

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

CISCO SYSTEMS, INC.,
Petitioner

IPR2023-00606
U.S. Patent No. 7,616,601

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

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PETITIONER’S EXHIBIT LIST

Ex.1001	U.S. 7,616,601
Ex.1002	Prosecution History of U.S. 7,616,601
Ex.1003	Declaration of R. Michael Buehrer, Ph.D. under 37 C.F.R. § 1.68
Ex.1004	<i>Curriculum Vitae</i> of R. Michael Buehrer, Ph.D.
Ex.1005	U.S. 7,043,225 to Patel et al. (“Patel-225”)
Ex.1006	U.S. 6,522,628 to Patel <i>et al.</i> (“Patel-628”)
Ex.1007	U.S. 6,850,764 to Patel <i>et al.</i> (“Patel-764”)
Ex.1008	U.S. 6,865,185 to Patel <i>et al.</i> (“Patel-185”)
Ex.1009	U.S. 7,031,266 to Patel <i>et al.</i> (“Patel-266”)
Ex.1010	U.S. 7,068,624 to Patel <i>et al.</i> (“Patel-624”)
Ex.1011	“Performance of QoS Agents for Provisioning Network Resources,” Schelen <i>et al.</i> published by IEEE in 1999 (“Schelen-1999”)
Ex.1012	Schelen, O. “Quality of Service Agents in the Internet,” Doctoral Thesis, Department of Computer Science and Electrical Engineering, Division of Computer Communication, Lulea University of Technology, Lulea 1998 (“Schelen Thesis”)
Ex.1013	U.S. 6,668,175
Ex.1014	U.S. 7,190,698
Ex.1015	“The 3GPP and 3GPP2 movements toward an all-IP mobile network,” by Patel et al., in <i>IEEE Personal Communications</i> , vol. 7, no. 4, pp. 62-64, Aug. 2000, doi: 10.1109/98.863998.
Ex.1016	“IP QOS: traveling in first class on the Internet,” Metz, in <i>IEEE Internet Computing</i> , vol. 3, no. 2, pp. 84-88, March-April 1999, doi: 10.1109/4236.761658.

Ex.1017	“GSM phase 2+ general packet radio service GPRS: Architecture, protocols, and air interface,” Bettstetter <i>et al.</i> , in <i>IEEE Communications Surveys</i> , vol. 2, no. 3, pp. 2-14, Third Quarter 1999, doi: 10.1109/COMST.1999.5340709.
Ex.1018	“WCDMA for UMTS: Radio Access for Third Generation Mobile Communications,” H. Holma <i>et al.</i>
Ex.1019	“Advance Reservations for Predictive Service in the Internet,” Degermark <i>et al.</i> , (“Degermark”)
Ex.1020	“A Discussion of Bandwidth Broker Requirements for Internet2 Qbone Deployment,” Hares <i>et al.</i>
Ex.1021	“A two-tier resource management model for the Internet,” by Terzis <i>et al.</i> , <i>Seamless Interconnection for Universal Services. Global Telecommunications Conference. GLOBECOM'99. (Cat. No.99CH37042)</i> , 1999, pp. 1779-1791 vol.3, doi: 10.1109/GLOCOM.1999.832469.
Ex.1022	U.S. Pub. 2001/0027490A1
Ex.1023	“End-to-End Quality of Service for High-End Applications,” Foster <i>et al.</i>
Ex.1024	Andrew T. Campbell “A Quality of Service Architecture,” Doctoral Thesis, Computing Department Lancaster University, Lulea 1996
Ex.1025	“A Two-Tier Resource Management Model for Differentiated Services Networks,” Reichmeyer <i>et al.</i>
Ex.1026	“Resource sharing in advance reservation agents,” Schelen <i>et al.</i>
Ex.1027	U.S. 6,744,767
Ex.1028	U.S. 6,714,515
Ex.1029	U.S. 6,529,499
Ex.1030	“An Architecture for Advance Reservations in the Internet,” Berson

	<i>et al.</i>
Ex.1031	“Sharing resources through advance reservation agents,” by Schelen <i>et al.</i> published in Proceedings of IFIP Fifth International Workshop on Quality of Service (IWQoS'97), New York, May 1997 (“Schelen-1997”)
Ex.1032	U.S. 6,631,122
Ex.1033	A two-bit differentiated services architecture for the internet. Internet draft, November 1997
Ex.1034	U.S. Pub. 2002/0087699A1
Ex.1035	“Internet QoS: A Big Picture,” Xiao <i>et al.</i>
Ex.1036	Complaint filed on May 24, 2022.
Ex.1037	Amended complaint filed on August 19, 2022.
Ex.1038	Declaration of Ingrid Hsieh-Yee, Ph.D. under 37 C.F.R. § 1.68
Ex.1039	<i>Reserved</i>
Ex.1040	<i>Reserved</i>
Ex.1041	Proposed Docket Control Order, <i>NetSocket, Inc., v. Cisco Systems, Inc.</i> , Civil Action No. 2:22-cv-172-JRG (E.D. Tex, Dec. 21, 2022)
Ex.1042	Federal Court Statistics

I. INTRODUCTION

Pursuant to 35 U.S.C. §§ 311, 314(a), and 37 C.F.R. § 42.100, Cisco Systems, Inc. (“Petitioner”) respectfully requests that the Board institute *inter partes* review and cancel claims 1-9 (hereinafter, the “Challenged Claims”) of U.S. 7,616,601 (the “’601 patent,” Ex.1001) because the claimed subject matter was already known and would have been obvious under pre-AIA 35 U.S.C. § 103.

II. GROUNDS FOR STANDING

Petitioner certifies that the ’601 patent is eligible for IPR and that Petitioner is not barred or estopped from requesting IPR challenging the patent claims. 37 C.F.R. § 42.104(a).

III. NOTE

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

IV. SUMMARY OF THE ’601 PATENT

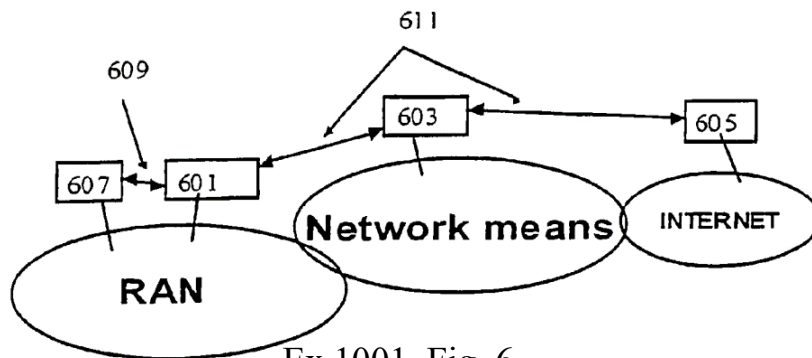
Dr. Buehrer’s Declaration Ex.1003, ¶¶27-42, summarizes the technology, as it relates to the ’601 patent. The ’601 patent generally discloses a mobile telecommunication system including a Core Network (“CN”) connected to a Radio Access Network (“RAN”), using Internet Protocol (“IP”) based transmission. Ex.1001, 1:15-24, 5:10-23, Abstract. A network resource manager (“NRM”) allocates bandwidth to provide end-to-end quality of service (“QoS”). Ex.1001,

10:1-11, Abstract. The NRM controls network resources in a network domain.

Ex.1001, 7:46-51. In larger systems with multiple domains, the NRM interacts with other NRMs responsible for other domains. Ex.1001, 7:51-59. “Preferred embodiments of the...invention” are described as including various functionalities of the NRM. Ex.1001, 6:8-7:24.

The '601 patent discloses a “radio resource manager” (also called a bearer service manager) to manage radio resources within the radio access network. Ex.1001, 3:1-5, 6:28-30, 8:32-34, 10:8-11.

Figure 6 illustrated below illustrates an embodiment where the system includes NRMs 601, 603, and 605 that communicate with each other and a radio resource manager 607. Ex.1003, ¶¶43-49.



V. PROSECUTION HISTORY

The claims of the '601 patent were allowed over the Schelen Thesis and other prior art, with the following reason for allowance. Ex.1002, 38.

However, *Schelen, Arunachalam*, and the other prior art of record fail to teach “communicating resource information between the NRM and the radio resource manager and reserving the IP network resources along the path by the NRM to fulfill the end-to-end QoS” in combination with the other limitations of claim **32**.

There is nothing novel, however, about the features identified by the examiner since they were known in the art and it would have been obvious to combine the teachings as analyzed below. Ex.1003, ¶¶50-52.

VI. LEVEL OF ORDINARY SKILL IN THE ART

A Person of Ordinary Skill in The Art (“POSITA”) on January 16, 2001, would have had a working knowledge of the mobile telecommunication network art that is pertinent to the ’601 patent. A POSITA would have had a bachelor’s degree in computer science, computer engineering, electrical engineering, or an equivalent, and two years of experience working with wireless communication systems, including cellular networks that utilize IP-based core networks. Lack of work experience can be remedied by additional education, and vice versa. Ex.1003, ¶¶19-21.

VII. CLAIM CONSTRUCTION

Claim terms in IPR are construed according to their “ordinary and customary meaning” to those of skill in the art. 37 C.F.R. § 42.100(b). Petitioner submits that, for the purposes of this proceeding and the grounds presented herein, no claim

term requires express construction. *Nidec Motor Corp. v. Zhongshan Broad Ocean Motor Co.*, 868 F.3d 1013, 1017 (Fed. Cir. 2017). For clarity, however, Petitioner notes below example embodiments in the specification. Ex.1003, ¶¶53-54.

In co-pending litigation, Petitioner may argue that the boundaries of certain terms are unclear, rendering such terms indefinite under 35 U.S.C. § 112, ¶ 2. Such issues are outside the scope of the present proceeding and do not preclude the Board’s evaluation of the challenged claims relative to the prior art as presented herein.

A. “*Network Resource Manager (NRM)*”

The ’601 patent cites to named inventor Olov Schelen’s doctoral thesis (“Schelen Thesis” Ex.1012) for exemplary disclosure of a “*Network Resource Manager (NRM)*.” Ex.1001, 7:59-64. According to the Schelen Thesis, the NRM corresponds to an “agent” or “bandwidth broker.” Ex.1012, 1, 25. The NRM may be software or hardware, and it may run as a standalone node or be distributed across the network. Ex.1001, 6:24-43; Ex.1003, ¶¶55-56.

Thus, a POSITA would have understood term “*Network Resource Manager (NRM)*” to include a centralized or distributed agent or bandwidth broker. Ex.1003, ¶57.

VIII. RELIEF REQUESTED AND REASONS FOR THE REQUESTED RELIEF

Petitioner asks that the Board institute a trial for *inter partes* review and cancel the Challenged Claims in view of the analysis below. Petitioner challenges the claims of the '601 patent because they are asserted in co-pending litigation. Finding the Challenged Claims unpatentable here will reduce the time and expense of '601 patent litigation for all parties.

IX. IDENTIFICATION OF HOW THE CLAIMS ARE UNPATENTABLE

A. Challenged Claims and Statutory Grounds for Challenges¹

Grounds	Claims	Basis
#1	1-8	35 U.S.C. § 103 (Pre-AIA) over Patel-225, Schelen-1999, and Schelen-1997
#2	2-5	35 U.S.C. § 103 (Pre-AIA) over Patel-225, Schelen-1999, Schelen-1997, and Patel-764
#3	9	35 U.S.C. § 103 (Pre-AIA) over Patel-225, Schelen-1999, Schelen-1997, and Degermark
#4	1-8	35 U.S.C. § 103 (Pre-AIA) over Patel-225, Schelen-1999, Schelen-1997, Patel-185, and Patel-624
#5	2-5	35 U.S.C. § 103 (Pre-AIA) over Patel-225, Schelen-1999, Schelen-1997, Patel-185, Patel-624 and Patel-764
#6	9	35 U.S.C. § 103 (Pre-AIA) over Patel-225, Schelen-1999, Schelen-1997, Patel-185, Patel-624 and Degermark

¹ For each combination presented herein, Petitioner relies on the teachings, and not on a physical incorporation of elements. *See In re Mouttet*, 686 F.3d 1322, 1332

Patel-225 (Ex.1005) is U.S. 7,043,225 filed on February 25, 2000 and issued on May 9, 2006. **Patel-764** (Ex.1007) is U.S. 6,850,764 filed on December 17, 1999, and issued on February 1, 2005. **Patel-185** (Ex.1008) is U.S. 6,865,185 filed on February 25, 2000 and issued on March 8, 2005. **Patel-624** (Ex.1010) is U.S. 7,068,624 filed on February 25, 2000 and issued on June 27, 2006. These references were assigned to Cisco and are prior art under at least 35 U.S.C. § 102(e).

Schelen-1999 (Ex.1011) is an article by named inventors Olov Schelén and Joakim Norrgård, among others, published by the IEEE in 1999. Ex.1011. **Schelen-1997** (Ex.1031) is an article by Olov Schelén et al., published by Chapman & Hall in 1997. Ex.1031. **Degermark** (Ex.1019) is an article by Degermark and named inventor Olov Schelén, among others, published in 1997. Dr. Hsieh-Yee, in declaration (Ex.1038), provides evidence and testimony establishing that Schelen-1999 (¶¶8-9, 40-64), Schelen-1997 (¶¶8-9, 18-39), and Degermark (¶¶8-9, 65-80), were publicly available to interested persons exercising reasonable diligence by more than one year before the earliest claimed priority date

(Fed. Cir. 2012); *In re Etter*, 756 F.2d 852, 859 (Fed. Cir. 1985); Ex.1003, ¶¶123, 265, 284.

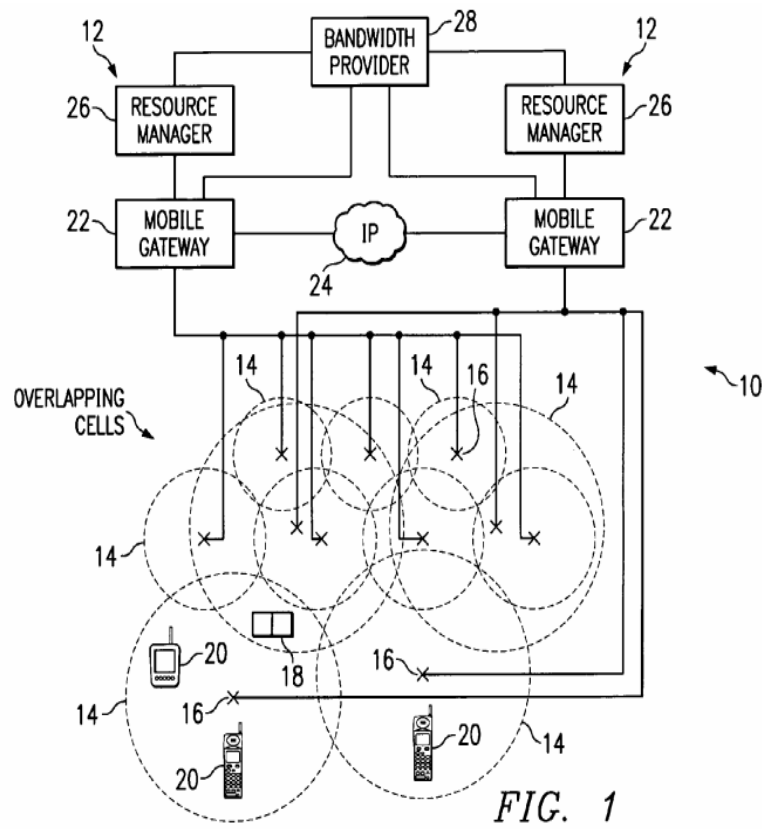
of the '601 patent. Ex.1038. Thus, these references are prior art at least under at least 35 U.S.C. §§ 102(a) and 102(b).

Petitioner's analysis cites additional prior art demonstrating knowledge in the art and to provide contemporaneous context to support Petitioner's assertions regarding what a POSITA would have understood from the asserted prior art. *See Yeda Research v. Mylan Pharm. Inc.*, 906 F.3d 1031, 1041-1042 (Fed. Cir. 2018) (affirming the use of "supporting evidence relied upon to support the challenge"); 37 C.F.R. § 42.104(b); *K/S HIMPP v. Hear-Wear Techs., LLC*, 751 F.3d 1362, 1365-66 (Fed. Cir. 2014); *Arendi S.A.R.L. v. Apple Inc.*, 832 F.3d 1355, (Fed. Cir. 2016).

B. Ground 1: Claims 1-8 are obvious over Patel-225, Schelen-1999, and Schelen-1997

1. Patel-225

Patel-225 generally relates to wireless network technology that uses a bandwidth broker to provide QoS. Ex.1005, 1:52-2:14, 3:59-67, 6:22-41, Abstract, Fig. 1; Ex.1008, 3:53-61. Figure 1, reproduced below, shows a mobile wireless communications network.

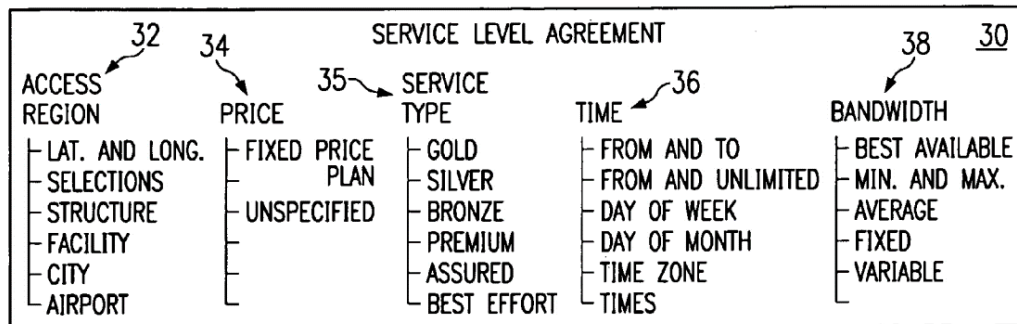


Ex.1005, Fig. 1.

The mobile wireless communications network 10 comprises a wireless network (e.g., one or more cellular networks 12) and a wireline IP network (e.g., wireline network 24), which utilize IP for communication. Ex.1005, 1:29-33, 3:59-64, 5:10-15. The cellular networks 12 support cellular standards to provide a radio frequency (“RF”) link to mobile devices 20. Ex.1005, 4:1-28. A radio resource manager 26 is connected to mobile gateways 22 that provide connectivity from the wireless network 12 to the wireline IP network 24. Ex.1005, 4:39-5:60, 6:42-8:23, Fig. 3.

Like the '601 patent's NRM—which as discussed above is also known as bandwidth broker—Patel-225's system utilizes “bandwidth brokers.” Ex.1005, 1:52-66. In Figure 1 above, the bandwidth broker may correspond to a service provider 28. Ex.1005, 5:61-6:4. The bandwidth broker controls and allocates network bandwidth to transmit data and voice traffic between mobile devices and the wireline IP network based on a specified QoS policy. Ex.1005, 1:29-38, 1:52-66, 2:43-49, 5:61-6:4.

The QoS policy corresponds to a service level agreement (“SLA”) 30, illustrated below at Figure 2. Ex.1005, 1:63-66, 5:31-6:2.



Ex.1005, Fig. 2.

The SLA 30 includes parameters for both immediate and advance scheduled reservations, where the advance reservations have a specified start and stop time. Ex.1005, 6:22-41, 7:54-56, 8:60-67; *see also* Ex.1005, 5:45-48, 9:21-10:29, Fig. 5. A service type 35 parameter is also included for specifying the QoS service class. Ex.1005, 6:32-35.

Patel-225 cites to and incorporates the teachings of numerous related U.S. patent applications, which have since issued as patents. Ex.1005, 1:5-19, 4:12-18, 4:58-64, 5:15-25; Exs.1006-1010; Ex.1003, ¶¶ 60-70.

2. Schelen-1999 and Schelen-1997

Schelen-1999 generally discloses a “QoS agent (also known as a bandwidth broker)” that uses resource and topology maps to perform end-to-end path-sensitive admission control in IP networks. Ex.1011, 17-18. The bandwidth broker allocates resources for immediate and advance reservations, based on a start and a stop time. Ex.1011, 18. A schedule for reserving resources over time is illustrated at Figure 1.

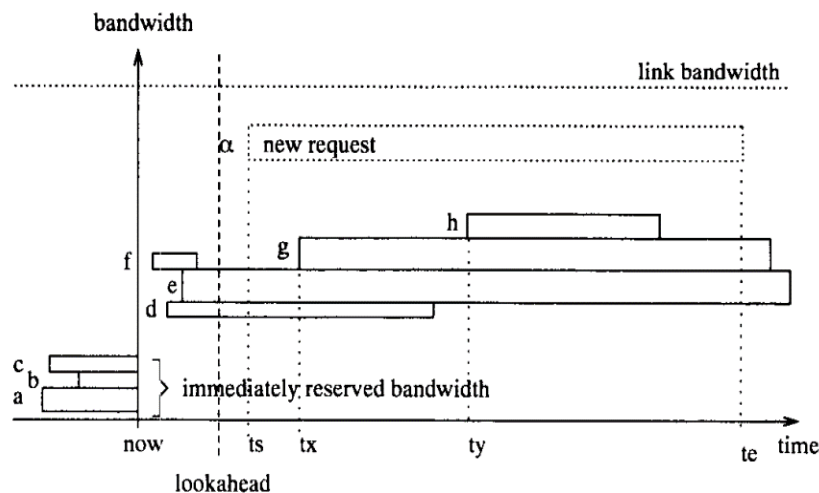


Figure 1: Advance reservations in a time-bandwidth domain

Ex.1011, Fig. 1.

The schedule has a “lookahead” time, which Schelen-1999 explains is covered in Schelen-1997. Ex.1011, 20.

Schelen-1997 describes the “lookahead” time as a “pre-allocation time, i.e., the time for starting to set aside resources for advance reservations.” Ex.1031, 265-266, 268. The pre-allocation of resources by setting them aside for a time before an advanced reservation mitigates the risk of over-allocation, since immediate reservations are rejected if there are insufficient resources in the near future (leading up to the advance reservations). Ex.1031, 268; Ex.1003, ¶¶71-75.

3. Reasons to Combine Patel-225, Schelen-1999, and Schelen-1997

As analyzed below and explained in the declaration of Dr. Buehrer (Ex.1003), a POSITA would have been motivated to combine the teachings of Schelen-1999 and Schelen-1997 with Patel-225. Ex.1003, ¶¶76-122.

First, Patel-225, Schelen-1999, and Schelen-1997 are analogous to the ’601 patent since they describe the use of a bandwidth broker (referred to as an NRM in the ’601 patent) to allocate resources. Ex.1001, 7:59-64; Ex.1005, 1:22-25, 5:31-6:8; Ex.1011, 17-18; Ex.1031, 265-266. Additionally, the references address the same problem of performing admission control for immediate and advanced reservations, like the ’601 patent. Ex.1001, 6:8-23; Ex.1005, 6:22-41; Ex.1011, 17-18, Fig. 1; Ex.1031, Ex.1031, 265-267, 273. Thus, Patel-225, Schelen-1999, and Schelen-1997 are analogous prior art to the ’601 patent and, given the similarities in subject matter, persons of skill would have considered their teachings together.

Ex.1003, ¶77.

Second, a POSITA would have been motivated to combine teachings of Patel-225, Schelen-1999, and Schelen-1997 to successfully practice Patel-225's method. Ex.1003, ¶78.

Patel-225 discloses a bandwidth broker to perform admission control to provide service to mobile devices across a wireless and IP network. Ex.1005, 1:29-63, 5:61-6:2, Abstract, Fig. 1. Patel-225, however, provides limited details pertaining to how the bandwidth broker performs admission control with respect to its IP network. Schelen-1999 and Schelen-1997 provide implementation details regarding how a bandwidth broker performs admission control to manage allocation of IP network resources as (already) suggested by Patel-225.

Specifically, the Schelen references teach how the bandwidth broker performs end-to-end admission control to manage IP network resources (limitations [1.2]-[1.5]), performs scheduling for immediate and advance reservations (limitation [1.6], and reserve end-to-end IP network resources for end-to-end QoS (limitation [1.8]). A person of skill would have found it obvious, when implementing Patel-225's system, to look to and apply the teachings of Schelen-1999 and Schelen-1997 because they provide more implementation details for achieving the results that Patel-225 is already describing. These implementation details would have allowed a POSITA to successfully practice Patel-225's method of providing service to

mobile devices, including providing premium QoS for the transfer of audio and other data. *See, e.g.*, Ex.1005, 1:39-66, 6:32-34. This is sufficient to explain why one of ordinary skill in the art would have sought to combine the identified disclosures of Patel-225, Schelen-1999, and Schelen-1997. Ex.1003, ¶79.

Additional reasons for combining the relevant teachings are provided in the claim analysis below. *See* [1.0.1], [1.2]-[1.6], [1.8].

Third, the results would have been predictable and there would have been a reasonable expectation of success given the similarities in the references, including that Patel-225 utilizes a bandwidth broker to perform admission control and Schelen-1999 and Schelen-1997 provide implementation details regarding how a bandwidth broker performs admission control within an IP network (which Patel-225 also has). *See* Ex.1005, 1:30-2:2, 5:33-6:4. Other similarities further support the reasonable expectation of success, including that all the references disclose immediate and advance scheduled reservations, among other similarities. Ex.1003, ¶¶119.

Any modification needed to the system of Patel-225, in order to accommodate the teachings of Schelen-1999 and Schelen-1997, would have been within the level of ordinary skill in the art. A POSITA, for example, would have been able to implement a bandwidth broker (per the combination) as software running on a general-purpose computer. Ex.1011, 25. Additionally, reasonable

expectation of success is evidenced by others in the art that had implemented a bandwidth broker per the Schelen references. Ex.1014, 3:64-4:45, 5:13-15.

Therefore, there would have been a reasonable expectation of success in combining the prior art teachings because the teachings of Schelen-1999 and Schelen-1997 represent known bandwidth broker functionality applicable to Patel-225's system, which also uses a bandwidth broker. Ex.1003, ¶¶120-122.

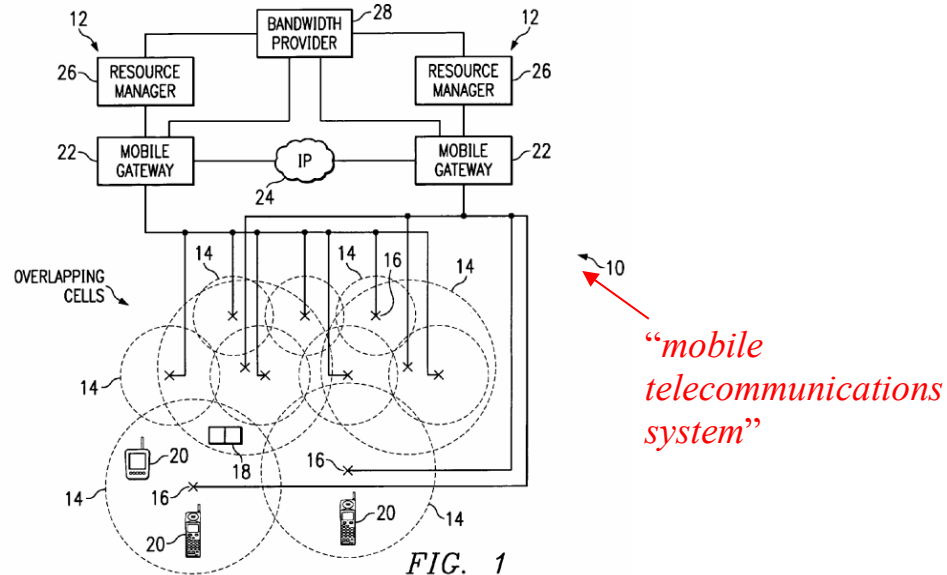
4. Claim 1

[1.0.1] *A method for providing end-to-end Quality of Service (QoS) within a mobile telecommunication system comprising*

To the extent the preamble is limiting, the combination of Patel-225, Schelen-1999, and Schelen-1997 renders it obvious. Ex.1003, ¶123.

First, Patel-225 discloses “a **method** and system for brokering bandwidth **in a wireless communications network**” for “**mobile devices.**” Ex.1005, 2:5-42, Abstract. The wireless communications network supports established telecommunications standards (e.g., cellular standards such as TDMA, CDMA, CDMA2000, W-CDMA, etc.). Ex.1005, 3:59-4:25. Accordingly, Patel-225's method corresponds to a “[a] *method for...a mobile telecommunication system.*” Ex.1003, ¶124.

Figure 1, reproduced below, shows Patel-225's wireless communications network 10 providing cellular service to mobile devices 20:



Ex.1005, Fig. 1 (annotated); Ex.1003, ¶125.

Patel-225's wireless communications network 10 supports “**different class or quality of service (QoS)** types such as gold, silver, bronze, premium, assured, and best effort.” Ex.1005, 6:32-35. A POSITA would have understood that Patel-225 is describing a packet header marking protocol called “Differentiated Services.” Ex.1035, 9-10 (“Differentiated services (DS) field...It is the Type of Service (TOS) octet in the IPv4 header or the traffic class octet in the IPv6 header” “Differentiated Services... Premium service...Assured service... gold, silver, and bronze.”). Also, a POSITA would have known that Differentiated Services was specifically developed to “**enable end-to-end QoS over IP networks.**” See Ex.1034, [0004] (“The efforts to enable end-to-end QoS over IP networks have led to the development of...the Differentiated Services architecture.”). Accordingly, a

POSITA would have recognized that Patel-225 seeks to provide end-to-end QoS. Ex.1003, ¶126.

It was known in the art that “premium” class provides predefined QoS characteristics, such as “**guarantee[ing]** that the contracted **bandwidth** will be available when traffic is sent.” Ex.1035, 11; *see also* Ex.1033, 2, 4 (“Premium service implements a **guaranteed peak bandwidth** service.”); Ex.1020, 4 (“Premium Service refers to a quantitative differentiated service which provides a **guaranteed low loss**.”). Because premium QoS guarantees bandwidth with low-loss, a POSITA would have understood that end-to-end QoS (from source to destination) is provided when end-to-end bandwidth is reserved for premium service. Ex.1003, ¶¶125-127.

Also, it was known in the art that premium QoS supports various technologies that utilize end-to-end QoS. For example, it was known that premium QoS supports virtual leased lines with guaranteed bandwidth for “end-to-end QoS.” Ex.1008, 3:53-61 (“...**end-to-end QoS**...”), 10:16-17 (“The premium class may be a virtual leased line service.”); Ex.1014, 1:24-26 (“...a **bandwidth guaranteed** service called Virtual Leased Line...”); Ex.1020, 4, 14 (“Premium service...may require that such a **service be established on an End-to-End basis**...”). As another example, there was a “strong appeal” to use premium QoS for transmission of real-time data (e.g., audio, video, etc.). *See* Ex.1035, 11;

Ex.1033, 4. And it was known that because transmission of such real-time data has “demanding quality of service (QoS) requirements,” **“it is essential that quality of service is... maintainable on an end-to-end basis.”** Ex.1023, Abstract; Ex.1024, 2; *see also* Ex.1022, [0003]; Ex.1032, 1:31-37. Accordingly, it would have been obvious to implement Patel-225’s method to provide end-to-end premium QoS (e.g., by guaranteeing end-to-end bandwidth with low-loss) to a mobile device, because: (1) premium class was specifically designed to provide end-to-end QoS, and (2) providing end-to-end QoS would support virtual leased lines and real-time data transmission (e.g., audio, video, etc.). Ex.1003, ¶¶128-130.

To illustrate by example, Patel-225’s mobile wireless communication network 10 transmits **“data and/or voice traffic** between mobile devices and a wireline network” per a specified “QoS policy” (e.g., premium QoS). Ex.1005, 1:39-66, 2:43-52, 6:32-35; *see also* Ex.1005, 3:59-64, 4:1-7, 5:6-15. A POSITA considering this disclosure would have known that to transmit real-time data (e.g., voice traffic) as Patel-225 contemplates, it was essential to provide end-to-end QoS. *See, e.g.*, Ex.1024, 2 (“[For] the transfer of continuous media of digital **audio and video, it is essential that quality of service is... maintainable on an end-to-end basis.**”). Therefore, it would have been obvious to a POSITA for Patel-225’s method to “*provid[e] end-to-end Quality of Service (QoS)*” within mobile wireless communications network 10, per a QoS policy (e.g., premium QoS),

because it would facilitate the transmission of real-time audio and other real-time data (e.g., video) between mobile devices and the wireline IP network. On the other hand, a POSITA would have understood that if end-to-end QoS was not provided, audio communication may be unintelligible (e.g., broken or including dropouts) and the quality of other real-time data (e.g., video etc.) will also be degraded. Ex.1003, ¶¶131-132.

Furthermore, Patel-225 discloses that a bandwidth broker negotiates QoS parameters with other bandwidth brokers for service across multiple network domains. Ex.1005, 1:54-60, 5:31-6:4. Patel-225's parameters include "required bandwidth, and/or type of service," among other parameters that make up a service level agreement ("SLA"). Ex.1005, 6:22-41, 7:54-56. It would have been obvious to a POSITA for the QoS negotiation with bandwidth brokers of other domains to result in an agreement for "*providing end-to-end Quality of Service (QoS)*" across multiple domains toward the destination, as known in the art. Ex.1032, 7:5-6 ("**[E]nd-to-end QoS is provided** through Service Level Agreements (SLA) between the networks."); *see also* Ex.1014, 4:54-56 ("The **end-to-end** issue is of great importance when service requests span multiple network provider domains."); Ex.1020, Abstract; Ex.1021, Abstract; Ex.1022, Abstract; Ex.1025, 11; Ex.1003, ¶¶133-135.

Second, one of ordinary skill in the art would have looked to other references in order to successfully implement Patel-225's method to provide end-to-end premium QoS across a single domain or multiple network domains. Ex.1003, ¶136.

A POSITA would have understood that premium service (as Patel-225 provides) is better than best-effort service. Ex.1005, 1:29-34; Ex.1013, 2:35-36; Ex.1016, 84-85; Ex.1033, 2. Schelen-1999 and Schelen-1997 provide implementation details applicable to Patel-225. Schelen-1999 discloses that when providing "better than best-effort" (e.g., premium service for virtual leased lines) in an IP network, it is important "to make sure that the service commitments can be met." Ex.1011, 17-18. To that end, Schelen-1999's bandwidth broker (referred to as a QoS agent) performs "**end-to-end admission control**" in its IP network domain. Ex.1011, 17. The bandwidth broker also cooperates with neighboring bandwidth brokers to make "**reservations...towards destination domains.**" Ex.1011, 17-18. Similarly, Schelen-1997 discloses that "**end-to-end reservations... involving several routing domains** are handled by cooperation between the involved" bandwidth brokers. Ex.1031, 265-266; Ex.1003, ¶¶137-140.

A POSITA would have understood that the bandwidth broker described by Schelen-1999 and Schelen-1997 performs end-to-end admission control to reserve end-to-end resources. And, because end-to-end resources are reserved in each

network domain toward the destination, end-to-end QoS service commitments can be met when providing better than best-effort service (e.g., premium QoS) across multiple network domains. Ex.1003, ¶141. This understanding is supported by submitted evidence, demonstrating that bandwidth brokers negotiate resource agreements to reserve end-to-end resources for end-to-end QoS. *See, e.g.*, Ex.1020, Abstract (describing inter-domain communication necessary to “achieve end-to-end QoS”); Ex.1021, Abstract (“End-to-end QoS support is achieved through the concatenation of such bilateral agreements”); *see also* Ex.1022, Abstract; Ex.1025, 11; Ex.1035, 12-13, Fig. 4; Ex.1003, ¶142.

Reasons to Combine

It would have been obvious to a POSITA to implement Patel-225’s bandwidth broker such that it performs end-to-end admission control, per Schelen-1999 and Schelen-1997, to thereby provide end-to-end QoS. Ex.1003, ¶143. In the combination, Patel-225’s bandwidth broker would perform end-to-end admission control in the wireless communications network and—when other network domains are implicated—the bandwidth broker would cooperate with bandwidth brokers of other network domains to thereby provide end-to-end QoS from the source to the destination. Implementation details of end-to-end admission control, per the proposed combination, are provided below in the context of limitations [1.2]-[1.6], and [1.8].

The combined teachings would “make sure that the service commitments can be met” when Patel-225’s service is “better than best-effort,” e.g., such as premium QoS. Ex.1011, 17-18. This would further Patel-225’s goal of transmitting voice traffic between mobile devices and the wireline IP network, and other network domains when the destination is external. *See, e.g.*, Ex.1024, 2 (“**[For] the transfer of...audio... it is essential that quality of service is... maintainable on an end-to-end basis.**”). Also, the combination would allow for Patel-225’s method to support other real-time data (e.g., video) and virtual leased lines across multiple network domains, which were known in the art to utilize end-to-end QoS. Ex.1022, [0003] (“...various real time applications (IP Telephony, **video** conferencing), streaming services (audio or video), or high quality data services (browsing with bounded download delays)...[require] QoS-enabled IP networks.”); Ex.1024, 2 (“**[For]... the transfer of... continuous media of digital audio and video, it is essential that quality of service is... maintainable on an end-to-end basis.**”); Ex.1030, 2 (“...for a **video** conference...[it is important to] ensure that the required QoS will be available...”); Ex.1031, 1 (“Real-time applications such as audio and **video** conferencing may need resource reservations in the network to perform well.”); Ex.1032, 1:31-35 (“With the proliferation of multimedia services via the Internet-**video**-conferencing, tele-medicine, telephony, video-on-demand etc., there is an increasing demand to support guaranteed

Quality-of-Service (QoS)"). Accordingly, each of the above noted reasons would have motivated a POSITA, implementing Patel-225's wireless communications network, to apply the end-to-end admission control teachings of Schelen-1999 and Schelen-1997, to provide end-to-end premium QoS (e.g., guaranteed end-to-end bandwidth with low-delay and low-jitter) across all implicated network domains. Ex.1003, ¶¶80-84, 143.

The combination of Schelen-1999 and Schelen-1997 with Patel-225 is merely combining prior art elements (e.g., end-to-end admission control, per Schelen-1999 and Schelen-1997, with Patel-225's bandwidth broker) to yield the predictable result of providing end-to-end premium QoS (e.g., guaranteed end-to-end bandwidth with low-delay and low-jitter) across both single and multiple network domains. Additionally, the combination is nothing more than applying a known technique (e.g., performing end-to-end admission control, per Schelen-1999 and Schelen-1997) to improve the similar system of Patel-225 (e.g., provide end-to-end priority QoS to support virtual leased lines and real-time audio and video data). *KSR Int'l Co. v. Teleflex Inc. (KSR)*, 550 U.S. 398 (2007); *see also* Reasons to Combine Schelen-1999 and Schelen-1997 with Patel-225; Ex.1003, ¶¶80-89, 143.

Thus, Patel-225 in combination with Schelen-1999 and Schelen-1997 discloses a method for providing end-to-end QoS within a mobile wireless

communications network 10, which renders obvious this portion of the preamble.

Ex.1003, ¶144.

[1.0.2] a Core Network (CN) connected to at least one Radio Access Network (RAN) using Internet Protocol (IP) based transmission, the method comprising the steps of:

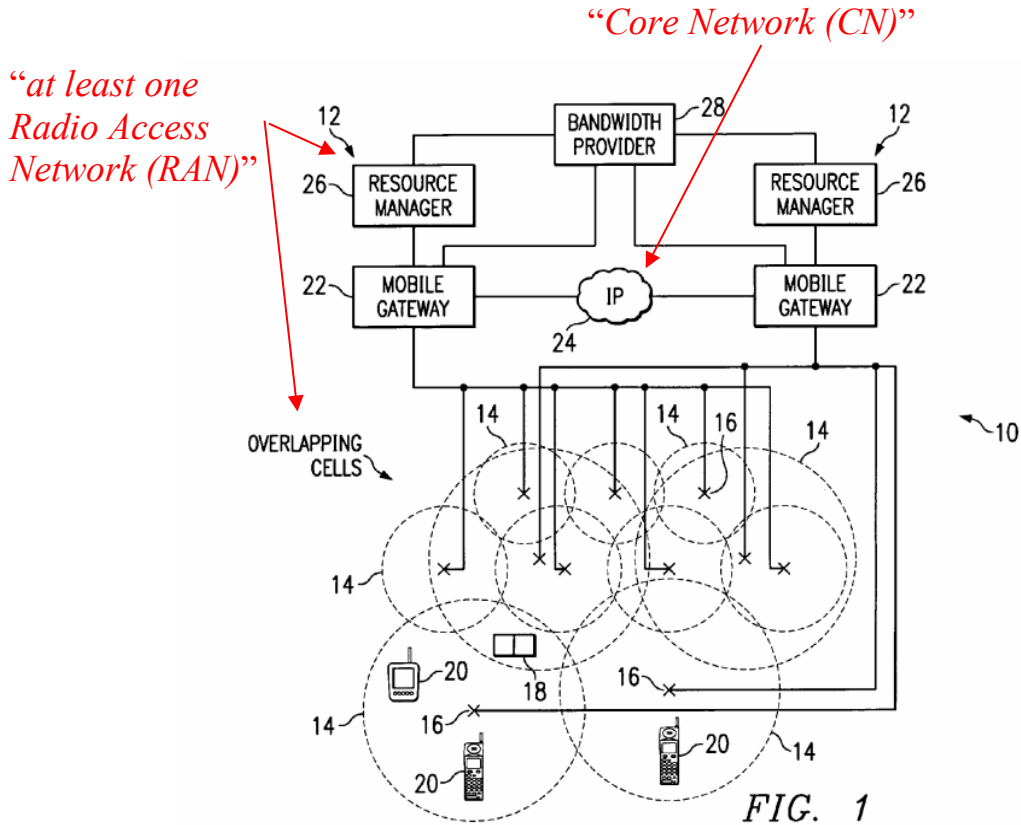
First, as discussed at [1.0.1], Patel-225's mobile wireless communications network 10 may implement common standards, including W-CDMA. Ex. 1005, 4:20-28. In the art, W-CDMA was another name for the UMTS air-interface, which is a cellular standard that has a CN and a RAN with IP protocol-based transmission. Ex.1013, 3:3-13, 7:14-18, 16:53-57; *see also*, Ex.1001, 2:19-27. It would have been obvious to a POSITA that Patel-225's mobile wireless communications network 10 includes a CN and a RAN, when it supports the W-CDMA standard. Ex.1003, ¶¶145-147.

Second, Patel-225 discloses that the mobile wireless communications network 10 comprises “**a wireline portion 24,**” which “may be the Internet, intranet, extranet, or other **suitable local or wide area network**” that uses “**IP data connections.**” Ex.1005, 5:10-15. It would have been obvious to a POSITA to implement Patel-225's wireline IP network 24 (which can be any suitable IP network) as a CN, because it would serve as the CN per the W-CDMA standard, which Patel-225's system supports. Ex.1005, 4:19-25; Ex.1013, 3:3-13; Ex.1003,

¶148. Accordingly, the wireline IP network 24 renders obvious a “*Core Network (CN)*.”

Patel-225 further discloses that the mobile wireless communications network 10 “comprises a **plurality of overlapping cellular networks 12**” that utilize a “**radio frequency (RF) link**” to provide mobile devices wireless access. Ex.1005, 2:6-14, 3:59-4:28, 9:33-37, Fig. 1. It would have been obvious to a POSITA that since Patel-225’s mobile wireless communications network 10 supports W-CDMA, cellular networks 12 correspond to a RAN per the standard. *See* Ex.1013, 3:3-13; Ex.1003, ¶¶149-150. Accordingly, one or more of Patel-225’s “cellular networks 12” that use RF links to provide radio access render obvious “*at least one Radio Access Network (RAN)*.”

As illustrated below at Figure 1, mobile gateways 22 “**provide connectivity**” between the wireline IP network 24 and cellular network 12, which discloses that the CN is “*connected to*” the RAN. Ex.1005, 5:6-15. Ex.1003, ¶¶151-152.



Ex.1005, Fig. 1 (annotated); Ex.1003, ¶151

Patel-225 discloses that “[w]ireline Internet protocol (IP) networks” and “wireless communication networks use...IP” with “Internet protocol...data connections.” Ex.1005, 1:29-30, 1:61-63, 5:6-25. As such, it would have been obvious to a POSITA that Patel-225’s mobile wireless communications network 10, including wireline IP network 24 (“CN”) and wireless cellular network 12 (“RAN”) “us[e] Internet Protocol (IP) based transmission,” per the supported W-CDMA standard. *See, e.g.,* Ex.1013, 7:14-18; Ex.1001, 2:17-35; Ex.1003, ¶153.

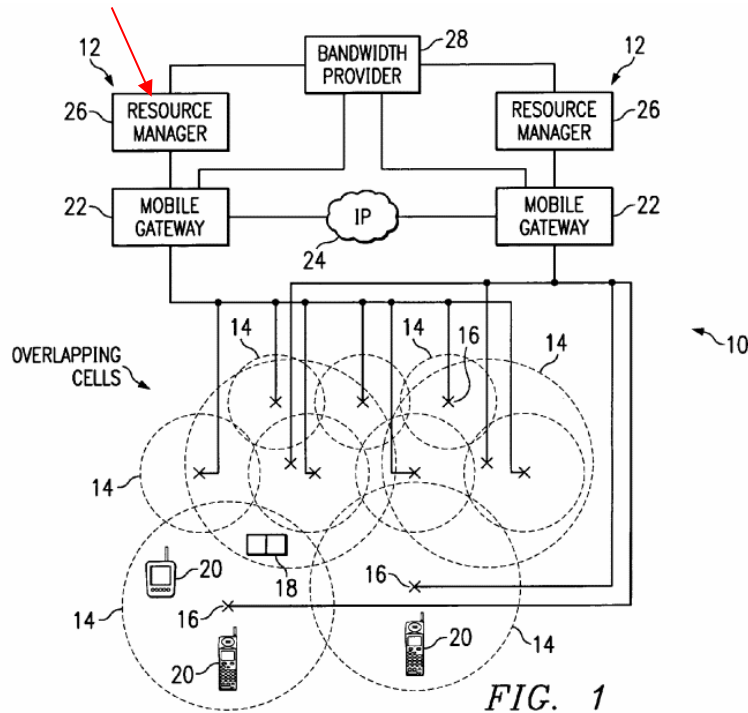
Thus, Patel-225 discloses that the mobile wireless communications network 10 comprises a wireline IP network 24 connected to wireless network 12 using IP based transmission, which renders obvious the preamble. Ex.1003, ¶154.

As explained below, Patel-225, Schelen-1999, and Schelen-1997 render obvious the method “*comprising*” the claimed steps. Ex.1003, ¶155.

[1.1] *handling radio resources within the RAN by using a radio resource manager;*

Patel-225 discloses that wireless cellular networks 12 (“*RAN*”) use a “**resource manager 26.**” Ex.1005, 5:31-39. Each resource manager 26, separately and together, corresponds to a “*radio resource manager.*” The resource manager 26 is illustrated below at Figure 1. Ex.1003, ¶¶156-158.

“radio resource manager”



Ex.1005, Fig. 1 (annotated); Ex.1003, ¶158.

Patel-225 discloses “**resource manager 26 manages bandwidth and other suitable network resources**” within the wireless cellular networks 12. Ex.1005, 5:31-39; see also Ex.1005, 6:42-48 (“[T]he **resource manager 26...control[s] bandwidth within a cellular network 12.**”); see also Ex.1005, 6:49-8:23, Fig. 3 (describing various aspects of the resource manager 26). Managing and controlling radio bandwidth and other radio resources within the wireless cellular network 12 renders obvious “*handling radio resources within the RAN.*” Ex.1003, ¶¶159-160.

Further, since Patel-225’s mobile wireless communications network 10 supports W-CDMA, it would have been obvious for resource manager 26 to

correspond to a radio resource manager per the standard. Ex.1018, p. 187;
Ex.1013, 11:26-32; Ex.1003, ¶161.

Thus, Patel-225 discloses handling radio resources (e.g., managing and controlling bandwidth and other radio resources) within the wireless cellular networks 12 by using a resource manager 26, which renders obvious this limitation. Ex.1003, ¶162.

[1.2] *controlling IP network resources by using a resource map in a Network Resource Manager (NRM) in order to provide said end-to-end QoS,*

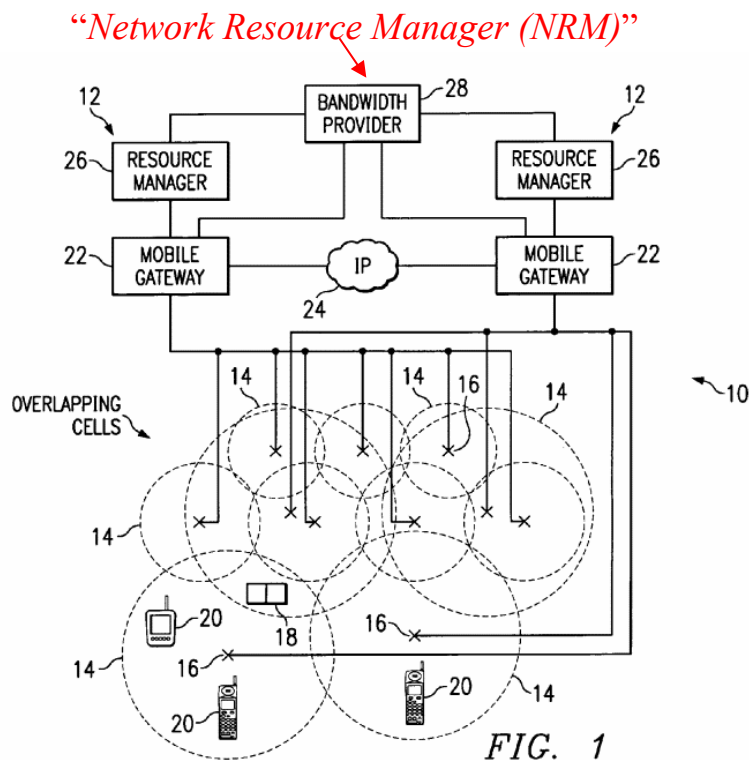
As discussed in the Claim Construction section, a POSITA would have understood term “*Network Resource Manager (NRM)*” to include a centralized or distributed agent or bandwidth broker. Ex.1003, ¶58.

First, as discussed at [1.0.1], Patel-225 in combination with Schelen-1999 and Schelen-1997 renders obvious “*providing end-to-end Quality of Service (QoS).*” Ex.1003, ¶¶163-165.

Second, consistent with the analysis at [1.0.1], Patel-225 in combination with Schelen-1999 and Schelen-1997 discloses that a bandwidth broker provides end-to-end QoS, which renders obvious “*a Network Resource Manager (NRM) ... [that] provide[s] said end-to-end QoS.*” Ex.1003, ¶166.

Patel-225’s system includes a “**bandwidth provider [that] may be...a bandwidth broker.**” Ex.1005, 5:61-6:2. A POSITA would have understood that a

“bandwidth broker” is a “a logical entity” and that “may take either a centralized or a distributed approach, or a combination of both.” Ex.1025, 5. For instance, it would have been obvious for Patel-225’s bandwidth broker to be distributed such that one bandwidth broker is used within the wireless network 12 and another bandwidth broker is used within the wireline IP network 24, as suggested by the disclosure of related Patel-764. See Ex.1007, 16:61-17:2 (“bandwidth broker...may be distributed.”). Accordingly, Patel-225’s bandwidth provider 28 (a “bandwidth broker”) illustrated at Figure 1 corresponds to “a Network Resource Manager (NRM),” as analyzed in the Claim Construction section. Ex.1003, ¶¶167-168.



Ex.1005, Fig. 1 (annotated); Ex.1003, ¶168.

Patel-225 further discloses that **“bandwidth brokers [] control and allocate Internet or other network bandwidth.”** Ex.1005, 1:29-34, 1:52-54. **“The bandwidth brokers manage the allocations of bandwidth within their network domain and communicate with bandwidth brokers of other network domains to negotiate QoS parameters.”** Ex.1005, 1:56-61; *see also* Ex.1005, 6:32-36 (“The service type parameters 35 include different class or quality of service (QoS) types such as gold, silver, bronze, premium, assured, and best efforts.”). Ex.1003, ¶169.

Consistent with the analysis at the preamble [1.0.1] of *“providing end-to-end Quality of Service (QoS),”* it would have been obvious for Patel-225’s bandwidth broker to perform end-to-end admission control, in view of Schelen-1999 and Schelen-1997, because it would guarantee that sufficient end-to-end IP network bandwidth is reserved for premium QoS. Ex.1003, ¶169.

Accordingly, the combined teachings of Patel-225, Schelen-1999, and Schelen-1997, disclose that the bandwidth broker performs admission control (including controlling, allocating, and reserving IP network resources) and negotiates QoS parameters with the bandwidth brokers of other domains to provide end-to-end QoS, which renders obvious *“controlling IP network resources...in order to provide said end-to-end QoS.”* Ex.1003, ¶170.

Patel-225 suggests using “*a resource map*” by disclosing that the bandwidth broker is “programmed with...current allocation traffic, and new requests for allocations.” Ex.1005, 1:54-56. Further, Schelen-1999 expressly discloses that a bandwidth broker (called QoS “agent”) uses a “**resource-map**” to perform “**end-to-end admission control**” within its IP network domain. Ex.1011, 17-18. When multiple domains are implicated, each bandwidth broker “along the path performs admission control within its own domain and aggregates several commitments into one commitment (per destination domain) with the downstream agent” to make “reservations... towards destination domains.” Ex.1011, 17-18. It would have been obvious to a POSITA that Schelen-1999’s disclosure of using a resource map to perform admission control includes controlling the IP network resources to provide end-to-end QoS from the source to the destination. *See also* analysis at [1.0.1] *supra*, [1.3]-[1.4], *infra*; Ex.1003, ¶¶171-172.

Reasons to Combine

It would have been obvious to a POSITA, in view of Schelen-1999’s teachings, for Patel-225’s bandwidth broker to use a resource map for admission control, because the map information would be useful for identifying available paths and resources (e.g., bandwidth) that may be reserved to provide end-to-end QoS. Ex.1003, ¶173. This is because the resource map information allows the bandwidth broker to determine if a specific path has sufficient resources and

decide to whether to grant a specific request if the resulting grant does not over-allocate resources or choose an alternative path. Ex.1014, 9:28-32. Implementing Patel-225's bandwidth broker to use a resource map as Schelen-1999 teaches is also beneficial since the map information would enable the bandwidth broker to manage IP network resources to control congestion. Ex.1008, 14:48-65; *see also* Reasons to Combine Schelen-1999 and Schelen-1997 with Patel-225; Ex.1003, ¶¶90-94.

Also, it would have been obvious to a POSITA for the resource map to be in Patel-225's bandwidth broker (e.g., in the bandwidth broker's memory along with the current bandwidth allocation (*see* Ex.1005, 1:54-56)) so that it may be easily accessed when performing path sensitive admission control in Patel-225's IP network thus controlling network resources. Ex.1003, ¶¶95-98, 171.

The combination of Schelen-1999 and Schelen-1997 with Patel-225 is merely the use of a known technique (controlling IP network resources by using a resource map in Patel-225's bandwidth broker to provide end-to-end QoS, per the teachings of Schelen-1999 and Schelen-1997) to improve the similar system of Patel-225 (see above noted benefits) in the same way. Ex.1003, ¶172.

Thus, Patel-225 in combination with Schelen-1999 and Schelen-1997 discloses controlling IP network resources by using a resource map in a bandwidth

broker² in order to provide end-to-end QoS, which renders obvious this limitation.

Ex.1003, ¶174.

[1.3] *the step of controlling the IP network resources including the steps of the NRM performing path-sensitive call admission control by using the resource map in the NRM,*

First, as discussed at [1.2], Patel-225 in combination with Schelen-1999 and Schelen-1997 renders obvious “*controlling the IP network resources... by using the resource map in the NRM.*” Ex.1003, ¶¶175-176.

Second, Schelen-1999 discloses that “**admission control is performed as we initiate a call.**” Ex.1011, 18. Schelen-1999 further discloses that the bandwidth broker “**performs path-sensitive admission control,**” including using a “**resource map to perform admission control in [its] domain.**” Ex.1011, 17-18; Ex.1003, ¶177.

Reasons to Combine

It would have been obvious to a POSITA, in the combination of Patel-225, Schelen-1999, and Schelen-1997, for the bandwidth broker to perform path-sensitive admission control using the resource map within its memory (see analysis

² See also analysis at [6.1], describing how the bandwidth broker in the proposed combination dynamically monitors topology changes, including retrieving routing information concerning the IP network.

at [1.2]), because it would allow for identifying a suitable path. Ex.1003, ¶178.

Once the path is identified, IP network end-to-end resources would be reserved to provide end-to-end QoS. *See* analysis at [1.8], *infra*. This also applies to reserving end-to-end resources across different network domains. *See* Ex.1011, 17-18; Ex.1031, 266; Ex.1035, 12-13; Ex.1003, ¶178.

Additionally, Schelen-1999 explains that path-sensitive admission control provides “favorable scalability properties...[for] virtual leased lines” because the reservation state is “aggregated in agents [bandwidth brokers] as their paths merge towards the destination domains.” Ex.1011, 17-18. Patel-225 supports “premium” service class (Ex.1005, 6:32-35), and it was known in the art that premium service “may be a virtual leased line service.” Ex.1008, 10:16-17; *see also* Ex.1020, 4. Accordingly, in view of Schelen-1999’s teachings, it would have been obvious to a POSITA to implement Patel-225’s bandwidth broker such that it use the resource map to perform path sensitive admission control of IP network resources to provide end-to-end QoS because the technique has favorable scalability properties for virtual leased lines, which Patel-225’s premium service would support. *See also* Reasons to Combine Schelen-1999 and Schelen-1997 with Patel-225; Ex.1003, ¶¶93-94.

The proposed combination is merely the use of a known technique (Patel-225’s bandwidth broker performing path-sensitive admission control using a

resource map, per the teachings of Schelen-1999 and Schelen-1997) to improve the similar system of Patel-225 (see above noted benefits) in the same way. Ex.1003, ¶¶97-99.

Thus, Patel-225 in combination with Schelen-1999 and Schelen-1997 discloses that the step of controlling the IP network resources includes the bandwidth broker performing path-sensitive call admission control by using the resource map in the bandwidth broker, which renders obvious this limitation. Ex.1003, ¶179.

[1.4] *the NRM checking that resources are available along a path, and*

First, as discussed at [1.2]-[1.3], Patel-225 in combination with Schelen-1999 and Schelen-1997 renders obvious “*the NRM performing path-sensitive call admission control.*” It would have been obvious to a POSITA that performing path-sensitive call admission control includes checking that resources are available along the path. Ex.1003, ¶¶180-181.

Second, Schelen-1999 discloses that advance admission control includes “**check[ing]** whether the total aggregate plus the new requested bandwidth is still below the link bandwidth.” Ex.1011, 19-20. Immediate admission control includes “**check[ing] for sufficient resources** so that both advance reservations and immediate reservations can be served.” Ex.1011, 17-18, 20; *see also* Ex.1011, 25. Consistent with the analysis at [1.0.1], [1.2]-[1.3], in the instance where multiple

network domains are implicated, each bandwidth broker checks that resources are available along a path within its network domain such that there are sufficient end-to-end resources available to provide end-to-end QoS. Ex.1003, ¶182.

Reasons to Combine

It would have been obvious to a POSITA, in view of Schelen-1999's teachings, to implement Patel-225's bandwidth broker such that it checks that sufficient resources are available along a path and to confirm that the path is not overly congested so that the resources may subsequently be reserved to provide end-to-end QoS. Ex.1003, ¶183. As discussed at [1.0.1], providing end-to-end QoS is desirable. Checking that resources are available would also reduce the risk of over-allocating resources for immediate and advance reservations, thereby furthering Patel-225's goal of assuring that the consumer is provided service. *See* Ex.1005, 8:60-62; Ex.1031, 268. If the sufficiency of resources was not checked and resources were over-allocated, advance reservations would potentially have to be canceled, which is undesirable. Ex.1031, 268; Ex.1011, 18; Ex.1003, ¶183. Checking improves reliability since reservations have less risk of being canceled. *See also* Reasons to Combine Schelen-1999 and Schelen-1997 with Patel-225; Ex.1003, ¶¶96-98.

The proposed combination is merely the use of a known technique (Patel-225's bandwidth broker checking that resources are available along a path, per the

teachings of Schelen-1999 and Schelen-1997) to improve the similar system of Patel-225 (see above noted benefits) in the same way. Ex.1003, ¶99.

Thus, Patel-225 in combination with Schelen-1999 and Schelen-1997 discloses the bandwidth broker checking that resources are available along a path, which renders obvious this limitation. Ex.1003, ¶184.

[1.5] *the NRM pre-allocating resources in an IP network;*

First, as discussed at [1.2], Patel-225 in combination with Schelen-1999 and Schelen-1997 discloses a bandwidth broker, which renders obvious the “NRM.” Further, Patel-225 discloses that the bandwidth broker (“NRM”) “control[s] and allocate[s] Internet or other network bandwidth.” Ex.1005, 1:52-54; *see also* Ex.1005, 1:54-66; analysis at [1.2]. The bandwidth may be allocated “for immediate use” or in advance for use “at a specified future time” and location. Ex.1005, 7:49-56, 8:60-62. This assures that if the consumer is traveling to a remote location, there are sufficient resources. Ex.1005, 8:57-67; Ex.1003, ¶¶185-187.

Second, Schelen-1999 discloses how the bandwidth broker allocates resources (like bandwidth) for immediate and advance reservations. Ex.1011, 17-18. “[I]mmediate reservations” include “look[ing] ahead a short period of time into the advance reservation state to find out about resources needed for advance reservations in the near future.” Ex.1011, 20. This is illustrated below at Figure 1.

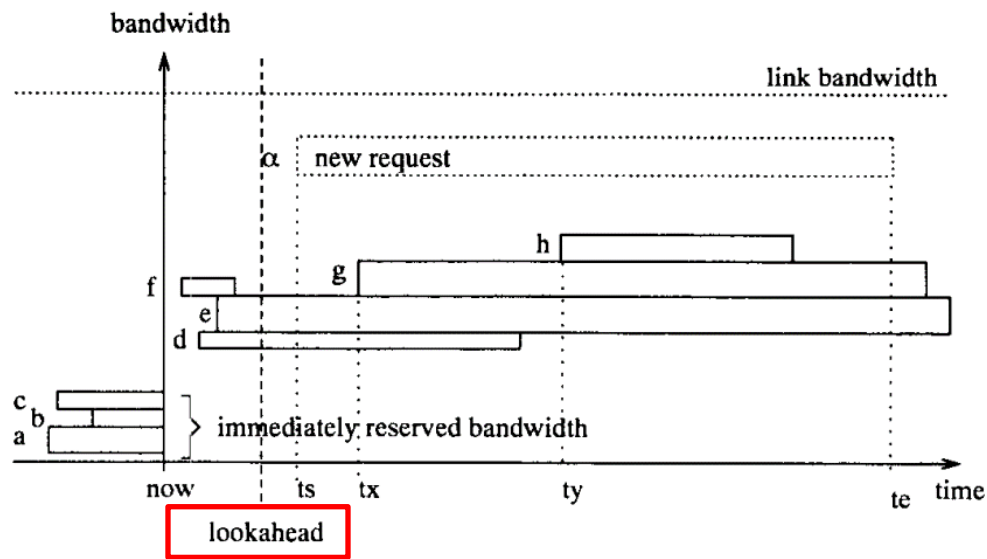


Figure 1: Advance reservations in a time-bandwidth domain

Ex.1011, Fig. 1 (annotated); Ex.1003, ¶188.

Schelen-1999 explains that the “lookahead time...issue is covered in” Schelen-1997. Ex.1011, 20; Ex.1003, ¶¶188-189.

Schelen-1997 discloses that there is a risk of over-allocation of IP network resources when granting immediate reservations, and that the “lookahead time” is used to minimize the risk. Ex.1031, 268. The “lookahead time” represents a “**pre-allocation** time, i.e., the time for starting to **set aside resources for advance reservations.**” Ex.1031, 268. In other words, when determining if there are sufficient resources for immediate reservations (which have unknown duration), Schelen-1997 pre-allocates (sets aside) resources before the advance reservation

begins, and if other resources are available then it grants the immediate reservation, else the “request could be rejected.” Ex.1031, 268. Ex.1003, ¶190.

The prior art disclosure is consistent with the ’601 patent, which describes “pre-allocat[ing] network resources to prevent over-utilisation [sic].” Ex.1001, 9:1-3; 9:8-10 (describing pre-allocating as “resources set aside”); Ex.1003, ¶192.

Reasons to Combine

It would have been obvious to implement Patel-225’s bandwidth broker (when performing end-to-end admission control, *see* [1.0.1], [1.3]) to utilize a lookahead time to pre-allocate (set aside) IP network resources for advance reservations, per Schelen-1999 and Schelen-1997. Ex.1003, ¶191. Pre-allocating resources would reduce the risk of over-allocating resources when immediate reservations and advance reservations share resources. Ex.1031, 268. Because in the combination Patel-225’s bandwidth broker would be implemented such that it pre-allocates IP network resources by setting them aside for a period of time before the advance reservations start, per Schelen-1999 and Schelen-1997, Patel-225’s system would beneficially assure end-to-end QoS for both immediate and advance reservations. Pre-allocating resources also furthers Patel-225’s goal of assuring that the consumer is provided adequate coverage by reducing the likelihood and advanced reservation cannot be fulfilled. Ex.1005, 8:60-67; *see also* Reasons to Combine Schelen-1999 and Schelen-1997 with Patel-225; Ex.1003, ¶¶93, 97, 191.

The proposed combination is merely the use of a known technique (Patel-225's bandwidth broker pre-allocating resources, per the teachings of Schelen-1999 and Schelen-1997) to improve the similar system of Patel-225 (see above noted benefits) in the same way. Ex.1003, ¶99.

Thus, Patel-225 in combination with Schelen-1999 and Schelen-1997 discloses the bandwidth broker pre-allocating (setting aside) resources in an IP network, which renders obvious this limitation. Ex.1003, ¶193.

[1.6] *scheduling resources over time by introducing a start and a stop time as a parameter in a resource request handled by the NRM;*

First, Patel-225 discloses in the context of Figure 5 a graphical interface 130 for scheduling resources, e.g., bandwidth 138, over time using a time parameter button 136 (“*scheduling resources over time*”). Ex.1003, ¶¶194-197.

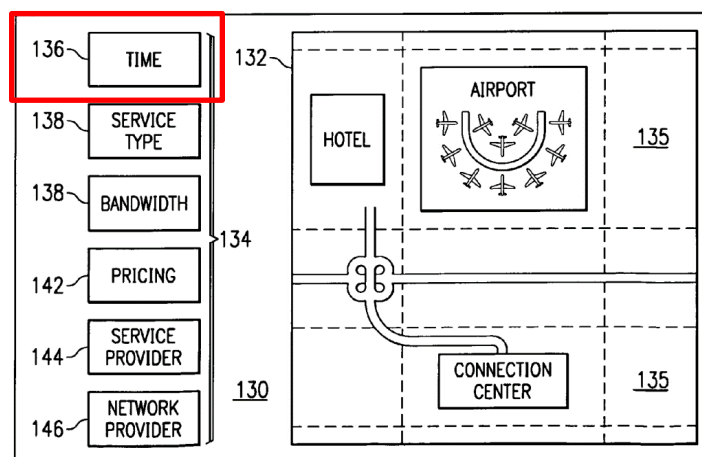


FIG. 5

Ex.1005, Fig. 5 (annotated); Ex.1003, ¶197.

The potential consumer uses “graphical interface 130” to input information and “**generate a request**” that is sent to the bandwidth broker. Ex.1005, 10:1-8, Fig. 5; *see also* Ex.1005, 5:61-6:4, 8:26-28. This includes requesting in advance services “at a specified future time,” using “**parameter buttons**” such as “the **time button 136 [which]** allows the service requester to **enter a time window** or a start time for wireless services.” Ex.1005, 8:57-62, 9:33-56, Fig. 5. The time window has both a “**from and to time** for services.” Ex.1005, 6:22-39. The time parameter button 136 enables specifying a from time and to time (“*introducing a start and a stop time as a parameter*”) in a request for wireless services (“*resource request*”) received by the bandwidth broker (“*handled by the NRM*”). Ex.1005, 3:45-47, 8:26-28, 9:33-10:29. Ex.1003, ¶¶196-198.

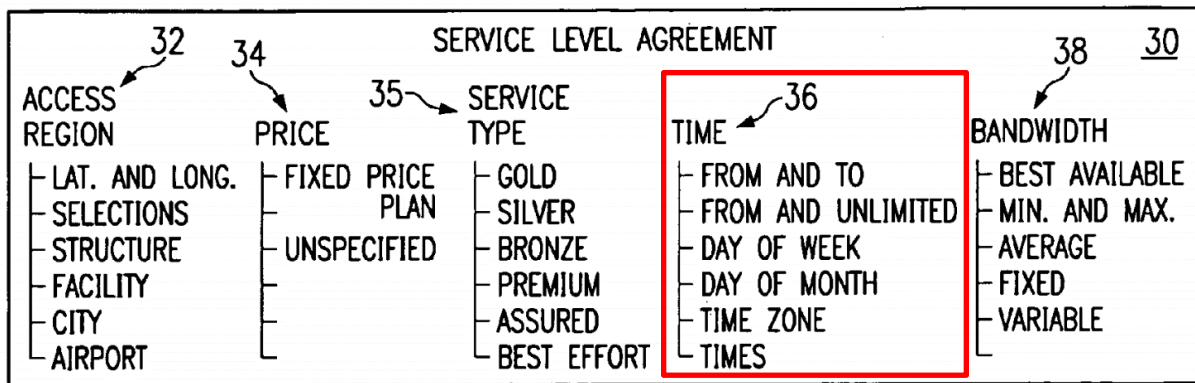
Thus, Patel-225’s disclosure of scheduling resources over time by introducing a from time and to time as a parameter (with time button 136) in a request for wireless services handled by the bandwidth broker, renders obvious this limitation. Ex.1003, ¶199.

Additionally, Patel-225 discloses that the bandwidth broker communicates with the resource manager 26 to define a “service level agreement (SLA) 30” based on the potential consumer’s request. Ex.1005, 5:31-67. The communication from the bandwidth broker includes transmitting a request for wireless services and handling additional negotiations with service parameters (e.g., time, bandwidth,

etc.). Ex.1005, 6:35-39; *see also* Ex.1005, 5:61-6:39, 7:54-56. This allows a consumer to reserve services at a specific time in the future. Ex.1005, 8:64-67; Ex.1003, ¶200.

As shown below at Patel-225's Figure 2, the defined SLA 30, per the communication ("*resource request*") from the bandwidth broker, includes a time parameter 36 with a from and to time ("*start and a stop time as a parameter*") for scheduling bandwidth 38 over time ("*scheduling resources over time*"). Ex.1003, ¶201.

FIG. 2



Ex.1005, Fig. 2 (annotated); Ex.1003, ¶201

The resource request is "*handled by the NRM*" at least because the bandwidth broker handled the communication (i.e., request and additional negotiation) when communicating with the resource manager 26. Ex.1005, 5:33-67; Ex.1003, ¶202.

Thus, in this additional way, Patel-225 discloses scheduling resources over time by introducing a from time and to time as a parameter 36 in a resource request handled by the bandwidth broker, which also renders obvious this limitation. Ex.1003, ¶203.

Third, the combination with Schelen-1999 and Schelen-1997 also renders obvious this limitation. Ex.1003, ¶202.

Schelen-1999 discloses that the bandwidth broker receives a client's "**admission requests**" for both immediate and advance resource reservations, which renders obvious a "*resource request handled by the NRM.*" Ex.1011, 17-18, Fig. 1; *see also* Ex.1031, 266. Advance reservation requests are limited and "have a **starting time and a finishing time**" provided as "**parameters.**" Ex.1011, 17-18; *see also* Ex.1031, 267. The starting time and finishing time allow for "**schedul[ing]...resources over time.**" Ex.1011, 18; Ex.1003, ¶¶204-208.

As illustrated below at Figure 1, Schelen-1999 uses a schedule for scheduling resources over time (x-axis) by introducing a start time ("ts") and a stop time ("te") parameter in the new admission request. Ex.1003, ¶209.

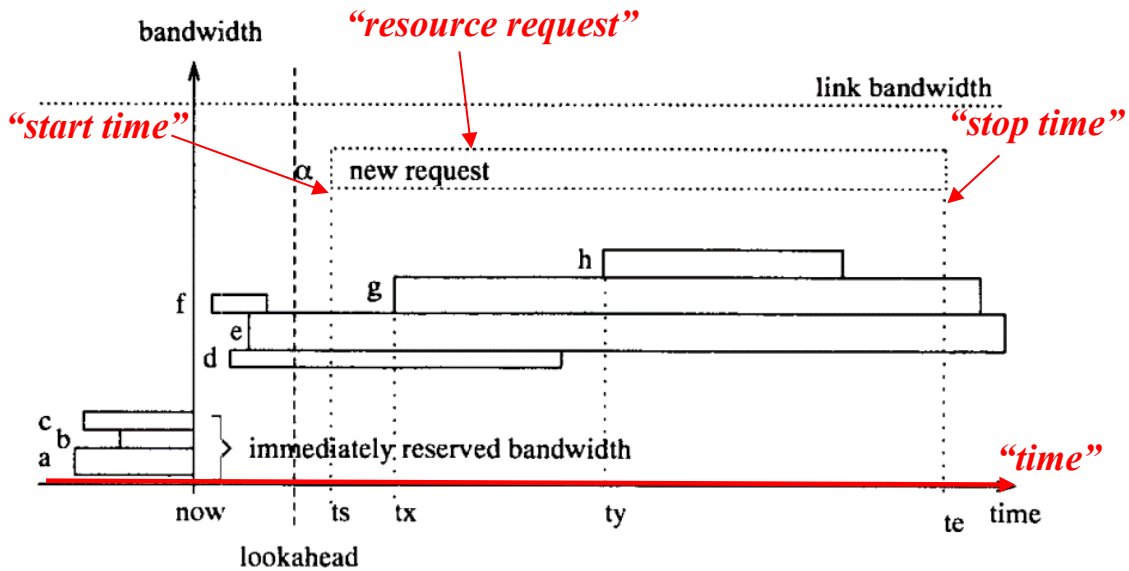


Figure 1: Advance reservations in a time-bandwidth domain

Ex.1011, Fig. 1 (annotated); Ex.1003, ¶209.

Reasons to Combine

It would have been obvious to a POSITA to apply the teachings of Schelen-1999 and Schelen-1997 to Patel-225's system, such that it utilizes a schedule (e.g., as illustrated at Figure 1) for scheduling resources over time, to thereby be able to predict when the total capacity will be insufficient. Ex.1011, 18; Ex.1031, 267; Ex.1003, ¶210. Because insufficient capacity would be predicted, new immediate reservations would not be admitted thereby reducing the risk of over-allocation. Ex.1031, 268. Not over-allocating IP network resources would reduce the risk of canceling planned events due to insufficient resources, which increases reliability. Ex.1011, 18. Another benefit is that scheduling, as taught by Schelen-1999 and

Schelen-1997, allows the IP network “resources [to be] more accurately allocated over time.” Ex.1031, 275. Also, since the schedule includes the lookahead time for pre-allocating resources, the numerous benefits discussed above would also be obtained in Patel-225’s system. *See* analysis at [1.5]; *see also* Reasons to Combine Schelen-1999 and Schelen-1997 with Patel-225; Ex.1003, ¶¶100-104, 210.

The combination of Schelen-1999 and Schelen-1997 with Patel-225 is merely the use of a known technique (using a schedule in Patel-225’s system for scheduling resources over time, per Schelen-1999 and Schelen-1997) to improve the similar system of Patel-225 (see above noted benefits) in the same way.

Ex.1003, ¶105.

Thus, Patel-225 in combination with Schelen-1999 and Schelen-1997 discloses utilizing a schedule for scheduling bandwidth over time by introducing a start time and a stop time as a parameter in an admission request handled by the bandwidth broker, which also renders obvious this limitation. Ex.1003, ¶211.

[1.7] *communicating resource information between the NRM and the radio resource manager; and*

Patel-225 discloses that “**the resource manager 26**” (“*radio resource manager*”) “**receives requests for wireless services from a ... bandwidth broker**” (“*NRM*”) and engages in “**additional negotiations**” for “**bandwidth and other suitable wireless resources.**” Ex.1005, 5:33-6:2. The resource manager 26

“generates a response based on resource availability, and sends the response” to the bandwidth broker. Ex.1005, 5:25-39. The resulting agreed upon terms “define a SLA and may specify a wireless region, price, time, type of service, bandwidth and other suitable conditions of service.” Ex.1005, 5:45-51, Fig. 2; *see also* analysis at [1.1]-[1.2]; Ex.1003, ¶¶212-215.

Thus, Patel-225’s disclosure of communicating requests, responses, and additional negotiation messages (including specifying a wireless region, time, type of service, bandwidth and other conditions of service) between the bandwidth broker and the resource manger 26, renders obvious this limitation. Ex.1003, ¶216.

[1.8] *reserving the IP network resources along the path by the NRM to fulfill the end-to-end QoS.*

First, as discussed in [1.0.1]-[1.3], Patel-225 in combination with Schelen-1999 and Schelen-1997 renders obvious that the “NRM” “*control[s] IP network resources*” by “*performing path-sensitive call admission control*” to “*provide said end-to-end QoS.*” Ex.1003, ¶¶217-218.

Second, Patel-225 discloses that the “**bandwidth brokers manage the allocations of bandwidth within their network domain ... to support transmission of data and/or voice traffic.**” Ex.1005, 1:56-63. It would have been obvious to a POSITA for Patel-225’s bandwidth broker to “manage [bandwidth] allocations” within the network domain by reserving end-to-end bandwidth along

the path in the wireline IP network 24 to provide end-to-end premium QoS for transmitting audio and other real-time data. *See* analysis at [1.0.1]; Ex.1003, ¶219.

Third, Schelen-1999 discloses that the bandwidth broker performs end-to-end path-sensitive admission control, including “**maintain[ing] per-link resource reservations** in a link-state routing domain.” Ex.1011, 17, 25. The bandwidth broker supports “immediate and advance reservations,” where “[i]mmediate reservations start as soon as they are granted.” Ex.1011, 18. As shown at Figure 1, the bandwidth broker performs admission control for immediate reservations (a, b, and c) by immediately reserving bandwidth. Ex.1003, ¶220.

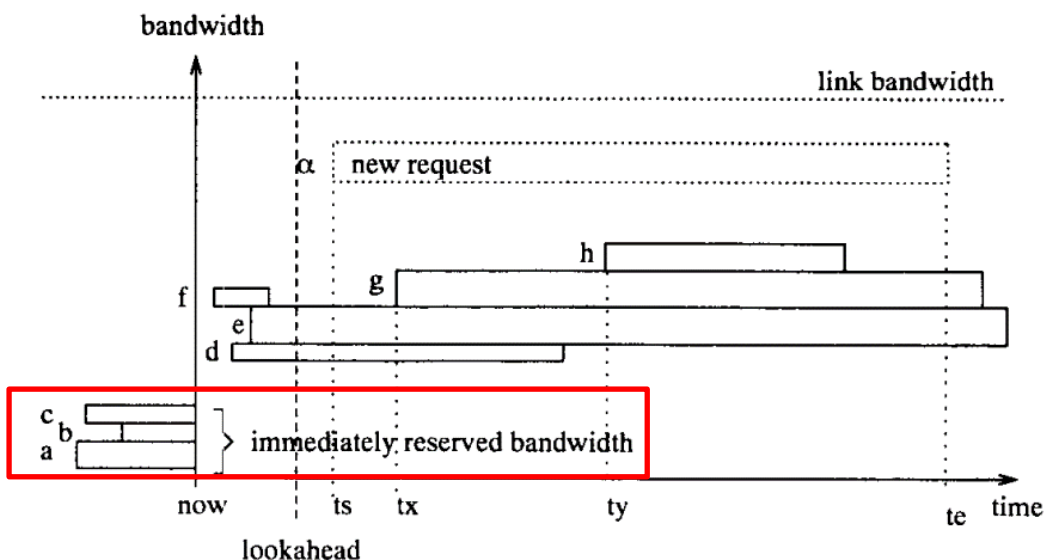


Figure 1: Advance reservations in a time-bandwidth domain

Ex.1011, Fig. 1 (annotated); Ex.1003, ¶220.

Further, Schelen-1999 discloses that the bandwidth brokers along the path cooperate to make “**reservations...towards destination domains.**” Ex.1011, 17-18. It would have been obvious to a POSITA that Schelen-1999’s bandwidth broker reserves the IP network resources along the path for immediate and advanced reservations to fulfill the end-to-end QoS from the source to the destination. Ex.1003, ¶221.

Additionally, Schelen-1997 describes the bandwidth broker making “**resource reservations**” in an IP network for “[r]eal-time applications such as audio and video conferencing.” Ex.1031, 265. According to Schelen-1997, the bandwidth brokers “select suitable routes and **reserve resources over the links in advance...allocate resources in the routers along the selected path and then periodically refresh those resource allocations through the duration of the reservation.**” Ex.1031, 266. In this way, the reserving bandwidth brokers support “**end-to-end reservations**” where “[r]equests involving several routing domains are handled by cooperation between the involved reservation agents [bandwidth brokers].” Ex.1031, 266; Ex.1003, ¶¶222-223.

It would have been obvious to a POSITA that Schelen-1997’s bandwidth broker, directly, or indirectly through communications with other (downstream) brokers toward the destination, reserves IP network resources along the path to make “end-to-end reservations,” thereby fulfilling end-to-end QoS for “audio and

video conferencing [applications which] may need resource reservations in the network to perform well.” Ex.1031, 265; *see also* Ex.1024, 2 (“[For] the transfer of... continuous media of digital audio and video, it is essential that quality of service is... maintainable on an end-to-end basis.”); Ex.1030, 2 (“...for a video conference...[it is important to] ensure that the required QoS will be available...”); Ex.1032, 1:31-35 (“With the proliferation of multimedia services via the Internet-video-conferencing, tele-medicine, telephony, video-on-demand etc., there is an increasing demand to support guaranteed Quality-of-Service (QoS)”). Ex.1003, ¶224.

Reasons to Combine

It would have been obvious to a POSITA, in view of Schelen-1999 and Schelen-1997, to implement Patel-225’s bandwidth broker such that it “manage[s] [bandwidth] allocations” by reserving IP network resources along the path, thereby making end-to-end reservations along the path from the source to the destination, to fulfill the end-to-end QoS for audio and other real-time data. *See* Ex.1005, 1:56-62; Ex.1024, 2 (“[For] the transfer of... continuous media of digital audio and video, it is essential that quality of service is... maintainable on an end-to-end basis.”); Ex.1030, 2 (“...for a video conference...[it is important to] ensure that the required QoS will be available...”); Ex.1031, 1 (“Real-time applications such as audio and video conferencing may need resource reservations in the network to

perform well.”); Ex.1032, 1:31-35 (“With the proliferation of multimedia services via the Internet-video-conferencing, tele-medicine, telephony, video-on-demand etc., there is an increasing demand to support guaranteed Quality-of-Service (QoS)”); *see also* analysis at [1.0.1]; Reasons to Combine Schelen-1999 and Schelen-1997 with Patel-225; Ex.1003, ¶225.

Schelen-1997 further explains that its bandwidth broker approach to reservations is advantageous since “advance reservations can be provided without having to maintain reservation state in the routers through periods when the reservations have no effect on packet forwarding.” Ex.1031, 266. “Furthermore, the [bandwidth broker] approach does not require the reserving endpoints to be present until the session for which resources have been reserved is starting.” Ex.1031, 266. Another advantage is that “[r]eservations can also be made for remote locations, thereby supporting third party reservations and nomadic computing, i.e., reservations for places where the host will be moving in the future.” Ex.1031, 266. These benefits, articulated by Schelen-1997, would have further motivated a POSITA to incorporate the bandwidth-reservation techniques of Schelen-1997 into the bandwidth broker of Patel-225 to reserve the IP network resources along the path. Ex.1003, ¶¶223-225.

Additionally, having Patel-225’s bandwidth broker reserve IP network resources along the path, as proposed, would allow for aggregating similar QoS

types and provide good scaling properties. Ex.1005, 1:49-51; Ex.1011, 17-18; Ex.1026, 4 (“Aggregation takes place in the agents because routers are not part of the admission control process... agents [bandwidth broker] can provide exact resource reservations with good scaling properties.”). Ex.1003, ¶109.

The combination is merely the use of a known technique (Patel-225’s bandwidth broker reserving IP network resources as taught by Schelen-1999 and Schelen-1997) to improve the similar system of Patel-225 (see above noted benefits) in the same way. Ex.1003, ¶111.

Thus, Patel-225 in combination with Schelen-1999 and Schelen-1997 discloses reserving IP network resources along the path by the bandwidth broker to fulfill the end-to-end QoS, which renders obvious this limitation. Ex.1003, ¶226.

5. Claim 2

[2.1] *Method according to claim 1, wherein the NRM is used within the RAN and the CN.*

Consistent with the analysis at [1.0.1]-[1.0.2], [1.2] and [1.6], “*the NRM is used within the RAN*” at least because the bandwidth broker is used within the wireless network 12 to receive communication requests for wireless services from the mobile device 20 of the potential consumer and to communicate with the RAN resource manager 26 to intelligently broker bandwidth, including setting up an SLA. Ex.1005, 5:61-6:2, 7:37-56, 8:24-9:20; Ex.1003, ¶227.

Furthermore, “*the NRM is used within...the CN*” at least because the bandwidth broker is used within the IP network 24 to control IP network resources by performing path-sensitive call admission control and because the bandwidth broker is used to pre-allocate and reserve IP network resources as analyzed at [1.2]-[1.5], and [1.7]. Additionally, in the combination, the bandwidth broker is used within IP network 24 because it manages the IP network bandwidth allocations and because it is used to communicate with bandwidth brokers of other network domains to negotiate QoS parameters. Ex.1005, 1:52-60; Ex.1003, ¶¶228-231.

6. Claim 3

[3.1] *Method according to claim 1, wherein the NRM is used within the RAN.*

See analysis at Claim 2. Ex.1003, ¶232.

7. Claim 4

[4.1] *Method according to claim 1, wherein the NRM is used within the CN.*

See analysis at Claim 2. Ex.1003, ¶233.

8. Claim 5

[5.1] *Method according to claim 1, the method comprising the further step of signalling resource information between the NRM and at least a second NRM used within at least a second network domain.*

First, Patel-225 discloses that the bandwidth broker (“NRM”) “communicate[s] with bandwidth brokers of other network domains to

negotiate QoS parameters.” Ex.1005, 1:56-61; Ex.1008, 3:59-61. A POSITA would have understood that “negotiat[ing] QoS parameters” includes signaling resource information (e.g., required and available bandwidth, service class, etc.) between the bandwidth brokers of the different network domains. Ex.1005, 1:54-60, 7:54-56; Ex.1003, ¶¶234-236.

Second, to the extent that Patel-225 is insufficient, Schelen-1999 and Schelen-1997 supplement by disclosing that resource information is transmitted between the bandwidth broker in one domain and the bandwidth broker of another domain to make end-to-end reservations across the involved domains. Schelen-1999’s bandwidth broker “performs admission control within its own domain and aggregates several commitments into one commitment (per destination domain) with the downstream agent” to make “reservations...towards destination domains.” Ex.1011, 17-18. Furthermore, Schelen-1997, discloses that “end-to-end reservations...involving several routing domains are handled by cooperation between the involved reservation agents [bandwidth broker].” Ex.1011, 17-18; Ex.1031, 265-266. A POSITA would have understood that cooperation in making end-to-end reservations across several domains includes signaling resource reservation information (e.g., required and available bandwidth, etc.) between the involved bandwidth brokers. Ex.1003, ¶237.

Since Patel-225 already communicates QoS parameter information between the bandwidth brokers of different domains, it would have been obvious to a POSITA, in view of the teachings of Schelen-1999 and Schelen-1997, for the communication to include reservation information (e.g., required and available bandwidth, etc.) to make end-to-end reservations involving several domains, thereby assuring end-to-end QoS. *See* Ex.1005, 1:61-63; Ex.1008, 3:53-61; Ex.1024, 2; Reasons to Combine Schelen-1999 and Schelen-1997 with Patel-225; Ex.1003, ¶¶238-239.

9. Claim 6

[6.1] Method according to claim 1, the method comprising the further step of monitoring topology changes by using the NRM, retrieving routing information concerning the IP network.

Schelen-1999, like the '601 patent (Ex.1001, 3:30-36, 6:44-7:3), discloses that the bandwidth broker monitors topology changes by participating in a link-state routing protocol (e.g., OSPF) to collect information regarding router interfaces. Specifically, Schelen-1999 discloses that the bandwidth broker is “**topology-aware**” and “knows the topology and static link resources in its domain” by “**participating in a link-state routing protocol (OSPF).**” Ex.1011, 17-18. Schelen-1999 describes using OSPF to “maintain[] an identical database describing the topology of the domain” to be able to identify “**topological changes.**” Ex.1011, 23; *see also* Ex.1011, 18 (“In this paper we present a prototype

implementation of a **QoS agent [bandwidth broker]...includ[ing] functionality for: obtaining a topological database through the link-state routing protocol.**”). Schelen-1997 similarly discloses that “[b]y **participating in a link-state routing protocol, the agents [bandwidth brokers] know the topology** and the static link capacities of their domains.” Ex.1031, 266. A POSITA would have understood that the bandwidth broker disclosed by Schelen-1999 and Schelen-1997 monitors topology changes and retrieves routing information about the IP network through participation in the link-state routing protocol. Ex.1003, ¶¶240-242.

Schelen-1999 further discloses that the bandwidth brokers “**retrieve link properties...by querying routers seen in the topological database**” “us[ing] a network management protocol (SNMP).” Ex.1011, 17-18, 21. SNMP is used to determine “the speed of the interfaces at the routers.” Ex.1011, 21; *see also* Ex.1011, 20. A POSITA would have understood that Schelen-1999’s bandwidth broker retrieves routing information concerning the IP network from the queried routers in the topological database, including speed and link properties to identify a link failure that affects the topology (i.e., identify topology changes from the failure). Ex.1003, ¶243.

It would have been obvious to a POSITA, in view of Schelen-1999 and Schelen-1997, for Patel-225’s bandwidth broker to monitor topology changes and retrieve routing information concerning the IP network (as discussed above) so that

the bandwidth broker has an up-to-date information for admission control.

Ex.1003, ¶¶112-114, 244. The topology database complements the use of the resource map (as analyzed above) to enable the bandwidth broker to determine if sufficient resources are available on a specific link to accept new immediate reservations and to select suitable routes and reserve resources over the links for new advance reservations. Ex.1031, 266 (“[T]he [bandwidth brokers] know the topology and the static link capacities of their domains and can therefore select suitable routes and reserve resources over the links in advance.”); Ex.1011, 23 (“From this [topology] database, a routing table is calculated by constructing a shortest-path tree.”). As an additional reason, having accurate topology and routing information is also beneficial since it makes “[p]ath-sensitive admission control...possible” and helps reduce over-allocation risk. Ex.1011, 17-18; Ex.1003, ¶113.

Also, the teachings of Schelen-1999 and Schelen-1997 are beneficial to Patel-225’s bandwidth broker because it allows for “recalculat[ing] routes quickly in the face of topological changes.” Ex.1011, 23. Based on the recalculated routes, the bandwidth broker is able to reallocate IP network resources to match the current topology, thereby maintaining active reservations while reducing the risk of over-allocation of resources for new reservation requests. Reducing the risk of over-allocation minimizes the potential of canceling planned events due to

insufficient resources. Ex.1011, 18 (“It is unfortunate if a planned event has to be canceled with late notice because it turns out there are insufficient network resources at the time.”); Ex.1003, ¶¶115-116.

The proposed combination is merely the use of a known technique (Patel-225’s bandwidth broker monitoring topology changes and retrieving routing information concerning the IP network, per Schelen-1999 and Schelen-1997) to improve the similar system of Patel-225 (see above noted benefits) in the same way. *See also* Reasons to Combine Schelen-1999 and Schelen-1997 with Patel-225; analysis at claim 7, *infra*; Ex.1003, ¶245.

10. Claim 7

[7.1] *Method according to claim 6, wherein the topology is monitored in order to be able to reallocate the IP network resources.*

First, Schelen-1999 discloses that the topology database of the IP network allows for “a routing table [to be] calculated by constructing a shortest-path tree” and for “**recalculate[ing] routes quickly in the face of topological changes.**” Ex.1011, 23. Schelen-1999 also discloses that the bandwidth broker “must be able to calculate shortest-path trees starting at any router in the domain.” Ex.1011, 23. A POSITA would have understood that topology changes are monitored to be able to recalculate the shortest-path routes and thereby be able to reallocate network

resources (for already scheduled advanced reservations) along the new route.

Ex.1003, ¶¶246-247.

Second, Schelen-1997 also discloses that the bandwidth brokers use the topology information to “select suitable routes and reserve resources” and **“periodically refresh those resource allocations through the duration of the reservation.”** Ex.1031, 266. A POSITA would have understood that the bandwidth brokers’ periodically refreshing resource allocations based on the topology includes reallocating IP network resources since the refreshed resource allocations are either reallocated to the same IP network route (when the topology does not change) or resources are reallocated for new IP network routes (when the topology changes). Ex.1003, ¶248.

It would have been obvious to a POSITA, in view of Schelen-1999 and Schelen-1997, to use the monitored topology information to reallocate IP network resources, including adjusting for link failure or other topological changes, so that a suitable route is utilized for a given reservation and the potential to over allocate resources is reduced. *See also* Reasons to Combine Schelen-1999 and Schelen-1997 with Patel-225; Ex.1003, ¶¶112-118, 249-250.

11. Claim 8

[8.1] Method according to claim 1, wherein the path-sensitive call admission control is parameter based.

Consistent with the analysis at [1.3]-[1.6], path-sensitive call admission control is based on QoS parameters (e.g., time, access region, price, service type, and bandwidth), which renders obvious this limitation. *See* Ex.1005, 6:22-41, 3:13-15, 6:22-41, 7:49-56, 9:6-20, 10:58-62, Fig. 2; Ex.1011, 17-18, Fig. 1; Ex.1003, ¶¶251-252.

It would have been obvious to a POSITA, in view of Schelen-1999 and Schelen-1997, to use parameters when performing path-sensitive call admission control, so that a suitable route is selected that can support the timing and bandwidth requirements, among other constraints defined by the parameters. *See also* Reasons to Combine Schelen-1999 and Schelen-1997 with Patel-225; Ex.1003, ¶¶91-94, 253-254.

C. Ground 2: Claims 2-5 are Obvious over Patel-225, Schelen-1999, Schelen-1997, and Patel-764

1. Patel-764

Patel-225 cites to and incorporates by reference Patel-764. Ex.1005, 4:12-18. Patel-764's incorporated teachings disclose that the "bandwidth broker or QoS manager... intelligently broker[s] bandwidth based on time and space considerations such as the geo-location of the demand and supply." Ex.1007, 16:47-52. This includes "[t]he QoS manager 320 [bandwidth broker] interact[ing] with QoS managers 332 of other network domains 334 to negotiate various QoS

provisioning 336.” Ex.1007, 16:52-54. Figure 14 illustrates bandwidth broker 320 used in first domain 322 and bandwidth broker 332 used in second domain 334 and the two-way arrow shows signaling QoS negotiations 336 therebetween. Ex.1003, ¶255.

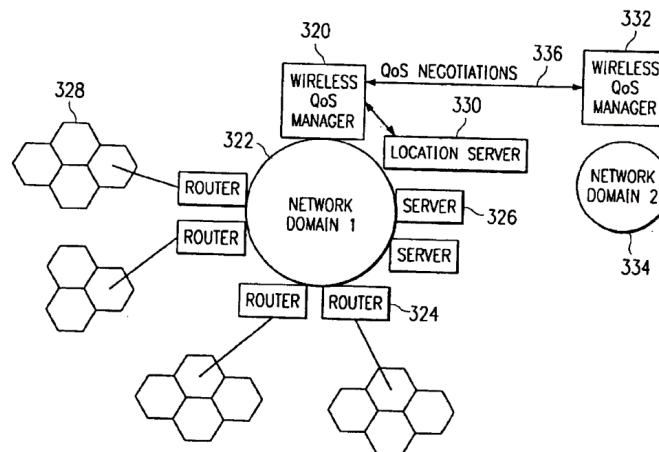


FIG. 14

Ex.1007, Fig. 14.

Further, Patel-764 recognizes that the “bandwidth broker...algorithms and functions may be distributed to various network elements such as application servers, routers and/or IP gateways, or cell sites to effectively allocate bandwidth.” Ex.1007, 16:61-17:2; Ex.1003, ¶256.

2. Reasons to Combine Patel-764 with Patel-225

A POSITA would have considered and applied the teachings of Patel-764 because Patel-225 suggests the combination by expressly citing to and incorporating it by reference. Ex.1005, 4:12-18; Ex.1003, ¶¶257-258.

As noted above, Patel-764 recognizes that the bandwidth broker may be distributed as algorithms and functions in network elements (e.g., IP gateway), to “effectively allocate bandwidth.” Ex.1007, 16:61-17:2. It would have been obvious to a POSITA, to implement Patel-225’s bandwidth broker as distributed algorithms and functions in various network elements, including IP gateways of the wireline IP network 24 and wireless network 12, to effectively allocate bandwidth. Ex.1007, 16:61-66; Ex.1003, ¶260. Implementing the bandwidth broker in the IP gateway of Patel-225 is beneficial since its position, at the border of the wireline IP network 24 and wireless network 12, means that the bandwidth broker has visibility to the traffic flows and resource utilization of both networks which is valuable for performing admission control. Additionally, a POSITA would have understood that having visibility to the traffic flows and resources utilization across both networks supports measurement-based admission control, which is beneficial since more immediate reservations can be admitted and because bandwidth utilization may be improved. *See* analysis at claim 9, *infra*. These benefits, separately and together, would have motivated a POSITA to combine the relevant teachings. Ex.1003, ¶¶259-260.

Furthermore, it would have been obvious to a POSITA, in view of Patel-764, to signal resource information between the bandwidth broker and at least a second bandwidth broker used within at least a second network domain in Patel-225.

Ex.1007, 16:46-54; Ex.1003, ¶261. This would be beneficial since it would give notice to Patel-225's bandwidth broker if the neighboring domain had sufficient resources and allow for reserving bandwidth across multiple domains to provide end-to-end QoS, which as discussed above provides multiple benefits. *See, e.g.*, Ex.1023, Abstract; Ex.1024, 2; Section IX.C.4 and analysis at [1.0.1]; Ex.1003, ¶261.

Signaling resource information between neighboring domains is consistent with the combination of Patel-225 with Schelen-1997 and Schelen-1999. Ex.1005, 1:56-61 ("The bandwidth brokers manage the allocations of bandwidth within their network domain and communicate with bandwidth brokers of other network domains to negotiate QoS parameters."); Ex.1011, 17-18 (the bandwidth broker cooperates with neighboring bandwidth brokers to make "reservations... towards destination domains."); Ex.1031, 265-266 ("end-to-end reservations... involving several routing domains are handled by cooperation between the involved" bandwidth brokers); Ex.1003, ¶261.

A POSITA would have considered the combination of Patel-764 with Patel-225 as merely the use of known techniques (using a distributed bandwidth broker and signaling resource information between bandwidth brokers of other domains, per Patel-764) to improve the similar system of Patel-225 (see above noted benefits) in the same way. The results would have been predictable and there

would have been a reasonable expectation of success since Patel-225 incorporates these teachings into its own specification. Ex.1003, ¶¶262-263.

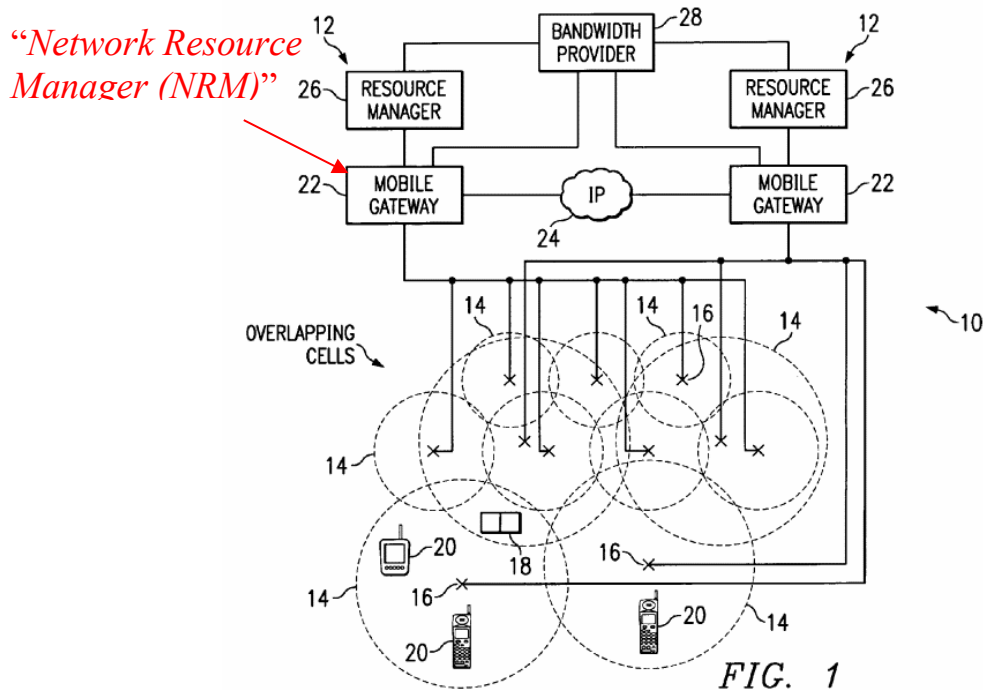
3. Claim 2

[2.1] Method according to claim 1, wherein the NRM is used within the RAN and the CN.

To the extent argued that the analysis at Ground 1 for Claim 2 is insufficient, the further combination with the incorporated teachings of Patel-764 renders the claim obvious. Ex.1003, ¶¶264-265.

It was known in the art that the “BB [bandwidth broker] is a logical entity; actual implementations may take either a centralized or a distributed approach, or a combination of both.” Ex.1025, 5. The incorporated teachings of related Patel-764 reflect this understanding, disclosing that the “**bandwidth broker...algorithms and functions may be distributed to various network elements such as application servers, routers and/or IP gateways, or cell sites to effectively allocate bandwidth.**” Ex.1007, 16:61-17:2. In view of Patel-764, it would have been obvious to a POSITA to implement Patel-225’s bandwidth broker as distributed algorithms and functions (since a bandwidth broker is merely a logical entity) in various network elements of the wireline IP network 24 (“CN”) and wireless network 12 (“RAN”) to effectively allocate bandwidth. *See also* Reasons to Combine Patel-764 with Patel-225. Ex.1003, ¶266.

As a nonlimiting example, the bandwidth broker may be implemented in part within mobile gateway 22, which operates as an IP gateway within the wireline IP network 24 and the wireless network 12. *See* Ex.1005, 5:6-15 (describing that mobile gateway 22 provides “access...for all transport control protocol/Internet protocol (TCP/IP) data connections” between “the wireless portion of the cellular network 12 [and] a wireline portion 24.”); *see also* Ex.1008, 21:12-37 (mobile IP gateway includes “a plurality of QoS engine cards 352, and a plurality of network side peripherals 354” for “routing,” “processing and handling traffic received from the wireless portion of the network,” including “cards for connection to disparate wireline formats or different portions of the network...to receive traffic for use by the QoS engine 352.”); *see also* Ex.1008, 11:32-12:5. Since the bandwidth broker is distributed, at least in part, in the mobile gateway 22, it has visibility to the traffic on both the wireline IP network 24 and the wireless network 12, which is useful information for effectively allocating bandwidth. Ex.1003, ¶267.



Ex.1005, Fig. 1 (annotated); Ex.1003, ¶267.

The bandwidth broker is “used within” the wireline IP network 24 and the wireless network 12 at least because the distributed algorithms and functions are used within various elements of these networks to effectively allocate bandwidth therein, as well as being used to perform various operations analyzed in Claim 1 (see also analysis at Claim 2 of Ground 1). Ex.1003, ¶¶268-269.

4. Claims 3-4

See analysis at Claim 2 of Ground 2. Ex.1003, ¶270.

5. Claim 5

[5.1] Method according to claim 1, the method comprising the further step of signalling resource information between the NRM and at least a second NRM used within at least a second network domain.

To the extent argued that the analysis at Ground 1 for Claim 5 is insufficient, the incorporated teachings of Patel-764 renders the claim obvious. Specifically, Patel-764 discloses that the bandwidth broker 320 of network domain 322 interacts with the bandwidth broker 332 “of other network domains 334 to negotiate various QoS provisioning 336.” Ex.1007, 16:46-54. The provisioning is “**based on time and space considerations such as the geo-location of the demand and supply.**” Ex.1007, 16:48-52. Figure 14 illustrates signaling QoS provisioning 336 (“*resource information*”) between (shown by arrows) bandwidth broker 320 (“*the NRM*”) used in first domain 322 and bandwidth broker 332 (“*a second NRM*”) used in second domain 334 (“*a second network domain*”). Ex.1003, ¶¶271-272.

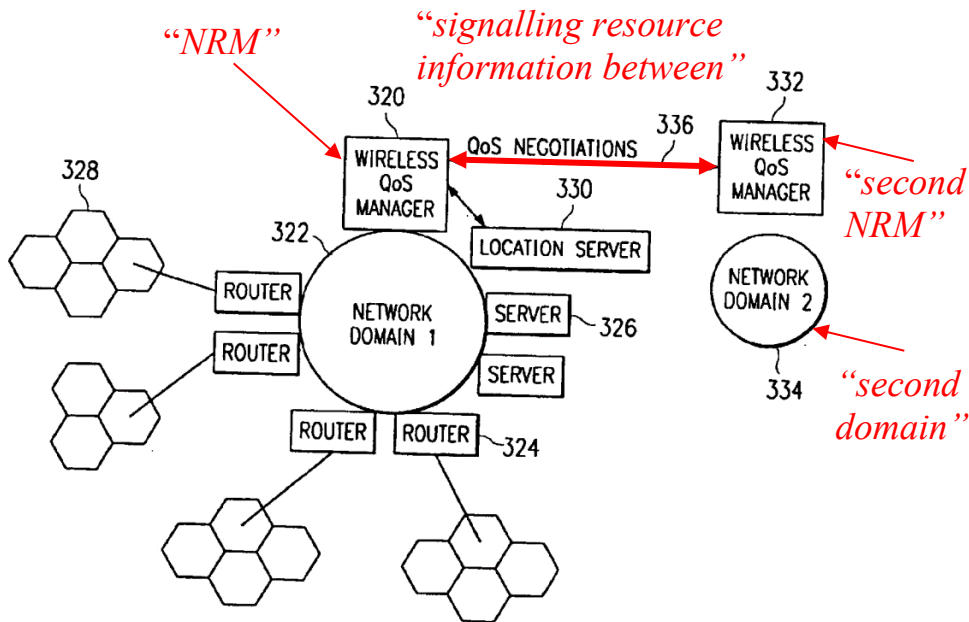


FIG. 14

Ex.1007, Fig. 14 (annotated); Ex.1003, ¶272.

It would have been obvious to a POSITA, in view of Patel-764, to signal resource information between Patel-222’s bandwidth broker and at least a second bandwidth broker used within at least a second network domain in Patel-225, to reserve end-to-end bandwidth when the destination is in the second domain and thereby fulfill end-to-end QoS. *See also* Reasons to Combine Patel-764 with Patel-225; Ex.1003, ¶¶273-274.

D. Ground 3: Claim 9 is Obvious over Patel-225, Schelen-1999, Schelen-1997, and Degermark

1. Degermark

Degermark describes performing admission control “along the path of a flow” using “end-to-end resource reservation protocol.” Ex.1019, 1-3. The technique utilizes “measurement-based admission control for advanced reservations” that is useful in “provid[ing] quality-of-service (QoS) for real time applications.” Ex.1019, 1-2.

According to Degermark, the admission decision “is based on requested rates for flows that have not yet started and on measured rates for currently active flows.” Ex.1019, 3-4. The measurement-based admission control is illustrated in Figure 1 (replicated below).

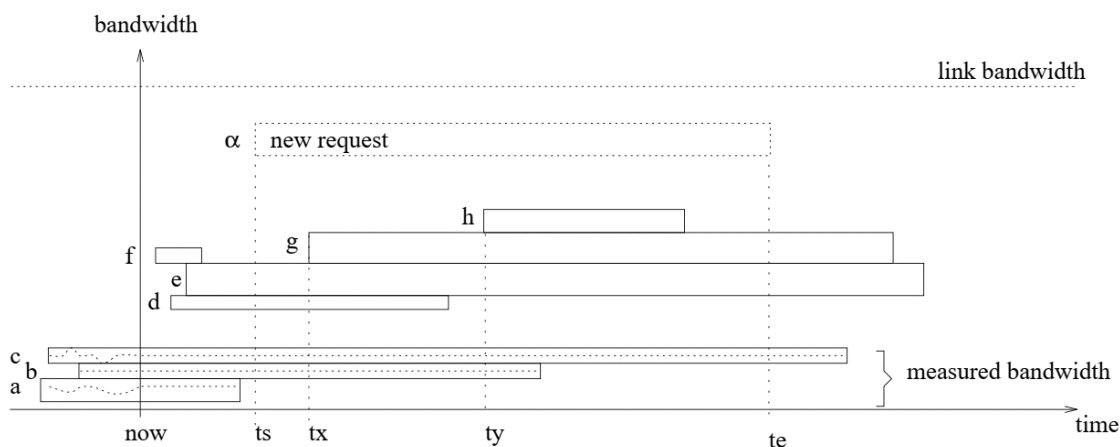


Fig. 1. Snap-shot of reservations

Ex.1019, Fig. 1.

Degermark explains that in the above figure, “[f]lows a, b and c are currently active and we have measurements of their rates and maximum delays which are used as predictions of their future behavior.” Ex.1019, 3-4. The admission “consider[s] flows that overlap with the new flow (b, c, d, e, g, h), using measured bandwidth if they have started or, otherwise, bandwidth requests.” Ex.1019, 3-4. “Thus, as we get closer in time to the point at which a flow with an advance reservation is to begin, we have a more accurate knowledge of the network load and more flows can be admitted [meaning that] [r]equests for immediate reservation can fill up the remaining bandwidth.” Ex.1019, 3-4. With this technique, a new admission “is granted if the new flow would not cause any delay bounds to be violated or bandwidth limits to be exceeded.” Ex.1019, 3-4; Ex.1003, ¶¶275-277.

2. Reasons to Combine Degermark with Patel-225

First, Degermark is analogous art to the ’601 patent, since it pertains to allocating bandwidth, including using agents (also known as bandwidth brokers). Ex.1019, 1-2; Ex.1031, 265-266. Further, Degermark would be considered together with Patel-225 since both addresses allocating bandwidth immediately and in advance. Ex.1005, 6:22-41; Ex.1019, 1-4. Thus, a POSITA considering Patel-225 would have also considered the teachings of Degermark. Ex.1003, ¶¶278-279.

Second, Patel-225 (as modified per Schelen-1999 and Schelen-1997) performs path sensitive admission control for immediate and advance reservations. Degermark discloses measurement-based admission control, as summarized above. It would have been obvious to a POSITA to utilize a measurement-based admission control when performing path-sensitive call admission control in Patel-225 (as modified per Schelen-1999 and Schelen-1997) because it allows for estimating the network load accurately for the near future so that more immediate reservations can be admitted and fill up the remaining bandwidth. Ex.1019, 1, 3-4; Ex.1003, ¶280. These benefits, separately and together, would have motivated a POSITA to combine the relevant teachings.

Third, a POSITA would have had a reasonable expectation of success since the scheduling admission control approach of Degermark is similar to and complements the approach in Patel-225 (as modified per Schelen-1999 and Schelen-1997). Also, a POSITA would have also known that measurement-based admission control may add signaling overhead in a centralized bandwidth broker approach, which may be addressed by implementing a distributed bandwidth broker that is within various network elements (e.g., routers, switches, etc.,) so that traffic measurements can be done directly. *See*, Ex.1007, 16:61-17:2; Ex.1031, 266. Both centralized and decentralized approaches would work, but a decentralized bandwidth broker would reduce the need to transmit measurements.

A POISTA would have known how to implement both approaches. Ex.1003, ¶¶281-282.

3. Claim 9

[9.1] Method according to claim 1, wherein the path-sensitive call admission control is measurement based.

First, as discussed at limitations [1.2]-[1.5], Patel-225 in combination with Schelen-1999 and Schelen-1997 discloses that the bandwidth broker controls IP network resources by performing “*path-sensitive call admission control*” for immediate and advance reservations. Ex.1003, ¶¶283-284.

Second, Degermark discloses that admission control is “**measurement-based**,” as illustrated in Figure 1 (replicated below). Ex.1019, Abstract, Fig. 1.

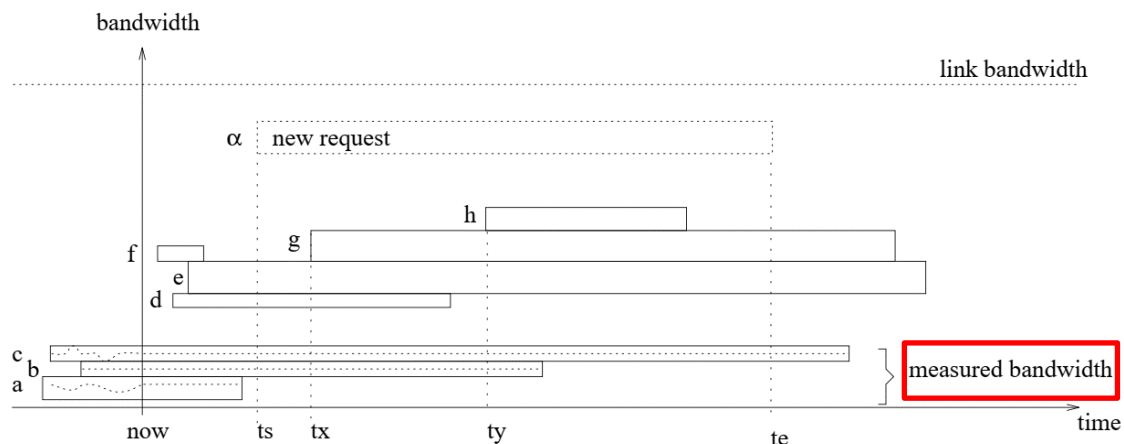


Fig. 1. Snap-shot of reservations

Ex.1019, Fig. 1 (annotated); Ex.1003, ¶285.

Degermark’s “measurement-based” admission control technique “consider[s] flows that overlap with the new flow (b, c, d, e, g, h), using **measured** bandwidth if they have started” and otherwise it considers the bandwidth requests (which is parameter based). Ex.1019, 3-4; *see also* Ex.1019, 1 (“We extend a **measurement-based admission control**...For flows that have not yet started, the requested values are used, and for those that have already started **measurements are used**.”). This technique “**allows [for] estimate[ing] the network load accurately for the near future**,” such that a new admission request “is granted if the new flow would not cause any delay bounds to be violated or bandwidth limits to be exceeded.” Ex.1019, 1, 3-4; Ex.1003, ¶286.

It would have been obvious to a POSITA to utilize a measurement-based admission control technique, per Degermark, when performing path-sensitive call admission control in Patel-225, because it would allow for estimating the load accurately for the near future admission requests. *See also* Reasons to Combine Degermark with Patel-225. Ex.1003, ¶¶287-288.

E. Ground 4: Claims 1-8 are Obvious over Patel-225, Schelen-1999, Schelen-1997, Patel-185, and Patel-624

1. Patel-185 and Patel-624

Patel-225 cites to and incorporates by reference Patel-185 and Patel-624. Ex.1005, 1:5-19, 4:58-64, 5:15-26. The incorporated teachings of related Patel-185

provide complementary disclosure, including teaching that the wireless communication system 10 (which is very similar to that of Patel-225) provides “improved wireless services” wherein “end-to-end QoS is assured.” Ex.1008, 3:53-61, 5:30-6:33. Ex.1003, ¶¶289-290.

Further, the incorporated teachings of related Patel-624 disclose a wireless communication network 10 (very similar to that of Patel-225). Ex.1010, 5:25-6:45. Patel-624 explains that its “cellular and other wireless networks are implemented with wireless routers that provide an all-Internet protocol (IP) access network, distribute traffic processing functionality to the cells, and seamlessly interwork with the core IP network.” Ex.1010, 2:7-11. Also, Patel-624 explains that the wireline network corresponds to “the core IP network and may be the Internet, intranet, extranet, or other suitable local, wide area network, or combination of networks.” Ex.1010, 5:52-60; Ex.1003, ¶291.

2. Reasons to Combine Patel-185 and Patel-624 with Patel-225

First, a POSITA would have considered and applied the teachings of Patel-185 and Patel-624 because Patel-225 suggests the combination by expressly citing to and incorporating them by reference. Ex.1005, 1:5-19, 4:58-64, 5:15-25; Ex.1003, ¶¶292-293.

Second, it would have been obvious to a POSITA, in view of Patel-185, to assure end-to-end QoS is provided in Patel-225 (as modified per Schelen-1999 and

Schelen-1997) at least because it was known in the art that end-to-end QoS is useful (and in certain instances essential) when transmitting audio and other real-time data. Ex.1003, ¶294. Additionally, each of the motivations for providing end-to-end QoS, articulated in the context of Ground 1, equally apply here for Ground 4. *See* Section IX.C.4 and analysis at [1.0.1]; Ex.1003, ¶294.

Furthermore, it would have been obvious to a POSITA, in view of Patel-624, to implement Patel-225's wireline portion 24 (which may be any suitable network) as a CN and use all IP based transmission in the instance where Patel-225's mobile wireless communications network 10 supports the W-CDMA standard (or another standard) that utilizes a CN and uses IP based transmission. Ex. 1005, 4:20-28 ("...established standards...W-CDMA..."), 5:10-12 ("The wireline portion 24 may be the Internet, intranet, extranet, or other suitable local or wide area network."); Ex.1013, 3:3-13 ("The general system architecture....includes User Equipment (UE), UMTS Terrestrial Radio Access Network (UTRAN) and the Core Network."), 7:14-18 ("packet data based cellular systems...using IP network protocol."),16:53-56 ("...WCDMA..."). Implementing Patel-225 per the incorporated teachings of Patel-624 would simply allow the system to function per the W-CDMA standard (or some other standard), which Patel-225 seeks to support. Ex.1003, ¶295.

This is nothing more than combining prior art elements (a CN per Patel-624 with Patel-225’s wireline portion 24) according to known methods (using IP based transmission) to yield predictable results (allow the system to support established standards). The results would have been predictable and there would have been a reasonable expectation of success since Patel-225 incorporates the noted teachings into its own specification. Ex.1003, ¶¶296-297.

3. Claim 1

Other than the below identified limitations, the remaining Claim 1 analysis of limitations [1.0.1]-[1.8] in Ground 1 remains the same in Ground 4. Ex.1003, ¶298.

To the extent argued that “*end-to-end QoS*” is not expressly disclosed in the Ground 1 analysis, the incorporated teachings of related Patel-185 discloses that “**end-to-end QoS is assured.**” Ex.1008, 3:53-61, 5:30-6:33. It would have been obvious to a POSITA, in view of Patel-185, to provide end-to-end QoS in Patel-225’s wireless communication network 10, because it would improve the likelihood of successfully transmitting of “data and/or voice traffic between mobile devices and a wireline network.” Ex.1005, 1:56-63. Also, providing end-to-end QoS would support additional real-time data, such as video. *See also* Reasons to Combine Patel-185 and Patel-624 with Patel-225; Ex.1003, ¶299.

To the extent argued that “*a Core Network (CN)*” and “*using Internet Protocol (IP) based transmission*” are not expressly disclosed in the Ground 1 analysis, the incorporated teachings of related Patel-624 disclose that its “cellular and other wireless networks are implemented with wireless routers that **provide an all Internet protocol (IP) access network**, distribute traffic processing functionality to the cells, and seamlessly interwork with the **core IP network**.” Ex.1010, 2:7-11. Patel-624 also explains that the wireline network corresponds to “**the core IP network** and may be the Internet, intranet, extranet, or other suitable local, wide area network, or combination of networks.” Ex.1010, 5:52-60. It would have been obvious to a POSITA, in view of Patel-624, to implement a CN and use all IP based transmission in Patel-225 when wireless communication network 10 supports a standard that requires such features (e.g., WCDMA). *See also* Reasons to Combine Patel-185 and Patel-624 with Patel-225; Ex.1003, ¶300.

Thus, the combination of Patel-225, Schelen-1999, Schelen-1997, Patel-185, and Patel-624 renders obvious Claim 1. Ex.1003, ¶301.

4. Claims 2-8

See analysis at Claim 1 of Ground 4 and Claims 2-8 of Ground 1. Ex.1003, ¶302.

F. Ground 5: Claims 2-5 are Obvious over Patel-225 Schelen-1999, Schelen-1997, Patel-185, Patel-624, and Patel-764

1. Claims 2-5

See analysis at Claim 1 of Ground 4 and Claims 2-5 of Ground 2. Ex.1003, ¶303.

G. Ground 6: Claim 9 is Obvious over Patel-225, Schelen-1999, Schelen-1997, Patel-185, Patel-624, and Degermark

1. Claim 9

See analysis at Claim 1 of Ground 4 and Claim 9 of Ground 3. Ex.1003, ¶304.

X. DISCRETIONARY DENIAL IS INAPPROPRIATE

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

The combinations of references presented in the grounds herein have not previously been presented to the Office. None of the references presented in the petition were cited or considered by the Examiner during prosecution of the '601 patent. While the Schelen Thesis, which was before the examiner, has some overlap in subject matter with the disclosure of Schelen-1999, Schelen-1997, and Degermark, the relevant teachings and the evidence were not considered as presented herein. Accordingly, discretionary denial under 35 U.S.C. § 325(d) is not appropriate.

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

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

1. No evidence regarding a stay

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

2. Parallel proceeding trial date

This factor weighs against discretionary denial because the projected trial date—based on median time-to-trial statistics—is in August of 2024, around the same time as the Board’s Final Written Decision is expected in August of 2024.³

The co-pending district court amended complaint was filed in the Eastern District of Texas on August 19, 2022. Ex.1037. To accommodate Patent Owner’s assertion of five additional patents, the parties have jointly petitioned the Court to

³ August 2024 is 18 months after February 2023, when Petitioner expects a notice of accorded filing date for this petition.

move the *Markman* hearing to November 2023, and the trial setting to “May 2024 or subject to convenience of the Court’s schedule.” Ex.1041, 1, 3. The Board recognizes “that scheduled trial dates are unreliable and often change.” *See* Director’s June 21, 2022 Memorandum on Discretionary Denials (“Memo”), 8. In accordance with the Memorandum, “[t]he PTAB will weigh this factor [factor 2] against exercising discretion to deny institution under *Fintiv* if the median time-to-trial is around the same time or after the projected statutory deadline for the PTAB’s final written decision.” Memo, 9. Here, recent statistics show a median time-to-trial in the Eastern District of Texas at 24.5 months. Ex.1042, 5. Accordingly, the projected trial date for purposes of *Fintiv* is August of 2024—approximately 24 months after July 2022, and around the same time as the Board’s Final Written Decision is expected in August of 2024. Thus, this factor weighs in favor of institution.

3. Investment in the parallel proceeding

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

4. Overlapping issues with the parallel proceeding

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

5. Identity of parties

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

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

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

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

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

The '601 patent has not been challenged in any prior IPR petition, so none of *General Plastic* discretionary institution factors apply to this Petition. *See General Plastic Indus. Co., Ltd. v. Canon Kabushiki Kaisha*, IPR2016-01357, Paper 19 at 16 (Sept. 6, 2016) (Section II.B.4.i. precedential).

XI. CONCLUSION

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

Respectfully submitted,

Dated: February 17, 2023
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Registration No. 57,456

XII. MANDATORY NOTICES

A. Real Party-in-Interest

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

B. Related Matters

Pursuant to 37 C.F.R. § 42.8(b)(2), to the best knowledge of the Petitioner, the '601 patent is or was involved in the following case(s):

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

C. Lead and Back-up Counsel and Service Information

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

CERTIFICATE OF WORD COUNT

Pursuant to 37 C.F.R. § 42.24(d), Petitioner hereby certifies, in accordance with and reliance on the word count provided by the word-processing system used to prepare this Petition, that the number of words in this paper is 13,899. Pursuant to 37 C.F.R. § 42.24(d), this word count excludes the table of contents, table of authorities, mandatory notices under § 42.8, certificate of service, certificate of word count, appendix of exhibits, and any claim listing.

Dated: February 17, 2023

/Theodore M. Foster/
Theodore M. Foster
Lead Counsel for Petitioner
Registration No. 57,456

CERTIFICATE OF SERVICE

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

Date of service February 17, 2023

Manner of service FEDERAL EXPRESS

Documents served Petition for *Inter Partes* Review Under 35 U.S.C. § 312 and 37 C.F.R. § 42.104 of U.S. 7,616,601; Petitioner's Exhibit List; Exhibits 1001-1038; Exhibits 1041-1042; and Petitioner's Power of Attorney.

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