UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

RPX CORP., ERICSSON INC., AND TELEFONAKTIEBOLAGET
LM ERICSSON,
Petitioner

v.

IRIDESCENT NETWORKS, INC. ("Iridescent"),
Patent Owner

Patent 8,036,119

Title: SYSTEM AND METHOD OF PROVIDING BANDWIDTH ON DEMAND

DECLARATION OF NARASIMHA REDDY, PH.D. UNDER 37 C.F.R. § 1.68

Table of Contents

I. Introduction

I, Narasimha Reddy, do hereby declare:

1. I am making this declaration at the request of RPX Corporation ("RPX"), Ericsson Inc. and Telefonaktiebolaget LM Ericsson ("Ericsson") (collectively, "Petitioners") in the matter of the *Inter Partes* Review of U.S. Patent No. 8,036,119 ("the '119 Patent") to Kathy McEwen.

2. In the preparation of this declaration, I have studied:

(1) The '119 Patent, ERIC-1001;

(2) The prosecution history of the '119 Patent, ERIC-1002;

(3) U.S. Patent No. 7,639,612 ("the '612 Patent"), of which the '119 Patent is a continuation, ERIC-1003;

(4) The prosecution history of the '612 Patent, ERIC-1004;

(5) U.S. Pat. Pub. No. 2003/0133552 ("Pillai"), ERIC-1011;

(6) U.S. Pat. Pub. No. 2002/0181462 ("Surdila"), ERIC-1014;

(7) The prosecution history of Surdila, ERIC-1015;

(8) B. Teitelbaum, P. Chimento, "QBone Bandwidth Broker Architecture," as included in the Surdila prosecution history ("QBone"), ERIC-1017;

(9) U.S. Pat. Pub. No. 2002/0181495 ("Requena"), ERIC-1018;

(10) U.S. Pat. No. 6,487,170 ("Chen"), ERIC-1019;

(11) U.S. Pat. Pub. No. 2005/0135243 (“Lee”), ERIC-1020;

(12) U.S. Pat. Pub. No. 2007/0201366 (“Liu”), ERIC-1021;

(13) English translation of PCT Publication No. WO2005/101730 (“Li”), ERIC-1023;

(14) B. Teitelbaum, P. Chimento, “QBone Bandwidth Broker Architecture,” as located by the Wayback Machine with the URL http://qbone.internet2.edu/bb/bboutline2.html (“QBone color copy”), ERIC-1024;

(15) PCT Publication No. WO2005/101730 in Chinese, ERIC-1026;

(16) Declaration of Xie Yun Fei attesting to translation of PCT Publication No. WO2005/101730, ERIC-1027; and

(17) U.S. Pat. No. 7,650,637 (U.S. national phase entry of PCT Publication No. WO2005/101730, ERIC-1028.

3. In forming the opinions expressed below, I have considered:

(1) The documents listed above, and

(2) My knowledge and experience based upon my work in this area as described below.

II. Level of Ordinary Skill in the Art

4. I am familiar with the technology at issue. I am also aware of the state of the art at the time the application resulting in the ’119 Patent was filed. The earliest priority date is May 2, 2006. Based on the technologies disclosed in the

’119 Patent, I believe that one of ordinary skill in the art would include someone who has a B.S. degree in Electrical Engineering, Computer Engineering, Computer Science, or equivalent training, as well as two to three years of technical experience in the field of packet-switched networking, such as Internet, local area, and wide area networks. Unless otherwise stated, when I provide my understanding and analysis below, it is consistent with the level of one of ordinary skill in these technologies at and around the priority date of the ’119 Patent.

III. Qualifications and Professional Experience

5. I am currently the J.W. Runyon Professor of Electrical and Computer Engineering at Texas A&M University in College Station, Texas. I have over 20 years of experience in a wide variety of technologies and industries relating to data communications, storage systems, distributed systems, including the development of mechanisms and protocols for detecting and avoiding network congestion.

6. My academic credentials include a Bachelor’s of Technology Degree in Electronics and Electrical Communications Engineering from the Indian Institute of Technology, in Kharagpur, India, in August 1985. I then received a Master’s of Science and a Ph.D. degree in Computer Engineering from the University of Illinois at Urbana-Champaign in May 1987 and August 1990, respectively.

7. My professional background and technical qualifications are stated above and are also reflected in my *Curriculum Vitae*, which is attached as ERIC-1006. I am being compensated at a rate of $550.00 per hour, with reimbursement for actual expenses, for my work related to this Petition for *Inter Partes* Review. My compensation is not dependent on, and in no way affects, the substance of my statements in this Declaration.

8. I have worked for over 25 years in the field of Electrical Engineering. My primary focus and research interest has been on Computer Networks, Storage Systems, Multimedia systems, and Computer Architecture. I have authored and co-authored over a hundred technical papers and book chapters related to several of these interests, including on such topics as multipath routing, route control, high-speed networks, congestion, packet management, quality of service regulation, network security, network modeling, differentiated services, storage system enhancements, and multimedia system enhancements to name a few examples. I am listed as an inventor on five patents in the field of multi-node communication networks.

9. My employment history following my graduation from the University of Illinois at Urbana-Champaign began at the IBM Almaden Research Center in San Jose, California in 1990. At IBM, I worked on projects related to disk arrays, multiprocessor communication, hierarchical storage systems and video servers.

10. In 1995, I joined the faculty of the department of Electrical Engineering at Texas A&M University initially as an Associate Professor and was later promoted to a full, tenured professor. At Texas A&M, I am Associate Agency Director for Strategic Initiatives and Centers for the Texas A&M Engineering Experiment Station (TEES), which engages in engineering and technology-oriented research and educational collaborations. Further, I currently serve as Associate Dean for Research.

11. At Texas A&M, I have taught dozens of courses related to computer networking and communications, as well as computer architecture, multimedia systems and networks, topics in networking security, multimedia storage and delivery, as well as networking for multimedia applications. I have also served on various committees for the benefit of the scientific community and the Texas A&M University community.

12. I am a member of a number of professional societies, including the Institute of Electrical and Electronic Engineers (IEEE), where I have been elevated to an IEEE Fellow, and the Association for Computing Machinery (ACM). I have been responsible for chairing or co-chairing numerous conferences and programs, as well as presenting research at major IEEE and ACM conferences. For example, I served as program co-chair for the 2008 5th International Conference on Broadband Communications, Networks and Systems, panels co-chair for the 2008

3rd International Conference on Communication Systems Software & Middleware, and panel chair of the IEEE Conference of High Performance Computer Architecture.

13. My recent presentations include the Keynote speech at International Conference on Information Technology-New Generations in 2013, the Keynote speech at IEEE International Symposium on Computers and Communications 2010, several invited talks including Georgia Tech (2013), COMSNETS Conference (2013), International Conference on Networking and Communications (2012), Samsung (2011), Korea University (2011), Aijou University (2011), Catedra Series talk at University of Carlos III, Madrid (2009), Thomson Research, Paris (2009), Telefonica Research, Barcelona (2009) and a Distinguished Seminar at IBM Austin Research Lab (2008).

14. I have received multiple awards in the field of networks and computer architecture. I received the NSF Career Award from 1996-2000. I received an outstanding professor award by the IEEE student branch at Texas A&M during 1997-1998, an outstanding faculty award by the department of Electrical and Computer Engineering during 2003-2004, a Distinguished Achievement award for teaching from the former students association of Texas A&M University, and a citation "for one of the most influential papers from the 1st ACM Multimedia conference."

15. A copy of my curriculum vitae is attached as ERIC-1006. Additional information regarding my education, technical experience and publications, including a list of the US patents of which I am an inventor/co-inventor, is included therein.

IV. Relevant Legal Standards

16. I have been asked to provide my opinions regarding whether the claims of the ’119 Patent would have been obvious to a person having ordinary skill in the art at the time of the alleged invention of the patent, in light of the prior art.

Obviousness

17. It is my understanding that a claimed invention is unpatentable under 35 U.S.C. § 103 if the differences between the invention and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which the subject matter pertains. I also understand that the obviousness analysis takes into account factual inquiries including the level of ordinary skill in the art, the scope and content of the prior art, and the differences between the prior art and the claimed subject matter.

18. I have been informed that the Supreme Court has recognized several rationales for combining references or modifying a reference to show obviousness of claimed subject matter. I understand some of these rationales include the following: combining prior art elements according to known methods to yield predictable results; simple substitution of one known element for another to obtain predictable results; use of a known technique to improve a similar device (method, or product) in the same way; applying a known technique to a known device (method, or product) ready for improvement to yield predictable results; choosing from a finite number of identified, predictable solutions, with a reasonable expectation of success; and some teaching, suggestion, or motivation in the prior art that would have led one of ordinary skill to modify the prior art reference or to combine prior art reference teachings to arrive at the claimed invention.

V. The ’119 Patent

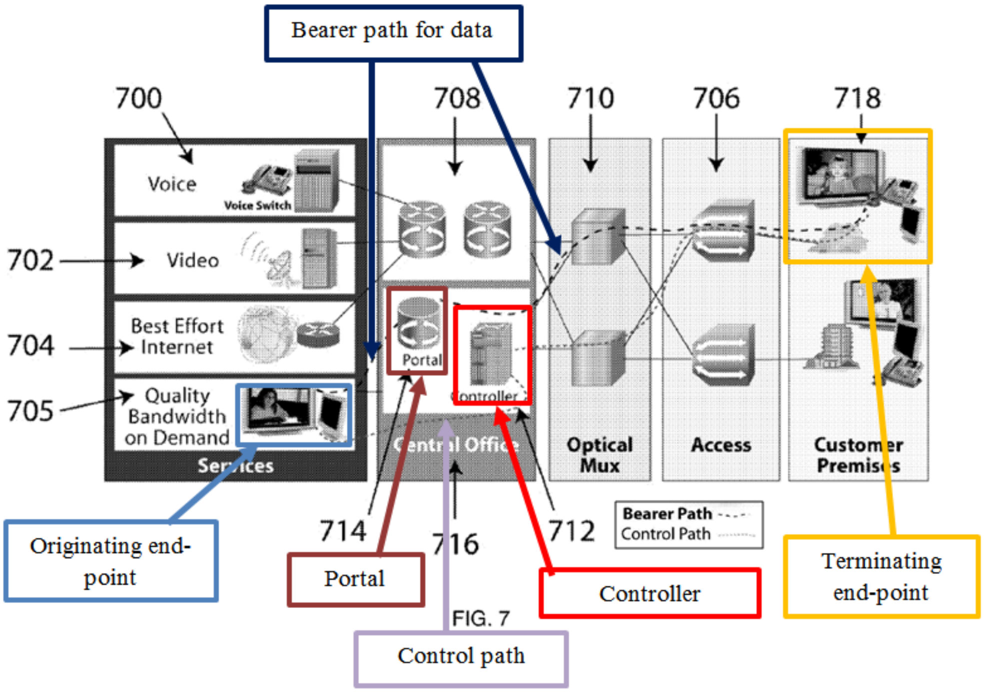
A. Overview

19. The findings below are based on my understandings of the art related to the ’119 Patent, as well as what I think one of ordinary skill in the art would have understood, at the time period at and prior to May 2, 2006.

20. The ’119 Patent relates to communications systems, such as systems that provide guaranteed bandwidth on demand for end users and/or enterprises. ERIC-1001, 1:19-22. According to ’119 Patent, “Internet protocol (IP) networks were designed to handle any traffic, on any port, at any time.” ERIC-1001, 1:23-24. “[E]ach of the computing platforms, or routers, were originally designed to be ad-hoc in nature … [a]s a result of IP's original design goals, the path that a packet takes from origin to destination is completely unpredictable." ERIC-1001, 1:30-37.

21. The '119 Patent states that it "provides an improved unique system and method of providing bandwidth on demand for an end user and/or enterprise." ERIC-1001, 4:46-48. "The invention involves taking a distributed approach to handling bearer packets, with a physically separated controller and managed portal platform." ERIC-1001, 4:64-66. "The Controller handles signaling, routing, dynamic bandwidth admission control, codec (video and/or voice) negotiation, end-to-end quality assurance, session management, subscriber data, billing, provisioning and associated operational functions." ERIC-1001, 4:66-5:3. "The Portal handles the packet bearer transport with the admission control and routing instructions given by the separate physical Controller." ERIC-1001, 5:3-6.

22. The '119 Patent illustrates the proposed "Controller and Portal solution in the Access Network" with the "controller" in red, the portal in brown, the originating end-point in blue, and the terminating end-point in orange:



ERIC-1001, FIG. 7 (annotated); 4:29-30.

23. “The Controller 712 accepts requests from an originating end-point to access the network with a high quality connection dynamically” and then “negotiates across the network with the terminating end-point(s) to set up the connection.” ERIC-1001, 5:27-31. The Controller 712 is used with “one class of service type … to cover all high quality services.” ERIC-1001, 5:35-38. Traffic requesting the service type is routed to the Controller 712 and Portal 714 for handling, or “if the broadband access provider does not want to provision a specific class of service for the Controller and Portal for handling, a consumer may signal directly to the Controller and Portal.” ERIC-1001, 5:39-45.

24. FIG. 8 illustrates a situation “when one dynamic video or bandwidth user wants to connect to another," in which "they simply dial a directory number or IP address or web page to request a connection on demand." ERIC-1001, 5:46-49. "The Controller 800 will receive the request, including bandwidth required and if video, a video codec type and a service type tag (if applicable) for billing purposes." ERIC-1001, 5:49-52. The Controller 800 will "determine from its embedded subscriber database whether the user is authorized to use the bandwidth, video type and service or not, how to bill them, and whether the destination party can be reached." ERIC-1001, 5:52-55.

25. The '119 Patent continues that "the Controller 800 inter-works with network protocols to dynamically provision a dedicated path, including required route and bandwidth, on demand through the network." ERIC-1001, 5:64-67. There is a Portal platform 802 associated with the Controller 800, as well as "any destination party's Controller" that is signaled to also reserve far-end resources. ERIC-1001, 5:67-6:3. Through the Controller 800, the end-users are enabled to negotiate with the network including "information elements necessary to ensure an end-to-end video connection free from video codec conversion in the core if possible." ERIC-1001, 6:4-8.

26. With reference to FIG. 9, "the Controller 900 and Portals 1102 [sic] can be physically located in the same location or in separate locations." ERIC-1001, 6:11-13. In particular, the '119 Patent states that it "takes distributed switching control concepts from the low-bandwidth voice domain, and extends them to the variable-bandwidth packet routing domain." ERIC-1001, 6:20-23. Specifically, "the Portal 902 is under the direct management of the Controller 900" such that it "only accepts traffic on its ports when authorized by the Controller 900 … and notifies the Controller 900 if a user's traffic terminates or exceeds allowance." ERIC-1001, 6:23-27.

27. The '119 Patent states with respect to the "Portal" that it "does not perform new routing on any packet, and only acts on the information provided by the controller 900." ERIC-1001, 6:27-29. In particular, the '119 Patent continues that "any packets [that] are received on any port at the Portal 902," if they are not from an authorized user, "are discarded without prejudice." ERIC-1001, 6:29-32. With authorized users, the Controller 900 "determines whether the user who is exceeding their limit [notified by alarm from the Portal 902] should be disconnected, or allowed to continue." ERIC-1001, 6:33-38.

28. FIG. 10 continues with another example of an end-to-end network solution. The '119 Patent states that "[t]he Controller 1000 and Portal 1002 interconnect to each other and any other platforms, which could be via existing IP/MPLS routers or multiplexing equipment or other transport connection mechanisms." ERIC-1001, 6:50-53.

29. FIG. 11 again shows a "Controller 1100 and Portal 1102 [that] interconnect to each other and any other platforms 1106, which could be via existing IP/MPLS routers 1108 and/or multiplexing equipment and/or any other transport mechanisms." ERIC-1001, 7:6-11. Notably, "the consumers 1110, businesses 1112, and or content providers 1114 are connected, for control signaling via path 1116 and via path 1118 for bearer path, directly to the Controller 1100 and Portal 1102 across the access domain." ERIC-1001, 7:11-15. FIG. 11 shows these paths:

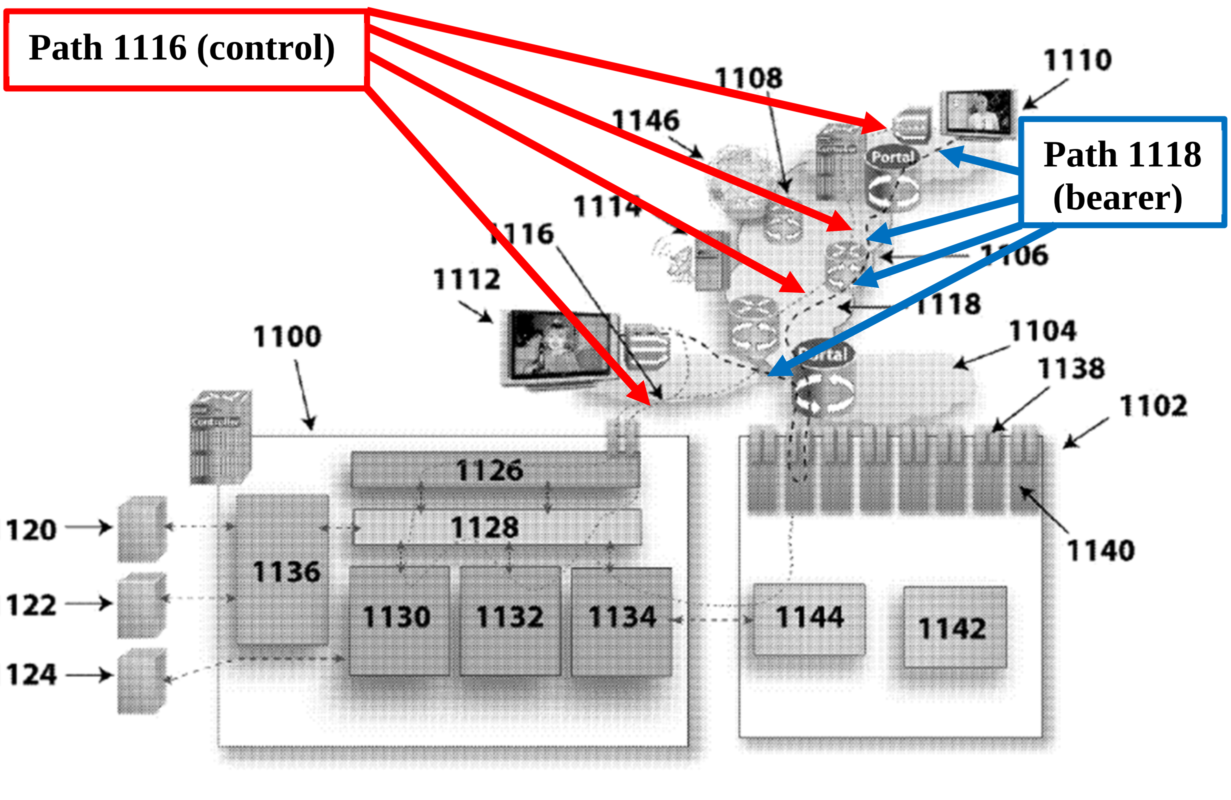


FIG. 11

ERIC-1001, FIG. 11 (annotated).

30. Thus, FIG. 11's control signaling path 1116, even though described as being connected between the end-points (consumers 1110, businesses 1112, and content providers 1114), FIG. 11 illustrates that these connections still may occur through one or more intermediary devices, such as the control path from the Controller 1100 to the consumer 1110 via existing routers 1108 and another controller.

31. With respect to the Portal 1102 specifically, the ’119 Patent states that it “includes I/O ports 1138 on line cards 1140 for the bearer connections, a switching matrix 1142 and a portal connectivity processing element 1144.” ERIC-1001, 7:24-26.

32. With respect to billing arrangements, the ’119 Patent states that “the Controller supports flexible charging arrangements” whether based on service type, time elapsed, codec type, bandwidth used, and whether billed after termination of a session or on a pre-paid mechanism. ERIC-1001, 6:61-7:1.

33. Independent claim 1 is exemplary and recites:

> 1. A method for providing bandwidth on demand comprising:
>
> receiving, by a controller positioned in a network, a request for a high quality of service connection supporting any one of a plurality of one-way and two-way traffic types between an originating end-point and a terminating end-point, wherein the request comes from the originating end-point and includes at least one of a requested amount of bandwidth and a codec;

determining, by the controller, whether the originating end-point is authorized to use the requested amount of bandwidth or the codec and whether the terminating end-point can be reached by the controller;

directing, by the controller, a portal that is positioned in the network and physically separate from the controller to allocate local port resources of the portal for the connection;

negotiating, by the controller, to reserve far-end resources for the terminating end-point; and

providing, by the controller to the portal, routing instructions for traffic corresponding to the connection so that the traffic is directed by the portal based only on the routing instructions provided by the controller, wherein the portal does not perform any independent routing on the traffic, and wherein the connection extending from the originating end-point to the terminating end-point is provided by a dedicated bearer path that includes a required route supported by the portal and dynamically provisioned by the controller, and wherein control paths for the connection are supported only between each of the originating and terminating end-points and the controller and between the portal and the controller.

34. The features of claim 1, as well as the other claims at issue, were well-known in the art prior to the priority date of the '119 Patent. For instance, others had already taught the usefulness and desirability of requesting bandwidth on demand from end-to-end, including requests for a high quality of service connection, dynamic provision of the requested connection by a separate control element, determination of a unique path for the requested connection, provision of that path at a portal so that the portal does not perform independent routing on traffic of the requested connection, and using separate control paths for the controller, endpoints, and provisioned portal. (*See* ERIC-1014, ERIC-1017, and ERIC-1023).

35. Accordingly, I show in the claim charts below that the elements and functionality recited in claims 1-16 of the ’119 Patent were already well known before the earliest claimed priority date of the ’119 Patent.

B. History of the ’119 Patent

36. The ’119 Patent issued on October 11, 2011 from U.S. Patent Application No. 12/632,786 by Kathy McEwen. I have been informed by counsel that the earliest alleged priority date for the ’119 Patent is May 2, 2006. In particular, the ’119 Patent is a continuation of U.S. Patent No. 7,639,612 (the ’612 Patent).

37. In an Office Action dated February 2, 2011, the Examiner rejected claims 2 and 3 under a statutory type double patenting rejection. ERIC-1002, p. 40. Further, the Examiner rejected claims 1 and 4-14 and allowed claims 20-23. *Id.* at pp. 40-42, 45. Finally, the Examiner rejected claims 15-19 under 35 U.S.C. § 103(a) as unpatentable over U.S. Patent No. 6,961,539 to Schweinhart. *Id.* at p. 42. In response, Applicant cancelled claims 2-3 and 15-19 and filed a terminal disclaimer over the parent patent, U.S. Patent No. 7,639,612. *Id.* at pp. 25-32.

38. In response thereto, the Patent Office issued a Notice of Allowance on June 14, 2011 for pending claims 1, 4-14, and 20-23 and subsequently the ’119 Patent as claims 1-16. *Id*. at pp. 14-18.

C. History of the ’612 Patent

39. I also reviewed the prosecution history of the ’612 Patent. The ’612 Patent issued on December 29, 2009 from U.S. Application No. 11/743,470 by Kathy McEwen.

40. In a Non-Final Office Action dated August 5, 2008, the Examiner rejected several claims under 35 U.S.C. § 112, first paragraph, for failing to comply with the enablement requirement. ERIC-1004, pp. 131-132. In particular, the Examiner stated that “[t]he specification does not adequately describe how high quality and low latency are determined.” ERIC-1004, p. 132. The Examiner also rejected the claims under various obviousness grounds. ERIC-1004, pp. 132-151.

41. In a response dated November 4, 2008, the Applicant argued that the claims had been amended to overcome the 35 U.S.C. § 112, first paragraph rejection, and argued that there was no suggestion or motivation to combine the references as provided in the Non-Final Office Action. *See* ERIC-1004, pp. 107-122.

42. The Examiner was not persuaded by the Applicant’s arguments. In a

Final Office Action mailed January 22, 2009, the Examiner maintained the same 35 U.S.C. § 112, first paragraph (enablement) rejection and raised new 35 U.S.C. § 112, second paragraph and 35 U.S.C. § 103(a) rejections. *See* ERIC-1004, pp. 71-99.

43. In response, the Applicant cancelled all of the pending claims and added new claims that formed the basis of what would eventually be issued in the ’612 Patent. ERIC-1004, pp. 43-48. In arguing against the 35 U.S.C. § 112, first paragraph (enablement) rejection, the Applicant focused on the newly-added language “high quality of service connection” with the assertion that it was supported by the specification. ERIC-1004, pp. 44-51. “More specifically, Applicant references Fig. 3 of the disclosure, which is reproduced below for convenience.” ERIC-1004, p. 50. That figure, as provided in the Applicant’s response, is likewise reproduced here (from the ’119 Patent, ERIC-1001, instead of the response on p. 50 of ERIC-1004 for better viewability):

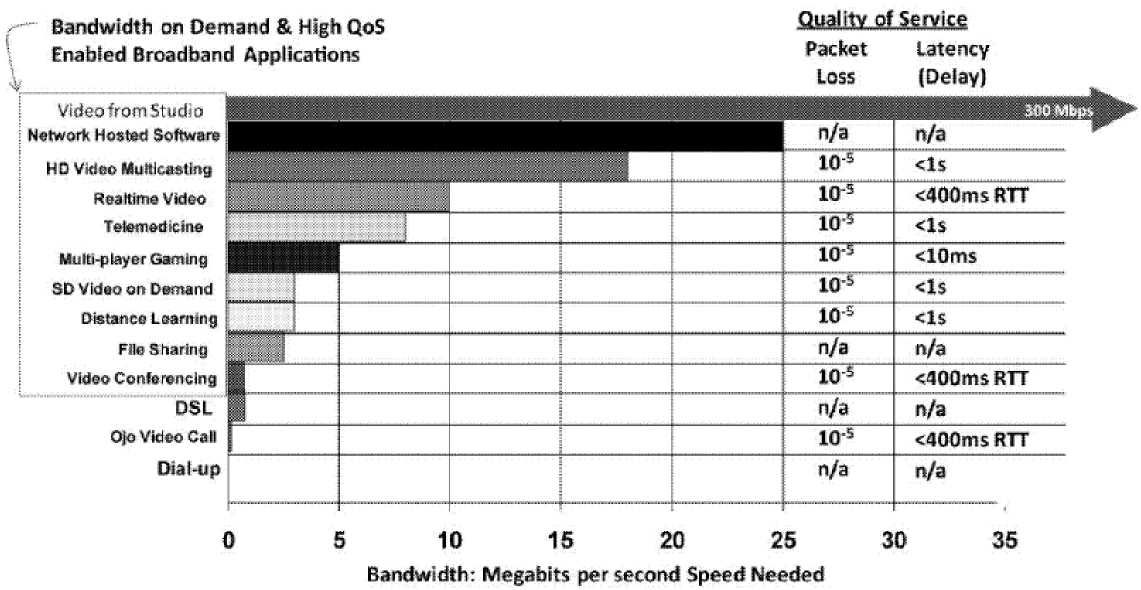


FIG. 3

ERIC-1001, FIG. 3 (*see also* ERIC-1004, p. 50).

44. Applicant argued in particular:

> As illustrated by the boxed set of applications on the left side of Fig. 3, high QoS (quality of service) may be viewed in the present application as having speeds varying from approximately 1-300 megabits per second, packet loss requirements that are typically about 10-5, and latency requirements that are typically less than one second. These are commonly used parameters and, as illustrated in Fig. 3, often vary somewhat based on the type of application. For example, video conferencing may be possible with the listed parameters, while HD video multicasting typically has more stringent requirements in order to be acceptable.

ERIC-1004, p. 51.

45. The Applicant then quoted from the specification:

> The services that may be delivered on broadband are many, ranging from real-time critical applications for communication purposes: video calling, multi-player gaming, telemedicine, television studio broadcast interviews, and high-definition news multicasting to name a few. These examples and a few others are listed in FIG. 3. These real time critical applications are very sensitive to any delay and for· any that may include video or gaming frames, very sensitive to any variance in the delay. Applications which include video are also sensitive to any packets (or frames) which may be lost in the transmission (0.0001 % packet loss is the preferred quality for video transmission).

ERIC-1004, p. 51 (from ERIC-1003, 1:59-2:3).

46. In addition, the Applicant argued that "much of the cited art is clearly directed to access networks and other connections that are not end-to-end." ERIC-1004, p. 52. "However, Applicant's claimed invention is directed to end-to-end connection management (i.e., between an originating end-point and a terminating end-point) with a controller that provides 'end-to-end quality assurance.'" *Id.*

47. The Applicant further argued that "an 'end-point' as used in the specification refers to both an originating point and a terminating point relative to the entire connection … In other words, the terms 'originating end-point' and 'terminating end-point' as used in the claims do not refer to intermediate points in a connection (e.g., network nodes or elements supporting the connection such as the controller and portal) but rather the two sides engaged in the connection." *Id.*

48. In response to the amendments and arguments filed, the Examiner proposed an Examiner's amendment in a call to Applicant's attorney, which was authorized and reflected in the Notice of Allowance that mailed October 19, 2009. ERIC-1004, pp. 23-27. The independent claim had added to it the limitations regarding receiving notification that traffic has exceeded an authorized limit and determining whether to terminate the connection. *See* ERIC-1004, pp. 25-26.

49. As shown herein, however, the Examiner during prosecution of the '612 Patent, and thus by extension the '119 Patent, failed to appreciate all of the relevant art that would have been known to a person having ordinary skill in the art as of the earliest alleged priority date of the '119 Patent. For example, QBone teaches a system for reserving a quality of service connection through domains that was requested by an end system, from the originating end system to the destination end system. *See, e.g.*, ERIC-1017, p. 10.

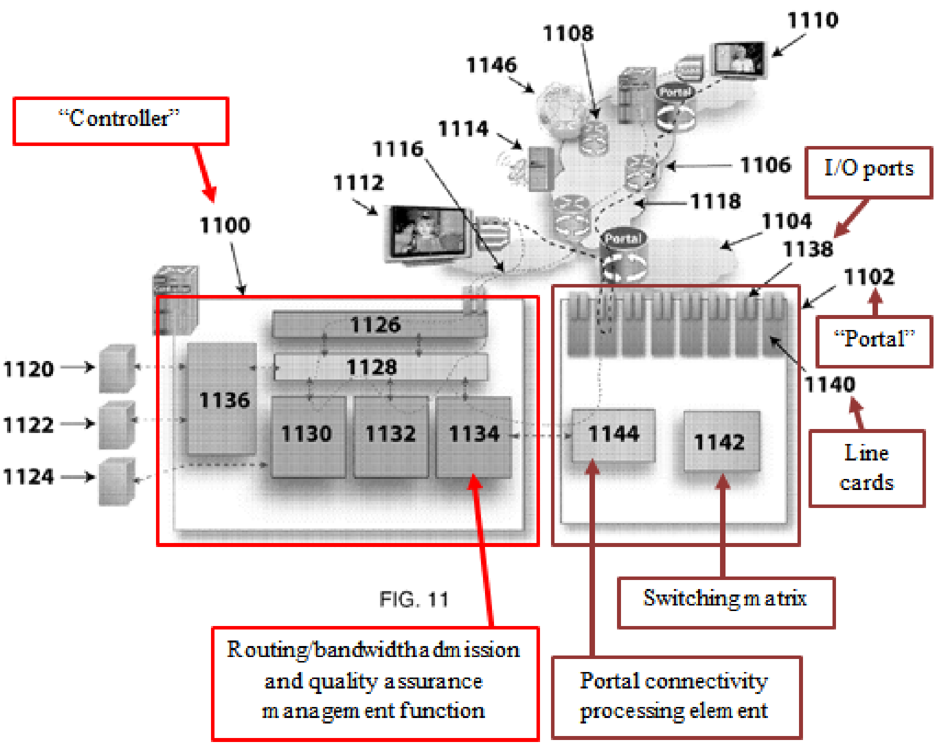
VI. Claim Construction of Certain Terms in the '119 Patent

50. It is my understanding that in order to properly evaluate the '119 Patent, the terms of the claims must be defined. It is my understanding that for the purposes of *inter partes* review, the claims are normally to be given their broadest reasonable interpretation in light of the specification. It is my further understanding that claim terms are given their ordinary and accustomed meaning as would be understood by one of ordinary skill in the art, unless the inventor, as a lexicographer, has set forth a special meaning for a term. As such, any claim term not construed below should be given its ordinary and customary meaning. In order to construe the following claim terms, I have reviewed the entirety of the ’119 Patent, as well as its prosecution history.

A. “directing, by the controller, … [a portal] … to allocate local port resources of the portal”

51. This claim term is found and used similarly in claims 1 and 13.

52. Resources of the portal are illustrated in FIG. 11, reproduced and annotated below, and described as “[t]he Portal 1102 includes I/O ports 1138 on line cards 1140 for the bearer connections, a switching matrix 1142 and a portal connectivity processing element 1144.” ERIC-1001, 7:24-26.



Id., FIG. 11 (annotated).

53. As shown, the Controller 1100 sends instructions from the "routing/admission and quality assurance management function 1134" element to the "portal connectivity processing element 1144" in the portal "necessary for the broadband services to be dynamically connected and managed with quality." ERIC-1001, 7:15-23. In operation, the '119 Patent in other embodiments discloses that "[t]he Controller 800 directs its associated Portal platform 802 to allocate local port resources" (the only usage of that term in the body of the specification) and the portal "only accepts traffic on its ports when authorized by the Controller." *Id.*, 5:67-6:1, 6:25-26.

54. Thus, the '119 Patent discloses that in response to allocation instructions from the controller, the elements included within the portal affect the routing, admission and quality of the connection determined by the controller. Moreover, as understood by a POSITA, the portal elements can be implemented as physical and/or logical elements.

55. Therefore, in view of the above, under a BRI a POSITA would have construed the claim term "directing, by the controller, … [a portal] … to allocate local port resources of the portal for the connection" to include at least *sending an allocation instruction from the controller to the portal, where the allocation instruction results in the portal allocating physical and/or logical elements of the portal*.

VII. Grounds of Invalidity

56. The ’119 Patent,” (ERIC-1001) is directed to a method for providing bandwidth on demand for a desired quality of service (QoS) between an “originating” end-point and a “terminating” end-point. The ’119 Patent’s purported novelty is to separate control functions and packet transmission functions into two physically separate entities: (1) a “controller” that provides end-to-end quality assurance, and (2) a “portal” that handles packet transmission based on routing instructions from the controller. ERIC-1001, 1:19-22, 4:64-5:6.

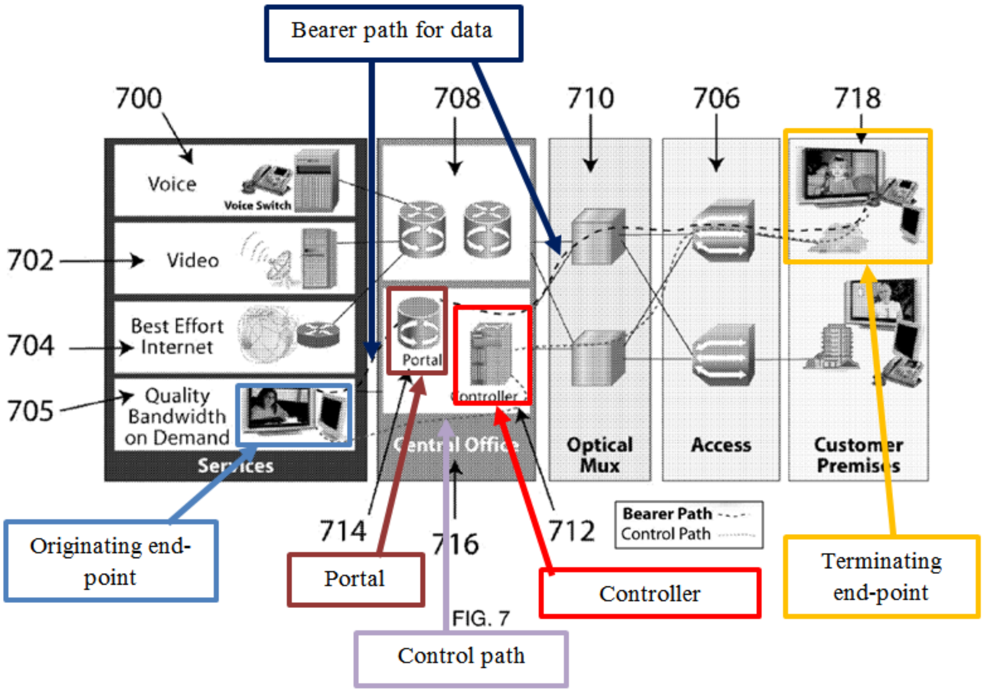
57. The architecture of the ’119 patent purportedly recognizes limitations of different prior art approaches for providing connectivity. According to the ’119 Patent, prior art routers in Internet networks were designed to be ad-hoc in nature, resulting in “completely unpredictable” paths from origin to destination for packets, ERIC-1001, 1:30-43, to the detriment of “real-time critical” applications. *Id.*, 1:61-2:5.

58. In contrast, the ’119 Patent states that dedicated lines offered greater control over quality assurance, but at the cost of failing to economically scale with the number of users as each service required a separate line. For example, the ’119 Patent alleges that “the only quality video transport with assurance that operators can use are dedicated line, virtual private networking services.” *Id.*, 3:23-25. These dedicated line/VPN services were limited in that each new service required a separate VPN, which did not economically scale with more services or users. *Id.*, 3:25-29. Further, the ’119

Patent alleges that prior art systems addressed to the core network only or to the access network only, and thus failed to provide quality assurance from originating end-point to terminating end-point. *Id.*, 2:6-3:2. That is, the prior art allegedly did not provide *end-to-end* quality assurance. *See id.*

59. To address these perceived shortcomings, the ’119 Patent offers “an improved unique system and method of providing bandwidth on demand for an end user and/or enterprise” from “end to end.” ERIC-1001, 4:46-48, 3:46-48. To do so, the ’119 Patent purports to separate control processing from data transport to manage services end-to-end with a “controller” in charge of a “portal” for a connection between an “originating end-point” and a “terminating end-point.” ERIC-1001, 4:64-5:6. A control path extends between the end-points and the controller and between the controller and the portal. A bearer path for data extends between the end-points.

60. An example of this architecture is shown in FIG. 7:



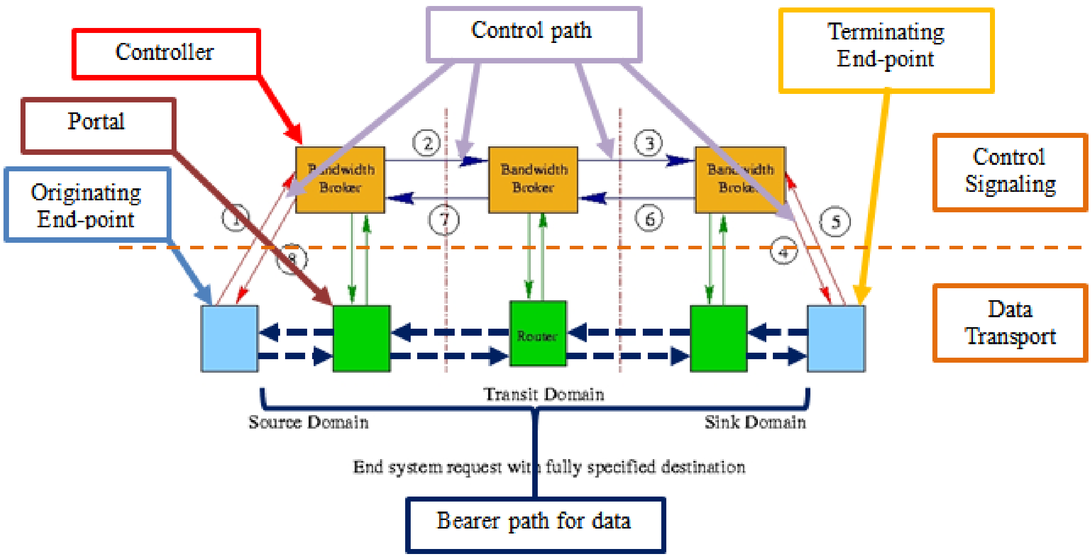
ERIC-1001, FIG. 7 (annotated).

61. However, what the solution proposed by the ’119 Patent was not unique or new. Before the earliest alleged priority date of the ’119 Patent, others had already developed a system to provide on-demand bandwidth assured connections end-to-end using a physically separate controller and portal platform.

62. For example, QBone recognized the need for providing quantitative, absolute bandwidth assurance extending end-to-end, that is, between an originating end-point and a terminating end-point, like that disclosed by the ’119 Patent. ERIC-1017, pp.3,4. Specifically, QBone discloses the separation of control functions from packet transmission functions into two physically separate entities: (1) a “bandwidth broker” (“BB,” i.e., controller) that assures end-to-end bandwidth, and

(2) a “router” (i.e., portal) that handles packet transmission based on routing instructions from the controller.

63. An example of QBone’s end-to-end architecture is illustrated in the figure from page 13 of QBone with terminology from the ’119 Patent:



ERIC-1017, p. 13 (modified and annotated).

64. QBone provides the requested service on demand (e.g., reserving bandwidth when requested and taking down reservations after use). *Id.*, pp. 8, 20. QBone discloses the separation of control processing from data transport to manage services from end-to-end using the bandwidth broker, which is disclosed as providing routing instructions to a physically separate portal called an access router for a connection extending between an originating end-point and a terminating end-point, and the access router for the originating end-point. ERIC-1017, pp. 5, 13-15.

Identical to the embodiment of FIG. 7 of the ’119 Patent, a control path extends between the endpoints and the controller and between the controller and the portal, and a bearer path for data extends between the end-points.

65. Using the control paths, an end-point end system, in combination with the multi-protocol label switching teachings of Surdila and Li, requests from a bandwidth broker a reserved connection (e.g., a dedicated bearer path set up by the bandwidth broker) meeting a specified service level. In the ’119 Patent, the controller “dynamically provisions a dedicated path, including required route and bandwidth, on demand through the network.” ERIC-1001, 5:64-67. Consistent with the ’119 Patent, QBone discloses reserving bandwidth along a specified required route (e.g., via amount of bandwidth reserved along the path end-to-end). *See* ERIC-1017, pp. 11, 13-15, 17.

66. Further, identical to the preferred embodiment of Figure 10 of the ’119 Patent, which discloses that the controller may interact with MPLS routers to provision the route, the prior art discloses that a route providing end-to-end quality assurance can be made within a multi-protocol label switching (MPLS) system according to related disclosures in Surdila and Li. *See* ERIC-1017, pp. 11, 13-15, 17.

67. It is my opinion that QBone in view of Surdila, further in view of Li, renders obvious at least claims 1-8 and 11 of the ’119 Patent.

68. QBone is a printed publication that was publicly available at least via the Internet as early as December 5, 2002. It is entitled "QBone Bandwidth Broker Architecture." QBone was discussed in Surdila, and incorporated by reference therein. Surdila was filed on April 24, 2001. The QBone paper (ERIC-1017) was submitted with the filing on April 24, 2001. On December 5, 2002, Surdila was published as a printed publication by the U.S. Patent Office.

69. I have been informed by counsel that the U.S. Patent Office grants access to the file histories of patent applications once they have been published. To that end, I accessed the USPTO full text database at http://appft.uspto.gov/netahtml/PTO/search-adv.html. In the "Query" field, I entered several different search strings including: "QBone"; "bandwidth broker architecture"; and "E2E QoS". Each of these brought up Surdila as one of the search results. Further, I note that Surdila (ERIC-1014), p.1, identifies both international and U.S. classifications which, when searched, would lead a person having ordinary skill in the art to Surdila. As a result of Surdila coming up in the different searches, I was therefore led from Surdila's disclosure to the QBone paper (ERIC-1017).

70. It is therefore my opinion that QBone (ERIC-1017), included with the file history of Surdila, was publicly available at least as late as December 5, 2002, when Surdila was published.

71. It is further my opinion that QBone in view of Surdila and Li, further in view of Requena, renders obvious at least claims 10 and 13-15 of the ’119 Patent.

72. It is further my opinion that QBone in view of Surdila and Li, further in view of Chen, renders obvious at least claims 9 and 12 of the ’119 Patent.

73. It is further my opinion that QBone in view of Surdila, Li, and Requena, further in view of Pillai, renders obvious at least claim 16 of the ’119 Patent.

74. Each of these grounds of invalidity will be addressed below with respect to the claims of the ’119 Patent.

VIII. Claims 1-8 and 11 are unpatentable over 35 U.S.C. § 103 over QBone in view of Surdila and Li.

75. It is my opinion that QBone in view of Surdila, further in view of Li, renders obvious at least claims 1-8 and 11 of the ’119 patent.

A. Overview of QBone

76. QBone is directed to the “QBone Bandwidth Broker Architecture.” ERIC-1017, Title. QBone stated that its goals included: “[d]efine a model of the ‘bandwidth broker’ resources managers to be deployed in the QBone. Recommend a deployment phasing for the QBone bandwidth broker work. Specify a common interdomain interface for the QBone bandwidth broker.” ERIC-1017, p. 1. QBone taught that its architecture is flexible to different combinations of network elements as a result of “experimentation and trying out ideas.” ERIC-1017, p. 2.

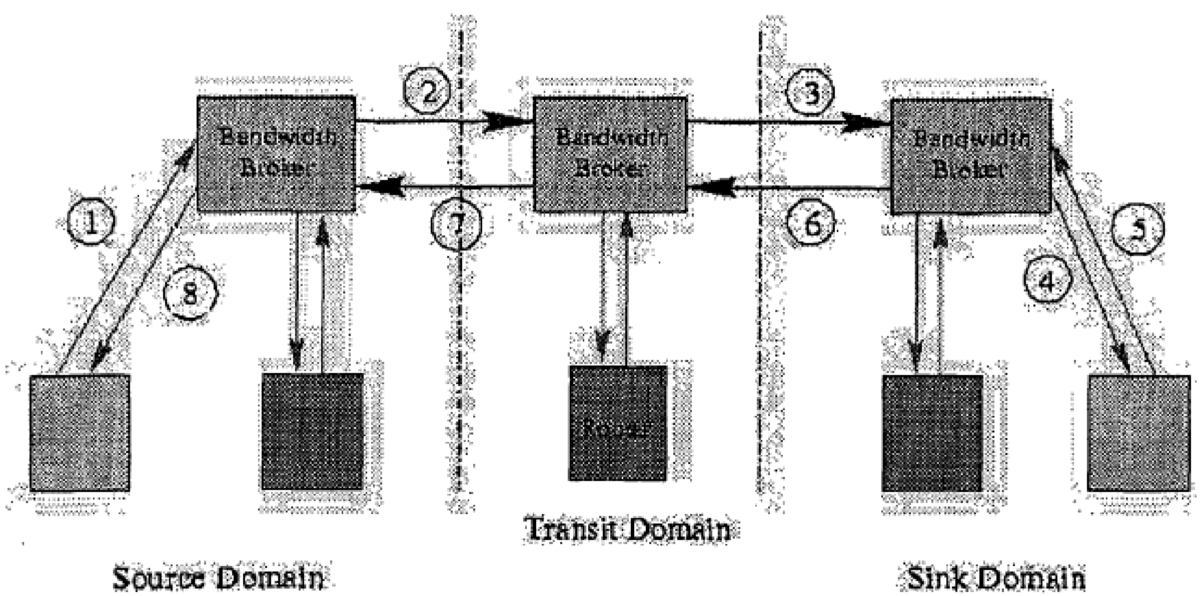
77. QBone is focused on enabling the provision of "a service with quantitative, absolute bandwidth assurance" that extends "end-to-end." ERIC-1017, pp. 3, 4. "The service may be provided entirely within a domain, from domain-edge to domain-edge (within the same domain) or across a number of domains." ERIC-1017, p. 3. The specification of what QBone's service provides can be "quantitative (as in the case of [QBone Premium Service, QPS]." ERIC-1017, p. 4.

78. To meet the service requirements, QBone teaches the use of "an 'oracle' that responds to admissions requests for network resources," which are also referred to as "bandwidth brokers." ERIC-1017, p. 5. "In general, a bandwidth broker may receive a resource allocation request (RAR) from one of two sources: Either a request from an element in the domain that the bandwidth broker controls (or represents), or a request from a peer (adjacent) bandwidth broker." ERIC-1017, p. 5.

79. In response to the request, QBone teaches that the bandwidth broker "responds … with a confirmation of service or denial of service … known as a Resource Allocation Answer (RAA)." ERIC-1017, p. 5. The bandwidth broker's action includes "altering the router configurations at the access, at the inter-domain borders, and/or internally within the domain." ERIC-1017, p. 5. This is in order to "treat the traffic as specified in the [service level specification, SLS] until those packets leave the domain" through every domain from end system to end system.

ERIC-1017, p. 7. In particular, the response of resource allocation assumes the form of reservation of resources. *See* ERIC-1017, p. 8 ("Actual reservations are accomplished via the protocols described in this document. A reservation represents actually committed resources but not necessarily used resources. As traffic flows, the resource is actually used.").

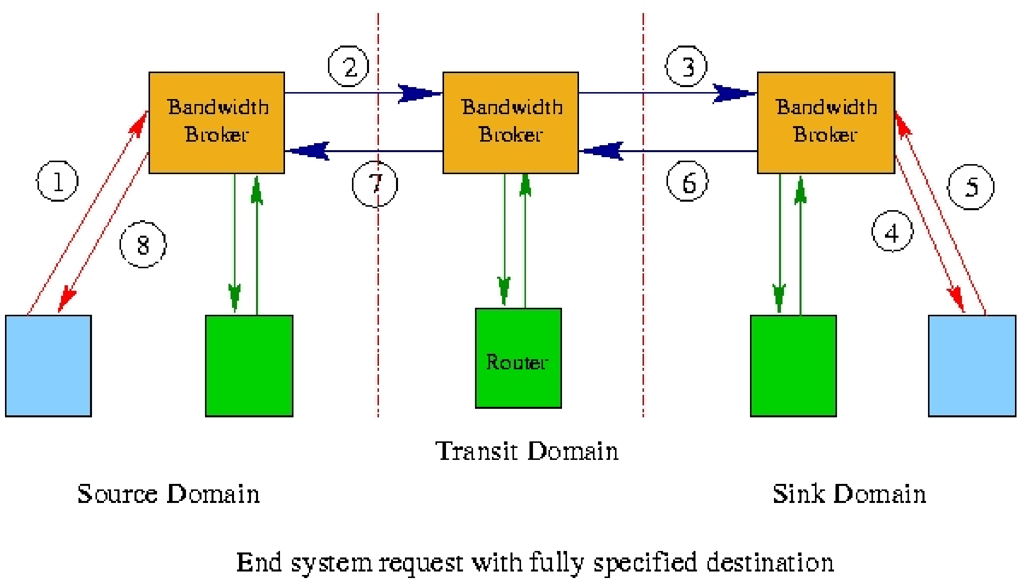
80. QBone teaches several different system phases and designs for the protocol that "works end-to-end." *See* ERIC-1017, pp. 10-12. One case involves an end system that "initiates a request for service … to another end system." ERIC-1017, p. 12. QBone provides an example of the use case for an end system initiating request for quality-assured service to another end system, reproduced from ERIC-1017 below (as provided in the file history):



End system request with fully specified destination

ERIC-1017, p. 13 (best available copy).

81. Because the visual quality of the copy from Surdila's file history (ERIC-1015) is poor, I was informed by counsel that other copies of the QBone paper exist that had cleaner figures, including at the Internet Archive's Wayback Machine (https://archive.org/web/). I obtained an additional copy of the QBone paper from the Wayback Machine. I did so by first entering the URL http://qbone.internet2.edu/bb/bboutline2.html into the search field of the Wayback Machine's webpage. I then selected the first archive date of April 13, 2001 (other dates were available and could have been used). That copy is identified as ERIC-1024 herein. From that copy of the QBone paper, I located the same system diagram as from page 13 of ERIC-1017 above, reproduced below.



ERIC-1024, p. 11.

82. I note that QBone (ERIC-1017) identifies aspects of the color coding for the figure in the corresponding text. *See, e.g.*, ERIC-1017, p. 14 ("these are indicated by green arrows in the figure). Further, from my comparison, both figures have the same components: each have boxes at each end from which arrows extend (arrow (1) from the left side, and arrow (5) from the right side) and to which arrows arrive (arrow (8) to the left side, and arrow (4) to the right side). Each has numbered arrows 1-8 in the same order and placement in their figures. Each also includes bandwidth brokers in source, transit, and sink domains in the same locations, as well as a "router" box in the "transit domain" and similar boxes that I understand to be routers as well in the "source domain" and "sink domain."

83. Because of their shared features, and because of the clarity of the copy of the figure from ERIC-1024, I will reproduce the figure on page 13 from ERIC-1017 as the figure from ERIC-1024, with my discussion focusing on the teachings of QBone (ERIC-1017), with reference to QBone herein referring to ERIC-1017 unless indicated otherwise.

84. Continuing now with the example use case in QBone, QBone teaches that the flow occurs as follows. First, the originating end system "sends an RAR to the bandwidth broker (1)," where the RAR "includes a globally well-known service ID and an IP destination IP address, a source IP address, an authentication field, times for which the service is requested and the other parameters of the service."

ERIC-1017, p. 13. The “other parameters” identified by the “RAR message format” (ERIC-1017, p. 21) include a “Service Parameterization Object (SPO).” ERIC-1017, p. 22. “This parameter is intended to be a service-specific specification of requested or learned service parameters. Depending on the service in question, this may be a simple parameter (e.g. bits-per-second of bandwidth) or may be quite complex (full TSpec, trTCM configuration, etc.).” ERIC-1017, p. 24.

85. QBone teaches that the bandwidth broker “makes a number of decisions” including: whether the “requester is authorized for this service,” the “egress router to which the flow may be assigned,” the “route through the domain to the egress router,” “[w]hether the flow fits in the SLS of the egress router with the net domain in the path to the destination,” and “[w]hether the flow … may be accepted for the specified service.” ERIC-1017, p. 13. If the parameters are possible, the bandwidth broker in the source domain (which I also refer to as an originating domain) “will modify the RAR … and sign the request with its own signature.” ERIC-1017, p. 13. The modified RAR is sent to the adjacent bandwidth broker (2) of the next domain (here, a transit domain) and on, where positive outcomes, to the next bandwidth broker until the “bandwidth broker in the destination domain” is reached. ERIC-1017, pp. 13-14.

86. The bandwidth broker in the destination domain (which, where there is only one domain, which is an acknowledged possibility in QBone, is the same as the bandwidth broker in the originating domain) makes additional decisions for it domain including "[a]uthenticat[ing] that the request is indeed from a peer bandwidth broker"; that "the intra-domain route from the ingress router to the end system and … whether the resources are available to support the flow"; "that the requested resources fall within any possible SLS with the end system"; and "whether the flow may be accepted." ERIC-1017, p. 14. In response, an RAA is propagated from the end system in the sink domain (which I also refer to as a destination domain or terminating domain) back to the originating domain.

87. In the originating domain, upon receipt of the RAA the bandwidth broker in the originating domain "completes any resource allocation actions within the domain," including "setting the marking functions for the flow in the access router serving the requesting end system (indicated by the green arrows in the figure)." ERIC-1017, p. 15. With that, a flow of packets from the originating end system begins to use the requested end-to-end quality of service. QBone notes that "there is nothing to prevent the end system from sending the flow earlier; ***however, the flow will not receive the requested service***" until the reservation procedure is completed. ERIC-1017, p. 15 (emphasis added). Therefore, to obtain the requested service so that packets are routed accordingly, the originating end system will have to wait until it receives the RAA from the bandwidth broker in the originating domain.

88. As QBone teaches, after the requested service is reserved, "the resource is actually used" as traffic flows, which usage "depends on the type of reservation." ERIC-1017, p. 8. To that end, the "bandwidth broker must … track: … the set of established reservations consuming resources in its domain and the availability of all reservable resources in its domain … [and] the actual resource use is tracked by the routers themselves and (possibly) monitored by the bandwidth broker." ERIC-1017, p. 8. QBone teaches a "data repository" that "contains common information for all the bandwidth broker components." ERIC-1017, p. 10. This information includes "[c]urrent reservations/resource allocations," "[c]onfiguration of routers," "[n]etwork management information," "[m]onitoring information from routers," and "[a]uthorization and authentication databases (for users and peers)." ERIC-1017, p. 10.

89. QBone describes different aspects of the system in the context of a DiffServ environment, but states that this can be extended "to support end-to-end signaling along paths that include non-DiffServ capable domains or elements." ERIC-1017, p. 2. This confirms my understanding that a person having ordinary skill in the art would have found the teachings of QBone with respect to end-to-end quality of service reservations to be applicable to multiple different protocols (either in homogenous or heterogeneous network environments).

B. Overview of Surdila

90. Surdila describes a "system and method of ensuring a requested Quality of Service (QoS) for a media flow." ERIC-1014, Abstract. The "media flow" is one "that is routed from a first terminal in an originating network, through at least one transit network, to a second terminal in a terminating network." ERIC-1014, ¶ [0009]. Surdila teaches that its intended purpose is to provide "End-to-End (E2E) Quality of Service (QoS) across multiple Internet Protocol (IP) networks." ERIC-1014, ¶ [0002].

91. Surdila particularly acknowledged the importance of E2E QoS support: "[t]he support of E2E QoS is a very important issue related to the launching of real-time applications such as IP telephony, mixed voice/video calls, etc. over the IP infrastructure." ERIC-1014, ¶ [0007]. Surdila particularly noted the desirability that a requested QoS "be assured all the way to the recipient." ERIC-1014, ¶ [0007]. Surdila taught how different application types have different amounts of bandwidth required in order to "achieve certain levels of Quality of Service (QoS)" for that particular application. ERIC-1014, ¶ [0006]. This table is reproduced from Surdila below:

Application Performance Rating Table

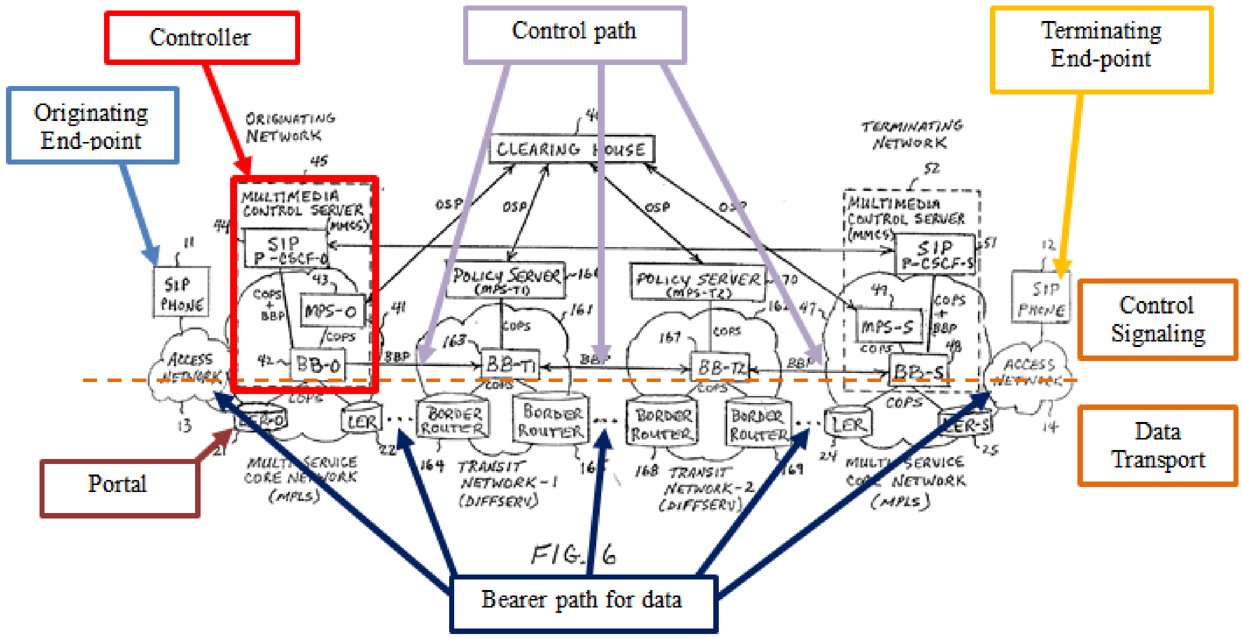
Data Rates (kbps) Applications	9.6	14.4	32	64	128	384	2000
	Application Performance Rating						
Voice, SMS	E	E	E	E	E	E	E
E-mail	P	F	E	E	E	E	E
Internet Web Access	P	P	F	F	E	E	E
Database Access	P	P	F	E	E	E	E
Synchronization	E	E	E	E	E	E	E
Document Transfer	P	P	F	E	E	E	E
Location Services	F	E	E	E	E	E	E
Still Image Transfer	P	F	E	E	E	E	E
Video Lower Quality	P	F	F	E	E	E	E
Video High Quality	P	P	P	F	F	E	E

Excellent (E) Fair (F) Poor (P)

ERIC-1014, ¶ [0007].

92. Surdila identified QBone's approach as "an architecture for coordinating bandwidth requirements across multiple networks at the transport level." ERIC-1014, ¶ [0025]. To provide the desired E2E QoS in view of the QBone architecture, Surdila taught a solution that "provides proper control of network transport resources when a single application is utilized across several transport networks. Proper control includes the ability to bind the utilization of transport resources across several administrative domains to the application utilizing these resources for the provision of end-to-end QoS. This binding is necessary regardless of the QoS solution used in each administrative domain for the provision of end-to-end QoS." ERIC-1014, ¶ [0039].

93. FIG. 6 in Surdila provides an example block diagram of QBone's "Phase 2 BB Architecture." ERIC-1014, ¶ [0020].



ERIC-1014, FIG. 6 (annotated).

94. Surdila teaches that the bandwidth broker for the originating network ("BB-O 42" in FIG. 6) is functionally included with a media policy server (MPS-O 43 in FIG. 6) and P-CSCF-O 44 as a multimedia control server 45. ERIC-1014, FIG. 6, ¶ [0041]. The servers further interface with a "Clearing House 46," which is used to "perform[] the functions of an IETF Authorization, Authentication, and Accounting (AAA) server." ERIC-1014, ¶ [0040].

95. Surdila teaches that an end system, referred to as a SIP Phone 11 in FIG. 6 and UE-A 11 in FIG. 7A, engages in SIP calls using the network with the terminating device, referred to in Surdila as SIP phone 12/UE-B 12. *See* ERIC-1014, ¶¶ [0062], [0063]. The UEs reach agreed SDP and codecs. ERIC-1014, ¶ [0065]. Surdila teaches that the originating UE-A sends the SIP Invite message to the multimedia control server 45, and include with the request a "proposed SDP (QoS Assured)." ERIC-1014, ¶ [0062].

96. Surdila teaches that the routers along the communication path in the network are label edge routers, which Surdila also calls "LERs." *See* ERIC-1014, ¶ [0034]. For example, the LER-O 21 is illustrated in FIG. 6. According to Surdila, the LERs generally "function as edge routers that also insert a specific label in the data packets to identify a specific media flow at the entry to the network, and remove the label upon exiting the network. The Multi-Protocol Label Switching (MPLS) protocol then routes packets based on the labels inserted by the LERs rather than the IP addresses." ERIC-1014, ¶ [0034].

97. Surdila was filed as U.S. Application No. 09/841,752 on April 24, 2001. I see that the correspondence address for the application was identified as "Ericsson Research Canada." *See* ERIC-1014, p. 1. In an Office Action dated June 30, 2005, the Patent Office rejected the claims in Surdila (as listed in the published application) over the QBone paper (ERIC-1017) that was submitted with the application. ERIC-1015, pp. 132, 135. The application went abandoned for failure to respond to the Office Action per a notice mailed May 2, 2006. ERIC-1015, pp.

151-52.

C. Reasons to Combine QBone and Surdila

98. It is my opinion that one of ordinary skill in the art would have been motivated to combine the teachings of QBone and Surdila for the reasons set forth below.

99. First, Surdila incorporates QBone in its entirety by reference into Surdila's disclosure: "A working group known as the QBone Working Group has defined, as part of the Internet 2 initiative, an architecture for coordinating bandwidth requirements across multiple networks at the transport level. ***The QBone group has published a description of the architecture in a paper entitled 'QBone Bandwidth Broker Architecture' found at http://www.internet2.edu/qos/qbone/papers/sibbs/, and this paper is incorporated by reference in its entirety herein.*** " ERIC-1014, ¶ [0025] (emphasis added). A copy of QBone was filed at the USPTO along with the filing of the Surdila application.

100. Thus, a person having ordinary skill in the art would have been motivated, upon reading Surdila, to turn to QBone to further understand the architecture and teachings of QBone, since it is incorporated by reference in Surdila. Further, Surdila continues by illustrating several "phases" taught in QBone: "FIG. 1 is a simplified block diagram of the QBone Phase 1 Bandwidth

Broker (BB) Architecture." ERIC-1014, ¶ [0034]. "FIG. 2 is a simplified block diagram of the QBone Phase 2 BB Architecture." ERIC-1014, ¶ [0037].

101. QBone teaches an access router serving a terminating end-point that has "marking functions for the flow" set in it by a bandwidth broker. ERIC-1017, p. 15. QBone teaches that the "marking functions" are part of the "traffic conditioning specification (TCS)," which "specifies classifier rules and any corresponding traffic profiles and metering, marking, discarding, and/or shaping rules which are to be applied to traffic aggregates selected by a classifier." ERIC-1017, p. 7. QBone's use of "marking functions" to assure end-to-end QoS is just one example of IP functions known to a POSITA for traffic control and other systems could utilize different techniques to accomplish similar control.

102. The TCS is part of a "service level specification," SLS, which focuses on the full domain "from ingress point to egress point" when specifying how traffic of a requested connection is to be treated. ERIC-1017, p. 7. Accordingly, a person having ordinary skill in the art reading QBone would have understood that QBone's SLS provided an assured service end-to-end (e.g., through each domain necessary to end-points), with a required route to the router.

103. However, QBone does not explicitly state that the "marking functions" require the network elements to use the determined path by the bandwidth broker should any routing parameters of the network elements change aside from changes from the bandwidth broker. Therefore, a person having ordinary skill in the art would have been motivated, when looking at QBone, to turn to a mechanism to impose the path determined by the bandwidth broker for a requesting flow. MPLS provides such a framework. Indeed, Surdila contemplated the use of MPLS in a QBone architectural framework. Surdila teaches the use of MPLS labels in "Label Edge Routers" (or LERs). In Surdila, LERs "***function as edge routers that also insert a specific label in the data packets*** to identify a specific media flow at the entry to the network, and remove the label upon exiting the network." ERIC-1014, ¶ [0034] (emphasis added). A person having ordinary skill in the art would have therefore been motivated, from QBone, to turn to Surdila in order to provide the guarantee that the routers in QBone use the paths determined by the bandwidth broker.

104. Surdila relies upon QBone as a basis of its implementation, while introducing further improvements thereon. *See* ERIC-1014, ¶¶ [0038], [0039]. Surdila, in particular, builds upon the foundation of QBone's disclosure by providing "proper control of network transport resources when a single application is utilized across several transport networks. Proper control includes the ability to bind the utilization of transport resources across several administrative domains to the application utilizing these resources for the provision of end-to-end QoS. This binding is necessary regardless of the QoS solution used in each administrative domain for the provision of end-to-end QoS." ERIC-1014, ¶ [0039].

105. In view of Surdila's stated improvements on QBone, a person having ordinary skill in the art would have similarly been motivated, upon reading the disclosure of QBone, to combine with the features of Surdila in order to improve QBone's operation to have "proper control of network transport resources when a single application is utilized across several transport networks" as taught by Surdila. *See* ERIC-1014, ¶ [0039].

106. Indeed, QBone expressly contemplated, welcomed, and encouraged further development of the QBone architecture: "[t]he technology being discussed here is too new for a complete and definitive analysis of the requirements for the bandwidth broker to take place. Therefore, the best approach is to discuss some of the basic requirements and basic models and to suggest some candidates for the inter-domain protocol that are likely to prove robust and extendible. ***This is a stage for experimentation and trying out ideas***." ERIC-1017, pp. 1-2 (emphasis added).

107. Implementation of this combination would have been within the ability of a person having ordinary skill in the art. QBone teaches the desirability of experimentation and new ideas, and Surdila does just that with a proposed approach utilizing "binding information" to assure "proper control of network transport resources." ERIC-1014, ¶ [0039]. Further, Surdila utilizes the QBone architecture in its solution: "FIG. 6 is a simplified block diagram of the preferred embodiment of the Phase 2 BB Architecture of the present invention when there are BBs in every transit network." ERIC-1014, ¶ [0076] ("Phase 2" being terminology Surdila adopted from the QBone Architecture, *see* ERIC-1014, ¶ [0037]).

108. To the extent that any modification would have been needed to the teachings of QBone in order to accommodate the teachings of Surdila, such modifications would have been within the level of ordinary skill in the art, because QBone teaches that "trying out ideas" is desirable for the QBone architecture and Surdila teaches that it relies upon the QBone architecture. Thus, a person having ordinary skill in the art would have been able to incorporate the teachings of Surdila into QBone without extraordinary effort.

109. Accordingly, a person having ordinary skill in the art before the earliest alleged priority date of the '119 patent would have been motivated to combine QBone's architecture teachings with Surdila's teachings of traffic-types and quality of service levels, because QBone expressly contemplated further development of ideas relating to the architecture and Surdila expressly incorporates QBone by reference in its entirety. Surdila built upon QBone by providing more details of how to apply QBone's concept across networks to obtain the E2E QoS taught by QBone. QBone's acknowledgment of further testing and development would have directed a person having ordinary skill in the art to look for further developments improving system performance and would have found Surdila, which identifies QBone by name. Likewise, a person having ordinary skill in the art reading Surdila would have been directed to look at QBone based on the identification and incorporation by reference in its entirety of QBone in the body of Surdila.

D. Overview of Li

110. Li focuses on a "system and a method for ensuring quality of service in a network based virtual private network." ERIC-1023, Abstract. Li teaches that its focus is on networks using "Multi-protocol Label Switch." ERIC-1023, p. 7, ¶1. "Multi-Protocol Label Switch," or "MPLS," "introduced a label-based mechanism to separate routing from forwarding." ERIC-1023, p. 7, ¶3. As a result of this separation, "the route of a packet in the network is determined by the label, and data transmission is accomplished via a Label Switch Path (abbreviated as "LSP")." ERIC-1023, p. 7, ¶3.

111. To achieve the targeted quality of service, Li taught the use of "centralized resource controllers." These controllers "perform[] resource calculation and route selection, send[] route indications to the routers, allocat[e] resources and perform[] access control in the logical bearer network," among other functions. ERIC-1023, p. 12, ¶7. Each domain may have one such centralized resource controller. ERIC-1023, p. 12, ¶7-p. 13, ¶1. These centralized resource controllers are provided "to centrally manage resources of the logical bearer network." ERIC-1023, p. 14, ¶5.

112. As part of managing resources, the centralized resource controller determines resource allocation and routing between sites. ERIC-1023, p. 17, ¶2. This includes "distributing MPLS label stacks that represent the routes to ingress PEs [provider edge routers]." ERIC-1023, p. 17, ¶2. The MPLS label stacks are communicated from the controller to the PEs to instruct the PEs how to process traffic streams. ERIC-1023, p. 23, ¶5; p. 24, ¶1 (the controller notifying the PE of the determined route, which is a label stack representing a set of LSPs).

113. In response to the label stack sent by the centralized resource controller based on a determined routing at the centralized resource controller, a PE that has received the MPLS label stack "obtains stream description information (which usually includes a source address, a source port, a destination address, a destination port, and a protocol type), then encapsulates the packet/frame with ***the label stack indicated by the VPN-CRC***," and "performs, in the VPN-LBN, forwarding along the route determined in the label stack." ERIC-1023, p. 19, ¶3, p. 22, ¶4.

E. Reasons to Combine QBone, Surdila, and Li

114. It is my opinion that one of ordinary skill in the art would have been motivated to combine the teachings of QBone, Surdila, and Li for the reasons set forth below.

115. As noted in Section VIII.C, a person having ordinary skill in the art would have therefore been motivated, from QBone, to turn to Surdila in order to provide a guarantee (by the MPLS labels in Surdila) that the routers in QBone use the paths determined by the bandwidth broker. A person having ordinary skill in the art would have understood that labels in a centralized implementation (such as in Surdila) would have been generated by the bandwidth broker taught therein and transmitted to the LERs for insertion into the packets. *See* ERIC-1014, ¶ [0034].

116. To the extent that the combination of QBone and Surdila does not explicitly describe how the LERs in Surdila obtain the labels that they insert into data packets and use for routing (instead of IP addresses, ERIC-1014, ¶ [0034]), it would have been obvious to modify QBone's bandwidth broker to generate labels and provide those to the routers (e.g., "access router" in QBone, "LERs" in Surdila). QBone already taught the setting of marking functions by the bandwidth broker with the access router, and Surdila taught that the LERs insert MPLS labels into packets and route based on those labels instead of IP addresses. ERIC-1014, ¶ [0034].

117. A person having ordinary skill in the art would have been motivated to look for further information about how the LERs in Surdila would receive MPLS labels that it inserts. Surdila teaches installing policies, by a bandwidth broker, into selected routers (ERIC-1014, claim 2), but does not provide detail about those policies' contents (namely, whether those policies include MPLS labels).

118. However, the concept of centralized controllers generating MPLS labels in support of path determinations was obvious and known prior to the earliest priority date of the '119 Patent. Further, it was obvious and known for a centralized controller to provide MPLS labels to routers that reflect the routes determined by the controllers (e.g., the bandwidth broker of QBone).

119. Li provides details on how to generate MPLS labels with a centralized controller and provide those MPLS labels to network elements including routers. According to Li, a centralized resource controller determines/generates MPLS label stacks and distributes those MPLS label stacks for determined routes to edge routers. ERIC-1023, p. 12, ¶7, p. 17, ¶2. Li teaches that the edge routers encapsulate the packets with the label stack it received from the centralized resource controller and forwards the packet according to the labels, "***rather than the IP addresses***." *See* ERIC-1023, p. 19, ¶3, p. 22, ¶4; ERIC-1014, ¶ [0034] (emphasis added).

120. It would have been within the skill of a person having ordinary skill in the art to implement Li's teachings of centralized controller label generation and provision to edge routers within the architecture of QBone and with Surdila's LER teachings. QBone already contemplated determining marking functions at the bandwidth broker and providing those to the access router. Surdila taught that LERs inserted labels into packets and routed based on those labels rather than IP addresses. Li provides additional teachings regarding the generation of MPLS labels at a centralized controller, like the bandwidth broker in QBone, to edge routers like the access routers according to Surdila's MPLS label teachings. The predictable result would be the centralized determination taught by QBone and Li, with the routing at the edge routers per the teachings of Surdila and Li.

F. Detailed Analysis

1. Independent Claim 1

[1.0] ***A method for providing bandwidth on demand comprising:***

121. To the extent that the preamble is limiting (and not just stating an intended use), QBone teaches a method for providing bandwidth on demand.

122. **First**, QBone teaches that the QBone Premium Service "is to provide a service with quantitative, absolute bandwidth assurance." ERIC-1017, p. 3.

123. **Second**, QBone teaches that the system supports reservations of bandwidth: "[a]ctual reservations are accomplished via the protocols described in this document. A reservation represents actually ***committed resources*** but not necessarily used resources. As traffic flows, the resource is ***actually used***. How much can be used depends on the type of reservation of course." ERIC-1017, p. 8

(emphasis added).

124. These reservations are obtained by "end systems" by "resource allocation requests" (RAR). "The end system sends an RAR to the bandwidth broker (1)." ERIC-1017, p. 13. The bandwidth broker receives the RAR and "makes a number of decisions … including … [w]hether the requester is authorized for this service …" as well as "the route through the domain to the egress router." ERIC-1017, p. 13.

125. **Third**, QBone teaches that the system supports taking down those reservations of bandwidth: "[e]ither of the endpoints of a QBone reservation may release the reservation, or the BBs in the endpoint domains (if they are not holders of the endpoint of the reservation) may do so." ERIC-1017, p. 20. The reservations include bandwidth: "[t]he final parameter of both message types, the Service Parameterization Object (SPO), merits further discussion. This parameter is intended to be a service-specific specification of requested or learned service parameters. Depending on the service in question, this may be a simple parameter (e.g. ***bits-per-second of bandwidth***) or may be quite complex (full TSpec, trTCM configuration, etc.)." ERIC-1017, p. 24.

126. Thus, QBone's requesting service with requested bandwidth, determining routes and reserving those routes, and taking down those routes, teaches "a method for providing bandwidth on demand" as recited in the claim.

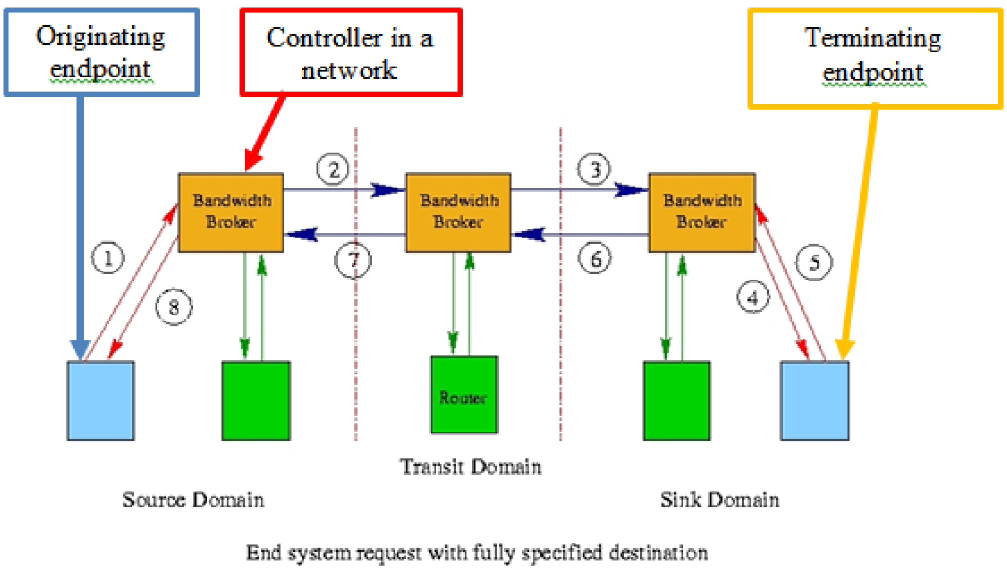
[1.1] ***receiving, by a controller positioned in a network, a request for a high quality of service connection supporting any one of a plurality of one-way and two-way traffic types between an originating end-point and a terminating end-point,***

127. QBone in combination with Surdila teaches receiving, by a controller positioned in a network, a request for a high quality of service connection supporting any one of a plurality of one-way and two-way traffic types between an originating end-point and a terminating end-point.

128. **First**, with respect to the claimed controller and end-points, QBone teaches a controller positioned in a network, where the network also includes an originating end-point and a terminating end-point. QBone's "bandwidth broker" is a controller: "[t]he oracle model is as follows: In general, a bandwidth broker may receive a resource allocation request (RAR) from one of two sources … the bandwidth broker responds to this request with a confirmation of service or denial of service." ERIC-1017, p. 5. Confirmation of service or denial of service are two examples of control that the bandwidth broker exercises.

129. Further, QBone teaches that the domains in which the bandwidth brokers are located are "networks": "[t]he purpose of this document is to establish a minimal set of requirements for ***network clouds*** wishing to participate in inter-domain QoS signaling trials across the QBone." ERIC-1017, p. 1 (emphasis added).

130. QBone's "end system" that initiates a request for service is an "originating end-point," which the bandwidth broker (controller) receives: "***[a]n end system*** initiates a request for service with a fully-specified destination address (e.g. /32 for IPv4). The request is thus for service to ***another end system***." ERIC-1017, p. 12 (emphasis added). The recipient end system in QBone is a "terminating end-point." This is illustrated in the modified (color added) and annotated figure below:



ERIC-1017, p. 13 (annotated).

131. **Second**, as discussed below, QBone in combination with Surdila teaches that the controller receives a request for "Video High Quality that includes bandwidth of at least 2 Mbps in some examples, thus specifying a high quality of service.

132. For the reasons to combine Surdila with QBone, please see Section XI.C above.

133. According to the ’119 Patent, “high quality bandwidth on demand services” that the embodiments provide include “video and gaming applications.” ERIC-1001, 5:23-26. During prosecution of the ’612 Patent, Patent Owner identified “the boxed set of applications on the left side of Fig. 3” as being “high QoS” applications. ERIC-1004, p.51. The applications identified in the box of FIG. 3 include video conferencing, file sharing, distance learning, SD video on demand, multi-player gaming, telemedicine, Realtime video, HD video multicasting, network hosted software, and video from studio. ERIC-1001, FIG. 3.

134. Counsel has informed me that claim terms are understood to encompass disclosed embodiments in the absence of clear disavowals of claim scope. With that in mind, I observe that the recital in claim 1 should cover at least the aspects relating to the depiction of high quality of service connections in FIG. 3 and the description in the ’119 Patent. To that end, QBone in combination with Surdila provide examples of applications that receive a requested quality of service, similar to those given in the ’119 Patent.

135. Surdila illustrates “high” QoS in a table reproduced below, which 1) expressly identifies an example “high” QoS application - “video high quality,” and 2) gives examples of applications requiring 2 Mbps data rates (compared to the 1Mbps data rates illustrated in the bar chart and considered by Patent Owner in Figure 3 of the ’119 Patent for “high QoS”):

Application Performance Rating Table

Data Rates (kbps) Applications	9.6	14.4	32	64	128	384	2000
			Application Performance Rating				
Voice, SMS	E	E	E	E	E	E	E
E-mail	P	F	E	E	E	E	E
Internet Web Access	P	P	F	F	E	E	E
Database Access	P	P	F	E	E	E	E
Synchronization	E	E	E	E	E	E	E
Document Transfer	P	P	F	E	E	E	E
Location Services	F	E	E	E	E	E	E
Still Image Transfer	P	F	E	E	E	E	E
Video Lower Quality	P	F	F	E	E	E	E
Video High Quality	P	P	P	F	F	E	E

Excellent (E) Fair (F) Poor (P)

ERIC-1014, ¶ [0007] (annotated).

136. The data rate, measured in kilobits per second in Surdila, constitutes a bandwidth. The bandwidth in Surdila for these different applications varies from “excellent” high quality service to “fair” or “poor” for the different application demands. Similar to the ‘119 disclosure of 1 Mbps for “Video Conferencing,” Surdila discloses 2 Mbps for “Video High Quality,” which is assured from end-to-end. ERIC-1014, ¶[0039] and FIG. 4A. The “Video High Quality” application is listed at the bottom of the “Application Performance Rating Table” reproduced above.

137. QBone teaches that the high quality of service request is in the form of a resource allocation request (RAR): "[t]he end system ***sends an RAR to the bandwidth broker*** (1). This message includes a globally well-known service ID and an IP destination IP address, a source IP address, an authentication field, times for which the service is requested and the other parameters of the service." ERIC-1017, p. 13 (emphasis added).

138. This "service" is for a quality of service: "[a] bandwidth broker (BB) manages network resources ***for IP QoS services supported in the network and used by customers of the network services***." ERIC-1017, p. 26 (emphasis added). "QoS" here refers to "quality of service" as a person having ordinary skill in the art would recognize. Surdila's 2 Mbps for "Video High Quality" is an example of the bandwidth parameter specified by QBone's SPO (in a RAR) which identifies "***bits-per-second of bandwidth***." ERIC-1017, p.24; ERIC-1014, ¶[0039], FIG. 4A. A person having ordinary skill in the art would have known that a quality of service connection, such as those requested per the teachings of QBone and Surdila, would have several different parameters associated with it including bandwidth.

139. Further, a person having ordinary skill in the art would have known that a quality of service connection, such as those requested per the teachings of QBone and Surdila, would have several other parameters associated with it in addition to bandwidth, including in certain applications latency and packet loss. For example, QBone teaches that "marking functions" for flows through the access router are part of the "traffic conditioning specification (TCS)," which "specifies classifier rules and any corresponding traffic profiles and metering, marking, discarding, and/or shaping rules." ERIC-1017, p.7.

140. The TCS is part of a "service level specification," SLS, which specifies an assured service end-to-end. ERIC-1017, p.7. The TCS, in particular, specifies "[d]etailed service performance parameters such as expected throughput, drop probability, [and] latency." *Id.* These specified "service performance parameters such as "drop probability," which corresponds to packet loss, and "latency" are further examples of the parameters that a requested quality of service connection would have in certain applications.

141. Third, QBone teaches that the quality of service connection constitutes a connection that assures at least a bandwidth parameter of the connection from end-to-end, and that the parameter is based on the requirements of the application and therefore is a "high" quality of service: "[n]ote that while the initial phases of the BB work concentrate on QPS [QBone Premium Service], the inter-domain BB protocol needs to be flexible enough to handle other services." ERIC-1017, p. 3. These "services" require specification of parameters: "[l]ikewise, from the customer side, there must be some specification of what the input is. ***Exactly what must be specified is dependent on the service being requested***." ERIC-1017, p. 4 (emphasis added).

142. A person having ordinary skill in the art would have appreciated that, since the exact input specified “is dependent on the service being requested,” the resulting specified parameter is based on the requirements of the application for which the requirement is specified. This is a “high” quality of service. Further, QBone states that its service is “end-to-end.” ERIC-1017, p. 4.

143. QBone continues with respect to service: “[o]ne can expect in general that stricter service requires more specification (as in QPS) whereas a service with fewer guarantees requires much less specification (or none, e.g. Best-effort).” ERIC-1017, p. 4. A person having ordinary skill in the art would have appreciated that requested service that is “stricter” than “best-effort” would constitute a “high” quality of service (i.e., the service being requested).

144. Surdila likewise teaches a quality of service connection where bandwidth parameter is assured based on the requirements of the application: “[t]he support of E2E QoS is a very important issue related to the launching of ***real-time applications such as IP telephony, mixed voice/video calls, etc. over the IP infrastructure***. The major challenge is to make sure that when a user requests a certain QoS, this QoS can be assured all the way to the recipient.” ERIC-1014, ¶ [0007] (emphasis added).

145. Further, Surdila teaches that the requested bandwidth parameter is assured from end to end: “Proper control includes the ability to bind the utilization of transport resources across several administrative domains to the application utilizing these resources ***for the provision of end-to-end QoS***." ERIC-1014, ¶ [0039] (emphasis added); *see also* FIG. 4A (callout to element 62, the SIP INVITE: "The QoS assured indicates that the user wants an assured E2E QoS.").

146. Fourth, QBone teaches that the quality of service connection supports a plurality of traffic types including one-way traffic: "[a]s traffic flows, the resource is actually used." ERIC-1017, p. 8. A person having ordinary skill in the art would have understood that, for traffic to flow, it flows in at least one direction (i.e., "one-way traffic") from source to sink. QBone further describes "traffic" entering and leaving DS (DiffServ) domains. *See* ERIC-1017, p. 26 ("A DS boundary node in its role of handling traffic as it leaves a DS domain" (DS egress node), "A DS boundary node in its role of handling traffic as it enters a DS domain." (DS ingress node)). QBone teaches that its "QBone Premium Service" (QPS) "is unidirectional." ERIC-1017, p. 3. A person having ordinary skill in the art would particularly have understood that "unidirectional" service is with respect to one-way traffic.

147. Further, Surdila teaches that a controller (multimedia control server in Surdila) receives a request for a quality of service connection that supports a two-way traffic type: "[a]t step 62, End User (UE-A) 11 sends an Invite message to the Originating P-CSCF-O 44 and includes the A-Name, B-Name, and Proposed

Session Description (SDP)(QoS Assured).” ERIC-1014, ¶ [0062]. The “originating P-CSCF-O 44” is part of the “multimedia control server.” The requested connection taught by Surdila is a bidirectional one: “[a]t 172, the BB-S sends a Resource Allocation Request (RAR) message to the BB-T1 163 ***indicating a bidirectional session*** and including the Binding Information.” ERIC-1014, ¶ [0080] (emphasis added).

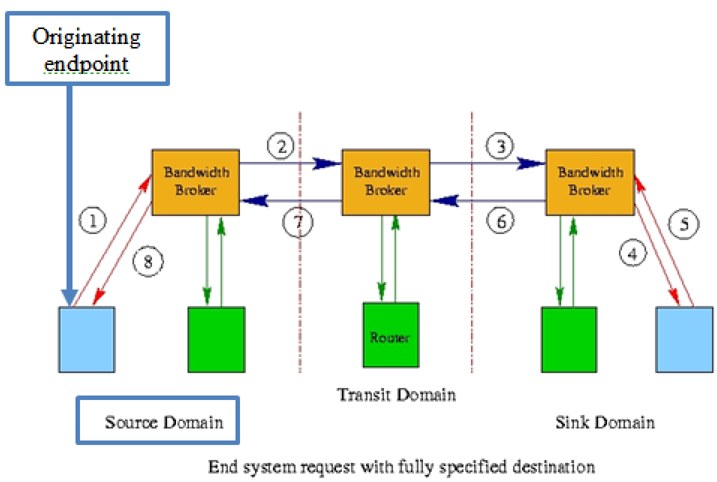
148. **Fifth**, QBone teaches that the traffic for a “high” quality of service connection is between the originating end-point and the terminating end-point: “***[a]n end system initiates a request for service*** with a fully-specified destination address (e.g. /32 for IPv4). The request is thus for service ***to another end system***.” ERIC-1017, p. 12 (emphasis added). That service involves sending flows from originating to terminating end-points: “[t]he ***end system*** receives the RAA and ***is able to send the flow***.” ERIC-1017, p. 15 (emphasis added).

149. Thus, QBone’s Bandwidth Broker in the network, with the end systems requesting the service at a quality of service level to each other and supporting traffic flows there between, in combination with Surdila’s implementation of QBone’s architecture including two-way traffic and a high quality of service request, teaches “receiving, by a controller positioned in a network, a request for a high quality of service connection supporting any one of a plurality of one-way and two-way traffic types between an originating end-point and a terminating end-point" as recited in the claim.

[1.2] ***wherein the request comes from the originating end-point and includes at least one of a requested amount of bandwidth and a codec;***

150. QBone in combination with Surdila teaches that the request comes from the originating end-point and includes at least one of a requested amount of bandwidth and a codec.

151. **First**, QBone teaches that the request comes from the originating end-point: "***An end system initiates a request for service*** with a fully-specified destination address (e.g. /32 for IPv4). The request is thus for service to another end system." ERIC-1017, p. 12 (emphasis added). The RAR is from the "end system" in the "source domain," as illustrated in the annotated figure from QBone below:



ERIC-1017, p. 13 (modified and annotated).

152. The "source" domain is the originating domain in QBone, in which

QBone teaches that the “end system” initiates the RAR. *See* ERIC-1017, p. 13.

153. **Second**, QBone teaches that the request includes a requested amount of bandwidth as specified in a RAR: “[t]he end system sends an RAR to the bandwidth broker (1). ***This message includes*** a globally well-known service ID and an IP destination IP address, a source IP address, an authentication field, times for which the service is requested ***and the other parameters of the service***.” ERIC-1017, p. 13 (emphasis added).

154. One of those other parameters, bandwidth, is described by the SPO: “[t]he following table outlines the RAR message format. … ***Service Parameterization Object (SPO)***.” ERIC-1017, pp. 21-22 (emphasis added). “The final parameter of both message types, the Service Parameterization Object (SPO) … is intended to be a service-specific specification of requested or learned service parameters. Depending on the service in question, this may be a simple parameter (e.g. ***bits-per-second of bandwidth***).” ERIC-1017, p. 24. In QBone, the “bits-per-second of bandwidth” is, as part of the RAR (in the SPO) from the end system, a requested amount of bandwidth included in the request. Accordingly, by teaching a request that includes a desired bandwidth from the originating end-point to the bandwidth broker, QBone teaches the limitation for “at least one of a requested amount of bandwidth ….”

155. **Third,** to the extent the limitation also requires a codec, the combination of QBone and Surdila teaches that requests involve a SIP message: "FIGS. 7A-7B are portions of a sequence diagram illustrating implementation of a Push Policy Mechanism for End-to-End QoS for a SIP call during Phase 2 when there are BBs in every transit network, as illustrated in FIG. 6." ERIC-1014, ¶ [0079]. Surdila teaches with respect to the steps that "FIGS. 4A-4B are portions of a sequence diagram illustrating the implementation of a Push Policy Mechanism for End-to-End QoS ***for a SIP call***." ERIC-1014, ¶ [0061] (emphasis added). "At step 62, End User (UE-A) 11 sends an Invite message to the Originating P-CSCF-O 44 and includes the A-Name, B-Name, and Proposed Session Description (SDP)(QoS Assured)." ERIC-1014, ¶ [0062].

156. As would have been recognized by a person having ordinary skill in the art, an SDP offer of a SIP invite has many parameters including both bandwidth ***and*** a desired codec (i.e., in the same request). This is evinced by U.S. Pat. Pub. No. 2002/0181495 to Requena *et al.* which describes with respect to SIP calls: "the UE1 (also referred to as the session originator) first generates, ***according to the SIP (Session Initiation Protocol) protocol, a SIP INVITE message comprising particular SIP header fields and a message body***. According to the proposal, the message body is generated according to the SDP (Session Description Protocol) protocol and it is called an SDP body." ERIC-1018, ¶ [0008] (emphasis added). "The UE1 generates ***the SDP body*** in such a way that it

contains a list (set) of codecs that the UE1 is able and willing to support for the session. ” ERIC-1018, ¶ [0009] (emphasis added).

157. Thus, as would have been recognized by a person having ordinary skill in the art based on the above teachings, the SIP message taught in Surdila as an example of what may be included with a RAR sent from an "end system" in QBone would include, in addition to the bits-per-second of bandwidth, one or more codecs that the end system is able and willing to support for the session. As a result, QBone in combination with Surdila teaches that the RAR includes at least *a requested amount of bandwidth, or a codec, or both*.

158. Thus, QBone's RAR from the end system in the "source domain," where the RAR includes at least the "bits-per-second of bandwidth" in combination with Surdila's teaching of a SIP message with a codec request, teaches "wherein the request comes from the originating end-point and includes at least one of a requested amount of bandwidth and a codec" as recited in the claim.

[1.3] ***determining, by the controller, whether the originating end-point is authorized to use the requested amount of bandwidth or the codec***

159. QBone in combination with Surdila teaches determining, by the controller, whether the originating end-point is authorized to use the requested amount of bandwidth or the codec.

160. **First**, QBone teaches that the bandwidth broker determines whether the originating end system is authorized for the requested service: "[t]he end system sends an RAR to the bandwidth broker (1) … ***The bandwidth broker makes a number of decisions at this point, including*** the following: … ***Whether the requester is authorized for this service***". ERIC-1017, p. 13 (emphasis added).

161. Second, QBone teaches that the requested service as specified in the RAR includes a requested amount of bandwidth: "[t]he end system sends an RAR to the bandwidth broker (1). ***This message includes*** … ***the other parameters of the service***." ERIC-1017, p. 13 (emphasis added). One of those other parameters is described by the SPO (service parameterization object, *see* ERIC-1017, p. 22): the "SPO … may be a simple parameter (e.g. ***bits-per-second of bandwidth***) or may be quite complex (full TSpec, trTCM configuration, etc.)." ERIC-1017, p. 24 (emphasis added).

162. According to QBone, it is only after the RAR is received that the bandwidth broker decides whether the requester is authorized for the requested service. Because QBone teaches that the RAR includes other parameters including "bits-per-second of bandwidth," it would have been understood by a person having ordinary skill in the art that QBone teaches that the authorization would be based on any number of factors, of which bandwidth is one. Thus, the bandwidth broker that determines whether the end system is authorized for the service identified in the RAR, where the RAR includes a requested amount of bandwidth, provides an example of determining whether an originating end-point is authorized to use the amount of bandwidth identified in the request.

163. Third, Surdila further teaches authorization where codecs are involved. According to Surdila, an end-user (i.e., originating end-point of the claim) sends a SIP Invite message (an example of a request) that "includes the A-Name, B-Name, and Proposed Session Description (SDP)(QoS Assured)." ERIC-1014, ¶ [0062]. As noted above in [1.2], a person having ordinary skill in the art would have recognized that a SIP Invite was known to include one or more codecs for use in the requested session. Surdila teaches that the response to the SIP Invite (including codecs identified in the SDP) is "an Invite message 72 … with the A-Name, B-Name, and Proposed SDP (QoS Assured) [which includes the codec(s)]. ***At this point, the UE-A is authenticated and the call is authorized***." ERIC-1014, ¶ [0063] (emphasis added).

164. Surdila therefore further teaches authorizing a request that includes codec(s) identified in the "Proposed SDP," which as noted above a person having ordinary skill in the art would have recognized may "***contain[] a list (set) of codecs that the UE1 is able and willing to support for the session.***" ERIC-1018, ¶ [0009] (emphasis added). It would have been obvious to authorize a request using the requested bandwidth or the codec in view of Surdila's teachings, since both would be available to the BB.

165. Thus, QBone's disclosure of a bandwidth broker that determines whether the requester (end system) is authorized to use the service, where the service RAR includes a requested amount of bandwidth, in combination with Surdila's teaching that the RAR may be part of a SIP call which is authorized, where SIP invites indicate supported codecs, teaches "determining, by the controller, whether the originating end-point is authorized to use the requested amount of bandwidth or the codec" as recited in the claim.

[1.4] ***and whether the terminating end-point can be reached by the controller;***

166. QBone teaches that the controller determines whether the terminating end-point can be reached by the controller.

167. **First**, QBone teaches that the bandwidth broker in the originating domain determines whether the "requester is authorized for this service," along with the "egress router to which the flow may be assigned," "[t]he route through the domain to the egress router," "[w]hether the flow fits in the SLS [service level specification] of the egress router with the net domain in the path to the destination," and "[w]hether the flow … may be accepted for the specified service." ERIC-1017, p. 13. If that is determined by the bandwidth broker, then the bandwidth broker "will modify the RAR including the ID for the domain … and sign the request with its own signature (2)." ERIC-1017, p. 13. The modified RAR is sent to the adjacent bandwidth broker (2) and on, where positive outcomes, to the next bandwidth broker until the "bandwidth broker in the destination domain" is reached. ERIC-1017, pp. 13-15.

168. If, at the destination domain, the bandwidth broker of the destination domain also determines a "positive outcome" to decisions including: "[a]uthenticate that the request is indeed from a peer bandwidth broker"; "the intra-domain route from the ingress router to the end system and … whether the resources are available to support the flow"; "that the requested resources fall within any possible SLS with the end system"; and "whether the flow may be accepted." ERIC-1017, p. 14. "In case all these decisions have positive outcomes, the bandwidth broker sends the RAR to the end system with appropriate changes (4)." ERIC-1017, p. 14.

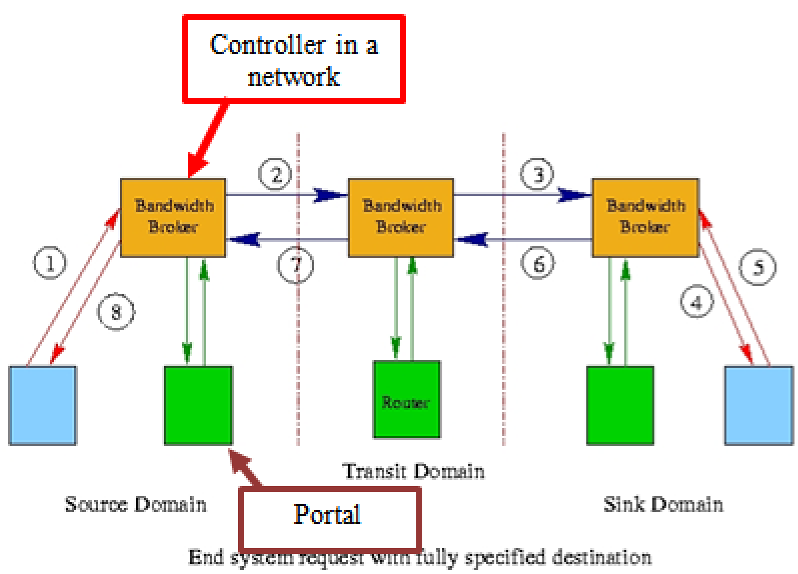
169. **Second**, if the flow is accepted, the bandwidth broker in the "sink domain" (destination domain) sends the RAR to the destination end system, where "the end system makes the determination whether it can receive the flow. This is signalled with an RAA [resource allocation answer] to the bandwidth broker of the destination domain (5)" and which is continued back along the path to the source (originating) domain's bandwidth broker. ERIC-1017, p. 14. Then, "[w]hen the bandwidth broker of the originating domain receives the RAA (7) and authenticates it, the bandwidth broker completes any resource allocation actions within the domain". ERIC-1017, p.15.

170. Thus, because QBone's originating domain bandwidth broker modifies the RAR and sends it along to reach the destination domain's end system, and which determines whether to flow can be received, QBone teaches "and whether the terminating end-point can be reached by the controller" as recited in the claim.

[1.5] ***directing, by the controller, a portal that is positioned in the network and physically separate from the controller to allocate local port resources of the portal for the connection;***

171. QBone teaches a controller that directs a portal in the network and that is physically separate from the controller to allocate local port resources of the portal for the connection.

172. **First**, QBone teaches a portal in the network that is physically separate from the controller, as illustrated in the figure reproduced below:



ERIC-1017, p. 13 (modified and annotated).

173. QBone teaches that the bandwidth broker communicates with the router (portal), specifically directing the access router to allocate resources for the reservation: "The purpose of this protocol [intra-domain protocol] is to communicate BB decisions ***to routers within the bandwidth broker's domain in the form of router configuration parameters for QoS operation*** ...." ERIC-1017, p. 9 (emphasis added). A person having ordinary skill in the art would have appreciated from this teaching in QBone that routers within the domain include an access router (e.g., that QBone also refers to as ingress routers), and that the access router is physically separate from the controller in the network.

174. **Second**, QBone provides details regarding what this communication of router configuration parameters entails. In particular, the bandwidth broker communicates the router configuration parameters "for QoS operation" to the access router (an example of a "portal"). ERIC-1017, p. 9. The RAR, per QBone, has "certain side effects … such as altering the router configurations at the access [router]." *Id.*, p. 5. Completing resource allocation actions within the originating domain "***may include setting the marking functions for the flow in the access router serving the requesting end system (indicated by the green arrows in the figure)***." ERIC-1017, p. 15 (emphasis added). The "access router" is an example of a "portal." The access router receives instructions from the bandwidth broker to allocate local resources for a requested QoS connection, namely the alterations to any one or more router configurations.

175. Third, a person having ordinary skill in the art would have appreciated that a router, like QBone's access router, has port resources impacted by alterations to router configurations, and that QBone's setting of marking functions for the access router corresponds to local port resource allocation directed by the bandwidth broker (at least because the bandwidth broker is the entity setting the marking functions). For example, U.S. Pat. Pub. No. 2005/0135243 to Lee *et al.* (ERIC-1020) evinces that routers have port resources, teaching that routers have resources including "buffers … or bandwidths" that can be allocated. *See* ERIC-1020, ¶ [0006].

176. Indeed, per QBone, the "QBone Premium Service" specifies "peakRate" (QPS peakRate in bytes per second) and jitter (QPS jitter bound in microseconds) as parameters that are included in a definition of a reservation. ERIC-1017, p. 24. Per QBone, traffic conditioning includes mechanisms for classification, marking, metering, shaping, and dropping which together constitutes the TCS. ERIC-1017, pp. 4-5. Each of these mechanisms are implemented by the bandwidth broker "configuring the routers at the edges (and internal to) its domain with the set of parameters for the PHB mechanisms and the traffic conditioning mechanisms." ERIC-1017, p. 5. As a result, QBone teaches that the bandwidth broker configures an access router with parameters that the router then uses to handle packets on its ports (whether allowing bandwidth usage, specific queue usage, dropping, etc.).

177. Further, Surdila teaches that "the resources required to meet the requested QoS are then reserved in the originating network." ERIC-1014, ¶ [0009]. To accomplish the reservation at the routers (portals), the bandwidth broker "instruct[s] specific routers in its network to install specific policies for treating payload flows." ERIC-1014, ¶ [0032]. For MPLS routers, the policy instructions provided by the bandwidth broker include instructing the MPLS routers to store labels in memory so the routers can "insert a specific label in the data packets to identify a specific media flow at the entry of the network." ERIC-1014, ¶[0034].

178. This reservation of resources for a router includes reservations with respect to flow and filters. These are, according to Surdila, examples of "resources required to meet the requested QoS in the originating network." ERIC-1014, Claim 1. Because the setting of marking functions and installation of policies and traffic conditioning mechanisms, as in QBone, encompass resources (i.e., bandwidth, queues, port usage) that affect usage of at least one port of QBone's access router. This determines what port packets traverse through the access router, and the bandwidth broker in QBone sets those functions at the access router. QBone therefore teaches the allocation of port resources in the form of the setting of the marking functions.

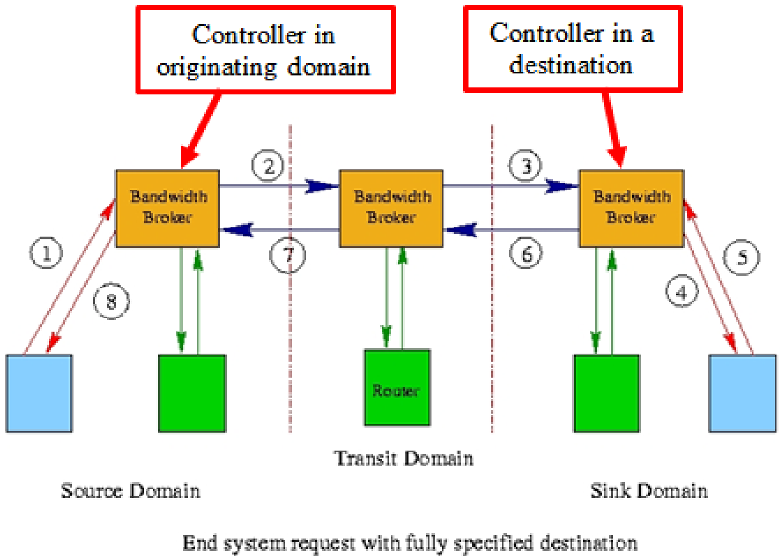
179. Therefore, as explained above, QBone in combination with Surdila teaches "directing, by the controller, … [a portal] to allocate local port resources of the portal" that includes at least *sending an allocation instruction from the controller to the portal, where the allocation instruction results in the portal allocating physical and/or logical elements of the portal*, per the teachings of QBone and Surdila.

180. Thus, QBone's bandwidth broker in the originating domain that modifies parameters in the access router teaches "directing, by the controller, a portal that is positioned in the network and physically separate from the controller to allocate local port resources of the portal for the connection" as recited in the claim.

[1.6] ***negotiating, by the controller, to reserve far-end resources for the terminating end-point; and***

181. QBone teaches that the controller negotiates to reserve far-end resources for the terminating end-point.

182. **First**, QBone teaches in a multi-domain scenario a bandwidth broker in the originating (source) and destination (sink) domains, referred to as "bandwidth broker in the originating domain" (the "controller") and "bandwidth broker in the destination domain," and as illustrated and annotated in the figure from QBone below:



ERIC-1017, p. 13 (modified and annotated).

183. Second, QBone teaches that the bandwidth broker in the originating domain sends the RAR on along the path to the destination domain for reservation of the far-end resources at the destination domain for the terminating end system. *See* ERIC-1017, pp. 14-15; *see also* analysis of claim element [1.4] (detailing how QBone's control signaling functions from originating domain to terminating domain, including determining whether resources are available as requested). The resources at the destination domain are "far end resources" inasmuch as they are at the far end of the connection.

184. In response to the decision at the end system for a RAR, the terminating end system sends an RAA to the bandwidth broker in the destination domain that "contains authentication of the end system, and ***parameters for the flow which the end system is willing to accept***." ERIC-1017, p. 14 (emphasis added). The bandwidth broker in the destination domain "may configure traffic conditioners ***at the ingress router*** [of the destination domain] and possibly at other routers along the intra-domain path to the destination." ERIC-1017, p. 14 (emphasis added).

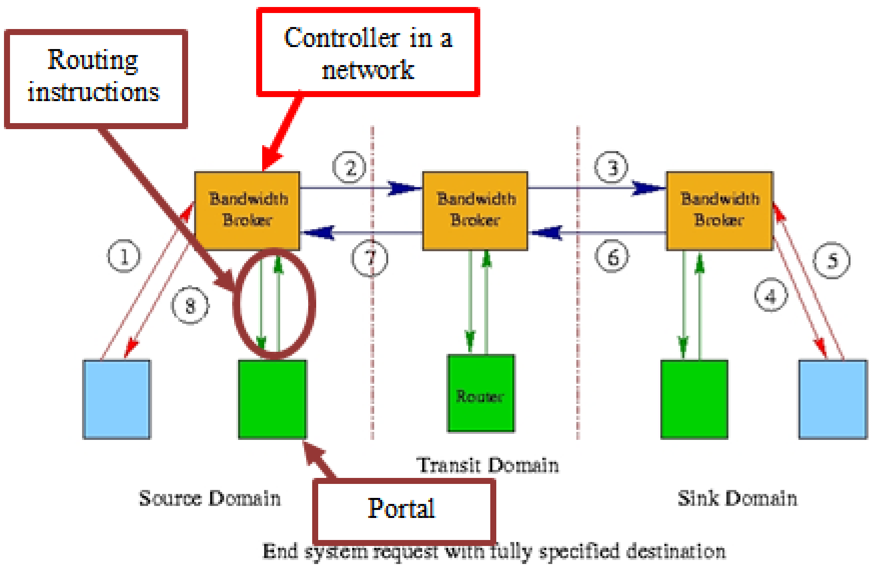
185. Thus, QBone's bandwidth broker in the originating domain sending the RAR on to the bandwidth broker of the destination domain, and the end system there, with the configuration of the routers along the path in the destination domain, teaches "negotiating, by the controller, to reserve far-end resources for the terminating end-point" as recited in the claim.

[1.7] ***providing, by the controller to the portal, routing instructions for traffic corresponding to the connection so that the traffic is directed by the portal based only on the routing instructions provided by the controller,***

186. QBone in combination with Surdila and Li teaches providing, by the controller to the portal, routing instructions for traffic corresponding to the connection so that the traffic is directed by the portal based only on the routing instructions provided by the controller.

187. **First**, QBone teaches that the bandwidth broker provides instructions to the access router in the originating domain: "the bandwidth broker completes any resource allocation actions within the domain … ***This may include setting the marking functions for the flow in the access router serving the requesting end system (indicated by the green arrows in the figure)***." ERIC-1017, p. 15

(emphasis added). The instructions are based on bandwidth broker determinations. Specifically, QBone teaches that "[t]he bandwidth broker [in the originating domain] makes a number of decisions … including … ***The route through the domain to the egress router.***" ERIC-1017, p. 13 (emphasis added). This "route through the domain" includes the access router.



ERIC-1017, p. 13 (modified and annotated).

188. The "setting the marking functions" identified by the green arrows in the figure from the bandwidth broker in the originating (source) domain to the access router in the originating domain shows the provision of instructions for traffic corresponding to the requested connection.

189. **Second,** to the extent that QBone's "marking functions" are not described as "routing instructions" specifically, Surdila expressly teaches an implementation of MPLS labels as "routing instructions" in a router (which Surdila refers to as a "Label Edge Router" (or LER)). Per Surdila, "***[t]he LERs function as edge routers that also insert a specific label in the data packets*** to identify a specific media flow at the entry to the network, and remove the label upon exiting the network." ERIC-1014, ¶ [0034] (emphasis added).

190. These "labels" are "routing instructions" because, as Surdila teaches, "[t]he Multi-Protocol Label Switching (MPLS) protocol then ***routes packets based on the labels inserted by the LERs rather than the IP addresses***." ERIC-1014, ¶ [0034] (emphasis added). As would have been recognized by a person having ordinary skill in the art, the routing of packets based on the labels inserted by the LERs begins with the LERs themselves. This is an example of the access router in QBone, modified with the teachings of Surdila regarding MPLS labels, directing traffic for the requested connection (corresponding to the labels) based only on those labels instead of IP addresses, because MPLS labels allow a router to route traffic based on the label-switched routing instructions instead of the information in its regular routing table.

191. **Third**, to the extent that QBone in combination with Surdila does not explicitly state that the MPLS labels in Surdila, as examples of the "routing instructions" provided from the bandwidth broker of QBone (e.g., in parallel to or as a replacement of the "marking functions"), are generated at the bandwidth broker and sent to the access router (LER in Surdila), Li provides such teachings.

192. In particular, Li teaches a centralized resource controller that determines resource allocation and routing between sites. ERIC-1023, p. 17, ¶2. This includes "distributing MPLS label stacks that represent the routes to ingress PEs [provider edge routers]." *Id.* PEs in Li are examples of what Surdila refers to as its LERs. Li's MPLS label stacks are examples of "marking functions" per QBone and the claimed "routing instructions." Per Li, a PE that has received the MPLS label stack "encapsulates the packet/frame with ***the label stack indicated by VPN-CRC***," and "performs forwarding along the route determined in the label stack." ERIC-1023, p. 19, ¶3, p. 22, ¶4.

193. Accordingly, QBone as modified by Surdila and Li teaches a bandwidth broker that determines a route through the network and generates MPLS label stacks that are sent to edge routers (per Li's teachings). Further, the access router in QBone modified by the teachings of Surdila and Li result in an access router that receives MPLS label stacks and routes based on those labels, instead of IP addresses (per Surdila's teachings). A person having ordinary skill in the art would have appreciated therefrom that the access router in QBone thereby directs traffic for the flow based only on the routing instructions (the MPLS labels) received from the bandwidth broker.

194. Thus, QBone's marking functions at the access router that are modified so that traffic is handled according to the service (by labels, rather than IP addresses according to the teachings of Surdila), as allocated/provided by the bandwidth broker according to the teachings of Li, teaches "providing, by the controller to the portal, routing instructions for traffic corresponding to the connection so that the traffic is directed by the portal based only on the routing instructions provided by the controller" as recited in the claim.

[1.8] ***wherein the portal does not perform any independent routing on the traffic,***

195. QBone in combination with Surdila and Li teaches that the portal does not perform any independent routing on the traffic.

196. QBone teaches that traffic for a requested QoS from end-to-end should be treated per the request: "[i]t is the responsibility of the service-providing domain (i.e. the receiver of the traffic specified in the SLS) ***to treat the traffic as specified*** in the SLS until those packets leave the domain." ERIC-1017, p. 7 (emphasis added).

197. The access router in QBone is configured by the routing instructions it receives (e.g., the MPLS label stacks Li teaches), and in particular the bandwidth broker sending MPLS label stacks to the edge routers per Li's teachings. As a result, traffic is routed according to the labels inserted (as explained by the teachings of Surdila), instead of according to the IP addresses of the traffic's packets: "***[t]he LERs function as edge routers*** that also insert a specific label in the data packets to identify a specific media flow at the entry to the network, and remove the label upon exiting the network. The Multi-Protocol Label Switching (MPLS) protocol then ***routes packets based on the labels inserted by the LERs rather than the IP addresses***." ERIC-1014, ¶ [0034] (emphasis added).

198. As would have been recognized by one having ordinary skill in the art, Surdila's teaching that the MPLS protocol routes packets based on the labels inserted by the LERs starts with the LERs themselves. Accordingly, the access router in QBone, whose marking functions are set by the bandwidth broker with MPLS labels centrally generated and distributed per Li, routes packets based on the labels according to the marking functions set as taught by Surdila. This is evinced by Li, which teaches that edge routers that receive MPLS label stacks from a centralized controller (such as QBone's bandwidth broker) perform not only MPLS encapsulation on packets, but also "forwarding along the route determined in the label stack." ERIC-1023, p. 22, ¶4.

199. Thus, QBone's access router routing the traffic corresponding to the connection based on the set marking functions and Li's label stacks, instead of IP addresses as in default routing (per Surdila and Li), teaches "wherein the portal does not perform any independent routing on the traffic" as recited in the claim.

[1.9] ***and wherein the connection extending from the originating end-point to the terminating end-point is provided by a dedicated bearer path that includes a required route supported by the portal and dynamically provisioned by the controller,***

200. QBone in combination with Surdila teaches that the connection extending from the originating end-point to the terminating end-point is provided by a dedicated bearer path that includes a required route supported by the portal and dynamically provisioned by the controller.

201. **First**, QBone teaches that the connection is reserved in each domain from the originating to the destination domains that results in a dedicated bearer path. In the originating domain, "[t]he bandwidth broker [in the originating domain] makes a number of decisions … including … ***The route through the domain to the egress router.***" ERIC-1017, p. 13 (emphasis added). In the transit domain, "[t]he bandwidth broker [of the transit domain] … check[s] that there are sufficient resources within the domain to support the flow from the ingress border router and (possibly) ***determine the intra-domain route***." ERIC-1017, p. 14 (emphasis added). This repeats in all the transit domains. "[T]he transit bandwidth broker modifies the RAR as appropriate (e.g. putting its own ID in the sender's ID field and authentication string in the message) and ***sends it to the bandwidth broker of the following domain en route to the destination IP address*** (3)." ERIC-1017, p. 14 (emphasis added).

202. In the destination domain, "[the destination domain bandwidth broker] makes the following decisions: … ***Determine the intra-domain route from the ingress router to the end system*** and decides whether the resources are available to support the flow." ERIC-1017, p. 14 (emphasis added). Accordingly, each domain has a route determined for the flow in response to the RAR from the originating end system which, in aggregate, creates a dedicated bearer path for the flow. This results in an end-to-end connection, which QBone itself states is the purpose. *See* ERIC-1017, p. 4 ("[t]he concept of service ***is end-to-end***"), p. 11 (Phase 1 deals with how to set up reservations end-to-end, "[w]e describe here how the protocol works end-to-end"). QBone's bandwidth broker is thus responsible for the provisioning the end-to-end dedicated bearer path for the connection, including a required route.

203. **Second,** with respect to the required route, QBone teaches that this dedicated bearer path includes a required route: "[t]he bandwidth broker [in the originating domain] makes a number of decisions … including … ***The route through the domain to the egress router.***" ERIC-1017, p. 13 (emphasis added). The route through the originating domain is a required route.

204. QBone further teaches that this required route is supported by the portal (access router of QBone): "[t]his may include ***setting the marking functions for the flow in the access router serving the requesting end system*** (indicated by the green arrows in the figure)." ERIC-1017, p. 15 (emphasis added). The required route determined through the originating domain traverses the access router, which is set to serve the requesting end system. Thus, the determined route is one that is supported by the portal.

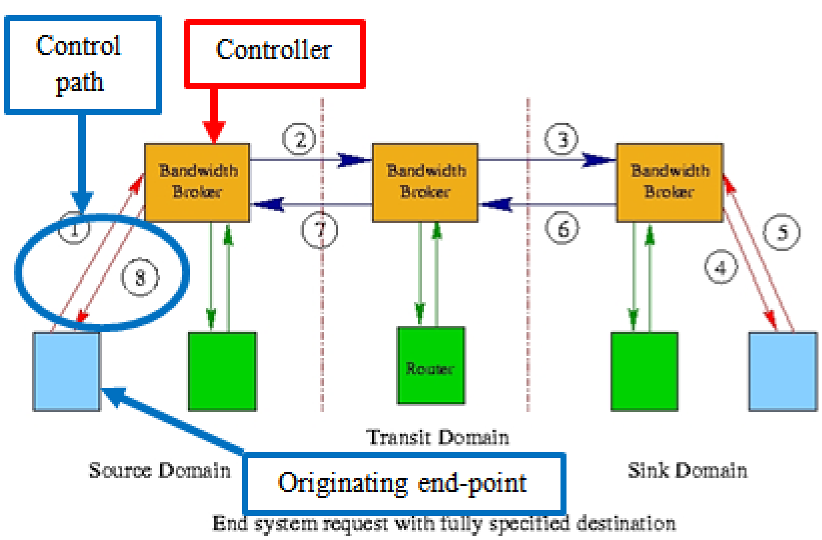
205. **Third**, QBone teaches that the end-to-end connection and/or route is dynamically provisioned by the bandwidth broker: "[a]ctual reservations are accomplished via the protocols described in this document. A reservation represents actually ***committed resources*** but not necessarily used resources. As traffic flows, the resource is ***actually used***." ERIC-1017, p. 8 (emphasis added). "When the bandwidth broker of the originating domain receives the RAA (7) and authenticates it, the bandwidth broker completes any resource allocation actions within the domain." ERIC-1017, p. 15 (and the connection and/or route is taken down in response to a reservation release, p. 20). Accordingly, QBone operates to reserve a dedicated bearer path including a required route for the end-to-end connection in response to a reservation (RAR), which a person of ordinary skill in the art would have appreciated is a dynamic provisioning (as it occurs in QBone in response to a request for a high QoS connection that is not scheduled).

206. Thus, QBone's connection is dynamically provisioned by the bandwidth broker end-to-end with a dedicated bearer path, which includes a required route supported by the edge router, as further expanded upon by Surdila's bearer reservation and binding of resources for a reservation, and thus teaches "and wherein the connection extending from the originating end-point to the terminating end-point is provided by a dedicated bearer path that includes a required route supported by the portal and dynamically provisioned by the controller" as recited in the claim.

[1.10] ***and wherein control paths for the connection are supported only between each of the originating and terminating end-points and the controller and between the portal and the controller.***

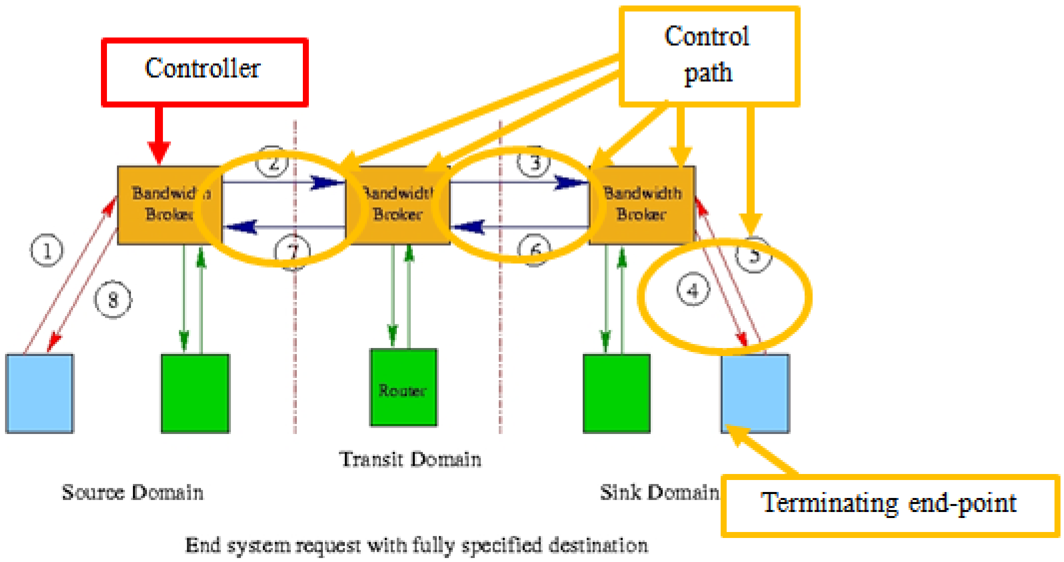
207. QBone teaches control paths for the connection are supported only between each of the originating and terminating end-points and the controller and between the portal and the controller.

208. **First**, QBone teaches the control paths are supported only between the end system (the originating end-point) and the bandwidth broker (the controller) in the originating domain (as shown in the annotated figure below):



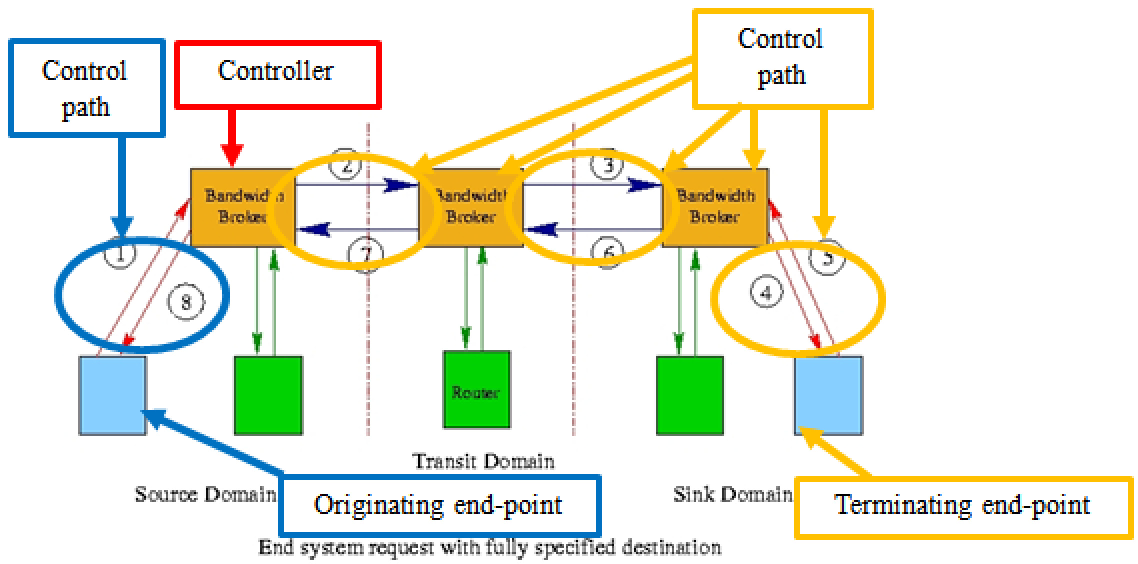
ERIC-1017, p. 13 (modified and annotated).

209. **Second**, QBone teaches the control paths for RAR (2, 3, and 4) and RAA (5, 6, and 7) are supported only between the destination end system and the bandwidth broker in the originating domain, because the bandwidth broker in the originating domain communicates using the RAR and RAA messages with the terminating end-point via one or more intervening bandwidth brokers (i.e., nodes in a multi-domain environment as illustrated in the following annotated figure in QBone):



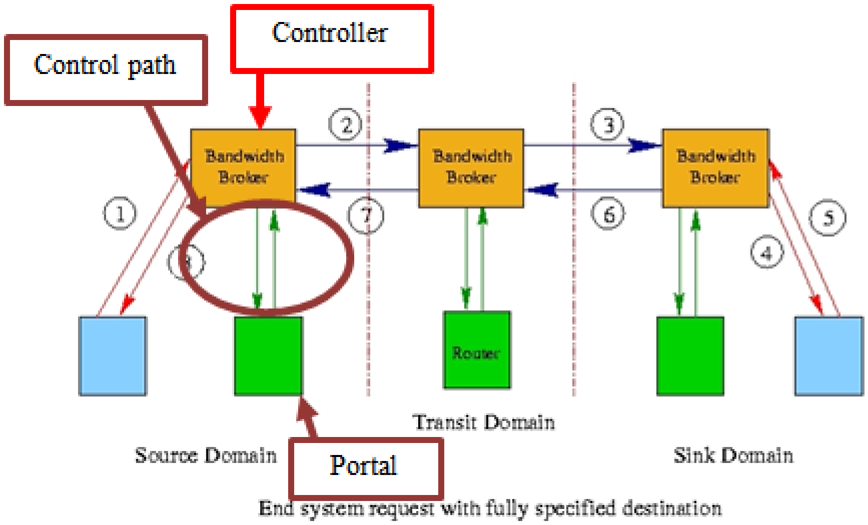
ERIC-1017, p. 13 (modified and annotated).

210. Because QBone teaches that each domain has a bandwidth broker, and the bandwidth broker in each domain receives the RAR forwarded from the preceding domains back to the originating domain (via a control path that is between the originating and destination endpoints and the bandwidth brokers), as well as the RAA from the terminating end-point back to the bandwidth broker in the originating domain, QBone teaches that the control path is supported only between the terminating end-point and the controller (the bandwidth broker in the originating domain). The control paths between each of the originating and terminating end-points and the controller are illustrated together in the following annotated figure:



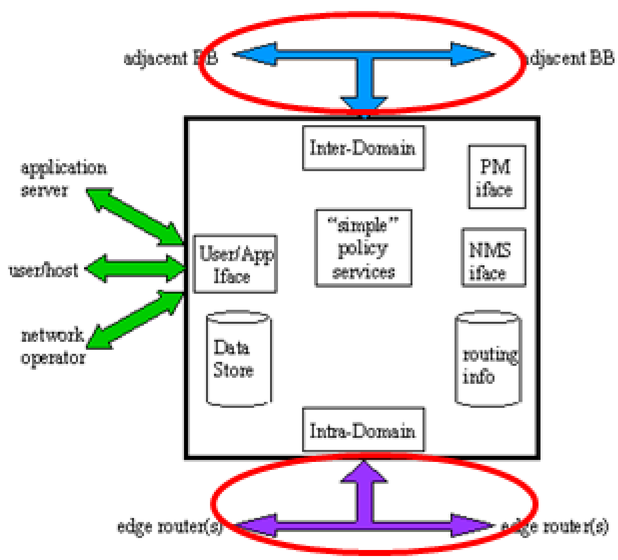
ERIC-1017, p. 13 (modified and annotated).

211. Third, QBone teaches the control path for provisioning the access router from the bandwidth broker in the originating domain is a different control path that is only between the bandwidth broker and the access router:



ERIC-1017, p. 13 (modified and annotated).

212. This is further illustrated in the functional decomposition model, where the inter-domain protocols communicate between "BB"s (bandwidth brokers) and extends to the end systems (because the RAR/RAA signals are propagated from end-to-end), while the intra-domain protocols for provisioning the routers follows a separate control path:



ERIC-1017, p. 9 (modified and annotated).

213. Thus, QBone's separate control paths between end systems and bandwidth brokers, and between routers and bandwidth brokers, teaches "and wherein control paths for the connection are supported only between each of the originating and terminating end-points and the controller and between the portal and the controller" as recited in the claim.

2. <u>Dependent Claim 2</u>

[2.0] ***The method of claim 1***

214. See analysis of claim elements [1.0] through [1.10].

[2.1] ***wherein the controller is associated with a single class of service and wherein a service type of the request identifies the request as being of the single class of service and the request is routed to the controller based on the service type.***

215. QBone in combination with Surdila and Li teaches that the controller is associated with a single class of service and wherein a service type of the request identifies the request as being of the single class of service and the request is routed to the controller based on the service type.

216. **First**, QBone teaches a single class of service, namely "QBone Premium Service." As QBone states, "QBone Premium Service (QPS) … [is] an instance of the Premium Service … [t]he fundamental idea [of QBone] is to provide a service with quantitative, absolute bandwidth assurance. The service may be provided entirely within a domain, from domain-edge to domain-edge (within the same domain) or across a number of domains." ERIC-1017, p. 3. On the other hand, if best effort service is used (another class of service), service requirements such as those for QPS are not required at all (and a request is not routed to the bandwidth broker). *Id.* at p. 4. Thus, QPS is a single class of service.

217. Second, QPS is managed by QBone's bandwidth broker. QBone teaches that "the initial phases of the BB [bandwidth broker] work concentrate on QPS" as a service it handles. ERIC-1017, p. 3. Accordingly, QBone teaches that a RAR, when requesting QPS, is "defined by the tuple: {source, dest, route, startTime, endTime, peakRate, MTU, jitter}." ERIC-1017, p. 24. As a result, the bandwidth broker would have been understood by a person having ordinary skill in the art to be "associated" with the single class of service.

218. Third, QBone modified by the teachings of Surdila teaches that the request includes a service type (identified as the "QoS Assured SDP" in Surdila): "At step 62, End User (UE-A) 11 sends an Invite message to the Originating P-CSCF-O 44 and includes the A-Name, B-Name, ***and Proposed Session Description (SDP)(QoS Assured)***." ERIC-1014, ¶ [0062] (emphasis added). In particular, Surdila teaches that the originating end user UE-A requests the service by the "QoS Assured" parameter for a particular session: "[g]uaranteed end-to-end QoS ***is requested for the session, as indicated by the QoS Assured parameter in the SDP***." ERIC-1014, ¶ [0062] (emphasis added).

219. This is consistent with how "service type" is used in the '119 specification. For example, the '119 Patent states: "[i]nstead of trying to introduce a new class of service type for each additional high quality service and content provider at the access edge (See FIG. 6), one class of service type is introduced to cover all high quality services (See FIG. 7). Then ***all traffic requesting this service type*** is routed to an access Controller 712 and 714 Portal for handling." ERIC-1001, 5:35-41 (emphasis added). Per the '119 Patent, the Controller 712 is associated with a service type, and if traffic requests the service type it is routed to the Controller 712. Similarly, QBone teaches that the service with quantitative, absolute bandwidth assurance is requested by end systems, and Surdila teaches that the request is identified by a QoS Assured SDP.

220. **Fourth**, QBone teaches that connection requests (for the QoS service) are routed to the controller based on the service type: "[t]he end system sends an RAR to the bandwidth broker (1) [in the originating domain]." ERIC-1017, p. 13. Surdila further teaches that a request is routed to the bandwidth broker because of the QoS Assured request for the particular service type: "[a]t step 62, End User (UE-A) 11 ***sends an Invite message to the Originating P-CSCF-O 44*** and includes the A-Name, B-Name, ***and Proposed Session Description (SDP)(QoS Assured)***." ERIC-1014, ¶ [0062]. Thus, if the end system of QBone includes the QoS Assured SDP according to the teachings of Surdila (as part of its RAR), it is routed to the bandwidth broker in QBone.

221. On the other hand, QBone teaches that if best-effort service is to be used, nothing is requested of the bandwidth broker: "[o]ne can expect in general that stricter service requires more specification (as in QPS) whereas a service with fewer guarantees requires much less specification (***or none, e.g. Best-effort***)." ERIC-1017, p. 4 (emphasis added). As would have been recognized by a person having ordinary skill in the art from the teachings of QBone, if a quality of service connection is not requested in the system taught by QBone, a request would not be routed to the bandwidth broker.

222. Thus, QBone's association of the bandwidth broker with the quality of service, in combination with Surdila's teachings of the QoS (Assured) SDP in requests, resulting in routing to a bandwidth broker, and that results in a reserved connection assuring the QoS from end to end, teaches "wherein the controller is associated with a single class of service and wherein a service type of the request identifies the request as being of the single class of service and the request is routed to the controller based on the service type" as recited in the claim.

3. <u>Dependent Claim 3</u>

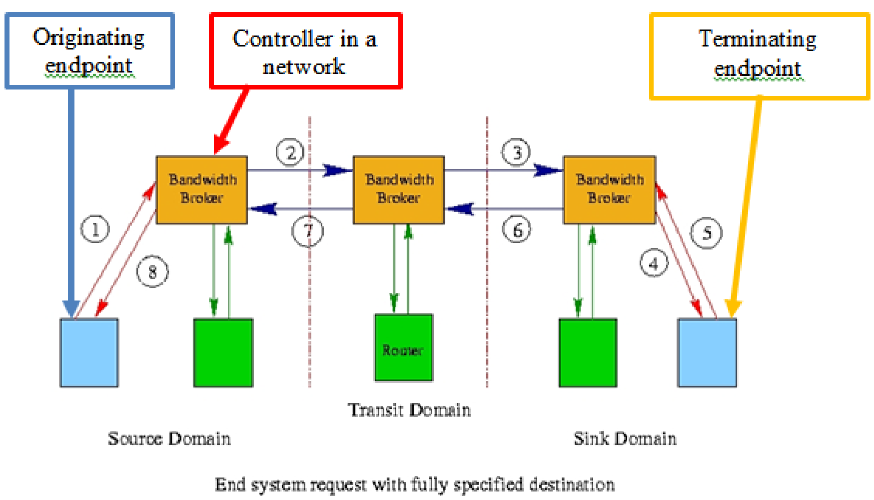
[3.0] ***The method of claim 1***

223. See analysis of claim elements [1.0] through [1.10].

[3.1] ***wherein the request is received by the controller based on signaling from a user to the controller.***

224. QBone in combination with Surdila and Li teaches that the request is received by the controller based on signaling from a user to the controller.

225. **First**, QBone teaches that the request is received at the bandwidth broker from a user via the end-system which may be "manual (e.g. via a web interface)". ERIC-1017, p. 9. QBone's "end system" that initiates a request for service is an "originating end-point": "***[a]n end system initiates a request for service*** with a fully-specified destination address (e.g. /32 for IPv4). The request is thus for service to ***another end system***." ERIC-1017, p. 12 (emphasis added). This is illustrated in the annotated figure from QBone reproduced below:



ERIC-1017, p. 13 (modified and annotated).

226. According to QBone, "***[t]he end system sends an RAR to the bandwidth broker (1)***: This message includes a globally well-known service ID and an IP destination IP address, a source IP address, an authentication field, times for which the service is requested and the other parameters of the service." ERIC-

1017, p. 13 (emphasis added).

227. **Second**, QBone teaches that the request is based on signaling from the user (e.g., via the web interface) to the controller: "***[t]he end system sends an RAR to the bandwidth broker (1)***". ERIC-1017, p. 13. The user initiated RAR is a form of signaling from the end system to the bandwidth broker in the source domain.

228. Thus, a user's activation of QBone's end system that sends the RAR to the bandwidth broker teaches "wherein the request is received by the controller based on signaling from a user to the controller" as recited in the claim.

4. Dependent Claim 4

[4.0] ***The method of claim 3***

229. See analysis of claim elements [1.0] through [1.10] and claim elements [3.0] – [3.1].

[4.1] ***wherein the request is received from the user via one of a directory request, an Internet Protocol address, and a web page.***

230. QBone in combination with Surdila and Li teaches that the request is received from the user via one of a directory request, an Internet Protocol address, and a web page.

231. QBone teaches that a user's RAR reaches the bandwidth broker via a web page: "[t]his is ***an interface provided for resource allocation requests*** from within the bandwidth broker's domain. ***These requests may be manual*** (e.g. ***via a web interface***) or they may consist of messages from one or another setup protocol (for example RSVP messages).” ERIC-1017, p. 9 (emphasis added). Such “manual” requests via a web interface constitute an example of “a web page” as recited.

232. Thus, QBone’s end-system using a manual request via web interface teaches “wherein the request is received from the user via one of a directory request, an Internet Protocol address, and a web page” as recited in the claim.

5. <u>Dependent Claim 5</u>

[5.0] ***The method of claim 1 further comprising:***

233. See analysis of claim elements [1.0] through [1.10].

[5.1] ***identifying, by the controller, billing information of a user corresponding to the request for a high quality of service connection; and***

234. QBone in combination with Surdila and Li teaches identifying, by the controller, billing information of a user corresponding to the request for a high quality of service connection.

235. **First**, QBone teaches that the use of resources is monitored: “[a] reservation represents actually committed resources but not necessarily used resources. ***As traffic flows, the resource is actually used. How much can be used depends on the type of reservation of course. Every bandwidth broker must, therefore, track***: … ***the set of established reservations consuming resources*** in its domain and the availability of all reservable resources in its domain. … ***The***

reservations are tracked by the bandwidth broker and (shared with) the network management system. ***The actual resource use is tracked by the routers themselves and (possibly) monitored by the bandwidth broker***." ERIC-1017, p. 8 (emphasis added). The resources monitored constitute "billing information."

236. **Second**, QBone teaches that the resource use monitoring will be per user: "Data Repository … This repository contains common information for all the bandwidth broker components. The repository includes some or all of the following information and may be shared with other network components such as policy control and network management. … [including] Authorization and authentication databases (***for users*** and peers)." ERIC-1017, p. 10 (emphasis added). "Resource Allocation Request (RAR) … A RAR refers to a request for network resources (or service) ***from an individual user to the BB of that user's domain***." ERIC-1017, p. 27 (emphasis added).

237. Moreover, QBone teaches that a requested QPS is also referred to as a "Virtual Leased Line." ERIC-1017, p. 27. The designation of a leased line suggests to a person having ordinary skill in the art that, as was common practice in the industry, a customer would be billed for the leased line. A person having ordinary skill in the art would have also been motivated to use the monitoring information to bill for requested service, such as the QPS as a matter of ordinary design choice, commercial and/or market forces, and common sense.

238. Third, it would have been obvious to one having ordinary skill in the art that "the actual resource use" monitored in QBone is a type of "billing information" because it is a basis of bills that are generated and sent to users.

239. For example, this is further shown in Surdila. Surdila teaches with respect to reserved resources that a "[w]hen a customer wants to reserve some resources it has to send an RAR to the BB of the transit domain, and it will be charged only for the time the reservation is active." ERIC-1014, ¶ [0078]. Surdila teaches a clearinghouse used for accounting, among other things: "[t]he MPS-O also interfaces with a Clearing House 46 using the Open Systems Protocol (OSP). ***The Clearing House performs the functions*** of an IETF Authorization, Authentication, and ***Accounting*** (AAA) server." ERIC-1014, ¶ [0040] (emphasis added). It would have been further obvious to one having ordinary skill in the art to incorporate the clearinghouse, or at the least its functionality, into the bandwidth broker.

240. As Surdila already teaches, it was possible to incorporate multiple different capabilities/functions, in Surdila into the multimedia control server including the bandwidth broker as from QBone: "***the combination of the BB-O 42, the MPS-O 43, and the P-CSCF-O 44 form a functional entity known as a Multimedia Control Server (MMCS) 45***." ERIC-1014, ¶ [0041] (emphasis added). Incorporating the teachings of the clearinghouse into the bandwidth broker would have been nothing more than the combination of known elements (the clearinghouse server and the bandwidth broker), according to known methods, to achieve a predictable result. Surdila already contemplated collecting different functions with appropriate protocols to interface with each other in a server entity, such as QBone's bandwidth broker. Adding the clearinghouse is merely the addition of another function.

241. Thus, QBone's tracking of actual use of reserved resources, which are reserved for individual users, in combination with Surdila's expanding on how the tracked information may be used in accounting, teaches "identifying, by the controller, billing information of a user corresponding to the request for a high quality of service connection" as recited in the claim.

[5.2] ***charging the user for the connection.***

242. QBone in combination with Surdila and Li teaches charging the user for the connection.

243. According to Surdila, "[w]hen ***the customer*** wants to reserve some resources it has to send an RAR to the BB of the transit domain, and ***it will be charged only for the time the reservation is active***." ERIC-1014, ¶ [0078] (emphasis added). Accordingly, as noted with respect to claim element [5.1], QBone teaches the monitoring of resource use, and likewise Surdila teaches that a customer (a user) will be charged only for the time the reservation is active.

244. It would have been obvious to one having ordinary skill in the art that, based on Surdila's teaching that the customer "will be charged," charging for the use (of the requested connection) occurs to compensate the network provider for the communication service utilized. A POSITA would have been motivated to use tracking information for such charges for quality assured connections as a matter of ordinary design choice, commercial and/or market forces, and common sense, since this was a well-known concept.

245. Thus, QBone's tracking of use in combination with Surdila's tracking and charging for that use teaches "charging the user for the connection" as recited in the claim.

6. Dependent Claim 6

[6.0] ***The method of claim 5***

246. See analysis of claim elements [1.0] through [1.10] and claim elements [5.0] – [5.2].

[6.1] ***wherein the charging may be based on at least one of a service type, an elapsed period of time, a codec type, and an amount of bandwidth used.***

247. QBone in combination with Surdila and Li teaches wherein the charging may be based on at least one of a service type, an elapsed period of time, a codec type, and an amount of bandwidth used.

248. Surdila teaches charging based on a time period the connection was active or for an amount of bandwidth used: "[w]hen ***the customer*** wants to reserve some resources it has to send an RAR to the BB of the transit domain, and ***it will be charged only for the time the reservation is active***." ERIC-1014, ¶ [0078] (emphasis added). The reservation can include a requested service type (i.e., QoS assured parameter), codec and amount of bandwidth. *See* ERIC-1014, ¶¶ [0062],[0065]; ERIC-1017, p. 24.

249. Further, QBone teaches that the resources actually used are tracked, which in combination with Surdila's teachings with respect to a clearinghouse result in accounting, and charging, for resources used including bandwidth as well as time. For example: "[t]he final parameter of both message types, the Service Parameterization Object (SPO), merits further discussion. This parameter is intended to be a service-specific specification of requested or learned service parameters. Depending on the service in question, this may be a simple parameter (e.g. ***bits-per-second of bandwidth***)." ERIC-1017, p. 24 (emphasis added).

250. Thus, because QBone in combination with Surdila teaches charging only for the time the reservation is active, as well as tracking other resources such as bandwidth, the combination teaches "wherein the charging may be based on at least one of a service type, an elapsed period of time, a codec type, and an amount of bandwidth used" as recited in the claim.

7. <u>Dependent Claim 7</u>

[7.0] ***The method of claim 1***

251. See analysis of claim elements [1.0] through [1.10].

[7.1] ***wherein determining whether the originating end-point is authorized is based on information in a subscriber database.***

252. QBone in combination with Surdila and Li teaches that the determining whether the originating end-point is authorized is based on information in a subscriber database.

253. QBone teaches: "Data Repository … This repository contains common information for all the bandwidth broker components. The repository includes some or all of the following information and may be shared with other network components such as policy control and network management. ... [including] ***Policy information*** … [and] ***Authorization and authentication databases (for users and peers)***." ERIC-1017, p. 10 (emphasis added).

254. The "authorization and authentication databases" in QBone are examples of "a subscriber database" – they are used for determining "whether the requester [originating end-point] is authorized for this service," which as noted above with respect to claim element [1.2] relies upon a RAR (request) that identifies a requested amount of bandwidth or a codec. ERIC-1017, p. 13.

255. Thus, QBone's authorization and authentication databases, for users and peers and used to determine whether the requester is authorized for the requested service, teaches "wherein determining whether the originating end-point is authorized is based on information in a subscriber database" as recited in the claim.

8. Dependent Claim 8

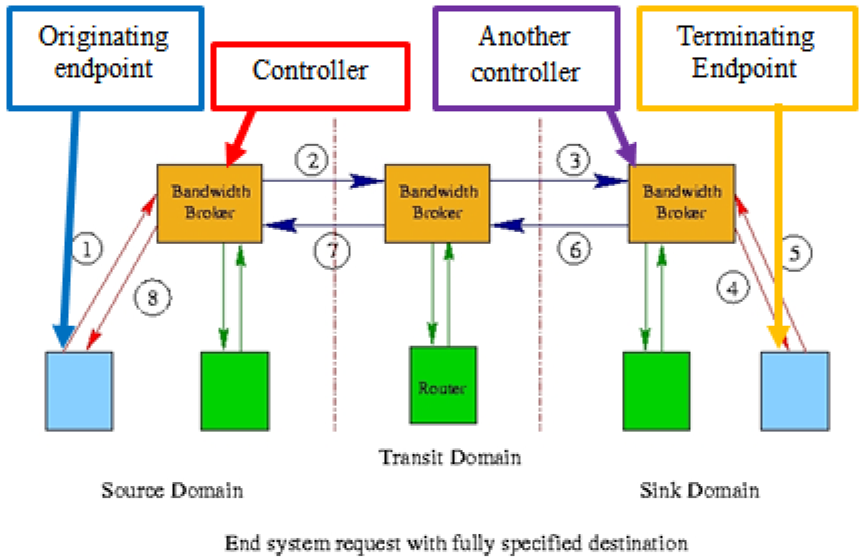
[8.0] ***The method of claim 1***

256. See analysis of claim elements [1.0] through [1.10].

[8.1] ***wherein the negotiating, by the controller, to reserve far-end resources on the terminating end-point includes negotiating with another controller associated with the terminating end-point.***

257. QBone in combination with Surdila and Li teaches that the negotiating, by the controller, to reserve far-end resources on the terminating end-point includes negotiating with another controller associated with the terminating end-point.

258. **First**, QBone teaches negotiating of a first controller with another controller. QBone teaches that the negotiation occurs in each domain from the originating to the destination domains. In the <u>destination domain</u>, "on the reception of the RAR (3) [that was sent by the prior bandwidth broker, starting with the originating domain's bandwidth broker], [the destination domain bandwidth broker] makes the following decisions: … ***Determine the intra-domain route from the ingress router to the end system*** and decides whether the resources are available to support the flow." ERIC-1017, p. 14 (emphasis added). This is illustrated in the annotated figure from QBone:



ERIC-1017, p. 13 (modified and annotated).

259. Accordingly, the bandwidth broker of the originating domain negotiates with the bandwidth broker in the destination domain.

260. **Second**, QBone teaches that the second controller is associated with the terminating end-point. *See* ERIC-1017, p. 14 (the destination bandwidth broker determining a route to the destination end system).

261. Thus, QBone's bandwidth broker in the originating domain that negotiates the RAR and RAA with the bandwidth broker in the destination domain that is associated with the end system in the destination domain teaches "wherein the negotiating, by the controller, to reserve far-end resources on the terminating end-point includes negotiating with another controller associated with the terminating end-point" as recited in the claim.

9. Dependent Claim 11

[11.0] ***The method of claim 1***

262. See analysis of claim elements [1.0] through [1.10].

[11.1] ***wherein the connection is a point-to-point connection between only the originating and terminating end-points.***

263. QBone in combination with Surdila and Li teaches that the connection is a point-to-point connection between only the originating and terminating end-points. A person having ordinary skill in the art would have understood the term "point-to-point connection" to be a connection between a single originating end-point and a single terminating end-point, as compared to the "point-to-multipoint connection" set forth in claim 12.

264. QBone teaches that the bandwidth broker determines "[t]he route through the domain to the egress router." ERIC-1017, p. 13. Each transit domain similarly has a bandwidth broker that determines "the intra-domain route." ERIC-1017, p. 14. At the destination domain, the bandwidth broker of the destination domain also determines "the intra-domain route from the ingress router to the end system." ERIC-1017, p. 14. Thus, through each domain a specific "intra-domain route" is determined for the flow. A person having ordinary skill in the art would have recognized that this route through each domain would be a point-to-point connection between the originating and destination end systems.

265. QBone further teaches establishing a tunnel between the endpoints in the origin and destination domains: "[i]n this section, we handle the setup of a pipe between an origin domain and a destination domain." ERIC-1017, p. 15. "The bandwidth broker in the origin domain creates an RAR which includes the IP prefix of the destination domain along with the normal information required in an RAR (where, extent, when) and an indication that a core tunnel is being requested. This RAR is sent to the ban[d]width broker in the next domain (1) in the path on the way to the destination domain." ERIC-1017, p. 17. "On receiving the RAA for its request (8), the origin bandwidth broker authenticates the RAA and checks the information in it to see whether the request was accepted or not. If the RAR was accepted, the bandwidth broker stores the voucher created in the penultimate domain in the path." ERIC-1017, p. 18.

266. Accordingly, as QBone teaches, a tunnel is established between the originating end point and the terminating end point through the domains therebetween.

267. Thus, QBone's intra-domain routes that are determined through each domain between originating and destination end systems, as well as the establishing of a tunnel between end-points, teaches "wherein the connection is a point-to-point connection between only the originating and terminating end-points" as recited in the claim.

IX. Claims 10 and 13-15 are unpatentable over 35 U.S.C. § 103 over QBone in view of Surdila and Li, further in view of Requena.

268. It is my opinion that QBone in view of Surdila and Li, further in view of Requena, renders obvious at least claims 10 and 13-15 of the ’119 patent.

A. Overview of Requena

269. Requena teaches the negotiation of the codec to be used for a SIP session between two endpoints. *See* ERIC-1018, ¶ [0007]. Requena teaches that a “SIP INVITE message” is sent from a first endpoint (“UE1” in Requena). ERIC-1018, ¶ [0059]. The SIP INVITE message, according to Requena, has multiple header fields and a message body. ERIC-1018, ¶ [0008]. Requena teaches the message body being an “SDP body … [that] contains a list (set) of codecs that the UE1 is able and willing to support for the session.” ERIC-1018, ¶ [0009]. Requena teaches that negotiation results in the destination endpoint (“UE2” in Requena) also identifying “the codecs that the UE2 is able and willing to support for the session.” ERIC-1018, ¶ [0009].

270. Requena teaches that the SIP INVITE messaging results in identifying “which of the codecs both the UE1 and all the network entities support” for a session. ERIC-1018, ¶ [0103]. The identification of codecs that each supports results in using a codec for the session “for both directions that is from UE1 to UE2 and vice versa.” ERIC-1018, ¶ [0114]. Requena teaches that its applicability is for video or audio data streams. ERIC-1018, ¶ [0007] (discussing codecs for audio streams and video streams).

B. Reasons to Combine QBone, Surdila, Li, and Requena

271. It is my opinion that one of ordinary skill in the art would have been motivated to combine the teachings of QBone, Surdila, and Li, with the teachings of Requena for the reasons set forth below.

272. First, Surdila teaches the use of SIP messaging to communicate: "[i]n the illustrated configuration, a first Session Initiation Protocol (SIP) phone 11 is conducting a multimedia session with a second SIP phone 12." ERIC-1014, ¶ [0034]. As part of that SIP messaging, Surdila contemplates that codecs are agreed upon between the endpoints: "[a]t 83, the UE-B 12 sends a SIP 183 response message to the Terminating P-CSCF-S with an indication that the Session Description (SD) is agreed upon." ERIC-1014, ¶ [0064].

273. Surdila further states what that agreement includes: "[a] QoS Reservation Success message 89 is then sent from the BB-S to the Terminating P-CSCF-S 51. The Terminating P-CSCF-S then forwards the SIP 183 response message 91 to the S-CSCF-B 77 ***with the Agreed SDP and codecs***." ERIC-1014, ¶ [0065] (emphasis added).

274. Surdila does not explicitly describe mechanics regarding how the endpoints reach agreement on codecs, and how the codecs are then used in operation after a session is established. It was well-known at the earliest priority date of the '119 Patent that SIP negotiation involving codecs would have included agreeing upon a common codec (or codecs) where included, and further that the same codec would have been used across the connection. A person having ordinary skill in the art would therefore have been motivated to look at the well-known techniques for codec negotiation and use in the context of the bandwidth broker negotiation of QBone, of which Requena is an example.

275. Requena provides details on how to arrive upon one or more agreed codecs between endpoints in a SIP environment. Requena teaches that "[t]he UE1 generates the SDP body in such a way that ***it contains a list (set) of codecs that the UE1 is able and willing to support*** for the session." ERIC-1018, ¶ [0009] (emphasis added). According to Requena, this is sent in a SIP message to the other endpoint. The other endpoint determines from the SIP message what codecs the originating endpoint supports and replies based on what codecs the terminating endpoint is willing to support. ERIC-1018, ¶¶ [0103]-[0104]. "The UE2 responds to the UE1 by generating and sending a reply message, also containing an SDP body, to the UE1. The reply message is referred to in the SIP protocol as the '183 message'. The SDP body of ***the reply message contains a second list of codecs indicating the codecs that the UE2 is able and willing to support for the session***." ERIC-1018, ¶ [0009] (emphasis added).

276. Further, Requena explains that "[i]n the preferred embodiment of the invention, described in the foregoing, it is assumed that the AMR [a particular codec] bit rate which is actually used for transmission ***is the same for both directions that is from UE1 to UE2 and vice versa***." ERIC-1018, ¶ [0114] (emphasis added). Using the teachings of Requena with the process in Surdila provides the advantage of not only whether network elements between endpoints can support a bandwidth usage of a given codec (ERIC-1018, ¶ [0011]), but also of supporting the indication of a particular bit rate for codecs that support multiple bit rates. ERIC-1018, ¶ [0021]. Further, a person having ordinary skill in the art would have been motivated to make the combination for other advantages, including reduction of computational overhead with a common codec, reduction of end-to-end latency due at least to the computational overhead reduction, and/or adding route flexibility to bypass any nodes that would have otherwise been responsible for codec conversion.

277. Implementing the teachings of Requena into the SIP messaging of Surdila, and particularly the bandwidth broker framework of QBone, would have been well within the skill of a person having ordinary skill in the art. Surdila already relied upon SIP messaging to facilitate its operations, and Requena merely provides additional teachings regarding that SIP messaging, by and with the bandwidth broker according to QBone and Surdila, with respect to the codecs specifically. Such a combination would yield the predictable result of the endpoints reaching agreed codecs, via the bandwidth broker as in QBone and Surdila, by the negotiation teachings in Requena that result in the same codec usage across the connection in Requena.

1. Dependent Claim 10

[10.0] ***The method of claim 1***

278. See analysis of claim elements [1.0] through [1.10].

[10.1] ***wherein the negotiating, by the controller, to reserve far-end resources for the terminating end-point includes negotiating a video codec for use with the connection to avoid video codec conversion between the originating and terminating end-points.***

279. QBone in combination with Surdila and Li teaches that the negotiating, by the controller, to reserve far-end resources for the terminating end-point includes negotiating a video codec for use with the connection to avoid video code conversion between the originating and terminating end-points.

280. **First**, QBone in combination with Surdila teaches negotiation by the bandwidth broker with other entities at the terminating side, *see* [1.6], as well as that the information in the request that is part of the negotiating includes forwarding a SIP message that includes codec parameters, as discussed above with respect to the analysis of claim element [1.2].

281. As would have been recognized by one having ordinary skill in the art, the SIP message with codecs taught by Surdila included a list of codecs. Surdila teaches this by describing the SIP response message as including "the Agreed SDP and codecs [plural]." ERIC-1014, ¶ [0065]. Accordingly, Surdila expressly teaches to a POSITA that the originating end-point provides a list of potential codecs it supports and the terminating end-point responds with a list of agreed codecs. A POSITA would understand this message exchange to be a negotiation to agree on a common codec that both end-points can use to avoid the need for codec conversion. Further, such would have been well known and obvious to a person having ordinary skill in the art. For example, Requena teaches agreeing on common codecs and using the same one between endpoints.

282. According to Requena, both the original SIP message from the originating end-point and the SIP response message from the terminating end-point usually include a list of codecs that each supports: "[t]he UE1 generates the SDP body in such a way that ***it contains a list (set) of codecs that the UE1 is able and willing to support*** for the session. The UE1 sends the SIP INVITE message to the UE2. When the SIP INVITE message arrives at the UE2, the UE2 responds to the UE1 by generating and sending a reply message, also containing an SDP body, to the UE1. The reply message is referred to in the SIP protocol as the '183 message'. The SDP body of ***the reply message contains a second list of codecs indicating the codecs that the UE2 is able and willing to support for the session***." ERIC-1018, ¶ [0009] (emphasis added).

283. **Second**, Surdila teaches that the originating and terminating end-points arrive at agreed-upon codecs as a result of the negotiation: "[a] QoS

Reservation Success message 89 is then sent from the BB-S to the Terminating P-CSCF-S 51. The Terminating P-CSCF-S then forwards ***the SIP 183 response message 91*** to the S-CSCF-B 77 ***with the Agreed SDP and codecs***. … The Originating P-CSCF-O then sends a QoS Reservation Request message 95 to the BB in the originating network (BB-O) 42 with the Agreed SDP and the Binding Information." ERIC-1014, ¶ [0065] (emphasis added).

284. Third, it would have been obvious to one having ordinary skill in the art, reading Surdila's statement of the "agreed … codecs," that this would include the possibility of the same codec for both originating and terminating end-points, to thereby avoid requiring codec conversions. Requena teaches that using the same codecs to avoid conversion was well known: "From the content of the SDP (that is from the m-line and the a-line) of the received SIP INVITE message ***it is directly derivable which of the codecs both the UE1 and all the network entities support*** for the (audio) session. … The reply message is generated based on the content of the received SIP INVITE message and ***based on the UE2's ability and willingness to support codecs*** and AMR modes." ERIC-1018, ¶¶ [0103]-[0104] (emphasis added).

285. Fourth, the "agreed … codecs" taught in Surdila would be an agreed codec that each supports, and which would be (in at least some examples) the same at each end-point such that no codec conversion would be required between end-points. This is explicitly taught in Requena, which states: "[i]n the preferred embodiment of the invention, described in the foregoing, it is assumed that the AMR [a particular codec] bit rate which is actually used for transmission ***is the same for both directions that is from UE1 to UE2 and vice versa***." ERIC-1018, ¶ [0114] (emphasis added).

286. Accordingly, a person having ordinary skill in the art would have been motivated to modify the bandwidth broker of QBone, according to the teachings of Surdila regarding SIP negotiation involving the bandwidth broker with the terminating end-point, to include the teachings of Requena with respect to codec negotiation. QBone teaches that the bandwidth broker negotiates resources along the path to the destination end-point, including with the destination end-point. The codecs in use are an example of a type of resource that the bandwidth broker would negotiate, so that the codecs are agreed upon end-to-end as taught by Surdila. Involving the BB in the negotiation would have been obvious to ensure that the negotiated codec is authorized, and to ensure users are billed appropriately for their codec use.

287. **Fifth**, Surdila teaches that the codecs include video codecs. Surdila teaches that uses of its E2E QoS assurances may include video applications, including video and video calls. ERIC-1014, ¶¶ [0006]-[0007]. It would have been obvious to a person having ordinary skill in the art that Surdila's video or video calls would both have video codecs to support their operation. This is further taught by Requena: "[w]hen the UE1 initiates a session with the UE2, ***the codec to be used for the session is to be determined (negotiated)***. If the session is going to be a multimedia session that is the session is going to be established with more than one media stream (***for example*** an audio stream and ***a video stream***) codecs to be used with each of the streams are to be negotiated." ERIC-1018, ¶ [0007] (emphasis added).

288. For the reasons to combine Requena with QBone, Surdila, and Li, please see Section VIII.E above.

289. Thus, Surdila's SIP messages that include agreed codecs using QBone's bandwidth brokers, which as would have been recognized by a person having ordinary skill in the art would include selecting the same codec for each end-point to avoid codec conversion requirements along the path (as taught by Requena), teaches "wherein the negotiating, by the controller, to reserve far-end resources for the terminating end-point includes negotiating a video codec for use with the connection to avoid video codec conversion between the originating and terminating end-points" as recited in the claim.

2. <u>Independent Claim 13</u>

[13.0] ***A method for providing bandwidth on demand comprising:***

290. See analysis of claim element [1.0].

[13.1] ***receiving, by a controller positioned in a network, a request for a high quality of service connection between an originating end-point and a terminating end-point,***

291. See analysis of claim element [1.1].

[13.2] ***wherein the request includes at least one of a requested amount of bandwidth and a video codec;***

292. See analysis of claim element [1.2].

[13.3] ***determining, by the controller, whether the originating end-point is authorized to use the requested amount of bandwidth or the video codec;***

293. See analysis of claim element [1.3].

[13.4] ***communicating, by the controller, with the originating and terminating end-points to ensure that the connection is free from video codec conversion;***

294. See analysis of claim element [10.1].

295. In particular, QBone, Surdila, and Li in combination with Requena teaches negotiating a video codec between end-points as discussed in [10.1]. Because Surdila teaches negotiating a video codec between endpoints via the bandwidth broker of QBone, Surdila (as combined with the bandwidth broker architecture of QBone and teachings of Requena) therefore also teaches that the bandwidth broker of QBone as modified with the teachings of Surdila and Requena communicates with the originating and terminating end-points. This is because "negotiating" as shown in [10.1] is a form of "communicating" per [13.4].

[13.5] ***directing, by the controller, one of a plurality of portals that is positioned in the network nearest to the originating end-point and***

> ***physically separate from the controller to allocate local port resources of the portal for the connection; and***

296. See analysis of claim element [1.5], which shows directing, by the controller, a portal that is positioned in the network and that is physically separate from the controller.

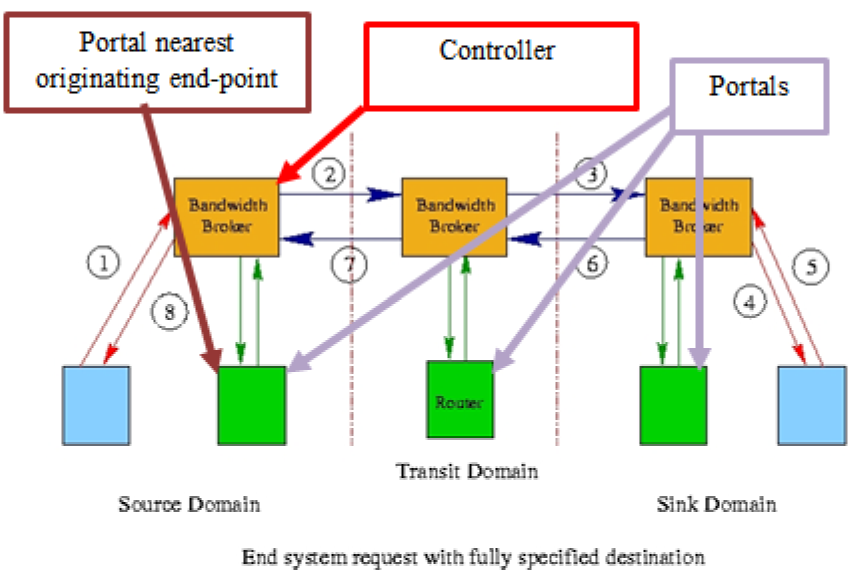
297. QBone in combination with Surdila and Li also teaches directing, by the controller, one of a plurality of portals that is positioned in the network nearest to the originating end-point and physically separate from the controller to allocate local port resources for the connection.

298. **First**, QBone teaches multiple routers and that the one nearest the originating end-point receives the allocation direction from the controller. The multiple routers include at least an ingress router (also called an access router in QBone) and an egress router: "[s]o, the scope of the SLS is ***through the domain, from ingress point to egress point*** or destination (if traffic sink is within the domain)." ERIC-1017, p. 7 (emphasis added). "This is possible because the SLSs stretch ***from ingress router to egress router(s) of a domain***." ERIC-1017, p. 10 (emphasis added).

299. The access router in QBone is an ingress router in the originating domain that is the one nearest the originating end-point: "[t]his field is replaced in the message by each sending bandwidth broker. ***When sent by an end-system, this field contains the IP address of the access router interface through which the***

flow will pass (for example, the default router) en route to the destination." ERIC-1017, p. 22 (emphasis added).

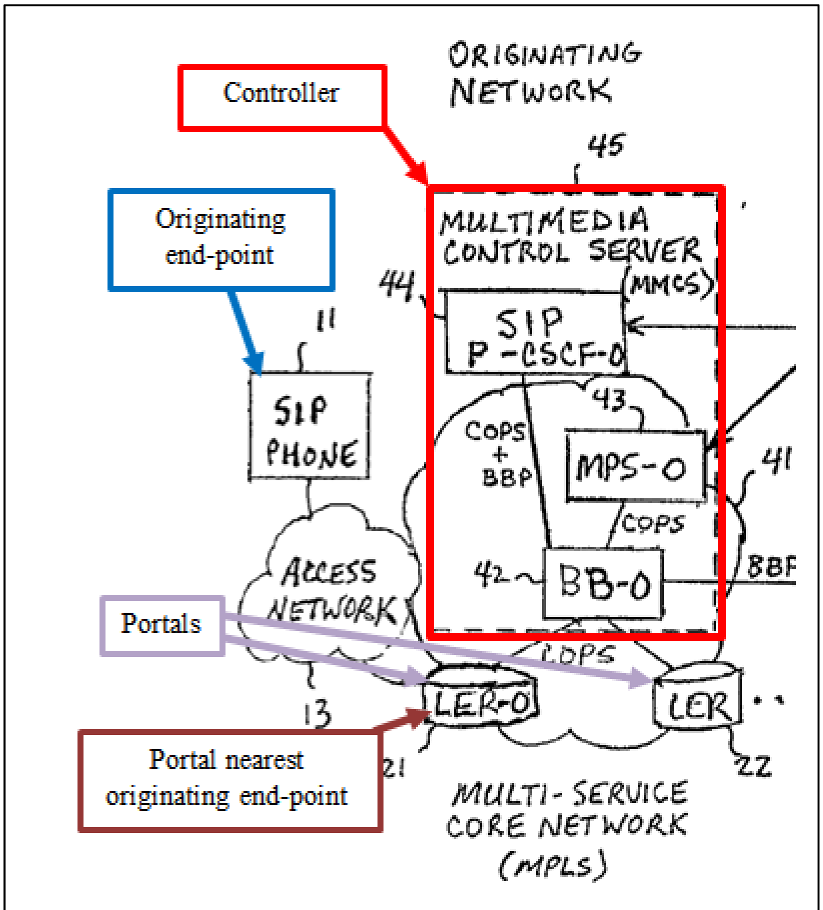
300. It is the access router that QBone teaches receives direction to set the marking functions: "the bandwidth broker completes any resource allocation actions within the domain, modifies PHB and traffic conditioner parameters at the egress router for the flow and forwards the RAA to the requesting end system (8). ***This may include setting the marking functions for the flow in the access router serving the requesting end system (indicated by the green arrows in the figure)***." ERIC-1017, p. 15 (emphasis added). This is further illustrated below:



ERIC-1017, p. 13 (modified and annotated).

301. In addition, Surdila further supports the teaching that the controller directs a portal from among a plurality of portals to allocate local port resources:

"[m]oreover, the BB of the multi-service core network needs to install policies ***only in the ingress LERs 21*** and 25 (the point of entrance of the access network traffic)." ERIC-1014, ¶ [0036] (emphasis added). "Thus, at 184 and 185, ***BB-O 42 sends COPS DEC messages to the ingress LER-O 21*** and the egress Rout-O 22." ERIC-1014, ¶ [0081] (emphasis added). This is illustrated in an annotated portion of FIG. 6 reproduced below:



Surdila, FIG. 6 (a section thereof, annotated).

ERIC-1014, FIG. 6 (an annotated portion thereof).

302. As would have been well-known by a person having ordinary skill in the art, the determination of a router that is "nearest" was based on cost metrics, which includes number of hops or physical distance as just two exemplary parameters. Under either example cost metric, the access router taught by QBone or the LER-O taught by Surdila would qualify as a "nearest" router according to a given network configuration. QBone uses this known fact regarding the cost metric in its description of the access router's interaction with the originating end system.

303. As a result of the setting of marking functions in QBone in the access router that is a portal nearest the originating end-point, and the policy instructions and binding information in Surdila, the port resources of the router is allocated for the requested QoS connection, as further evinced by the teachings of Lee (that routers' port resources include at least buffers, bandwidth, and/or queues which are modified as a result).

304. Thus, the combination of QBone and Surdila's multiple routers that are portals, and the bandwidth broker's allocation of local port resources at the portal nearest the originating end-point, teaches "directing, by the controller, one of a plurality of portals that is positioned in the network nearest to the originating end-point and physically separate from the controller to allocate local port resources of the portal for the connection" as recited in the claim.

[13.6] ***sending, by the controller to the portal, routing instructions for the connection, wherein traffic for the connection is routed by the portal based only on the routing instructions,***

305. See analysis of claim element [1.7]. As noted with respect to claim element [1.7], QBone, Surdila, and Li in combination teaches "providing, by the controller to the portal," and therefore also teaches "sending" because "providing" includes "sending" as a method of providing routing instructions.

306. Further, as noted with respect to claim element [1.7], QBone combined with Surdila and Li teaches that the routing instructions (the marking functions in QBone, with the teachings of Surdila regarding the labels in the LERs generated and distributed per the teachings of Li) provided by the bandwidth broker are for the traffic corresponding to the connection. Therefore, the combination likewise teaches the same aspects for "traffic for the connection."

307. Finally, as noted with respect to claim element [1.7], the access router in QBone, as expanded and modified by Surdila and Li, would route packets based on the labels provided by the bandwidth broker (routing instructions) instead of IP addresses. Therefore, the combination of QBone, Surdila, and Li further teaches that the traffic for the requested QoS connection is routed by the access router of QBone based only on the routing instructions it receives at least in the form of the marking functions from the bandwidth broker.

308. Thus, QBone's access routers modified with marking functions from the bandwidth broker, and Surdila's explanation that the result is routing traffic based on the marking functions instead of IP addresses (distributed as per Li), teaches “sending, by the controller to the portal, routing instructions for the connection, wherein traffic for the connection is routed by the portal based only on the routing instructions” as recited in the claim.

[13.7] ***and wherein the connection extending from the originating end-point to the terminating end-point is provided by a dedicated bearer path that includes a required route supported by the portal and dynamically provisioned by the controller,***

309. See analysis of claim element [1.9].

[13.8] ***and wherein control paths for the connection are supported between each of the originating and terminating end-points and the controller and between the portal and the controller.***

310. See analysis of claim element [1.10]. Because it was shown with respect to claim element [1.10] that the control paths in QBone are supported only between the originating and terminating endpoints and the controller and between the portal and the controller, QBone also shows that the control paths for the connection are supported between each of the originating and terminating endpoints and the controller and between the portal and the controller, as claimed.

3. Dependent Claim 14

[14.0] ***The method of claim 13***

311. See analysis of claim elements [13.0] through [13.8].

[14.1] ***further comprising negotiating, by the controller, to reserve far-end resources on the terminating end-point.***

312. See analysis of claim elements [1.6] and [10.1].

313. Specifically, as discussed with respect to claim 10, QBone in combination with Surdila teaches that a SIP call may be used in establishing an assured QoS end-to-end (per Surdila's teachings). "At step 62, End User (UE-A) 11 sends an Invite message to the Originating P-CSCF-O 44 and includes the A-Name, B-Name, ***and Proposed Session Description (SDP)(QoS Assured)***." ERIC-1014, ¶ [0062] (emphasis added).

314. As would have been recognized by a person having ordinary skill in the art, a SIP invite may include many parameters including a desired codec. This is clarified by Requena, which describes with respect to SIP: "[t]he UE1 generates ***the SDP body*** in such a way that it ***contains a list (set) of codecs that the UE1 is able and willing to support for the session.*** The UE1 sends the SIP INVITE message to the UE2." ERIC-1018, ¶ [0009] (emphasis added).

315. As further discussed with respect to claim 10, Surdila specifically teaches that the originating and terminating end-points arrive at agreed-upon codecs, and that this would include the same codec for both originating and terminating end-points, and additionally that video codecs are among those available in the lists of codecs taught by Surdila as taught by Requena.

316. The determining of the agreed codec(s) in the terminating endpoint is an example of resources reserved on the terminating endpoint in QBone as modified by Surdila and Requena. For example, QBone teaches that the RAR is sent to the end system (the terminating endpoint) and that the end system responds with the RAA (after determining whether the end system can receive the flow). ERIC-1017, p. 14.

317. The bandwidth broker of QBone, according to the teachings of Surdila and Requena, negotiates with the destination domain elements (including the destination domain's bandwidth broker, if a different domain than the originating bandwidth broker, and the terminating endpoint) to arrive at a codec via the RAR and RAA signaling identified above. As would have been recognized by a person having ordinary skill in the art, the selection of codec at a device, such as a terminating endpoint, itself impacts multiple resources including processor resources, bandwidth resources, and memory resources for execution of that confirmed codec.

318. Thus, QBone's bandwidth broker that negotiates with far-end resources for the terminating end-point, including arriving at agreed codecs as taught by Requena of what would have been known to a person having ordinary skill in the art when reading Surdila, teaches "further comprising negotiating, by the controller, to reserve far-end resources on the terminating end-point" as recited in the claim.

4. <u>Dependent Claim 15</u>

[15.0] ***The method of claim 14***

319. See analysis of claim elements [13.0] through [13.8] and claim elements [14.0] through [14.1].

[15.1] ***wherein the negotiating is performed with one of another controller associated with the terminating end-point or directly with the terminating end-point.***

320. See analysis of claim element [8.1] (showing that QBone teaches that the negotiating is performed with another controller associated with the terminating end-point).

X. Claims 9 and 12 are unpatentable over 35 U.S.C. § 103 over QBone in view of Surdila and Li, further in view of Chen.

321. It is my opinion that QBone in view of Surdila and Li, further in view of Chen, renders obvious at least claims 9 and 12 of the '119 patent.

A. Overview of Chen

322. Chen teaches a "centralized bandwidth broker" that "has control over the entire domain and centrally handles bandwidth allocation requests." ERIC-1019, 2:33-35. This includes the centralized bandwidth broker receiving a request for "a particular level of service" from a sender device to a receiver device. ERIC-1019, 2:38-48. Chen also teaches that bandwidth brokers were utilized to support multicast sessions. ERIC-1019, 3:36-53, 5:50-6:40.

B. Reasons to Combine QBone, Surdila, Li, and Chen

323. It is my opinion that one of ordinary skill in the art would have been motivated to combine the teachings of QBone with the teachings of Chen for the reasons set forth below.

324. QBone teaches that the bandwidth broker is the entity in the originating domain that receives the connection request as well as the entity (whether in the same originating domain or in the destination domain where there are multiple domains) that works with the destination point (end system) within that domain to reserve resources at the far end.

325. A person having ordinary skill in the art would have appreciated that any number of domains may exist between originating and destination end systems, as taught by QBone. A way to implement the bandwidth broker teachings is where the originating and destination end systems are part of the same domain (e.g., without intervening domains). A person having ordinary skill in the art would have been motivated, from the teachings of QBone, to look at the different implementation details of the bandwidth broker architecture in different domain combinations, including those with a single domain.

326. Chen is an example of such a domain that QBone states is an option. In Chen's example, an "approach for performing admission control suggested by the DiffServ framework involves ***using a centralized bandwidth broker 210***. ***The centralized bandwidth broker 210 has control over the entire domain and centrally handles bandwidth allocation requests***." ERIC-1019, 2:31-35 (emphasis added). The combination would have been obvious because it provides details of the example case of QBone where there is a single domain (i.e., the originating end system operates with the same domain as the destination end system). Further, as Chen discloses, BB's were utilized to support multicast sessions. ERIC-1019, 3:36-53, 5:50-6:40.

327. It would have been within the skill of one having ordinary skill in the art to combine the teachings of Chen regarding a single domain between end systems because it is a simple use case of the teachings of QBone. This would have been nothing more than the combination of prior art elements according to known methods to yield the predictable result of QBone's end-to-end reservations with Chen's simplified, single-domain use case. The resulting combination would benefit from QBone's guaranteed QoS in a single domain network. Similarly, the desirability of multicast communication sessions were well known and implementation as taught by Chen would have yielded known benefits.

1. <u>Dependent Claim 9</u>

[9.0] ***The method of claim 1***

328. See analysis of claim elements [1.0] through [1.10].

[9.1] ***wherein the negotiating, by the controller, to reserve far-end resources for the terminating end-point includes negotiating directly with the terminating end-point.***

329. QBone in combination with Surdila, Li, and Chen teaches that the negotiating, by the controller, to reserve far-end resources for the terminating end-point includes negotiating directly with the terminating end-point.

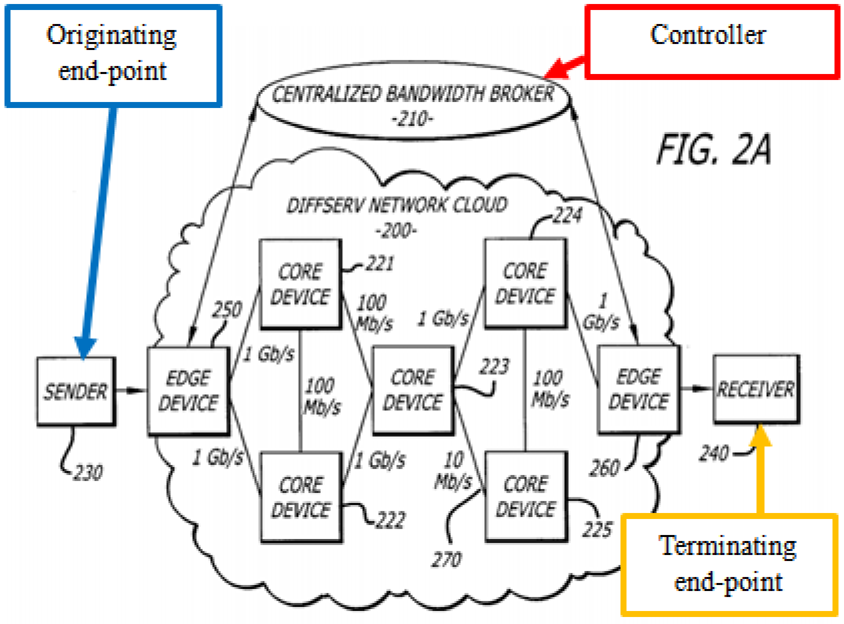
330. QBone teaches that a request for service from an originating end system is sent to a bandwidth broker: "***[a]n end system*** initiates a request for service with a fully-specified destination address (e.g. /32 for IPv4). The request is thus for service to ***another end system***." ERIC-1017, p. 12 (emphasis added). "***The end system sends an RAR to the bandwidth broker (1).***" ERIC-1017, p. 13 (emphasis added).

331. QBone further teaches that the bandwidth broker in the originating domain that receives that request (RAR) makes a number of decisions including a route through the domain. ERIC-1017, p. 13. Still further, QBone teaches that the last bandwidth broker before the destination end system (in the "destination domain") "[d]etermines the intra-domain route ***from the ingress router to the end system and decides whether the resources are available to support the flow*** [and] whether the flow may be accepted." ERIC-1017, p. 14 (emphasis added).

332. Relatedly, QBone contemplates that a given bandwidth broker may be in the same domain as the destination end system (the "traffic sink"): "the scope of the SLS is through the domain, from ingress point to egress point or destination (***if traffic sink is within the domain***)." ERIC-1017, p. 7 (emphasis added). "***The service may be provided entirely within a domain***, from domain-edge to domain-edge (within the same domain) or across a number of domains." ERIC-1017, p. 3 (emphasis added).

333. Surdila further teaches the negotiation of codecs so that the UEs reach agreed codecs. *See* ERIC-1014, ¶ [0065]. The combination of QBone's bandwidth broker negotiation teachings and Surdila's codec negotiation teachings accordingly teaches negotiation by the bandwidth broker with respect to codecs. Thus, in QBone's examples where the terminating end-point is in the same domain as the originating end-point, codecs are also negotiated as taught by Surdila.

334. A terminating end system that is part of the same domain as where the bandwidth broker is in control of the originating end system is further taught expressly by Chen: "[o]ne approach for performing admission control suggested by the DiffServ framework involves using a centralized bandwidth broker 210. ***The centralized bandwidth broker 210 has control over the entire domain and centrally handles bandwidth allocation requests***." ERIC-1019, 2:31-48 (emphasis added). This centralized control of the end system in the same domain is further illustrated by Chen's FIG. 2A, annotated below.



ERIC-1019, FIG. 2A (annotated).

335. Thus, Chen teaches that it was known for a bandwidth broker to serve end systems that were both at points of the same domain and managed by the same bandwidth broker, affirming the understanding a person having ordinary skill in the art would have had from QBone. As a result, the combination of QBone and Chen teaches negotiating, by the bandwidth broker, to reserve far-end resources (described as the resources at the destination domain in QBone, confirmed by the teaching of Chen that the destination domain may be the same as the originating domain) by negotiating directly with the terminating end-point.

336. Specifically, QBone's teaches that, for the destination domain, the bandwidth broker determines whether the resources are available to support the flow including the route all the way to the end system. This is a negotiation with the destination end system in QBone. Further, QBone as modified by Surdila teaches codecs being negotiated between end-points, using QBone's bandwidth broker with Surdila's codec negotiation teachings. The presence of the edge device 260 taught in Chen between the centralized bandwidth broker 210 and the receiver 240 does not change this understanding, since the negotiation includes both the checking of the resources at the edge device 260 as well as to the end system, receiver 240, itself. *See* ERIC-1019, FIG. 2A.

337. Indeed, this is consistent with the depiction of negotiation from a controller to a terminating end-point in the '119 Patent. For example, at least FIG. 7 of the '119 Patent has a controller that must communicate through at least one intervening network node before reaching the terminating end-point. This figure is reproduced and annotated below.

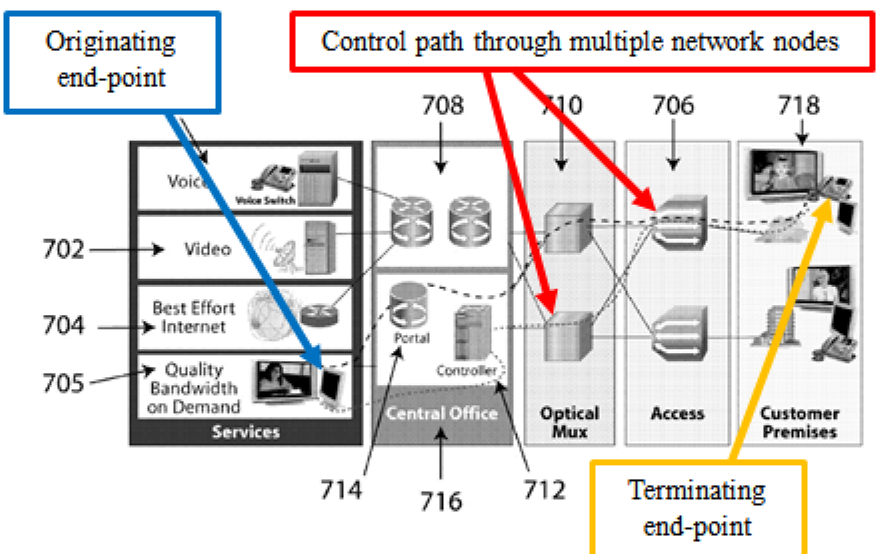


FIG. 7

ERIC-1001, FIG. 7 (annotated).

338. In FIG. 7 of the '119 Patent, the control path does not reach a second controller before arriving at the customer premises 718. As the '119 Patent states with respect to this figure, "[t]he Controller 712 accepts requests from an originating end-point to access the network with a high quality connection dynamically. ***The Controller 712 then negotiates across the network with the terminating end-point(s) to set up the connection***." ERIC-1001, 5:27-31 (emphasis added). The '119 Patent also contemplated direct negotiation occurring with one or more intervening network nodes in between.

339. For the reasons to combine Chen with QBone and Surdila, please see Section X.B above.

340. Thus, QBone's destination domain bandwidth broker negotiating with the end system (e.g., whether resources are available all the way to the end system) in combination with Chen's end systems operating with the same domain, teaches "wherein the negotiating, by the controller, to reserve far-end resources for the terminating end-point includes negotiating directly with the terminating end-point" as recited in the claim.

2. <u>Dependent Claim 12</u>

[12.0] ***The method of claim 1***

341. See analysis of claim elements [1.0] through [1.10].

[12.1] ***wherein the connection is a point-to-multipoint connection between one of the originating and terminating end-points and the other of the originating and terminating end-points and at least one other end-point.***

342. QBone in combination with Surdila, Li, and Chen teaches wherein the connection is a point-to-multipoint connection between one of the originating and terminating end-points and the other of the originating and terminating end-points and at least one other end-point.

343. In particular, QBone teaches generally the concept of achieving "end-to-end QoS assurances" in a bandwidth broker architecture. To the extent that QBone does not expressly state whether the end-to-end QoS assurance may be from a point to multiple points (or from multiple points to a point), such would have been obvious to a person having ordinary skill in the art.

344. Point-to-multipoint connections, in networking generally and in bandwidth broker architectures specifically, were well known prior to the earliest priority date of the '119 Patent. This is evinced, for example, by U.S. Pat. Pub. No. 2007/0201366 to Liu: "[t]he QoS request and negotiation processing flow described in step 71 to step 73 is suitable for point-to-point or point-to-multipoint data services that require QoS assured paths." ERIC-1021, ¶ [0105]. Liu states that this suitability extends to user terminals that have different QoS negotiation capabilities including those "that support negotiating QoS requirement in service signaling such as Session Initiation Protocol/Session Description Protocol

(SIP/SDP), etc." ERIC-1021, ¶¶ [0069]-[0073].

345. Chen also acknowledges that multicast sessions are possible for bandwidth broker architectures using a centralized bandwidth broker. Specifically, Chen acknowledges that "a centralized bandwidth broker has limited capability to handle bandwidth requests for multicast sessions." ERIC-1019, 2:57-58. Chen continues on to provide a multicast option using distributed bandwidth broker concepts instead. However, it was known to a person having ordinary skill in the art that bandwidth broker architectures, like those in QBone and Surdila, support QoS bandwidth requests for multicast sessions. That Chen went on to propose a further improvement thereon does not change that conclusion.

346. Thus, QBone's teaching of end-to-end assurances between end systems, with the knowledge by a person having ordinary skill in the art that such connections include point-to-multipoint connections as evinced by Liu and further taught by Chen, teaches "wherein the connection is a point-to-multipoint connection between one of the originating and terminating end-points and the other of the originating and terminating end-points and at least one other end-point" as recited in the claim.

XI. Claim 16 is unpatentable over 35 U.S.C. § 103 over QBone in view of Surdila, Li, and Requena, further in view of Pillai.

347. It is my opinion that QBone in view of Surdila, Li, and Requena, further in view of Pillai, renders obvious at least claim 16 of the '119 patent.

A. Overview of Pillai

348. Pillai is directed to user configurable platforms that are adaptable for use with “a variety of separate and distinct support systems.” ERIC-1011, ¶ [0044]. One aspect of Pillai’s teachings describes “method and apparatus for using the integration platform 700 to support combined and integrated billing and rating for both voice and data services,” including “prepaid integrated voice and data services.” *Id.*, ¶ [0071].

349. Pillai teaches that, to improve upon techniques for management of prepaid services, a “separate control element, a Real-Time Universal Resource Consumption Monitor (RURCM) 300 … is provided to keep track of ongoing usage [o]f system resources in real-time or approximately real-time, and applies prepaid service definitions to effectively regulate network usage.” ERIC-1011, ¶ [0087]. Pillai teaches that the RURCM 300 “is responsible for maintaining real-time active connections with the network elements … which regulate the user’s ongoing calls/sessions.” *Id.*, ¶ [0088].

350. For example, the RURCM 300 in Pillai may periodically poll the network elements, such as switches or routers, or configure the network elements to send live updates to the RURCM 300 after triggering by a threshold. ERIC-1011, ¶ [0088]. According to Pillai, the RURCM 300 compares the usage “against the authorized limits specified by the pre-paid policy.” *Id.*, ¶ [0089]. “Using real-time information about resource usage by the customer, the RURCM 300 decides at what point one or more of the ongoing sessions/connections should be terminated." *Id.*, ¶ [0093]. Based on the result of a determination to terminate the connection, the RURCM 300 "instructs the appropriate network switch … to terminate the ongoing call/session." *Id.*

B. Reasons to Combine QBone, Surdila, Li, Requena, and Pillai

351. It is my opinion that one of ordinary skill in the art would have been motivated to combine the teachings of QBone, Surdila, Li, and Requena with the teachings of Pillai for the reasons set forth below.

352. QBone as well as Surdila contemplated that various authorization, authentication, and accounting (AAA) functions are performed by their control systems: "[i]t is also generally recognized that policy control, policy-based admission control, accounting, authorization and authentication functions, network management functions and both inter- and intra-domain routing either affect or are (or can be) affected by the bandwidth broker." ERIC-1017, p. 2. QBone left open that further additions are made here, noting "if there is interest, experimental extensions may be specified in the minimal inter-domain BB protocol to allow for this." ERIC-1017 p. 2. Similarly, Surdila states: "[t]he MPS-O also interfaces with a Clearing House 46 using the Open Systems Protocol (OSP). ***The Clearing House performs the functions*** of an IETF ***Authorization, Authentication***, and

Accounting (AAA) server." ERIC-1014, ¶ [0040] (emphasis added).

353. QBone and Surdila do not explicitly state all the different AAA functions that the bandwidth broker (or multimedia control server including the bandwidth broker and clearing house functions as possible with Surdila), or all that may be done with the resource usage tracked and monitored by the routers and bandwidth broker in QBone. Because QBone remains general about the tracking, monitoring, and general authorization/authentication/accounting functions, a person having ordinary skill in the art would have been motivated to look at the different well-known techniques in the industry then available for how to make use of tracked and monitored usage information.

354. Pillai is an example of certain uses of monitoring/tracking usage data and functions based on that information that a controller may implement in a telecommunications context. Pillai states that it "relates to the integration of electronic and software systems and subsystems used in the operation of a telecommunications enterprise." ERIC-1011, ¶ [0002]. Specifically, Pillai contemplates particular ways in which to "support combined and integrated billing and rating for … data services in a distributed wireless architecture; to support prepaid integrated … data services in cellular network architectures …" ERIC-1011, ¶ [0071].

355. Notably, Pillai clarifies that the "teachings [in Pillai] may be applied to other types of systems, and are not limited for use with wireless telecommunication systems." ERIC-1011, ¶ [0050]. Pillai, as part of its focus on improving the "effective flow of data between … support systems, while providing for data integrity and efficient operation of the telecommunication system" (ERIC-1011, ¶ [0059]), teaches the separate control element RURCM 300 which receives traffic usage updates for data connections from switches in the network, as well as determining based on real-time usage whether the connection should be terminated.

356. Using these teachings from Pillai with the bandwidth broker in QBone provides the advantage of managing prepaid services (ERIC-1011, ¶ [0087]) as well as "ensuring that the customer only has access to whatever was specified in the prepaid contract." ERIC-1011, ¶ [0093]. Market forces dictate that service providers be compensated for usage of their communication networks such that implementation of the billing and access teachings of Pillai are readily combinable with the tracked/monitored usage data that QBone already teaches that the bandwidth broker may collect.

357. Implementation of the teachings of Pillai with respect to the RURCM and the switches communicating therewith with the teachings of QBone regarding the bandwidth broker would have been well within the ability of a person having ordinary skill in the art. Pillai contemplated that the RURCM would be a separate element from other aspects of the network. Further, QBone left open what specific admission control, accounting, authorization and authentication functions would be accomplished with the bandwidth broker, which was also a separate control element.

358. To the extent that any modifications would have been needed to the teachings of QBone in order to accommodate the teachings of Pillai, they would have been within the level of ordinary skill in the art. QBone left open what would be done with tracked usage and how, and Pillai teaches ways to take advantage of those things that the bandwidth broker can implement.

1. Dependent Claim 16

[16.0] ***The method of claim 13 further comprising:***

359. See analysis of claim elements [13.0] through [13.8].

[16.1] ***receiving, by the controller, a notification from the portal that traffic on the connection has exceeded an authorized limit; and***

360. QBone in combination with Surdila, Li, Requena, and Pillai teaches receiving, by the controller, a notification from the portal that traffic on the connection has exceeded an authorized limit.

361. **First**, QBone teaches a bandwidth broker, which is a controller. *See* analysis of claim elements [13.1] and [1.1].

362. **Second**, QBone teaches that the use of resources is tracked: "***[a]s traffic flows, the resource is actually used. How much can be used depends on***

the type of reservation of course. Every bandwidth broker must, therefore, track: the SLSs between its DS domain and peering DS domains, ***the set of established reservations consuming resources*** in its domain and the availability of all reservable resources in its domain. … ***The reservations are tracked by the bandwidth broker*** and (shared with) the network management system. ***The actual resource use is tracked by the routers themselves and (possibly) monitored by the bandwidth broker***.” ERIC-1017, p. 8 (emphasis added).

363. **Third**, Surdila teaches that “[t]he MPS-O also interfaces with a Clearing House 46 using the Open Systems Protocol (OSP). ***The Clearing House performs the functions*** of an IETF ***Authorization, Authentication***, and Accounting (AAA) server.” ERIC-1014, ¶ [0040] (emphasis added). The AAA server in Surdila teaches a centralized entity that maintains tracked data, such as the data tracked as taught by QBone.

364. **Fourth,** to the extent that QBone in combination with Surdila and Requena does not explicitly teach what the bandwidth broker does with the tracked reservations and monitored actual resource use (with actual resource use tracked by the routers themselves), and particularly that a tracked usage notification corresponds to traffic on a connection exceeding an authorized limit, Pillai teaches these limitations.

365. In particular, Pillai teaches a controller that is separate from other network elements: "[i]n order to overcome some of the above-described disadvantages of current techniques for management of prepaid services, ***a separate control element, a Real-Time Universal Resource Consumption Monitor (RURCM) 300 (FIG. 3) is provided to keep track of ongoing usage*** [o]f system resources in real-time or approximately real-time, and applies prepaid service definitions to effectively regulate network usage." ERIC-1011, ¶ [0087] (emphasis added).

366. Pillai teaches that a switch monitors traffic and notifies the RURCM 300 when usage exceeds an authorized limit: "[t]he RURCM agent 300 is responsible for maintaining real-time active connections with the network elements, such as the MSC 100 and the PDSN 150, ***which regulate the user's ongoing calls/sessions***. The RURCM agent 300 uses these connections to either periodically poll the network switches to obtain usage statistics, or to configure thresholds on the switches that trigger ***the switch to send live updates to the RURCM 300***." ERIC-1011, ¶ [0088] (emphasis added).

367. Pillai teaches that the "usage" updated from the switches to the RURCM 300 is compared "against the authorized limits specified by the pre-paid policy." ERIC-1011, ¶ [0089]. Accordingly, QBone's bandwidth broker and routers modified by the teachings in Pillai result in a controller that monitors specific usage with notification of that usage exceeding a limit as an example of the tracking and monitoring done in QBone, and an example of functions performed by the multimedia control server of Surdila.

368. For the reasons to combine Pillai with QBone and Surdila, please see Section XI.B above.

369. Thus, QBone's bandwidth broker (and Surdila's clearing house) teachings in combination with Pillai's specific example of how to use the usage information tracked and monitored in QBone by a switch communicating with a separate control element regarding traffic usage, teaches "receiving, by the controller, a notification from the portal that traffic on the connection has exceeded an authorized limit" as recited in the claim.

[16.2] ***instructing the portal, by the controller, whether to terminate or allow the connection to continue.***

370. QBone, in combination with Surdila, Requena, and Pillai, teaches instructing the portal, by the controller, whether to terminate or allow the connection to continue.

371. QBone teaches tracking resource usage information. *See* analysis of claim element [16.1].

372. To the extent that QBone does not teach particular details about what the tracking is used for, Pillai teaches that the control element determines whether to terminate the connection based on the data tracked and sent to the separate control element: "[u]sing real-time information about resource usage by the customer, ***the RURCM 300 decides at what point one or more of the ongoing sessions/connections should be terminated***." ERIC-1011, ¶ [0093] (emphasis added).

373. As a result of the determination, Pillai teaches conveying the determination to the portal (switch as taught in Pillai): "[a]fter making this decision, the RURCM 300 instructs the appropriate network switch (the MSC 100 in this example) to terminate the ongoing call/session, thereby ensuring that the customer only has access to whatever was specified in the prepaid contract." ERIC-1011, ¶ [0093].

374. Thus, QBone's bandwidth broker that can monitor resource usage and that can influence admission control, accounting, authorization, and authentication functions, in combination with Pillai's specific example of determining to terminate a connection based on monitored usage and sending that instruction to the appropriate switch, teaches "instructing the portal, by the controller, whether to terminate or allow the connection to continue" as recited in the claim.

XII. Conclusion

375. This declaration and my opinions herein are made to the best of my knowledge and understanding, and based on the material available to me, at the time of signing this declaration. I declare that all statements made herein on my own knowledge are true and that all statements made on information and belief are believed to be true, and further, that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 or Title 18 of the United States Code.

A. L. Narasimha Reddy

June 22 2017

Date

Narasimha Reddy, Ph.D.