

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

CISCO SYSTEMS, INC.,
Petitioner

IPR2023-00607
U.S. Patent No. 7,190,698

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

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PETITIONER’S EXHIBIT LIST

Ex.1001	U.S. 7,190,698
Ex.1002	Prosecution History of U.S. 7,190,698
Ex.1003	Declaration of Henry H. Houh, Ph.D. under 37 C.F.R. § 1.68
Ex.1004	<i>Curriculum Vitae</i> of Henry H. Houh, Ph.D.
Ex.1005	“Internet QoS: A Big Picture,” Xiao <i>et al.</i> , (“Xiao”)
Ex.1006	U.S. 6,678,264 to Gibson (“Gibson”)
Ex.1007	“Resource sharing in advance reservation agents,” Schelén <i>et al.</i> , (“Schelen-2”)
Ex.1008	Multiprotocol Label Switching Architecture, Rosen <i>et al.</i>
Ex.1009	RFC 1518
Ex.1010	U.S. 6,701,437
Ex.1011	“Performance of QoS Agents for Provisioning Network Resources,” Schelen <i>et al.</i>
Ex.1012	Schelen, O. “Quality of Service Agents in the Internet,” Doctoral Thesis, Department of Computer Science and Electrical Engineering, Division of Computer Communication, Lulea University of Technology, Lulea 1998 (“Schelen Thesis”)
Ex.1013	U.S. 6,079,020
Ex.1014	U.S. 6,487,170
Ex.1015	“An Architecture for Differentiated Services,” Blake <i>et al.</i>
Ex.1016	“RATES: A Server for MPLS Traffic Engineering,” Aukia <i>et al.</i>
Ex.1017	“White Paper - QoS protocols & architectures,” QoSforum.com
Ex.1018	U.S. 5,884,297

Ex.1019	“Advance Reservations for Predictive Service in the Internet,” Degermark <i>et al.</i> , (“Degermark”)
Ex.1020	“A Discussion of Bandwidth Broker Requirements for Internet2 Qbone Deployment,” Hares <i>et al.</i> , Internet2 Qbone BB Advisory Council, August 1999
Ex.1021	“A two-tier resource management model for the Internet,” by Terzis et al., <i>Seamless Interconnection for Universal Services. Global Telecommunications Conference. GLOBECOM'99. (Cat. No.99CH37042)</i> , 1999, pp. 1779-1791 vol.3, doi: 10.1109/GLOCOM.1999.832469
Ex.1022	“Definition of the Differentiated Services Field (DS Field) in the IPv4 and IPv6 Headers,” Nichols <i>et al.</i>
Ex.1023	“Network Element Service Specification Template,” Shenker <i>et al.</i> ,
Ex.1024	“Specification of Guaranteed Quality of Service,” Shenker <i>et al.</i>
Ex.1025	“A Two-Tier Resource Management Model for Differentiated Services Networks,” Reichmeyer <i>et al.</i>
Ex.1026	Andrew T. Campbell “A Quality of Service Architecture,” Doctoral Thesis, Computing Department Lancaster University, Lulea 1996
Ex.1027	U.S. 6,744,767
Ex.1028	“Current status on quality of service in IP,” Chiu
Ex.1029	“A Framework for IP Based Virtual Private Networks,” Gleeson <i>et al.</i>
Ex.1030	“An Architecture for Advance Reservations in the Internet,” Berson <i>et al.</i>
Ex.1031	“Sharing resources through advance reservation agents,” Schelen <i>et al.</i> published in Proceedings of IFIP Fifth International Workshop on Quality of Service (IWQoS'97), New York
Ex.1032	“An Agent-based Architecture for Advance Reservations,” Schelen

	<i>et al.</i> , (“Schelen-1”)
Ex.1033	“A Two-bit Differentiated Services Architecture for the Internet,” Nichols <i>et al.</i>
Ex.1034	“Aggregating Resource Reservations over Multiple Routing Domains,” Schelen <i>et al.</i>
Ex.1035	“A Better Model for Generating Test Networks,” Doar <i>et al.</i>
Ex.1036	Complaint filed on May 24, 2022
Ex.1037	Amended complaint filed on August 19, 2022
Ex.1038	“Modeling Internet Topology,” Doar <i>et al.</i>
Ex.1039	Declaration of Ingrid Hsieh-Yee, Ph.D. under 37 C.F.R. § 1.68
Ex.1040	’698 Patent Provisional Application (from WIPO)
Ex.1041	Proposed Docket Control Order, <i>NetSocket, Inc., v. Cisco Systems, Inc.</i> , Civil Action No. 2:22-cv-172-JRG (E.D. Tex, Dec. 21, 2022)
Ex.1042	Federal Court Statistics

I. INTRODUCTION

Pursuant to 35 U.S.C. §§ 311, 314(a), and 37 C.F.R. § 42.100, Cisco Systems, Inc. (“Petitioner”) respectfully requests that the Board institute *inter partes* review and cancel claims 1-8 (hereinafter, the “Challenged Claims”) of U.S. 7,190,698 (“’698 patent,” Ex.1001) because the claimed subject matter was already known and would have been obvious under pre-AIA 35 U.S.C. § 103.

II. GROUNDS FOR STANDING

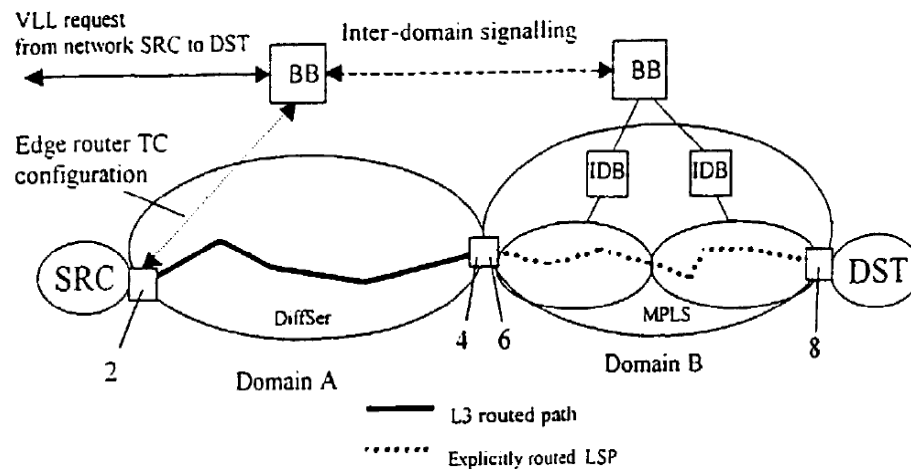
Petitioner certifies that the ’698 patent is eligible for IPR and that Petitioner is not barred or estopped from requesting IPR challenging the patent claims. 37 C.F.R. § 42.104(a).

III. NOTE

Petitioner cites to exhibits’ original page or column numbers where available. Emphasis in quoted material has been added.

IV. SUMMARY OF THE ’698 PATENT

Dr. Houh’s Declaration Ex.1003, ¶¶35-49, summarizes the technology, as it relates to the ’698 patent. The ’698 patent generally discloses a method of establishing a virtual leased line (“VLL”) between a source (“SRC”) and a destination (“DST”) across different domains. Ex.1001, 1:5-10, 7:19-20.



Ex.1001, Fig. 4

In Figure 4, domain A is a differentiated services (“DiffServ”) domain, and domain B is Multi-Protocol Label Switching (“MPLS”) domain. Ex.1001, 7:10-25. Inter-domain bandwidth brokers (“BB”) are associated with each domain, and the MPLS domain B also includes intra-domain brokers (“IDBs”). Ex.1001, 7:10-25, Figs. 3-4. The BBs communicate with each other to set up the VLL for packet transfer from the SRC to the DST. Ex.1001, 2:53-55; Ex.1003, ¶¶50-53.

V. PROSECUTION HISTORY

The Applicant, before an action on the merits, submitted an IDS identifying a paper authored by Schelen et al. Ex. 1031; Ex.1002, 115-116. After an Examiner interview, which generally made clarification amendments, the claims were allowed. Ex.1002, 38. The Notice of Allowance noted that the IDS “fails to comply with 37 CFR 1.98(a)(2) [because] applicant failed to provide a legible copy of the”

Schelen paper and, therefore, it was “not ... considered.” Ex.1002, 41; Ex.1003, ¶¶54-56.

VI. LEVEL OF ORDINARY SKILL IN THE ART

A Person of Ordinary Skill in The Art (“POSITA”) on April 13, 2000, would have been knowledgeable and familiar with packet-based communication network techniques available at the time. Such a POSITA would have had a bachelor’s degree in computer science, computer engineering, electrical engineering, or equivalent training, and approximately two years of experience working in the field of network communications. Additional work experience can substitute for specific educational background, and vice versa. Ex.1003, ¶¶27-29.

VII. CLAIM CONSTRUCTION

Claim terms in IPRs are construed according to their “ordinary and customary meaning” to those of skill in the art. 37 C.F.R. § 42.100(b). Petitioner submits that, for the purposes of this proceeding and the grounds presented herein, only one term requires express construction. *Nidec Motor Corp. v. Zhongshan Broad Ocean Motor Co.*, 868 F.3d 1013, 1017 (Fed. Cir. 2017). Ex.1003, ¶¶57-58.

In co-pending litigation, Petitioner may argue that the boundaries of certain terms are unclear, rendering such terms indefinite under 35 U.S.C. § 112, ¶ 2. Such issues are outside the scope of the present proceeding and do not preclude the

Board’s evaluation of the challenged claims relative to the prior art as presented herein.

A. “*bandwidth broker*”

The ’698 patent states that “[a] bandwidth broker is an entity in a network domain that manages policies for bandwidth resources.” Ex.1001, 2:48-49. Exemplary policy management activities include, “maintaining a database of the domain’s resources,” “provid[ing] admission control,” “configuring the network,” “communicat[ing] with bandwidth brokers in neighbouring domains,” among other policy management activities. Ex.1001, 2:27-55.

Thus, a POSITA would have understood “*bandwidth broker*” to include entities that manage policies for bandwidth resources by, for example, maintaining resource information, providing admission control, configuring the network, or communicating with neighboring bandwidth brokers to allocate resources across multiple domains. Ex.1003, ¶¶59-60.

VIII. RELIEF REQUESTED AND REASONS FOR THE REQUESTED RELIEF

Petitioner asks that the Board institute a trial for *inter partes* review and cancel the Challenged Claims in view of the analysis below. Petitioner challenges the claims of the ’698 patent because they are asserted in co-pending litigation. Finding the Challenged Claims unpatentable here will reduce the time and expense

of '698 patent litigation for all parties.

IX. IDENTIFICATION OF HOW THE CLAIMS ARE UNPATENTABLE

A. Challenged Claims and Statutory Grounds for Challenges¹

Grounds	Claims	Basis
#1	1-5, 7-8	35 U.S.C. § 103 (Pre-AIA) over Xiao, Schelen-1, and Gibson
#2	4-8	35 U.S.C. § 103 (Pre-AIA) over Xiao, Schelen-1, Gibson, and Schelen-2

The '698 patent cites to Provisional No. 60/197,006, filed on April 13, 2000, and a PCT No. PCT/EP01/04062, filed on April 6, 2001. The '006 Provisional does not support the issued claims of the '698 patent. *See* Ex.1001, 9:60-10:8; Ex.1040, *generally*. For example, among other claimed features, the '006 Provisional fails to disclose “*establish[ing] a virtual leased line,*” “*generat[ing] a request....,*” or that the bandwidth broker “*establishes the different domains involved...*” Accordingly, the '698 patent's priority date is the PCT date of April 6, 2001. *See* 35 U.S.C. §§ 102 (b), 112 first paragraph, 119(a). Regardless, the

¹ Petitioner relies on the teachings, and not on a physical incorporation of elements. *See In re Mouttet*, 686 F.3d 1322, 1332 (Fed. Cir. 2012); *In re Etter*, 756 F.2d 852, 859 (Fed. Cir. 1985).

cited prior art predates and renders obvious the claims even if the '698 patent's priority date was the date of the '006 Provisional.

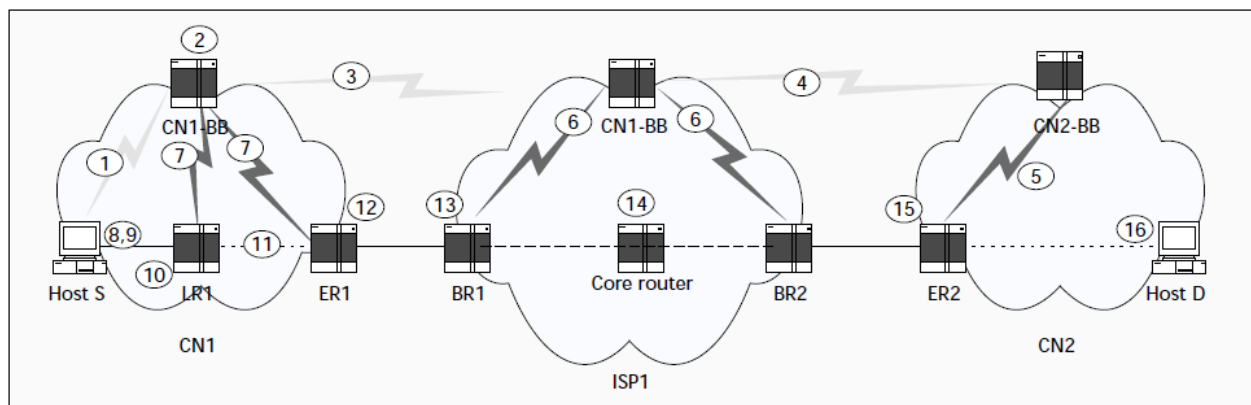
Gibson (Ex.1006) is U.S. Patent 6,678,264 which was filed by Gibson et al., on June 30, 1999. **Xiao** (Ex.1005) is an article by Xiao et al., that was published by the IEEE around "March/April 1999." **Schelen-1** (Ex.1032) is an article by Schelén et al., that was published in 1997. Ex.1011. **Schelen-2** (Ex.1007) is an article by Schelén et al., that was published in January 1998. The declaration of Dr. Hsieh-Yee (Ex.1039) provides evidence establishing that Xiao (¶¶8-9, 18-43), Schelen-1 (¶¶8-9, 68-84) and Schelen-2 (¶¶8-9, 44-67) were publicly available by more than one year before the priority of the '698 patent. Ex.1039. These references are prior art under at least 35 U.S.C. §§ 102(a), 102(b), and 102(e).

Petitioner's analysis cites additional prior art to support assertions regarding what a POSITA would have understood from the asserted prior art. *See Yeda Research v. Mylan Pharm. Inc.*, 906 F.3d 1031, 1041-1042 (Fed. Cir. 2018); 37 C.F.R. § 42.104(b); *see also K/S HIMPP v. Hear-Wear Techs., LLC*, 751 F.3d 1362, 1365-66 (Fed. Cir. 2014); *Arendi S.A.R.L. v. Apple Inc.*, 832 F.3d 1355, (Fed. Cir. 2016).

B. Summary of the Art and Reasons to Combine

1. Xiao

Xiao discloses a framework for “differentiated services [DiffServ], multiprotocol label switching (MPLS),” among other quality of service protocols. Ex.1005, 1. Within the context of DiffServ, Xiao at Figure 4 discloses providing “premium service” that supports “virtual lease lines” between a source “Host S” and a destination “Host D.” Ex.1005, 11-14.



■ Figure 4. The delivery process of premium service with a dynamic SLA.

Ex.1005, Fig. 4.

Xiao further explains that “MPLS can be used together with differentiated services” and that these two protocols “can easily interoperate.” Ex.1005, 14; Ex.1003, ¶¶61-65.

2. Schelen-1 and Schelen-2

Schelen-1 generally discloses how reservation agents (“also known as bandwidth brokers”) perform admission control. Ex.1032, 451-454; Ex.1011, 17;

Ex.1012, 25. Schelen-2 discloses that the bandwidth broker has a “topology map of the domain,” routing information (such as link resources) used to perform admission control, and storage for storing the granted reservation state. Ex.1007, 213-215, 221; Ex.1003, ¶¶66-69.

3. Gibson

Gibson discloses an MPLS network, illustrated below at Figure 1.

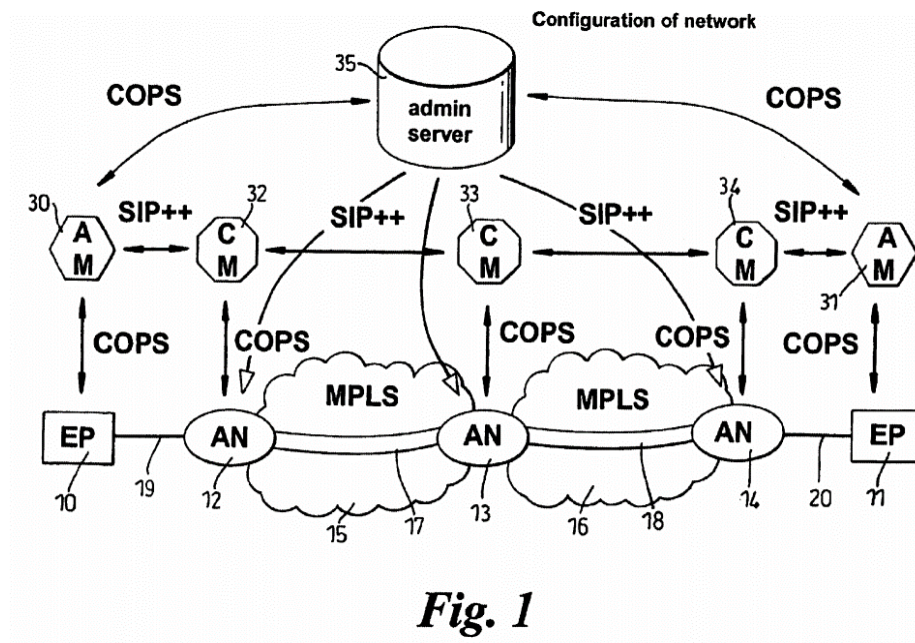


Fig. 1

Ex.1006, Fig. 1.

Gibson has a management layer comprising admission managers (AM 30, 31) connection managers (CM 32, 33, 34) and an administrative server (admin server 35). Ex.1006, 6:11-16; see also Ex.1006, 5:13-25; 17:24-26. Gibson’s admission manager, for example, maintains a topological map that it uses for

admission control to establish a connection between two endpoints. Ex.1006, 7:25-8:54; Ex.1003, ¶¶70-72.

4. Reasons to Combine Schelen-1 and Schelen-2 with Xiao

First, Xiao, Schelen-1, and Schelen-2, are analogous art to the '698 patent, because each reference discloses a bandwidth broker that performs admission control within a given domain. Ex.1001, 1:5-10, 3:64-4:2; Ex.1005, 11-13; Ex.1007, Abstract; Ex.1032, Abstract, 451-452. A POSITA considering Xiao would have also considered Schelen-1 and Schelen-2, which provide additional bandwidth broker teachings applicable to Xiao's bandwidth brokers. Ex.1003, ¶75.

Second, the combined teachings of Xiao, Schelen-1, and Schelen-2 would produce beneficial and predictable results. Ex.1003, ¶76.

Xiao uses a bandwidth broker to perform admission control in different network domains but provides limited details regarding the bandwidth broker. Ex.1005, 11-13. Schelen-1 and Schelen-2 provide implementation details regarding how a bandwidth broker performs admission control as contemplated by Xiao. For instance, Schelen-1 discloses using a bandwidth broker in each network domain, including hierarchical routing domains (elements [1.0.2]-[1.0.4]). Schelen-1 provides more implementation details of how the bandwidth broker operates, including how it establishes the different bandwidth brokers and network domains involved to reach a destination network (element [1.2]), communicates reservation

request with neighboring bandwidth brokers (elements [1.3]-[1.5.2]) and performs admission control to establish a communication session from the source to the destination. For example, the Schelen references teach how the bandwidth broker performs admission control based on topology and routing information, as well as how the bandwidth broker stores reservation and accounting information (*see* claims 4-8). It would have been obvious to a POSITA to consider and apply the bandwidth broker details of Schelen-1 and Schelen-2, when implementing Xiao's bandwidth broker to achieve the results that Xiao is already describing. This reason is sufficient to explain why one of ordinary skill in the art would have sought to combine the relevant teachings. Ex.1003, ¶73.

Additional reasons for combining the relevant teachings are provided in the claim analysis below. Ex.1003, ¶¶74, 77-107.

Third, the results would have been predictable and there would have been a reasonable expectation of success in the combination since Xiao, Schelen-1, and Schelen-2 all address the same technology, as analyzed above. Any modification needed to Xiao, to accommodate the bandwidth broker teachings of Schelen-1, and Schelen-2, would have been within the ordinary skill in the art, including implementing the combined teachings in hardware and software. *See* Ex.1005, 11; Ex.1011, 25. Ex.1003, ¶¶108-109.

5. Reasons to Combine Gibson with Xiao

First, Gibson is analogous art. Gibson discloses an “admission manager” that corresponds with a bandwidth broker and performs admission control in an MPLS network. Ex.1001, 6:47-54, 7:10-25; Ex.1006, 7:25-57. Xiao similarly addresses MPLS networks. Ex.1005, 14. Accordingly, a POSITA considering Xiao would have found Gibson’s MPLS teachings relevant. Ex.1003, ¶110.

Second, a POSITA would have had reasons to combine the teachings of Gibson and Xiao to produce numerous predictable and beneficial results, as analyzed in the claim analysis below. Ex.1003, ¶¶111-121.

Third, the results would have been predictable and there would have been a reasonable expectation of success in the combination since Xiao already discloses an MPLS domain and uses a bandwidth broker. Gibson simply provides additional implementation details on how to manage the MPLS domain with bandwidth brokers. A POSITA would have possessed the skills to make the proposed combination, including being able to implement the combined teachings in corresponding hardware and software. Ex.1005, 11; Ex.1011, 25; Ex.1003, ¶¶122-123.

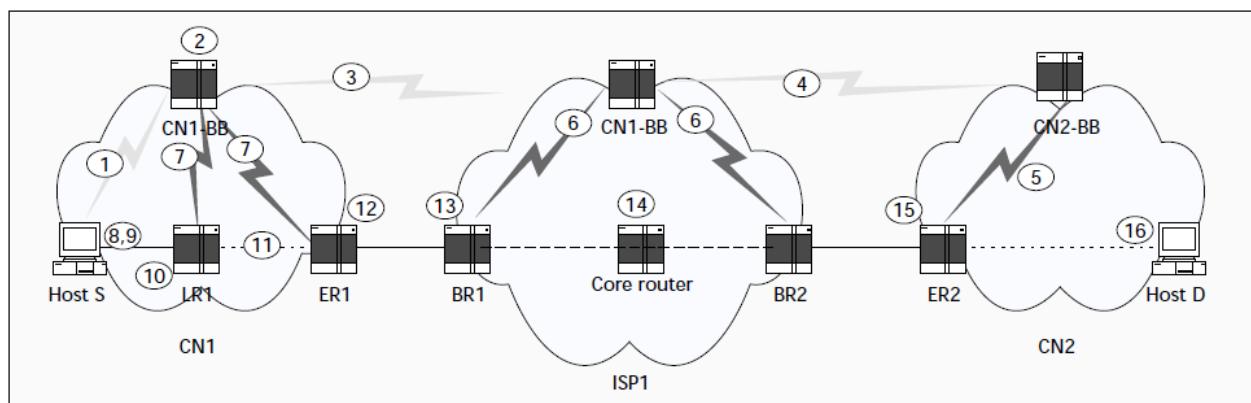
C. Ground 1: Claims 1-5 and 7-8 are obvious over Xiao, Schelen-1, and Gibson

1. Claim 1

[1.0.1] Method in a packet based communication network including network domains, wherein at least one domain is a Multiprotocol Label Switching MPLS domain,

To the extent limiting, the prior art combination renders obvious the preamble. Ex.1003, ¶¶124-125.

First, Xiao discloses a **“process of premium service”** for delivering **“packets”** in a communication network including multiple network domains, as illustrated at Figure 4. Ex.1005, 12-13 (Example 2).



■ Figure 4. *The delivery process of premium service with a dynamic SLA.*

Ex.1005, Fig. 4.

Since Xiao supports “premium service,” which is available as a DiffServ class (Ex.1005, 10-13), it would have been obvious to a POSITA for the illustrated network domains of Figure 4 to be DiffServ. Ex.1003, ¶¶126-127; *see also* Ex.1022.

In more detail, Figure 4 includes a source “corporate network 1” CN1, a destination “corporate network 2” CN2, and an internet service provider network “ISP1.” Ex.1005, 10, 12-13, Fig. 4. The source corporate network CN1 and the destination corporate network CN2 are two different “**customer domains**” that are separated by at least ISP1, an ISP “**domain.**” Ex.1005, 13. Although only one ISP is illustrated, Xiao contemplates that “**there are multiple ISPs between CN1 and CN2.**” Ex.1005, 13. Xiao also explains that “**MPLS can be used together with differentiated services to provide QoS.**” Ex.1005, 14. Xiao’s teaching is consistent with “real-world use, [where] it is unlikely that [DiffServ and MPLS] QoS protocols will be used independently.” Ex.1017, 16; Ex.1003, ¶¶128-129.

Reasons to Combine

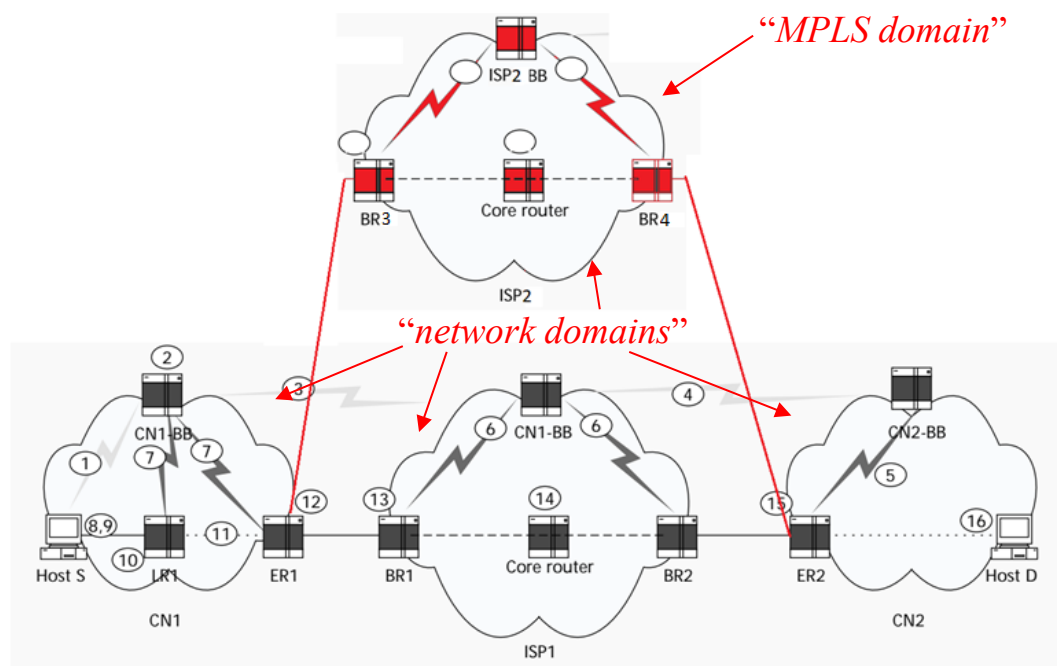
It would have been obvious to a POSITA to implement multiple ISPs in the communications network of Figure 4, including ISPs that support different QoS protocols such as DiffServ and MPLS, since Xiao itself suggests this modification. Ex.1005, 14. Additional reasons to use an MPLS ISP in various configurations are provided below. Ex.1003, ¶130.

Xiao discloses how MPLS ingress and egress routers modify headers of DiffServ packets. Ex.1005, 14. Xiao’s teachings of using DiffServ and MPLS together, coupled with the teachings of how the MPLS routers modify the packet

headers of DiffServ packets, supports a reasonable expectation of success in implementing an MPLS domain ISP in Figure 4. Ex.1003, ¶¶131-134.

Parallel DiffServ and MPLS ISP Domains

Below modified Figure 4 illustrates parallel DiffServ and MPLS domain ISPs.



■ Figure 4. The delivery process of premium service with a dynamic SLA.

Ex.1005, Fig. 4 (annotated and modified showing parallel ISPs); Ex.1003, ¶133.

In modified Figure 4, the MPLS domain ISP (referred to as "ISP2") includes border routers BR3 and BR4 (which would perform the MPLS header insertion and removal on packets transmitted via ER1 and ER2). Ex.1005, 14. The MPLS domain ISP2 would also include a bandwidth broker (referred to as "ISP2-BB"). It would have been obvious to associate ISP2-BB with the ISP2 domain in view of

Xiao’s recognition that “at the ISP...admission control decisions can be made...by a BB” and that “[i]t is technically better to have a BB to allocate resources.”

Ex.1005, 11; *see also* [1.0.3], *infra*; Ex.1003, ¶134.

It would have been obvious to a POSITA to utilize parallel ISPs in Xiao’s Figure 4 for redundancy. Ex.1025, 2-3; Ex.1035, 8. Such an implementation would be beneficial since, if one ISP is unavailable, the customer would still be able to obtain service through the parallel ISP. Another reason is to reduce the chance of exceeding peak rates and thereby avoid dropping excess traffic. Xiao explains that the customer must not exceed a peak rate—which is defined by the service level agreement (“SLA”)—else the excess traffic would be dropped. Ex.1005, 15, 11. Xiao suggests that a solution to this issue may be to “provide more resources by upgrading the infrastructure.” Ex.1005, 15. A POSITA would have understood that a parallel ISP would be an upgrade to the infrastructure and therefore reduce the risk of exceeding peak rate and dropping excess traffic. Ex.1003, ¶¶135-136.

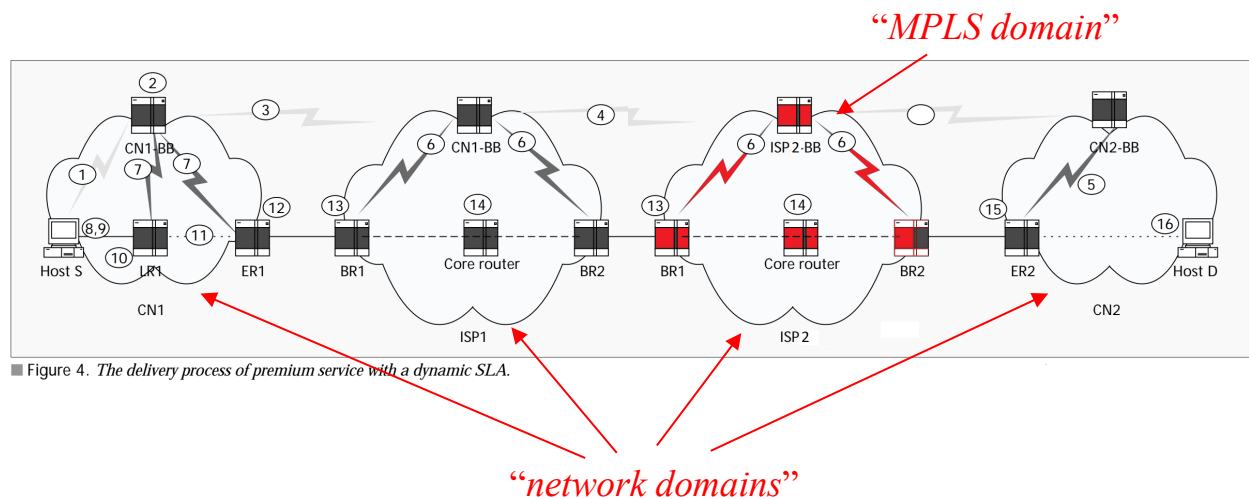
A parallel ISP may also provide cost savings in instances where one ISP has a cost structure more favorable per its SLA. Ex.1005, 8. In a scenario where the customer needs to transfer packets that exceed a negotiated peak rate of the SLA, a customer could renegotiate a higher peak rate but at a potentially higher cost. If the customer domain has a parallel ISP domain, the bandwidth broker may select the

ISP with the lowest cost based on the quality of service needed, the time of communication, or other factors. Ex.1003, ¶137.

Accordingly, it would have been obvious to a POSITA to utilize parallel ISPs in the architecture of modified Figure 4, to obtain numerous benefits discussed above. Ex.1005, 14; Ex.1003, ¶138.

Series DiffServ and MPLS ISP Domains

A POSITA would have understood that ISP domains may also be positioned in series, such that the MPLS domain ISP2 is positioned before or after the DiffServ domain ISP1. See, ex.1017, Figure 7. Modified Figure 4 below illustrates DiffServ and MPLS domains together in series. Ex.1003, ¶¶139-140.



Ex.1005, Fig. 4 (annotated and modified showing series ISPs); Ex.1003, ¶140.

It would have been obvious to utilize a series of ISP domains to provide service to destinations which are not directly connected to the same ISP domain as

the source network. Ex.1025, 3. This implementation represents potential “real-world” scenarios. Ex.1017, 16, 18. Ex.1003, ¶141. Thus, it would have been obvious to a POSITA to also, or alternatively, utilize ISP domains configured in series, to allow for reaching destinations that are not directly connected to the same ISP domain as the source. Ex.1003, ¶141.

Whether multiple ISPs are implemented in Xiao’s Figure 4 in parallel or series (or both) is a mere design choice that would have been obvious to a POSITA, since these and combinations thereof are the only possible implementations.² Ex.1003, ¶142.

A POSITA would have had a reasonable expectation of success in using DiffServ and MPLS domains together, in both parallel and series. Xiao teaches how the MPLS domain’s border routers perform packet processing to account for DiffServ packets and explains that these two protocols “**can easily interoperate.**” Ex.1005, 14. It was also recognized in the art that “DiffServ and MPLS are similar” and “**are not mutually exclusive...On the contrary, they complement each other nicely.**” Ex.1017, 5-6, 19; Ex.1003, ¶¶143-144.

² The Petition primarily will refer to modified Figure 4 showing parallel ISPs, with the understanding that the analysis equally applies to a series implementation.

[1.0.2] to establish a virtual leased line, VLL, between a source (SRC) and a destination (DST) in different domains in order to achieve packet transfer between the source (SRC) and the destination (DST),

First, Xiao discloses a source “**Host S in corporate network 1 (CN1)**” and a destination “**Host D in corporate network 2 (CN2)**” in different “**customer domains**,” which renders obvious “*a source (SRC) and a destination (DST) in different domains.*” Ex.1005, 11-15, Fig. 4; Ex.1003, ¶¶145-146.

Xiao further discloses that the process (discussed at [1.0.1]), for “**[p]remium service is suitable ... for creating virtual lease lines**,” between the source and the destination, which renders obvious “*establish[ing] a virtual leased line, VLL, between*” the source and the destination. Ex.1005, 11; Ex.1003, ¶147.

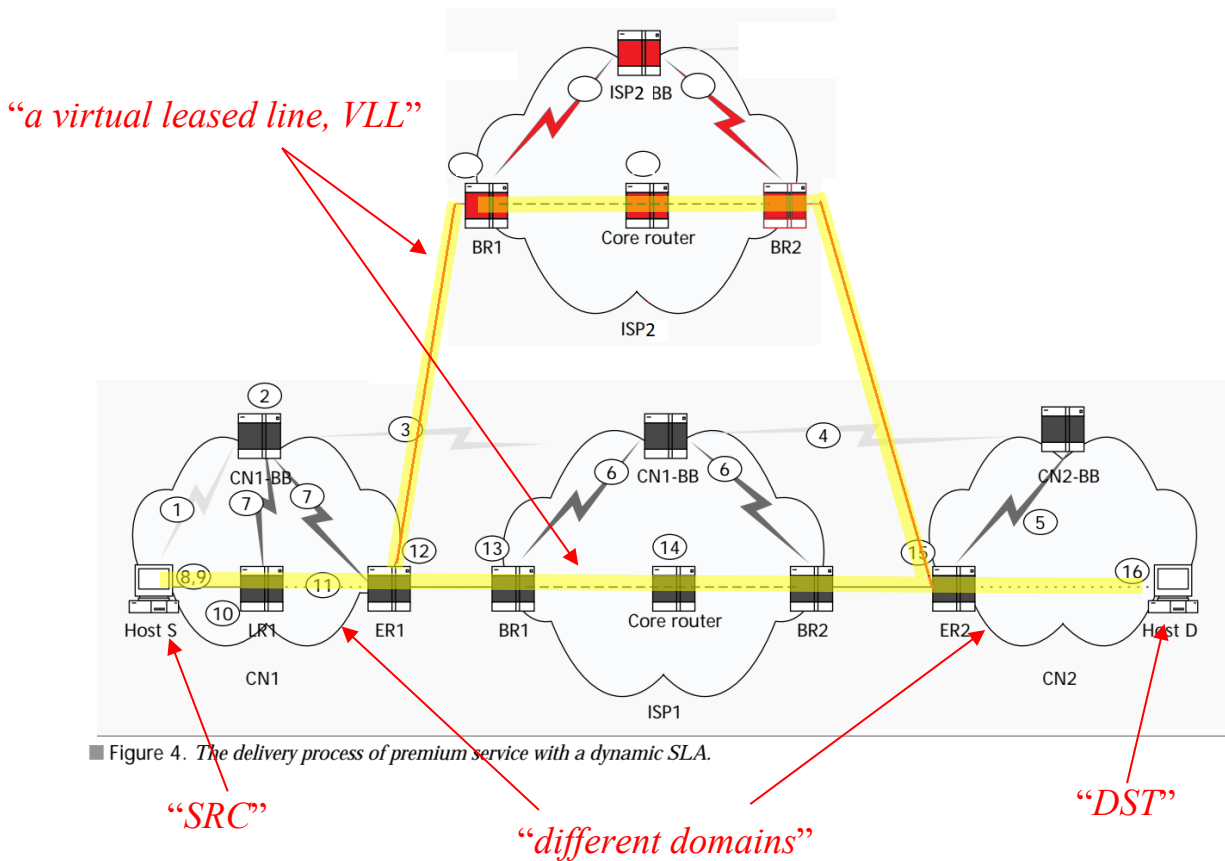
It would have been obvious to a POSITA that when implementing modified Figure 4 that both DiffServ domain ISP1 and MPLS domain ISP2 would support premium service, including virtual lease lines. For instance, Xiao discloses that with “differentiated services,” the source “**host S in CN1...use[s] premium service to send data.**” Ex.1005, 10, 12; Ex.1003, ¶148. Additionally, Xiao discloses providing “**premium service in an MPLS-based architecture.**” Ex.1005, 14. To support premium service in MPLS, Xiao performs packet header processing at the ingress and egress of the MPLS domain ISP. Ex.1005, 14. Because the MPLS domain ingress router receives premium service packets and processes them to be transported across the MPLS domain ISP2, a POSITA would

have understood that the MPLS domain ISP2 supports premium service. Thus, in the modified Figure 4 (*see* element [1.0.1]) both the DiffServ domain ISP1 and MPLS domain ISP2 support premium service. Ex.1003, ¶¶149-150.

It would have been obvious to a POSITA, in view of Xiao's teaching, to use premium service to establish a virtual lease line between the source Host S and the destination Host D to "sav[e] the cost of building and maintaining a separate network." Ex.1033, 2; Ex.1003, ¶151.

Additionally, a POSITA would have been motivated to establish VLLs "for virtual private networks (VPNs)" when providing secure communications between Xiao's source and the destination. Ex.1005, 11; Ex.1012, 22; Ex.1010, 2:29-31. The noted benefits, separately and together, would have motivated a POSITA to make this implementation. Ex.1003, ¶152.

In the implementation, a POSITA would utilize premium service to establish a VLL across the DiffServ domain ISP1, the MPLS domain ISP2, or both ISP domains, between the source Host S and the destination Host D, as illustrated below at Figure 4. *See* analysis at [1.0.1]; Ex.1003, ¶153.



Ex.1005, Fig. 4 (annotated and modified showing parallel ISPs); Ex.1003, ¶153.

Thus, Xiao teaches using premium service to establish a VLL across the DiffServ domain ISP1 and the MPLS domain ISP2 between a source Host S and a destination Host D in different customer domains, which renders obvious “establish[ing] a virtual leased line, VLL, between a source (SRC) and a destination (DST) in different domains.” Ex.1003, ¶154.

Second, Xiao discloses that the network provides “end-to-end service” (Ex.1005, 12, Abstract) and that premium service packets (which would include VLL packets) are transmitted between the source Host S and the destination Host

D, which renders obvious that the VLL is established in “*in order to achieve packet transfer between the source (SRC) and the destination (DST).*” Ex.1005, 13 (“**Host S sends packets...[that] are delivered to host D.**”); Ex.1003, ¶155.

Petitioner notes that a VLL provides uni-directional packet transmission. Ex.1027, 3:33-4:47; Ex.1012, 22. To the extent the phrase “*between*” requires bi-directional transmission, in the instance where Xiao’s VLL supports VPNs (as discussed above), bi-directional packet transfer would be achieved since several VLLs (between the source and destination) are combined to build the VPN. Ex.1012, 22; Ex.1020, 12; Ex.1003, ¶¶156-157.

[1.0.3] wherein the³ bandwidth broker (BB) is associated to each network domain and

First, Xiao discloses that bandwidth brokers “**CN1-BB**” and “**CN2-BB**” are associated with the customer domains and that a bandwidth broker “**ISP1-BB**” is associated with the DiffServ ISP1 domain. Ex.1005, 12-14; Ex.1003, ¶¶158-160.

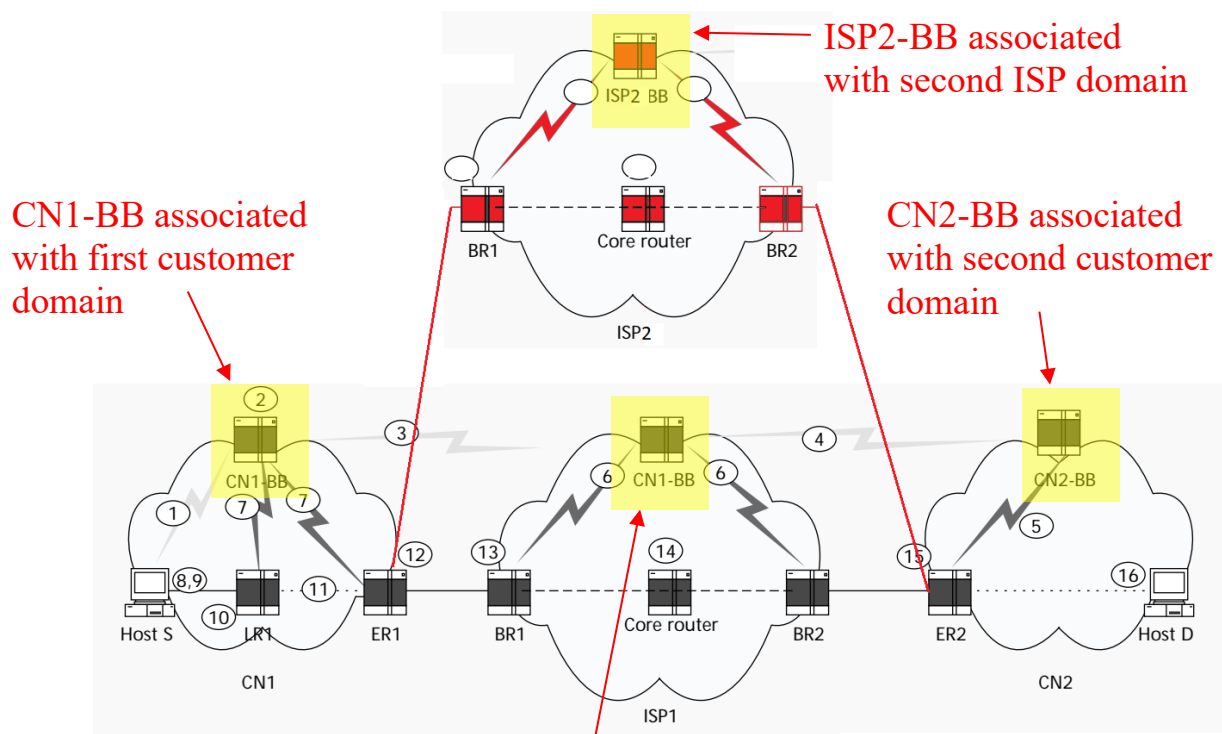
A POSITA would have recognized that although Xiao states that “BBs may not be needed in MPLS-based ISP networks,” this statement does not teach away. To the contrary, Xiao states that “**it is technically better to have a BB**

³ The claim’s recitation of “*the bandwidth broker*” lacks antecedent basis and for purposes of this analysis, the language is addressed as “*a bandwidth broker.*”

[bandwidth broker] to allocate resources” and that **“[a]t the ISP side, admission control decisions can be made...by a BB.”** Ex.1005, 11, 12; *see also* 14. Furthermore, in the context of Figure 5’s MPLS architecture, a bandwidth broker “ISP1-BB” sends “the PATH message through an LSP to BR2.” Ex.1005, 14. Accordingly, it would have been obvious to a POSITA to associate a bandwidth broker with MPLS domain ISP2 in modified Figure 4, since it is better to have a bandwidth broker to allocate resources. Ex.1003, ¶¶61.

The additionally cited prior art also teaches that each network domain has an associated bandwidth broker. Schelen-1 discloses that **“[f]or each routing domain in the network, there will be a reservation agent [bandwidth broker] responsible for admission control.”** Ex.1032, 451-452. Also, Gibson discloses that its MPLS network has a **“management layer”** that includes **“[a]dmission manager[s] responsible for maintaining network topology information”** and **“provides admission control** to the communication network.” Ex.1006, 6:11-16, 7:1-28, 7:46-48, Fig. 1. A POSITA would have understood that Gibson’s admission manager, which is part of the management layer, maintains network topology, and provides admission control, corresponds to a *“bandwidth broker,”* as construed. Claim Construction Section VII.A; *see also* analysis at [1.4] and [5.1]; Ex.1003, ¶¶162-163.

In the instance where the communication network of Figure 4 was implemented with an MPLS domain ISP2 (*see* [1.0.1]) in addition to the DiffServ domain ISP1, it would have been obvious for a bandwidth broker (referred to as “ISP2-BB”) to be associated with the ISP2 MPLS domain. The noted bandwidth brokers are shown at modified Figure 4.



■ Figure 4. The delivery process of premium service with a dynamic SLA.

Ex.1005, Fig. 4 (annotated and modified showing parallel ISPs); Ex.1003, ¶164.

Reasons to Combine

A POSITA would have associated a bandwidth broker with the MPLS domain, in view of Xiao’s disclosure that “it is technically better to have a BB

[bandwidth broker] to allocate resources” and that at “the ISP side, admission control decisions can be made...by a BB [bandwidth broker].” Ex.1005, 11-12; Ex.1003, ¶165.

Also, it would have been obvious to a POSITA, in view of Schelen-1 and Gibson, to associate a bandwidth broker with Xiao’s MPLS domain ISP2 in modified Figure 4, to provide admission control within that network domain. Ex.1006, 7:26-37, 7:54-57. Additionally, it was known that having a bandwidth broker associated with each domain provides scaling benefits. *See, e.g.*, Ex.1025, 1; Ex.1011, 17. Thus, a POSITA would have been motivated apply the bandwidth broker teachings of Schelen-1 and Gibson such that a bandwidth broker is associated with each of Xiao’s domains (including the MPLS domain) to provide admission control and to obtain scaling benefits. Ex.1003, ¶166.

Additionally, it was known that associating a bandwidth broker with each domain allows for “**minimiz[ing] reservation state and admission control overhead**” since “reservations from different sources to the same destination domain are aggregated in agents as their paths merge toward the destination.” Ex.1012, 3. This additional reason would have motivated a POSITA to associate a bandwidth broker with each of Xiao’s domains (including the MPLS domain). Ex.1003, ¶167.

A POSITA would have had a reasonable expectation of success, since Xiao already utilizes bandwidth brokers. Also, the prior art evidence that there is a reasonable expectation of success. Ex.1017, Fig. 7 (showing that a bandwidth broker is associated with each domain, including MPLS and DiffServ domains). *See* Reasons to Combine; analysis at [1.0.4], *infra*, which discloses hierarchical routing; *KSR International Co. v. Teleflex Inc. (KSR)*, 550 U.S. 398 (2007); Ex.1003, ¶¶77-78, 112-123, 168-169.

[1.0.4] the bandwidth broker (BB) is configured to control a hierarchical routing domain, the method comprises the following steps:

First, Xiao further discloses that the bandwidth broker is a “**resource controller**” configured to “**to allocate resources**” in the customer domain. Ex.1005, 11. Further, at “**the ISP side, admission control decisions**” are made by the bandwidth broker. Ex.1005,12. Consistent with the analysis at [1.0.3], it would have been obvious when implementing the communications network of modified Figure 4 for the bandwidth broker ISP2-BB of the MPLS domain to perform admission control for ISP2. Thus, Xiao renders obvious that “*the bandwidth broker (BB) is configured to control a... domain.*” Ex.1003, ¶¶170-173.

Second, Schelen-1 discloses that an agent (known as bandwidth broker) “**provide[s] admission control for it’s [sic] own routing domain**” that implements “**hierarchical routing.**” Ex.1032, 452; *see also* Ex.1032, 454

(describing that bandwidth brokers control resources in a hierarchy of routing domains). Schelen-1's description is within the scope of the '698 patent, which simply references the similar hierarchical routing of the Schelen Olov Thesis. *See* Ex.1001, 3:64-4:37; Ex.1012, 42, 45; Ex.1032, 452-454; *see also* [1.6.2], where the MPLS domain ISP2 utilizes a hierarchical routing architecture that is controlled by bandwidth brokers. Ex.1003, ¶¶174-175.

Reasons to Combine

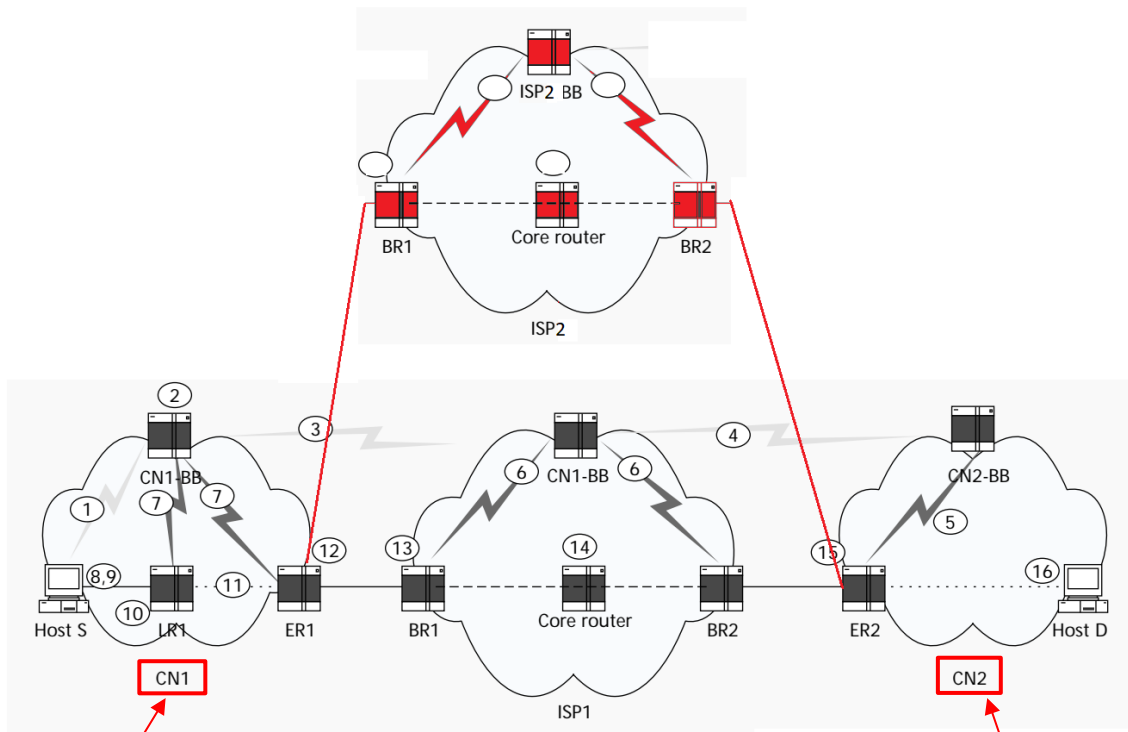
It would have been obvious to a POSITA to incorporate the hierarchical routing domain teachings of Schelen-1 when implementing Xiao, such that one or more, including all, of Xiao's domains (*see* [1.0.1]) are hierarchical routing domains. Ex.1003, ¶176. Such an implementation would support scaling and accommodate a network with a large topology. Ex.1038, 1 (using hierarchical routing within "the topology of large networks."); Ex.1025, 2 ("...hierarchical approach to scalable bandwidth allocation support..."); Ex.1012, 45. Additional benefits of hierarchical routing domains include achieving routing data abstraction and reducing resource utilization (e.g., CPU, memory, bandwidth) in support of routing. Ex.1009, 3. These benefits, separately and together, would have motivated a POSITA to implement Xiao's domains as a hierarchical routing domain, per Schelen-1's. Ex.1003, ¶¶79-80, 176-177.

The result would have been predictable and a POSITA would have had a reasonable expectation of success in implementing one or more (or all) of Xiao's domains as hierarchical routing domains as evidenced by others who had implemented DiffServ and MPLS domains as hierarchical routing domains. Ex.1008, 14 (“MPLS supports a hierarchy.”); Ex.1021, 2 (DiffServ hierarchical); Ex.1003, ¶¶178-179.

[1.1.1] i) generate a request from *en equity*⁴ for a Virtual Leased Line, VLL, having a predefined Quality of Service, QoS, from a source network (SRC) to a destination network (DST) and

First, as explained at [1.0.2], Xiao uses premium service to establish a VLL between the source Host S in a “**corporate network 1 (CN1)**” and the destination Host D in a “**corporate network 2 (CN2)**.” Ex.1005, 12-13. The source corporate network CN1 corresponds to “*a source network (SRC)*” and the destination corporate network CN2 corresponds to “*a destination network (DST)*.” Ex.1003, ¶¶180-181.

⁴ Original claims recited “*an entity*,” which was modified to “*en equity*,” without explanation, in an Examiner's Amendment dated November 8, 2006. The Petition addresses “*en equity*” as “*an entity*.” Ex.1003, ¶180.



■ Figure 4. The delivery process of premium service with a dynamic SLA.

“source network (SRC)”

“destination network (DST)”

Ex.1005, Fig. 4 (annotated and modified showing parallel ISPs); Ex.1003, ¶181.

Xiao discloses that “**Host S sends an RSVP PATH message** to its local domain BB CN1-BB,” which “specif[ies] the characteristics of the traffic.”

Ex.1005, 9, 12-14. It would have been obvious to a POSITA that Host S sending the message includes generating the message specifying the characteristics of the type of service that it requires, e.g., premium service for VLL. *See* Ex.1005, 12 (assured service in Example 1 and premium service in Example 2); Ex.1003, ¶182.

In the example, the RSVP PATH message requests premium service, which Xiao explains has predefined QoS characteristics, such “**low-delay and low-**

jitter... bit rate” and that the bandwidth is “**guarantee[d]**.” Ex.1005, 11. In the ’698 patent, delay and rate are predefined QoS characteristics. Ex.1001, 1:66-2:3, claim 4; *see also* Ex.1026, 14. As analyzed at [1.0.2], it would have been obvious to use premium service to establish a VLL, which would as a result have the above noted predefined QoS characteristics. Ex.1003, ¶183.

Thus, Xiao discloses generating a premium service RSVP PATH message request from Host S for establishing a VLL having predefined QoS (e.g., delay, jitter, rate, and guaranteed bandwidth) from a source corporate network CN1 to a destination corporate network CN2, which renders obvious this element. Ex.1003, ¶185.

Second, to the extent Patent Owner contends that Xiao does not sufficiently disclose this element, the combination with Gibson renders it obvious. Ex.1003, ¶186.

Gibson discloses that an “endpoint is any node...through which a user may **request a communication session.**” Ex.1006, 6:65-7:1; *see also*, Ex.1006, 5:35-37. The request is for establishing a “connection [that] provides a **pre-specified quality of service.**” Ex.1006, 2:6-12; *see also* Ex.1006, 4:49-55, 6:9-13, 20:53-21:11, 22:12-24, Abstract; Ex.1023, 2; Ex.1024, . It would have been understood by a POSITA that the user interacts with the endpoint so that it generates a request for a communication session with a pre-specified quality of service. Ex.1003, ¶187.

The user or the endpoint, separately and together, correspond to “*an entity*” that generates a request.

It would have been obvious to a POSITA, in view of Gibson, to implement Xiao such that a user interacts with Host S to generate a request for a communication session having a pre-specified QoS, because this would allow the user initiate an immediate session or schedule in advance a session for Internet telephony and videoconferencing, which have predefined QoS. Ex.1005, 8; Ex.1026, 2; *see* Reasons to Combine. In the combination of Xiao and Gibson, the generated PATH message request would be for a VLL (*see* [1.0.2]) having a pre-specified QoS from the source corporate network CN1 to the destination corporate network CN2. Ex.1003, ¶¶188.

Thus, Xiao in combination with Gibson discloses generating a PATH message request from an entity (e.g., user or Host S, separately and together) for a VLL having a pre-specified QoS from a source corporate network CN1 to a destination corporate network CN2, which renders obvious this element. Ex.1003, ¶189.

Third, additionally, the combination with Schelen-1 also discloses generating a “**reservation requests**” from a user for service, with the request being “**parameter-based**” with predefined “**traffic descriptions**” used to “**setup resources along the path**” and “**perform QoS routing**” between source and

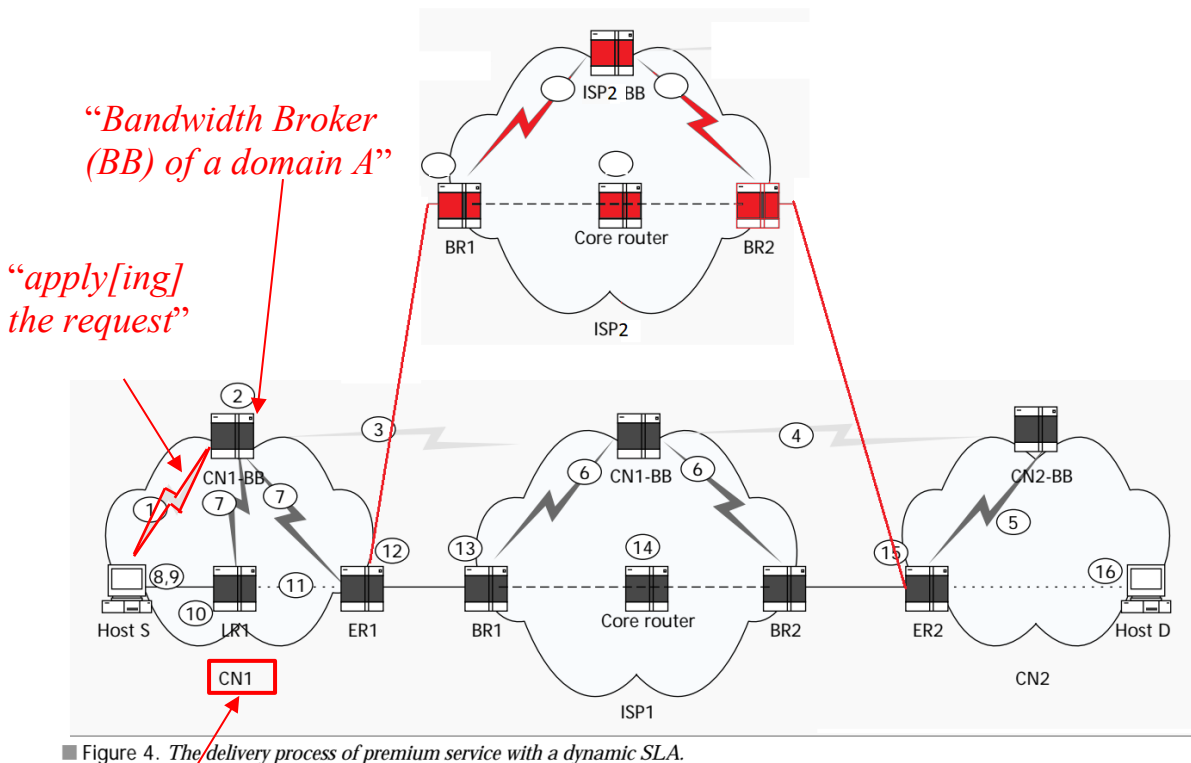
destination. Ex.1032, 451, 453. A POSITA would have understood that because the QoS parameters (providing traffic descriptions) are in the reservation request and the bandwidth broker performs QoS resource allocation based on the parameters, the request “*has a predefined Quality of Service, QoS*” from the source to the destination. Ex.1003, ¶¶190-191.

It would have been obvious to a POSITA to include in Xiao’s PATH message request predefined QoS parameters describing the traffic from the source to the destination. Ex.1003, ¶192. This would allow the user to have greater control in specifying the service (e.g., type of service, time of service, duration, etc.) for the bandwidth broker when performing admission control. Ex.1034, 30. Because the user can specify, for example, advance reservation parameters such as the time of service, resources could be more effectively scheduled. Ex.1032, 451; Ex.1003, ¶192. Also, utilizing parameter-based requests (with predefined QoS) would be beneficial since it would “**avoid undue signaling overhead** and scalability problems” as compared to other approaches. *See* Ex.1032, 453; Ex.1034, 29; *see* Reasons to Combine; Ex.1003, ¶¶81-82, 114-115, 193.

In the further combination with Schelen-1, Xiao’s user would interact with Host S to generate a PATH message request for a VLL having parameters that specify QoS from source corporate network CN1 to destination corporate network CN2. Ex.1003, ¶¶194-195.

[1.1.2] *apply the request to a Bandwidth Broker (BB) of a domain A, BB_A , associated to the source network;*

First, Xiao discloses that Host S “send[s]” the generated PATH message to the “**local domain BB CN1-BB**,” associated with the source corporate network CN1, as illustrated below. Ex.1005, 12; Ex.1003, ¶¶196-198.



“source network (SRC)”

Ex.1005, Fig. 4 (annotated and modified showing parallel ISPs); Ex.1003, ¶198.

Since the sent “**request is accepted by CN1-BB**” (see also analysis at elements [1.2]-[1.6], *infra*), Xiao renders obvious this element. Ex.1003, ¶199.

Second, Schelen-1 discloses that “**requests are forwarded to the agent [bandwidth broker] responsible for the routing domain.**” Ex.1032, 451; see

also Ex.1032, 453. Additionally, Gibson discloses that the admission manager (“*bandwidth broker*”) “**recei[ves]...a request**” that was sent by the endpoint. Ex.1006, 3:36-53, 7:25-57, Abstract; Ex.1003, ¶¶200-201.

It would have been obvious to a POSITA for Xiao’s CN1-BB to receive the generated PATH message request, per Schelen-1 and Gibson, to perform admission control so that premium service is set up based on the request. Ex.1005, 12; Ex.1003, ¶¶202-203.

[1.2] ii) *BB_A establishes the different domains involved to reach the destination network (DST)*;

First, as explained at [1.0.1] Xiao (per the modified Figure 4) discloses that the communication network comprises a DiffServ domain ISP1 and an MPLS domain ISP2. It would have been obvious to a POSITA that the ISP domains are involved to reach the destination corporate network CN2 from the source corporate network CN1. Ex.1003, ¶¶204-205. For example, Xiao discloses that the “[c]ustomers will **have SLAs [service level agreements] with their ISPs**” to obtain premium service. Ex.1005, 10-11. A POSITA would have understood that the SLA is an agreement that specifies the “that specifies the forwarding service a customer should receive” from its ISPs. Ex.1005, 9; *see also* Ex.1021, 4. Ex.1003, ¶¶206-207.

Based on SLA information, Xiao teaches that the bandwidth broker CN1-BB signals its ISP domain to request services for external communications. Ex.1005, 12; *see also* Ex.1005, 12 (“In Fig. 4, host S in CN1 wants to use premium service to send data to host D in CN2. CN1 has a dynamic SLA with ISP1...Host S sends an RSVP PATH message to the local BB, CN1-BB...CN1-BB sends the PATH message to ISP1-BB.”). It would have been obvious to a POSITA that for the bandwidth broker CN1-BB to send the PATH message to the bandwidth broker ISP1-BB of the ISP1 domain, the bandwidth broker CN1-BB would have established that the ISP1 domain was involved to reach the domain of the destination corporate network CN2. Ex.1003, ¶¶208-209.

Also, consistent with the analysis at [1.0.1], in the instance where there are multiple ISPs and the bandwidth broker CN1-BB has an SLA with each, it would have been obvious to a POSITA that bandwidth broker CN1-BB establishes that multiple ISP domains are involved to reach the domain of the destination corporate network CN2. Ex.1005, 14, Ex.1025, 2, 3. To illustrate the concept with respect to multiple ISP domains, provided below is modified Figure 4 (*see* [1.0.1]).

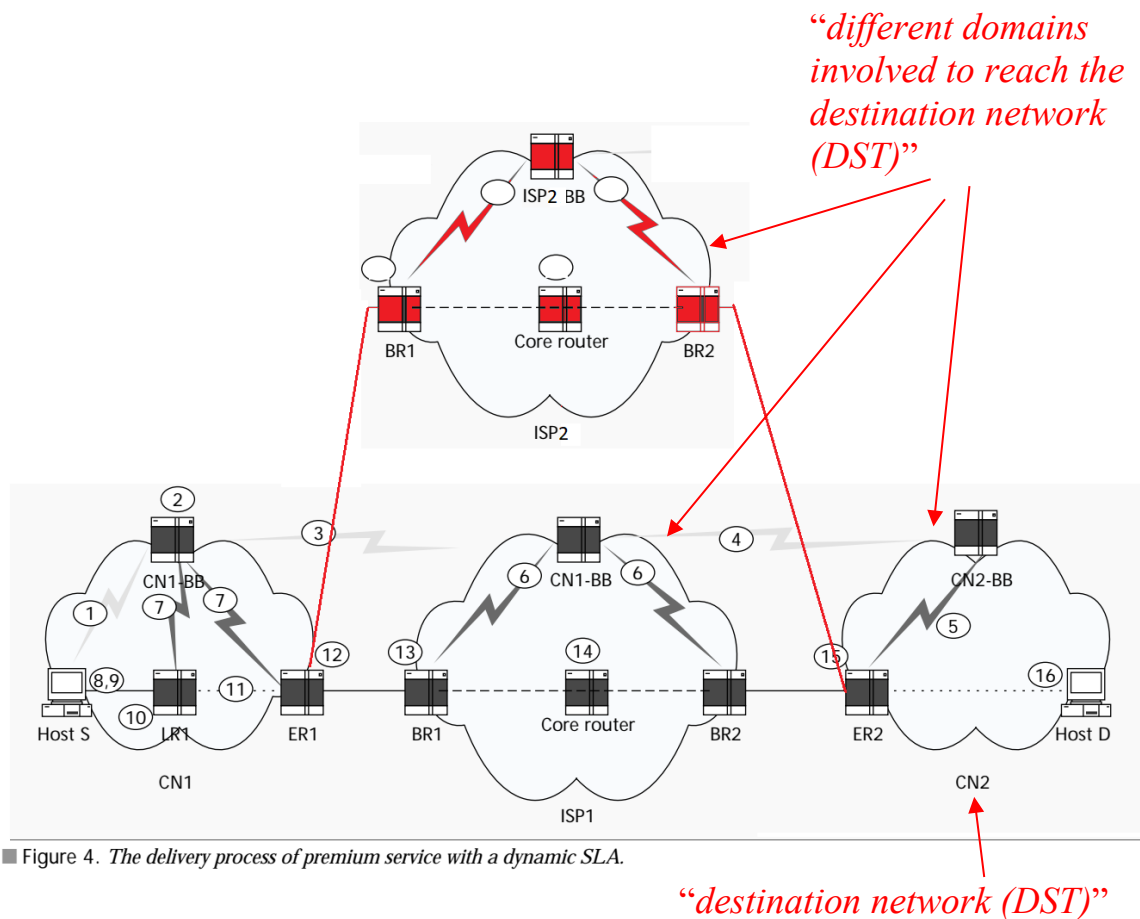


Figure 4. The delivery process of premium service with a dynamic SLA.

Ex.1005, Fig. 4 (annotated and modified showing parallel ISPs); Ex.1003, ¶210.

In the above figure, when the customer domain bandwidth broker CN1-BB receives the PATH message request from Host S for communication with destination Host D, it will establish that ISP1, ISP2, and the destination customer domains are involved to reach corporate network CN2. This is consistent with the generally understood approach. See Ex.1025, 2, 3 (“That is, the campus contracts one or a few ISPs for its data delivery services to *all* destinations.”). As further discussed at [1.3], below, once bandwidth broker CN1-BB establishes the domains

involved to reach the destination corporate network CN2, it sends the PATH message request (directly or indirectly) to the bandwidth brokers of the involved domains for admission control. Ex.1005, 12 (Phase 1: Signaling); Ex.1003, ¶¶210-211.

Thus, Xiao's disclosure that the customer domain bandwidth broker CN1-BB establishes the different domains involved to reach the outside destination corporate network CN2, renders obvious this element. Ex.1003, ¶212.

Second, to the extent determined that the above cited teachings are insufficient, Schelen-1 discloses that a bandwidth broker listens to a well-known multicast address where all other bandwidth brokers "giv[e] **their identity and which routing domain (AS) they are responsible for,**" thereby allowing the bandwidth broker to establish the existence of all other bandwidth brokers and their domains. Ex.1032, 452. This information about bandwidth brokers of all other domains is used to reserve bandwidth toward the destination. Ex.1032, Abstract ("Requests involving several routing domains are forwarded for admission control with agents [bandwidth brokers] along the path for the requested service."); Ex.1003, ¶¶213215.

In view of Schelen-1's disclosure, it would have been obvious to a POSITA for each of the bandwidth brokers associated with Xiao's domains (*see* [1.0.3]) to communicate via a multicast address. This would allow for each bandwidth broker

to establish the existence of all other bandwidth brokers and their respective domains. With this information, in the present example, the customer domain bandwidth broker CN1-BB would become aware of the involved bandwidth brokers (ISP1-BB, ISP2-BB, CN2-BB) and which domains they are responsible for (DiffServ domain ISP1, MPLS domain ISP2, and destination customer domain CN2), so that a PATH message request may be sent to reserve ISP resources toward the destination network CN2. Ex.1005, 12 (“[T]he BB in the customer domain must also use some signaling protocol to request resources on demand from its ISP.” “CN1-BB sends the PATH message to ISP1-BB.” “ISP1-BB sends the PATH message to CN2-BB.”); *see also* [1.3], *infra*; Reasons to Combine; Ex.1003, ¶¶83-84, 116, 216-217.

[1.3] iii) *BB_A directly or indirectly passes requests to all Bandwidth Brokers (BB) of the involved domains regarding a VLL of the predefined QoS from ingress to egress of each domain;*

First, as explained at elements [1.1.1]-[1.1.2], the prior art renders obvious that the bandwidth broker CN1-BB receives a PATH message request for a VLL having predefined QoS from the source corporate network CN1 to the destination corporate network CN2. Further, as explained at [1.2], the prior art discloses that the bandwidth broker CN1-BB establishes that ISP1, ISP2, and destination customer domains are involved to reach the destination corporate network CN2. Ex.1003, ¶¶218-219.

Second, Xiao generally discloses that **“the BB in the customer domain must also use some signaling protocol to request resources on demand from its ISP.”** Ex.1005, 12. In the example of setting up premium service, the source customer domain bandwidth broker CN1-BB *“directly”* **“sends the PATH message to ISP1-BB”** and *“indirectly”* **“sends the PATH message to CN2-BB.”** Ex.1005, 12 (Phase 1: Signaling).

Xiao also teaches that “if there are multiple ISPs between CN1 and CN 2,” then the steps are “repeat[ed]...for each ISP[domain].” Ex.1005, 13. It would have been obvious to a POSITA that when there are multiple ISPs between CN1 and CN2 (*see* [1.0.1]), the bandwidth broker CN1-BB would forward PATH message requests, directly or indirectly, to bandwidth brokers ISP1-BB and also to ISP2-BB of the involved ISP1 and ISP2 domains, respectively. In the parallel implementation, it would have been obvious that a PATH message request is *“directly”* sent to both ISPs, so that in the event one ISP is not available the other redundant ISP would still provide services. *See e.g.*, Ex.1025, 2. On the other hand, in the series implementation, it would have been obvious for the bandwidth broker of one ISP to forward the PATH message request to the downstream ISP to reserve resources in that network domain toward the destination. This would correspond to *“indirectly”* passing the request to the involved domain. *See* [1.0.1], providing

more details regarding implementing parallel and series ISP domain in Xiao's Figure 4; Ex.1003, ¶¶220-221.

Thus, Xiao renders obvious that the "*BB_A directly or indirectly passes requests to all Bandwidth Brokers (BB) of the involved domains.*" Ex.1003, ¶222.

Third, Schelen-1 also teaches that "[r]equests involving several routing domains are forwarded for admission control to agents [bandwidth brokers] along the path for the requested service" "to support end-to-end advance reservation requests." Ex.1032, Abstract, 453. A POSITA would have understood that, regardless of whether the domains are in parallel or in series, Schelen-1 generally teaches forwarding the request to the bandwidth broker of the involved routing domain to support end-to-end reservations. Ex.1003, ¶¶223-224.

Accordingly, it would have been obvious to a POSITA, in view of Schelen-1, for Xiao's customer domain bandwidth broker CN1-BB to pass PATH message requests directly (for parallel ISPs) or indirectly (for series ISPs) to bandwidth brokers ISP1-BB, ISP2-BB, CN2-BB of the involved domains, so that end-to-end reservations may be made for the requested service. Thus, Xiao in combination with Schelen-1 also renders obvious "*BB_A directly or indirectly passes requests to all Bandwidth Brokers (BB) of the involved domains.*" Ex.1003, ¶224.

Fourth, consistent with the analysis at elements [1.0.2] and [1.1.1], Xiao's PATH message request from the source Host S is for premium service (e.g., for a

VLL of the predefined QoS from the source corporate network CN1 to the destination corporate network CN2) and the customer CN1-BB forwards the PATH message request to each of the ISP domains' bandwidth brokers ISP1-BB, ISP2-BB, and CN2-BB. Since the steps are repeated for each domain, it is obvious that each BB is managing bandwidth allocation for the portion of the communication path passing through the BB's own domain, i.e., from ingress to egress. Ex.1005, 13 (“[I]f there are multiple ISPs between CN1 and CN 2,” then the steps are “repeat[ed]...for each ISP[domain].”). Accordingly, it would have been obvious to a POSITA that the forwarded request is “*regarding a VLL of the predefined QoS from ingress to egress of each domain.*” Ex.1003, ¶225.

reserved from ingress to egress of each domain involved, per the request. Ex.1003, ¶226.

It would have been obvious to a POSITA, in view of Schelen-1, for Xiao's PATH message request, to regard reserving end-to-end resources (from ingress to egress) of each involved domain so that resources would be reserved and available to establish the VLL per the original request from source Host S. *See* analysis at elements [1.0.2] and [1.1.1]; Ex.1003, ¶¶227-228.

[1.4] iv) each involved bandwidth broker (BB) performs admission control in its domain;

First, as discussed at [1.2]-[1.3], the prior art renders obvious that a PATH message request is passed to bandwidth brokers (ISP1-BB, ISP2-BB, CN2-BB) of the involved domains. Ex.1003, ¶¶229-230.

Second, Xiao teaches that “[a]dmission control” is “[t]he decision process of whether to accept a request for resources (link bandwidth plus buffer space).” Ex.1005, 9. “At the ISP side, **admission control** decisions can be made... by a BB.” Ex.1005, 12. In the specific context of premium service, Xiao discloses that the involved bandwidth brokers perform admission control. Ex.1005, 12 (“ISP1-BB makes an **admission control** decision....CN2-BB makes an **admission control** decision.”); 13 (“[I]f there are multiple ISPs between CN1 and CN 2,” then the steps are “repeat[ed]... for each ISP[domain].”); Ex.1003, ¶231.

It would have been obvious to a POSITA that when there are multiple ISPs between CN1 and CN2 (*see* [1.0.1]), both bandwidth brokers ISP1-BB and ISP2-BB of the involved ISP1 and ISP2 domains, respectively, perform admission control. Because each involved bandwidth broker ISP1-BB, ISP2-BB, and CN2-BB performs admission control, a determination is made as to whether the request is accepted or denied, and Host-S is notified accordingly. Ex.1005, 12 (“Sender S will be notified.”). Also, because Host-S is notified, further appropriate action may be taken, e.g., in the instance where both ISPs deny the request with error messages, Host-S may renegotiate its SLAs for additional bandwidth. Ex.1005, 10; Ex.1003, ¶232.

Thus, Xiao discloses that each involved ISP1-BB, ISP-2BB, and CN2-BB performs admission control in its domain, which renders obvious that “*each involved bandwidth broker (BB) performs admission control in its domain.*” Ex.1003, ¶233.

Third, to the extent determined that Xiao’s disclosure is insufficient, Schelen-1 discloses that for “**each routing domain** in the network, there will be a **reservation agent [bandwidth broker] responsible for admission control.**” Ex.1032, 451; *see also* Ex.1032, 453, Abstract; Ex.1003, ¶234.

Also, Gibson discloses that an admission manager (“*bandwidth broker*” *see* [1.0.3]) “effectively provides **admission control**” in the MPLS domain. Ex.1006,

7:42-48; *see also* 5:13-28. A POSITA would have understood that, regardless of whether the domains are in parallel or in series, Gibson and Schelen-1 generally teach that the bandwidth broker of the involved routing domain performs admission control. Ex.1003, ¶¶234-236.

Reasons to Combine

It would have been obvious to a POSITA, in view of Schelen-1 and Gibson, for the involved bandwidth brokers ISP1-BB, ISP2-BB, and CN2-BB to perform admission control, so that end-to-end reservations may be made for the requested service if resources are available such that Xiao's source and destination would be able to communicate. *See* Reasons to Combine; Ex.1003, ¶¶87, 236-237.

[1.5.1] v) each involved bandwidth broker (BB) returns a result of the admission control to BB_A that passes it back to the requesting entity and

First, Xiao discloses that the bandwidth broker of the involved ISP domain and destination customer domain “**makes an admission control decision**” and returns a result (e.g., “**an error message**” if the request is denied or “**an RSVP RESV message**” if admitted) to CN1-BB, which passes the result to Host S. Ex.1005, 12 (“Sender S will be notified”); *see also* Ex.1005, 13 (“...send the RESV message to host S.” “[I]f there are multiple ISPs between CN1 and CN 2,” then the steps are “repeat[ed]...for each ISP[domain].”); Ex.1003, ¶¶238-241.

It would have been obvious to a POSITA that when there are multiple ISPs between CN1 and CN2 (*see* [1.0.1]), both bandwidth brokers ISP1-BB and ISP2-BB of the involved ISP1 and ISP2 domains, respectively, perform admission control and return a corresponding result so that Host-S is notified accordingly. In instances where there are parallel ISPs and the Host-S is notified that only one ISP has granted the request, then Host-S know which ISP to use and may renegotiate its SLA with the ISP that denied the request. Also, for serial implementations, in the instance where the directly connected ISP denies the request, appropriate action may be taken, e.g., Host-S may renegotiate its SLAs for additional bandwidth.

Ex.1005, 10; Ex.1003, ¶¶242-243.

[1.5.2] *if the request was admitted along all domains between the source (SRC) and the destination (DST) a VLL of the predefined QoS is granted,*

First, as analyzed at elements [1.0.2] and [1.1.1], the PATH message request is for premium service for a VLL of predefined QoS between source Host S and destination Host D. Ex.1003, ¶¶244-245.

Second, Xiao discloses that if the request is admitted, the bandwidth broker of each domain between the source Host-S and the destination Host-D configures its boundary router with “classification,” “policing rules,” and “reshaping rules.” Ex.1005, 12; *see also* Ex.1005, 13 (“[I]f there are multiple ISPs between CN1 and CN 2,” then the steps are “repeat[ed]...for each ISP[domain].”). Since all boundary

routers are configured, “[w]hen host S receives the RESV message [indicating that it was admitted], it can start transmitting data.” Ex.1005, 12-13; Ex.1003, ¶¶246-247.

A POSITA would have understood that configuring boundary routers with classification, policing, and shaping rules for premium service establishes the VLL (*see* [1.0.2]). *See e.g.*, Ex.1027, 12:67-13:6. Since the Host-S is able to start transmitting, it would have been understood that the requested premium service for VLL of the predefined QoS was granted. Ex.1003, ¶248.

It would have been obvious to a POSITA that when there are multiple ISPs between CN1 and CN2 (*see* [1.0.1]), the bandwidth brokers ISP1-BB and ISP2-BB of these domains configure the boundary routers when the request was admitted. That is, in instances where there are parallel ISPs and Host-S is notified that only one ISP has admitted the request, then the boundary routers of that ISP are configured while the boundary routers of the other ISPs are not configured. On the other hand, for serial instances, the boundary routers of both ISP domains are directly involved and therefore would be configured if the request was admitted. Ex.1003, ¶¶249-250.

[1.6.1] characterized in that step iv) comprises the following step: performing [LSP] Label Switched Path, LSP, setup and

First, as discussed at [1.4], the prior art renders obvious that bandwidth broker ISP2-BB performs admission control in the MPLS domain. Ex.1003, ¶¶251-252.

Second, Xiao discloses that “[w]ith MPLS, **LSPs are set up** between each ingress-egress pair.” Ex.1005, 17. The “**LSP setup** can be...data-driven (i.e., triggered by the request of a flow or traffic trunk).” Ex.1005, 13. It would have been obvious to POSITA that because the LSP set up may be triggered by the request, the LSP set up is performed, at least in part, when the bandwidth broker performs admission control in response to the request (*see* [1.4]). Thus, Xiao renders obvious “*that step iv) comprises the following step: performing [LSP] Label Switched Path, LSP, setup.*” Ex.1003, ¶253.

Third, Gibson discloses that its MPLS communications network includes “admission managers, connection managers and administrative server can be though[t]of as a ‘management layer.’” Ex.1006, 6:14-16. As analyzed at [1.0.3], the admission manager corresponds to a “*bandwidth broker.*” Ex.1003, ¶¶254-255.

Gibson discloses that the “request **new high capacity label switch paths** across the MPLS network” from an “Administrative Server 35.” Ex.1006, 8:16-54. Gibson’s process for LSP set up is shown at Figure 2, reproduced below:

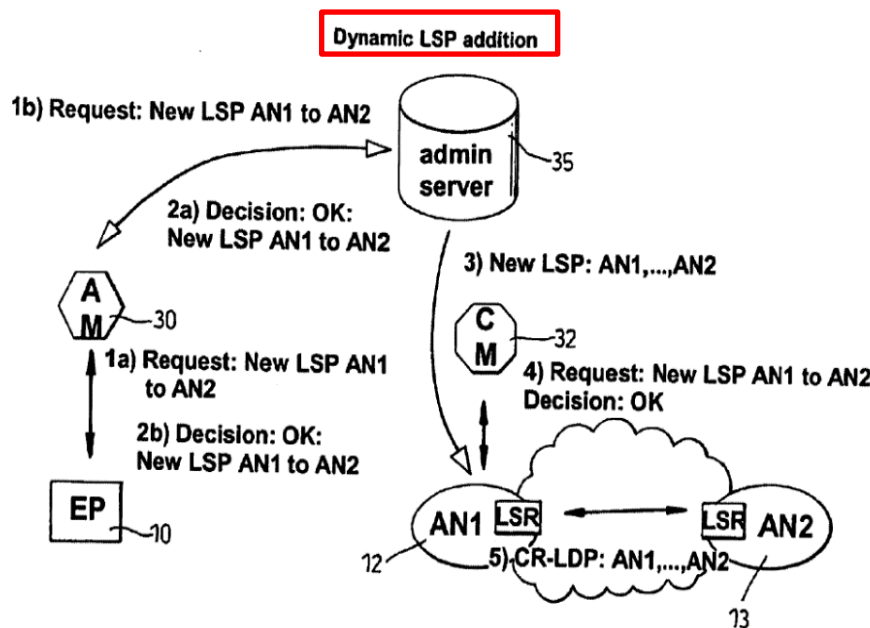


Fig. 2

Ex.1006, Fig. 2 (annotated); Ex.1003, ¶256.

In the context of the above figure, Gibson discloses that the administrative server works with a connection manager to set up “a new LSP,” in response to the admission manager’s request. Ex.1006, 8:55-9:10; *see also* Ex.1006, 8:11-14 (“...registration of **new label switch paths**....”); Ex.1003, ¶257.

In view of Gibson, it would have been obvious to a POSITA to dynamically set up an LSP as part of admission control in Xiao, because it would allow for creating an LSP path that provides services across the MPLS network domain ISP2. *See* [1.0.1]. Also, a POSITA would have combined the teachings because Xiao discloses that its LSPs may be setup with “a generic *label distribution protocol* (LDP)” and Gibson provides additional details on this implementation.

Ex.1005, 13; Ex.1006, 1:60-63 (“Mechanisms such as CR-LDP allow MPLS the ability to **set-up paths** between two endpoints over a list of routers.”), 20:32-33; *see also* Ex.1006, *Generally*; Reasons to Combine; Ex.1003, ¶¶258-259.

[1.6.2] passing resource requests from the Bandwidth Broker (BB) to at least one intra-domain (IDB),

In the context of the '698 patent, an exemplary “intra-domain bandwidth broker” (“*at least one intra-domain (IDB)*”)⁵ corresponds to an “**MPLS traffic-engineering server**,” described in “a system known as Routing and Traffic Engineering Server (RATES).” Ex.1001, 3:49-63; 5:57-60 (“The present invention relates to a method using...RATES”); Ex.1001, 6:60-64 (“For MPLS networks the LSP set-up mechanism used in RATES is used. This includes setting up FEC-associations in MPLS edge devices and to distribute labels for LSP-set-up in the MPLS core-devices.”); Ex.1016, 8 (“**The RATES server** uses the client specific extension for **intra-domain** traffic engineering”); Ex.1016, 9 (“RATES has components with functions similar to those needed in a bandwidth broker and is extensible for use as an **intra-domain bandwidth broker**.”); Ex.1003, ¶¶260-262, 270.

⁵ Note that at element [1.7.1], the claim clarifies that the “*at least one intra-domain (IDB)*” is “*intra-domain **broker** (IDB)*.”

First, Gibson similarly discloses that its MPLS network includes **“connection managers and administrative server.”** Ex.1006, 6:14-16. The administrative server together with one or more connection manager, corresponds to *“at least one intra-domain (IDB),”* as discussed below. Ex.1003, ¶263.

The administrative server communicates utilizing “standard CR-LDP (Constraint-based Routing Label Distribution Protocol) protocol” used to “allow **traffic engineering methods to be applied to an MPLS** network such that specific paths can be established through a set of chosen nodes with a particular Quality of Service.” Ex.1006, 17:45-55. The administrative server, for example, “uses CR-LDP over [an] interface to provision high capacity label switch paths” Ex.1006, 8:25-29. The administrative server also “has a much more detailed view of the **topology** of the intermediate MPLS network.” Ex.1006, 8:32-34; Ex.1003, ¶264.

The connection manager works together with the administrative server to setup LSPs and perform admission control within different areas of the MPLS network. Gibson explains that the “connection manager...allow[s] registration of new label switch paths or a change in parameters of an existing label switch path.” Ex.1006, 8:11-14. The connection manager also performs admission control, including determining if it has resources to allow a new session (Ex.1006, 10:11-24) and, if so, making a temporary reservation for the session (Ex.1006, 10:24-30),

else denying the session and sending “error message” (Ex.1006, 10:30-34). If all of the connection managers along a path have sufficient resources, then the connection manager “converts its temporary reservation for the requested communication session into a permanent reservation.” Ex.1006, 10:66-11:6; Ex.1003, ¶266.

For example, in the context of Figure 1 below, provided is an example of Gibson’s’ admins server and connection managers, which are responsible for admission control in sub areas (clouds of nodes 15 and 16) of the MPLS network.

“at least one intra-domain (1DB)”

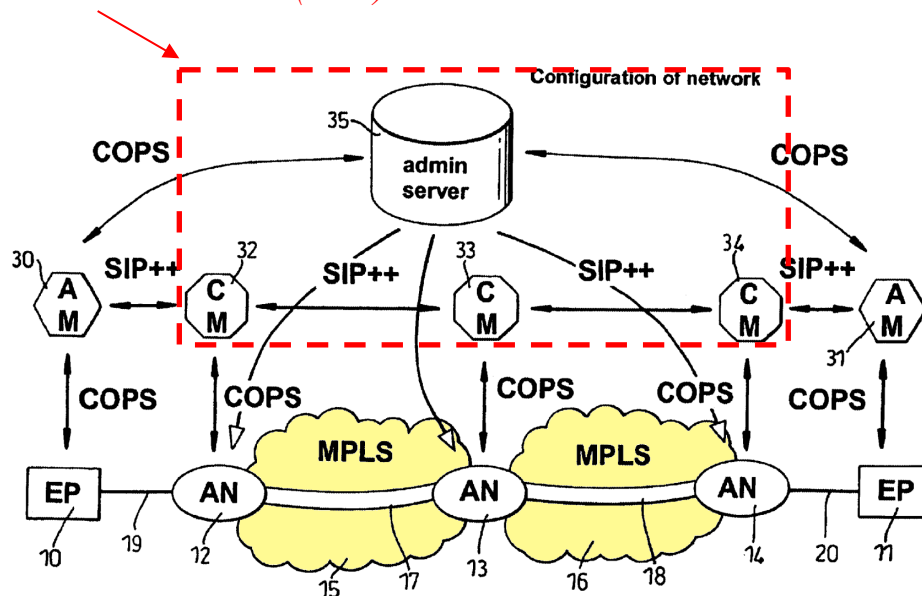


Fig. 1

Ex.1006, Fig. 1 (annotated); Ex.1003, ¶267.

Gibson also provides another example of how the connection manager performs

admission control using CR-LDP. Ex.1006, 11:60-12:67. Administrative server and the connection manager utilize “Common Open Policy Service (COPS) messaging protocol” to manage network policy. Ex.1006, 5:13-25; 17:25-27 (“COPS is a **policy** messaging protocol”); Ex.1003, ¶¶267-268.

A POSITA would have understood that the administrative server and the connection manager may be readily implemented together as a centralized entity, to the extent that is required. *See e.g.*, Ex.1005, 12 (disclosing that bandwidth brokers may be centralized); Ex.1016, 2 (describing that the server can be implemented in software using a “centralized paradigm”); Ex.1025, 5; Ex.1003, ¶271.

Additionally, Gibson notes that although the administrative server is “pictured as a single entity in FIG. 1, an administrative server 35 may take the form of multiple servers that administer their local area.” Ex.1006, 8:22-24, Fig. 1. Since Gibson’s administrative server may take the form of multiple servers, it would have been obvious to implement one server for each communications manager, as depicted at Figure 2. For example, it was known that MPLS traffic engineering servers may be implemented with “software” and as such may be distributed (as Gibson teaches) to be part of any network node or device. These are implementation details that would have been recognized and well within the skillset of a POSITA. Ex.1003, ¶271.

Accordingly, Gibson's administrative server (an MPLS traffic engineering server that manages policy, has topology information, and sets up LSPs) and connection manager (an administrative entity that manages policy, has topological information, sets up LSPs, and performs admission control within its MPLS area) together render obvious "*at least one intra-domain (1DB).*" Ex.1003, ¶269.

Reasons to Combine

It would have been obvious to a POSITA, in view of Gibson, for Xiao's MPLS network domain ISP2 to include at least one administrative server (Ex.1006, 8:22-24) and at least one connection manager (Ex.1006, 8:4-7) to facilitate setting up LSPs in Xiao's MPLS network domain ISP2. *See* [1.6.1]. Because the administrative server and connection manager are within the MPLS network domain, the admission manager ("*bandwidth broker*") would be free to manage communications with neighboring bandwidth brokers while the internal management elements (administrative server and connection manager) handle internal resource reservations and admission control. Such an implementation would allow for scaling, while also supporting fine grained resource allocation within the domain. *See e.g.*, Ex.1032, 454; Ex.1021, 3; Ex.1003, ¶272.

A POSITA would have had a reasonable expectation of success in such an implementation, since this is merely utilizing prior art components (e.g., administrative server and connection manager) in the same way. Expectation of

success is also evidenced by others that had used intra-domain bandwidth brokers. *See e.g.*, Ex.1015, 11 (MPLS with “**intra-domain** implementation technology”); Ex.1016, 8-9 (MPLS with an “**intra-domain bandwidth broker.**”); Ex.1020, 8 (“**intra-domain BBs**”); Ex.1003, ¶273.

Second, as discussed below, Gibson discloses that the admission manager (“*bandwidth broker*”) passes various resource requests to the administrative server and the connection manager (“*at least one intra-domain (IDB)*”), which renders obvious “*passing resource requests from the Bandwidth Broker (BB).*” Ex.1003, ¶274.

1. Gibson’s requests for new LSPs disclose “resource requests”

Gibson discloses that the “admission manager” (“*bandwidth broker*”) passes a “**Request message**” to the administrative server (“*at least one intra-domain (IDB)*”), “**request[ing] new high capacity label switch paths.**” Ex.1006, 8:49-65, Fig. 2; *see also* Ex.1006, 8:22-24, Fig. 1. Also, the “**Request message**” (e.g., for a new LSP) is passed to a connection manager (“*at least one intra-domain (IDB)*”). Ex.1006, 8:55-9:10; *see also* Ex.1006, 8:11-14; Ex.1003, ¶¶275-276.

As shown below at Gibson’s Figure 2, a “Request” for a new LSP is passed from the admission manager (“*bandwidth broker*”) to both the administrative server and also to the connection manager (collectively “*at least one intra-domain (IDB)*”).

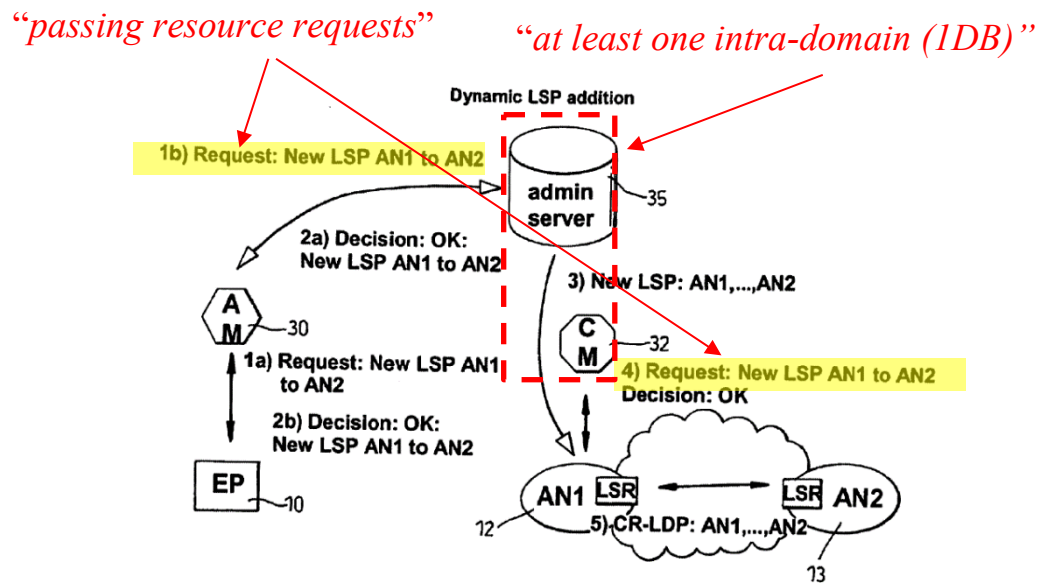


Fig. 2

Ex.1006, Fig. 2 (annotated); Ex.1003, ¶277.

Although Figure 2 is simplified to illustrate a single connection manager 32, it would have been obvious to a POSITA that the MPLS network may include additional connection managers, as illustrated at Figure 1, when the MPLS network has multiple cloud areas. *See e.g.*, Ex.1006, 8:5-6 (“...other administrative elements [] such as other connection managers...”), Figs. 1, 4-5, 10 (illustrating more than one connection manager); Ex.1003, ¶277.

Additionally, it would have been obvious to a POSITA for the admission manager to pass a plurality of requests to set up a plurality of LSPs when sustaining a plurality of separate communications sessions. *See* Ex.1006, 3:24-35 (“Preferably, said communications network... is capable of sustaining a plurality of separate communication sessions. By provisioning the communications network

in this way high capacity routes which act as ‘motorways’ are created.”). The requests for new LSPs passed to the administrative server and connection manager render obvious “*passing resource requests.*” Ex.1003, ¶278.

It would have been obvious to a POSITA, in view of Gibson, for Xiao’s bandwidth broker ISP2-BB in the MPLS domain to send resources requests (e.g., to set up new LSPs) to an administrative server and to one or more connection managers. Because the resource request is for a new LSP, the administrative server and connection manager would have notice of the need. In response, they would cooperate to set up new LSPs for service from the source Host S to the destination Host D through the MPLS network domain ISP2. *See* [1.0.1], [1.6.2], [1.7.1]; *see* Reasons to Combine; Ex.1003, ¶¶279-280.

2. Gibson’s INVITE messages disclose “*resource requests*”

Gibson also teaches that the admission manager (“*bandwidth broker*”) sends “one or more **INVITE messages**” to a connection manager. Ex.1006, 9:51-10:11. The INVITE message “contains a **description of the requirements** for the desired communication session.” Ex.1006, 9:61-62. In response, the connection manager determines if it has sufficient resources to reserve, as specified by the INVITE message’s session requirements, and if there are insufficient resources it returns an error message, else it “makes a temporary **reservation for the session.**” Ex.1006, 10:12-34. A POSITA would have understood that the INVITE messages are

“resource requests” because they contain a description of the requirements (e.g., resources to reserve) for a communication session. Ex.1003, ¶¶281-282.

Figure 1, reproduced below, illustrates passing INVITE messages from the admission manager (“bandwidth broker”) to a connection manager (collectively with the administrative server correspond to “at least one intra-domain (1DB)”).

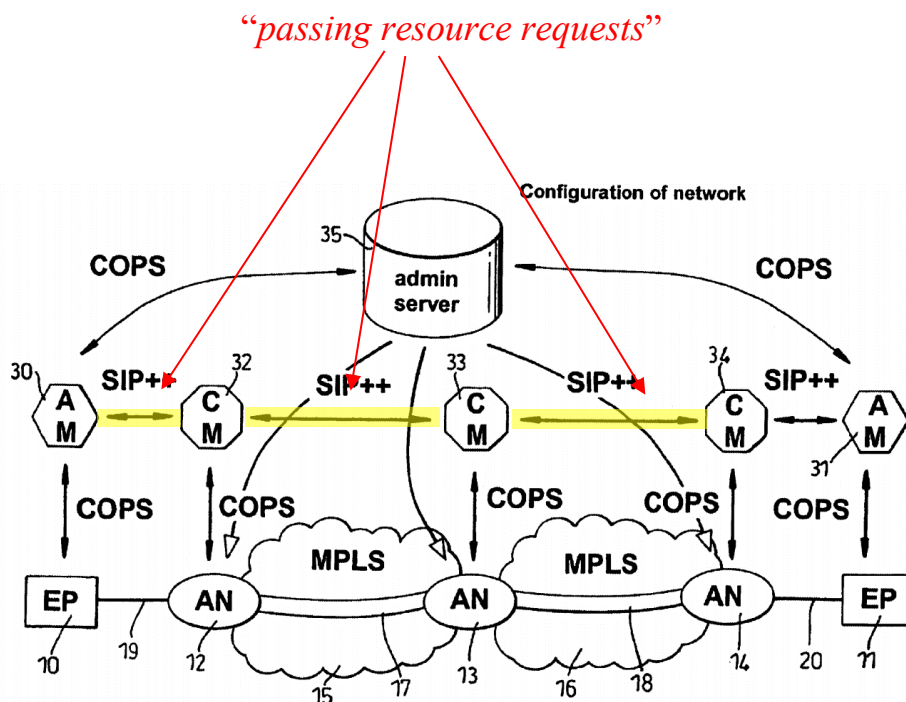


Fig. 1

Ex.1006, Fig. 1 (annotated); Ex.1003, ¶283.

It would have been obvious to a POSITA, in view of Gibson, to pass INVITE messages from the MPLS domain bandwidth broker ISP2-BB to one or more connection managers to perform admission control, including checking for sufficiency of resources and if available and reserving resources. This would allow

for establishing a communication session from the source Host S to the destination Host D through the MPLS network domain ISP2. *See* [1.0.1]; Reasons to Combine; Ex.1003, ¶¶283-285.

[1.7.1] *wherein each intra-domain broker (IDB) is responsible for admission control and*

First, as discussed at [1.6.2], the administrative server in combination with the connection manager renders obvious the “*to at least one intra-domain broker (IDB).*” Further, as discussed above, the prior art renders obvious passing requests (for new LSPs and INVITE messages for resources) from the bandwidth broker ISP2-BB to a connection manager. Ex.1003, ¶¶286-287.

Second, Gibson discloses that the connection manager decides whether to accept the request for resources (e.g., new LSP) and issues a corresponding “Decision message.” Ex.1006, 8:55-9:10; *see also* Ex.1006, 8:11-14; Ex.1003, ¶¶288. A POSITA would have understood “admission control” as the “decision process of whether to accept a request for resources.” Ex.1005, 9. Gibson’s disclosure of the connection manager deciding whether to accept the resource request (for a new LSP) discloses that the “*intra-domain broker (IDB) is responsible for admission control admission control.*” It would have been obvious to a POSITA, when the MPLS network includes more than one connection manager that receives a resource request, for each connection manager to perform

admission control to determine whether to accept the request for the new LSP.

Ex.1003, ¶289.

Additionally, Gibson discloses that the connection manager, in response to receiving an INVITE message, determines if it can accommodate the new session and if so it makes a temporary reservation, else the connection manager will respond with an error message. Ex.1006, 10:12-33. “This process is repeated until the INVITE messages reach the destination endpoint.” Ex.1006, 10:32-34. It would have been obvious to a POSITA that the decision process is performed by each connection manager on the path toward the destination. Gibson’s disclosure of each connection manager determining whether to accept the INVITE request and reserve resources or respond with an error message discloses that the “*intra-domain broker (IDB) is responsible for admission control admission control.*” Ex.1003, ¶¶290-291.

It would have been obvious to a POSITA, when implementing Xiao in combination with Gibson, for the connection manager to perform admission control with respect to resource requests (e.g., new LSP and a new session). The connection manager has visibility of the MPLS network that it manages (Ex.1006, 7:66-8:15) so it would be well positioned to decide whether to accept or deny the request for a new LSP. Also, the connection manager is able to determine if there are sufficient resources for a newly requested communication session defined by

the INVITE message, since it has visibility regarding available resources (Ex.1006, 7:66-8:15, 19:26-33) and is able to temporarily reserve the resources accordingly. Because in the combination the connection manager performs admission control within local areas of the MPLS network, Xiao's higher level bandwidth broker ISP2-BB would be free to communicate with neighboring bandwidth brokers outside the MPLS domain, which supports scaling. Ex.1032, 454; *see* Reasons to Combine; Ex.1003, ¶¶117, 292.

[1.7.2] *wherein each intra-domain broker (IDB) is responsible for...the Label Switched Path, LSP, setup.*

First, as discussed at [1.6.1], the prior art renders obvious “*performing [LSP] Label Switched Path, setup.*” Further, as discussed at [1.6.2], the administrative server in combination with the connection manager renders obvious the “*at least one intra-domain broker (IDB).*” Consistent with the above analysis, the administrative server and the connection manager collectively are responsible for setting up the LSPs across the MPLS network, which renders obvious that “*each intra-domain broker (IDB) is responsible for...the Label Switched Path, LSP.*” For instance, Gibson discloses that the administrative server initially provisions LSPs and sets up new LSPs via a request mechanism. Ex.1006, 8:16-9:10; Ex.1003, ¶¶293-295.

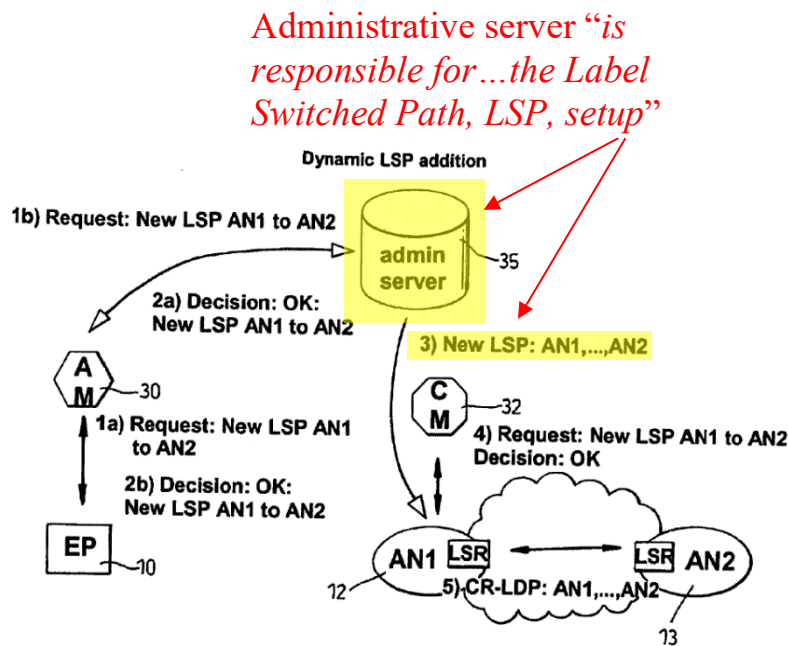


Fig. 2

Ex.1006, Fig. 2 (annotated); Ex.1003, ¶295.

Additionally, the connection manager is responsible for the LSP setup since it sends an “OK” decision message to the abstract node 12 to set up the LSP.

Ex.1006, 8:55-9:10.

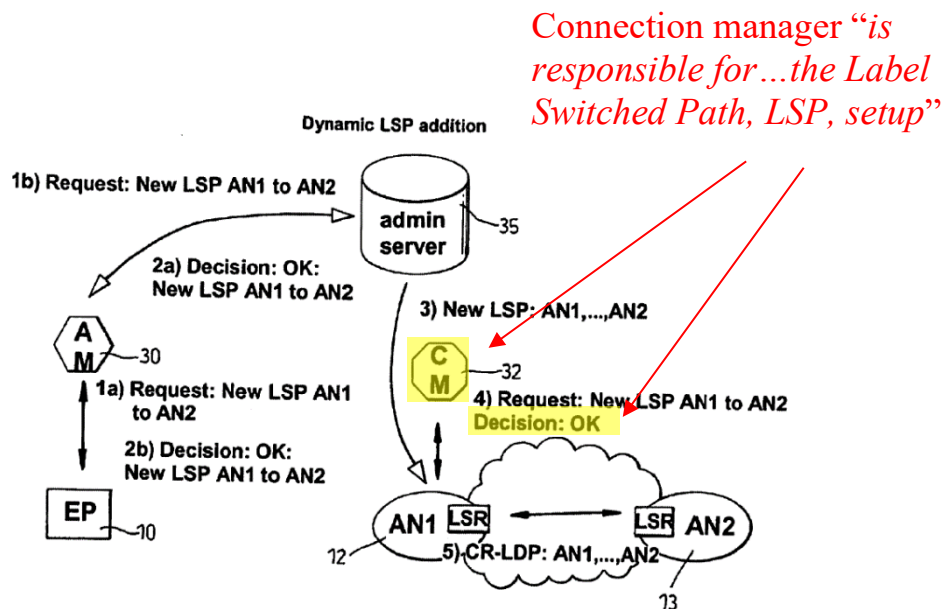


Fig. 2

Ex.1006, Fig. 2 (annotated); Ex.1003, ¶296.

A disclosure of either the administrative server or the connection manager being responsible to set up the LSP is sufficient to meet the claimed element, since, as mapped above at [1.6.2], they collectively render obvious the “*at least one intra-domain broker (IDB).*” Ex.1003, ¶¶296-297.

A POSITA would have understood that the MPLS network, as shown at Figure 1 below, may comprise sub areas (or clouds 15, 16) and therefore may include additional connection managers (CM 32-34) along the path toward the destination. Ex.1003, ¶298.

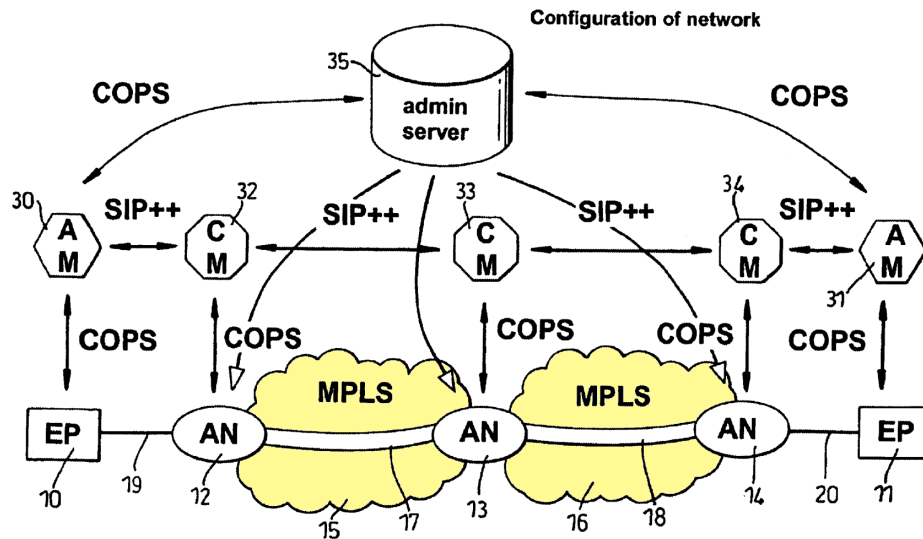


Fig. 1

Ex.1006, Fig. 1 (annotated); Ex.1003, ¶298.

In such instances, it would have been obvious to a POSITA for each of the connection managers (CM 32-34) in cooperation with the administrative server (35) to setup “new high capacity label switch paths across the MPLS network.” Ex.1006, 8:49-54; Ex.1003, ¶299.

It would have been obvious to a POSITA, when setting up an LSP in Xiao’s MPLS network domain ISP2 (*see* [1.6.1]), for the administrative server and each connection manager along the path toward to cooperate to set up the LSP within its MPLS area, to thereby provide “new high capacity label switch paths across the MPLS network.” Ex.1006, 8:49-54; Reasons to Combine; Ex.1003, ¶¶118, 300-301.

2. Claim 2

[2.1] ... if said domains comprise at least one Differentiated Services, DiffServ, domain, the method comprises the following step to be performed after step v): vi) BB_A engages in Traffic Conditioners configuration in the ingress router for SRC in order to establish a VLL of the predefined QoS.

Consistent with the analysis at [1.0.1]-[1.0.3] Xiao comprises “*at least one...DiffServ, domain.*” Further, Xiao discloses that the source bandwidth broker, after admission control, engages in traffic conditioning by “**set[ting] the classification and shaping rules on [ingress] router LR1.**” Ex.1005, 12; Ex.1025, 5; Ex.1003, ¶¶302-304.

3. Claim 3

[3.1] ... said domains comprise at least one Differentiated Services, DiffServ, domain and one Multiprotocol Label Switching, MPLS, domain.

See [1.0.1] and [2.0]; Ex.1003, ¶¶305-306.

4. Claim 4

[4.1] ... said predefined QoS is a rate, R.

The '698 patent's rate, R, corresponds to a predefined bandwidth. Ex.1001, 7:32-36. As discussed at [1.1.1], Xiao discloses that the service level agreement (SLA) predefines “**bit-rate**” with guaranteed “**bandwidth.**” Ex.1005, 11. A POSITA would have understood that the guaranteed bandwidth corresponds to a bit-rate (e.g. Mbps). Ex.1024, 5; Ex.1025, 12; Ex.1026, 133. Additionally, it would have understood that implementation of a VLL in general, described by Xiao,

would include providing quality of service at a predefined rate. Ex.1027, 3:33-35, 4:46-47; Ex.1003, ¶¶307-311.

5. Claim 5

[5.1] ... the bandwidth broker (BB) comprises a topology map and routing information to be able to perform path sensitive admission control of incoming requests,

Gibson's admission manager ("*bandwidth broker*") maintains "**topological information**" by "processes[ing] all the **route advertisements** it receives" and uses this information to "**build up a map** of all the reachable nodes." Ex.1006, 7:28-46. The information is used "to select a route" to "effectively provide[] admission control." Ex.1006, 7:46-48; Ex.1003, ¶¶312-315.

Schelen-1 similarly teaches that the bandwidth broker "**know[s] the topology**" by accessing a "**topology database**." Ex.1032, 452. The bandwidth broker also obtains routing information by participating in "**a link state routing protocol**," to "detect topology changes" and "**link or router failure**" so that it can perform path-sensitive admission control for a request. Ex.1032, 452-453, 456; Ex.1034, 29. A POSITA would have understood that Schelen-1's topology information is a map of the communication network topology since it is obtained from a topology database and accurate enough to determine if the routing topology has changed. Ex.1003, ¶¶316-318.

It would have been obvious to a POSITA, in view of Gibson and Schelen-1, for Xiao's bandwidth broker to comprise a topology map and routing information, to be able to perform path sensitive admission control. This would enable Xiao's bandwidth broker to have an understanding of the available paths and to choose the best path, when performing admission control in response to receiving an incoming RSVP PATH message request. *See* [1.1.1]-[1.4]; *see also* Reasons to Combine; Ex.1003, ¶¶88-89, 119-120, 319.

[5.2] *wherein the information is retrieved by peering as a link-state router.*

As discussed at [5.1], Schelen-1's routing information is obtained by the agent participating in a link state routing protocol. It would have been obvious to a POSITA for Xiao's bandwidth broker to participate in a link-state routing protocol because this would allow the bandwidth broker to be informed regarding any link or router failure quickly and take appropriate action (e.g., re-route) to remedy the failure. Ex.1032, 456; Ex.1007, 218; *see also* Reasons to Combine; Ex.1003, ¶¶320-322.

6. Claim 7

[7.1] ... *a bandwidth broker (BB) in a specific domain performs admission control for all links in the path that belong to that domain.*

Xiao discloses that the bandwidth broker “**allocate[s] resources**” for “**all hosts**” in its domain. Ex.1005, 11. A POSITA would have understood that

resource allocation decisions for all hosts in a domain includes making decisions for all links in the path within the domain because the links transport traffic to and from the hosts. Ex.1038, 1; Ex.1003, ¶¶323-326.

Schelen-1 further discloses that “**admission control and service commitments are all managed**” by a bandwidth broker “on behalf of the routers in the domain.” Ex.1032, 451, 457. This includes “**considering static link resources** and traffic descriptions given in admission requests” and “**set[ing] setup resources along shortest paths.**” Ex.1032, 453. It would have been obvious to a POSITA, in view of Schelen-1, for Xiao’s bandwidth broker to perform admission control for all links in its domain, because Xiao recognizes that it is better for the bandwidth broker to perform admission control and because such an implementation would relieve the routers from related computations. Ex.1005, 11; Ex.1032, 457. Individual routers may also not have the requisite information (e.g., link resources or topology) to make such decisions appropriately. *See also* Reasons to Combine; Ex.1003, ¶¶90-91, 327-328.

7. Claim 8

[8.1] ... a bandwidth broker (BB) comprises a storage, where it stores records of all its granted requests, and

Schelen-1 discloses that “**reservations are maintained**” by bandwidth brokers. Ex.1032, 458; *see also* Ex.1032, 452. Similarly, Gibson discloses that the

“admission manager [bandwidth broker] is able to correlate its **successful requested** path element that it sent with the actual path reserved, and **store** this for future use” in storage, such as “**computer readable medium.**” Ex.1006, 2:54-59, 15:20-23; Ex.1003, ¶¶329-330.

It would have been obvious to a POSITA to maintain the reservation state for all granted reservations in the computer readable medium of the bandwidth broker since it will be needed for “for future use” such as “future packet forwarding.” Ex.1006, 15:20-23, 20:9-11; Ex.1032, 452; *see also* Ex.1020, 18; Ex.1014, 10:47-50. Additionally, maintaining all of the granted reservations allows for aggregating multiple reservations, releasing resources when reservation ends, and planning future allocations. Ex.1005, 13; Ex.1019, 4; Ex.1032, 457. Without maintaining all of the granted reservations, there would be the potential that new reservations will be granted without having sufficient resources. *See* Ex.1011, 17-18, 17; Ex.1003, ¶¶121, 331-332; *see also* Reasons to Combine; Ex.1003, ¶¶121, 332.

[8.2] *also user-related data such as policies or accounting information.*

Xiao’s bandwidth broker configures routers with policy information, e.g., “classification, policing, and shaping rules,” “derived from the SLAs” with the “**customer.**” Ex.1005, 9-10. It would have been obvious for Xiao’s bandwidth broker to store the SLA in its storage (*see* [8.1]) so that it would have this

information for configuring routers when a request is granted. Ex.1020, 7, 23; Ex.1003, ¶333.

Schelen-1 discloses that the bandwidth broker has “**records for managing accounting etc.**” Ex.1032, 453. It would have been obvious to a POSITA that the accounting records are user-related since the bandwidth broker manages its domain for the purposes of servicing the user, similar to a travel agent. Ex.1032, 453. It would have been obvious to a POSITA for Xiao’s bandwidth broker to manage accounting records by storing the records in its storage so that they are available as needed for billing the user. Also, storing the accounting records (e.g., cost per route charged to a user) would be useful when the bandwidth broker supports traffic engineering in the MPLS domain. Ex.1005, 13, 15; *see also* Reasons to Combine; Ex.1003, ¶¶92-94, 334.

D. Ground 2: Claims 4-8 are Obvious over Xiao, Schelen-1, Gibson, and Schelen-2

1. Claim 4

[4.1] ... said predefined QoS is a rate, R.

Schelen-2 teaches parameter-based admission control, where “[e]ach **reservation request contains a bandwidth to be reserved,**” which would be understood to correspond to a rate (e.g., Mbps). Ex.1007, 215, 218; Ex.1024, 5; Ex.1025, 12; Ex.1026, 133. It would have been obvious to a POSITA, in view of

Schelen-2, for Xiao's PATH message request (*see* [1.1.1]) to contain the bandwidth to be reserved as part of the QoS parameters, so that the bandwidth broker knows what resources to check for and reserve, as well as how to plan and schedule future reservations. Ex.1007, 220-221, Fig. 5. This reduces the risk of over allocating resources. Ex.1031, 268; *see also* Reasons to Combine; Ex.1003, ¶¶97, 336-340.

2. Claim 5

[5.1] ... the bandwidth broker (BB) comprises a topology map and routing information to be able to perform path sensitive admission control of incoming requests,

Schelen-2's bandwidth broker has a **"topology map"** and **"participat[es] in a link state routing protocol (e.g., OSPF)"** to **"detect routing changes on average as fast as any router."** Ex.1007, 215, 218; *see also* Ex.1007, 214, 218.

The topology map and routing information enables the bandwidth broker to **"perform admission control on the links from the starting point to an edge router in its domain"** and allow for detecting routing changes to **"schedule resources along new paths."** Ex.1007, 215, 218; Ex.1003, ¶¶341-344.

It would have been obvious to a POSITA, in view of Schelen-2, for the Xiao's bandwidth broker to comprise a topology map and routing information to be able to determine if there are sufficient resources along a specific path when performing admission control in response to receiving an incoming RSVP PATH

message request, thereby reducing the risk of overallocation of resources. This would also allow for the bandwidth broker to choose the best path for a given request and also distribute load more evenly. *See also* Reasons to Combine; Ex.1003, ¶¶98-99, 345.

[5.2] *wherein the information is retrieved by peering as a link-state router.*

As discussed at [5.1], Schelen-2's routing information is obtained by the bandwidth broker participating in a "link state routing protocol (e.g., OSPF)." It would have been obvious to a POSITA for Xiao's bandwidth broker to participate in a link-state routing protocol because this would allow the bandwidth broker to be informed regarding any link or router failure quickly and take appropriate action (e.g., re-route) to remedy the failure. Ex.1032, 456; Ex.1007, 218; *see also* Reasons to Combine; Ex.1003, ¶¶346-347.

3. Claim 6

[6.1] ... *the bandwidth broker (BB) comprises a data structure which keeps resource usage information over time for each link in the topology which enables ability to plan ahead of time.*

Schelen-2 discloses "**data structures** that manage reservations," including "information about the **current reserved aggregate bandwidth**" as well as "**the aggregated bandwidth reserved in advance over time.**" Ex.1007, 221. Schelen-2's bandwidth broker also "**maintains information about reserved resources on each link in its domain**" per a "**topology map of the domain.**" Ex.1007, 215.

Figure 5 illustrates using resource information to plan bandwidth for a new request over time. Ex.1007, 220-221; Ex.1003, ¶¶348-350.

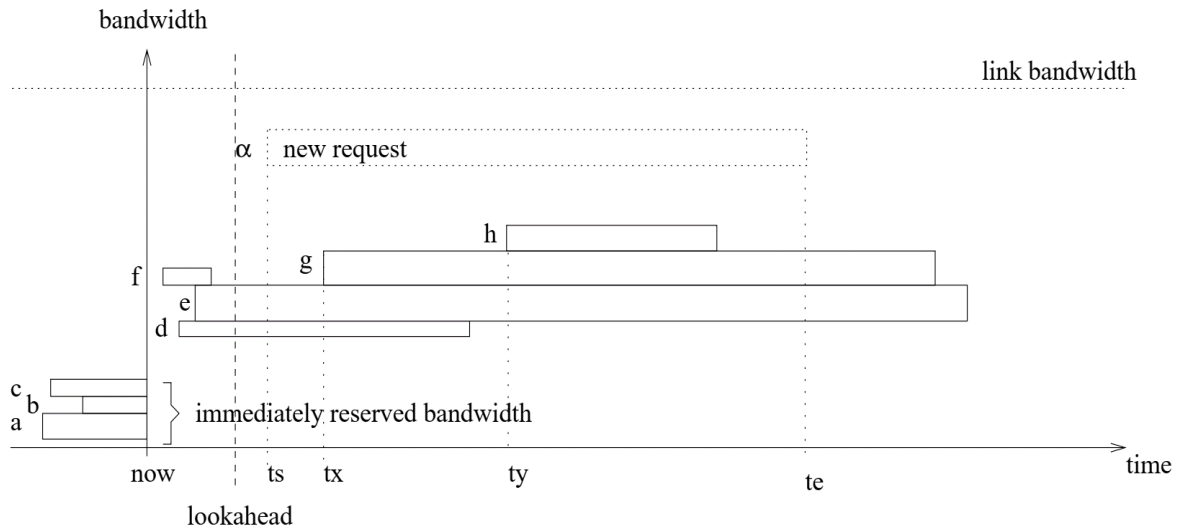


Figure 5: Snap-shot of reservations
 Ex.1007, Fig. 5.

It would have been obvious to a POSITA, in view of Schelen-2, for Xiao's bandwidth broker to comprise a data structure to keep resource usage information over time for each link in the network domain as defined by the topology map (*see* [5.1]) so that it can plan ahead over time and determine whether there are sufficient resources available when making immediate and advanced reservations and to also reduce the risk over allocating resources. Ex.1007, 213, 220-222, 224, Fig. 5; Ex.1020, 23; Ex.1031, 268; *see also* Reasons to Combine; Ex.1003, ¶¶100-102, 351.

4. Claim 7

[7.1] ... a bandwidth broker (BB) in a specific domain performs admission control for all links in the path that belong to that domain.

Schelen-2's bandwidth broker **"perform[s] admission control on the links from the starting point to an edge router in its domain"** and that it **"maintains information about reserved resources on each link in its domain."** Ex.1007, 215. It would have been obvious to a POSITA, in view of Schelen-2, for Xiao's bandwidth broker to perform admission control for all links in the path in its domain because Xiao recognizes that it is better for the bandwidth broker to perform admission control and because such an implementation would relieve the routers from related computations. Ex.1005, 11; Ex.1032, 457. Another benefit is that the bandwidth broker has visibility of all reserved and available resources, which allows it to schedule efficiently. Ex.1007, 220-221, Fig. 5. Such an implementation also simplifies administration with neighboring bandwidth brokers. *See* Reasons to Combine; Ex.1003, ¶¶103-104, 352-354.

5. Claim 8

[8.1] ... a bandwidth broker (BB) comprises a storage, where it stores records of all its granted requests, and

Schelen-2 discloses **"grant[ing] a generalized reservation"** and that the bandwidth broker uses **"data structures"** and **"memory and disk"** to **"store"** the **"reservation state."** Ex.1007, 221-223, 10. It would have been obvious to a

POSITA for the bandwidth broker's memory and disk to store, in a data structure, the reservation state of all granted requests so that resources are managed appropriately (e.g., allocated at start and released when finished) and to plan allocations for new requests. Ex.1007, 220-222, Fig. 5. If the reservation state was not stored for all granted requests, there would be the potential that new reservations will be granted without having sufficient resources. *See* Ex.1011, 17-18. As another example, when routing changes occur, the bandwidth broker would be able to schedule resources along new paths to service the granted requests that it has stored. Ex.1007, 218; Ex.1003, ¶¶355-358.

In view of Schelen-2, it would have been obvious to a POSITA for Xiao's bandwidth broker to comprise memory and disk with a data structure, where it stores the reservation state of all its granted requests so that it can manage granted reservations and plan for new reservations. *See* Reasons to Combine; Ex.1003, ¶¶105-106, 359.

[8.2] *also user-related data such as policies or accounting information.*

Schelen-2 discloses that the bandwidth broker “**manages a user's account**” and that “**accounting information is aggregated**” to determine related “charges.” Ex.1007, 215. It would have been obvious to a POSITA to store the accounting information within the bandwidth broker's storage (*see* [8.2]) so that it can be used

for determining “charges” associated with the user’s reservation and thereafter to bill the user per the SLA. Ex.1007, 215; Ex.1005, 11; Ex.1003, ¶360.

In view of Schelen-2, it would have been obvious to a POSITA for Xiao’s bandwidth broker to manage and store user-related accounting information in its storage (memory and disk as analyzed at [8.2]) so that the user’s charges are accounted for and billed. *See* Reasons to Combine; Ex.1003, ¶¶107, 361.

X. DISCRETIONARY DENIAL IS INAPPROPRIATE

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

None of the references presented in the petition were cited or considered by the Examiner during prosecution of the ’698 patent. While the Schelen Thesis, which is cited in the ’689 patent, has some overlap in subject matter with the disclosure of Schelen-1 and Schelen-2, the relevant teachings and the evidence were not considered by the Examiner as presented herein. Ex.1002, 41.

Accordingly, discretionary denial under 35 U.S.C. § 325(d) is not appropriate.

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

The six factors considered for § 314 denial strongly favor institution. *See Apple Inc. v. Fintiv, Inc.*, IPR2020-00019, Paper 11 (PTAB Mar. 20, 2020) (precedential).

1. No evidence regarding a stay

No motion to stay has been filed, so the Board should not infer the outcome of such a motion. *Sand Revolution II LLC v. Cont’l Intermodal Grp. – Trucking LLC*, IPR2019-01393, Paper 24 at 7 (PTAB June 16, 2020) (informative); *see also Dish Network L.L.C. v. Broadband iTV, Inc.*, IPR2020-01359, Paper 15 (Feb. 12, 2021). Thus, this factor is neutral.

2. Parallel proceeding trial date

This factor weighs against discretionary denial because the projected trial date—based on median time-to-trial statistics—is in August of 2024, around the same time as the Board’s Final Written Decision is expected in August of 2024.⁶

The co-pending district court amended complaint was filed in the EDTX on August 19, 2022, and the parties have jointly petitioned the Court to move the *Markman* hearing to November 2023, and the trial setting to “May 2024 or subject to convenience of the Court’s schedule.” Ex.1037; Ex.1041, 1, 3. The Board recognizes “that scheduled trial dates are unreliable and often change.” *See* Director’s June 21, 2022 Memorandum on Discretionary Denials (“Memo”), 8. In accordance with the Memorandum, factor 2 weighs “against exercising discretion

⁶ August 2024 is 18 months after February 2023, when Petitioner expects a notice of accorded filing date for this petition.

to deny institution under *Fintiv* if the median time-to-trial is around the same time or after the projected statutory deadline for the PTAB’s final written decision.”

Memo, 9. Here, recent statistics show a median time-to-trial in the Eastern District of Texas at 24.5 months. Ex.1042, 5. Accordingly, the projected trial date for purposes of *Fintiv* is August of 2024—approximately 24 months after July 2022, and around the same time as the Board’s Final Written Decision is expected in August of 2024. Thus, this factor weighs in favor of institution.

3. Investment in the parallel proceeding

The co-pending litigation is in its very early stages, and the investment in it has been minimal. The parties have not exchanged preliminary positions on claim construction or invalidity, expert discovery has not begun. *See PEAG LLC v. Varta Microbattery GmbH*, IPR2020-01214, Paper 8, 17 (Jan. 6, 2021).

4. Overlapping issues with the parallel proceeding

There is no present overlap of prior art issues due to the early stage of district court litigation. Consequently, this factor favors institution.

5. Identity of parties

Petitioner is a defendant in the litigation. Ex.1036; Ex.1037. That is true of most Petitioners in IPR proceedings. Accordingly, this factor should not be a basis for denying institution.

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

As analyzed above, the prior art presented in this Petition renders the Challenged Claims unpatentable as obvious. The merits of Petitioner's arguments are strong, and this factor weighs against discretionary denial. *See* Memo, 4.

Because the *Fintiv* factors are either neutral or weigh against discretionary denial, and institution should not be denied on discretionary factors.

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

The '698 patent has not been challenged in any prior IPR petition, so none of *General Plastic* factors apply to this Petition. *See General Plastic Indus. Co., Ltd. v. Canon Kabushiki Kaisha*, IPR2016-01357, Paper 19 at 16 (Sept. 6, 2016) (Section II.B.4.i. precedential).

XI. CONCLUSION

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

Respectfully submitted,

Dated: February 17, 2023
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XII. MANDATORY NOTICES

A. Real Party-in-Interest

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

B. Related Matters

Pursuant to 37 C.F.R. § 42.8(b)(2), to the best knowledge of the Petitioner, the '698 patent is or was involved in the following case(s):

Case Heading	Number	Court	Filed
<i>NetSocket, Inc. v. Cisco Systems, Inc.</i>	2-22-cv-00172	EDTX	May 24, 2022

C. Lead and Back-up Counsel and Service Information

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

XIII. CLAIMS APPENDIX

[1.0.1] 1. Method in a packet based communication network including network domains, wherein at least one domain is a Multiprotocol Label Switching MPLS domain,

[1.0.2] to establish a virtual leased line, VLL, between a source (SRC) and a destination (DST) in different domains in order to achieve packet transfer between the source (SRC) and the destination (DST),

[1.0.3] wherein the bandwidth broker (BB) is associated to each network domain and the

[1.0.4] bandwidth broker (BB) is configured to control a hierarchical routing domain, the method comprises the following steps:: and

[1.1.1] i) generate a request from en equity for a Virtual Leased Line, VLL, having a predefined Quality of Service, QoS, from a source network (SRC) to a destination network (DST) and,

[1.1.2] apply the request to a Bandwidth Broker (BB) of a domain A, BBA, associated to the source network;

[1.2] ii) BBA establishes the different domains involved to reach the destination network (DST);

[1.3] iii) BBA directly or indirectly passes requests to all Bandwidth Brokers (BB) of the involved domains regarding a VLL of the predefined QoS from

ingress to egress of each domain;

[1.4] iv) each involved bandwidth broker (BB) performs admission control in its domain;

[1.5.1] v) each involved bandwidth broker (BB) returns a result of the admission control to BBA that passes it back to the requesting entity and

[1.5.2] if the request was admitted along all domains between the source (SRC) and the destination (DST) a VLL of the predefined QoS is granted,

[1.6.1] characterized in that step iv) comprises the following step: performing [LSP] Label Switched Path, LSP. setup and

[1.6.2] passing resource requests from the Bandwidth Broker (BB) to at least one intra-domain (1DB),

[1.7.1] wherein each intra-domain broker (1DB) is responsible for admission control and

[1.7.2] wherein each intra-domain broker (1DB) is responsible for...the Label Switched Path, LSP, setup.

[2.1] 2. Method according to claim 1, characterized in that if said domains comprise at least one Differentiated Services, DiffServ, domain, the method comprises the following step to be performed after step v): vi) BBA engages in Traffic Conditioners configuration in the ingress router for SRC in order to establish a VLL of the predefined QoS.

- [3.1] 3. Method according to claim 1, characterized in that said domains comprise at least one Differentiated Services, DiffServ, domain and one Multiprotocol Label Switching, MPLS, domain.
- [4.1] 4. Method according to claim 1, characterized in that said predefined QoS is a rate, R.
- [5.1] 5. Method according to claim 1, characterized in that the bandwidth broker (BB) comprises a topology map and routing information to be able to perform path sensitive admission control of incoming requests,
- [5.2] wherein the information is retrieved by peering as a link-state router.
- [6.1] 6. Method according to claim 4, characterized in that the bandwidth broker (BB) comprises a data structure which keeps resource usage information over time for each link in the topology which enables ability to plan ahead of time.
- [7.1] 7. Method according to claim 1, characterized in that a bandwidth broker (BB) in a specific domain performs admission control for all links in the path that belong to that domain.
- [8.1] 8. Method according to claim 1, characterized in that a bandwidth broker (BB) comprises a storage, where it stores records of all its granted requests and
- [8.2] also user-related data such as policies or accounting information.

CERTIFICATE OF WORD COUNT

Pursuant to 37 C.F.R. § 42.24(d), Petitioner hereby certifies, in accordance with and reliance on the word count provided by the word-processing system used to prepare this Petition, that the number of words in this paper is 13,996. Pursuant to 37 C.F.R. § 42.24(d), this word count excludes the table of contents, table of authorities, mandatory notices under § 42.8, certificate of service, certificate of word count, appendix of exhibits, and any claim listing.

Dated: February 17, 2023

/Theodore M. Foster/
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CERTIFICATE OF SERVICE

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

Date of service February 17, 2023

Manner of service FEDERAL EXPRESS

Documents served Petition for *Inter Partes* Review Under 35 U.S.C. § 312 and 37 C.F.R. § 42.104 of U.S. 7,190,698; Petitioner's Exhibit List; Exhibits 1001- 1042; and Petitioner's Power of Attorney.

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