

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

CISCO SYSTEMS, INC., DELL TECHNOLOGIES INC., AND DELL INC.,
Petitioners

IPR2023-00169
U.S. Patent No. 7,330,431

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

TABLE OF CONTENTS

Petitioners’ Exhibit List	6
I. Introduction.....	8
II. Grounds for standing	9
III. Note.....	9
IV. Summary of the ’431 patent	9
V. Prosecution history	10
VI. Effective priority date of the ’431 patent	11
VII. Level of ordinary skill in the art	11
VIII. Claim construction.....	11
IX. Relief requested and the reasons for the requested relief.....	12
X. Identification of how the claims are unpatentable.....	12
A. Challenged claims	12
B. Grounds	12
C. Ground 1: Claims 1-4, 7-9, 11, 25-26 Obvious Over Baker-Wright. 13	
1. Baker	13
2. Wright	14
3. Reasons to combine Baker and Wright.....	15
4. Claim 1	20
5. Claim 2.....	38
6. Claim 3	39

7.	Claim 4.....	42
8.	Claim 7.....	42
9.	Claim 8.....	44
10.	Claim 9.....	46
11.	Claim 11.....	47
12.	Claim 25.....	49
13.	Claim 26.....	53
D.	Ground 2: Claims 5, 10, 12-16, 18-24, 27-30 Obvious Over Baker-Wright-Holender	53
1.	Holender.....	53
2.	Reasons to combine Baker and Holender.....	54
3.	Claim 5.....	57
4.	Claim 10.....	59
5.	Claim 12.....	61
6.	Claim 13.....	67
7.	Claim 14.....	67
8.	Claim 15.....	67
9.	Claim 16.....	68
10.	Claim 18.....	68
11.	Claim 19.....	68
12.	Claim 20.....	69

13.	Claim 21	69
14.	Claim 22	70
15.	Claim 23	70
16.	Claim 24	71
17.	Claim 27	73
18.	Claim 28	75
19.	Claim 29	77
20.	Claim 30	77
E.	Ground 3: Claim 6 Obvious Over Baker-Wright-Zheng	78
1.	Zheng	78
2.	Reasons to combine Baker, Wright, and Zheng	78
3.	Claim 6	80
F.	Ground 4: Claim 17 Obvious Over Baker-Wright-Holender-Zheng	82
1.	Claim 17	82
XI.	Discretionary denial is inappropriate	83
A.	No basis for 35 U.S.C. § 325(d) denial	83
B.	Discretionary denial under the <i>Fintiv</i> factors is not appropriate	84
1.	No evidence regarding a stay	84
2.	Parallel proceeding trial date	84
3.	Investment in the parallel proceeding	85
4.	Overlapping issues with the parallel proceeding	86

5.	Whether the petitioners are defendants.....	86
6.	Other circumstances.....	87
C.	Discretionary denial under <i>General Plastic</i> is not appropriate.....	87
1.	Factor 1	88
2.	Factors 2-5.....	89
3.	Factors 6-7.....	89
XII.	Conclusion	90
XIII.	Mandatory notices	91
A.	Real party-in-interest.....	91
B.	Related matters	91
C.	Lead and back-up counsel and service information.....	91
XIV.	Appendix of Challenged Claims.....	93
	Certificate of Word Count	104
	Certificate of Service	105

PETITIONERS' EXHIBIT LIST

Ex.1001	U.S. 7,330,431
Ex.1002	Prosecution History of U.S. 7,330,431
Ex.1003	Declaration of Henry Houh, Ph.D. under 37 C.F.R. § 1.68
Ex.1004	<i>Curriculum Vitae</i> of Henry Houh, Ph.D.
Ex.1005	U.S. Pub. 2004/0095946 by Baker
Ex.1006	U.S. Pub. 2004/0174884 by Wright
Ex.1007	U.S. 6,104,699 to Holender
Ex.1008	U.S. 6,757,247 to Zheng
Ex.1009	U.S. Pub. 2003/0147400 by Devi
Ex.1010	U.S. 6,430,150 to Azuma
Ex.1011	U.S. Pub. 2007/0038753 by Jorgensen
Ex.1012	U.S. 7,675,926 to Olsen
Ex.1013	U.S. 7,953,888 to Ricciulli
Ex.1014	U.S. 7,450,598 to Chen
Ex.1015	Houh, Henry H., “Designing Networks for Tomorrow’s Traffic,” Thesis for the degree of Doctor of Philosophy at the Massachusetts Institute of Technology, February 1998
Ex.1016	Scheduling Order, <i>Corrigent Corp. v. Cisco Systems, Inc.</i> , No. 6:22-cv-00396, Dkt. 37 (W.D. Tex. Aug. 12, 2022).
Ex.1017	United States District Court – National Judicial Caseload Profile (June 2022).
Ex.1018	U.S. Pub. 2004/0223497 to Sanderson

Ex.1019	Preliminary Infringement Contentions, <i>Corrigent Corporation v. Cisco Systems, Inc.</i> , WDTX-6-22-cv-00396, Dkt. 1 (served August 3, 2022).
---------	---

I. INTRODUCTION

Cisco Systems, Inc., Dell Technologies Inc., and Dell Inc. (“Petitioners”) respectfully request that the Board review and cancel as unpatentable under (pre-AIA) 35 U.S.C. §103(a) claims 1-30 (the “Challenged Claims”) of U.S. 7,330,431 (the “’431 patent,” Ex.1001).

The ’431 patent describes network “bandwidth allocation” for a “service ha[ving] a logical connection topology that may be different from the [network’s] physical topology.” Ex.1001, 2:7-16. The Examiner allowed the claims because the prior art allegedly failed to teach “*mapping [a] connection topology to the physical topology...*” and “*allocating a bandwidth for the service on each of the links....*” Ex.1002, 28-31.

However, these concepts—and the rest of the claimed subject matter—were already well known. For example, the Baker prior art (Ex.1005) describes “automatically assigning network resources” when “a logical star topology... is overlaid on [a] non-star network.” Ex.1005, [0015]-[0016]. In doing so, Baker explains how “resources such as bandwidth can be more effectively managed.” Ex.1005, [0062].

Because the Challenged Claims merely recite concepts and techniques that were already known, Petitioners ask the Board to institute trial and find them unpatentable.

II. GROUNDS FOR STANDING

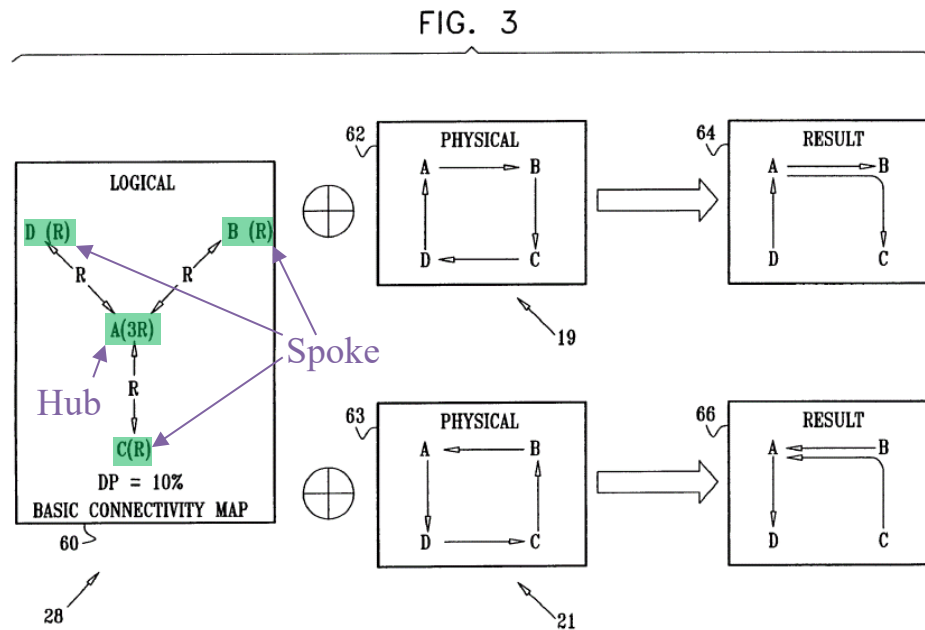
Petitioners certify that the '431 patent is eligible for IPR and that Petitioners are not barred or estopped from requesting IPR challenging the patent claims. 37 C.F.R. § 42.104(a).

III. NOTE

Petitioners cite to exhibits' original page numbers. **Emphasis** in quoted material has been added. Claim terms are presented in *italics*.

IV. SUMMARY OF THE '431 PATENT

The '431 patent relates to “methods and systems for bandwidth allocation that make more efficient use of the guaranteed bandwidth available on [a] ring network.” Ex.1001, 2:7-10. The ring network is arranged in “a physical topology” with nodes and links, with “data transmission services” operating between nodes based on a “logical connection topology” different from the physical topology. Ex.1001, 2:11-16. Figure 3 (below) illustrates this with a hub-and-spoke logical topology mapped onto both directions of a two-way ring physical topology:



Ex.1001, Fig. 3 (annotated).

A network operator defines the logical topology and “required bandwidths for each of the nodes” via a manager node. Ex.1001, 7:12-28. The manager node maps this information to the physical topology, sums the bandwidth requirements for each link, and “allocates actual bandwidths to each of the links.” Ex.1001, 7:42-62; Ex.1003, ¶¶25-27.

V. PROSECUTION HISTORY

The examiner allowed the claims in the first Office action. Ex.1002, 25-31. The examiner’s reasons for allowance emphasized, inter alia, the “*mapping*” and “*allocating*” limitations in the independent claims. Ex.1002, 27-31.

VI. EFFECTIVE PRIORITY DATE OF THE '431 PATENT

The '431 patent was filed September 3, 2004 and does not claim priority to any earlier application. For purposes of this IPR only, Petitioners do not dispute that the Challenged Claims are entitled to a September 3, 2004 priority date.

VII. LEVEL OF ORDINARY SKILL IN THE ART

A Person of Ordinary Skill in The Art (“POSITA”) in September 2004 would have had a working knowledge of the networking art that is pertinent to the '431 patent, including network communications techniques and bandwidth management methodologies. A POSITA would have had a bachelor’s degree in computer science, computer engineering, electrical engineering, or an equivalent, and two years of professional experience relating to network communications including the use of logical topologies and bandwidth management. Lack of professional experience can be remedied by additional education, and vice versa. Ex.1003, ¶¶18-20.

VIII. 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). Petitioners submit 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); Ex.1003, ¶28.

IX. RELIEF REQUESTED AND THE REASONS FOR THE REQUESTED RELIEF

Petitioners ask that the Board institute a trial for *inter partes* review and cancel the Challenged Claims in view of the analysis below.

X. IDENTIFICATION OF HOW THE CLAIMS ARE UNPATENTABLE

A. Challenged claims

Petitioners challenge all claims of the '431 patent. A finding that the Challenged Claims (1-30) are unpatentable in this proceeding will resolve the parties' dispute in the co-pending litigations and obviate any need for a trial regarding the '431 patent, substantially reducing the time and expense of those litigations for all parties.

B. Grounds

Ground	Claims	Basis
#1	1-4, 7-9, 11, 25-26	35 U.S.C. § 103 (Pre-AIA) over Baker and Wright
#2	5, 10, 12-16, 18-24, 27-30	35 U.S.C. § 103 (Pre-AIA) over Baker, Wright, Holender
#3	6	35 U.S.C. § 103 (Pre-AIA) over Baker, Wright, Zheng
#4	17	35 U.S.C. § 103 (Pre-AIA) over Baker, Wright, Holender, Zheng

U.S. 2004/0095946 (Ex.1005, “**Baker**”) was filed on November 18, 2002.

U.S. 2004/0174884 (Ex.1006, “**Wright**”) was filed on March 5, 2003.

U.S. 6,104,699 (Ex.1007, “**Holender**”) issued August 15, 2000.

U.S. 6,757,247 (Ex.1008, “**Zheng**”) was filed February 20, 1998 and issued June 29, 2004.

Baker and Wright are prior art under 35 U.S.C. § 102(e). Holender is prior art under 35 U.S.C. § 102(b). Zheng is prior art under 35 U.S.C. § 102(a) and (e). None of these references were before the Patent Office during prosecution.

Petitioners’ grounds rely on the combined teachings of the references and not on a physical incorporation of elements. *See In re Mouttet*, 686 F.3d 1322, 1332 (Fed. Cir. 2012); Ex.1003, ¶¶49, 194, 362.

Petitioners also cite additional prior art below as evidence of the background knowledge of a POSITA and to provide contemporaneous context to support Petitioners’ assertions regarding what a POSITA would have understood from the prior art in the grounds. *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); *see also K/S HIMPP v. Hear-Wear Techs., LLC*, 751 F.3d 1362, 1365-66 (Fed. Cir. 2014); *Arendi S.A.R.L. v. Apple Inc.*, 832 F.3d 1355, 1363 (Fed. Cir. 2016).

C. Ground 1: Claims 1-4, 7-9, 11, 25-26 Obvious Over Baker-Wright

1. Baker

Baker describes how to overlay a logical topology (*e.g.*, a star topology) “on

a non-star network, such as a ring network” using virtual paths, and it discloses automatically assigning network resources (including bandwidth) to the network’s elements. Ex.1005, [0012], [0016], [0031], [0062]. Figure 5 shows an example star topology:

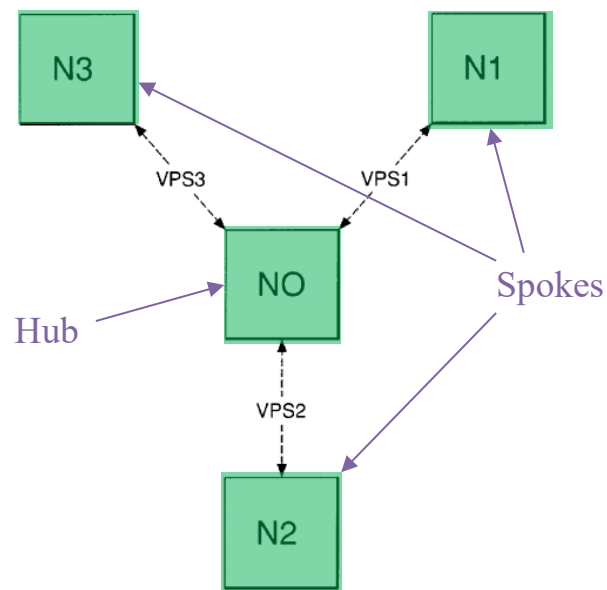


FIG. 5

Ex.1005, FIG. 5 (annotated); Ex.1003, ¶¶32-33.

Automatically assigning network resources includes “detecting the topology of connected elements in the network... allocating the network resources, and assigning the network resources to the network elements.” Ex.1005, [0016]; Ex.1003, ¶34.

2. Wright

Like Baker, Wright discloses a logical topology overlaid onto a physical

topology, and a procedure for assigning network resources. *See* Ex.1006, [0015]-[0016]. Wright's system constrains the logical connectivity to a "restricted topology (e.g., a virtual topology)" through the physical network to minimize bandwidth reservations used for providing "a bandwidth QoS." Ex.1006, [0016]-[0017]. The system receives the logical connectivity as data, provided "in terms of edge nodes and communication requirements between edge nodes" including "queuing and link scheduling mechanisms" for bandwidth guarantees. Ex.1006, [0018], [0015], [0024]. The "restricted topology" is created for a VPN service using the "logical connectivity data" and physical connections, and the bandwidth requirements calculated for "links within the restricted topology." Ex.1006, [0007], [0015], [0017], [0024]. Wright teaches reserving bandwidth on each physical link traversed by the restricted topology based on the calculation. Ex.1006, Abstract, [0005]-[0007], [0018], [0024]; Ex.1003, ¶¶35-37.

3. Reasons to combine Baker and Wright

A POSITA considering the teachings of Baker would have also considered the teachings of Wright, as they are analogous prior art pertaining to the same field of endeavor, namely, managing network resources for logical topology connections over an underlying physical topology. *See* Ex.1005, [0016] (disclosed is a method for automatically assigning network resources), [0030] (logical topology overlaid onto physical ring network); Ex.1006, [0005] (connectivity data received for

logical topology and bandwidth reserved). A POSITA would have been motivated to combine the teachings of Baker and Wright for multiple reasons, as discussed below. Ex.1003, ¶38.

First, Baker teaches several concepts, including the overlaying of a logical topology onto a physical topology, assigning and managing network resources, and conveying traffic between nodes, while Wright provides further details about those very same operations. For example, while Baker discloses overlaying a logical topology (such as a star topology) on an underlying physical network (such as a ring network), Baker is not concerned with where the logical topology originated. *See* Ex.1005, [0030]. A POSITA would have been motivated to turn to Wright for logical topology origination details, including a node receiving logical topology information. Ex.1003, ¶39.

Wright discloses a node receiving “logical connectivity data,” which is used to define a “restricted topology” (i.e., a logical topology) over a physical topology. Ex.1006, [0005]. It was well-known for one or more network nodes to receive logical topology information of the type disclosed in Baker, as demonstrated by Wright. *See, e.g.*, Ex.1006, [0005] (logical connectivity data received and used for logical topology); *see also* Ex.1010, 3:63-67 (each node “retains ... logical topology information”), 6:26-36 (nodes communicate logical topology updates to each other). It would have been obvious for a POSITA to turn to Wright for details

regarding the receipt of logical connectivity data. Ex.1003, ¶39.

Baker generally discloses assigning network resources to network elements and managing bandwidth in the network. *See* Ex.1005, [0016] (assign network resources), [0062] (bandwidth management). Wright provides more details about assigning and managing bandwidth a network such as Baker's (with a logical topology over a physical topology). *See, e.g.*, Ex.1006, [0016]-[0018], [0024]. For example, Wright determines logical connection bandwidth requirements, and aggregates those requirements on underlying physical links. *See id.* It would have been obvious to turn to Wright for details about bandwidth (for links and nodes) and the assignment of bandwidth as a network resource in Baker. Ex.1003, ¶40.

Baker also describes that traffic is conveyed between nodes in the physical network according to an overlaid logical topology, but Baker is agnostic to the types of services supported by, or associated with, that traffic. *See* Ex.1005, [0012], [0037]-[0038], [0080]. Wright provides, as examples of a service as a type of traffic, a virtual private network (VPN) service and also VoIP, video-on-demand, and video conferencing. *See* Ex.1006, [0003], [0015], [0025]. A POSITA would have been additionally motivated to apply Wright's additional examples of the types of service whose traffic traverses Baker's network. Ex.1003, ¶41.

Second, a POSITA would have had a reasonable expectation of success in combining the teachings of Wright with Baker. Ex.1003, ¶42. Wright's teachings

are compatible with Baker’s teachings. Baker teaches “using Asynchronous Transfer Mode (ATM) over SONET [Synchronous Optical NETwork].” Ex.1005, [0037]. Wright, similarly, teaches using SONET for the physical links with ATM virtual circuits over those links. Wright, [0015]; Ex.1007, 5:12-35 and FIG. 3 (ATM over SONET). Baker and Wright therefore teach using compatible network technologies, including ATM over SONET. Ex.1003, ¶42.

Further, both Baker and Wright disclose the imposition of a logical network onto the physical network. In Baker, this is described as overlaying “a logical star topology ... on an underlying non-star network, such as a ring network” (which can be the physical network). Ex.1005, [0030]. In Wright, this is described as a “restricted topology” over the physical topology, based on “[l]ogical connectivity data” for VPN services. Ex.1006, [0005]-[0007], [0014]. A POSITA would have had a reasonable expectation of success in view of the compatibilities between Baker’s and Wright’s teachings, including logical networks overlaid onto similar underlying physical networks. Ex.1003, ¶43.

Third, Baker’s “head node” is capable of implementing Wright’s teachings related to receiving connectivity data, determining bandwidth requirements, and supporting VPN services as a type of traffic. Baker’s head node “executes the Administer Ring routine” as part of the overlay procedures of the logical topology onto the physical topology. Ex.1005, [0051]-[0052]. The head node is designated

as a “peer group leader,” or “PGL,” which gives the PGL responsibilities beyond other peer nodes for routing and communication control. Ex.1005, [0046]. Baker teaches configuring the head node with additional computing and hardware resources so the “PGL/head node” can accomplish its tasks. Ex.1005, [0047]. With these additional resources, Baker’s head node would have sufficient resources to perform Wright’s disclosed tasks, such that a POSITA would have had a reasonable expectation of success in combining Wright’s and Baker’s teachings. Ex.1003, ¶¶44-45.

Fourth, it would have been predictable and within a POSITA’s skillset to combine Wright’s and Baker’s teachings. Overlaying logical topologies onto physical topologies and managing available bandwidth were known concepts, as demonstrated by Wright and others. *See, e.g.*, Ex.1006, [0016]-[0018]; Ex.1009, [0015]. The combination of Baker’s and Wright’s teachings would predictably result in Baker’s head node receiving logical topology information and assigning network resources (including bandwidth) based on the logical topology information, using techniques adapted from Wright. *See* Ex.1005, [0016]; Ex.1006, [0016]-[0018], [0024]. Applying Wright’s concepts to Baker’s network would advantageously allow Baker’s network to provide “bandwidth QoS guarantees” for traffic such as Wright’s connectionless VPN services. Ex.1006, [0014]; *see also* [0003]-[0004] (drawbacks of prior bandwidth management), [0015]; Ex.1005,

[0013]; Ex.1003, ¶¶46, 48.

Finally, in view of the foregoing, the combination of Baker and Wright is nothing more than the combination of known elements (Baker’s head node and traffic teachings, and Wright’s procedure and VPN service teachings), according to known methods (using Wright’s teachings in Baker’s network by the head node), to yield predictable results (Baker’s head node receiving the logical topology information, determining bandwidth requirements, and allocating bandwidth per Wright, with Baker’s network providing service for traffic like Wright’s VPN service, VoIP, VOD, etc.). Ex.1003, ¶47.

4. Claim 1

[1.0] *A method for assigning bandwidth in a network including nodes coupled by links arranged in a physical topology, the method comprising:*

Baker discloses the preamble, to the extent it is limiting.

First, Baker discloses “a method for automatically **assigning network resources** to a collection of elements in a network,” which includes “partitioning resources of the network, allocating the network resources, and assigning the network resources to the network elements.” Ex.1005, [0016]. Baker’s allocated network resources include “**bandwidth**.” *See* Ex.1005, [0062]; Ex.1003, ¶¶50-51.

Second, Baker’s managed network includes “*nodes*” coupled by “*links*” arranged in a “*physical topology*.” Figure 1 (below) illustrates “a bidirectional

physical communications ring where N0 through N7 represent routing and switching **nodes**, PH1 through PH8 represent bidirectional physical **links** between nodes.” Ex.1005, Fig. 1, [0031]-[0032]; *see also* [0030] (ring topology can “correspond to the topology of the actual physical network”); Ex.1003, ¶52.

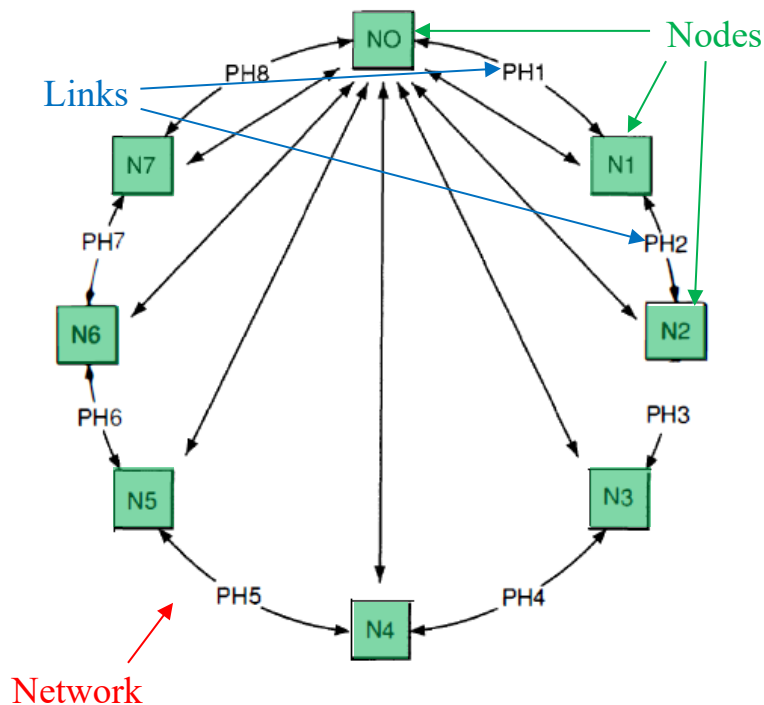


FIG. 1

Ex.1005, FIG. 1 (annotated); Ex.1003, ¶¶52-53.

Figure 2 illustrates another example of a ring network (a “*physical topology*”) with links PH1-PH4 coupling nodes N0-N4:

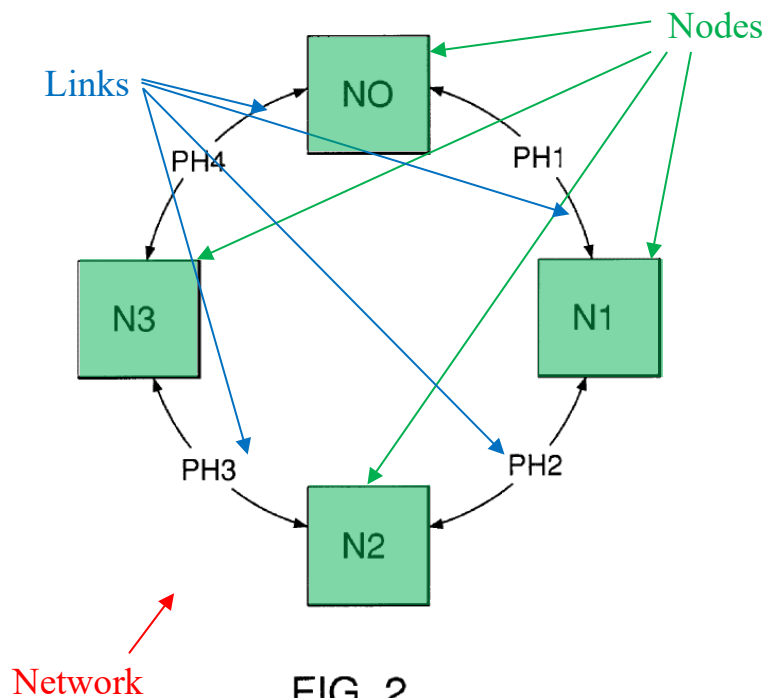


FIG. 2

Ex.1005, FIG. 2 (annotated), [0019]; Ex.1003, ¶¶53-54.

[1.1] defining between the nodes logical connections associated with a data transmission service to be provided over the network,

Baker, alone and in combination with Wright, renders this limitation obvious.

First, Baker discloses defining logical connections between the nodes. Baker overlays a logical topology onto a physical network. Ex.1005, [0030]. Figure 1 (below) illustrates physical links PH1-PH8 and “virtual paths” “VP1 through VP7” associated with the logical topology. Ex.1005, [0031]; *see also*

[0032], [0076]. These virtual paths—which Baker also refers to as logical paths¹—are “*logical connections.*” Ex.1003, ¶¶55-56.

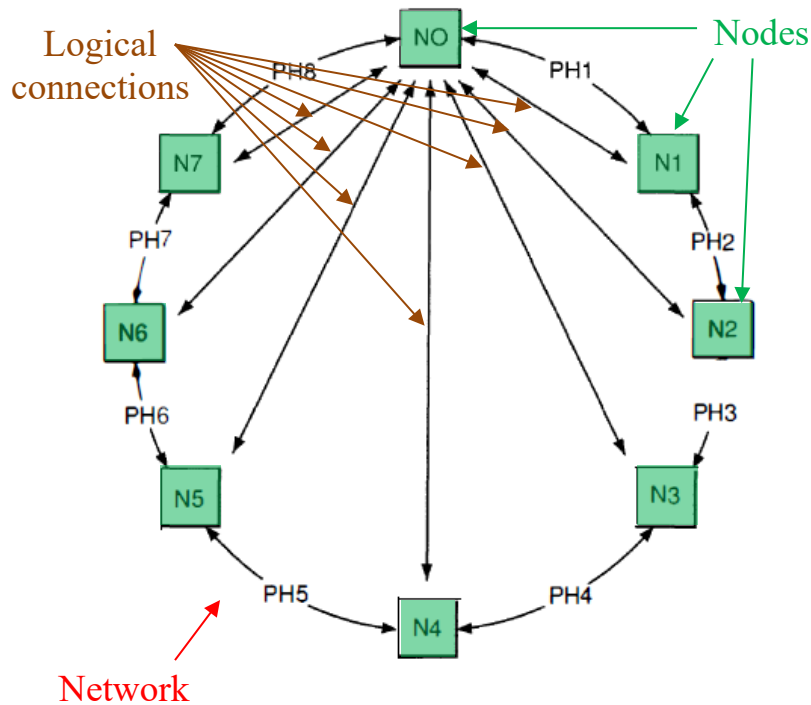


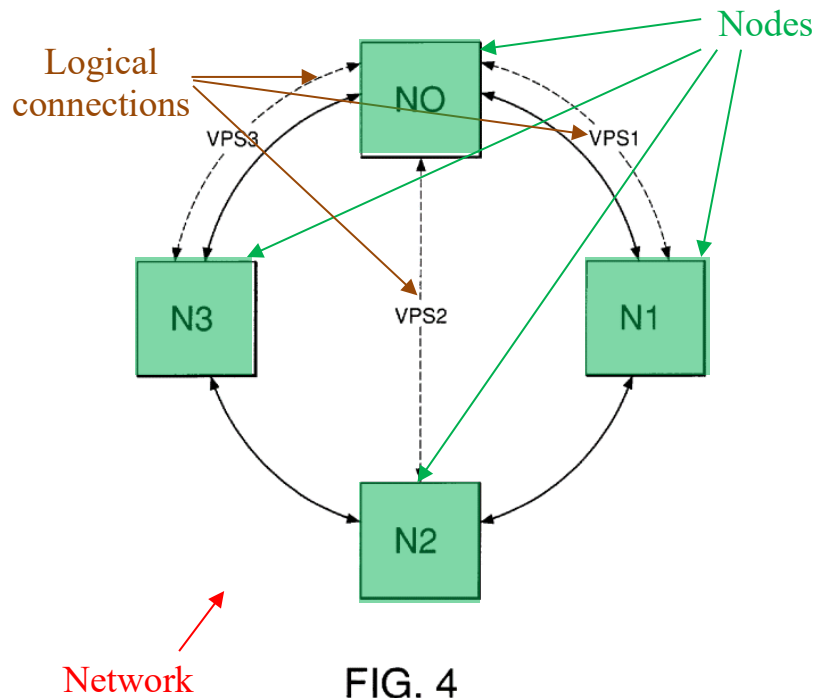
FIG. 1

Ex.1005, FIG. 1 (annotated); Ex.1003, ¶57.

Baker’s Figure 4 (below) illustrates another example, where a logical

¹ This petition will generally use the term “virtual path” in referring to Baker’s disclosure. See Ex.1005, [0032] (“the terms ‘virtual’ and ‘logical’ are used interchangeably”), [0088] (“logical or virtual paths”).

topology with virtual paths VPS1-VPS3 (“*logical connections*”)² is overlaid onto a physical ring network. Ex.1005, [0054].



Ex.1005, FIG. 4 (annotated); Ex.1003, ¶¶58-59.

Baker creates a virtual path by “**predefining** a route through the network in advance of a communication.” Ex.1005, [0076]. Baker’s creation of multiple virtual paths therefore discloses “*defining between the nodes logical connections.*” Ex.1003, ¶60.

² A POSITA would have recognized that the “VPS” in Figure 4 correspond to the “VPG” described in the specification’s description of Figure 4. Ex.1003, ¶59; Ex.1005, [0054] (“...dotted lines in FIG. 4 represent virtual paths...”).

Second, Baker’s virtual paths are associated with a “*data transmission service to be provided over the network.*” For example, “data traffic” is transported on Baker’s network, “logically carried” on logical links between nodes using the underlying physical topology. Ex.1005, [0080]; *see also* [0038]. Baker also discloses that “signals are transmitted” through the physical network according to the logical topology. Ex.1005, [0012]. Baker’s “data traffic” and transmitted “signals” correspond to the claimed “*data transmission service.*” *See* Ex.1001, 7:29-31 (“traffic of a data transmission service”) & 1:20-30 (“services” that “transfer packets” and handle “traffic”); Ex.1003, ¶¶61-62, 64.

Baker illustrates in Figure 11 (below) virtual paths L1-L3, which “support information flow between their respective interconnected nodes.” Ex.1005, [0080] (“...service traffic logically carried on L1...”). The “information flow” is another example of a “*data transmission service.*” Thus, the virtual paths are “*associated with a data transmission service to be provided over the network.*” Ex.1003, ¶63.

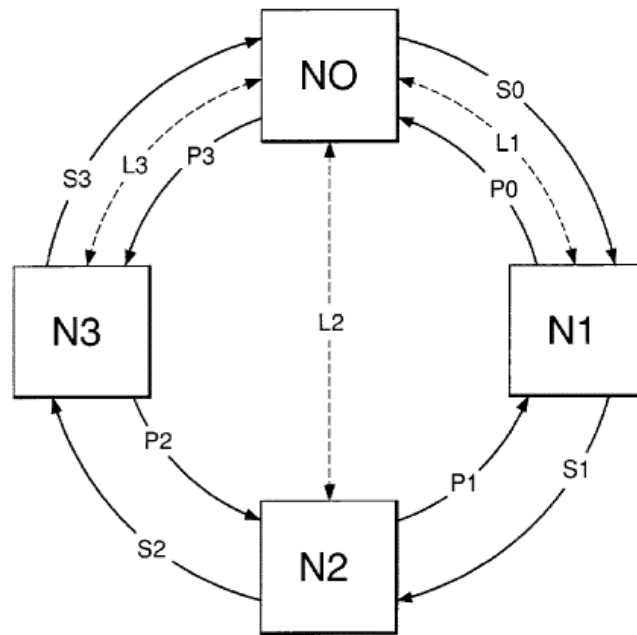


FIG. 11

Ex.1005, FIG. 11.

Third, the combination of Baker and Wright also renders obvious “*logical connections*” associated with a “*data transmission service*.” Like Baker, Wright describes a logical topology overlaid onto a physical topology. *See* Ex.1006, [0002]. Wright’s “traffic engineering” for “virtual private network (VPN) services” with “bandwidth QoS guarantees” begins with “receiving physical connectivity data” and “[l]ogical connectivity data.” Ex.1006, [0005]-[0007], [0014]. The bandwidth guarantees are provided “to ensure adequate bandwidth for the service.” *Id.*, [0014]. Like Baker’s virtual paths, the logical connectivity data illustrate how nodes communicate with one another “without regard to the physical

implementation.” Ex.1006, [0016]; *see also id.* [0003] (“traffic between the endpoints of the VPN”). VPN services (another example “*data transmission service*”) are provided as “packet-by-packet routing for a layer 3 service, or alternatively, an emulated VPLS [virtual private LAN service] for a layer 2 service.” Ex.1006, [0015], *and* [0025] (VoIP, video-on-demand, video conferencing as traffic examples on the VPN); *cf.* Ex.1001, 1:60-2:1 (VPLS as an example service). Wright’s logical connectivity data used in traffic engineering for VPN services render obvious “*logical connections associated with a data transmission service to be provided over the network.*” Ex.1003, ¶¶65-66.

A POSITA would have recognized that Wright’s services (including VPN, VoIP, video-on-demand, and video conferencing) are examples of a “*data transmission service.*” Baker’s logical connections are configurable to convey traffic for such services since both Baker and Wright describe using the same underlying network communication technologies, such as ATM and SONET. Ex.1003, ¶67. It would have been obvious for various services (as described by Wright) to transmit packets over Baker’s logical connections, and thus for such services to be associated with logical connections. Ex.1003, ¶¶67-68.

[1.2] *the logical connections having a connection topology different from the physical topology;*

Baker discloses this limitation. Baker’s logical topology is different from the

physical network onto which it is overlaid. For example, Baker teaches a “logical star topology” that is overlaid onto an “underlying non-star network, such as a ring network,” where the underlying network is a physical network. Ex.1005, [0030], [0013]. Baker’s Figure 1 (below) shows a “physical communications ring” overlaid with a “logical star topology.” Ex.1005, [0031].

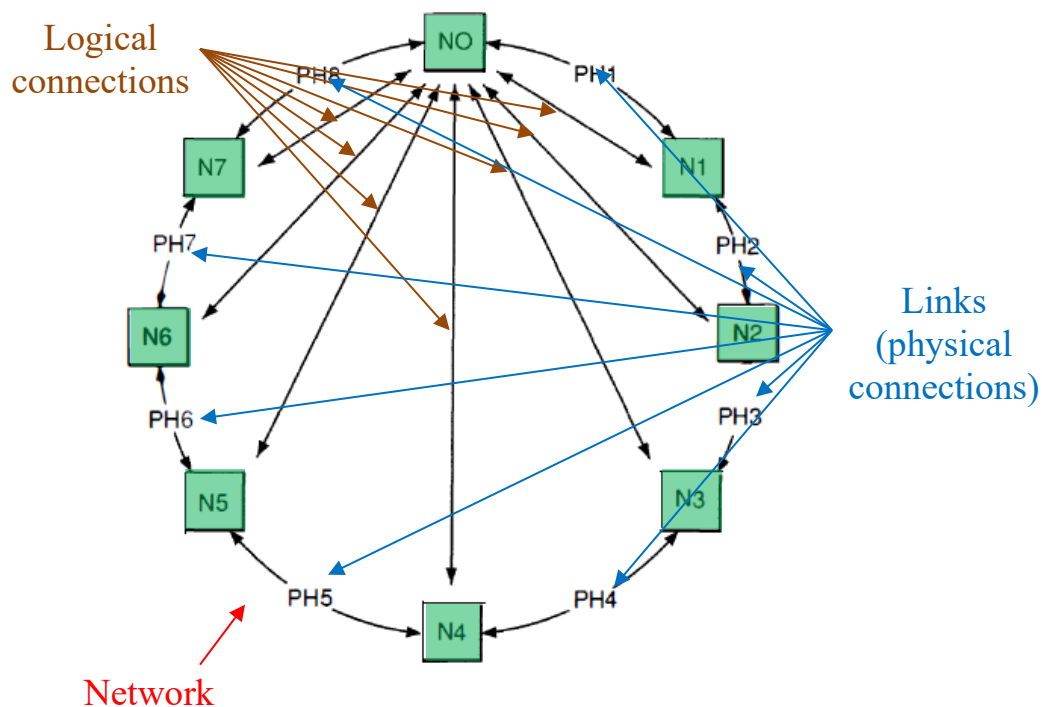
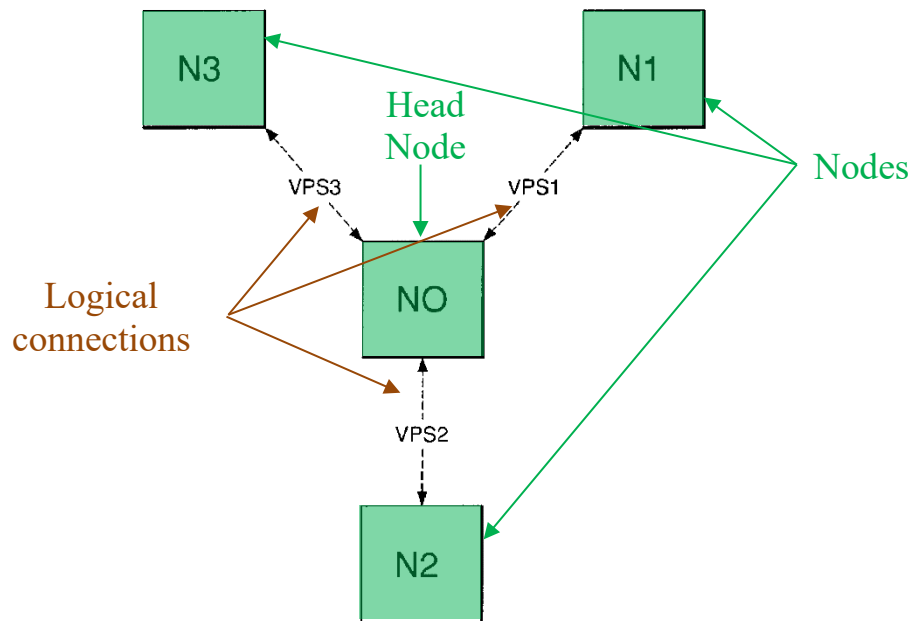


FIG. 1

Ex.1005, FIG. 1 (annotated); ¶¶69-70.

Baker illustrates in Figure 4 “a star topology that is overlaid on the underlying ring network.” Ex.1005, [0054]. The resulting logical star topology is shown in Figure 5 (Ex.1005, [0022]):



Ex.1005, Fig. 5 (annotated).

Thus, Baker discloses “*logical connections*” (the virtual paths in Figures 1 and 5) with a “*connection topology*” (a logical star topology) that is “*different from the physical topology*” (a ring network). Ex.1003, ¶¶71-73.

[1.3] determining respective bandwidth requirements for the logical connections based on parameters of the service;

The Baker-Wright combination renders this limitation obvious.

First, as discussed at [1.1], Baker’s virtual paths and Wright’s logical connectivity data, separately and together, render obvious “*logical connections.*”

Baker describes managing network resources such as bandwidth. Ex.1005, [0062]. It would have been obvious to a POSITA that in managing a limited resource such as bandwidth, Baker’s system would have made decisions based on

the bandwidth needed, desired, or used by the services operating over Baker's virtual paths. *See* Ex.1005, [0016], [0054]; Ex.1003, ¶¶74-76.

Second, Wright and Baker render obvious determining bandwidth requirements based on service parameters. Wright teaches “to identify the required bandwidth and to provide guarantees for that bandwidth.” Ex.1006, [0018]. For example, “ATM virtual circuits are dimensioned to the required bandwidth.” Ex.1006, [0018]; Ex.1003, ¶¶77-78.

Wright describes identifying exemplary bandwidth requirements for two logical connections: Node A to Node B (A-B), and Node A to Node C (A-C). Ex.1006, [0017]. Link A<->B requires x Mb/s, and link A<->C requires y Mb/s. Ex.1006, [0017]. This identification of connection bandwidth requirements discloses “*determining respective bandwidth requirements for the logical connections.*” Ex.1003, ¶78.

Wright further teaches the limitation with calculating “[a] bandwidth requirement for each link in the restricted topology.” Ex.1006, [0005]-[0007], [0017] (e.g., links 302, 304, 306 of the restricted topology), [0024] (bandwidth requirements are determined for point-to-point links from “communication requirements” of logical connectivity data); FIG. 5:

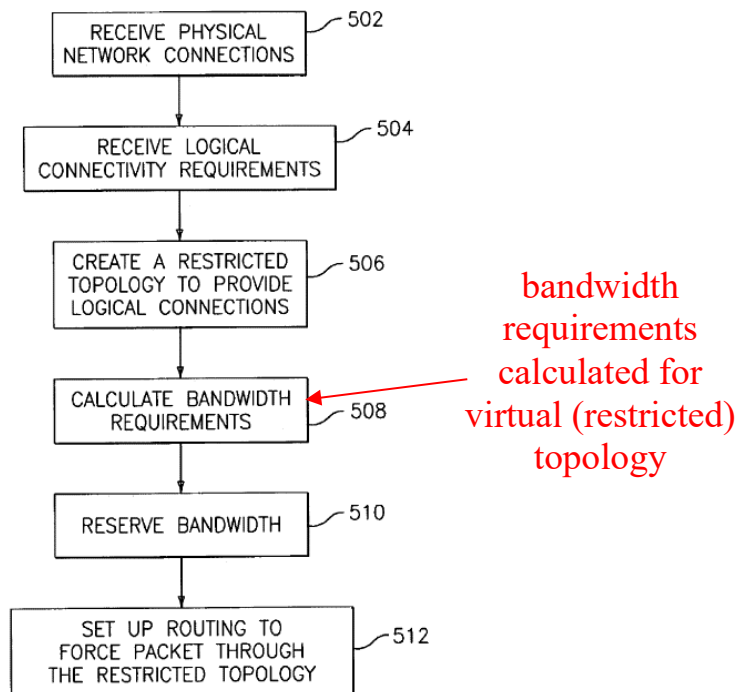


FIG. 5

Ex.1006, FIG. 5 (annotated); Ex.1003, ¶79.

From Figure 5, the bandwidth requirements are determined based on the “restricted topology,” which is in turn created from the “logical connectivity requirements.” Ex.1006, [0024]. It would have been obvious that the determined bandwidth requirements would include those for the logical connections (such as logical connections A-B and A-C in FIG. 3), since the bandwidth requirements of the logical connections are identified from the restricted topology. Ex.1003, ¶80; Ex.1006, [0017]. Wright’s “bandwidth requirements” calculated for virtual links of the virtual topology are therefore based on the “communication requirements” (“*parameters of the service*”) of the logical connectivity requirements. Ex.1006,

[0024]; Ex.1003, ¶¶80-81. Wright describes multiple additional exemplary ways in which bandwidth requirements are “*based on parameters of [a] service*”:

- “[B]andwidth allocation at each link could specify a minimum bandwidth, or a maximum bandwidth.” Ex.1006, [0018]. The minimum and maximum bandwidth values are each an example of “*parameters of the service.*”
- VPN service may include “QoS [quality of service] guarantees.” Ex.1006, [0020]. A QoS guarantee is another example “*parameter[] of the service.*”
- “[T]he bandwidth requirement would correspond to the number of active calls” supported by the service. Ex.1006, [0020].
- Whether a service is “symmetric” or “asymmetric.” Ex.1006, [0020].
- Whether a service is a “dynamic session based service[],... (e.g., video-on-demand, video conferencing).” Ex.1006, [0025].

See Ex.1003, ¶82.

Wright further describes example services such as voice over IP (VoIP) and video conferencing. Ex.1006, [0025]. A POSITA would have been familiar with how video conferencing commonly requires significantly greater bandwidth than VoIP, and thus it would have been obvious to determine a bandwidth requirement based on a parameter specifying a type of communication service (e.g., whether

voice or video). Ex.1003, ¶¶83-85.

[1.4] *mapping the connection topology to the physical topology, so that each of the logical connections is associated with one or more links of the physical topology; and*

Baker discloses this limitation. Baker describes “a set of special ‘star overlay’ procedures including ‘Administer Ring’” to overlay the logical topology to the physical topology. Ex.1005, [0051]. The Administer Ring procedure, when executed the first time, includes determining the total number of nodes and partitioning a virtual path (VP) address space by the number of nodes. Ex.1005, [0053]. For a logical star topology, each network node is assigned one or more virtual paths between itself and a head node. Ex.1005, [0053]-[0054]. Figure 1 shows how each node has a VP connection to a central node N0. *See* Ex.1005, [0054]; [0032]. Figure 4 (below) similarly shows “virtual paths assigned between the head node [N0] and” each other node in the network using the underlying physical communication links between nodes. Ex.1005, [0054].

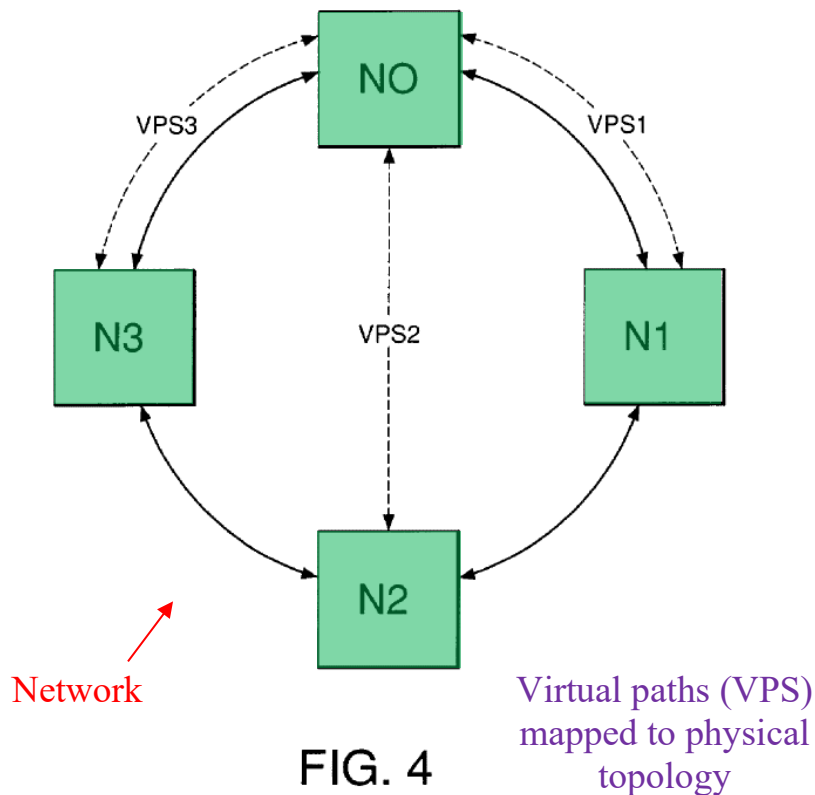


FIG. 4

Ex.1005, FIG. 4 (annotated); Ex.1003, ¶87.

Baker provides further examples of “mappings” that demonstrate how each virtual path corresponds to one or more physical links that physically carry traffic for the virtual path. *See, e.g.*, Ex.1005, [0069]-[0070] (“Traffic logically carried on [virtual path] L2 in an abstraction may be physically carried on the combination of [physical links] PH2 and PH3.”). Baker further describes “mapping between logical paths and physical paths” for the example network of Figure 10. Ex.1005, [0083]; *see also* [0078]-[0085]. Baker’s multiple disclosures and examples of overlaying or mapping virtual paths to a physical topology disclose the claimed “mapping.” Ex.1003, ¶¶88-89.

[1.5] *allocating a bandwidth for the service on each of the links in response to the bandwidth requirements of the logical connections and to the mapping.*

The Baker-Wright combination renders this limitation obvious.

First, Baker discloses a “method for automatically assigning network resources” that includes “allocating the network resources.” Ex.1005, [0016]; *see also* [1.0]. One allocated resource is “bandwidth.” Ex.1005, [0062]. Baker’s resource and bandwidth allocation techniques are executed as part of an overlay procedure that includes the “Administer Ring” routine. Ex.1005, [0051]-[0056], Fig.3; Ex.1003, ¶¶90-91.

Second, Baker acknowledges a need to ensure that “sufficient bandwidth is available.” *See* Ex.1005, [0009]. Wright provides further details on ensuring the available bandwidth is sufficient for the service (e.g., Baker’s data traffic, transmitted signals, information flow, Wright’s VPN service, voice-over-IP, video-on-demand, and video conferencing, *see* [1.1], [1.4]). Ex.1003, ¶92.

Wright teaches the use of “logical connectivity requirements” (virtual paths) and “communication requirements” (service parameters, *see* [1.3]) to “calculate bandwidth requirements on links.” Ex.1006, [0024]. And, as demonstrated at [1.3], it would have been obvious for Wright’s “communication requirements” to include “*bandwidth requirements*” for the logical connections as one of the “*parameters of the service*” so that the bandwidth requirements on the physical links may be

calculated. Ex.1003, ¶93.

Wright further explains that after the bandwidth is calculated, “the required bandwidth is reserved” on “each link in the restricted topology.” Ex.1006, [0024], [0005]. It would have been obvious that the bandwidth reservations are for the physical links corresponding to the virtual links of the virtual topology, since the restricted (virtual) topology is implemented “utilizing the underlying ... links 108 depicted in FIG. 1.” Ex.1003, ¶94; Ex.1006, [0015]-[0016]. The bandwidth reservations are for the physical links even if Wright’s “links within the restricted topology” (Ex.1006, [0024]) references the virtual links: “only the bandwidth actually required is reserved on the **links 108**” (i.e., physical links 108). Ex.1006, [0017]. It would have been obvious for reserving bandwidth on those virtual links to include reserving bandwidth on the underlying physical links (“*in response to... the mapping*”). Thus, Wright’s description renders obvious “*allocating a bandwidth for the service on each of the links.*” Ex.1003, ¶¶94-95.

Wright explains that bandwidth guarantees (e.g., allocations) are “designed to ensure adequate bandwidth for the service.” Ex.1006, [0014]. Wright also explains that “only the bandwidth actually required is reserved.” Ex.1006, [0017]. Accordingly, it would have been obvious for Wright’s bandwidth allocations to be “*in response to the bandwidth requirements*” of the services provided. Ex.1003, ¶97.

Further, Wright’s FIG. 5 process shows that bandwidth reservation (“*allocat[ion]*”) in step 510 occurs after defining the logical network relative to the physical links (the “*mapping*”) and calculating “*bandwidth requirements.*” See generally Ex.1006, [0024], FIG. 5:

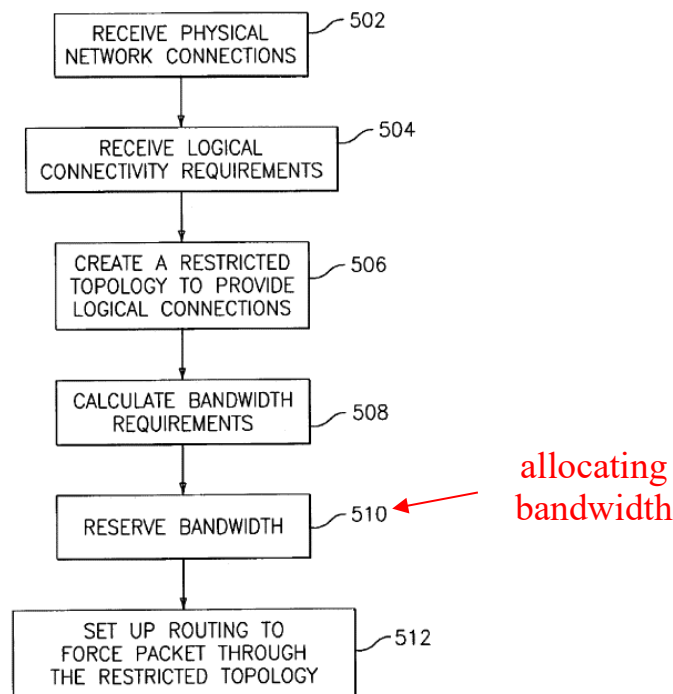


FIG. 5

Ex.1006, FIG. 5 (annotated); Ex.1003, ¶96.

A POSITA would have implemented Wright’s “*allocat[ing]*” as part of Baker’s “special ‘star overlay’ procedures” that includes “Administer Ring” (the “*mapping*”). Just as Baker’s Administer Ring routine results in a logical-to-physical network mapping, Wright discloses a logical-to-physical mapping when creating the restricted topology. See Ex.1005, [0016], [0062], [0051]-[0056].

Wright’s allocation follows the creation of the restricted topology, and thus in combination with Baker would follow Baker’s “Administer Ring” routine (“*mapping*”). See Ex.1006, [0024]; Ex.1003, ¶96. In addition to following the logical-to-physical mapping, Wright’s “*allocating*” occurs after the bandwidth determination (“*determining*”). Ex.1006, [0024]. It would have therefore been obvious that the logical-to-physical mapping and bandwidth requirements calculated (“*determin[ed]*”) would be used in allocating bandwidth in Wright’s step 510, so that the “*allocating*” is “*in response to the bandwidth requirements ... and to the mapping.*” Ex.1006, [0024]; Ex.1003, ¶¶96-98.

5. Claim 2

[2.0] *The method according to claim 1,*

See [1.0]-[1.5].

[2.1] *wherein the network comprises a ring network, and wherein the physical topology comprises a ring topology.*

Baker discloses overlaying a logical topology onto an underlying network, “such as a ring network” that “may correspond to the topology of the actual physical network.” Ex.1005, [0030]; *see also* [0019], FIGs. 1, 2; [1.0]. For example, Figure 2 shows a physical ring network with a ring topology:

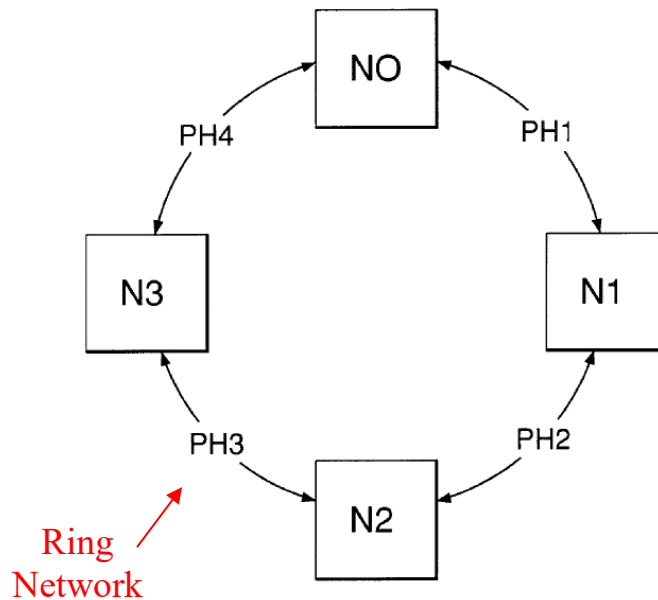


FIG. 2

Ex.1005, FIG. 2 (annotated); Ex.1003, ¶¶99-102.

6. Claim 3

[3.0] *The method according to claim 1,*

See [1.0]-[1.5].

[3.1] *wherein the connection topology is chosen from one of a hub-and-spoke topology and a full mesh topology.*

Baker discloses this limitation. Baker describes a “logical star topology” that is “overlaid onto an underlying non-star network.” Ex.1005, [0030]. The overlaid logical star topology (“*connection topology*” per [1.2]) is illustrated in FIG. 2:

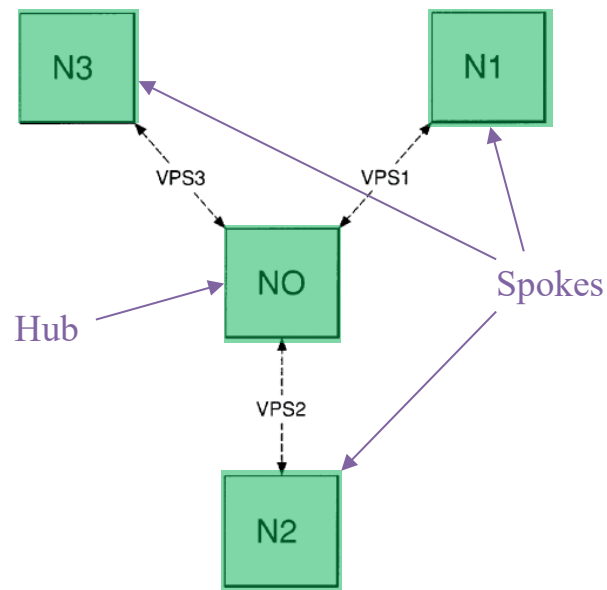
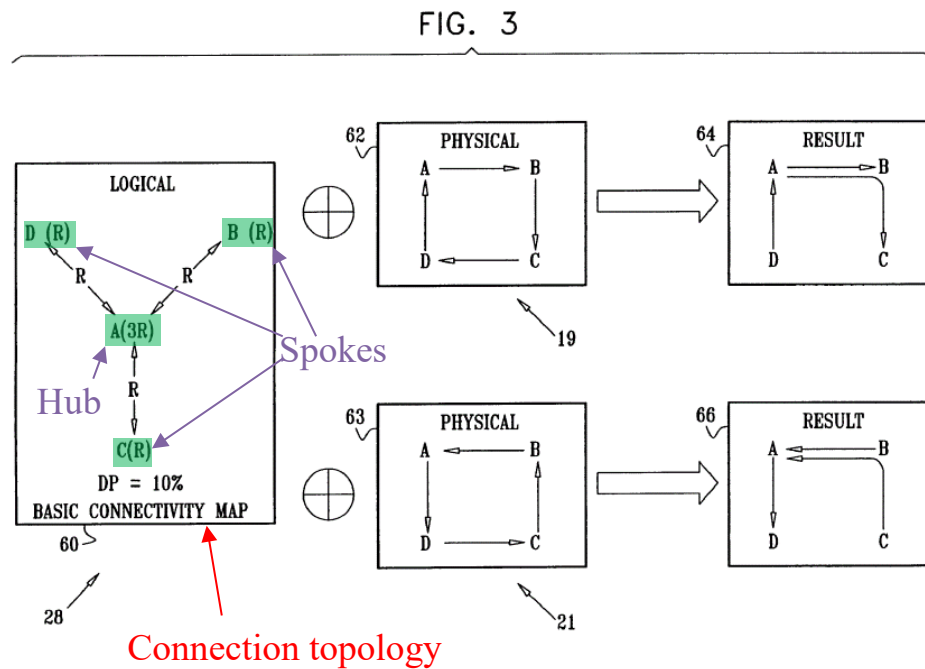


FIG. 5

Ex.1005, FIG. 5 (annotated); Ex.1003, ¶¶103-05.

Baker’s star topology is a “*hub-and-spoke*” topology; the star has a “hub” and “spoke nodes.” Ex.1005, [0011]. The ’431 patent illustrates an **identical** “hub-and-spoke” layout in Figure 3:



Ex.1001, Fig. 3 (annotated); Ex.1003, ¶106.

Claim 3 requires “one of” two topologies, so Baker’s star topology alone discloses this limitation. Ex.1003, ¶107. Baker and Wright each also disclose a “full mesh” topology. Ex.1005, [0046]; Ex.1006, [0014], [0016]. The hub-and-spoke and full mesh topologies were well-known and among a limited set of topology options, making it obvious to try either or both. *See, e.g.*, Ex.1013, 6:17-20, 40-43, FIG. 3a (full connectivity mesh); Ex.1014, 3:32-37, claims 14, 17 (full mesh logical topology); Ex.1003, ¶108 (citing Ex.1015, 60-61 & Ex.1018, [0007]). While Wright notes advantages that some topologies have over a full mesh topology, Wright does not discourage a POSITA from pursuing the full mesh topology. Ex.1003, ¶¶107-10.

7. Claim 4

[4.0] *The method according to claim 1,*

See [1.0]-[1.5].

[4.1] *wherein the data transmission service comprises a guaranteed bandwidth service.*

Baker and Wright render obvious this limitation.

As discussed at [1.1], Baker and Wright disclose multiple examples of a “*data transmission service.*” Wright further teaches “to provide a quality of service guarantee on a connectionless VPN service” and “to ensure adequate bandwidth for the service.” Ex.1006, [0001], [0014]; *see also* [0004] (“to guarantee bandwidth for a connectionless service”); [0025] (services); *see also* [0015] (VPLS as a service); Ex.1001, 2:27-35 (VPLS is a service). Further, services may be “characterized by a quality of service (QoS) metric, or guarantee,” for which bandwidth is “fundamental.” Ex.1006, [0002]-[0003]; Ex.1003, ¶¶111-14.

Thus, Wright’s disclosure of guaranteeing bandwidth for various network services renders obvious a “*guaranteed bandwidth service.*” Ex.1003, ¶¶114-15.

8. Claim 7

[7.0] *The method according to claim 1,*

See [1.0]-[1.5].

[7.1] *wherein mapping the connection topology to the physical topology comprises generating a bandwidth requirement for each of the links.*

Baker combined with Wright renders obvious this limitation.

First, as discussed at [1.4], the prior art renders obvious “*mapping*.”

Ex.1003, ¶¶116-18. As discussed at [1.3], the prior art renders obvious determining “*bandwidth requirements for the logical connections*,” such as Baker’s virtual paths. Ex.1003, ¶118. And as discussed at [1.5], the prior art renders obvious “*allocating a bandwidth*” on each of the physical links. Ex.1003, ¶118.

Second, Wright renders obvious “*generating a bandwidth requirement for each of the links*” when it teaches “calculat[ing] bandwidth requirements on links within the restricted topology.” Ex.1006, [0024]. It would have been obvious that the “bandwidth requirement” for each link is for the physical links impacted by the restricted topology (and, thus, by Baker’s logical topology in combination), since the restricted topology is implemented by the underlying physical links. Ex.1003, ¶119 (citing Ex.1006, [0015]-[0016] (referring to “physical links” of the “physical connectivity”)). Wright explains that the bandwidth requirement for a link may be calculated as a sum of virtual path bandwidths on a physical link or as the maximum of the virtual path bandwidths on the physical link. Ex.1006, [0017]; Ex.1003, ¶120.

Combining Wright’s teachings with Baker would have resulted in Baker’s head node calculating, per Wright’s teachings, bandwidth requirements for each physical link as a sum or maximum of corresponding virtual path bandwidths.

Ex.1003, ¶121. Wright’s restricted topology is based on received logical connectivity and physical topology information. Ex.1006, [0024]. Further, Wright’s calculation requires as an input the restricted topology. *Id.* Thus, it would have been obvious that the calculating would occur after determining the logical connectivity bandwidth requirements from the restricted topology, so that “only the bandwidth actually required is reserved **on the links 108**” (i.e., physical links). Ex.1006, [0024], [0017]; Ex.1003, ¶¶121-22.

Third, it would have been obvious to determine the appropriate bandwidth to be allocated on each of the physical links before actually allocating it as part of the “*mapping*.” Ex.1003, ¶123. Wright teaches “the reserved bandwidth is calculated” and afterward “the bandwidth actually required is reserved,” resulting in “the bandwidth actually required [being] reserved on the [physical] links 108.” Ex.1006, [0017]; Ex.1003, ¶123. In Wright each physical link’s required bandwidth is determined before it is allocated (and after mapping the restricted topology). Ex.1006, [0017]. It would have therefore been obvious to determine (“*generat[e]*”) a bandwidth requirement on each physical link as part of the “*mapping*” according to Baker-Wright’s overlay procedures, prior to the allocating step. Ex.1003, ¶¶123-24.

9. Claim 8

[8.0] *The method according to claim 1,*

See [1.0]-[1.5].

[8.1] *wherein parameters of the service comprise respective node-bandwidths required by each of the nodes to provide the service.*

Baker combined with Wright renders obvious this limitation.

First, as discussed at [1.3], the prior art renders obvious “*determining... bandwidth requirements... based on parameters of the service.*” Ex.1003, ¶¶125-28.

Second, Wright further renders obvious the bandwidth requirements including “*node-bandwidths.*” Wright explains that there is a “maximum bandwidth that can be generated from edge node 102 ‘A,’” which corresponds to the claimed “*node-bandwidth[].*” Ex.1006, [0017]. Wright uses this information in determining bandwidth requirements in an “exemplary virtual topology.” Ex.1006, [0017]. Thus, Wright’s use of a node’s maximum bandwidth in calculating bandwidths for a virtual topology renders obvious using “*node-bandwidths*” as “*parameters of the service*” when “*determining respective bandwidth requirements for the logical connections.*” Ex.1003, ¶129.

Alternatively, Wright also describes a “restricted topology” determined based on logical connectivity requirements. Ex.1006, [0018], [0024]. The logical connectivity requirements are “in terms of edge nodes and communication requirements between edge nodes.” Ex.1006, [0024]. Providing bandwidth

guarantees for nodes includes “provid[ing] the necessary queuing and link scheduling mechanisms to provide the bandwidth guarantees for each link.” Ex.1006, [0018]; *see also* [0015] (queuing at a node occurs with contention for service on an egress link); Ex.1003, ¶130.

Queuing and link scheduling were both known as examples related to “*node-bandwidths*.” *See, e.g.*, Ex.1012, 1:45-59 (node traffic management involves queues and control of the queue depth, as well as queue scheduling), 5:20-28 (queue depth impacts packet treatment); Ex.1003, ¶131. It would have been obvious to have provided a bandwidth guarantee for the nodes of the restricted topology (via Wright’s queuing and link scheduling) to handle the traffic of the restricted topology in a prioritized manner over other traffic. *See* Ex.1006, [0016]. Wright’s logical connectivity requirements (“*parameters of the service*”) therefore include “*node-bandwidths*” for each node on the targeted paths. Ex.1003, ¶¶131-33.

10. Claim 9

[9.0] *The method according to claim 1,*

See [1.0]-[1.5].

[9.1] *and comprising monitoring traffic generated in the network by the data transmission service, and adjusting the bandwidth in response to the traffic.*

First, Baker describes the head node “check[ing] to see ... whether a

topology update has occurred,” which can be “triggered by a change... in traffic patterns” in the network. Ex.1005, [0052]. Baker’s “check[ing] to see” renders obvious “*monitoring*.” Additionally, it would have been obvious that detecting a change in traffic patterns would have included “*monitoring traffic generated in the network*.” Ex.1003, ¶¶134-37; Ex.1007, 4:51-53 (known for controllers to monitor the traffic).

Second, Baker discloses that when a traffic change or other topology update is detected in response to checking, the “Administer Ring” routine executes. Ex.1005, [0057], [0052]. As discussed at [1.5], the Baker-Wright combination renders obvious allocating bandwidth as part of Baker’s overlay procedure. *See* Ex.1005, [0016], [0062]; Ex.1006, [0005], [0024]. Thus, executing the Administer Ring routine (including re-allocating bandwidth following the mapping) in response to a change in traffic renders obvious “*adjusting the bandwidth in response to the traffic*.” Ex.1003, ¶¶138-41.

11. Claim 11

[11.0] *The method according to claim 1,*

See [1.0]-[1.5].

[11.1] *wherein allocating the bandwidth comprises comparing a mapping bandwidth determined in response to the bandwidth requirements of the logical connections and to the mapping with a full bandwidth determined by assuming all possible logical connections in the network are provided for.*

First, as discussed at [1.5], the prior art renders obvious “*allocating*.” Ex.1003, ¶¶142-44.

Second, the prior art renders obvious determining a “*mapping bandwidth*.” The bandwidth Wright determines “*for the service*” (see [1.5]) is an example of the “*mapping bandwidth*.” As a further example, Wright teaches that “[o]ne way to calculate the required reserved bandwidth... is to reserve ‘x+y’ Mb/s.” Ex.1006, [0017]; Ex.1003, ¶146. Wright’s required reserve bandwidth, calculated by summing the bandwidths of virtual paths sharing a link, is a “*mapping bandwidth*.” Ex.1003, ¶¶145-47; *see* Ex.1001, 7:42-44, 8:67-9:2.

Third, Baker-Wright further renders obvious comparing a “*mapping bandwidth*” with a “*full bandwidth*.” Wright illustrates a “logical connectivity mesh” in Figure 2, which Wright differentiates from “a full logical mesh approach” with a much larger bandwidth requirement. Ex.1006, [0016]; FIG. 2. Wright’s “full logical mesh approach” represents a “*full bandwidth determined by assuming all possible logical connections in the network are provided for*” because it corresponds to all logical connections of Wright’s logical topology (mirroring the underlying physical connectivity). Wright contrasts – or “*compar[es]*” – the full mesh approach with the “logical connectivity mesh that is constrained to a specific restricted topology (e.g., a virtual topology).” Ex.1006, [0014], [0016]. It is those physical links underlying the logical connectivity mesh that have bandwidth

reserved for a target QoS. Ex.1006, [0016]. Comparing cannot occur in Wright until after the bandwidth requirements are calculated, and only the reserving step follows the calculating step in Wright. Ex.1006, [0024], FIG. 5. Therefore, it would have been obvious for Wright’s comparing to occur as part of the reserving (“*allocating*”) step. Ex.1003, ¶148.

Wright’s comparing the full mesh approach with a logical connectivity mesh mirrors the ’431 patent’s description. Ex.1003, ¶¶149, 145. The ’431 patent describes “*mapping bandwidth*” as “[t]he bandwidth for each link [that] is derived by summing the individual connection requirements of the link.” Ex.1001, 8:67-9:2. This is compared to the “*full bandwidth*,” “bandwidth[] for each link if every possible connection in the network is provided for.” Ex.1001, 7:46-49, 9:31-44 (Table III), 11:1-29 (Table VI). The ’431 patent lists the same connections in Tables III and VI, but Table III shows “full bandwidth requirements” (all possible connections) while Table VI shows a “balanced full mesh map.” Ex.1001, 9:18-22 (full bandwidth), 10:26-30 (Table V is full mesh), 10:65-67 (Table VI relates to Table V). Thus, Wright’s comparing a full mesh approach to a logical connectivity approach is substantially the same as the ’431 patent’s corresponding disclosure and renders obvious the “*comparing*.” Ex.1003, ¶¶149-50.

12. Claim 25

[25.0] *Apparatus for assigning bandwidth in a network including nodes coupled*

by links arranged in a physical topology, the apparatus comprising:

To the extent the preamble is limiting, Baker discloses it. As demonstrated at [1.0], Baker discloses a method “*for assigning bandwidth in a network including nodes coupled by links arranged in a physical topology.*” Baker further discloses a head node, which is part of the network’s physical topology, that executes the overlay procedure including the “Administer Ring” routine to overlay a logical topology onto the physical topology. Ex.1005, [0051]; *see* [1.4]. Baker’s head node renders obvious an “*apparatus*” as claimed. Ex.1003, ¶¶151-54.

[25.1] a controller which is adapted to:

Baker renders obvious this limitation. Baker’s “head node” is responsible for executing the overlay procedure including the “Administer Ring” routine. Ex.1005, [0051]-[0052]. The head node acts as a “peer group leader” (“PGL”). Ex.1005, [0051], [0044]; Ex.1003, ¶¶155-56.

The PGL includes “additional resources ... e.g., processing power, redundant hardware for protection, and memory” to perform tasks including “topology and routing control.” Ex.1005, [0047], [0046]. Thus, it would have been obvious that the PGL includes one or more components that perform such control tasks; those components correspond to the claimed “*controller.*” *See* Ex.1005, [0047], [0046]; *see also* Ex.1006, [0006] (“a computer program product ... for execution by the processing circuit for performing a method”), [0026]; Ex.1003,

¶¶157-58.

[25.2] *[a controller which is adapted to] receive a definition of logical connections between the nodes, the logical connections being associated with a data transmission service to be provided over the network,*

First, as discussed at [1.1], Baker-Wright renders obvious “*defining... logical connections associated with....*” Ex.1003, ¶¶159-60.

Second, it would have been obvious for the controller in Baker’s PGL to “*receive a definition of logical connections.*” Baker explains that the PGL is “designated” to overlay a star network topology. Ex.1005, [0047]. Because the PGL “knows” that it will perform “‘star overlay’ procedures,” it would have been obvious that the PGL has received information about the virtual paths to be established. Ex.1005, [0051]; Ex.1003, ¶161. Furthermore, it was well-known for a controller to receive information about desired virtual paths to be set up between nodes. Ex.1003, ¶162; *see also* Ex.1010, 3:63-67 (nodes retain logical topology information), 6:26-36 (each node receives logical topology information as it is updated in all nodes in the network).

Third, Wright further confirms this limitation is obvious. Wright teaches that “logical connectivity requirements are **received**,” which are used for creating the restricted topology “to provide logical connections.” Ex.1006, [0024], FIG. 5:

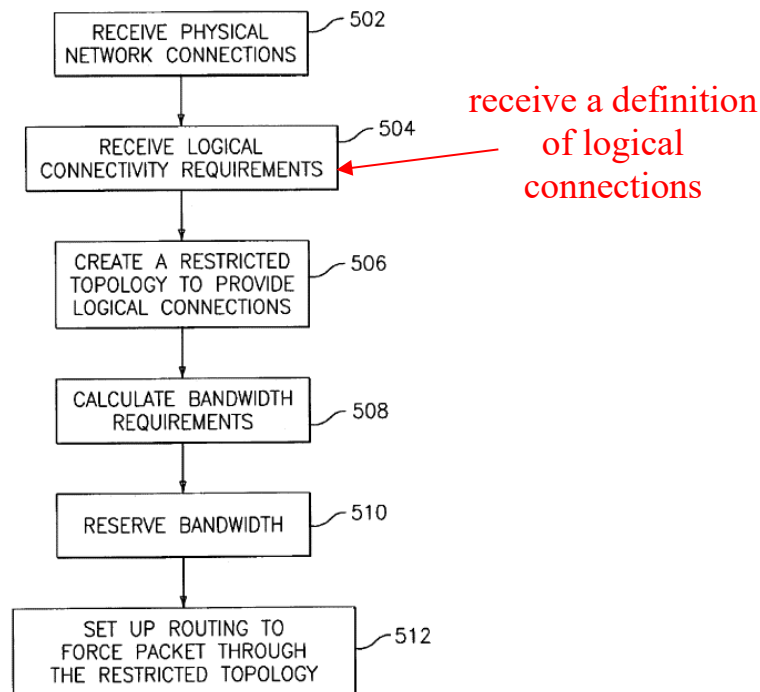


FIG. 5

Ex.1006, FIG. 5 (annotated); Ex.1003, ¶163.

As discussed at [1.5], Wright’s logical connectivity requirements correspond to Baker’s virtual paths and the claimed “*logical connections*.” It would have therefore been obvious for Baker’s PGL to receive its logical topology information, as demonstrated by Wright. Ex.1003, ¶¶163-66.

[25.3]-[25.6] *the logical connections... to the mapping.*

The remainder of claim 25 recites steps corresponding to limitations [1.2]-[1.5], which the prior art renders obvious. *See supra* [1.2]-[1.5]; Ex.1003, ¶¶167-76. It would have been obvious for Baker’s PGL to perform these steps because they relate to “topology and routing control.” Ex.1005, [0046]; Ex.1003, ¶¶167-76.

13. Claim 26

[26.0] *Apparatus according to claim 25,*

See [25.0]-[25.6].

[26.1] *wherein the controller is comprised in one of the nodes.*

As discussed at [25.1], it would have been obvious for Baker's PGL to include the "*controller.*" Baker's PGL is also the "head node" in the network and is therefore "*one of the nodes.*" Ex.1005, [0049], [0051], [0044], Fig. 2; Ex.1003, ¶¶177-81.

D. Ground 2: Claims 5, 10, 12-16, 18-24, 27-30 Obvious Over Baker-Wright-Holender

1. Holender

Holender, like Baker and Wright, discusses "partitioning of physical network resources" so multiple logical networks overlay the same physical network. Ex.1007, 1:6-8, 3:54-58. The overlaid network topologies "differ from the topology of the underlying physical network." Ex.1007, 4:22-30; FIG. 1. Separate logical networks are offered for different services to support the often-different demands the different services have on resources such as "bandwidth." Ex.1007, 3:60-67. This separation supports service classes, also referred to as traffic classes, arranged in groups "of similar properties ... handled together in a logical network." Ex.1007, 3:67-4:15, 4:66-5:5; Ex.1003, ¶¶182-84.

2. Reasons to combine Baker and Holender

A POSITA considering the teachings of Baker would have also considered the teachings of Holender, as they are analogous prior art pertaining to the same field of endeavor of partitioning physical resources of an underlying physical topology for overlaying logical topologies. *See* Ex.1005, [0016], [0030] (assigning network resources for a logical topology overlaid onto a physical topology); Ex.1007, 1:6-8, 3:54-58 (partitioning physical resources shared among logical networks); *see also* Ex.1006, [0005] (link bandwidth requirements based on physical and logical connections); Ex.1003, ¶185.

First, a POSITA would have been motivated to turn to Holender for the well-known option of overlaying multiple networks onto the same physical network. Baker discloses multiple logical topologies sequentially overlaid “on top of the ultimate, actual physical network.” Ex.1005, [0030], [0064] (sequential overlay); *see also* [0030] (logical star), [0066] (logical ring). Holender describes how different service demands can be met by employing multiple different logical networks at the same time over single a physical network. Ex.1007, 4:22-30 3:63-67; Ex.1003, ¶195.

Holender explains that it was already known to establish multiple logical networks on top of a physical network, illustrated as logical networks 1 through *X* in Figure 1, which are all overlaid onto a single physical network. Ex.1007, 1:12-

27, 4:22-30, FIG. 1. Holender's approach for overlaying different logical networks onto a physical network demonstrates a well-known alternative for overlaying different logical network types, such as Baker's, onto a physical network. Doing so would have been nothing more than applying Baker's multiple overlaying logical networks onto a physical network at the same time and in parallel, per Holender. Ex.1003, ¶187.

Second, a POSITA would have been motivated to turn to Holender and combine it with Baker to obtain Holender's stated benefits. Recognizing the drawbacks of supporting different services with very different demands (e.g., bandwidth, grade of service, etc., and difficulty of network management) on the same logical network, Holender instead offers "separate logical networks" for different services with such differing demands. Ex.1007, 3:60-4:4. Grouping services with similar demands together into a logical network provides the benefit of simplified network management at a higher level. Ex.1007, 4:66-5:1, and 3:67-4:14. A POSITA would have been motivated to obtain these benefits for Baker. Ex.1003, ¶188.

Third, a POSITA would have had a reasonable expectation of success in combining Holender's teachings with the systems of Baker and the Baker-Wright combination. Like Baker and Wright, Holender teaches using a network with SONET on the bottom of the transmission strata and a cross-connect stratum based

on ATM on top of that. Ex.1007, 5:12-37, 6:14-22, FIG. 3; Ex.1005, [0037]; Ex.1003, ¶189.

Further like Baker and Wright, Holender overlays a logical network onto a physical network. Holender illustrates this in Figure 1's logical networks LN1-LNX overlaid onto physical network PN. Ex.1007, 4:22-26, FIG. 1; *cf.* Ex.1005, [0030]; Ex.1006, [0005]-[0007]. Thus, Holender, Baker, and Wright all apply similar concepts (overlaying logical networks onto physical networks) in compatible manners, giving a POSITA a reasonable expectation of success in combining their collective disclosures. Ex.1003, ¶190.

Fourth, it would have been predictable and within a POSITA's skillset to combine Holender's and Baker-Wright's teachings. Baker's traffic traversing the network is an example of Holender's more general teachings of "a wide variety of traffic types" that have various service/traffic classes. *See* Ex.1005, [0012], [0038], [0080] (traffic); Ex.1007, 5:7-9, 4:66-5:11 (various traffic types). Further, Baker already contemplated imposing multiple logical networks onto a physical network. While Baker teaches doing so sequentially, Holender demonstrates that it was known and within a POSITA's skillset to do so in parallel to each other. Ex.1007, 4:22-26, FIG. 1; Ex.1003, ¶¶191-92.

Combining Holender's teachings with Baker's and Wright's teachings is nothing more than the combination of known elements (Baker's and Wright's

physical and logical networks, and Holender’s multiple logical networks per physical network for different traffic classes), according to known methods (Holender’s teaching to employ multiple parallel logical networks) to yield predictable results (expanding the Baker-Wright combination to allow for multiple logical networks in parallel). Ex.1003, ¶192.

Fifth, a POSITA would have also been motivated to turn to Holender and combine it with Baker to achieve advantages associated with employing multiple simultaneous logical network overlays. These include supporting a variety of traffic types and services, of potentially varying bandwidth, grade of service, control demands, delay sensitivity, and/or loss sensitivity, etc. *See* Ex.1007, 3:60-4:8. For at least the above reasons, a POSITA would have been motivated to combine Baker and Holender. Ex.1003, ¶¶193-94.

3. Claim 5

[5.0] *The method according to claim 1,*

See [1.0]-[1.5].

[5.1] *wherein the data transmission service comprises a class of service defined by a protocol under which the network operates.*

First, as discussed at [1.1], the prior art renders obvious various “*data transmission service[s]*.” Ex.1003, ¶¶196-97.

Second, Baker and Wright describe networks operating under the

asynchronous transfer mode (ATM) protocol. *See, e.g.*, Ex.1005, [0045]; Ex.1006, [0015]. A POSITA would have known that the ATM protocol defines classes of service for data traffic on a network. Ex.1003, ¶199, *quoting* Ex.1011, [0279] (“ATM can also support multiple quality of service (QoS) classes...”). With this understanding, it would have been obvious for each of the data traffic examples taught by Baker-Wright to comprise one of the QoS classes defined by ATM. Ex.1003, ¶199. Thus, this limitation would have been obvious based on Baker, Wright, and the POSITA’s background knowledge about network protocols including ATM. Ex.1003, ¶¶198-99.

Third, Holender confirms this limitation’s obviousness by describing how logical resource separation offers “different Grade of Service classes.” Ex.1007, 2:54-59; *see also* 4:66-5:9 (grade of service classes also referred to as traffic classes). Handling different traffic groups, each with one or more service classes, in different logical networks is “advantageous for an **ATM network carrying a wide variety of traffic types**.” Ex.1007, 4:66-5:9; *see also* 3:60-4:14; Ex.1003, ¶200. As Baker and Wright use ATM networking, it would have been obvious to achieve this advantage by employing Holender’s traffic grouping techniques with the Baker-Wright combination’s “*data transmission service*” on Baker’s ATM network. Ex.1003, ¶¶200-02.

4. Claim 10

[10.0] *The method according to claim 1,*

See [1.0]-[1.5].

[10.1] *wherein the data transmission service comprises a plurality of subclasses of traffic, and*

First, as discussed at [1.1], the prior art renders obvious various “*data transmission service[s]*.” Ex.1003, ¶¶203-05. It would have been obvious that Baker’s and Wright’s different examples of a “*data transmission service*” would have comprised “*a plurality of subclasses of traffic*” because they include different types of traffic, such as “voice over IP... video-on-demand, [and] video conferencing.” Ex.1006, [0025]; Ex.1003, ¶205.

Second, Holender further renders this limitation obvious by extending Baker’s and Wright’s logical network concepts to multiple logical networks. Holender explains that it is “not at all easy to integrate services with very different demands.” Ex.1007, 3:60-63. Instead, it “turn[s] out to be better to support different services by offering separate logical networks” for them. Ex.1007, 3:54-58, 63-67. Holender teaches arranging traffic of different service classes (also called traffic classes) into different groups, so that “only those of similar properties are handled together in a logical network.” Ex.1007, 3:67-4:4, 4:66-5:5; Ex.1003, ¶¶206-07 (further citing Ex.1007, 4:1-14).

Each group has potentially varying bandwidth demands. Ex.1007, 4:66-5:7, 8:59-62. As a result, different “traffic groups are handled separately in different logical subnetworks.” Ex.1007, 5:5-7. This is consistent with the ’431 patent’s use of “*subclasses*,” where a “guaranteed traffic” service includes a specific “subclass of guaranteed traffic.” Ex.1001, 12:39-44. It would have been obvious that Holender’s different traffic groups are, with their service classes of multiple traffic types with “similar properties” grouped together, a “*data transmission service compris[ing] a plurality of subclasses of traffic*.” Ex.1007, 3:67-4:4; Ex.1003, ¶¶208-11.

[10.2] *wherein allocating the bandwidth comprises allocating a reserved bandwidth to one of the subclasses.*

First, as discussed at [1.5], the prior art renders obvious “*allocating a bandwidth*.” See Ex.1005, [0016]; Ex.1006, [0024], [0005]; Ex.1003, ¶¶212-13.

Second, as discussed at [10.1], Holender teaches arranging traffic classes into groups with one or more traffic types per group, and each group “handled separately in [a] different logical subnetwork[.]” Ex.1007, 5:5-7; Ex.1003, ¶214. Where traffic types are sufficiently different, Holender teaches each individual traffic type (and, thus, a “*subclass*”) being handled by its own separate logical network. Ex.1007, 5:1-11. Wright’s and Baker’s disclosures respectively have a per-logical-topology focus, including the allocation of bandwidth per Wright.

Ex.1005, [0059]; Ex.1006, [0024]. It would have been obvious to repeat Wright's bandwidth allocations for each individual traffic type according to Holender's per-logical-network basis, resulting in "*allocating a reserved bandwidth to one of the subclasses.*" Ex.1007, 5:1-11; Ex.1003, ¶¶215, 217.

Holender renders this limitation obvious yet another way. Holender's traffic types are associated with routes over "logical links which belong to the same logical network." Ex.1007, 2:1-14. Each route "carries only a single type of traffic," with parallel routes for multiple traffic types, and requires an amount of bandwidth per logical link. Ex.1007, 7:8-11, 8:20-25. It would have been obvious for each traffic type (with different route) to have its own bandwidth requirement and allocation. Ex.1003, ¶¶216-18.

5. Claim 12

[12.0] *A method for assigning bandwidth in a network including nodes coupled by links arranged in a physical topology, the method comprising:*

To the extent the preamble is limiting, Baker discloses it. *See* [1.0]; Ex.1003, ¶219.

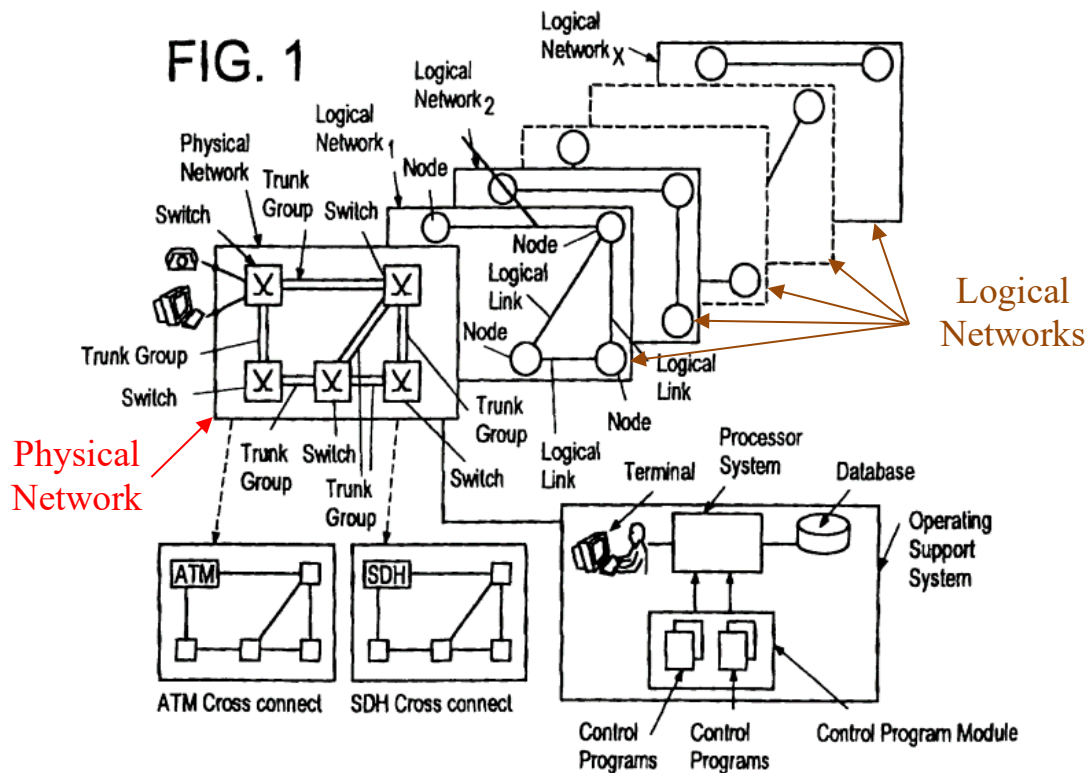
[12.1] *defining between the nodes a first set of logical connections associated with a first data transmission service to be provided over the network, and a second set of logical connections associated with a second data transmission service to be provided over the network, the first set of logical connections having a first connection topology, the second set of logical connections having a second connection topology,*

First, as discussed at [1.1] and [1.2], the prior art renders obvious

“defining... logical connections... having a connection topology.” Ex.1003, ¶¶220-21.

Second, it would have been obvious to provide for multiple data transmission services, since networks commonly supported numerous services. Ex.1003, ¶222; Ex.1006, [0025] (VPN, VoIP, video-on-demand, video conferencing services). And as discussed at [1.1] and [1.2], the prior art renders obvious multiple different data transmission services, which correspond to the recited *“first...”* and *“second...”* *“data transmission service[s]”* limitations. *See* Ex.1006, [0014]; [0005], [0006]; Ex.1005, [0038], [0080]; Ex.1003, ¶222.

Third, Holender describes how **“a number of logical networks are established... shar[ing] the same physical transmission and switching resources.”** Ex.1007, 2:50-53; *see also* FIG. 1 (below), 4:23-30 (logical network topologies differ from underlying physical network), 4:54-65 (defining multiple logical topologies).



Ex.1007, FIG. 1 .(annotated).

Holender teaches different logical networks for different traffic groups, including going so far as to provide a different logical network for each individual traffic type, rendering obvious a different set of “*logical connections*” for each “*data transmission service*.” Ex.1007, 5:1-11. The different logical networks have different “view[s]” of the physical network, with each logical network different from the other. Ex.1007, 1:16-27. Further, Figure 1 (above) shows that different logical networks have different connection topologies from each other. Thus, Holender renders obvious defining multiple “*set[s] of logical connections*,” each with its own “*connection topology*,” and each for a different “*data transmission*

service.” Ex.1003, ¶¶223-24; *see also* Ex.1007, 5:1-11, 3:60-4:14.

In combination with Baker-Wright, Holender renders obvious applying Baker-Wright’s bandwidth allocating procedures (*see* claim 1) to each “separate logical network.” Ex.1003, ¶¶225-26.

[12.2] the first and second connection topologies being different from the physical topology;

Baker (*see* [1.2]) and Holender describe how each logical topology (a “connection topolog[y]”) differ from an underlying physical topology. Ex.1005, [0030], [0013], Figs. 1&2; Ex.1007, 4:28-30, 4:54-65; Ex.1003, ¶¶227-31.

[12.3] determining respective first bandwidth requirements for the first set of logical connections based on first parameters of the first data transmission service and respective second bandwidth requirements for the second set of logical connections based on second parameters of the second data transmission service;

First, as discussed at [1.3], the prior art renders obvious “*determining respective bandwidth requirements*” Ex.1003, ¶¶232-33.

Second, Wright contemplates bandwidth determination per logical topology. Ex.1006, [0024]. Likewise, Baker’s focus is on a particular logical topology for bandwidth management. Ex.1005, [0059]. Finally, Holender teaches the application of multiple logical topologies. *See* Ex.1007, 4:54-65. A POSITA would have therefore been motivated to apply Baker-Wright’s combined teachings and allocate bandwidth on a per-logical network basis. Ex.1003, ¶¶234-35.

[12.4] *generating a first mapping of the first connection topology to the physical topology, so that each of the first set of logical connections is associated with one or more links of the physical topology;*

The prior art renders obvious “mapping...” See [1.4]. It would have been obvious that performing [1.4]’s “mapping...” results in “generating a... mapping.” The prior art’s act of associating physical network resources to logical network resources results in the mapping between those resources. Ex.1003, ¶¶236-37.

Holender further describes “how to distribute or partition said physical network resources among the logical networks,” which is an act of “generating a... mapping.” See Ex.1007, 2:59-67, 5:38-41; *see also* 1:53-57 (physical link is logically subdivided into logical links); Ex.1003, ¶¶238-39.

[12.5] *allocating a first bandwidth for the first data transmission service on each of the links in response to the first bandwidth requirements of the first set of logical connections and to the first mapping;*

The prior art renders this limitation obvious. See [1.5]; Ex.1003, ¶240.

[12.6] *generating a second mapping of the second connection topology to the physical topology, so that each of the second set of logical connections is associated with one or more links of the physical topology;*

As discussed at [12.4] and [1.4], the prior art renders obvious “generating a... mapping...” Based on Holender’s multiple logical topologies and Baker-Wright’s per-logical-network granularity, it would have been obvious to perform “generating...” for each logical topology. See Ex.1007, 4:54-65; Ex.1003, ¶¶241-43.

[12.7] *allocating a second bandwidth for the second data transmission service on each of the links in response to the second bandwidth requirements of the second set of logical connections and to the second mapping; and*

As discussed at [12.5] and [1.5], the prior art renders obvious “*allocating....*” Based on Holender’s multiple logical topologies and Baker-Wright’s per-logical-network granularity, it would have been obvious to perform “*allocating...*” for each logical topology. *See* Ex.1007, 4:54-65; Ex.1003, ¶¶244-46.

[12.8] *summing the first and the second bandwidths to determine a total allocation for each of the links.*

Holender explains that the “sum of logical link capacities on the same physical link cannot exceed the capacity of the physical link.” Ex.1007, 6:60-65. The “logical link capacities” are from the “number of logically separate logical networks” established on top of the physical network. Ex.1007, 6:50-52. It would have been obvious to sum allocated bandwidths for the first and second data transmission services to ensure that they do not exceed the available physical link capacity. Ex.1003, ¶¶247-50; *see also* Ex.1005, [0009] (discussing “available” bandwidth); Ex.1006, [0004], [0016] (same).

Wright additionally teaches summing bandwidths by explaining that “[o]ne way to calculate the required reserved bandwidth... is to reserve ‘x+y’ Mb/s.” Ex.1006, [0017]. It would have been obvious to repeat Wright’s summing for each logical topology, as demonstrated by Holender. Ex.1003, ¶¶251-52.

6. Claim 13

[13.0] *The method according to claim 12,*

See [12.0]-[12.8].

[13.1] *wherein the network comprises a ring network, and wherein the physical topology comprises a ring topology.*

See [2.1]; Ex.1003, ¶¶253-54.

7. Claim 14

[14.0] *The method according to claim 12,*

See [12.0]-[12.8].

[14.1] *wherein the first connection topology comprises a hub-and-spoke topology and the second connection topology comprises a full mesh topology.*

First, as discussed at [3.1], the prior art renders obvious “*hub-and-spoke*” and “*full mesh*” topologies. Ex.1003, ¶¶255-57.

Second, Holender renders obvious multiple logical topologies, each with a different topology. Ex.1007, 1:21-25, 9:4-7, Fig. 1; Ex.1003, ¶258. It would have been obvious for two logical topologies to have the well-known and commonly used hub-and-spoke and full mesh topologies. Ex.1003, ¶¶258-59.

8. Claim 15

[15.0] *The method according to claim 12,*

See [12.0]-[12.8].

[15.1] *wherein at least one of the first and second data transmission services comprises a guaranteed bandwidth service.*

See [4.1]. Ex.1003, ¶¶260-63.

9. Claim 16

[16.0] *The method according to claim 12,*

See [12.0]-[12.8].

[16.1] *wherein at least one of the first and second data transmission services comprises a class of service defined by a protocol under which the network operates.*

See [5.1]. Ex.1003, ¶¶264-67.

10. Claim 18

[18.0] *The method according to claim 12,*

See [12.0]-[12.8].

[18.1] *wherein generating the first mapping comprises generating a first bandwidth requirement for each of the links, and wherein generating the second mapping comprises generating a second bandwidth requirement for each of the links.*

See [7.1]. Based on Holender’s multiple logical topologies, it would have been obvious to perform “*generating a... bandwidth requirement*” for physical links used by each logical topology. See Ex.1007, 4:54-65; Ex.1003, ¶¶268-70.

11. Claim 19

[19.0] *The method according to claim 12,*

See [12.0]-[12.8].

[19.1] *wherein the first parameters of the first service comprise respective first node-bandwidths required by each of the nodes to provide the first service, and wherein the second parameters of the second service comprise respective second*

node-bandwidths required by each of the nodes to provide the second service.

See [8.1]. Based on Holender’s multiple logical topologies providing multiple services, it would have been obvious for “*parameters*” of each service to include “*node-bandwidths*.” See Ex.1007, 4:54-65; Ex.1003, ¶¶271-73.

12. Claim 20

[20.0] *The method according to claim 12,*

See [12.0]-[12.8].

[20.1] *and comprising monitoring traffic generated in the network by the first and second data transmission services, and adjusting the total allocation in response to the traffic.*

See [9.1]. Based on Holender’s multiple logical topologies providing multiple services, it would have been obvious to “*monitor[] traffic generated*” by each service and “*adjust[]*” accordingly. See Ex.1007, 4:54-65; Ex.1003, ¶¶274-76.

13. Claim 21

[21.0] *The method according to claim 12,*

See [12.0]-[12.8].

[21.1] *wherein the first data transmission service comprises a plurality of subclasses of traffic, and*

See [10.1]; Ex.1003, ¶¶277-78.

[21.2] *wherein allocating the first bandwidth comprises allocating a reserved bandwidth to one of the subclasses.*

See [10.2]; Ex.1003, ¶279.

14. Claim 22

[22.0] *The method according to claim 12,*

See [12.0]-[12.8].

[22.1] *wherein the first connection topology is different from the second connection topology.*

See [14.1]. Ex.1003, ¶¶280-83.

15. Claim 23

[23.0] *The method according to claim 12, wherein summing the first and the second bandwidths to determine a total allocation for each of the links comprises:*

See [12.0]-[12.8].

[23.1] *determining a first mapping bandwidth in response to the first bandwidth requirements of the first set of logical connections and to the first mapping;*

As discussed at [11.1], the prior art renders obvious “*a mapping bandwidth determined...*” as part of “*allocating.*” Thus, it would have been obvious to “*determin[e] a first mapping bandwidth*” as part of the step of “*summing...to determine a total allocation.*” Ex.1003, ¶¶284-89.

[23.2] *determining a second mapping bandwidth in response to the second bandwidth requirements of the second set of logical connections and to the second mapping; and*

See [23.1] and [11.1]. Based on Holender’s multiple logical topologies providing multiple services, it would have been obvious to “*determin[e] a second mapping bandwidth*” for a “*second set of logical connections.*” See Ex.1007, 4:54-

65; Ex.1003, ¶¶290-94.

[23.3] *comparing the first mapping bandwidth and the second mapping bandwidth with a full bandwidth determined by assuming all possible logical connections in the network are provided for.*

See [11.1]. Based on Holender’s multiple logical topologies providing multiple services, it would have been obvious to “*compar[e]*” each “*mapping bandwidth*” with a “*full bandwidth.*” See Ex.1007, 4:54-65; Ex.1003, ¶¶295-97.

Alternatively, it would have been obvious to “*compar[e]*” the combination of the “*first mapping bandwidth*” and the “*second mapping bandwidth*” with a “*full bandwidth.*” Wright and Holender each teach summing bandwidth requirements of all logical connections over the same physical link, to avoid using more bandwidth than is available for that link. See Ex.1006, [0016], [0017]; Ex.1007, 6:63-65 (sum of logical link capacities cannot exceed physical link capacity); Ex.1008, 5:16-25 (same). In combination, it would have been obvious to consider all logical network’s logical link capacities on a given physical link when comparing with the “*full bandwidth.*” Ex.1003, ¶¶297-99.

16. Claim 24

[24.0] *A method... comprising:*

See [1.0] and [2.1]. Ex.1003, ¶300.

[24.1] *defining between the nodes... to be provided over the network,*

See [12.1]. Ex.1003, ¶301.

[24.2] *the first set of logical connections... connection topology;*

See [12.1] and [14.1]. Ex.1003, ¶¶302-04.

[24.3] *determining... of the second data transmission service;*

See [12.3]. Ex.1003, ¶305.

[24.4] *generating... the ring network;*

See [12.4]. Ex.1003, ¶306.

[24.5] *determining... first mapping;*

See [23.1] (“*first mapping bandwidth*” corresponding to “*first bandwidth*”).
Ex.1003, ¶307.

[24.6] *generating... the ring network;*

See [12.6]. Ex.1003, ¶308.

[24.7] *determining... second mapping;*

See [23.2] (“*second mapping bandwidth*” corresponding to “*second bandwidth*”). Ex.1003, ¶309.

[24.8] *summing... for each of the links; and*

See [12.8]. Ex.1003, ¶310.

[24.9] *allocating one of... over the network.*

As discussed at [12.5] and [1.5], the prior art renders obvious “*allocating a first bandwidth.*” As discussed at [12.7], the prior art renders obvious “*allocating a second bandwidth.*” And as discussed at [12.8], the prior art renders obvious

“*summing... bandwidths to determine a total allocation.*” Since [24.9] recites a Markush group, any of those alone is sufficient to render this limitation obvious. Ex.1003, ¶311.

Additionally, as discussed at [12.8], it was known that the allocated bandwidth should not exceed the available link capacity. *See, e.g.,* Ex.1006, [0025] (admission on a session-by-session basis, such that bandwidth is not allocated when sufficient capacity not available); Ex.1007, 6:60-65. Thus, it would have been obvious to provide less than all services (the *first service* or *second service*) when the link capacity would not be sufficient to provide both services. Ex.1003, ¶¶311-15.

17. Claim 27

[27.0] *Apparatus according to claim 25,*

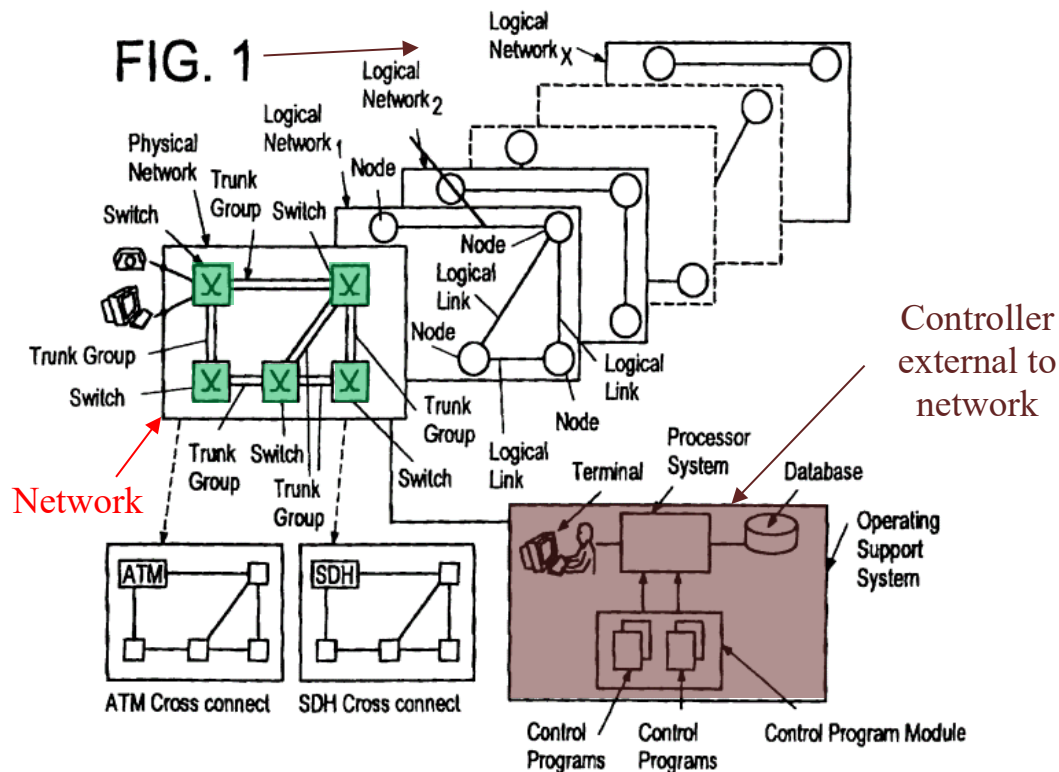
See [25.0]-[25.6].

[27.1] *wherein the controller is external to the network.*

As discussed at [25.1], the prior art renders obvious a “*controller*” such as Baker’s PGL and processing hardware within a node of the network. *See* Ex.1005, [0051]; Ex.1003, ¶¶316-18.

Holender describes an “operation and support system OSS” responsible for mapping logical networks to the physical network, including determining and allocating bandwidth. Ex.1007, 4:31-32, 54-65. The OSS is external to the physical

network and communicates via “[s]pecial data links.” Ex.1007, 4:48-53; FIG. 1:



Ex.1007, FIG. 1 (annotated); Ex.1003, ¶319.

Holender explains that the location of various processors and functions is largely a design choice. Ex.1007, 4:32-53 (discussing “usual[]” arrangements and options such as “regional processors” for a “not completely distributed system”). Thus, it would have been obvious as a simple design choice to partly or completely centralize the PGL functionality of the Baker-Wright combination in an external controller as suggested by Holender. Ex.1003, ¶320. Alternatively, it would have been obvious to try locating PGL functionality external to the network, because there were a limited number of predictable solutions as demonstrated by both

Baker (internal to the network) and Holender (partially or completely external to the network), demonstrating a reasonable expectation of success in locating the controller externally. Ex.1003, ¶¶321-22.

18. Claim 28

[28.0] *Apparatus... comprising:*

See [25.0]. Ex.1003, ¶323.

[28.1] *a controller which is adapted to:*

See [25.1]. Ex.1003, ¶324.

[28.2] *receive... a second connection topology,*

As discussed at [25.2]-[25.3] and [1.1]-[1.2], the prior art renders obvious a “controller... adapted to: receive...” and “logical connections having a connection topology.” Ex.1003, ¶¶325-26.

Based on Holender’s multiple logical topologies providing multiple services, it would have been obvious to “receive” multiple “set[s] of logical connections,” each associated with a “data transmission service” and having a “connection topology.” *See* Ex.1007, 4:54-65; Ex.1003, ¶¶327-28; *see also supra* [12.1].

[28.3] *the first and second connection topologies being different from the physical topology,*

See [12.2], [25.3]. Ex.1003, ¶329.

[28.4] *determine... based on second parameters of the second data transmission service,*

As discussed for [25.3]-[25.6] and [1.3], the prior art renders obvious a
“*controller... adapted to: determine respective bandwidth requirements...*”
Ex.1003, ¶330-31.

Based on Holender’s multiple logical topologies providing multiple services,
it would have been obvious to “*determine*” multiple “*bandwidth requirements.*”
See Ex.1007, 4:54-65; Ex.1003, ¶¶332-33; *see also supra* [12.1], [12.3].

[28.5] *generate a first mapping... links of the physical topology,*

As discussed for [25.3]-[25.6] and [1.4], the prior art renders obvious a
“*controller... adapted to: map the connection topology...*” Ex.1003, ¶¶334-36.

[28.6] *allocate a first bandwidth... and to the first mapping,*

As discussed for [25.3]-[25.6] and [1.5], the prior art renders obvious a
“*controller... adapted to: allocate a bandwidth...*” Ex.1003, ¶337.

[28.7] *generate a second mapping... links of the physical topology,*

See [28.5]. Based on Holender’s multiple logical topologies providing
multiple services, it would have been obvious to “*generate a mapping*” for each of
multiple “*connection topolog[ies]*” to the “*physical topology.*” See Ex.1007, 4:54-
65; Ex.1003, ¶¶338-41; *see also* [12.1], [12.4], [12.6].

[28.8] *allocate a second bandwidth... and to the second mapping, and*

See [28.6]. Based on Holender’s multiple logical topologies providing
multiple services, it would have been obvious to “*allocate a bandwidth*” for each

of multiple “*data transmission service[s]*.” See Ex.1007, 4:54-65; Ex.1003, ¶¶342-45; *see also* [12.1], [12.7].

[28.9] *sum... for each of the links.*

First, as discussed at [12.8], the prior art renders obvious “*summing...*”

Second, as discussed for claim 25, the prior art renders obvious a “*controller.*” Ex.1005, [0046]; Ex.1003, ¶¶346-47. It would have been obvious for Baker’s PGL and corresponding hardware (“*controller*”) to “*sum... bandwidths*” as part of its duty to perform “*topology and routing control*” and ensure that the physical link capacity is not exceeded. Ex.1005, [0046]; *see also* [12.8]; Ex.1006, [0017] (teaching “to reserve ‘x+y’ Mb/s”); Ex.1003, ¶¶348-50.

19. Claim 29

[29.0] *Apparatus according to claim 28,*

See [28.0]-[28.9].

[29.1] *wherein the controller is comprised in one of the nodes.*

See [26.1]. Ex.1003, ¶¶351-52.

20. Claim 30

[30.0] *Apparatus according to claim 28,*

See [28.0]-[28.9].

[30.1] *wherein the controller is external to the network.*

See [27.1]. Ex.1003, ¶¶353-54.

E. Ground 3: Claim 6 Obvious Over Baker-Wright-Zheng

1. Zheng

Zheng relates to “controlling virtual circuit connections in a ring network.” Ex.1008, 1:8-10. Zheng’s controller determines when to allow a connection in the network so that the bandwidth capacities of the ring segments are not exceeded by the sum of all required bandwidth. Ex.1008, 5:4-25. To further buttress against over-allocation, Zheng discloses using “over-allocated bandwidth,” which is “bandwidth that is allocated to a virtual connection that exceeds the required or subscribed bandwidth for service on the virtual connection.” Ex.1008, 5:29-35; Ex.1003, ¶¶355-57.

2. Reasons to combine Baker, Wright, and Zheng

A POSITA considering the teachings of Baker would have also considered the teachings of Zheng. Baker and Zheng both describe how to manage physical resources (like bandwidth) in a network. *See* Ex.1005, [0016], [0030] (assigning network resources, which includes bandwidth); Ex.1007, 1:8-10, 4:56-5:14 (assessing whether enough bandwidth on each link of connection); *see also* Ex.1006, [0005] (bandwidth requirements for each link); Ex.1003, ¶358.

First, while Baker contemplates how to manage network resources, Baker provides limited details about how to best manage highly variable traffic flows, including traffic from sources that may briefly exceed their peak rate. A POSITA

would have been motivated to refer to other sources, such as Zheng, to take advantage of Zheng’s over-allocated bandwidth teachings. *See* Ex.1008, 6:21-23, 5:31-35 (over-allocated bandwidth referring to deliverable bandwidth that exceeds the required bandwidth). Zheng teaches using an over-allocation approach for bandwidth management because it “assures quality of performance in the network.” Ex.1008, 5:29-35. The over-allocated bandwidth is not wasted, but rather “may be used at different times by different traffic sources ... when a traffic source meets or exceeds its peak rate.” Ex.1008, 6:30-34; Ex.1003, ¶359.

Second, a POSITA would have had a reasonable expectation of success in combining Zhen’s over-allocated bandwidth teachings with Baker’s and Baker-Wright’s teachings. Zheng’s network teachings are compatible with Baker’s network teachings, just like Wright. *See supra*, Section X.C.3. Zheng uses ATM over a SONET ring network, just like Baker. Ex.1008, 1:36-40, 1:52-54; Ex.1005, [0037]; *see also* Ex.1006, [0015]. Further, Zheng’s determination of over-allocated bandwidth, and whether to allow a connection, is performed by a “connection controller 102” that controls a network feeder. *See* Ex.1008, 5:16-46. This is compatible with Baker’s PGL (a “*controller*”) that is used to manage “network feeder utilization” for better management of bandwidth. *See* Ex.1005, [0062]; Ex.1003, ¶360.

Baker's PGL, configured with sufficient resources to accomplish its additional tasks, would in combination with Zheng have sufficient resources to apply Zheng's over-allocation determination teachings. *See* Ex.1005, [0047]. Accordingly, since Baker and Zheng are applicable to ATM over SONET, and contemplated implementing their respective functions at a controller, Zheng was compatible with Baker such that a POSITA would have had a reasonable expectation of success in the Baker-Zheng combination. Ex.1003, ¶361.

Third, the Baker-Zheng combination would have been predictable and within a POSITA's skill set. As already noted, Baker and Zheng are both applicable to ATM over SONET. Accordingly, combining Zheng with Baker would have been nothing more than the combination of known elements (Baker's PGL managing bandwidth, and Zheng's over-allocated bandwidth), according to known methods (applying Zheng's teachings in Baker's PGL), to yield predictable results (Baker's PGL determining an over-allocated bandwidth, per Zheng, for a link's deliverable bandwidth). For at least the above reasons, a POSITA would have been motivated to combine Baker and Zheng. Ex.1003, ¶¶362-63.

3. Claim 6

[6.0] *The method according to claim 1,*

See [1.0]-[1.5].

[6.1] *and comprising multiplying the bandwidth by a correction factor to*

determine an actual bandwidth.

First, As discussed at [1.3], Baker and Wright render obvious “determining... bandwidth requirements.” Ex.1003, ¶¶364-68.

Second, Zheng further teaches an approach for determining a bandwidth requirement that over-allocates bandwidth to virtual connections, while remaining within the underlying physical links’ limits. Like Wright, Zheng ensures that “the sum of all the bandwidth required for each connection... is less than or equal to the total bandwidth available” on each physical link. Ex.1008, 5:4-25. To achieve this result, Zheng teaches dividing a sum of bandwidth B_j requirements by a granularity value G , applying a “ceiling function,” and then multiplying the ceiling value by the granularity value G :

$$DB = \left\lceil \frac{\sum_j B_j}{G} \right\rceil \times G$$

Ex.1008, 6:1-18; *see also* 6:47-7:7, 5:36-37.

A POSITA would have known that dividing by G is mathematically equivalent to multiplying by $\frac{1}{G}$, so Zheng teaches multiplying a sum of bandwidths by both G and $\frac{1}{G}$, either of which is a “*correction factor*.” Ex.1003, ¶¶369-70.

It would have been obvious for Baker’s PGL to multiply Baker-Wright’s

bandwidth requirements by a granularity value to determine an “over-allocated” bandwidth for the actual bandwidth, used for the same purpose in Baker-Wright as in Zheng, to provide extra bandwidth should a traffic source exceed an allowed peak rate. Ex.1003, ¶¶371-72.

F. Ground 4: Claim 17 Obvious Over Baker-Wright-Holender-Zheng

Ground 4 includes claim 17, which recites similar limitations to claim 6 demonstrated as obvious over Baker-Wright-Zheng in Ground 3 above. Further, Claim 17 depends from claim 12, analyzed in Ground 2 with the addition of Holender. Therefore, claim 17 is obvious over Baker-Wright-Holender-Zheng. A POSITA would have been motivated to combine Zheng with Baker-Wright-Holender for substantially the same reasons given for each reference. *See supra* Section X.D.2 (Holender), X.E.2 (Zheng); Ex.1003, ¶373.

1. Claim 17

[17.0] *The method according to claim 12,*

See [12.0]-[12.8].

[17.1] *and comprising multiplying at least one of the first and second bandwidths by a correction factor to determine a corrected bandwidth.*

First, as discussed at [6.1], the prior art renders obvious “*multiplying... by a correction factor....*” Since claim 17 recites a Markush group, this teaching alone renders the claim obvious. Ex.1003, ¶¶374-76.

Second, Based on Holender’s multiple logical topologies providing multiple services with corresponding bandwidths, it would have been obvious to “*multiply[]*” multiple “*bandwidths*” by a correction factor. *See* Ex.1007, 4:54-65; Ex.1003, ¶¶377-78; *see also* [12.1], [12.3].

XI. DISCRETIONARY DENIAL IS INAPPROPRIATE

A. No basis for 35 U.S.C. § 325(d) denial

None of Baker, Wright, Holender, and Zheng were cited or considered by the Examiner during prosecution of the ’431 patent. *See* Ex.1002; Ex.1001, p. 1 (056). In contrast to the art considered by the Examiner, the prior art presented in this petition renders obvious the “*mapping*” and “*allocating*” limitations that the Examiner emphasized in allowing the claims.

Claims 25-27 of the ’431 patent were recently challenged by a different petitioner (“Unified”) in IPR2022-01514 (September 29, 2022). *See* IPR2022-01514, Paper 1. While some of the art used in Unified’s petition is the same, the arguments are different because the present petition targets different claims than Unified’s petition. Also, the PTO has not yet passed judgment on any of the overlapping art, because Unified’s petition is still pre-Patent Owner Preliminary Response and pre-Institution Decision. *See also* analysis at Section XI.C below (discretionary denial not warranted under *General Plastic*). 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 (Mar. 20, 2020).

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. Continental Intermodal Group – Trucking LLC*, IPR2019-01393, Paper 24 at 7 (June 16, 2020) (informative); *see also Dish Network L.L.C. v. Broadband iTV, Inc.*, IPR2020-01359, Paper 15 (Feb. 12, 2021) (“It would be improper to speculate, at this stage, what the Texas court might do regarding a motion to stay...”). This factor is neutral.

2. Parallel proceeding trial date

Cisco’s Scheduling Order sets December 30, 2022, as the date for the parties to submit a Joint Claim Construction Statement. Ex.1016, 2. The Order, however, does not set a date for the *Markman* hearing or trial. Ex.1016, 2, 4. The expected date for a Final Written Decision in this case is the second quarter of 2024. The Dell litigation does not have a Scheduling Order.

This factor weighs against discretionary denial because the Petitioners have worked expeditiously to prepare and file this petition approximately three months after Cisco received Patent Owner’s infringement contentions on August 3, 2022. Ex.1019; *Fintiv*, Paper 11 at 11–12.

Furthermore, notwithstanding a yet-to-be-issued trial date for the Cisco litigation, the current average time-to-trial for the W.D. Texas district court hearing the co-pending litigation is over two years. Ex.1017 at 37 (showing W.D. Texas median time-to-trial for patent cases of 28.3 months); *In re Apple Inc.*, 979 F.3d 1332, 1350 (Fed. Cir. 2020). Petitioners note that “a court’s general ability to set a fast-paced schedule is not particularly relevant... where, like here, the forum itself has not historically resolved cases so quickly.” *In re Apple Inc.*, 979 F.3d 1332, 1344 (Fed. Cir. 2020). The current average time-to-trial for the Delaware district court(for the lawsuit against Dell) is much longer. Ex.1017 at 14 (median time-to-trial of 36 months).

Accordingly, this factor weighs against discretionary denial. *See Sand Revolution II, LLC v. Continental Intermodal Grp.—Trucking LLC*, IPR2020-01393, Paper 24 (June 16, 2020) (granting institution on rehearing based on finding that uncertainty over district court’s trial date weighed against discretionary denial).

3. Investment in the parallel proceeding

The co-pending litigations are in their early stages, and the investment in them has been minimal. Cisco’s Scheduling Order does not set any dates after the date for the parties to submit a Joint Claim Construction Statement. Ex.1016, 2; *see PEAG LLC v. Varta Microbattery GMBH*, IPR2020-01214, Paper 8 at 17 (Jan. 6,

2021) (finding that since no claim construction hearing had yet been held and discovery was not completed, the little investment in the parallel proceeding weighed against discretionary denial).

4. Overlapping issues with the parallel proceeding

Preliminary invalidity contentions in the Cisco litigation were served on Patent Owner on September 28, 2022. Instituting a proceeding will allow the Board to address the asserted prior art, and the issues will be narrowed in the co-pending litigations due to the estoppel provisions of 35 U.S.C. § 315(e)(2).

Moreover, there will be no overlap of prior art issues. If the Board institutes trial, Petitioners will cease asserting in the co-pending litigations the combination of references on which trial is instituted for the claims on which trial is instituted, to the extent Petitioners even assert the same combination in the litigations against them. This factor weighs against discretionary denial. *See Verizon v. Huawei*, IPR2020-01079, Paper 10 at 38 (Jan. 14, 2021) (finding a similar stipulation “mitigates the concern about overlapping issues” and weighs “against discretionary denial of the Petition.”).

5. Whether the petitioners are defendants

Petitioners are defendants in co-pending litigations. This is true of most Petitioners in IPR proceedings. While the *Fintiv* case indicates that a difference between the district court defendant and the petitioner may weigh against

discretionary denial, nothing within the *Fintiv* case suggests that the same party between the proceedings weighs in favor of discretionary denial. *See HP Inc. v. Slingshot Printing LLC*, IPR2020-01084, Paper 13 at 9 (having the “same parties as parallel proceeding” makes factor 5 “neutral”). Accordingly, this factor is neutral and should not be a basis for denying institution.

6. Other circumstances

As discussed in detail above, the prior art presented in this Petition renders the Challenged Claims unpatentable as obvious. The merits of Petitioners’ arguments are compelling because they lead to a strong conclusion that one or more claims are unpatentable by a preponderance of the evidence. This factor therefore weighs against discretionary denial.

As such, the *Fintiv* factors are either neutral or weigh against discretionary denial. Because this Petition was filed approximately five months before the statutory bar date, institution should not be denied on discretionary factors.

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

None of the *General Plastic* discretionary institution factors favor denial. *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).

1. Factor 1

As noted at section XI.A, claims 25-27 of the '431 patent were recently challenged by Unified in IPR2022-01514 (September 29, 2022). *See* IPR2022-01514, Paper 1. In contrast to the three claims challenged in Unified's petition, the present Petition challenges all claims (30 total). The overwhelming majority of claims at issue in the present Petition are not the "same claims" as in IPR2022-01514. For this reason alone, Factor 1 weighs against discretionary denial.

Moreover, Unified is not a co-defendant and has no products accused of infringement, distinguishing the present facts from *Valve. Compare to Valve Corp. v. Elec. Scripting Prods., Inc.*, IPR2019-00062, Paper 11 at 9-10 (precedential) (different petitioners were "co-defendants in the District Court litigation" and sued based on the same product); *see also* IPR2022-01514, Paper 1, p. 92 ("Unified is not a defendant in a related court case"). Here, "Unified ... certifies that no other party exercised control or could exercise control over Unified's participation in this proceeding, filing this Petition, or conduct in any ensuing trial." *Id.* at 1. While Petitioners are members of Unified Patents, Petitioners have not communicated with Unified Patents regarding the substance of Unified's petition and had no notice of Unified's petition until after it was filed. Thus, there is no "significant relationship." *Valve* at 10; *see also Mercedes-Benz USA, LLC v. Carucel Investments, L.P.*, IPR2019-01404, Paper 12 at 12 (Petitioners' memberships in

Unified did not justify discretionary denial). This further weighs against discretionary denial.

2. Factors 2-5

Given the short difference in time between the filing of Unified's petition and the present Petition, Factors 2 and 4 also weigh against discretionary denial. *See Mercedes-Benz* at 13. Baker and Wright are used in both the present Petition and Unified's petition in various different combinations, demonstrating that Petitioners exercised reasonable diligence, especially in view of the many different challenged claims. No Patent Owner Preliminary Response in Unified's IPR has been filed, so Petitioners receive no potential benefit or tactical advantage. Factors 3-5 therefore weigh against discretionary denial.

3. Factors 6-7

Petitioners challenge all claims, whereas Unified's petition only challenges claims 25-27. Therefore, joinder would not be possible with Unified's petition. Even were both proceedings to result in trial, the small overlap between challenged claims would result in a limited amount of repetition considering both petitions, such that there is only a *de minimis* burden on Patent Owner or the Board. Instead, the similarities that do exist between petitions provide some basis for efficiency arising from becoming familiar with similar disclosures.

Petitioners also have a meaningful due process interest to be heard in this forum on the merits, because of their choice to raise the unpatentability grounds in this Petition before the Board. This fact also favors not denying institution.

XII. CONCLUSION

Petitioners have established a reasonable likelihood that the Challenged Claims are unpatentable.

Respectfully submitted,

Dated: November 17, 2022
HAYNES AND BOONE, LLP
2323 Victory Avenue, Suite 700
Dallas, Texas 75219
Customer No. 27683

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

XIII. MANDATORY NOTICES

A. Real party-in-interest

Pursuant to 37 C.F.R. § 42.8(b)(1), Petitioners certify that the real parties-in-interest are Cisco Systems, Inc., Dell Technologies Inc., and Dell Inc.

B. Related matters

Pursuant to 37 C.F.R. § 42.8(b)(2), to the best knowledge of Petitioners, the '431 patent is or was involved in the following cases:

Case Heading	Number	Court	Filed
<i>Corrigent Corporation v. Dell Technologies, Inc. et al</i>	1-22-cv-00496	D. Del.	April 19, 2022
<i>Corrigent Corporation v. Arista Networks, Inc.</i>	1-22-cv-00497	D. Del.	April 19, 2022
<i>Corrigent Corporation v. Cisco Systems, Inc.</i>	6-22-cv-00396	W.D. Tex.	April 19, 2022
<i>Unified Patents, LLC v. Corrigent Corporation</i>	IPR2022-01514	PTAB	September 29, 2022

C. Lead and back-up counsel and service information

Lead Counsel

Theodore M. Foster
HAYNES AND BOONE, LLP
2323 Victory Ave. Suite 700
Dallas, TX 75219

Phone: (972) 739-8649
Fax: (214) 200-0853
ipr.theo.foster@haynesboone.com
USPTO Reg. No. 57,456

Back-up Counsel

David L. McCombs
HAYNES AND BOONE, LLP
2323 Victory Ave. Suite 700
Dallas, TX 75219

Phone: (214) 651-5533
Fax: (214) 200-0853
david.mccombs.ipr@haynesboone.com
USPTO Reg. No. 32,271

Eugene Goryunov
HAYNES AND BOONE, LLP
2323 Victory Ave. Suite 700
Dallas, TX 75219

Phone: 312-216-1630
Fax: 214-200-0853
eugene.goryunov.ipr@haynesboone.com
USPTO Reg. No. 61,579

Adam C. Fowles
HAYNES AND BOONE, LLP
2323 Victory Ave. Suite 700
Dallas, TX 75219

Phone: 972-739-8674
Fax: 214-200-0853
adam.fowles.ipr@haynesboone.com
USPTO Reg. No. 65,005

Matthew Beck
HAYNES AND BOONE, LLP
2323 Victory Ave. Suite 700
Dallas, TX 75219

Phone: 202-654-4573
Fax: 214-200-0853
matthew.beck.ipr@haynesboone.com
USPTO Reg. No. 79,791

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

XIV. APPENDIX OF CHALLENGED CLAIMS

[1.0] A method for assigning bandwidth in a network including nodes coupled by links arranged in a physical topology, the method comprising:

[1.1] defining between the nodes logical connections associated with a data transmission service to be provided over the network,

[1.2] the logical connections having a connection topology different from the physical topology;

[1.3] determining respective bandwidth requirements for the logical connections based on parameters of the service;

[1.4] mapping the connection topology to the physical topology, so that each of the logical connections is associated with one or more links of the physical topology; and

[1.5] allocating a bandwidth for the service on each of the links in response to the bandwidth requirements of the logical connections and to the mapping.

[2.0] The method according to claim 1,

[2.1] wherein the network comprises a ring network, and wherein the physical topology comprises a ring topology.

[3.0] The method according to claim 1,

[3.1] wherein the connection topology is chosen from one of a hub-and-spoke topology and a full mesh topology.

[4.0] The method according to claim 1,

[4.1] wherein the data transmission service comprises a guaranteed bandwidth service.

[5.0] The method according to claim 1,

[5.1] wherein the data transmission service comprises a class of service defined by a protocol under which the network operates.

[6.0] The method according to claim 1,

[6.1] and comprising multiplying the bandwidth by a correction factor to determine an actual bandwidth.

[7.0] The method according to claim 1,

[7.1] wherein mapping the connection topology to the physical topology comprises generating a bandwidth requirement for each of the links.

[8.0] The method according to claim 1,

[8.1] wherein parameters of the service comprise respective node-bandwidths required by each of the nodes to provide the service.

[9.0] The method according to claim 1,

[9.1] and comprising monitoring traffic generated in the network by the data transmission service, and adjusting the bandwidth in response to the traffic.

[10.0] The method according to claim 1,

[10.1] wherein the data transmission service comprises a plurality of

subclasses of traffic, and

[10.2] wherein allocating the bandwidth comprises allocating a reserved bandwidth to one of the subclasses.

[11.0] The method according to claim 1,

[11.1] wherein allocating the bandwidth comprises comparing a mapping bandwidth determined in response to the bandwidth requirements of the logical connections and to the mapping with a full bandwidth determined by assuming all possible logical connections in the network are provided for.

[12.0] A method for assigning bandwidth in a network including nodes coupled by links arranged in a physical topology, the method comprising:

[12.1] defining between the nodes a first set of logical connections associated with a first data transmission service to be provided over the network, and a second set of logical connections associated with a second data transmission service to be provided over the network, the first set of logical connections having a first connection topology, the second set of logical connections having a second connection topology,

[12.2] the first and second connection topologies being different from the physical topology;

[12.3] determining respective first bandwidth requirements for the first set of logical connections based on first parameters of the first data transmission service

and respective second bandwidth requirements for the second set of logical connections based on second parameters of the second data transmission service;

[12.4] generating a first mapping of the first connection topology to the physical topology, so that each of the first set of logical connections is associated with one or more links of the physical topology;

[12.5] allocating a first bandwidth for the first data transmission service on each of the links in response to the first bandwidth requirements of the first set of logical connections and to the first mapping;

[12.6] generating a second mapping of the second connection topology to the physical topology, so that each of the second set of logical connections is associated with one or more links of the physical topology;

[12.7] allocating a second bandwidth for the second data transmission service on each of the links in response to the second bandwidth requirements of the second set of logical connections and to the second mapping; and

[12.8] summing the first and the second bandwidths to determine a total allocation for each of the links.

[13.0] The method according to claim 12,

[13.1] wherein the network comprises a ring network, and wherein the physical topology comprises a ring topology.

[14.0] The method according to claim 12,

[14.1] wherein the first connection topology comprises a hub-and-spoke topology and the second connection topology comprises a full mesh topology.

[15.0] The method according to claim 12,

[15.1] wherein at least one of the first and second data transmission services comprises a guaranteed bandwidth service.

[16.0] The method according to claim 12,

[16.1] wherein at least one of the first and second data transmission services comprises a class of service defined by a protocol under which the network operates.

[17.0] The method according to claim 12,

[17.1] and comprising multiplying at least one of the first and second bandwidths by a correction factor to determine a corrected bandwidth.

[18.0] The method according to claim 12,

[18.1] wherein generating the first mapping comprises generating a first bandwidth requirement for each of the links, and wherein generating the second mapping comprises generating a second bandwidth requirement for each of the links.

[19.0] The method according to claim 12,

[19.1] wherein the first parameters of the first service comprise respective first node-bandwidths required by each of the nodes to provide the first service,

and wherein the second parameters of the second service comprise respective second node-bandwidths required by each of the nodes to provide the second service.

[20.0] The method according to claim 12,

[20.1] and comprising monitoring traffic generated in the network by the first and second data transmission services, and adjusting the total allocation in response to the traffic.

[21.0] The method according to claim 12,

[21.1] wherein the first data transmission service comprises a plurality of subclasses of traffic, and

[21.2] wherein allocating the first bandwidth comprises allocating a reserved bandwidth to one of the subclasses.

[22.0] The method according to claim 12,

[22.1] wherein the first connection topology is different from the second connection topology.

[23.0] The method according to claim 12, wherein summing the first and the second bandwidths to determine a total allocation for each of the links comprises:

[23.1] determining a first mapping bandwidth in response to the first bandwidth requirements of the first set of logical connections and to the first mapping;

[23.2] determining a second mapping bandwidth in response to the second bandwidth requirements of the second set of logical connections and to the second mapping; and

[23.3] comparing the first mapping bandwidth and the second mapping bandwidth with a full bandwidth determined by assuming all possible logical connections in the network are provided for.

[24.0] A method for assigning bandwidth in a ring network including nodes coupled by links, the method comprising:

[24.1] defining between the nodes a first set of logical connections associated with a first data transmission service to be provided over the network, and a second set of logical connections associated with a second data transmission service to be provided over the network,

[24.2] the first set of logical connections having a hub-and-spokes connection topology, the second set of logical connections having a full mesh connection topology;

[24.3] determining respective first bandwidth requirements for the first set of logical connections based on first parameters of the first data transmission service and respective second bandwidth requirements for the second set of logical connections based on second parameters of the second data transmission service;

[24.4] generating a first mapping of the first connection topology to the ring

network, so that each of the first set of logical connections is associated with one or more links of the ring network;

[24.5] determining a first bandwidth for the first data transmission service on each of the links in response to the first bandwidth requirements of the first set of logical connections and to the first mapping;

[24.6] generating a second mapping of the second connection topology to the ring topology, so that each of the second set of logical connections is associated with one or more links of the ring network;

[24.7] determining a second bandwidth for the second data transmission service on each of the links in response to the second bandwidth requirements of the second set of logical connections and to the second mapping;

[24.8] summing the first and the second bandwidths to determine a total bandwidth for each of the links; and

[24.9] allocating one of the first bandwidth, the second bandwidth, and the total bandwidth to each of the links in response to respectively providing the first service, the second service, and both services, over the network.

[25.0] Apparatus for assigning bandwidth in a network including nodes coupled by links arranged in a physical topology, the apparatus comprising:

[25.1] a controller which is adapted to:

[25.2] [a controller which is adapted to] receive a definition of logical

connections between the nodes, the logical connections being associated with a data transmission service to be provided over the network,

[25.3] the logical connections having a connection topology different from the physical topology,

[25.4] [a controller which is adapted to] determine respective bandwidth requirements for the logical connections based on parameters of the service,

[25.5] [a controller which is adapted to] map the connection topology to the physical topology, so that each of the logical connections is associated with one or more links of the physical topology, and

[25.6] [a controller which is adapted to] allocate a bandwidth for the service on each of the links in response to the bandwidth requirements of the logical connections and to the mapping.

[26.0] Apparatus according to claim 25,

[26.1] wherein the controller is comprised in one of the nodes.

[27.0] Apparatus according to claim 25,

[27.1] wherein the controller is external to the network.

[28.0] Apparatus for assigning bandwidth in a network including nodes coupled by links arranged in a physical topology, the apparatus comprising:

[28.1] a controller which is adapted to:

[28.2] [a controller which is adapted to:] receive a definition of a first set of

logical connections, between the nodes, associated with a first data transmission service to be provided over the network, and a second set of logical connections, between the nodes, associated with a second data transmission service to be provided over the network, the first set of logical connections having a first connection topology, the second set of logical connections having a second connection topology,

[28.3] the first and second connection topologies being different from the physical topology,

[28.4] [a controller which is adapted to:] determine respective first bandwidth requirements for the first set of logical connections based on first parameters of the first data transmission service and respective second bandwidth requirements for the second set of logical connections based on second parameters of the second data transmission service,

[28.5] [a controller which is adapted to:] generate a first mapping of the first connection topology to the physical topology, so that each of the first set of logical connections is associated with one or more links of the physical topology,

[28.6] [a controller which is adapted to:] allocate a first bandwidth for the first data transmission service on each of the links in response to the first bandwidth requirements of the first set of logical connections and to the first mapping,

[28.7] [a controller which is adapted to:] generate a second mapping of the second connection topology to the physical topology, so that each of the second set of logical connections is associated with one or more links of the physical topology,

[28.8] [a controller which is adapted to:] allocate a second bandwidth for the second data transmission service on each of the links in response to the second bandwidth requirements of the second set of logical connections and to the second mapping, and

[28.9] [a controller which is adapted to:] sum the first and the second bandwidths to determine a total allocation for each of the links.

[29.0] Apparatus according to claim 28,

[29.1] wherein the controller is comprised in one of the nodes.

[30.0] Apparatus according to claim 28,

[30.1] wherein the controller is external to the network.

CERTIFICATE OF WORD COUNT

Pursuant to 37 C.F.R. § 42.24(d), Petitioners hereby certify, 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 13,986. 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: November 17, 2022

/Theodore M. Foster/
Theodore M. Foster
Lead Counsel for Petitioners
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 November 17, 2022

Manner of service Priority Express Mail & Fed Ex

Documents served Petition for *Inter Partes* Review Under 35 U.S.C. § 312 and 37 C.F.R. § 42.104 of U.S. 7,330,431; Petitioners' Exhibit List; Exhibits 1001-1019.

Persons served May Patents Ltd. (attorney/agent of record)
c/o Dorit Shem-Tov
P. O. Box 7230
Ramat-Gan, - 5217102
Israel

Corrigent Corporation (assignee of record)
291 Main St.
C/O New England Intellectual Property
West Newbury, Massachusetts 01985

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