUBPORTS] 84 -- NO --> 86{NEXT SUBPORT CAN ACCOMMODATE THIS LSP WITHOUT BW OVERFLOWING BEYOND FIRST PHASE BANDWIDTH THRESHOLD ?} 86 -- YES --> 88[USE THIS SUBPORT] 86 -- NO --> 89{ALL SUBPORTS CHECKED ?} 89 -- YES --> 94[ALLOCATE BANDWIDTH AMONG ALL SUBPORTS SO AS TO SPREAD CIR TRAFFIC EVENLY BETWEEN THEM] 89 -- NO --> 86 88 --> End([END]) 90 --> End 92 --> End 94 --> End </pre> <p>FIG.5</p>

Exhibit E-4 – Invalidity of U.S. Patent No. 9,118,602 in view of Raz

Claim Limitation	Disclosure
	<p>Raz, Fig. 6 and corresponding text:</p> <p align="center">FIG.6</p> <p>Raz, 6:65–7:6: “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 FIG. 1. The LSR network device, generally referenced 10, comprises a 10G PHY 24 coupled to a 10G link 28, a port forwarding module 22, a plurality of subports 14, labeled subport 0 through subport 9, switching fabric 12, CPU 16 and NMS interface 18. Note that the network device may comprise additional ports which are not shown for clarity.”</p>
<p>7 The method according to claim 1, wherein said selecting comprises selecting a</p>	<p>Raz discloses, either expressly or inherently, performing methods 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.</p>

Exhibit E-4 – Invalidity of U.S. Patent No. 9,118,602 in view of Raz

Claim Limitation	Disclosure
<p>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.</p>	<p>Raz, Abstract: “A subport forwarding and provisioning mechanism whereby a plurality of subports implemented using slower speed processors are used to perform the packet processing for a higher speed packet stream. Outbound packets are assigned a subport based on their MPLS labels. Once assigned, the packets are forwarded to a particular subport. The output of all the subports is aggregated and combined into a single high speed packet stream and transmitted over the link. Inbound packets are received by the high speed PHY and forwarded to one of a plurality of subports. The subport chosen is the one having the same subport index as the one through which the packet was sent out over at the transmitting node. Conventional layer 2 switches can also be used whereby reserved source MAC addresses are assigned to subports. The switch forwards the inbound packets to one of the subports in accordance with the packet's source MAC address. The invention also comprises a mechanism for provisioning protection tunnels and a method for allocating subport bandwidth to subports.”</p>

Exhibit E-4 – Invalidity of U.S. Patent No. 9,118,602 in view of Raz

Raz, Fig. 3 and corresponding text:

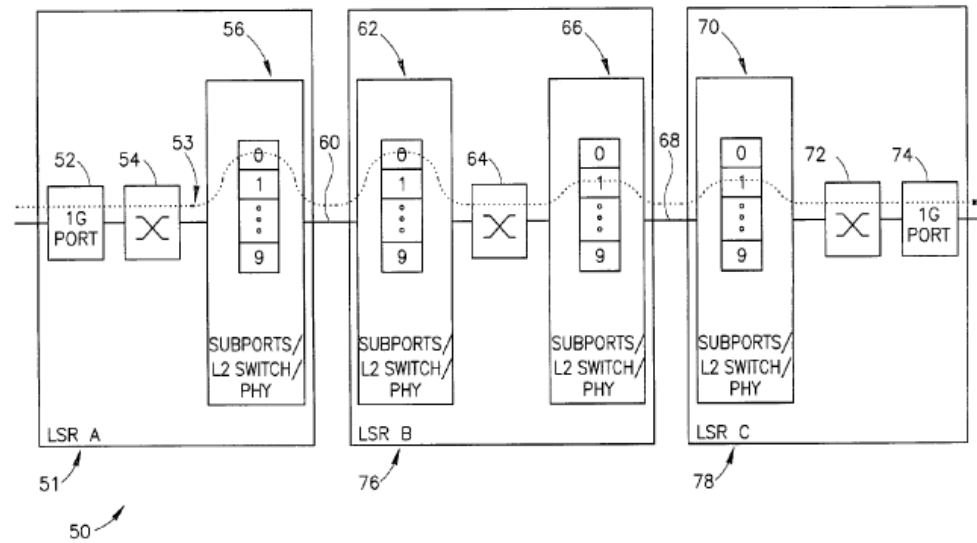


FIG.3

Raz, Fig. 5 and corresponding text:

Exhibit E-4 – Invalidity of U.S. Patent No. 9,118,602 in view of Raz

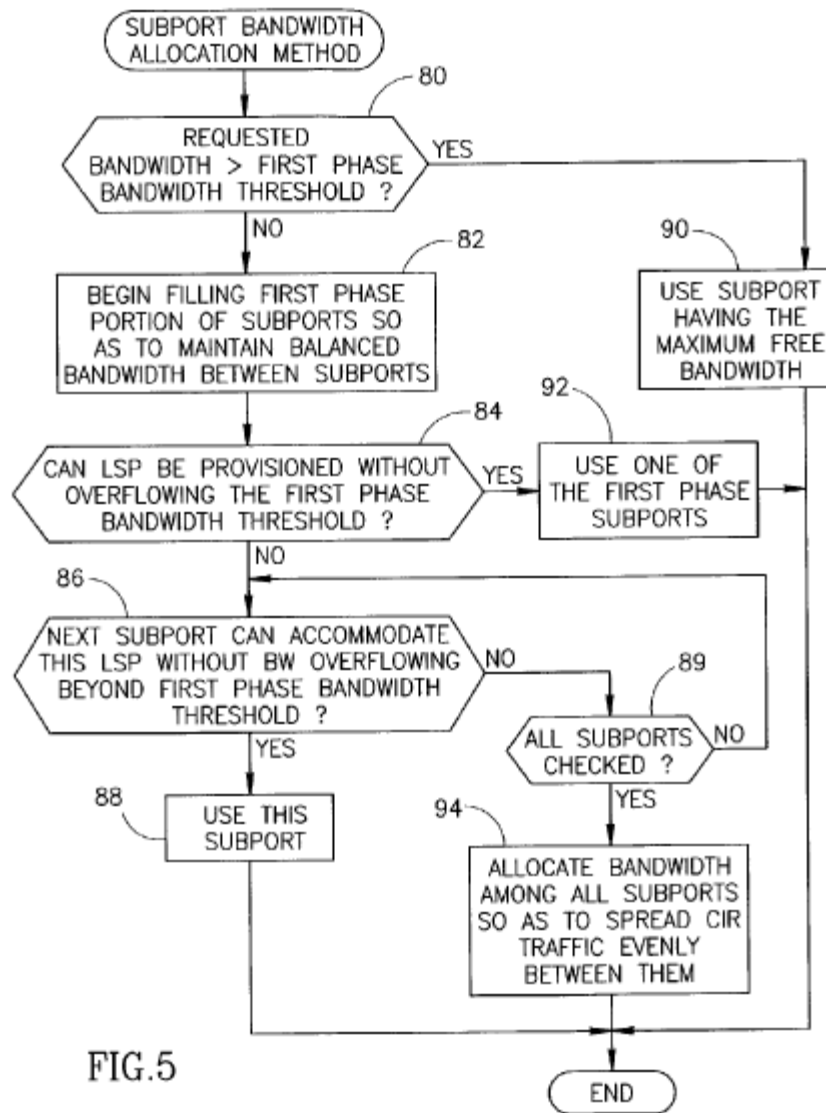


FIG.5

Raz, Fig. 6 and corresponding text:

Exhibit E-4 – Invalidity of U.S. Patent No. 9,118,602 in view of Raz

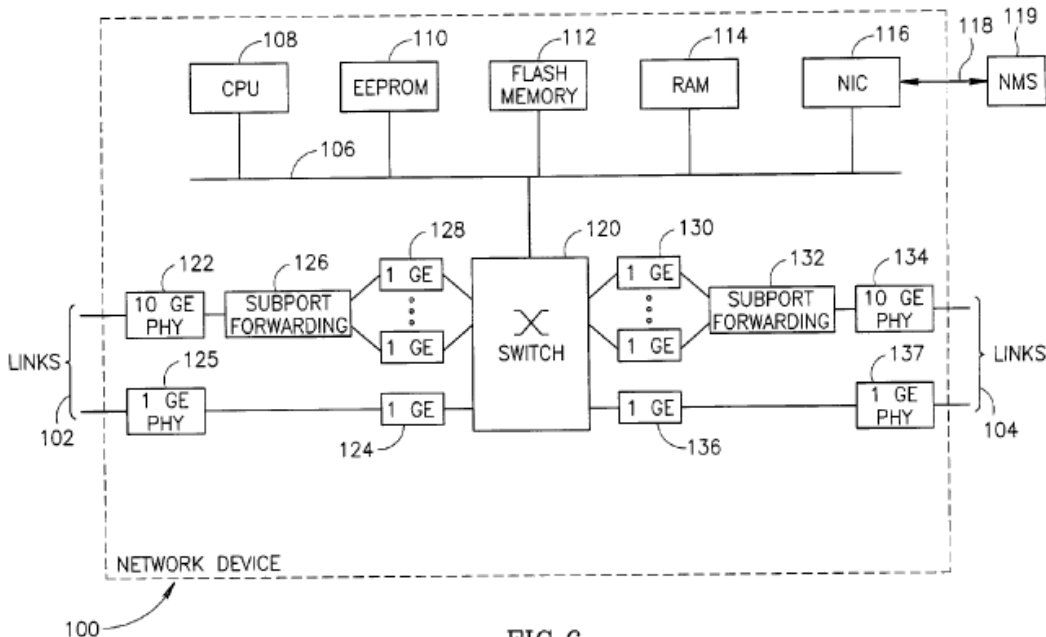
Claim Limitation	Disclosure
	 <p style="text-align: center;">FIG. 6</p>
<p>8 The method according to claim 1, wherein said switching said data packet is according to a mapping function.</p>	<p>Raz discloses, either expressly or inherently, perform methods wherein said switching said data packet is according to a mapping function.</p> <p>Raz, Abstract: “A subport forwarding and provisioning mechanism whereby a plurality of subports implemented using slower speed processors are used to perform the packet processing for a higher speed packet stream. Outbound packets are assigned a subport based on their MPLS labels. Once assigned, the packets are forwarded to a particular subport. The output of all the subports is aggregated and combined into a single high speed packet stream and transmitted over the link. Inbound packets are received by the high speed PHY and forwarded to one of a plurality of subports. The subport chosen is the one having the same subport index as the one through which the packet was sent out over at the transmitting node. Conventional layer 2 switches can also be used whereby reserved source MAC addresses are assigned to subports. The switch forwards the inbound packets to one</p>

Exhibit E-4 – Invalidity of U.S. Patent No. 9,118,602 in view of Raz

Claim Limitation	Disclosure
	<p>of the subports in accordance with the packet's source MAC address. The invention also comprises a mechanism for provisioning protection tunnels and a method for allocating subport bandwidth to subports.”</p> <p>Raz, Figs. 1–2 and corresponding text:</p>

Exhibit E-4 – Invalidity of U.S. Patent No. 9,118,602 in view of Raz

Claim Limitation	Disclosure
	<div> <p>FIG. 1</p> </div> <div> <p>FIG. 2</p> </div> <p>Raz, Fig. 6 and corresponding text:</p>

Exhibit E-4 – Invalidity of U.S. Patent No. 9,118,602 in view of Raz

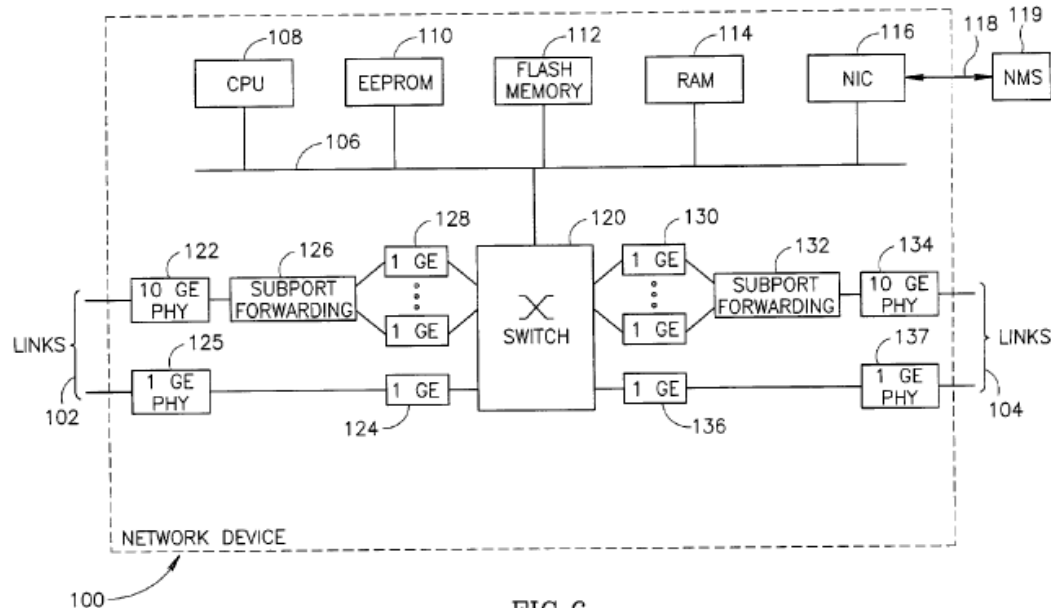
Claim Limitation	Disclosure
	 <p style="text-align: center;">FIG. 6</p> <p>Raz, 1:11–39: “Currently, the number of data networks and the volume of traffic these networks carry are increasing at an ever increasing rate. The network devices making up these networks generally consist of specialized hardware designed to move data at very high speeds. Typical asynchronous packet based networks, such as Ethernet or MPLS based networks, are mainly comprised of end stations, hubs, switches, routers, bridges and gateways. A network management system (NMS) is typically employed to provision, administer and maintain the network. Multiprotocol Label Switching (MPLS) based networks 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). The route of an LSP is determined by the network layer routing function or by a centralized entity (e.g., a Network Management System) from the topology of the network, the status of its resources and the demands of the user. Any suitable link state routing protocol may be used such as Open Shortest Path First (OSPF) or Intermediate System to Intermediate System (ISIS) routing protocol to provide the link state topology information needed by the network layer routing to engineer data traffic. It is also possible to use a local neighbor-</p>

Exhibit E-4 – Invalidity of U.S. Patent No. 9,118,602 in view of Raz

Claim Limitation	Disclosure
	<p>discovery protocol and have a centralized management entity maintain the topology view. LSPs may be setup using any suitable signaling protocol such as RSVP-TE or CR-LDP or using the management plane (e.g., NMS setting the relevant MIB items that create the LSPs).”</p> <p>Raz, 2:3–8: “To provide the flexibility required for protocols such as MPLS, a network processor or FPGA is used to implement the subport. A network processor is a device optimized for packet processing while a FPGA can be programmed with any desired custom circuit to implement the required algorithms and processing.”</p> <p>Raz, 2:41–51: “There is thus provided in accordance with the invention 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 and forwarding inbound packets from the high speed packet stream to a subport corresponding to the subport the inbound packet was originally sent out on.”</p> <p>Raz, 3:1–33: “There is further provided in accordance with the invention an apparatus for forwarding a high speed packet stream to a plurality of subports of lesser speed in a label switching network, comprising assignment means for assigning outbound packets to one of a plurality of subports in accordance with the label associated with each outbound packet, a line interface adapted to transmit and receive a high speed packet stream, a plurality of subports, each subport of lesser speed than the line interface, a subport forwarding module in communication with the line interface and the plurality of subports, the subport forwarding module adapted to forward each outbound packet from its assigned subport to the line-interface and to forward inbound packets from the line interface to one of the plurality of subports in accordance with the label of each inbound packet.</p> <p>There is also provided in accordance with the invention a network device for use in a label switching network comprising a switching fabric, a line interface adapted to interface to one or more data links, a plurality of subports, each subport of lesser speed than the speed of the line interface, a memory having at least one region for storing executable program code, a programmed central processor for executing the program code stored in the memory, wherein the program code further comprises code to assign outbound packets to one of a plurality of subports in accordance with the label associated with each outbound packet and a subport forwarding module in communication with the line interface and the plurality of subports, the subport forwarding module</p>

Exhibit E-4 – Invalidity of U.S. Patent No. 9,118,602 in view of Raz

Claim Limitation	Disclosure
	<p>further comprises means for forwarding outbound packets from the subports to the line-interface and for forwarding inbound packets from the line interface to one of the plurality of subports in accordance with the label of each inbound packet.”</p> <p>Raz, 3:55–4:2: “‘There is also provided in accordance with the invention a computer program product for use in a network device, the computer program product comprising a computer useable medium having computer readable program code means embodied in the medium for performing forwarding of packets to a plurality of subports, the computer program product comprising computer readable program code means for assigning outbound packets to one of a plurality of subports in accordance with the label associated with each outbound packet, computer readable program code means for forwarding each outbound packet to its assigned subport and computer readable program code means for forwarding inbound packets from a high speed packet stream to a subport corresponding to the subport having the same index as the one the inbound packet was originally sent out on.’”</p>
<p>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.</p>	<p>Raz discloses, either expressly or inherently, performing methods 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.</p> <p>Raz, Abstract: “‘A subport forwarding and provisioning mechanism whereby a plurality of subports implemented using slower speed processors are used to perform the packet processing for a higher speed packet stream. Outbound packets are assigned a subport based on their MPLS labels. Once assigned, the packets are forwarded to a particular subport. The output of all the subports is aggregated and combined into a single high speed packet stream and transmitted over the link. Inbound packets are received by the high speed PHY and forwarded to one of a plurality of subports. The subport chosen is the one having the same subport index as the one through which the packet was sent out over at the transmitting node. Conventional layer 2 switches can also be used whereby reserved source MAC addresses are assigned to subports. The switch forwards the inbound packets to one of the subports in accordance with the packet's source MAC address. The invention also comprises a mechanism for provisioning protection tunnels and a method for allocating subport bandwidth to subports.’”</p> <p>Raz, Figs. 1–2 and corresponding text:</p>

Exhibit E-4 – Invalidity of U.S. Patent No. 9,118,602 in view of Raz

Claim Limitation	Disclosure
	<div> <p>FIG. 1</p> </div> <div> <p>FIG. 2</p> </div>

Exhibit E-4 – Invalidity of U.S. Patent No. 9,118,602 in view of Raz

Claim Limitation	Disclosure
	<p>Raz, Fig. 4 and corresponding text:</p> <div><p>The diagram illustrates the structure of an MPLS label. It is a horizontal rectangle divided into three sections. The first section on the left is labeled 'LINE INTERFACE CARD' and is associated with bit positions 19 and 17. The middle section is labeled 'SUBPORT' and is associated with bit positions 16 and 13. The third section on the right is labeled 'LABEL' and is associated with bit positions 12 and 0. A reference numeral '140' with an arrow points to the entire structure. Reference numerals '142', '144', and '146' are placed below the first, second, and third sections respectively.</p></div> <p>FIG.4</p> <p>Raz, Fig. 6 and corresponding text:</p>

Exhibit E-4 – Invalidity of U.S. Patent No. 9,118,602 in view of Raz

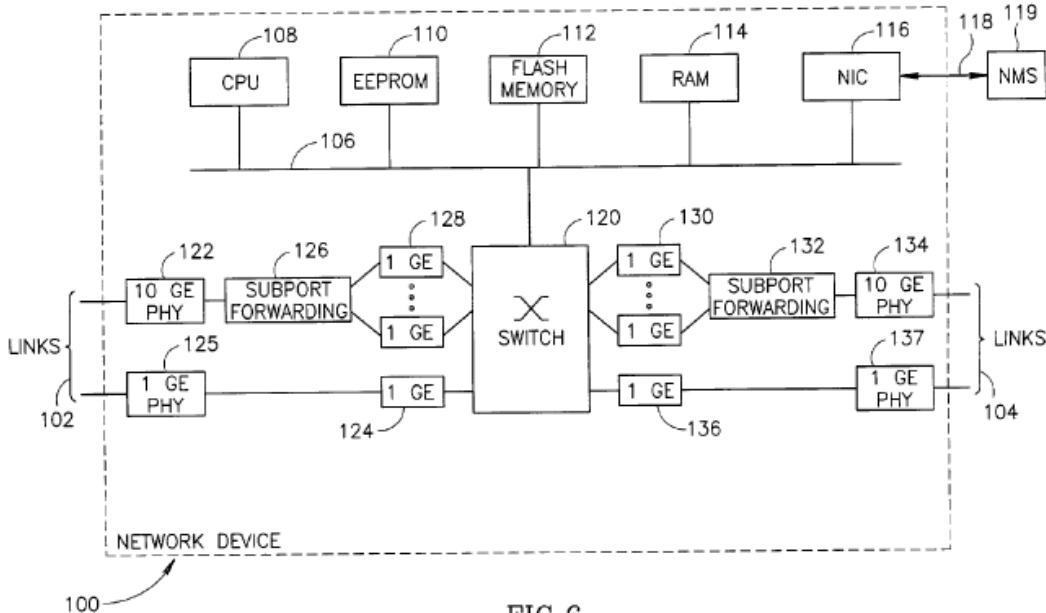
Claim Limitation	Disclosure
	 <p style="text-align: center;">FIG. 6</p> <p>Raz, 1:11–39: “Currently, the number of data networks and the volume of traffic these networks carry are increasing at an ever increasing rate. The network devices making up these networks generally consist of specialized hardware designed to move data at very high speeds. Typical asynchronous packet based networks, such as Ethernet or MPLS based networks, are mainly comprised of end stations, hubs, switches, routers, bridges and gateways. A network management system (NMS) is typically employed to provision, administer and maintain the network. Multiprotocol Label Switching (MPLS) based networks 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). The route of an LSP is determined by the network layer routing function or by a centralized entity (e.g., a Network Management System) from the topology of the network, the status of its resources and the demands of the user. Any suitable link state routing protocol may be used such as Open Shortest Path First (OSPF) or Intermediate System to Intermediate System (ISIS) routing protocol to provide the link state topology information needed</p>

Exhibit E-4 – Invalidity of U.S. Patent No. 9,118,602 in view of Raz

Claim Limitation	Disclosure
	<p>by the network layer routing to engineer data traffic. It is also possible to use a local neighbor-discovery protocol and have a centralized management entity maintain the topology view. LSPs may be setup using any suitable signaling protocol such as RSVP-TE or CR-LDP or using the management plane (e.g., NMS setting the relevant MIB items that create the LSPs).”</p> <p>Raz, 2:3–8: “To provide the flexibility required for protocols such as MPLS, a network processor or FPGA is used to implement the subport. A network processor is a device optimized for packet processing while a FPGA can be programmed with any desired custom circuit to implement the required algorithms and processing.”</p> <p>Raz, 2:9–20: “Outbound packets are assigned a subport based on their MPLS labels. Once assigned, the packets are forwarded to a particular subport. The outputs of all the subports are aggregated and combined into a single high-speed packet stream and transmitted over the link. Inbound packets are received by the high speed PHY and forwarded to one of a plurality of subports. The subport chosen is the same subport as the one the packet was sent out from at the transmitting node. The subport is determined in accordance with the label within the packet itself. The subports used on both sides of the next hop, however, are independent. Thus, the subports may be different for each hop of the connection.”</p> <p>Raz, 2:41–51: “There is thus provided in accordance with the invention 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 and forwarding inbound packets from the high speed packet stream to a subport corresponding to the subport the inbound packet was originally sent out on.”</p> <p>Raz, 3:1–33: “There is further provided in accordance with the invention an apparatus for forwarding a high speed packet stream to a plurality of subports of lesser speed in a label switching network, comprising assignment means for assigning outbound packets to one of a plurality of subports in accordance with the label associated with each outbound packet, a line interface adapted to transmit and receive a high speed packet stream, a plurality of subports, each subport of lesser speed than the line interface, a subport forwarding module in communication with the line interface and the plurality of subports, the subport forwarding module adapted to forward each</p>

Exhibit E-4 – Invalidity of U.S. Patent No. 9,118,602 in view of Raz

Claim Limitation	Disclosure
	<p>outbound packet from its assigned subport to the line-interface and to forward inbound packets from the line interface to one of the plurality of subports in accordance with the label of each inbound packet.</p> <p>There is also provided in accordance with the invention a network device for use in a label switching network comprising a switching fabric, a line interface adapted to interface to one or more data links, a plurality of subports, each subport of lesser speed than the speed of the line interface, a memory having at least one region for storing executable program code, a programmed central processor for executing the program code stored in the memory, wherein the program code further comprises code to assign outbound packets to one of a plurality of subports in accordance with the label associated with each outbound packet and a subport forwarding module in communication with the line interface and the plurality of subports, the subport forwarding module further comprises means for forwarding outbound packets from the subports to the line-interface and for forwarding inbound packets from the line interface to one of the plurality of subports in accordance with the label of each inbound packet.”</p> <p>Raz, 3:55–4:2:</p> <p>“There is also provided in accordance with the invention a computer program product for use in a network device, the computer program product comprising a computer useable medium having computer readable program code means embodied in the medium for performing forwarding of packets to a plurality of subports, the computer program product comprising computer readable program code means for assigning outbound packets to one of a plurality of subports in accordance with the label associated with each outbound packet, computer readable program code means for forwarding each outbound packet to its assigned subport and computer readable program code means for forwarding inbound packets from a high speed packet stream to a subport corresponding to the subport having the same index as the one the inbound packet was originally sent out on.”</p> <p>Raz, 6:34–45:</p> <p>“Outbound packets are assigned a subport based on their MPLS labels. Once assigned, the packets are forwarded to a particular subport. The output of all the subports is aggregated and combined into a single high-speed packet stream and transmitted over the link. Inbound packets are received by the high speed PHY and forwarded to one of a plurality of subports. The subport chosen is the same subport that the packet was sent out over at the transmitting node. The subport is determined in accordance with the label within the packet itself. The subports used on both sides of the next hop, however, are independent of the current hop. Thus, the subports may be different for each hop of the connection.”</p>
10 The method according to	Raz discloses, either expressly or inherently, performing methods wherein said preparing

Exhibit E-4 – Invalidity of U.S. Patent No. 9,118,602 in view of Raz

Claim Limitation	Disclosure
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.	<p>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.</p> <p>Raz, Abstract: “A subport forwarding and provisioning mechanism whereby a plurality of subports implemented using slower speed processors are used to perform the packet processing for a higher speed packet stream. Outbound packets are assigned a subport based on their MPLS labels. Once assigned, the packets are forwarded to a particular subport. The output of all the subports is aggregated and combined into a single high speed packet stream and transmitted over the link. Inbound packets are received by the high speed PHY and forwarded to one of a plurality of subports. The subport chosen is the one having the same subport index as the one through which the packet was sent out over at the transmitting node. Conventional layer 2 switches can also be used whereby reserved source MAC addresses are assigned to subports. The switch forwards the inbound packets to one of the subports in accordance with the packet's source MAC address. The invention also comprises a mechanism for provisioning protection tunnels and a method for allocating subport bandwidth to subports.”</p> <p>Raz, Figs. 1–2 and corresponding text:</p>

Exhibit E-4 – Invalidity of U.S. Patent No. 9,118,602 in view of Raz

Claim Limitation	Disclosure
	<div> <p>FIG. 1</p> </div> <div> <p>FIG. 2</p> </div>

Exhibit E-4 – Invalidity of U.S. Patent No. 9,118,602 in view of Raz

Claim Limitation	Disclosure
	<p>Raz, Fig. 4 and corresponding text:</p> <div><p>FIG.4</p></div> <p>Raz, Fig. 6 and corresponding text:</p>

Exhibit E-4 – Invalidity of U.S. Patent No. 9,118,602 in view of Raz

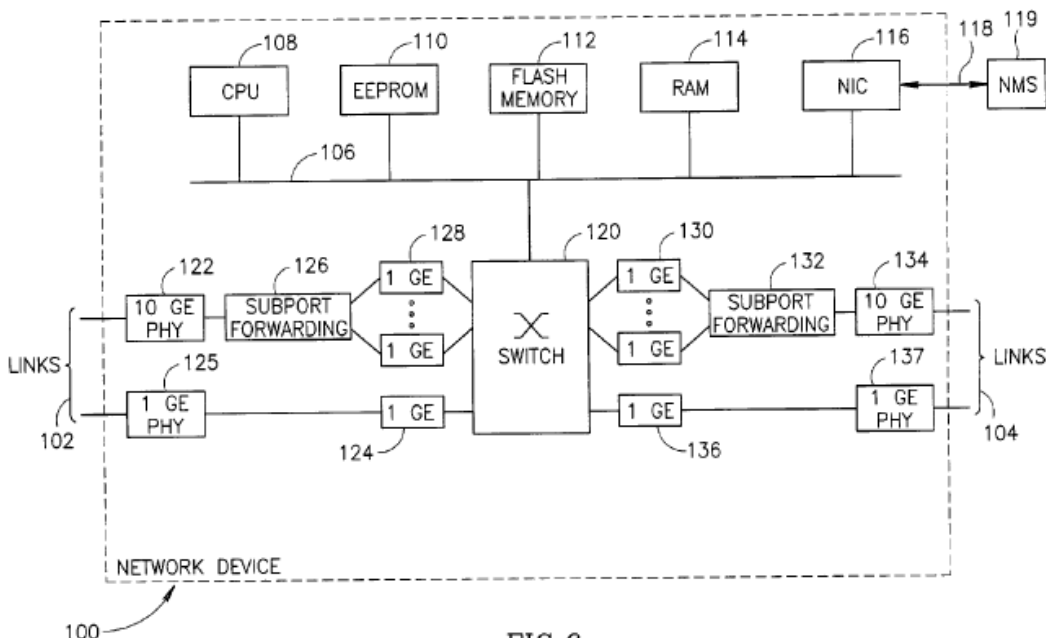
Claim Limitation	Disclosure
	 <p style="text-align: center;">FIG. 6</p> <p>Raz, 1:11–39: “Currently, the number of data networks and the volume of traffic these networks carry are increasing at an ever increasing rate. The network devices making up these networks generally consist of specialized hardware designed to move data at very high speeds. Typical asynchronous packet based networks, such as Ethernet or MPLS based networks, are mainly comprised of end stations, hubs, switches, routers, bridges and gateways. A network management system (NMS) is typically employed to provision, administer and maintain the network. Multiprotocol Label Switching (MPLS) based networks 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). The route of an LSP is determined by the network layer routing function or by a centralized entity (e.g., a Network Management System) from the topology of the network, the status of its resources and the demands of the user. Any suitable link state routing protocol may be used such as Open Shortest Path First (OSPF) or Intermediate System to Intermediate System (ISIS) routing protocol to provide the link state topology information needed</p>

Exhibit E-4 – Invalidity of U.S. Patent No. 9,118,602 in view of Raz

Claim Limitation	Disclosure
	<p>by the network layer routing to engineer data traffic. It is also possible to use a local neighbor-discovery protocol and have a centralized management entity maintain the topology view. LSPs may be setup using any suitable signaling protocol such as RSVP-TE or CR-LDP or using the management plane (e.g., NMS setting the relevant MIB items that create the LSPs).”</p> <p>Raz, 2:3–8: “To provide the flexibility required for protocols such as MPLS, a network processor or FPGA is used to implement the subport. A network processor is a device optimized for packet processing while a FPGA can be programmed with any desired custom circuit to implement the required algorithms and processing.”</p> <p>Raz, 2:9–20: “Outbound packets are assigned a subport based on their MPLS labels. Once assigned, the packets are forwarded to a particular subport. The outputs of all the subports are aggregated and combined into a single high-speed packet stream and transmitted over the link. Inbound packets are received by the high speed PHY and forwarded to one of a plurality of subports. The subport chosen is the same subport as the one the packet was sent out from at the transmitting node. The subport is determined in accordance with the label within the packet itself. The subports used on both sides of the next hop, however, are independent. Thus, the subports may be different for each hop of the connection.”</p> <p>Raz, 2:41–51: “There is thus provided in accordance with the invention 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 and forwarding inbound packets from the high speed packet stream to a subport corresponding to the subport the inbound packet was originally sent out on.”</p> <p>Raz, 3:1–33: “There is further provided in accordance with the invention an apparatus for forwarding a high speed packet stream to a plurality of subports of lesser speed in a label switching network, comprising assignment means for assigning outbound packets to one of a plurality of subports in accordance with the label associated with each outbound packet, a line interface adapted to transmit and receive a high speed packet stream, a plurality of subports, each subport of lesser speed than the line interface, a subport forwarding module in communication with the line interface and the plurality of subports, the subport forwarding module adapted to forward each</p>

Exhibit E-4 – Invalidity of U.S. Patent No. 9,118,602 in view of Raz

Claim Limitation	Disclosure
	<p>outbound packet from its assigned subport to the line-interface and to forward inbound packets from the line interface to one of the plurality of subports in accordance with the label of each inbound packet.</p> <p>There is also provided in accordance with the invention a network device for use in a label switching network comprising a switching fabric, a line interface adapted to interface to one or more data links, a plurality of subports, each subport of lesser speed than the speed of the line interface, a memory having at least one region for storing executable program code, a programmed central processor for executing the program code stored in the memory, wherein the program code further comprises code to assign outbound packets to one of a plurality of subports in accordance with the label associated with each outbound packet and a subport forwarding module in communication with the line interface and the plurality of subports, the subport forwarding module further comprises means for forwarding outbound packets from the subports to the line-interface and for forwarding inbound packets from the line interface to one of the plurality of subports in accordance with the label of each inbound packet.”</p> <p>Raz, 3:55–4:2: “There is also provided in accordance with the invention a computer program product for use in a network device, the computer program product comprising a computer useable medium having computer readable program code means embodied in the medium for performing forwarding of packets to a plurality of subports, the computer program product comprising computer readable program code means for assigning outbound packets to one of a plurality of subports in accordance with the label associated with each outbound packet, computer readable program code means for forwarding each outbound packet to its assigned subport and computer readable program code means for forwarding inbound packets from a high speed packet stream to a subport corresponding to the subport having the same index as the one the inbound packet was originally sent out on.”</p> <p>Raz, 6:34–45: “Outbound packets are assigned a subport based on their MPLS labels. Once assigned, the packets are forwarded to a particular subport. The output of all the subports is aggregated and combined into a single high-speed packet stream and transmitted over the link. Inbound packets are received by the high speed PHY and forwarded to one of a plurality of subports. The subport chosen is the same subport that the packet was sent out over at the transmitting node. The subport is determined in accordance with the label within the packet itself. The subports used on both sides of the next hop, however, are independent of the current hop. Thus, the subports may be different for each hop of the connection.”</p> <p>Raz, 7:17–38: “In accordance with the invention, the assignment of traffic to 1G subports is based on LSPs. Thus,</p>

Exhibit E-4 – Invalidity of U.S. Patent No. 9,118,602 in view of Raz

Claim Limitation	Disclosure
	<p>the MPLS label is used in order to assign an incoming packet to one of the subports. The selected subport is the same for both sides of a 10G link. In the next link on the path, however, the subport may be different. This is because the next link may have other connections in addition to the 10G link and therefore 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. Note that it is the downstream (i.e. receiving) node that determines the subport it wants to receive the LSP on. This decision is communicated to the upstream (i.e. sending) node via the label that is assigned to the LSP. As an example, consider two LSRS, LSR A and LSR B, each with 10 subports wherein each subport is mapped to an 8K range of labels. An LSP is to be provisioned from LSR A to LSR B. When the LSP is signaled or provisioned through management, the CAC in LSR B decides to accept the LSP on subport 3 and thus assigns a label comprising an indication that subport 3 was selected. The label is communicated to LSR A which now knows that the output subport should be subport 3 (i.e. the same subport is provisioned).”</p>
<p>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 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.</p>	<p>Raz discloses, either expressly or inherently, performing methods 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 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.</p> <p>Raz, Abstract: “A subport forwarding and provisioning mechanism whereby a plurality of subports implemented using slower speed processors are used to perform the packet processing for a higher speed packet stream. Outbound packets are assigned a subport based on their MPLS labels. Once assigned, the packets are forwarded to a particular subport. The output of all the subports is aggregated and combined into a single high speed packet stream and transmitted over the link. Inbound packets are received by the high speed PHY and forwarded to one of a plurality of subports. The subport chosen is the one having the same subport index as the one through which the packet was sent out over at the transmitting node. Conventional layer 2 switches can also be used whereby reserved source MAC addresses are assigned to subports. The switch forwards the inbound packets to one of the subports in accordance with the packet's source MAC address. The invention also comprises a mechanism for provisioning protection tunnels and a method for allocating subport bandwidth to subports.”</p> <p>Raz, Figs. 1–2 and corresponding text:</p>

Exhibit E-4 – Invalidity of U.S. Patent No. 9,118,602 in view of Raz

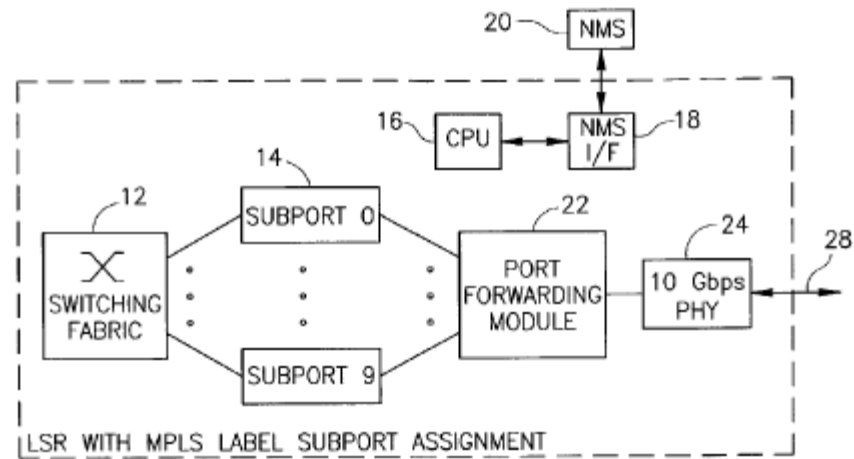


FIG.1

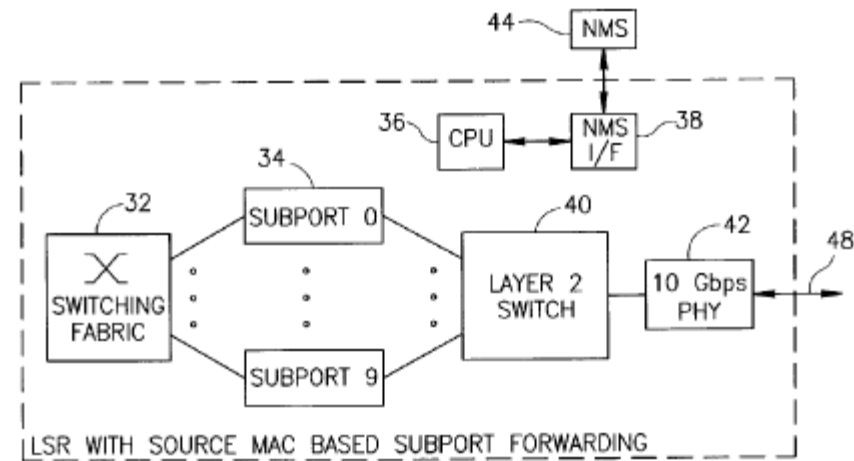


FIG.2

Exhibit E-4 – Invalidity of U.S. Patent No. 9,118,602 in view of Raz

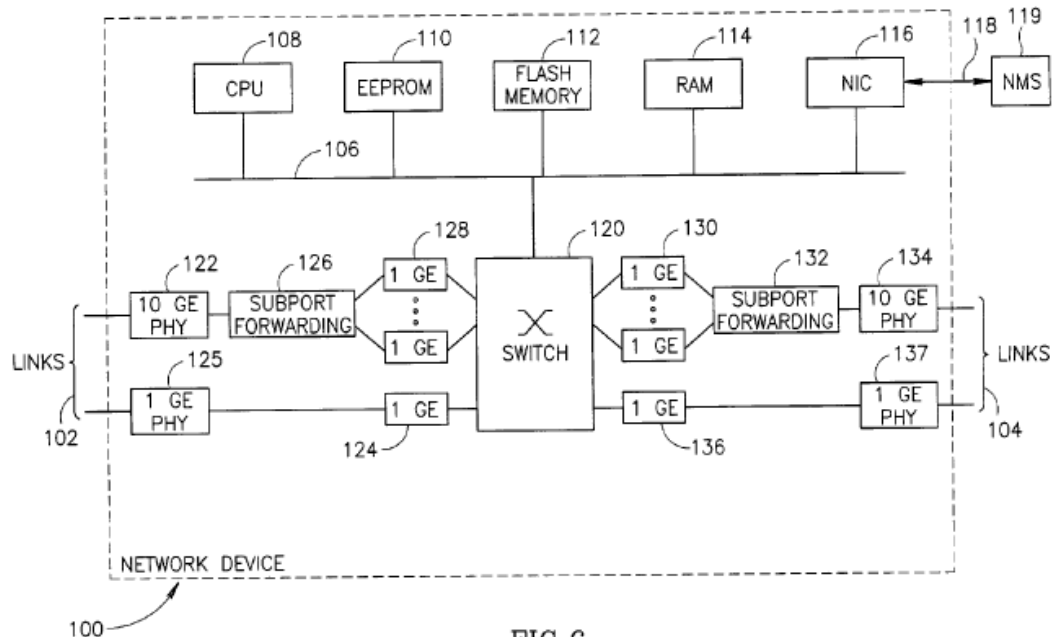
Claim Limitation	Disclosure
	<p>Raz, Fig. 6 and corresponding text:</p>  <p>FIG.6</p> <p>Raz, 1:11–39: “Currently, the number of data networks and the volume of traffic these networks carry are increasing at an ever increasing rate. The network devices making up these networks generally consist of specialized hardware designed to move data at very high speeds. Typical asynchronous packet based networks, such as Ethernet or MPLS based networks, are mainly comprised of end stations, hubs, switches, routers, bridges and gateways. A network management system (NMS) is typically employed to provision, administer and maintain the network. Multiprotocol Label Switching (MPLS) based networks 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). The route of an LSP is determined by the network layer routing function or by a centralized entity (e.g., a Network Management System) from the topology of the</p>

Exhibit E-4 – Invalidity of U.S. Patent No. 9,118,602 in view of Raz

Claim Limitation	Disclosure
	<p>network, the status of its resources and the demands of the user. Any suitable link state routing protocol may be used such as Open Shortest Path First (OSPF) or Intermediate System to Intermediate System (ISIS) routing protocol to provide the link state topology information needed by the network layer routing to engineer data traffic. It is also possible to use a local neighbor-discovery protocol and have a centralized management entity maintain the topology view. LSPs may be setup using any suitable signaling protocol such as RSVP-TE or CR-LDP or using the management plane (e.g., NMS setting the relevant MIB items that create the LSPs).”</p> <p>Raz, 2:3–8: “To provide the flexibility required for protocols such as MPLS, a network processor or FPGA is used to implement the subport. A network processor is a device optimized for packet processing while a FPGA can be programmed with any desired custom circuit to implement the required algorithms and processing.”</p> <p>Raz, 2:41–51: “There is thus provided in accordance with the invention 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 and forwarding inbound packets from the high speed packet stream to a subport corresponding to the subport the inbound packet was originally sent out on.”</p> <p>Raz, 3:1–33: “There is further provided in accordance with the invention an apparatus for forwarding a high speed packet stream to a plurality of subports of lesser speed in a label switching network, comprising assignment means for assigning outbound packets to one of a plurality of subports in accordance with the label associated with each outbound packet, a line interface adapted to transmit and receive a high speed packet stream, a plurality of subports, each subport of lesser speed than the line interface, a subport forwarding module in communication with the line interface and the plurality of subports, the subport forwarding module adapted to forward each outbound packet from its assigned subport to the line-interface and to forward inbound packets from the line interface to one of the plurality of subports in accordance with the label of each inbound packet. There is also provided in accordance with the invention a network device for use in a label switching network comprising a switching fabric, a line interface adapted to interface to one or more data links, a plurality of subports, each subport of lesser speed than the speed of the line interface, a memory having at least one region for storing executable program code, a programmed</p>

Exhibit E-4 – Invalidity of U.S. Patent No. 9,118,602 in view of Raz

Claim Limitation	Disclosure
	<p>central processor for executing the program code stored in the memory, wherein the program code further comprises code to assign outbound packets to one of a plurality of subports in accordance with the label associated with each outbound packet and a subport forwarding module in communication with the line interface and the plurality of subports, the subport forwarding module further comprises means for forwarding outbound packets from the subports to the line-interface and for forwarding inbound packets from the line interface to one of the plurality of subports in accordance with the label of each inbound packet.”</p> <p>Raz, 3:55–4:2: “There is also provided in accordance with the invention a computer program product for use in a network device, the computer program product comprising a computer useable medium having computer readable program code means embodied in the medium for performing forwarding of packets to a plurality of subports, the computer program product comprising computer readable program code means for assigning outbound packets to one of a plurality of subports in accordance with the label associated with each outbound packet, computer readable program code means for forwarding each outbound packet to its assigned subport and computer readable program code means for forwarding inbound packets from a high speed packet stream to a subport corresponding to the subport having the same index as the one the inbound packet was originally sent out on.”</p> <p>Raz, 6:34–45: “Outbound packets are assigned a subport based on their MPLS labels. Once assigned, the packets are forwarded to a particular subport. The output of all the subports is aggregated and combined into a single high-speed packet stream and transmitted over the link. Inbound packets are received by the high speed PHY and forwarded to one of a plurality of subports. The subport chosen is the same subport that the packet was sent out over at the transmitting node. The subport is determined in accordance with the label within the packet itself. The subports used on both sides of the next hop, however, are independent of the current hop. Thus, the subports may be different for each hop of the connection.”</p> <p>Raz, 7:17–38: “In accordance with the invention, the assignment of traffic to 1G subports is based on LSPs. Thus, the MPLS label is used in order to assign an incoming packet to one of the subports. The selected subport is the same for both sides of a 10G link. In the next link on the path, however, the subport may be different. This is because the next link may have other connections in addition to the 10G link and therefore 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. Note that it is the downstream (i.e. receiving) node that determines the subport it wants to receive the LSP on. This decision is communicated to the upstream (i.e. sending) node via the label that is assigned to the LSP.</p>

Exhibit E-4 – Invalidity of U.S. Patent No. 9,118,602 in view of Raz

Claim Limitation	Disclosure
	<p>As an example, consider two LSRS, LSR A and LSR B, each with 10 subports wherein each subport is mapped to an 8K range of labels. An LSP is to be provisioned from LSR A to LSR B. When the LSP is signaled or provisioned through management, the CAC in LSR B decides to accept the LSP on subport 3 and thus assigns a label comprising an indication that subport 3 was selected. The label is communicated to LSR A which now knows that the output subport should be subport 3 (i.e. the same subport is provisioned).”</p>
<p>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.</p>	<p>Raz discloses, either expressly or inherently, performing methods 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.</p> <p>Raz, Abstract: “A subport forwarding and provisioning mechanism whereby a plurality of subports implemented using slower speed processors are used to perform the packet processing for a higher speed packet stream. Outbound packets are assigned a subport based on their MPLS labels. Once assigned, the packets are forwarded to a particular subport. The output of all the subports is aggregated and combined into a single high speed packet stream and transmitted over the link. Inbound packets are received by the high speed PHY and forwarded to one of a plurality of subports. The subport chosen is the one having the same subport index as the one through which the packet was sent out over at the transmitting node. Conventional layer 2 switches can also be used whereby reserved source MAC addresses are assigned to subports. The switch forwards the inbound packets to one of the subports in accordance with the packet's source MAC address. The invention also comprises a mechanism for provisioning protection tunnels and a method for allocating subport bandwidth to subports.”</p> <p>Raz, Figs. 1–2 and corresponding text:</p>

Exhibit E-4 – Invalidity of U.S. Patent No. 9,118,602 in view of Raz

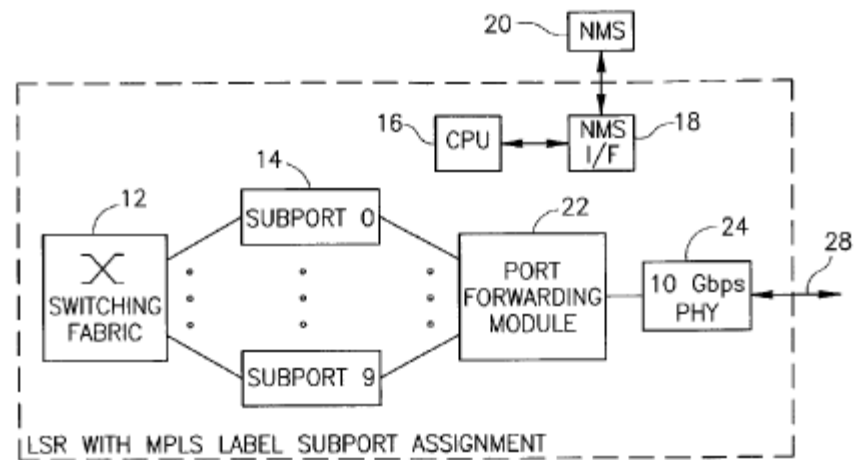


FIG.1

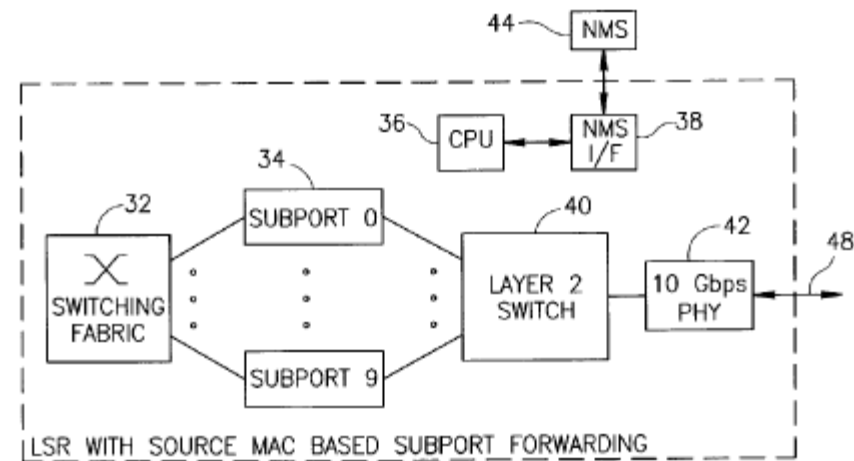


FIG.2

Exhibit E-4 – Invalidity of U.S. Patent No. 9,118,602 in view of Raz

Claim Limitation	Disclosure
	<p>Raz, Fig. 6 and corresponding text:</p> <div> </div> <p>FIG.6</p> <p>Raz, 1:11–39:</p> <p>“Currently, the number of data networks and the volume of traffic these networks carry are increasing at an ever increasing rate. The network devices making up these networks generally consist of specialized hardware designed to move data at very high speeds. Typical asynchronous packet based networks, such as Ethernet or MPLS based networks, are mainly comprised of end stations, hubs, switches, routers, bridges and gateways. A network management system (NMS) is typically employed to provision, administer and maintain the network. Multiprotocol Label Switching (MPLS) based networks 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). The route of an LSP is determined by the network layer routing function or by a centralized entity (e.g., a Network Management System) from the topology of the</p>

Exhibit E-4 – Invalidity of U.S. Patent No. 9,118,602 in view of Raz

Claim Limitation	Disclosure
	<p>network, the status of its resources and the demands of the user. Any suitable link state routing protocol may be used such as Open Shortest Path First (OSPF) or Intermediate System to Intermediate System (ISIS) routing protocol to provide the link state topology information needed by the network layer routing to engineer data traffic. It is also possible to use a local neighbor-discovery protocol and have a centralized management entity maintain the topology view. LSPs may be setup using any suitable signaling protocol such as RSVP-TE or CR-LDP or using the management plane (e.g., NMS setting the relevant MIB items that create the LSPs).”</p> <p>Raz, 2:3–8: “To provide the flexibility required for protocols such as MPLS, a network processor or FPGA is used to implement the subport. A network processor is a device optimized for packet processing while a FPGA can be programmed with any desired custom circuit to implement the required algorithms and processing.”</p> <p>Raz, 2:41–51: “There is thus provided in accordance with the invention 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 and forwarding inbound packets from the high speed packet stream to a subport corresponding to the subport the inbound packet was originally sent out on.”</p> <p>Raz, 3:1–33: “There is further provided in accordance with the invention an apparatus for forwarding a high speed packet stream to a plurality of subports of lesser speed in a label switching network, comprising assignment means for assigning outbound packets to one of a plurality of subports in accordance with the label associated with each outbound packet, a line interface adapted to transmit and receive a high speed packet stream, a plurality of subports, each subport of lesser speed than the line interface, a subport forwarding module in communication with the line interface and the plurality of subports, the subport forwarding module adapted to forward each outbound packet from its assigned subport to the line-interface and to forward inbound packets from the line interface to one of the plurality of subports in accordance with the label of each inbound packet. There is also provided in accordance with the invention a network device for use in a label switching network comprising a switching fabric, a line interface adapted to interface to one or more data links, a plurality of subports, each subport of lesser speed than the speed of the line interface, a memory having at least one region for storing executable program code, a programmed</p>

Exhibit E-4 – Invalidity of U.S. Patent No. 9,118,602 in view of Raz

Claim Limitation	Disclosure
	<p>central processor for executing the program code stored in the memory, wherein the program code further comprises code to assign outbound packets to one of a plurality of subports in accordance with the label associated with each outbound packet and a subport forwarding module in communication with the line interface and the plurality of subports, the subport forwarding module further comprises means for forwarding outbound packets from the subports to the line-interface and for forwarding inbound packets from the line interface to one of the plurality of subports in accordance with the label of each inbound packet.”</p> <p>Raz, 3:55–4:2: “There is also provided in accordance with the invention a computer program product for use in a network device, the computer program product comprising a computer useable medium having computer readable program code means embodied in the medium for performing forwarding of packets to a plurality of subports, the computer program product comprising computer readable program code means for assigning outbound packets to one of a plurality of subports in accordance with the label associated with each outbound packet, computer readable program code means for forwarding each outbound packet to its assigned subport and computer readable program code means for forwarding inbound packets from a high speed packet stream to a subport corresponding to the subport having the same index as the one the inbound packet was originally sent out on.”</p> <p>Raz, 6:34–45: “Outbound packets are assigned a subport based on their MPLS labels. Once assigned, the packets are forwarded to a particular subport. The output of all the subports is aggregated and combined into a single high-speed packet stream and transmitted over the link. Inbound packets are received by the high speed PHY and forwarded to one of a plurality of subports. The subport chosen is the same subport that the packet was sent out over at the transmitting node. The subport is determined in accordance with the label within the packet itself. The subports used on both sides of the next hop, however, are independent of the current hop. Thus, the subports may be different for each hop of the connection.”</p> <p>Raz, 7:17–38: “In accordance with the invention, the assignment of traffic to 1G subports is based on LSPs. Thus, the MPLS label is used in order to assign an incoming packet to one of the subports. The selected subport is the same for both sides of a 10G link. In the next link on the path, however, the subport may be different. This is because the next link may have other connections in addition to the 10G link and therefore 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. Note that it is the downstream (i.e. receiving) node that determines the subport it wants to receive the LSP on. This decision is communicated to the upstream (i.e. sending) node via the label that is assigned to the LSP.</p>

Exhibit E-4 – Invalidity of U.S. Patent No. 9,118,602 in view of Raz

Claim Limitation	Disclosure
	<p>As an example, consider two LSRS, LSR A and LSR B, each with 10 subports wherein each subport is mapped to an 8K range of labels. An LSP is to be provisioned from LSR A to LSR B. When the LSP is signaled or provisioned through management, the CAC in LSR B decides to accept the LSP on subport 3 and thus assigns a label comprising an indication that subport 3 was selected. The label is communicated to LSR A which now knows that the output subport should be subport 3 (i.e. the same subport is provisioned).”</p>
<p>13 The method according to claim 1, wherein said first MPLS/LAG switch comprises a Label Switched Router (LSR).</p>	<p>Raz discloses, either expressly or inherently, performing methods wherein said first MPLS/LAG switch comprises a Label Switched Router (LSR).</p> <p>Raz, Abstract: “A subport forwarding and provisioning mechanism whereby a plurality of subports implemented using slower speed processors are used to perform the packet processing for a higher speed packet stream. Outbound packets are assigned a subport based on their MPLS labels. Once assigned, the packets are forwarded to a particular subport. The output of all the subports is aggregated and combined into a single high speed packet stream and transmitted over the link. Inbound packets are received by the high speed PHY and forwarded to one of a plurality of subports. The subport chosen is the one having the same subport index as the one through which the packet was sent out over at the transmitting node. Conventional layer 2 switches can also be used whereby reserved source MAC addresses are assigned to subports. The switch forwards the inbound packets to one of the subports in accordance with the packet’s source MAC address. The invention also comprises a mechanism for provisioning protection tunnels and a method for allocating subport bandwidth to subports.”</p> <p>Raz, Figs. 1–2 and corresponding text:</p>

Exhibit E-4 – Invalidity of U.S. Patent No. 9,118,602 in view of Raz

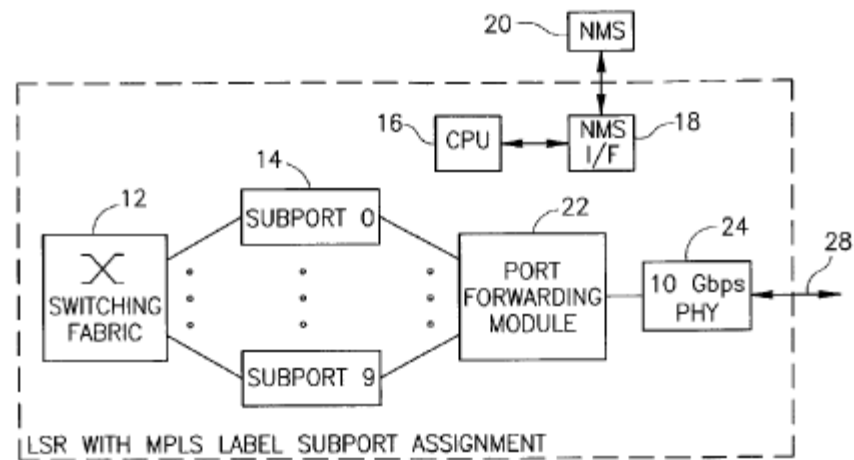


FIG.1

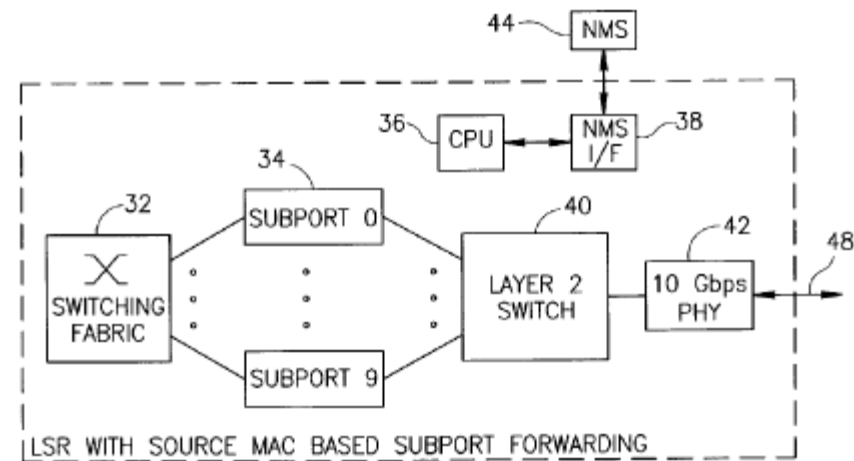


FIG.2

Exhibit E-4 – Invalidity of U.S. Patent No. 9,118,602 in view of Raz

Claim Limitation	Disclosure
	<p>Raz, Fig. 4 and corresponding text:</p> <div><p>FIG.4</p></div> <p>Raz, Fig. 6 and corresponding text:</p>

Exhibit E-4 – Invalidity of U.S. Patent No. 9,118,602 in view of Raz

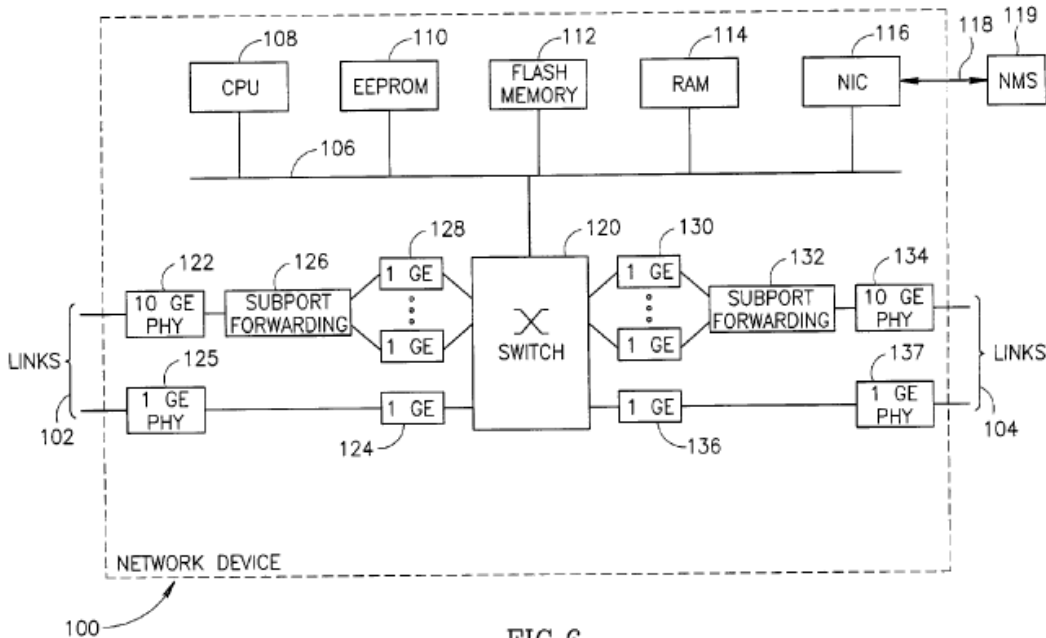
Claim Limitation	Disclosure
	 <p style="text-align: center;">FIG. 6</p> <p>Raz, 1:11–39: “Currently, the number of data networks and the volume of traffic these networks carry are increasing at an ever increasing rate. The network devices making up these networks generally consist of specialized hardware designed to move data at very high speeds. Typical asynchronous packet based networks, such as Ethernet or MPLS based networks, are mainly comprised of end stations, hubs, switches, routers, bridges and gateways. A network management system (NMS) is typically employed to provision, administer and maintain the network. Multiprotocol Label Switching (MPLS) based networks 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). The route of an LSP is determined by the network layer routing function or by a centralized entity (e.g., a Network Management System) from the topology of the network, the status of its resources and the demands of the user. Any suitable link state routing protocol may be used such as Open Shortest Path First (OSPF) or Intermediate System to Intermediate System (ISIS) routing protocol to provide the link state topology information needed by the network layer routing to engineer data traffic. It is also possible to use a local neighbor-</p>

Exhibit E-4 – Invalidity of U.S. Patent No. 9,118,602 in view of Raz

Claim Limitation	Disclosure
	<p>discovery protocol and have a centralized management entity maintain the topology view. LSPs may be setup using any suitable signaling protocol such as RSVP-TE or CR-LDP or using the management plane (e.g., NMS setting the relevant MIB items that create the LSPs).”</p> <p>Raz, 2:3–8: “To provide the flexibility required for protocols such as MPLS, a network processor or FPGA is used to implement the subport. A network processor is a device optimized for packet processing while a FPGA can be programmed with any desired custom circuit to implement the required algorithms and processing.”</p> <p>Raz, 2:9–20: “Outbound packets are assigned a subport based on their MPLS labels. Once assigned, the packets are forwarded to a particular subport. The outputs of all the subports are aggregated and combined into a single high-speed packet stream and transmitted over the link. Inbound packets are received by the high speed PHY and forwarded to one of a plurality of subports. The subport chosen is the same subport as the one the packet was sent out from at the transmitting node. The subport is determined in accordance with the label within the packet itself. The subports used on both sides of the next hop, however, are independent. Thus, the subports may be different for each hop of the connection.”</p> <p>Raz, 2:41–51: “There is thus provided in accordance with the invention 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 and forwarding inbound packets from the high speed packet stream to a subport corresponding to the subport the inbound packet was originally sent out on.”</p> <p>Raz, 3:1–33: “There is further provided in accordance with the invention an apparatus for forwarding a high speed packet stream to a plurality of subports of lesser speed in a label switching network, comprising assignment means for assigning outbound packets to one of a plurality of subports in accordance with the label associated with each outbound packet, a line interface adapted to transmit and receive a high speed packet stream, a plurality of subports, each subport of lesser speed than the line interface, a subport forwarding module in communication with the line interface and the plurality of subports, the subport forwarding module adapted to forward each outbound packet from its assigned subport to the line-interface and to forward inbound packets</p>

Exhibit E-4 – Invalidity of U.S. Patent No. 9,118,602 in view of Raz

Claim Limitation	Disclosure
	<p>from the line interface to one of the plurality of subports in accordance with the label of each inbound packet.</p> <p>There is also provided in accordance with the invention a network device for use in a label switching network comprising a switching fabric, a line interface adapted to interface to one or more data links, a plurality of subports, each subport of lesser speed than the speed of the line interface, a memory having at least one region for storing executable program code, a programmed central processor for executing the program code stored in the memory, wherein the program code further comprises code to assign outbound packets to one of a plurality of subports in accordance with the label associated with each outbound packet and a subport forwarding module in communication with the line interface and the plurality of subports, the subport forwarding module further comprises means for forwarding outbound packets from the subports to the line-interface and for forwarding inbound packets from the line interface to one of the plurality of subports in accordance with the label of each inbound packet.”</p> <p>Raz, 3:55–4:2:</p> <p>“There is also provided in accordance with the invention a computer program product for use in a network device, the computer program product comprising a computer useable medium having computer readable program code means embodied in the medium for performing forwarding of packets to a plurality of subports, the computer program product comprising computer readable program code means for assigning outbound packets to one of a plurality of subports in accordance with the label associated with each outbound packet, computer readable program code means for forwarding each outbound packet to its assigned subport and computer readable program code means for forwarding inbound packets from a high speed packet stream to a subport corresponding to the subport having the same index as the one the inbound packet was originally sent out on.”</p> <p>Raz, 6:9–20:</p> <p>“MPLS protection domain refers to the set of LSRs over which a working path and its corresponding recovery path are routed. MPLS protection plan refers to the set of all LSP protection paths and the mapping from working to protection paths deployed in an MPLS protection domain at a given time.</p> <p>The term MPLS protection domain refers to the set of LSRs over which a working path and its corresponding recovery path are routed. The term MPLS protection plan refers to the set of all LSP protection paths and the mapping from working to protection paths deployed in an MPLS protection domain at a given time.”</p> <p>Raz, 6:34–45:</p> <p>“Outbound packets are assigned a subport based on their MPLS labels. Once assigned, the packets are forwarded to a particular subport. The output of all the subports is aggregated and combined</p>

Exhibit E-4 – Invalidity of U.S. Patent No. 9,118,602 in view of Raz

Claim Limitation	Disclosure
	<p>into a single high-speed packet stream and transmitted over the link. Inbound packets are received by the high speed PHY and forwarded to one of a plurality of subports. The subport chosen is the same subport that the packet was sent out over at the transmitting node. The subport is determined in accordance with the label within the packet itself. The subports used on both sides of the next hop, however, are independent of the current hop. Thus, the subports may be different for each hop of the connection.”</p> <p>Raz, 6:65–7:6: “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 FIG. 1. The LSR network device, generally referenced 10, comprises a 10G PHY 24 coupled to a 10G link 28, a port forwarding module 22, a plurality of subports 14, labeled subport 0 through subport 9, switching fabric 12, CPU 16 and NMS interface 18. Note that the network device may comprise additional ports which are not shown for clarity.”</p> <p>Raz, 7:17–38: “In accordance with the invention, the assignment of traffic to 1G subports is based on LSPs. Thus, the MPLS label is used in order to assign an incoming packet to one of the subports. The selected subport is the same for both sides of a 10G link. In the next link on the path, however, the subport may be different. This is because the next link may have other connections in addition to the 10G link and therefore 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. Note that it is the downstream (i.e. receiving) node that determines the subport it wants to receive the LSP on. This decision is communicated to the upstream (i.e. sending) node via the label that is assigned to the LSP. As an example, consider two LSRS, LSR A and LSR B, each with 10 subports wherein each subport is mapped to an 8K range of labels. An LSP is to be provisioned from LSR A to LSR B. When the LSP is signaled or provisioned through management, the CAC in LSR B decides to accept the LSP on subport 3 and thus assigns a label comprising an indication that subport 3 was selected. The label is communicated to LSR A which now knows that the output subport should be subport 3 (i.e. the same subport is provisioned).”</p> <p>Raz, 12:13–21: “A network device can be adapted to implement the subport forwarding and provisioning mechanism of the present invention. Hardware means and/or software means adapted to execute the mechanism may be incorporated within a network device such as a Label Switching Router (LSR) adapted to implement the MPLS protocol, network switch, Network Management System or any other wired or wireless network device. The device may be constructed using any combination of hardware and/or software.”</p>

Exhibit E-4 – Invalidity of U.S. Patent No. 9,118,602 in view of Raz

Claim Limitation	Disclosure

Exhibit E-4 – Invalidity of U.S. Patent No. 9,118,602 in view of Raz

<p>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.</p>	<p>Raz discloses, either expressly or inherently, performing methods 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.</p> <p>Raz, Abstract: “A subport forwarding and provisioning mechanism whereby a plurality of subports implemented using slower speed processors are used to perform the packet processing for a higher speed packet stream. Outbound packets are assigned a subport based on their MPLS labels. Once assigned, the packets are forwarded to a particular subport. The output of all the subports is aggregated and combined into a single high speed packet stream and transmitted over the link. Inbound packets are received by the high speed PHY and forwarded to one of a plurality of subports. The subport chosen is the one having the same subport index as the one through which the packet was sent out over at the transmitting node. Conventional layer 2 switches can also be used whereby reserved source MAC addresses are assigned to subports. The switch forwards the inbound packets to one of the subports in accordance with the packet's source MAC address. The invention also comprises a mechanism for provisioning protection tunnels and a method for allocating subport bandwidth to subports.”</p> <p>Raz, Figs. 1–2 and corresponding text:</p>
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Exhibit E-4 – Invalidity of U.S. Patent No. 9,118,602 in view of Raz

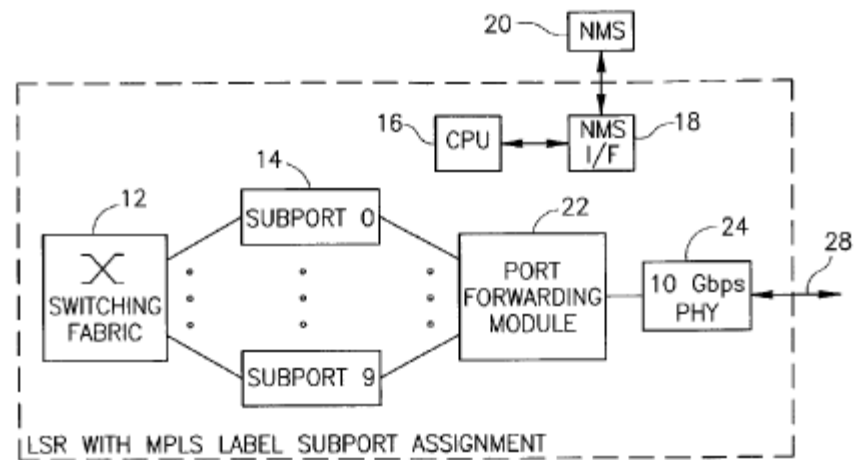


FIG.1

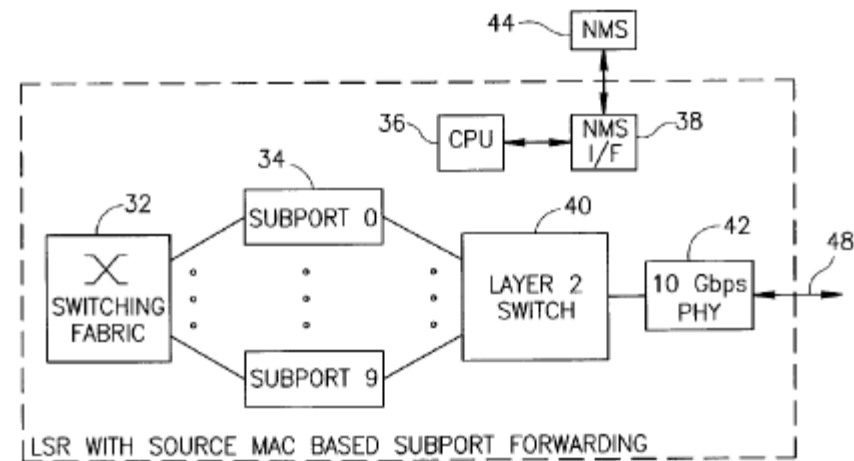


FIG.2

Exhibit E-4 – Invalidity of U.S. Patent No. 9,118,602 in view of Raz

Raz, Fig. 6 and corresponding text:

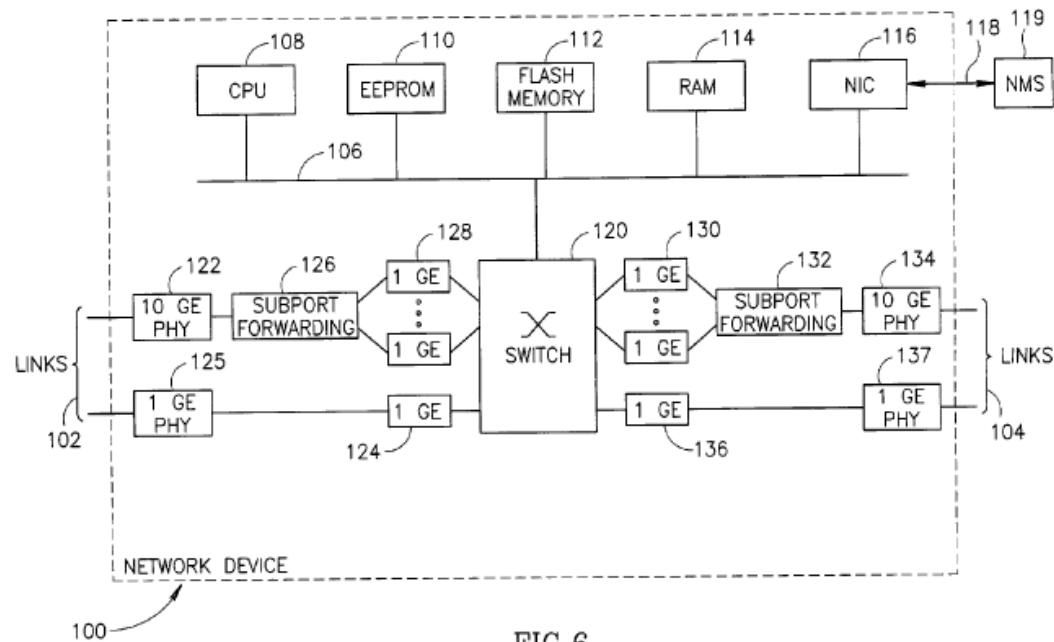


FIG.6

Raz, 1:11–39:

“Currently, the number of data networks and the volume of traffic these networks carry are increasing at an ever increasing rate. The network devices making up these networks generally consist of specialized hardware designed to move data at very high speeds. Typical asynchronous packet based networks, such as Ethernet or MPLS based networks, are mainly comprised of end stations, hubs, switches, routers, bridges and gateways. A network management system (NMS) is typically employed to provision, administer and maintain the network. Multiprotocol Label Switching (MPLS) based networks 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). The route of an LSP is determined by the network layer routing function or by a centralized entity (e.g., a Network Management System) from the topology of the network, the status of its resources and the demands of the user. Any suitable link state routing

Exhibit E-4 – Invalidity of U.S. Patent No. 9,118,602 in view of Raz

protocol may be used such as Open Shortest Path First (OSPF) or Intermediate System to Intermediate System (ISIS) routing protocol to provide the link state topology information needed by the network layer routing to engineer data traffic. It is also possible to use a local neighbor-discovery protocol and have a centralized management entity maintain the topology view. LSPs may be setup using any suitable signaling protocol such as RSVP-TE or CR-LDP or using the management plane (e.g., NMS setting the relevant MIB items that create the LSPs).”

Raz, 2:3–8:

“To provide the flexibility required for protocols such as MPLS, a network processor or FPGA is used to implement the subport. A network processor is a device optimized for packet processing while a FPGA can be programmed with any desired custom circuit to implement the required algorithms and processing.”

Raz, 2:9–20:

“Outbound packets are assigned a subport based on their MPLS labels. Once assigned, the packets are forwarded to a particular subport. The outputs of all the subports are aggregated and combined into a single high-speed packet stream and transmitted over the link. Inbound packets are received by the high speed PHY and forwarded to one of a plurality of subports. The subport chosen is the same subport as the one the packet was sent out from at the transmitting node. The subport is determined in accordance with the label within the packet itself. The subports used on both sides of the next hop, however, are independent. Thus, the subports may be different for each hop of the connection.”

Raz, 2:41–51:

“There is thus provided in accordance with the invention 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 and forwarding inbound packets from the high speed packet stream to a subport corresponding to the subport the inbound packet was originally sent out on.”

Raz, 3:1–33:

“There is further provided in accordance with the invention an apparatus for forwarding a high speed packet stream to a plurality of subports of lesser speed in a label switching network, comprising assignment means for assigning outbound packets to one of a plurality of subports in accordance with the label associated with each outbound packet, a line interface adapted to transmit and receive a high speed packet stream, a plurality of subports, each subport of lesser speed than the line interface, a subport forwarding module in communication with the line

Exhibit E-4 – Invalidity of U.S. Patent No. 9,118,602 in view of Raz

interface and the plurality of subports, the subport forwarding module adapted to forward each outbound packet from its assigned subport to the line-interface and to forward inbound packets from the line interface to one of the plurality of subports in accordance with the label of each inbound packet.

There is also provided in accordance with the invention a network device for use in a label switching network comprising a switching fabric, a line interface adapted to interface to one or more data links, a plurality of subports, each subport of lesser speed than the speed of the line interface, a memory having at least one region for storing executable program code, a programmed central processor for executing the program code stored in the memory, wherein the program code further comprises code to assign outbound packets to one of a plurality of subports in accordance with the label associated with each outbound packet and a subport forwarding module in communication with the line interface and the plurality of subports, the subport forwarding module further comprises means for forwarding outbound packets from the subports to the line-interface and for forwarding inbound packets from the line interface to one of the plurality of subports in accordance with the label of each inbound packet.”

Raz, 3:55–4:2:

“There is also provided in accordance with the invention a computer program product for use in a network device, the computer program product comprising a computer useable medium having computer readable program code means embodied in the medium for performing forwarding of packets to a plurality of subports, the computer program product comprising computer readable program code means for assigning outbound packets to one of a plurality of subports in accordance with the label associated with each outbound packet, computer readable program code means for forwarding each outbound packet to its assigned subport and computer readable program code means for forwarding inbound packets from a high speed packet stream to a subport corresponding to the subport having the same index as the one the inbound packet was originally sent out on.”

Raz, 6:34–45:

“Outbound packets are assigned a subport based on their MPLS labels. Once assigned, the packets are forwarded to a particular subport. The output of all the subports is aggregated and combined into a single high-speed packet stream and transmitted over the link. Inbound packets are received by the high speed PHY and forwarded to one of a plurality of subports. The subport chosen is the same subport that the packet was sent out over at the transmitting node. The subport is determined in accordance with the label within the packet itself. The subports used on both sides of the next hop, however, are independent of the current hop. Thus, the subports may be different for each hop of the connection.”

Raz, 7:17–38:

“In accordance with the invention, the assignment of traffic to 1G subports is based on LSPs. Thus,

Exhibit E-4 – Invalidity of U.S. Patent No. 9,118,602 in view of Raz

	<p>the MPLS label is used in order to assign an incoming packet to one of the subports. The selected subport is the same for both sides of a 10G link. In the next link on the path, however, the subport may be different. This is because the next link may have other connections in addition to the 10G link and therefore 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. Note that it is the downstream (i.e. receiving) node that determines the subport it wants to receive the LSP on. This decision is communicated to the upstream (i.e. sending) node via the label that is assigned to the LSP. As an example, consider two LSRS, LSR A and LSR B, each with 10 subports wherein each subport is mapped to an 8K range of labels. An LSP is to be provisioned from LSR A to LSR B. When the LSP is signaled or provisioned through management, the CAC in LSR B decides to accept the LSP on subport 3 and thus assigns a label comprising an indication that subport 3 was selected. The label is communicated to LSR A which now knows that the output subport should be subport 3 (i.e. the same subport is provisioned).”</p>
<p>15[pre] 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:</p>	<p>To the extent the preamble is limiting, Raz discloses, either expressly or inherently, 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 MultiProtocol Label Switching (MPLS) network tunnel employing Resource Reservation Protocol Traffic Engineering (RSVPTE) tunnel provisioning, the LAG having a first MPLS/LAG switch and second MPLS/LAG switch.</p> <p>Raz, Abstract: “A subport forwarding and provisioning mechanism whereby a plurality of subports implemented using slower speed processors are used to perform the packet processing for a higher speed packet stream. Outbound packets are assigned a subport based on their MPLS labels. Once assigned, the packets are forwarded to a particular subport. The output of all the subports is aggregated and combined into a single high speed packet stream and transmitted over the link. Inbound packets are received by the high speed PHY and forwarded to one of a plurality of subports. The subport chosen is the one having the same subport index as the one through which the packet was sent out over at the transmitting node. Conventional layer 2 switches can also be used whereby reserved source MAC addresses are assigned to subports. The switch forwards the inbound packets to one of the subports in accordance with the packet's source MAC address. The invention also comprises a mechanism for provisioning protection tunnels and a method for allocating subport bandwidth to subports.”</p> <p>Raz, Figs. 1–2 and corresponding text:</p>

Exhibit E-4 – Invalidity of U.S. Patent No. 9,118,602 in view of Raz

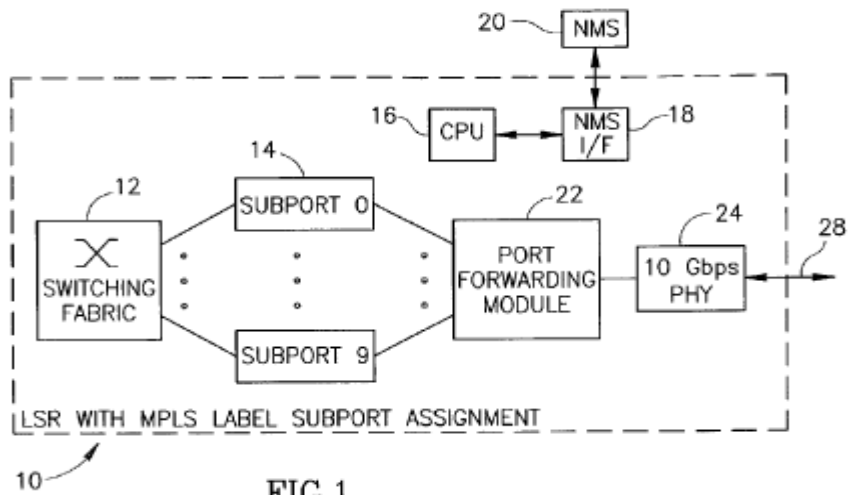
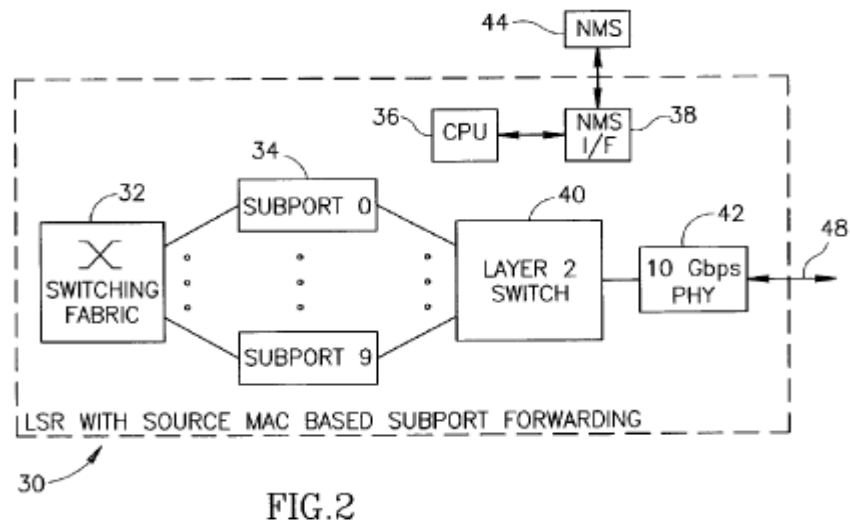


Exhibit E-4 – Invalidity of U.S. Patent No. 9,118,602 in view of Raz

Raz, Fig. 3 and corresponding text:

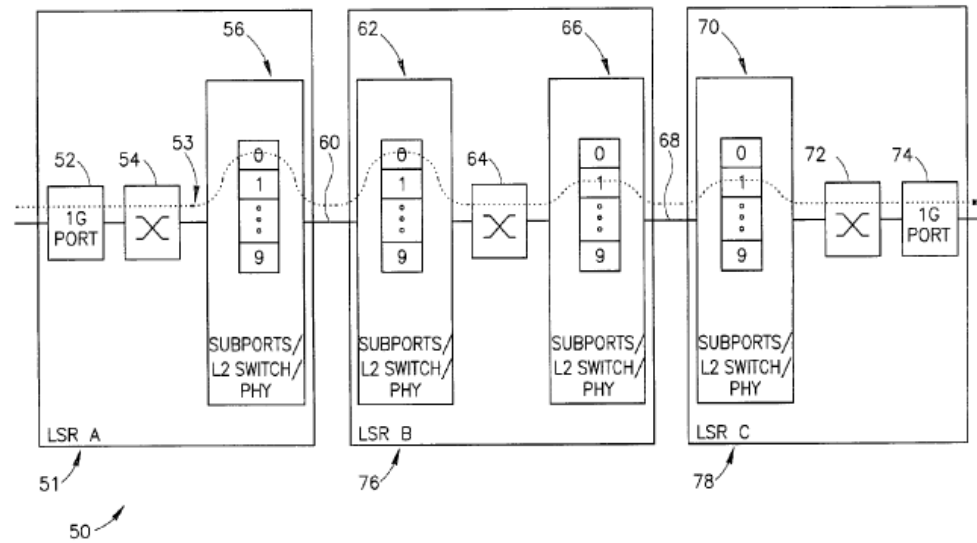


FIG.3

Raz, Fig. 6 and corresponding text:

Exhibit E-4 – Invalidity of U.S. Patent No. 9,118,602 in view of Raz

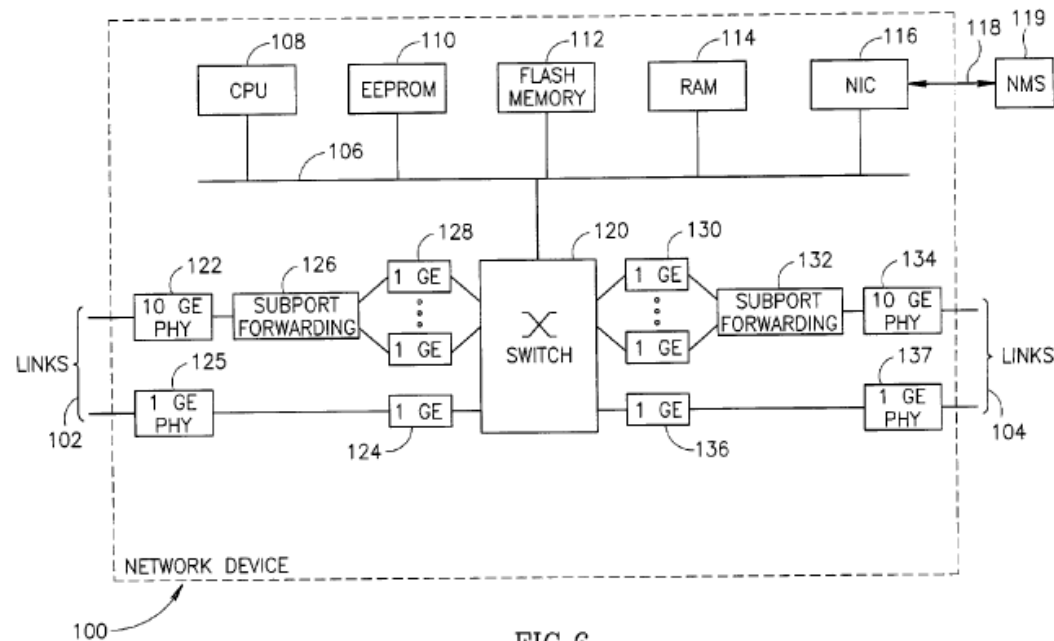


FIG. 6

Raz, 1:11–39:

“Currently, the number of data networks and the volume of traffic these networks carry are increasing at an ever increasing rate. The network devices making up these networks generally consist of specialized hardware designed to move data at very high speeds. Typical asynchronous packet based networks, such as Ethernet or MPLS based networks, are mainly comprised of end stations, hubs, switches, routers, bridges and gateways. A network management system (NMS) is typically employed to provision, administer and maintain the network.

Multiprotocol Label Switching (MPLS) based networks 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). The route of an LSP is determined by the network layer routing function or by a centralized entity (e.g., a Network Management System) from the topology of the network, the status of its resources and the demands of the user. Any suitable link state routing protocol may be used such as Open Shortest Path First (OSPF) or Intermediate System to Intermediate System (ISIS) routing protocol to provide the link state topology information needed by the network layer routing to engineer data traffic. It is also possible to use a local neighbor-

Exhibit E-4 – Invalidity of U.S. Patent No. 9,118,602 in view of Raz

discovery protocol and have a centralized management entity maintain the topology view. LSPs may be setup using any suitable signaling protocol such as RSVP-TE or CR-LDP or using the management plane (e.g., NMS setting the relevant MIB items that create the LSPs).”

Raz, 2:3–8:

“To provide the flexibility required for protocols such as MPLS, a network processor or FPGA is used to implement the subport. A network processor is a device optimized for packet processing while a FPGA can be programmed with any desired custom circuit to implement the required algorithms and processing.”

Raz, 2:9–20:

“Outbound packets are assigned a subport based on their MPLS labels. Once assigned, the packets are forwarded to a particular subport. The outputs of all the subports are aggregated and combined into a single high-speed packet stream and transmitted over the link. Inbound packets are received by the high speed PHY and forwarded to one of a plurality of subports. The subport chosen is the same subport as the one the packet was sent out from at the transmitting node. The subport is determined in accordance with the label within the packet itself. The subports used on both sides of the next hop, however, are independent. Thus, the subports may be different for each hop of the connection.”

Raz, 2:41–51:

“There is thus provided in accordance with the invention 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 and forwarding inbound packets from the high speed packet stream to a subport corresponding to the subport the inbound packet was originally sent out on.”

Raz, 3:1–33:

“There is further provided in accordance with the invention an apparatus for forwarding a high speed packet stream to a plurality of subports of lesser speed in a label switching network, comprising assignment means for assigning outbound packets to one of a plurality of subports in accordance with the label associated with each outbound packet, a line interface adapted to transmit and receive a high speed packet stream, a plurality of subports, each subport of lesser speed than the line interface, a subport forwarding module in communication with the line interface and the plurality of subports, the subport forwarding module adapted to forward each outbound packet from its assigned subport to the line-interface and to forward inbound packets from the line interface to one of the plurality of subports in accordance with the label of each

Exhibit E-4 – Invalidity of U.S. Patent No. 9,118,602 in view of Raz

inbound packet.

There is also provided in accordance with the invention a network device for use in a label switching network comprising a switching fabric, a line interface adapted to interface to one or more data links, a plurality of subports, each subport of lesser speed than the speed of the line interface, a memory having at least one region for storing executable program code, a programmed central processor for executing the program code stored in the memory, wherein the program code further comprises code to assign outbound packets to one of a plurality of subports in accordance with the label associated with each outbound packet and a subport forwarding module in communication with the line interface and the plurality of subports, the subport forwarding module further comprises means for forwarding outbound packets from the subports to the line-interface and for forwarding inbound packets from the line interface to one of the plurality of subports in accordance with the label of each inbound packet.”

Raz, 3:55–4:2:

“There is also provided in accordance with the invention a computer program product for use in a network device, the computer program product comprising a computer useable medium having computer readable program code means embodied in the medium for performing forwarding of packets to a plurality of subports, the computer program product comprising computer readable program code means for assigning outbound packets to one of a plurality of subports in accordance with the label associated with each outbound packet, computer readable program code means for forwarding each outbound packet to its assigned subport and computer readable program code means for forwarding inbound packets from a high speed packet stream to a subport corresponding to the subport having the same index as the one the inbound packet was originally sent out on.”

Raz, 6:24–33:

“The present invention provides a subport forwarding and provisioning mechanism whereby a plurality of subports comprising slower speed processors are used to perform the packet processing for a higher speed packet stream. To provide the flexibility required for protocols such as MPLS, a network processor or FPGA is used to implement the subport. A network processor is a device optimized for packet processing while a FPGA can be programmed with any desired custom circuit to implement the required algorithms and processing.”

Raz, 6:34–45:

“Outbound packets are assigned a subport based on their MPLS labels. Once assigned, the packets are forwarded to a particular subport. The output of all the subports is aggregated and combined into a single high-speed packet stream and transmitted over the link. Inbound packets are received by the high speed PHY and forwarded to one of a plurality of subports. The subport chosen is the same subport that the packet was sent out over at the transmitting node. The subport is determined in accordance with the label within the packet itself. The subports used on both sides of the next

Exhibit E-4 – Invalidity of U.S. Patent No. 9,118,602 in view of Raz

	<p>hop, however, are independent of the current hop. Thus, the subports may be different for each hop of the connection.”</p> <p>Raz, 6:46–50: “For illustration purposes, the principles of the present invention 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 or uses management-plane based provisioning instead or in addition thereto.”</p> <p>Raz, 6:51–54: “Further, 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</p> <p>Raz, 6:65–7:6: “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 FIG. 1. The LSR network device, generally referenced 10, comprises a 10G PHY 24 coupled to a 10G link 28, a port forwarding module 22, a plurality of subports 14, labeled subport 0 through subport 9, switching fabric 12, CPU 16 and NMS interface 18. Note that the network device may comprise additional ports which are not shown for clarity.”</p> <p>Raz, 7:17–38: “In accordance with the invention, the assignment of traffic to 1G subports is based on LSPs. Thus, the MPLS label is used in order to assign an incoming packet to one of the subports. The selected subport is the same for both sides of a 10G link. In the next link on the path, however, the subport may be different. This is because the next link may have other connections in addition to the 10G link and therefore 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. Note that it is the downstream (i.e. receiving) node that determines the subport it wants to receive the LSP on. This decision is communicated to the upstream (i.e. sending) node via the label that is assigned to the LSP. As an example, consider two LSRS, LSR A and LSR B, each with 10 subports wherein each subport is mapped to an 8K range of labels. An LSP is to be provisioned from LSR A to LSR B. When the LSP is signaled or provisioned through management, the CAC in LSR B decides to accept the LSP on subport 3 and thus assigns a label comprising an indication that subport 3 was selected. The label is communicated to LSR A which now knows that the output subport should be subport 3 (i.e. the same subport is provisioned).”</p>
15[a.i] a processor, which is	Raz discloses, either expressly or inherently, a processor.

Exhibit E-4 – Invalidity of U.S. Patent No. 9,118,602 in view of Raz

configured to:	<p>Raz, Abstract:</p> <p>“A subport forwarding and provisioning mechanism whereby a plurality of subports implemented using slower speed processors are used to perform the packet processing for a higher speed packet stream. Outbound packets are assigned a subport based on their MPLS labels. Once assigned, the packets are forwarded to a particular subport. The output of all the subports is aggregated and combined into a single high speed packet stream and transmitted over the link. Inbound packets are received by the high speed PHY and forwarded to one of a plurality of subports. The subport chosen is the one having the same subport index as the one through which the packet was sent out over at the transmitting node. Conventional layer 2 switches can also be used whereby reserved source MAC addresses are assigned to subports. The switch forwards the inbound packets to one of the subports in accordance with the packet's source MAC address. The invention also comprises a mechanism for provisioning protection tunnels and a method for allocating subport bandwidth to subports.”</p> <p>Raz, Figs. 1–2 and corresponding text:</p>
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Exhibit E-4 – Invalidity of U.S. Patent No. 9,118,602 in view of Raz

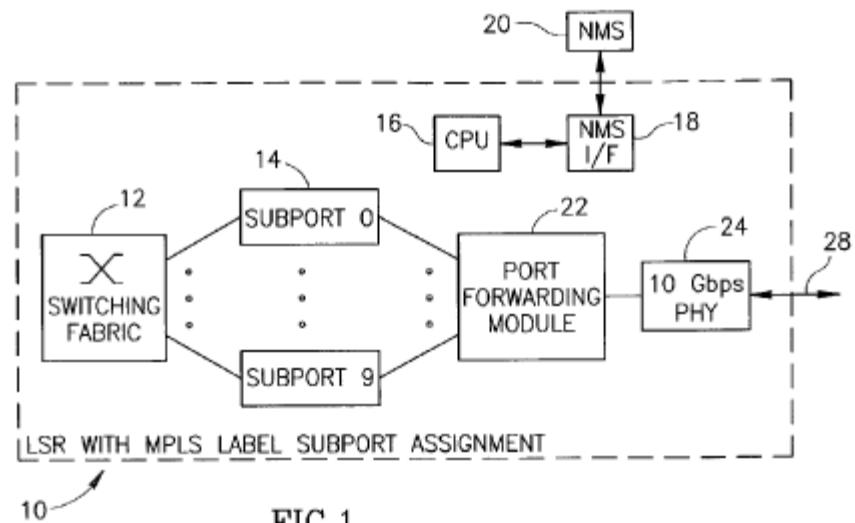
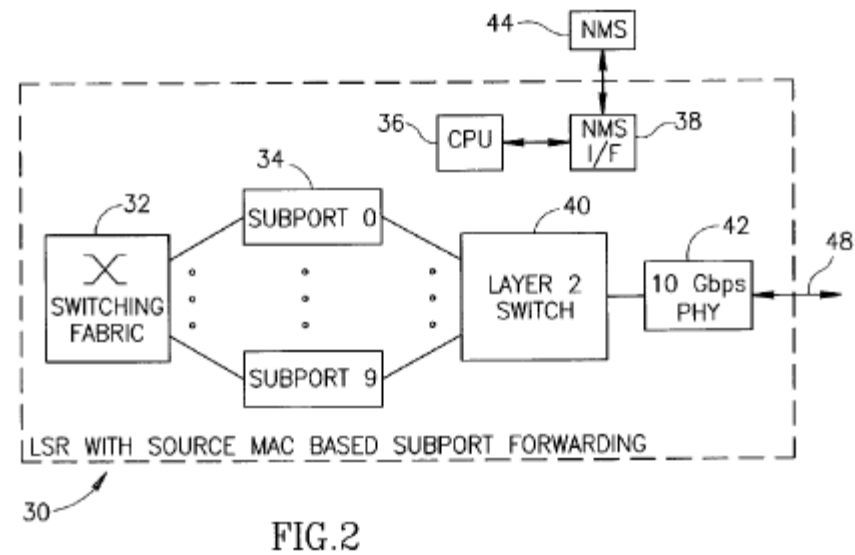


Exhibit E-4 – Invalidity of U.S. Patent No. 9,118,602 in view of Raz

Raz, Fig. 6 and corresponding text:

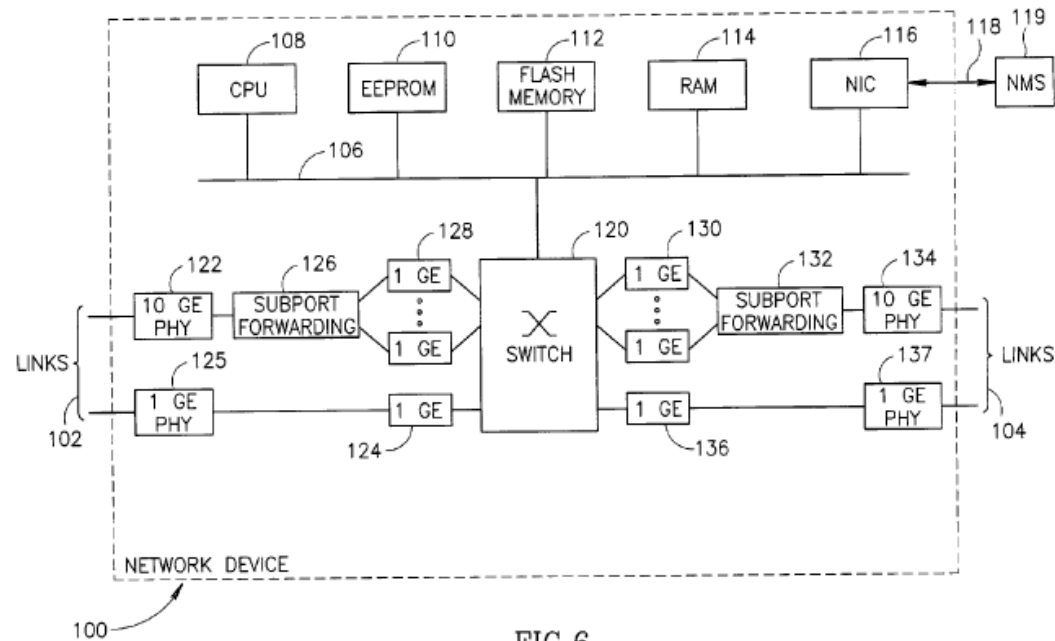


FIG.6

Raz, 1:11–39:

“Currently, the number of data networks and the volume of traffic these networks carry are increasing at an ever increasing rate. The network devices making up these networks generally consist of specialized hardware designed to move data at very high speeds. Typical asynchronous packet based networks, such as Ethernet or MPLS based networks, are mainly comprised of end stations, hubs, switches, routers, bridges and gateways. A network management system (NMS) is typically employed to provision, administer and maintain the network. Multiprotocol Label Switching (MPLS) based networks 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). The route of an LSP is determined by the network layer routing function or by a centralized entity (e.g., a Network Management System) from the topology of the network, the status of its resources and the demands of the user. Any suitable link state routing protocol may be used such as Open Shortest Path First (OSPF) or Intermediate System to

Exhibit E-4 – Invalidity of U.S. Patent No. 9,118,602 in view of Raz

	<p>Intermediate System (ISIS) routing protocol to provide the link state topology information needed by the network layer routing to engineer data traffic. It is also possible to use a local neighbor-discovery protocol and have a centralized management entity maintain the topology view. LSPs may be setup using any suitable signaling protocol such as RSVP-TE or CR-LDP or using the management plane (e.g., NMS setting the relevant MIB items that create the LSPs).”</p> <p>Raz, 2:3–8: “To provide the flexibility required for protocols such as MPLS, a network processor or FPGA is used to implement the subport. A network processor is a device optimized for packet processing while a FPGA can be programmed with any desired custom circuit to implement the required algorithms and processing.”</p> <p>Raz, 2:33–40: “Note that the invention is suited for implementation in hardware such as a network processor adapted to implement the mechanism of the present invention, software or a combination of hardware and software. In one embodiment, a network device comprising a processor, memory, etc. is operative to execute software adapted to perform the subport forwarding and provisioning mechanism of the present invention.”</p> <p>Raz, 6:24–33: “The present invention provides a subport forwarding and provisioning mechanism whereby a plurality of subports comprising slower speed processors are used to perform the packet processing for a higher speed packet stream. To provide the flexibility required for protocols such as MPLS, a network processor or FPGA is used to implement the subport. A network processor is a device optimized for packet processing while a FPGA can be programmed with any desired custom circuit to implement the required algorithms and processing.”</p> <p>Raz, 6:65–7:6: “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 FIG. 1. The LSR network device, generally referenced 10, comprises a 10G PHY 24 coupled to a 10G link 28, a port forwarding module 22, a plurality of subports 14, labeled subport 0 through subport 9, switching fabric 12, CPU 16 and NMS interface 18. Note that the network device may comprise additional ports which are not shown for clarity.”</p>
<p>15[a.ii] assign a single physical tunnel port of a LAG to a network tunnel, wherein said single physical tunnel port</p>	<p>Raz discloses, either expressly or inherently, a processor, which is configured to 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.</p>

Exhibit E-4 – Invalidity of U.S. Patent No. 9,118,602 in view of Raz

<p>meets a bandwidth requirement of the network tunnel, and wherein said single physical tunnel port has a port serial number;</p>	<p>Raz, Abstract: “A subport forwarding and provisioning mechanism whereby a plurality of subports implemented using slower speed processors are used to perform the packet processing for a higher speed packet stream. Outbound packets are assigned a subport based on their MPLS labels. Once assigned, the packets are forwarded to a particular subport. The output of all the subports is aggregated and combined into a single high speed packet stream and transmitted over the link. Inbound packets are received by the high speed PHY and forwarded to one of a plurality of subports. The subport chosen is the one having the same subport index as the one through which the packet was sent out over at the transmitting node. Conventional layer 2 switches can also be used whereby reserved source MAC addresses are assigned to subports. The switch forwards the inbound packets to one of the subports in accordance with the packet's source MAC address. The invention also comprises a mechanism for provisioning protection tunnels and a method for allocating subport bandwidth to subports.”</p> <p>Raz, Figs. 1–2 and corresponding text:</p>
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Exhibit E-4 – Invalidity of U.S. Patent No. 9,118,602 in view of Raz

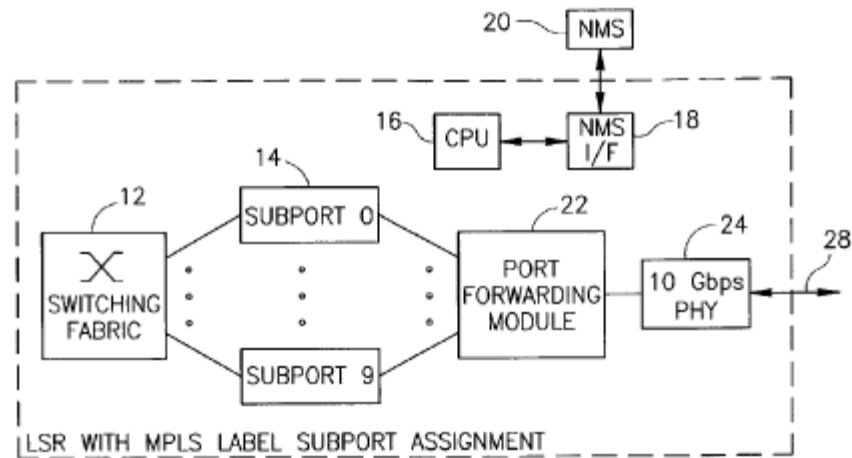
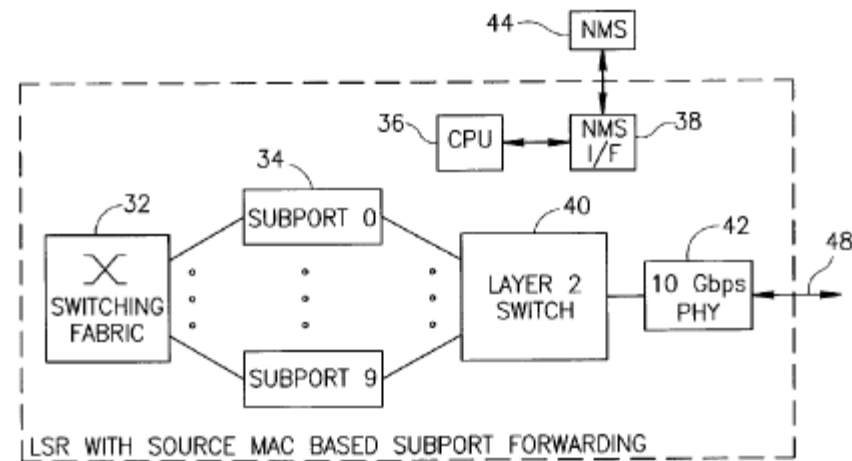
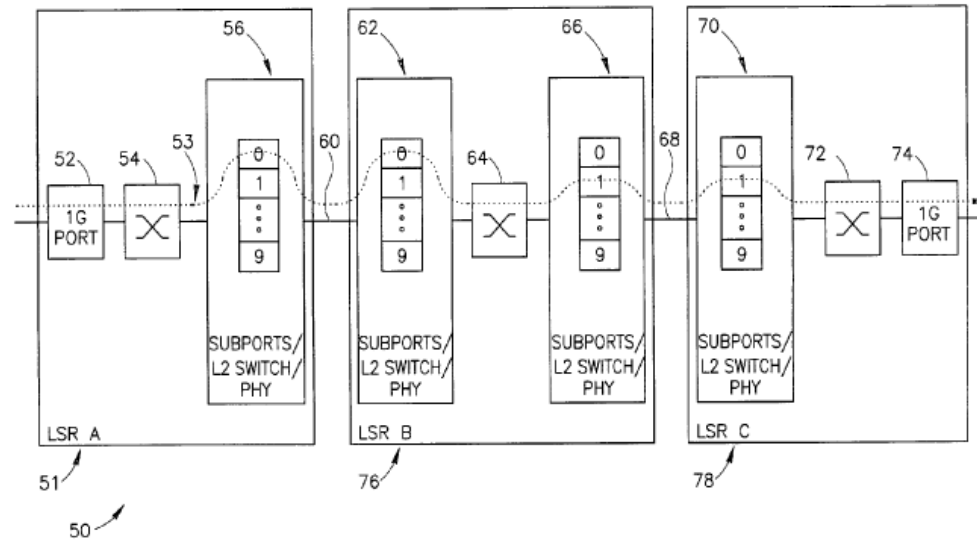


Exhibit E-4 – Invalidity of U.S. Patent No. 9,118,602 in view of Raz

Raz, Fig. 3 and corresponding text:



Raz, Fig. 6 and corresponding text:

Exhibit E-4 – Invalidity of U.S. Patent No. 9,118,602 in view of Raz

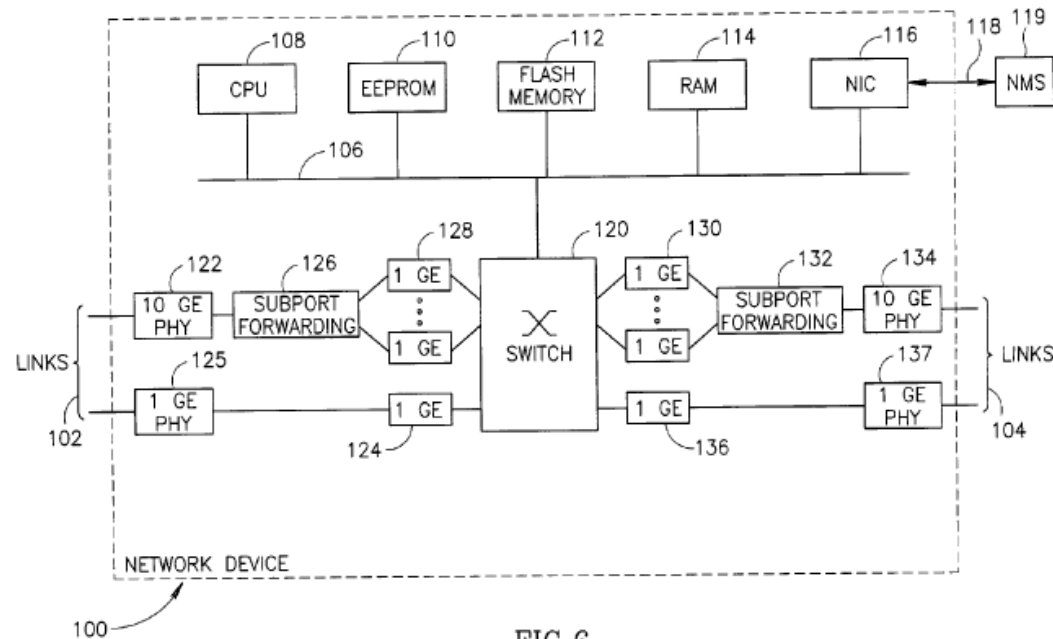


FIG.6

Raz, 1:11–39:

“Currently, the number of data networks and the volume of traffic these networks carry are increasing at an ever increasing rate. The network devices making up these networks generally consist of specialized hardware designed to move data at very high speeds. Typical asynchronous packet based networks, such as Ethernet or MPLS based networks, are mainly comprised of end stations, hubs, switches, routers, bridges and gateways. A network management system (NMS) is typically employed to provision, administer and maintain the network. Multiprotocol Label Switching (MPLS) based networks 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). The route of an LSP is determined by the network layer routing function or by a centralized entity (e.g., a Network Management System) from the topology of the network, the status of its resources and the demands of the user. Any suitable link state routing protocol may be used such as Open Shortest Path First (OSPF) or Intermediate System to

Exhibit E-4 – Invalidity of U.S. Patent No. 9,118,602 in view of Raz

Intermediate System (ISIS) routing protocol to provide the link state topology information needed by the network layer routing to engineer data traffic. It is also possible to use a local neighbor-discovery protocol and have a centralized management entity maintain the topology view. LSPs may be setup using any suitable signaling protocol such as RSVP-TE or CR-LDP or using the management plane (e.g., NMS setting the relevant MIB items that create the LSPs).”

Raz, 2:3–8:

“To provide the flexibility required for protocols such as MPLS, a network processor or FPGA is used to implement the subport. A network processor is a device optimized for packet processing while a FPGA can be programmed with any desired custom circuit to implement the required algorithms and processing.”

Raz, 2:9–20:

“Outbound packets are assigned a subport based on their MPLS labels. Once assigned, the packets are forwarded to a particular subport. The outputs of all the subports are aggregated and combined into a single high-speed packet stream and transmitted over the link. Inbound packets are received by the high speed PHY and forwarded to one of a plurality of subports. The subport chosen is the same subport as the one the packet was sent out from at the transmitting node. The subport is determined in accordance with the label within the packet itself. The subports used on both sides of the next hop, however, are independent. Thus, the subports may be different for each hop of the connection.”

Raz, 6:24–33:

“The present invention provides a subport forwarding and provisioning mechanism whereby a plurality of subports comprising slower speed processors are used to perform the packet processing for a higher speed packet stream. To provide the flexibility required for protocols such as MPLS, a network processor or FPGA is used to implement the subport. A network processor is a device optimized for packet processing while a FPGA can be programmed with any desired custom circuit to implement the required algorithms and processing.”

Raz, 7:17–38:

“In accordance with the invention, the assignment of traffic to 1G subports is based on LSPs. Thus, the MPLS label is used in order to assign an incoming packet to one of the subports. The selected subport is the same for both sides of a 10G link. In the next link on the path, however, the subport may be different. This is because the next link may have other connections in addition to the 10G link and therefore 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. Note that it is the downstream (i.e. receiving) node that determines the subport it wants to receive the LSP on. This decision is communicated to the upstream (i.e. sending) node via the label that is assigned to the LSP.

Exhibit E-4 – Invalidity of U.S. Patent No. 9,118,602 in view of Raz

	<p>As an example, consider two LSRS, LSR A and LSR B, each with 10 subports wherein each subport is mapped to an 8K range of labels. An LSP is to be provisioned from LSR A to LSR B. When the LSP is signaled or provisioned through management, the CAC in LSR B decides to accept the LSP on subport 3 and thus assigns a label comprising an indication that subport 3 was selected. The label is communicated to LSR A which now knows that the output subport should be subport 3 (i.e. the same subport is provisioned).”</p>
<p>15[a.iii] 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;</p>	<p>Raz discloses, either expressly or inherently, a processor, which is configured to 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.</p> <p>Raz, Abstract: “A subport forwarding and provisioning mechanism whereby a plurality of subports implemented using slower speed processors are used to perform the packet processing for a higher speed packet stream. Outbound packets are assigned a subport based on their MPLS labels. Once assigned, the packets are forwarded to a particular subport. The output of all the subports is aggregated and combined into a single high speed packet stream and transmitted over the link. Inbound packets are received by the high speed PHY and forwarded to one of a plurality of subports. The subport chosen is the one having the same subport index as the one through which the packet was sent out over at the transmitting node. Conventional layer 2 switches can also be used whereby reserved source MAC addresses are assigned to subports. The switch forwards the inbound packets to one of the subports in accordance with the packet's source MAC address. The invention also comprises a mechanism for provisioning protection tunnels and a method for allocating subport bandwidth to subports.”</p> <p>Raz, Figs. 1–2 and corresponding text:</p>

Exhibit E-4 – Invalidity of U.S. Patent No. 9,118,602 in view of Raz

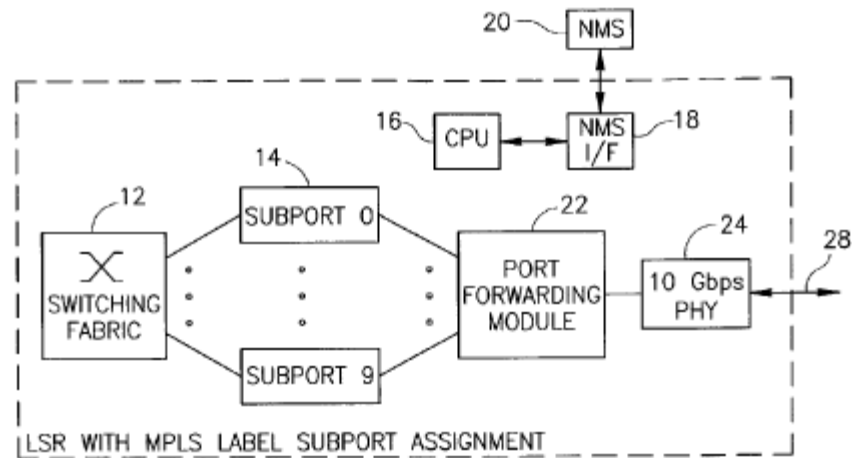
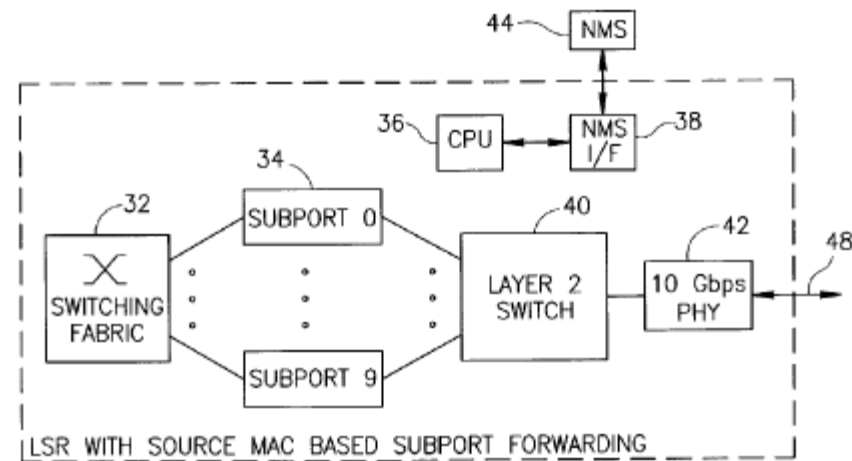


Exhibit E-4 – Invalidity of U.S. Patent No. 9,118,602 in view of Raz

Raz, Fig. 4 and corresponding text:

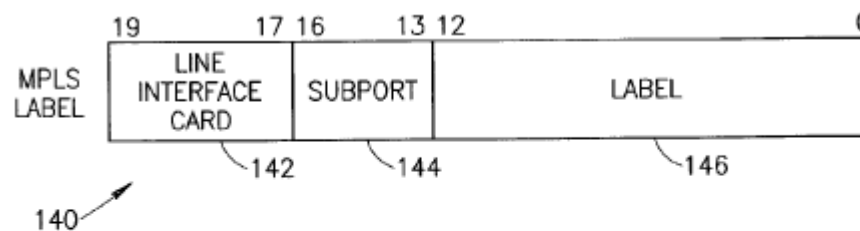


FIG.4

Exhibit E-4 – Invalidity of U.S. Patent No. 9,118,602 in view of Raz

Raz, Fig. 6 and corresponding text:

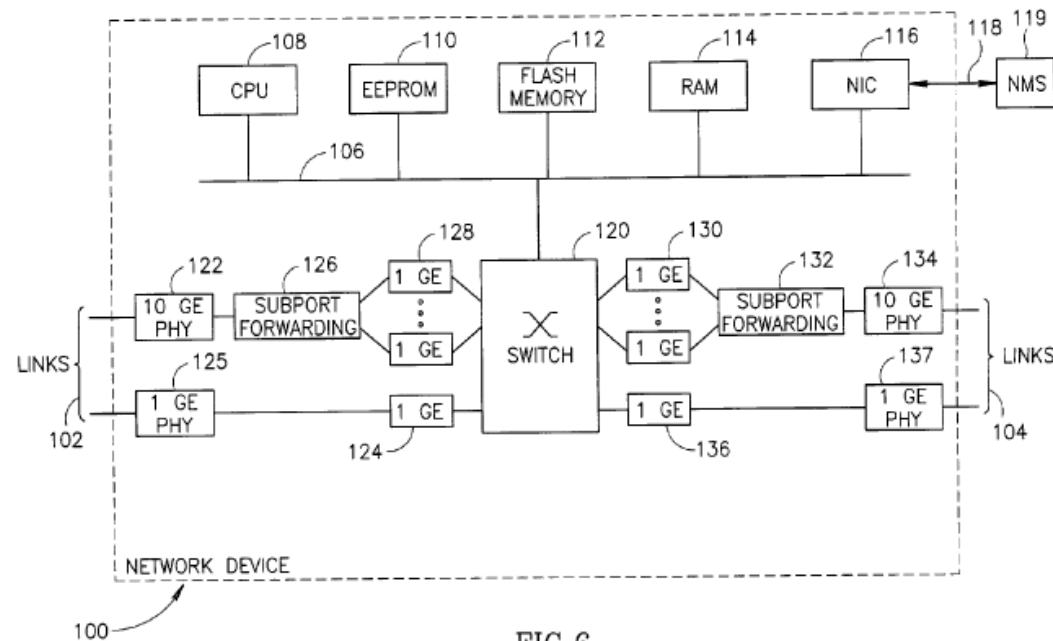


FIG. 6

Raz, 1:11–39:

“Currently, the number of data networks and the volume of traffic these networks carry are increasing at an ever increasing rate. The network devices making up these networks generally consist of specialized hardware designed to move data at very high speeds. Typical asynchronous packet based networks, such as Ethernet or MPLS based networks, are mainly comprised of end stations, hubs, switches, routers, bridges and gateways. A network management system (NMS) is typically employed to provision, administer and maintain the network. Multiprotocol Label Switching (MPLS) based networks 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). The route of an LSP is determined by the network layer routing function or by a centralized entity (e.g., a Network Management System) from the topology of the network, the status of its resources and the demands of the user. Any suitable link state routing protocol may be used such as Open Shortest Path First (OSPF) or Intermediate System to

Exhibit E-4 – Invalidity of U.S. Patent No. 9,118,602 in view of Raz

Intermediate System (ISIS) routing protocol to provide the link state topology information needed by the network layer routing to engineer data traffic. It is also possible to use a local neighbor-discovery protocol and have a centralized management entity maintain the topology view. LSPs may be setup using any suitable signaling protocol such as RSVP-TE or CR-LDP or using the management plane (e.g., NMS setting the relevant MIB items that create the LSPs).”

Raz, 2:3–8:

“To provide the flexibility required for protocols such as MPLS, a network processor or FPGA is used to implement the subport. A network processor is a device optimized for packet processing while a FPGA can be programmed with any desired custom circuit to implement the required algorithms and processing.”

Raz, 2:9–20:

“Outbound packets are assigned a subport based on their MPLS labels. Once assigned, the packets are forwarded to a particular subport. The outputs of all the subports are aggregated and combined into a single high-speed packet stream and transmitted over the link. Inbound packets are received by the high speed PHY and forwarded to one of a plurality of subports. The subport chosen is the same subport as the one the packet was sent out from at the transmitting node. The subport is determined in accordance with the label within the packet itself. The subports used on both sides of the next hop, however, are independent. Thus, the subports may be different for each hop of the connection.”

Raz, 6:34–45:

“Outbound packets are assigned a subport based on their MPLS labels. Once assigned, the packets are forwarded to a particular subport. The output of all the subports is aggregated and combined into a single high-speed packet stream and transmitted over the link. Inbound packets are received by the high speed PHY and forwarded to one of a plurality of subports. The subport chosen is the same subport that the packet was sent out over at the transmitting node. The subport is determined in accordance with the label within the packet itself. The subports used on both sides of the next hop, however, are independent of the current hop. Thus, the subports may be different for each hop of the connection.”

Raz, 7:17–38:

“In accordance with the invention, the assignment of traffic to 1G subports is based on LSPs. Thus, the MPLS label is used in order to assign an incoming packet to one of the subports. The selected subport is the same for both sides of a 10G link. In the next link on the path, however, the subport may be different. This is because the next link may have other connections in addition to the 10G link and therefore 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. Note that it is the downstream (i.e.

Exhibit E-4 – Invalidity of U.S. Patent No. 9,118,602 in view of Raz

	<p>receiving) node that determines the subport it wants to receive the LSP on. This decision is communicated to the upstream (i.e. sending) node via the label that is assigned to the LSP. As an example, consider two LSRS, LSR A and LSR B, each with 10 subports wherein each subport is mapped to an 8K range of labels. An LSP is to be provisioned from LSR A to LSR B. When the LSP is signaled or provisioned through management, the CAC in LSR B decides to accept the LSP on subport 3 and thus assigns a label comprising an indication that subport 3 was selected. The label is communicated to LSR A which now knows that the output subport should be subport 3 (i.e. the same subport is provisioned).”</p>
<p>15[a.iv] publish said packet label upstream; and</p>	<p>Raz discloses, either expressly or inherently, publish said packet label upstream.</p> <p>Raz, Abstract: “A subport forwarding and provisioning mechanism whereby a plurality of subports implemented using slower speed processors are used to perform the packet processing for a higher speed packet stream. Outbound packets are assigned a subport based on their MPLS labels. Once assigned, the packets are forwarded to a particular subport. The output of all the subports is aggregated and combined into a single high speed packet stream and transmitted over the link. Inbound packets are received by the high speed PHY and forwarded to one of a plurality of subports. The subport chosen is the one having the same subport index as the one through which the packet was sent out over at the transmitting node. Conventional layer 2 switches can also be used whereby reserved source MAC addresses are assigned to subports. The switch forwards the inbound packets to one of the subports in accordance with the packet's source MAC address. The invention also comprises a mechanism for provisioning protection tunnels and a method for allocating subport bandwidth to subports.”</p> <p>Raz, 7:17–38: “In accordance with the invention, the assignment of traffic to 1G subports is based on LSPs. Thus, the MPLS label is used in order to assign an incoming packet to one of the subports. The selected subport is the same for both sides of a 10G link. In the next link on the path, however, the subport may be different. This is because the next link may have other connections in addition to the 10G link and therefore 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. Note that it is the downstream (i.e. receiving) node that determines the subport it wants to receive the LSP on. This decision is communicated to the upstream (i.e. sending) node via the label that is assigned to the LSP. As an example, consider two LSRS, LSR A and LSR B, each with 10 subports wherein each subport is mapped to an 8K range of labels. An LSP is to be provisioned from LSR A to LSR B. When the LSP is signaled or provisioned through management, the CAC in LSR B decides to accept the LSP on subport 3 and thus assigns a label comprising an indication that subport 3 was selected. The label is communicated to LSR A which now knows that the output subport should be subport 3 (i.e. the same subport is provisioned).”</p>

Exhibit E-4 – Invalidity of U.S. Patent No. 9,118,602 in view of Raz

15[b.1] a mapper, which is configured to:	<p>Raz discloses, either expressly or inherently, a mapper.</p> <p>Raz, Abstract:</p> <p>“A subport forwarding and provisioning mechanism whereby a plurality of subports implemented using slower speed processors are used to perform the packet processing for a higher speed packet stream. Outbound packets are assigned a subport based on their MPLS labels. Once assigned, the packets are forwarded to a particular subport. The output of all the subports is aggregated and combined into a single high speed packet stream and transmitted over the link. Inbound packets are received by the high speed PHY and forwarded to one of a plurality of subports. The subport chosen is the one having the same subport index as the one through which the packet was sent out over at the transmitting node. Conventional layer 2 switches can also be used whereby reserved source MAC addresses are assigned to subports. The switch forwards the inbound packets to one of the subports in accordance with the packet's source MAC address. The invention also comprises a mechanism for provisioning protection tunnels and a method for allocating subport bandwidth to subports.”</p>
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Exhibit E-4 – Invalidity of U.S. Patent No. 9,118,602 in view of Raz

Raz, Fig. 6 and corresponding text:

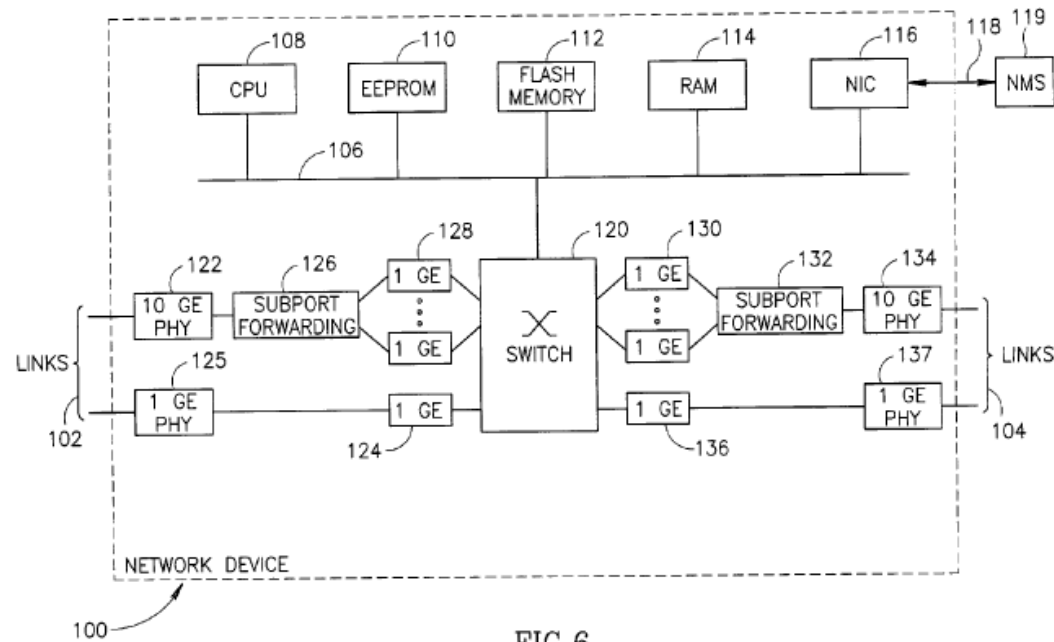


FIG.6

Raz, 2:9–20:

“Outbound packets are assigned a subport based on their MPLS labels. Once assigned, the packets are forwarded to a particular subport. The outputs of all the subports are aggregated and combined into a single high-speed packet stream and transmitted over the link. Inbound packets are received by the high speed PHY and forwarded to one of a plurality of subports. The subport chosen is the same subport as the one the packet was sent out from at the transmitting node. The subport is determined in accordance with the label within the packet itself. The subports used on both sides of the next hop, however, are independent. Thus, the subports may be different for each hop of the connection.”

Raz, 6:65–7:6:

“A diagram illustrating an example LSR with label based subport assignment constructed in

Exhibit E-4 – Invalidity of U.S. Patent No. 9,118,602 in view of Raz

	<p>accordance with a first embodiment of the present invention is shown in FIG. 1. The LSR network device, generally referenced 10, comprises a 10G PHY 24 coupled to a 10G link 28, a port forwarding module 22, a plurality of subports 14, labeled subport 0 through subport 9, switching fabric 12, CPU 16 and NMS interface 18. Note that the network device may comprise additional ports which are not shown for clarity.”</p> <p>Raz, 7:17–38: “In accordance with the invention, the assignment of traffic to 1G subports is based on LSPs. Thus, the MPLS label is used in order to assign an incoming packet to one of the subports. The selected subport is the same for both sides of a 10G link. In the next link on the path, however, the subport may be different. This is because the next link may have other connections in addition to the 10G link and therefore 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. Note that it is the downstream (i.e. receiving) node that determines the subport it wants to receive the LSP on. This decision is communicated to the upstream (i.e. sending) node via the label that is assigned to the LSP. As an example, consider two LSRS, LSR A and LSR B, each with 10 subports wherein each subport is mapped to an 8K range of labels. An LSP is to be provisioned from LSR A to LSR B. When the LSP is signaled or provisioned through management, the CAC in LSR B decides to accept the LSP on subport 3 and thus assigns a label comprising an indication that subport 3 was selected. The label is communicated to LSR A which now knows that the output subport should be subport 3 (i.e. the same subport is provisioned).”</p>
<p>15[b.ii] receive a data packet from an upstream node;</p>	<p>Raz discloses, either expressly or inherently, receiving a data packet from an upstream node.</p> <p>Raz, Abstract: “A subport forwarding and provisioning mechanism whereby a plurality of subports implemented using slower speed processors are used to perform the packet processing for a higher speed packet stream. Outbound packets are assigned a subport based on their MPLS labels. Once assigned, the packets are forwarded to a particular subport. The output of all the subports is aggregated and combined into a single high speed packet stream and transmitted over the link. Inbound packets are received by the high speed PHY and forwarded to one of a plurality of subports. The subport chosen is the one having the same subport index as the one through which the packet was sent out over at the transmitting node. Conventional layer 2 switches can also be used whereby reserved source MAC addresses are assigned to subports. The switch forwards the inbound packets to one of the subports in accordance with the packet's source MAC address. The invention also comprises a mechanism for provisioning protection tunnels and a method for allocating subport bandwidth to subports.”</p> <p>Raz, Fig. 3 and corresponding text:</p>

Exhibit E-4 – Invalidity of U.S. Patent No. 9,118,602 in view of Raz

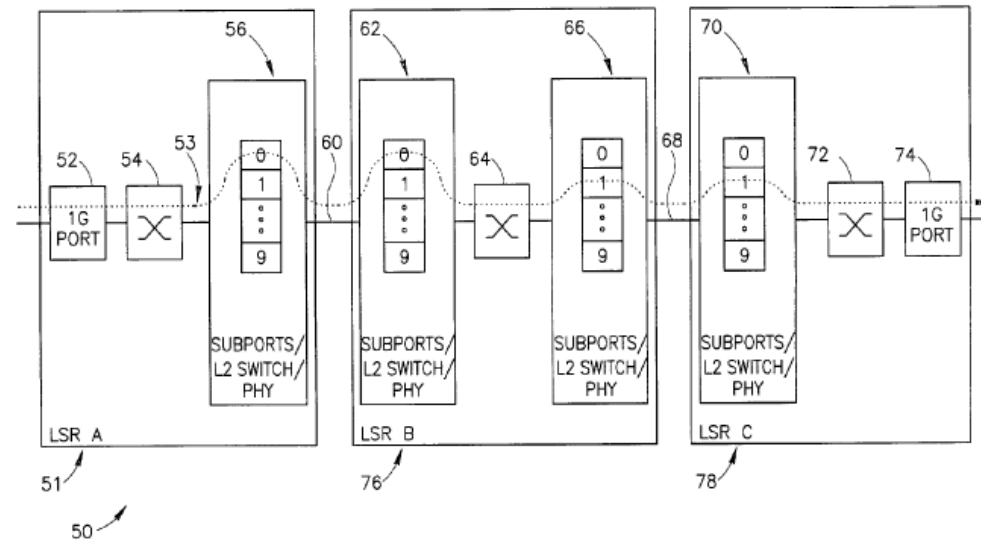


FIG.3

Raz, Fig. 6 and corresponding text:

Exhibit E-4 – Invalidity of U.S. Patent No. 9,118,602 in view of Raz

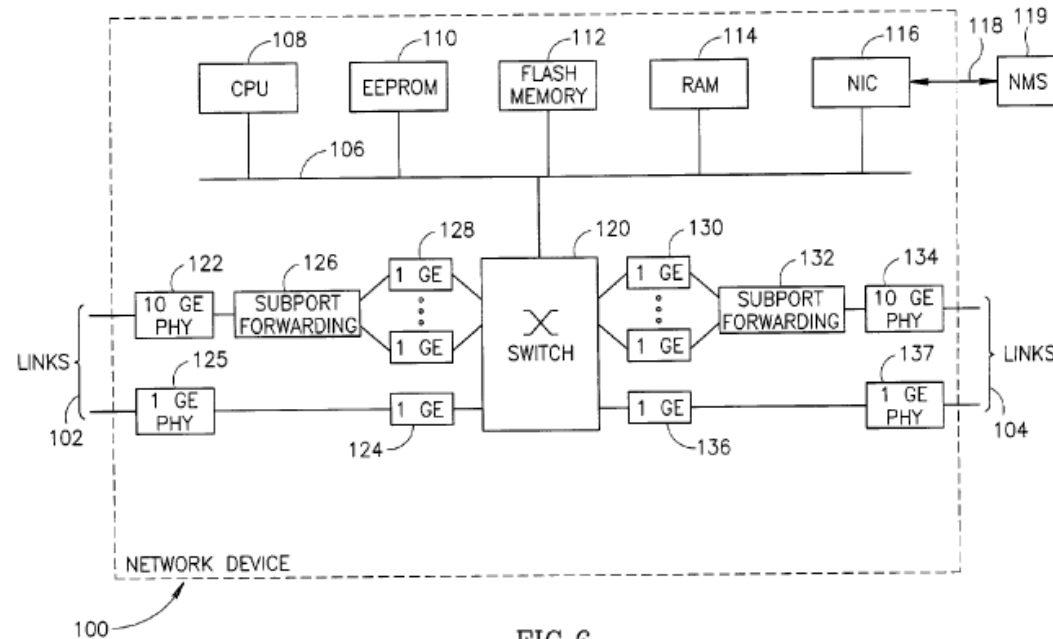


FIG.6

Raz, 2:9–20:

“Outbound packets are assigned a subport based on their MPLS labels. Once assigned, the packets are forwarded to a particular subport. The outputs of all the subports are aggregated and combined into a single high-speed packet stream and transmitted over the link. Inbound packets are received by the high speed PHY and forwarded to one of a plurality of subports. The subport chosen is the same subport as the one the packet was sent out from at the transmitting node. The subport is determined in accordance with the label within the packet itself. The subports used on both sides of the next hop, however, are independent. Thus, the subports may be different for each hop of the connection.”

Raz, 6:34–45:

“Outbound packets are assigned a subport based on their MPLS labels. Once assigned, the packets are forwarded to a particular subport. The output of all the subports is aggregated and combined into a single high-speed packet stream and transmitted over the link. Inbound packets are received

Exhibit E-4 – Invalidity of U.S. Patent No. 9,118,602 in view of Raz

	<p>by the high speed PHY and forwarded to one of a plurality of subports. The subport chosen is the same subport that the packet was sent out over at the transmitting node. The subport is determined in accordance with the label within the packet itself. The subports used on both sides of the next hop, however, are independent of the current hop. Thus, the subports may be different for each hop of the connection.”</p> <p>Raz, 6:51–54: “Further, 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</p> <p>Raz, 7:17–38: “In accordance with the invention, the assignment of traffic to 1G subports is based on LSPs. Thus, the MPLS label is used in order to assign an incoming packet to one of the subports. The selected subport is the same for both sides of a 10G link. In the next link on the path, however, the subport may be different. This is because the next link may have other connections in addition to the 10G link and therefore 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. Note that it is the downstream (i.e. receiving) node that determines the subport it wants to receive the LSP on. This decision is communicated to the upstream (i.e. sending) node via the label that is assigned to the LSP. As an example, consider two LSRS, LSR A and LSR B, each with 10 subports wherein each subport is mapped to an 8K range of labels. An LSP is to be provisioned from LSR A to LSR B. When the LSP is signaled or provisioned through management, the CAC in LSR B decides to accept the LSP on subport 3 and thus assigns a label comprising an indication that subport 3 was selected. The label is communicated to LSR A which now knows that the output subport should be subport 3 (i.e. the same subport is provisioned).”</p> <p>Raz, 7:39–48: “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. Unlabeled packets do not belong to any LSP. Usually these comprise control packets so there are not many of them. These unlabeled packets will always use a specific subport, for example, subport 8.”</p>
15[b.iii] detect said data packet label in said data packet; and if said data packet contains said	Raz discloses, either expressly or inherently, a mapper, which is configured to detect said data packet label in said data packet; and 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.

Exhibit E-4 – Invalidity of U.S. Patent No. 9,118,602 in view of Raz

<p>data packet label, send said data packet to the second MPLS/LAG switch via said single physical tunnel port.</p>	<p>Raz, Abstract: “A subport forwarding and provisioning mechanism whereby a plurality of subports implemented using slower speed processors are used to perform the packet processing for a higher speed packet stream. Outbound packets are assigned a subport based on their MPLS labels. Once assigned, the packets are forwarded to a particular subport. The output of all the subports is aggregated and combined into a single high speed packet stream and transmitted over the link. Inbound packets are received by the high speed PHY and forwarded to one of a plurality of subports. The subport chosen is the one having the same subport index as the one through which the packet was sent out over at the transmitting node. Conventional layer 2 switches can also be used whereby reserved source MAC addresses are assigned to subports. The switch forwards the inbound packets to one of the subports in accordance with the packet's source MAC address. The invention also comprises a mechanism for provisioning protection tunnels and a method for allocating subport bandwidth to subports.”</p> <p>Raz, Figs. 1–2 and corresponding text:</p>
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Exhibit E-4 – Invalidity of U.S. Patent No. 9,118,602 in view of Raz

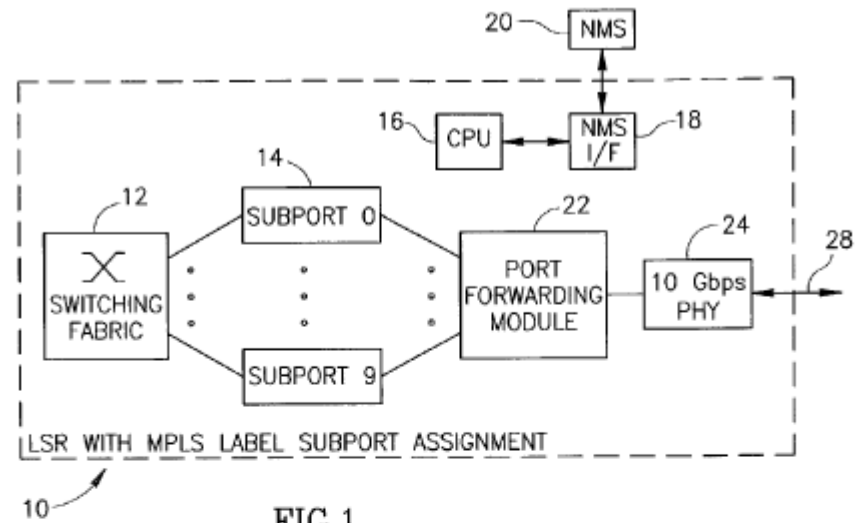


FIG.1

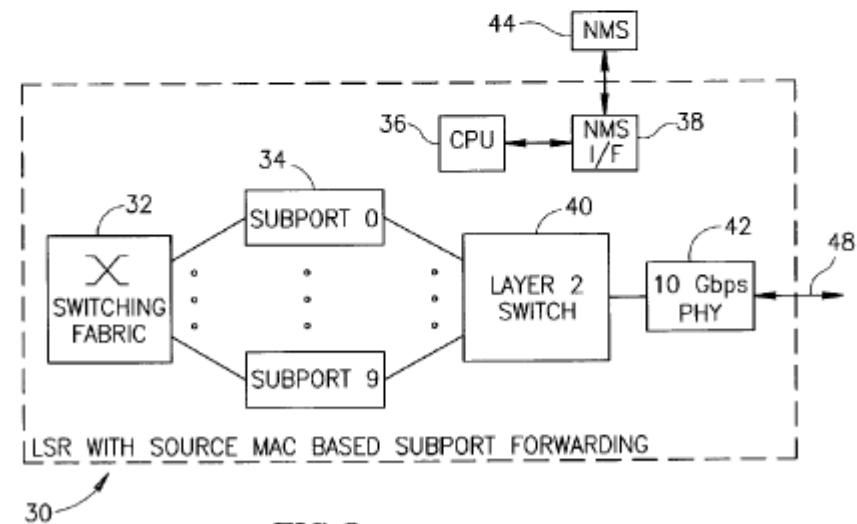


FIG.2

Exhibit E-4 – Invalidity of U.S. Patent No. 9,118,602 in view of Raz

Raz, Fig. 4 and corresponding text:

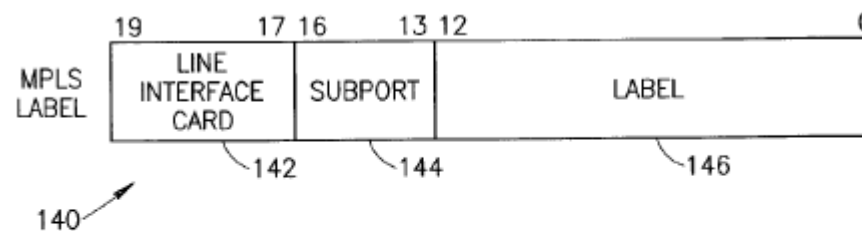


FIG.4

Raz, Fig. 6 and corresponding text:

Exhibit E-4 – Invalidity of U.S. Patent No. 9,118,602 in view of Raz

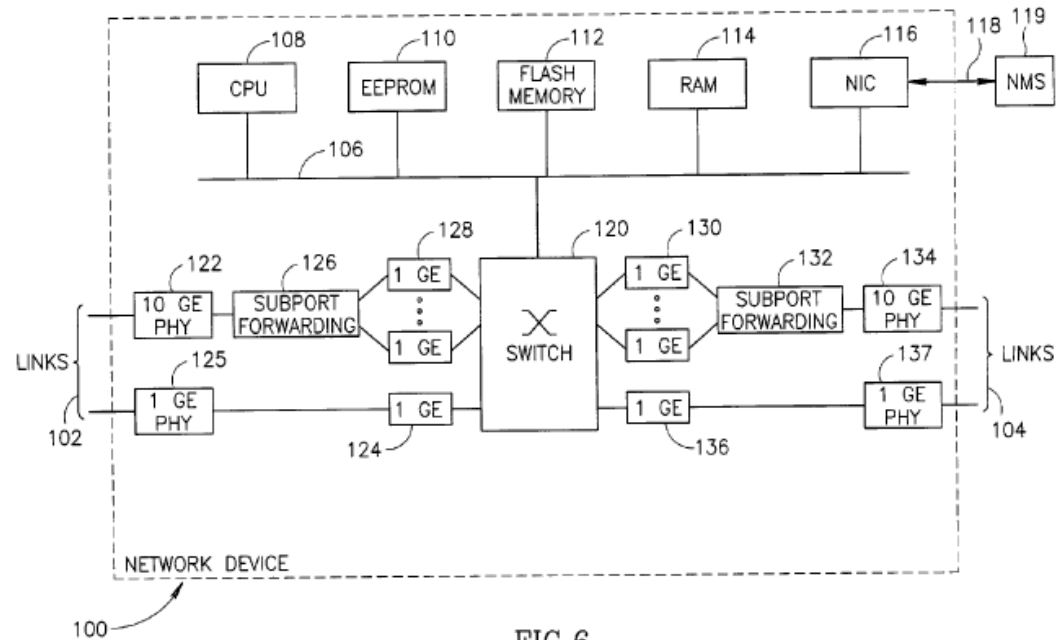


FIG.6

Raz, 1:11–39:

“Currently, the number of data networks and the volume of traffic these networks carry are increasing at an ever increasing rate. The network devices making up these networks generally consist of specialized hardware designed to move data at very high speeds. Typical asynchronous packet based networks, such as Ethernet or MPLS based networks, are mainly comprised of end stations, hubs, switches, routers, bridges and gateways. A network management system (NMS) is typically employed to provision, administer and maintain the network.

Multiprotocol Label Switching (MPLS) based networks 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). The route of an LSP is determined by the network layer routing function or by a centralized entity (e.g., a Network Management System) from the topology of the network, the status of its resources and the demands of the user. Any suitable link state routing protocol may be used such as Open Shortest Path First (OSPF) or Intermediate System to Intermediate System (ISIS) routing protocol to provide the link state topology information needed by the network layer routing to engineer data traffic. It is also possible to use a local neighbor-

Exhibit E-4 – Invalidity of U.S. Patent No. 9,118,602 in view of Raz

discovery protocol and have a centralized management entity maintain the topology view. LSPs may be setup using any suitable signaling protocol such as RSVP-TE or CR-LDP or using the management plane (e.g., NMS setting the relevant MIB items that create the LSPs).”

Raz, 2:3–8:

“To provide the flexibility required for protocols such as MPLS, a network processor or FPGA is used to implement the subport. A network processor is a device optimized for packet processing while a FPGA can be programmed with any desired custom circuit to implement the required algorithms and processing.”

Raz, 2:9–20:

“Outbound packets are assigned a subport based on their MPLS labels. Once assigned, the packets are forwarded to a particular subport. The outputs of all the subports are aggregated and combined into a single high-speed packet stream and transmitted over the link. Inbound packets are received by the high speed PHY and forwarded to one of a plurality of subports. The subport chosen is the same subport as the one the packet was sent out from at the transmitting node. The subport is determined in accordance with the label within the packet itself. The subports used on both sides of the next hop, however, are independent. Thus, the subports may be different for each hop of the connection.”

Raz, 2:41–51:

“There is thus provided in accordance with the invention 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 and forwarding inbound packets from the high speed packet stream to a subport corresponding to the subport the inbound packet was originally sent out on.”

Raz, 3:1–33:

“There is further provided in accordance with the invention an apparatus for forwarding a high speed packet stream to a plurality of subports of lesser speed in a label switching network, comprising assignment means for assigning outbound packets to one of a plurality of subports in accordance with the label associated with each outbound packet, a line interface adapted to transmit and receive a high speed packet stream, a plurality of subports, each subport of lesser speed than the line interface, a subport forwarding module in communication with the line interface and the plurality of subports, the subport forwarding module adapted to forward each outbound packet from its assigned subport to the line-interface and to forward inbound packets from the line interface to one of the plurality of subports in accordance with the label of each

Exhibit E-4 – Invalidity of U.S. Patent No. 9,118,602 in view of Raz

	<p>inbound packet.</p> <p>There is also provided in accordance with the invention a network device for use in a label switching network comprising a switching fabric, a line interface adapted to interface to one or more data links, a plurality of subports, each subport of lesser speed than the speed of the line interface, a memory having at least one region for storing executable program code, a programmed central processor for executing the program code stored in the memory, wherein the program code further comprises code to assign outbound packets to one of a plurality of subports in accordance with the label associated with each outbound packet and a subport forwarding module in communication with the line interface and the plurality of subports, the subport forwarding module further comprises means for forwarding outbound packets from the subports to the line-interface and for forwarding inbound packets from the line interface to one of the plurality of subports in accordance with the label of each inbound packet.”</p> <p>Raz, 3:55–4:2:</p> <p>“There is also provided in accordance with the invention a computer program product for use in a network device, the computer program product comprising a computer useable medium having computer readable program code means embodied in the medium for performing forwarding of packets to a plurality of subports, the computer program product comprising computer readable program code means for assigning outbound packets to one of a plurality of subports in accordance with the label associated with each outbound packet, computer readable program code means for forwarding each outbound packet to its assigned subport and computer readable program code means for forwarding inbound packets from a high speed packet stream to a subport corresponding to the subport having the same index as the one the inbound packet was originally sent out on.”</p> <p>Raz, 6:34–45:</p> <p>“Outbound packets are assigned a subport based on their MPLS labels. Once assigned, the packets are forwarded to a particular subport. The output of all the subports is aggregated and combined into a single high-speed packet stream and transmitted over the link. Inbound packets are received by the high speed PHY and forwarded to one of a plurality of subports. The subport chosen is the same subport that the packet was sent out over at the transmitting node. The subport is determined in accordance with the label within the packet itself. The subports used on both sides of the next hop, however, are independent of the current hop. Thus, the subports may be different for each hop of the connection.”</p> <p>Raz, 7:17–38:</p> <p>“In accordance with the invention, the assignment of traffic to 1G subports is based on LSPs. Thus, the MPLS label is used in order to assign an incoming packet to one of the subports. The selected subport is the same for both sides of a 10G link. In the next link on the path, however, the subport may be different. This is because the next link may have other connections in addition to the 10G</p>
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Exhibit E-4 – Invalidity of U.S. Patent No. 9,118,602 in view of Raz

	<p>link and therefore 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. Note that it is the downstream (i.e. receiving) node that determines the subport it wants to receive the LSP on. This decision is communicated to the upstream (i.e. sending) node via the label that is assigned to the LSP. As an example, consider two LSRS, LSR A and LSR B, each with 10 subports wherein each subport is mapped to an 8K range of labels. An LSP is to be provisioned from LSR A to LSR B. When the LSP is signaled or provisioned through management, the CAC in LSR B decides to accept the LSP on subport 3 and thus assigns a label comprising an indication that subport 3 was selected. The label is communicated to LSR A which now knows that the output subport should be subport 3 (i.e. the same subport is provisioned).”</p>
16 The apparatus according to claim 15, wherein the processor is configured to make said selection in compliance with a service property.	See Claim 4.
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.	See Claim 5.
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.	See Claim 6.
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.	See Claim 6.

Exhibit E-4 – Invalidity of U.S. Patent No. 9,118,602 in view of Raz

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.	See Claim 9.
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.	See Claim 10.
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 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.	See Claim 11.

Exhibit E-4 – Invalidity of U.S. Patent No. 9,118,602 in view of Raz

23 The apparatus according to claim 15, wherein said first MPLS/LAG switch comprises a Label Switched Router (LSR).	<i>See Claim 13.</i>
24 The apparatus according to claim 15, wherein said processor comprises a network processor.	<i>See Claim 15[a.i].</i>
25 The apparatus according to claim 15, wherein said plurality of physical data ports are selected from a single logical port.	<i>See Claim 14.</i>
26[pre] 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:	<i>See Claim 1–14.</i>
26[a] 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;	<i>See Claim 1–14.</i>
26[b] 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	<i>See Claim 1–14.</i>

Exhibit E-4 – Invalidity of U.S. Patent No. 9,118,602 in view of Raz

of the LAG, which meets the specified bandwidth requirement, wherein said single physical tunnel port of said LAG has a port serial number;	
26[c] 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;	See Claim 1–14.
26[d] 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;	See Claim 1–14.
26[e] 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	See Claim 1–14.
26[f] 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.	See Claim 1–14.