UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

Cox Communications, Inc.
Petitioner
v.

Entropic Communications, LLC.
Patent Owner

Inter Partes Review No.
IPR2024-00579

Patent No. 8,223,775
Filing Date: September 30, 2003
Issue Date: July 17, 2012

DECLARATION OF DR. JAMES MARTIN

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I, James Martin, declare as follows:

I. Introduction

1. I am an independent consultant. I am over eighteen years of age, and I would otherwise be competent to testify as to the matters set forth herein if I am called upon to do so.

2. I have prepared this Declaration for consideration by the Patent Trial and Appeal Board in the *Inter Partes* Review of U.S. Patent No. 8,223,775 ("the '775 Patent").

3. I provide this Declaration at the request of Cox Communications, Inc. in connection with the above-captioned *Inter Partes* Review. I have been informed andunderstand that Cox Communications, Inc. contends that claims 18 and 19 of the '775 Patent (the "Challenged Claims") are invalid.

4. I have been asked to provide my opinions regarding: (1) the field of art pertinent to the '775 Patent; (2) the level of ordinary skill in that field of art as of approximately the filing date of the application that yielded the '775 Patent; (3) how a person having such ordinary skill in the art ("POSITA") of the '775 Patent would have understood certain terms used in the claims of the pertinent '775 Patent; (4) how a POSITA of the '775 Patent would have understood the contents of various patents and other art that was publicly available before the priority date of the '775 Patent; (5) whether any of those documents—alone or in combination with each other and/or the general

knowledge of a person of ordinary skill in the art—disclose each and every element of any of the Challenged Claims; and (6) whether the Challenged Claims would have been obvious to one of ordinary skill in the art in light of the references that I considered alone or in combination with each other and/or the general knowledge of a person of ordinary skill in the art.

5. I am being compensated at my standard hourly rate of $350 per hour. My compensation is not dependent on the outcome of, or any issue in relation to, the above captioned *Inter Partes* Review. I have no interest in either party.

6. In forming my opinions, I relied on my own personal knowledge, recollection, and experience in the field and on documents and information referenced in this Declaration.

7. My complete qualifications and professional experience as well as the list of litigation matters in which I have been engaged as an expert over the previous four years are described in my *Curriculum Vitae*, a copy of which can be found in Exhibit 1004. The following is a brief summary of my relevant qualifications and professional experience.

8. I am not an attorney. As shown in my *curriculum vitae*, I have extensive industry experience with telecommunications, including broadband access, specifically DOCSIS Cable HFC access networks, systems, and services. Specifically, I have over thirty years of relevant industry and academic

experience.

9. I divide my background summary into two parts. The first part summarizes my education and relevant work experiences prior to August, 2022 when I left the corporate world and entered the academic world. The second part summarizes the academic research and consulting engagements which are relevant for this Declaration. Please refer to my CV for further details. I point out that I contributed to the DOCSIS CableLabs standards as well as to the IEEE 802.16 WiMAX standards.

10. I received a B.S. degree in Electrical Engineering from the University of Illinois (Champaign/Urbana) in 1983. My focus was wireless communications. I received an MS in Computer Science from Arizona State University (Tempe, AZ) in 1989. I received a Ph.D. from North Carolina State University (Raleigh, NC) in Electrical Engineering in 1999. My dissertation research involved TCP congestion control. I invented the TCP variant referred to as delay-based TCP congestion control. Aspects of this work, along with aspects of my academic research discussed below, have been foundational to the Cable Industry's relatively recent adoption of delay-based Active Queue Management (AQM) methods such as CoDel and PIE.

11. My industry employment includes 6 years at Motorola, 2 years at a startup (FileNet), 10 years at IBM, and 2 years at Gartner. At Motorola, I worked

on chip set design and embedded system design for military satellite communications (the DAMA program to be specific). At IBM, I worked on R&D topics related to Systems Network Architecture (SNA) networking system. While at IBM, my work generated 3 patents in the 2001-2005 timeframe. At Gartner, I was a telecommunications consultant based out of Raleigh NC. I was also an Adjunct Faculty at NCSU. During this time period, I developed a simulation model of the DOCSIS 1.1 protocols.

12. In August of 2002, I joined Clemson University as an Assistant Professor in the Computer Science Department. Much of my research during the 2002-2015 time period explored resource allocation strategies for DOCSIS-based cable access systems. The 2015 publication in IEEE Communications Magazine "DOCSIS 3.1: Scaling broadband cable to Gigabit Speeds", co-authored with leading Industry technical leaders, identified open problems in DOCSIS. Two that are relevant to this Declaration are: 1) Channel aware packet scheduling taking into account bonded channels and channel profiles; 2) Channel and spectrum analysis/monitoring with Proactive Network Management, and specifically, how it should be used to autonomically adapt the network based on spectrum issues.

13. The DOCSIS lineage originates from the 'Aloha with reservations' protocol. Academic and industry research in ATM over wireless, which again cemented the duality between DOCSIS cable and wireless, led to the IEEE 802.16

standards (WiMAX). In the 2012 timeframe, I switched my main research focus to wireless. From 2012 through present, my wireless research evolved from WiMAX, to 802.11 and now to 3GPP 5G/6G. The majority of my ideas and research in wireless involves methods for monitoring and characterizing channels. I have numerous papers that present ideas I have developed related to wireless system optimization and spectrum sharing.

II. Information Considered

14. I have considered the following documents:

a. The ’775 Patent (Ex. 1001);

b. The prosecution history of the ’775 Patent (Ex. 1002); and

c. The other materials cited in my declaration.

III. Obviousness

15. I have been informed and understand that a claim is obvious in light of the prior art if the difference or differences between the claimed subject matter and the prior art are such that the subject matter as a whole would have been obvious, at the time the invention was made, to a person having ordinary skill in the art. I have been informed and understand that the Supreme Court provided an outline for analyzing obviousness in which it rejected an earlier test in favor of an “expansive and flexible approach” using “common sense.” I have also been informed and understand that the Supreme Court explained that under the correct

analysis, any need or problem known in the field of endeavor at the time of invention and addressed by the patent can provide a reason for combining the elements in the manner claimed. I have also been informed and understand that the Supreme Court explained that “[t]he combination of familiar elements according to known methods is likely to be obvious when it does no more than yield predictable results.” I further have been informed and understand that the Court pointed to other factors that may show obviousness. These factors include the following principles:

a. combination that unites old elements with no change in their respective functions is unpatentable. As a result, the combination of familiar elements according to known methods is likely to be obvious when it does no more than yield predictable results,

b. a predictable variation of a work in the same or a different field of endeavor is likely obvious if a person of ordinary skill would be able toimplement the variation,

c. an invention is obvious if it is the use of a known technique to improve a similar device in the same way, unless the actual application of the technique would have been beyond the skill of the person of ordinary skill in the art. In this case, a key inquiry is whether the improvement is more than the predictable use of prior art elements according to theirestablished functions,

d. an invention is obvious if there existed at the time of invention a known problem for which there was an obvious solution encompassed by the patent's claims,

e. inventions that were "obvious to try" — chosen from a finite number of identified, predictable solutions, with a reasonable expectation of success — are likely obvious,

f. known work in one field of endeavor may prompt variations of it for use in either the same field or a different one based on design incentives or other market forces if the variations would have been predictable toone of ordinary skill in the art, and

g. an explicit teaching, suggestion, or motivation in the art to combine references, while not a requirement for a finding of obviousness,remains "a helpful insight" upon which a finding of obviousness may be based.

IV. U.S. Patent No. 8,223,775

16. I have been informed that the earliest priority date to which the Patent Owner may claim the '775 Patent is entitled to is September 30, 2003.

V. Claim Construction

17. I have been informed and understand that in an *inter partes* review

claim terms are construed according to their ordinary and customary meaning as understood by one of ordinary skill in the art in view of the specification and the prosecution history of the patent.

18. In my opinion the claims of the ’775 Patent use terms that have ordinary and customary meanings in the art and do not use these terms inconsistently with those ordinary and customary meanings. Therefore, it is my opinion that no terms need explicit construction.

VI. Level of Skill in the Art

19. I am informed and understand that a person of ordinary skill in the art is a hypothetical person presumed to have known the relevant art at the time of the alleged invention. I am informed and understand that factors that may be considered in determining the level of ordinary skill in the art may include: (A) the type of problems encountered in the art; (B) prior art solutions to those problems; (C) the rapidity with which innovations are made; (D) the sophistication of the technology; and (E) the educational level of active workers in the field.

20. Upon consideration, in my opinion, a person of ordinary skill in the art (“POSITA”) of the ’775 Patent is someone who would have had at least i) a bachelor-level degree in electrical engineering or an equivalent subject and three or more years of experience working in the field of cable and/or satellite signal

processing and communication systems; ii) a master's-level degree in electrical engineering or an equivalent subject and one or more years of experience working in the field of cable and/or satellite television signal processing and communication systems; or iii) a Ph.D.-level degree in electrical engineering or an equivalent subject and at least some experience working in the field of cable and/or satellite television signal processing and/or communication systems. Additional education may substitute for professional experience, and significant work experience may substitute for formal education. Such academic and industry experience would be necessary to appreciate what was obvious and/or anticipated in the industry and what a POSITA would have thought and understood at the time.

21. As of the relevant time frame for the '775 Patent, I possessed at least such experience and knowledge of a POSITA; hence, I am qualified to opine on the '775 Patent.

VII. Prior Art

A. The '333 Publication to Schain, et al. (Ex. 1005)

22. U.S. Patent Pub. No. 2003/0161333 ("Schain"), entitled "Broadband Modem Residential Gateway with Efficient Network Traffic Processing," describes a "broadband gateway 135 that combines a broadband modem 120 and a residential gateway 130 in a single unit." Ex. 1005 at Abstract. Schain is in the

same field as the ’775 Patent, as both relate to cable modem systems.

23. “The cable bridge 315 is responsible for processing external packets received at the cable modem and also provides DOCSIS specified filtering of the external packets.” Id. at [0046]. “The local bridge 345, on the other hand, provides address filtering, general filtering, and translating for local packets and packets crossing the interface.” *Id.*

24. Thus, the cable bridge performs cable modem functionality, and the local bridge performs networking functionality in Schain. *Id.* at [0026], [0046].

25. The cable bridge and the local bridge in Schain are kept separate so that “the processing of external and local packets can be kept separate.” *Id*. at [0051]. The separation of the bridges in Schain also “permits the designer to concentrate on the design of each module. Additionally, a change made to one module does not necessarily affect another module, since each are designed to operate independently of one another. This allows the continued fine-tuning of the modules without affecting the other modules in a negative way.” *Id.*

B. The ’012 Publication to Thi, et al. (Ex. 1006)

26. U.S. Patent Pub. No. 2002/0061012 (“Thi”), entitled, “Cable Modem with Voice Processing Capability,” describes a “network gateway [that] is configured to facilitate on line and off line bi-directional communication . . . via a hybrid fiber coaxial network and a cable modem termination system.” Ex. 1006 at

Abstract. Thi is in the same field as the '775 Patent, as both relate to cable modem systems.

27. The network gateway in Thi includes a DOCSIS MAC. *Id.* at [0169]. Further, in Thi, "[t]he extracted MAC frames are passed to a MAC header processing block in a message processor 282." and "[t]he MAC header processor routes all PDUs matching the network gateway extended header type to the downstream DES 284 for decryption." *Id.* at [0169], [0170].

28. The system in Thi also includes "voice and data processor 160" which "supports the exchange of voice, as well as fax and modem, between a traditional circuit switched network or any number of telephony devices and the CMTS (not shown). The voice and data processor may be implemented with a variety of technologies including, by way of example, embedded communications software that enables transmission of voice over packet based networks." *Id.* at [0147].

C. The '866 Publication to Perlman (Ex. 1007)

29. U.S. Patent Pub. No. 2002/0091866 ("Perlman"), entitled "Selectable Mode Multimedia System," describes "a multimedia system capable of selecting between different network protocols for transmitting and receiving data and multimedia content." Ex. 1007 at ¶ 2. The multimedia system has "a selectable protocol module 230 which includes standard MPEG-2 logic 234 for processing multimedia cable/television channels and DOCSIS logic 235 for processing

packetized data according to the DOCSIS Standard." *Id.* at ¶ 23. Perlman is in the same field as the '775 Patent, as both relate to cable modem systems.

D. The '046 Patent to Crocker, et al. (Ex. 1008)

30. U.S. Patent No. 7,769,046 ("Crocker"), entitled "Technique for Interfacing MAC and Physical Layers of Access Networks," describes an interface "for enabling communication between a physical layer device and an access control device in an access network." Ex. 1008 at 3:51-53. A particular embodiment of the claimed invention includes a Cable Modem Termination System (CMTS), where "plurality of nodes represents a plurality of cable modems that communicate with at least one CMTS . . . using at least one shared access upstream and downstream channel. *Id.* at 21:25-29. Crocker is in the same field as the '775 Patent, as both relate to cable modem systems.

31. The CMTS in Crocker has "different types of line cards which have been specifically configured to perform specific functions." *Id.* at 15:44-45. Line cards 735 "correspond to network interface cards which have been configured or designed to interface with different types of external networks (e.g. WANs, LANs.) utilizing different types of communication protocols." *Id*. at 15:49-52. There are also line cards 731, which "correspond to radio-frequency (RF) line cards which have been configured or designed for use in a cable network. *Id.* at 15:46-48." Line card interface circuitry (e.g. 733a, 733b) runs on line cards 731.

Id. at Figure 7.

32. A line card such as line card 731 includes a "MAC layer 830 [which] includes a MAC hardware portion 834 and a MAC software portion 884. The MAC layer software portion may include software relating to DOCSIS MAC functionality, etc." *Id.* at 18:29-32.

E. The '240 Patent to Fox, et al. (Ex. 1009)

33. U.S. Patent No. 7,225,240 ("Fox"), entitled "Decoupling Processes from Hardware with Logical Identifiers," describes "methods and apparatus for decoupling functional processes, such as network protocol applications and device drivers, from hardware resources through the use of logical resources. Ex. 1009 at Abstract. Fox is in the same field as the '775 Patent, as both relate to efficient networking systems.

34. In Fox, a "modular software architecture solves some of the more common scenarios seen in existing architectures when software is upgraded or new features are deployed. Id. at 4:34-36. Further, "software applications may be upgraded and downgraded independent of each other and without having to reboot the computer system." Ex. 1009 at Claim 1.

VIII. Motivation to Combine the Prior Art

A. Motivation to Combine Schain and Thi

35. It is my opinion that a POSITA would have been motivated to

combine the teachings of the Schain and Thi.

36. Schain and Thi both relate to cable modems with DOCSIS functionality. The underlying technology related to DOCSIS-based cable systems, at least from a standards perspective, is managed by CableLabs. Schain and Thi are in the same field and describe similar systems that people with similar technical backgrounds, including a POSITA as defined here, would be well aware of.

37. Schain and Thi also recognize the need to accommodate new and updated applications and technology related to cable networking.

38. For example, an object of Schain is to "reduce[] interaction and interference between local and external packet processing." Ex. 1005 at [0007]. Similarly, Thi recognizes a specific latency problem with VoIP traffic, highlighting the need to avoid "excessive path latency." Ex. 1006 at [0242]. Thus, both Schain and Thi recognize similar problems and have similar goals, reducing latency for a more efficient processing system.

39. Because Schain and Thi relate to analogous systems that would have been known to a POSITA and deal with similar issues, it is my opinion that a POSITA would have motivated to modify the cable modem of Schain to forward packets without the involvement of the DOCSIS controller as described in Thi to ensure efficiency and avoid issues such as latency and jitter.

40. In my opinion, a POSITA would have had a reasonable expectation of

success in making such modifications, since Schain and Thi describe using hardware and software that was conventional at the time of the alleged invention and known by a POSITA. Thus, they would have understood the technology of each and known how to successfully modify the hardware and software as I've laid out in my declaration.

41. A POSITA would also be knowledgeable and experienced with ensuring the network's ability to flexibly and efficiently transmit data, and creating a more flexible and efficient system would be a goal of a POSITA. Given this commonly-understood goal and a POSITA's familiarity with the similar systems in Schain and Thi, it is my opinion that a POSITA be motivated to and have a reasonable expectation of success in modifying Schain to include forwarding of downstream PDU packets as in Thi.

B. Motivation to Combine Perlman with Crocker and Fox

42. It is my opinion that a POSITA would have been motivated to combine the teachings of Perlman with Crocker and Fox for at least the following reasons.

43. Perlman, Crocker, and Fox all relate to systems and methods for networking. *See* Ex. 1007 at Abstract; Ex. 1008 at Abstract; Ex. 1009 at Abstract

44. Perlman and Crocker relate to analogous systems, involving cable modem and CMTS, and also relate to the same field, the cable industry. Ex. 1007

at [0002]-[0003]; Ex. 1008 at 2:16-35. Perlman and Crocker also involve transmitting and receiving data in cable networks using the same communications standard, DOCSIS. *See, e.g*. Ex. 1007 at ¶ 11; Ex. 1008 at 2:28-48.

45. Because Perlman and Crocker describe similar systems in the same field, a POSITA designing the system described in Perlman, involving a cable modem, would be very familiar with the system described in Crocker, involving a CMTS, and vice versa. The underlying technology at both perspectives are tightly coupled through protocol standardization (CableLabs DOCSIS standards, IETF TCP/IP standards) and through physics (data communications over a hybrid-fiber co-axial physical medium).

46. Because Perlman, Crocker, and Fox relate to the same subject matter, and for the reasons I set out below, it is my opinion that a POSITA would have been motivated to combine them.

47. In addition to relating to the same subject matter, Perlman, Crocker, and Fox all recognize the need to accommodate new and upgraded applications and technology to deal with similar problems. While these are common problems in networking and computer system in general, these three references all provide specific issues for cable system specifically and networking systems generally. For example, Perlman states that in previous systems, "new transmission techniques/protocols which would allow cable providers to transmit content in a

more flexible, efficient and intelligent manner may not be employed" so "what is needed is a system and method for receiving and transmitting data and multimedia content over a cable network in a more flexible, efficient and intelligent manner." Ex. 1007 at ¶¶ 10-11. Similarly, Crocker states that "it is also desirable to improve upon the interoperability of hardware and/or software components in access networks in order to accommodate new and emerging network applications and technologies." Ex. 1008 at 3:42-45. Fox also notes that "[s]ervice providers not only incur downtime due to failures, but also incur downtime for upgrades to deploy new or improved software, hardware, software or hardware fixes or patches that are needed to deal with current network problems" and the "majority of Internet outages are directly attributable to software upgrade issues." Ex. 1009 at 1:6-7.

48. Perlman, Crocker, and Fox thus all identify and seek to provide a solution for leveraging the evolution and advances in relevant technologies thereby promoting more efficient system and flexible systems. By being flexible, the systems in Perlman, Crocker, and Fox are able to adapt to new developments in the art, leading to optimal performance and new capabilities.

49. Further, the analogous systems described in Perlman in Crocker are in the same field and would have been worked on by the same people or people having similar technical backgrounds. This people include my definition of a

POSITA. Thus, it is my opinion that a POSITA would be motivated to modify the multimedia apparatus of Perlman to include the functionality of the CMTS in Crocker to help provide the "more flexible, efficient and intelligent" system that Perlman seeks.

50. Fox provides further support for Perlman's statements related to enhancing system efficiency, and would help provide the more efficient system sought by Perlman. Fox states that it is advantageous to allow "software applications [to] be upgraded and downgraded independent from each other," to mitigate the problems with prior systems and adapting to updates as described in Perlman, Crocker, and Fox. Ex. 1009 at 8:43-56.

51. In my opinion, a POSITA would be motivated to modify the cable modem system of Perlman and Crocker to include independent software upgrades as described in Fox so that, for example, one engine can be updated independently of the other, meaning that the engine not being upgraded can still operate fully while the other is being updated. This modification would create a more flexible system by allowing software and hardware updates and repairs to be done while also minimizing downtime, because an engine not being upgraded or repaired can still operate fully.

52. In my opinion, because Perlman, Crocker, and Fox describe using hardware and software that was conventional at the time of the alleged invention, a

POSITA would expect this modification to be successful. The relatively high level of skill in the art, coupled with familiarity and experience that a POSITA would have with ensuring the network's ability to flexibly and efficiently transmit data, to update the corresponding software, and to ensure interoperability likewise meant a POSITA would have a reasonable expectation of success in so modifying Perlman.

IX. Analysis and Identification of how the Claims are Unpatentable

A. Ground 1: Claims 18 and 19 are unpatentable as obvious over Schain in view of Thi

53. Schain discloses all the elements recited in independent claim 18 and dependent claim 19 with the exception of "the DOCSIS MAC processor configured to process downstream PDU packets and forward the processed packets directly to the data networking engine without the involvement of the DOCSIS controller in order to boost downstream throughput." Thi discloses "the DOCSIS MAC processor configured to process downstream PDU packets and forward the processed packets directly to the data networking engine without the involvement of the DOCSIS controller in order to boost downstream throughput." It is my opinion that the combination of Schain and Thi makes claims 18 and 19 obvious.

1. Independent claim 18

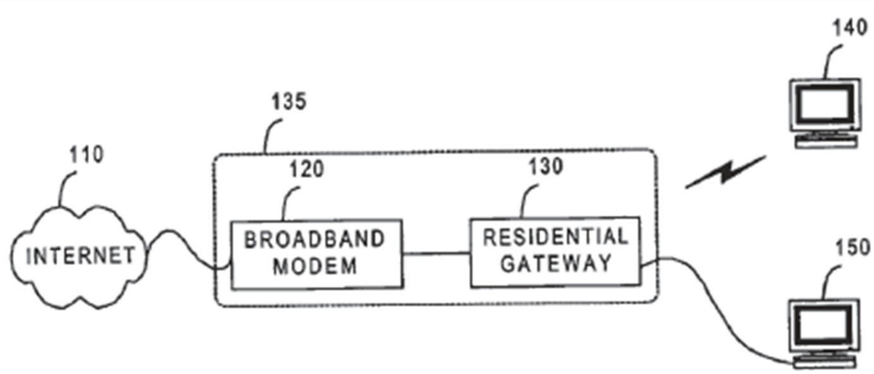
a. *Claim 18 Preamble – "A cable modem system comprising:"*

54. I understand that the preamble is not necessarily limiting. In this case,

whether or not it is limiting does not affect my opinion as Schain discloses the preamble.

55. Schain describes "a basic architecture of a broadband gateway for a DOCSIS 1.0 and 1.1 compliant cable modem/residential gateway device" where "a circuit comprising a broadband modem coupled to a broadband medium." Ex. 1005 at [0008], [0025].

56. The "broadband gateway 135" in Schain combines a broadband modem 120 and a residential gateway 130 in a single unit. *Id.* at Abstract; *see also* Figure 1.



57. In my opinion, the broadband gateway 135 in Schain is a cable modem system as recited in the preamble. It is thus my opinion that Schain makes the preamble of claim 18 obvious.

b. Claim 18a – "a data networking engine implemented in a first circuit that includes at least one processor,"

58. Schain discloses a data networking engine implemented in a first

circuit that includes at least one processor.

59. Schain describes a "local bridge 345" that "provides address filtering, general filtering, and translating for local packets and packets crossing the interface. The presence of the local bridge 345 also isolates the remainder of the broadband gateway 135 from local packet flows, for example, local Ethernet packets that are destined for a device connected to the USB would not be seen by any processes on the cable modem portion of the broadband gateway 135 since any filtering and processing of the packets are performed by the residential gateway portion." *Id.* at [0046].

60. Schain further states that "[b]eneath each bridge is a separate driver layer, with the cable modem featuring a cable driver 310 and the residential gateway various drivers, such as an Ethernet driver 330, an USB driver 335, and a wireless driver 340." *Id. see also* Figure 3. A POSITA would understand the functionality of the local bridge 345 to be data networking functions.

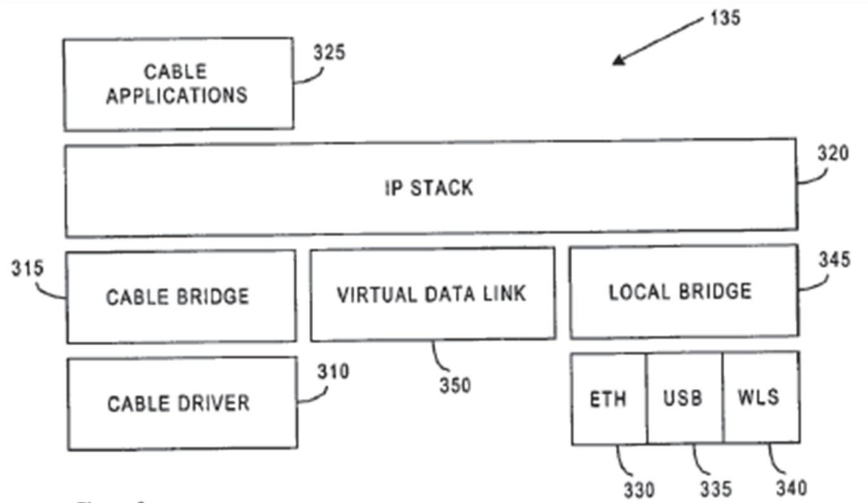


Figure 3

61. Schain also describes "[a] circuit comprising . . . a local bridge." *Id*. at Claim 1. Thus, the local bridge is implemented on a circuit.

62. Schain further states that "“[c]onnected to the common bus 515 is a central processing unit (CPU) 520," which "is responsible for performing any decoding, high-level error detection and correction, high-level Signaling, IP packet processing, address translation, etc." *Id.* at [0061]; see also Figure 5.

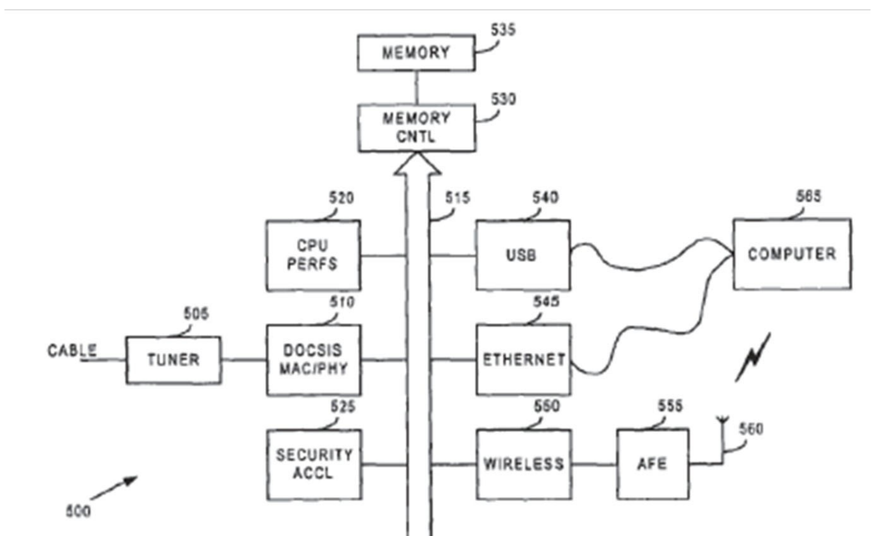


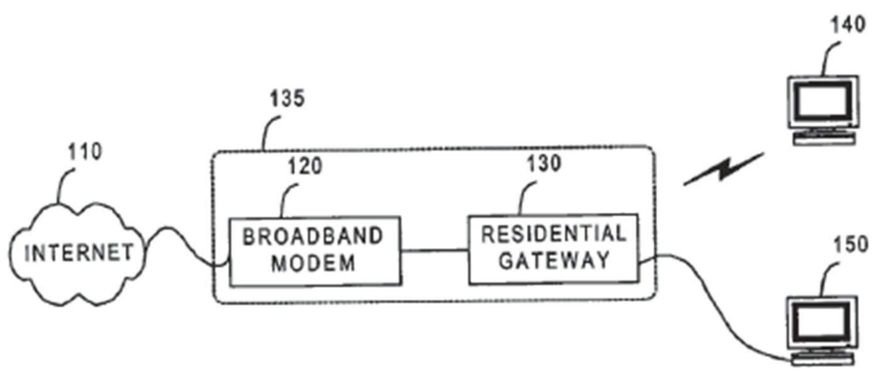
Figure 5

63. It is thus my opinion that Schain makes claim 18a obvious.

c. *Claim 18b – "the data networking engine programmed with software that when executed by the at least one processor of the first circuit causes the data networking engine to perform home networking functions including interfacing with customer provided equipment;"*

64. Schain describes "a local bridge coupled to a network connection, the local bridge containing circuitry to filter packets." *Id.* at Claim 1.

65. Further, Schain Figure 1 "illustrates a typical installation of a subscriber's computer equipment 140 and 150 with a broadband modem 120 and a residential gateway 130, connecting the computer equipment to a network 110, such as the Internet." *Id.* at [0026]; *see also* Figure 1.



66. Thus, the residential or home networking functions performed by the local bridge include interfacing with subscriber or customer provided equipment, such as a subscriber's computer equipment.

67. Schain also discloses a "software portion of the driver layer being

programs that makes the hardware portion operable." *Id.* at [0031]. Thus, Schain describes software that makes the local bridge operable to perform functions, including home networking functions, such as interfacing with customer provided equipment.

68. It is therefore my opinion that Schain makes claim 18b obvious.

d. *Claim 18c – "a cable modem engine implemented in a second circuit that includes at least one processor,"*

69. Schain describes a "cable bridge 315 [that] is responsible for processing external packets received at the cable modem." *Id.* at [0046].

70. The cable bridge in Schain includes a "DOCSIS compliant cable modem" such as a "DOCSIS 1.0 and 1.1 compliant cable modem/residential gateway device." *Id.* at [0025].

71. Based on this functionality, POSITA would understand the cable bridge 315 to be a cable modem engine as recited in claim 18.

72. Schain also refers to the cable bridge as "broadband bridge . . . containing circuitry." Thus the cable bridge (or broadband bridge) is implemented on a second circuit.

73. Schain also describes "DOCSIS MAC/PHY processor 510" where "the information stream . . . is converted into a standardized data format . . . that can be used by devices connected to the broadband gateway." *Id.* at [0060]. The

DOCSIS MAC/PHY processor is part of the cable modem engine disclosed in Schain. Thus, in my opinion, the cable modem engine of Schain includes a processor.

74. It is therefore my opinion that Schain makes claim 18c obvious.

e. *Claim 18d – "the second circuit being separate from the first circuit,"*

75. The local bridge and cable bridge in Schain are described and shown as separate components because "[b]y keeping the two bridges separate, the processing of external and local packets can be kept separate." *Id.* at [0051]; *see also* Figure 3.

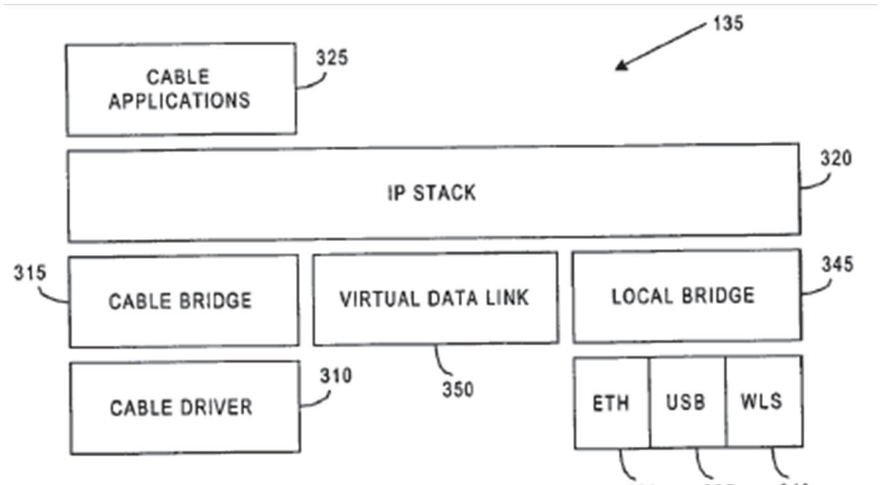


Figure 3

76. Schain further describes the components associated with the local bridge and cable bridge as separate, stating that "[b]eneath each bridge is a separate driver layer, with the cable modem featuring a cable driver 310 and the

residential gateway various drivers, such as an Ethernet driver 330, an USB driver 335, and a wireless driver 340. As previously discussed, should the broadband gateway 135 support other network types, the driver layer of the residential gateway would include an appropriate driver for that network type." *Id.* at [0046].

77. The cable bridge and local bridge of Schain are therefore implemented on separate circuits, and it is my opinion that Schain makes claim 18d obvious.

f. *Claim 18e – "the cable modem engine programmed with software that when executed by the at least one processor of the second circuit causes the cable modem engine to perform cable modem functions other than the home networking functions performed by the data networking engine,"*

78. Schain states that "[t]he cable bridge 315 is responsible for processing external packets received at the cable modem and also provides DOCSIS specified filtering of the external packets. The local bridge 345, on the other hand, provides address filtering, general filtering, and translating for local packets and packets crossing the interface." *Id.* at [0046]. Thus, the cable bridge performs cable modem functions other than the home networking functions performed by the data networking engine.

79. The cable modem bridge is programmed with software that causes the cable modem engine to perform the cable modem functions when executed by a processor, as Schain states that "the software architecture displays its shared IP

stack 420 as being partitioned into two parts. The first IP stack module 422 is present in the external group 405 and is used to provide typical IP stack functionality for the broadband modem portion of the broadband gateway." *Id.* at [0055].

80. It is thus my opinion that Schain makes claim 18e obvious.

g. *Claim 18f – "the cable modem functions including interfacing with cable media, and"*

81. Schain states that "broadband gateway 135 ha[s] two portions, a broadband modem portion and a residential gateway portion, for the specific case of coaxial cabling being the broadband medium. However, modifications to (or simple replacement of) the cable modem portion of the broadband gateway 135 will permit use of the present invention with other broadband media." *Id.* at [0037].

82. A POSITA would understand the coaxial cabling described in Schain to be cable media. The broadband gateway (cable bridge/cable modem functions) in Schain thus interfaces with cable media in the form of coaxial cabling.

83. It is thus my opinion that Schain makes claim 18f obvious.

h. *Claim 18g – "the cable modem engine configured to enable upgrades to its software in a manner that is independent of upgrades to the software of the data networking engine,"*

84. Schain states that "[u]se of the virtual data link 350 permits the logical separation of the two bridges 315 and 345 while permitting the sharing of the same

IP stack 320. By keeping the two bridges separate, the processing of external and local packets can be kept separate. The separation of the bridges can even allow each bridge to be implemented using separate modules, even if the modules are executing on the same processing element." *Id.* at [0052].

85. Further, Schain states that "[t]he use of separate bridges, application and driver layer modules, also permits the designer to concentrate on the design of each module. Additionally, a change made to one module does not necessarily affect another module, since each are designed to operate independently of one another. This allows the continued fine-tuning of the modules without affecting the other modules in a negative way." *Id.* at [0051].

86. Because the local bridge 345 and cable bridge 315 are implemented using separate modules, operate independently, and a change made to one module does not necessarily affect another module, it is my opinion that cable bridge 315 enable upgrades to its software in a manner that is independent of upgrades to the software of the local bridge 345, and vice versa.

87. It is thus my opinion that Schain makes claim 18g obvious.

i. *Claim 18h – "the cable modem engine including a DOCSIS controller and a DOCSIS MAC processor,"*

88. Schain discloses "a data/information stream (typically, a bi-directional Stream) that contains the actual information being received and transmitted by the

computer(s) and digital device(s) connected to the broadband gateway 500. The information stream is forwarded to a DOCSIS MAC/PHY layer processor 510, where the information stream (in its encoded form) is converted into a standardized data format, such as a data packets or even a raw data stream that can be used by the devices connected to the broadband gateway 500." Id. at [0060].

89. Schain further states that an "information stream is forwarded to a DOCSIS MAC/PHY layer processor 510, where the information stream (in its encoded form) is converted into a standardized data format, such as a data packets or even a raw data stream that can be used by the devices connected to the broadband gateway 500." Id. at [0061]. In my opinion, the DOCSIS MAC/PHY processor 510 is a DOCSIS MAC processor as described in claim 18h.

90. Schain also states that "[a]ny required software support for the network connectivity could be provided in the CPU 520, or in specially designed controllers." *Id*. at [0063]

91. Schain also discloses a "cable applications layer 325" which "implements the DOCSIS socket-based processes." *Id.* at [0032], [0047]. The cable application layer 325 is separate from the cable bridge 315. The CableLabs PacketCable 1.0 Architecture Framework, in particular the PacketCable Component Reference Model, defines VoIP as a hardware/software component that operates outside of a cable modem, however, it requires and utilizes the QoS

features that were available in cable modems in the 2002 timeframe[1]. VoIP is, and has always been, considered an 'application'[2]. Therefore, in my opinion, the functions of the 'cable applications layer' are analogous to VoIP, and the 'DOCSIS controller' is located within the 'cable applications layer.' This is similar to how the '775 Patent differentiates between the controller and processor. For example, claim 6 recites that "all VoIP functionality is implemented in the DOCSIS controller" and claim 7 adds "wherein the VoIP functionality is in conformance with the PacketCable specification." The language in these other claims and the description in the specification confirms my understanding of the difference between these two components claim 18 is attempting to make.

92. In Figure 5, Schain shows Schain shows "a hardware view of the broadband gateway 500," including the DOCSIS MAC/PHY layer processor 510.

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[1] CableLabs, "PacketCable: Architecture Framework Technical Report", CableLabs Standards PKT-TR-ARCH-C01-071129, November 2007, available online: https://www.cablelabs.com/specifications/packetcable-1-0-architecture-framework-technical-report

[2] R. Cole, J. Rosenbluth, "Voice Over IP Performance Monitoring", ACM SIGCOM Computer Communication Review, Vol 31, Issue 2, April 2001.

Id. at Figure 5.

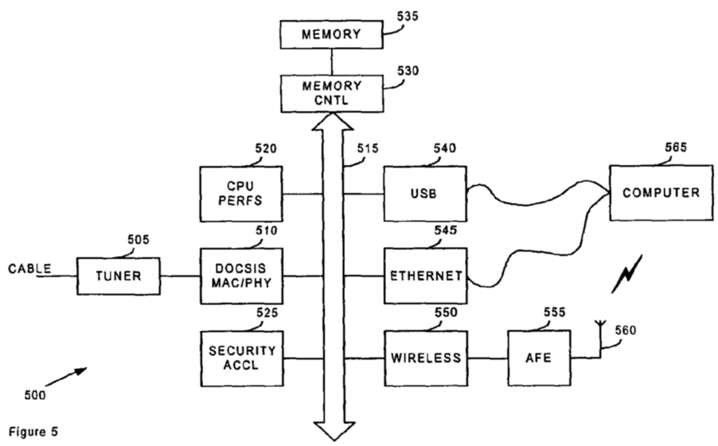


Figure 5

93. It is thus my opinion that Schain makes claim 18h obvious.

j. *Claim 18i – "the DOCSIS MAC processor configured to process downstream PDU packets and forward the processed packets directly to the data networking engine without the involvement of the DOCSIS controller in order to boost downstream throughput; and"*

94. Schain discloses forwarding packets, stating that "the transfer of the packet in the virtual data link 350 may be implemented as simply as a transfer of a memory address. For example, a packet that needs to cross the virtual data link 350 is stored in memory. In fact, it is normal to store packets in memory and therefore, does not require any additional operations. The memory address of the packet in the memory is transferred from one bridge to the other bridge via the virtual data link 350. The address of the packet is provided to the virtual data link 350 by the source bridge (for example, the local bridge 345) and is in turn provided to the receiving bridge (for example, the cable bridge 315). The receiving bridge then

simply references the memory location specified in the address. The packet has just traversed the virtual data link 350 without actually being moved… Alternatively, rather than passing the memory address between bridges, the entire packet may be passed. The source bridge can write the entire contents of the packet into the memory space of the virtual data link 315 and the virtual data link 315 passes the packet onto the destination bridge. The entire packet may need to be passed due to the design of the broadband gateway 135 is implemented." *Id.* at [0049], [0050].

95. A POSITA would understand this to be a description of forwarding a PDU (at least in this context) from the DOCSIS partition of a Cable Modem to the Data partition where the PDU is processed as an IP packet destined for consumption by end user equipment. A POSITA would also understand this description to reflect the system design goal that minimizes the processing and communication time (delay) required from when a PDU arrives at the Cable Modem from the physical medium until the PDU has been forwarded to end user equipment.

96. While the '775 Patent does not provide any description of what PDU packets are or the use of PDU packets, PDU is a well-known term in networking; a POSITA would understand that PDU packets are units of information being transmitted. Based on a POSITA's understanding of PDU packets and how downstream PDU packets might be forwarded in common telecommunications

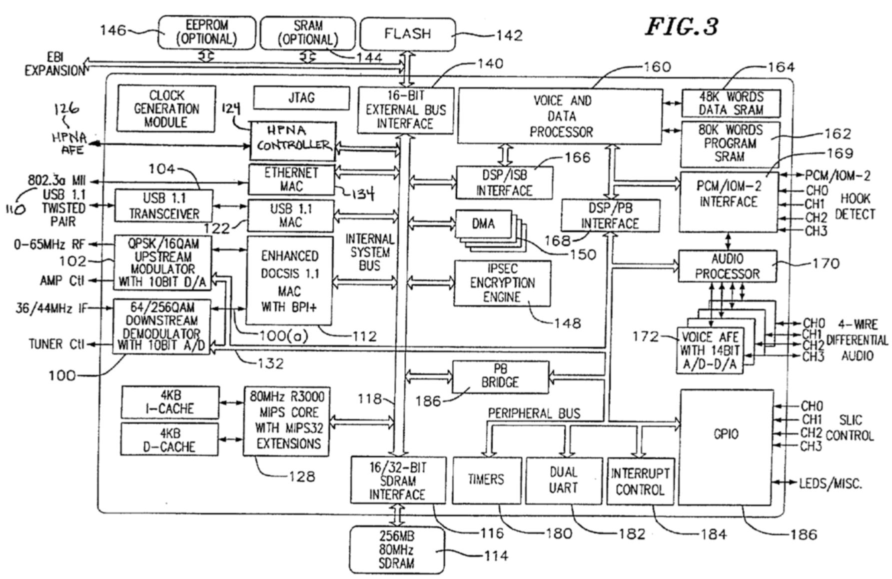
equipment, a POSITA would understand that Schain discloses or implies that the PDU packets are transmitted directly from the cable bridge to the local bridge without involvement of the DOCSIS controller. As illustrated in Figure 5, downstream PDUs, assuming they are not VoIP PDUs, are processed by the cable bridge and then forwarded to the local bridge rather than the cable applications component. This is because of the goal of minimizing processing and communication time as I describe above. Further, there is no reason for the DOCSIS controller to be involved, and so it is highly likely it is not, i.e., a POSITA would not needlessly add steps to a process that the POSITA is trying to optimize in terms of processing load and throughput.

97. To the extent that Schain does not disclose forwarding downstream PDU packets, this is disclosed by Thi.

98. Thi discloses a "DOCSIS Media Access Controller (MAC) 112." Ex. 1006 at [0121], *see also* Fig. 3 below. "The DOCSIS MAC 112 extracts DOCSIS MAC frames from MPEG-2 frames, processes MAC headers, and filters and processes messages and data. *Id.* at [0122]. Thus, a POSITA would understand the DOCSIS MAC to function as a processor. In particular, a POSITA would understand the DOCSIS MAC described in Thi, which extracts, processes, and filters, to be a DOCSIS MAC processor as recited in Claim 18.

99. Thi also discloses a "voice and data processor 160" which "supports

the exchange of voice, as well as fax and modem, between a traditional circuit Switched network or any number of telephony devices and the CMTS (not shown). The voice and data processor may be implemented with a variety of technologies including, by way of example, embedded communications software that enables transmission of ***voice over packet based networks***." Ex. 1006 at [0147] (emphasis added). Thus, the voice and data processor 160 is implementing VoIP functionality. As I describe above, the '775 Patent describes the controller as handling VoIP processing. Thus, based on this same functionality, the voice and data processor in Thi is a DOCSIS controller as recited in Claim 18.



Id. at Figure 3

100. Thi also recognizes the latency problem with VoIP traffic, stating that

"[w]ith regard to path latency and the jitter in that latency, it is not desirable to have packets assembled on one end of the network and leisurely delivered at the other end." *Id*. at [0242]. Thi also states that "audio quality may be affected by lost samples due to congestion and transmission errors and excessive path latency. *Id.* at [0242]; *see also id.* at [0250]-[0256]. A POSITA would understand this concept. Each lost packet or sample will lead to some level of degradation in audio quality, and will at some point be noticeable to the user. A POSITA would want to avoid such degradation. Thi therefore discloses forwarding VoIP packets in a manner that minimizes the path and processing of the packets to avoid latency and errors that may occur with a longer path.

101. Indeed, Thi is seeking to forward downstream packetized voice signals, or VoIP packets, to the data networking engine in as timely a manner as possible by the DOCSIS MAC. In other words, Thi suggests doing as little processing as possible to the packetized voice data to avoid problems like jitter.

102. Avoiding jitter and latency with transmission of data, including PDUs, was a well known goal in the art. Creating a system for transmission of PDUs with a little error and latency as possible to create a more efficient system with less frequent errors would be a goal of a POSITA. Thi shows precisely how latency, jitter, and loss could directly impact the end user perceived quality of a VoIP call. *See, e.g., id.* at [0250]-[0256].

103. Thi further describes forwarding PDUs downstream, stating that "[t]he MAC header processor routes all PDUs matching the network gateway extended header type to the downstream DES 284 for decryption." *Id.* at [0170].

104. As shown in Figure 3, the DOCSIS MAC processor right next to the DES 284, and the voice and data processor 160 is "at the other end." Id. at Figure 3, [0146]. Further, the voice and data processor has a function that is not related to the VoIP data packets being transmitted from the DOCSIS MAC processor. Because Thi is seeking to minimize the path taken by the VoIP data packets being transmitted from the DOCSIS MAC processor to the DES 284 to avoid latency and errors, a POSITA would know that the VoIP data packets would not proceed to the other end of the system to a component with unrelated functionality such as the voice and data processor 160 before going to the DES 284. Thus, the DOCSIS controller in Thi is not involved in the forwarding of the VoIP data packets, or PDUs.

105. "The downstream DES 284 receives data packets and control signals from the header processor" and "decrypts packets using [a] key" in the "baseline privacy header." *Id.* at 171. As described in the '775 Patent, the data networking engine of Claim 18 performs security processing, which is the function being performed by DES 284. Thus, a POSITA would understand the DES 284 of Thi to be a data networking engine.

106. A POSITA thus would understand the DOCSIS MAC, which is a DOCSIS MAC processor, to be routing PDUs packetized voice data, which are PDUs, downstream to the data networking engine, without the involvement of the voice and data processor 160, which is the DOCSIS controller.

107. Thi also describes the forwarding of downstream PDU packets as boosting throughput, because by decreasing latency as is a goal of Thi, the system of Thi would be able to more efficiently process packets, leading to a greater amount of information being processed in a shorter period of time.

108. It is thus my opinion that Schain in combination with Thi makes claim 18i obvious.

k. *Claim 18j – "a data bus that connects the data networking engine to the cable modem engine,"*

109. Schain discloses that a "converted information stream is provided to a common bus 515 by the DOCSIS MAC/PHY processor 510. The common bus 515 is used by devices and functional units in the broadband gateway 500 to share and exchange control information and data." Ex. 1005 at [0060].

110. The local bridge and cable bridge are functional units in the broadband gateway. Thus, they are connected by the common bus 515. It was well known in the art at the time of the alleged invention to connect different components, such as the local and cable bridges, using a bus.

111. In my opinion, the common bus is a data bus as described in claim 18j. It is thus my opinion that Schain makes claim 18j obvious.

l. *Claim 18k – "wherein the cable modem functions performed by the cable modem engine are completely partitioned from the home networking functions performed by the data networking engine."*

112. The cable bridge in Schain is described and shown as separate from the local bridge.

113. Schain discloses a "dual bridge logical architecture [that] means that packets that do not need to cross the interface between the local and external networks are processed by a single bridge and do not cause any interference or place any processing load on the other bridge." Id. at [0046]. Further, Schain states that "[u]se of the virtual data link 350 permits the logical separation of the two bridges 315 and 345 while permitting the sharing of the same IP stack 320. By keeping the two bridges separate, the processing of external and local packets can be kept separate. The separation of the bridges can even allow each bridge to be implemented using separate modules, even if the modules are executing on the same processing element." Id. at [0052].

114. Further, in Schain "[t]he use of separate bridges, application and driver layer modules, also permits the designer to concentrate on the design of each module. Additionally, a change made to one module does not necessarily affect

another module, since each are designed to operate independently of one another. This allows the continued fine-tuning of the modules without affecting the other modules in a negative way." Id. at [0051]; *see also* Figure 3.

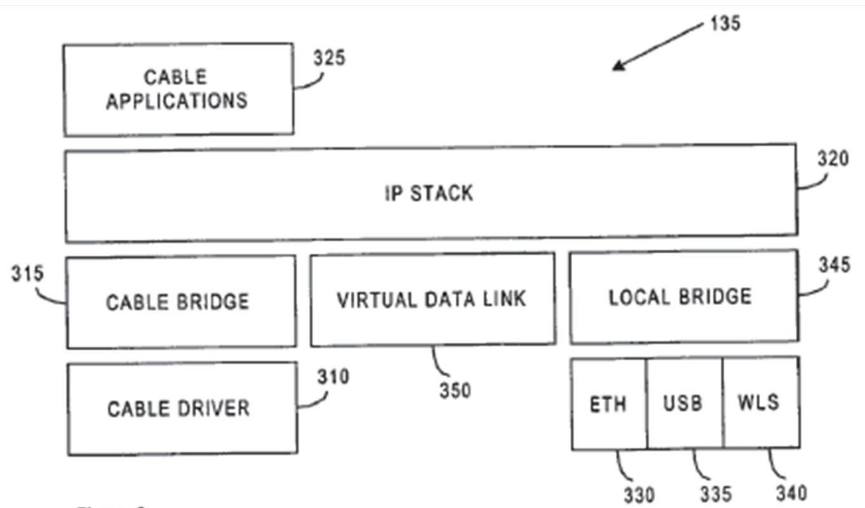


Figure 3

115. Thus, the cable bridge in Schain is physically separated from and designed to operate independently from the local bridge.

116. It is thus my opinion that Schain makes claim 18k obvious.

2. *Dependent claim 19 – "A cable modem system as claimed in claim 18, wherein all DOCSIS functions are localized in the cable modem engine."*

117. Schain states that "[t]he cable bridge 315 is responsible for processing external packets received at the cable modem and also provides DOCSIS specified filtering of the external packets." *Id.* at [0046]. Further, Schain states that "in a DOCSIS cable modem, the cable applications layer 210 implements the DOCSIS socket-based processes." *Id.*

118. Thus, the cable bridge in Schain is responsible for implementing all DOCSIS functions. In my opinion, Schain describes a design pattern with separation of logical components. Because all DOCSIS functions are being implemented by the cable modem engine, a POSITA would understand this to be localization of the DOCSIS functions in the cable modem engine.

119. It is therefore my opinion that Schain makes claim 19 obvious.

B. Ground 2: Claims 18 and 19 are unpatentable as obvious over Perlman in view of Crocker and Fox

120. Perlman discloses all the elements recited in independent claim 18 and dependent claim 19 with the exception of "the data networking engine…interfacing with customer provided equipment," "the cable modem functions including interfacing with cable media," a "DOCSIS controller and a DOCSIS MAC processor" and "the cable modem engine configured to enable upgrades to its software in a manner that is independent of upgrades to the software of the data networking engine." Crocker discloses "the data networking engine…interfacing with customer provided equipment," "the cable modem functions including interfacing with cable media," and a "DOCSIS controller and a DOCSIS MAC processor." Fox discloses "the cable modem engine configured to enable upgrades to its software in a manner that is independent of upgrades to the software of the data networking engine." It is my opinion that the combination of

Perlman, Crocker, and Fox makes claims 18 and 19 obvious.

1. Independent claim 18

a. *Claim 18 Preamble – "A cable modem system comprising:"*

121. I understand that the preamble is not necessarily limiting. In this case, whether or not it is limiting does not affect my opinion as Perlman and Crocker disclose the preamble.

122. Perlman discloses "a multimedia system capable of selecting between different network protocols for transmitting and receiving data and multimedia content." Ex. 1007 at ¶ 2. The multimedia system has a "selectable protocol module 230 which includes standard MPEG-2 logic 234 for processing multimedia cable/television channels and DOCSIS logic 235 for processing packetized data according to the DOCSIS Standard."

123. Thus, the system described in Perlman modulates and demodulates multimedia signals. The invention combines a cable modem with a set top box. A POSITA would know that the system of Perlman thus functions as a cable modem system. . Thus, it is my opinion that Perlman discloses a cable modem system.

124. To the extent that a cable modem system is not explicitly disclosed by Perlman, one is disclosed by Crocker. Crocker states that "[o]ne important class of device that may be used to implement the present invention is the Cable Modem

Termination System." Ex. 1008 at 13:46-48.

125. Crocker also describes that "[i]n the cable network, the plurality of nodes represents a plurality of cable modems that communicate with at least one CMTS at the centralized termination system using at least one shared access upstream and downstream channel." *Id.* at 21:25-29.

126. It is my opinion that the CMTS and plurality of cable modems in Crocker can be viewed as a cable modem system as recited in the preamble. Thus, it is my opinion that Perlman in view of Crocker makes the preamble of claim 18 obvious.

127. Therefore, in my opinion, a POSITA would be motivated to combine Perlman with Crocker, which deal with closely related technology in the same field, such that the multimedia system of Perlman has the functionality of the CMTS described in Crocker, when applied in a cable modem system, because Perlman and Crocker have the same goals of providing a more flexible and efficient way of receiving and transmitting data, and the combination of Perlman and Crocker would help reach those goals.

128. Indeed, Perlman states its goal as providing "a system and method for receiving and transmitting data and multimedia content over a cable network in a more flexible, efficient and intelligent manner." Ex. 1007 at ¶ 10-11. Similarly, Crocker explains that "it is also desirable to improve upon the interoperability of

hardware and/or software components in access networks in order to accommodate new and emerging network applications and technologies." Ex. 1008 at 3:42-45.

b. *Claim 18a – "a data networking engine implemented in a first circuit that includes at least one processor,"*

129. Perlman describes a "MPEG-2 logic 234 for processing multimedia cable/television channels, or "processing the incoming multimedia content." Ex. 1007 at ¶ 23, 24. In my opinion, based on this functionality, a POSITA would understand that this functionality (the MPEG-2) logic would be considered to be a part of the data networking engine.

130. Perlman also discloses "software executed by the CPU 225" which is configured to select the MPEG-2 logic when appropriate. Ex. 1007 at ¶ 28. In my opinion, a POSITA would understand a CPU to be a processor.

131. Further, to the extent that Perlman does not disclose this element, it is my opinion that it is disclosed by Crocker.

132. Crocker discloses line cards 735 which "correspond to network interface cards which have been configured or designed to interface with different types of external networks (e.g. WANs, LANs.) utilizing different types of communication protocols." *Id*. at 15:49-52. The line cards 735 have a data network interface 735a which "functions as an interface component between external data sources and the cable system." *Id.* at 15:54-55. The data network interface 735a on

line cards 735a may interface with packet-switched networks, thereby connecting the cable modem system with the Internet. *Id*. at 15:60-65.

133. A POSITA would understand line cards 735 to be a data networking engine based on this functionality.

134. A POSITA would know that a line card constitutes a circuit.

135. Crocker states that "[o]ne skilled in the art would appreciate that multiple processors, a variety of memory formats, or multiple system controllers, for example, can be used in this context as well as in other contexts while falling within the scope of the present invention." *Id*. at 14:22-27. A POSITA would understand that line card 735 includes a processor.

136. Thus, it is my opinion that Crocker, with the knowledge of a POSITA, makes claim 18a obvious.

137. In my opinion, POSITA would be motivated to modify the MPEG logic of Perlman with the line cards 735 of Crocker because both have similar data networking functionality. Further, it is my opinion that the configuration of the line cards 735 on a first circuit that includes at least one processor would increase the flexibility of the system described in Perlman, which is one of Perlman's stated goals, as well as a goal of Crocker. Ex. 1007 at ¶ 10-11; Ex. 1008 at 3:42-45. This is because implementing the MPEG logic on a separate circuit, such that the hardware is isolated from other components, would make it easier to modify and

update just the MPEG logic without affecting any other components of the system. Further, the relevant timeframe (2000-2002) represents a time of peak technological innovation involving MPEG standards. The ISO/IEC released the initial MPEG-4 standards which were meant to eventually replace the incumbent broadcast technology based on MPEG-1 and MPEG-2.[3] During the early 2000's, ISO/IEC continued to introduce the broad set of MPEG-4 standards. MPEG-4 technology quickly emerged as foundational to the broadcast community's adoption of the Internet Protocol. It is reasonable to assume that these events would manifest to economic incentives for relevant equipment to leverage the chipsets and circuitry becoming available in the timeframe.

138. Therefore, in my opinion, a POSITA would also understand that the combination of Perlman and Crocker would lead to a more efficient and cost-effective system than conventional systems, because as stated in Crocker, "[u]sing the standardized component manufacturers are able to combine different MAC and PHY devices from different vendors, thereby facilitating price and value

[3] Internation Organisation for Standardization Organisation ISO/IEC JTC1/SC29/WG11, N3156, December 1999, available online https://sound.media.mit.edu/resources/mpeg4/audio/general/w3156.pdf

competition between Vendors." Ex. 1008 at Abstract.

c. *Claim 18b – "the data networking engine programmed with software that when executed by the at least one processor of the first circuit causes the data networking engine to perform home networking functions including interfacing with customer provided equipment;"*

139. Perlman describes MPEG-2 logic processing as multimedia cable/television channels, or "processing the incoming multimedia content." Ex. 1007 at ¶ 23, 24. Further, "if a user is watching a first cable channel via tuner 120 and decides to concurrently record a second cable channel or watch the second channel on a separate display or picture-in-picture window, the second tuner 222 will lock on to the second channel responsive to the user's request and the selection logic 251 will select the MPEG-2 logic 234… for processing the incoming multimedia content from the second channel." Ex. 1007 at ¶ 24.

140. Additionally, by using prior art systems, "a user is able to concurrently receive two cable broadcast channels while communicating over the Internet (e.g., sending email, browsing Web pages, downloading interactive content related to a particular TV program, ... etc)." Ex. 1007 at ¶ 28. A POSITA would understand the functions of the MPEG-2 as described in Perlman as being home networking functions.

141. Perlman also discloses "software executed by the CPU 225" which

selects the MPEG-2 logic when appropriate based on the actions of a user. Ex. 1007 at ¶ 28. Thus, when the software in Perlman is executed by the processor, it causes the MPEG-2 logic to perform its functions, which are home networking functions.

142. To the extent that Perlman does not describe the MPEG logic as performing home networking functions including interfacing with customer provided equipment, it is my opinion that this is described by Crocker. Crocker states that the data network interface 735a on line cards 735 "interface[s] with different types of external networks (e.g. WANs, LANs.) utilizing different types of communication protocols (e.g. Ethernet, Frame Relay, ATM, TCP/IP, etc)." Crocker at 15:50-53. The external networks 755 and 757 may be, for example, the Internet. *Id.* at 16:30-32. Crocker Figure 7 shows the line card 735 coupled to external networks 755 and 757.

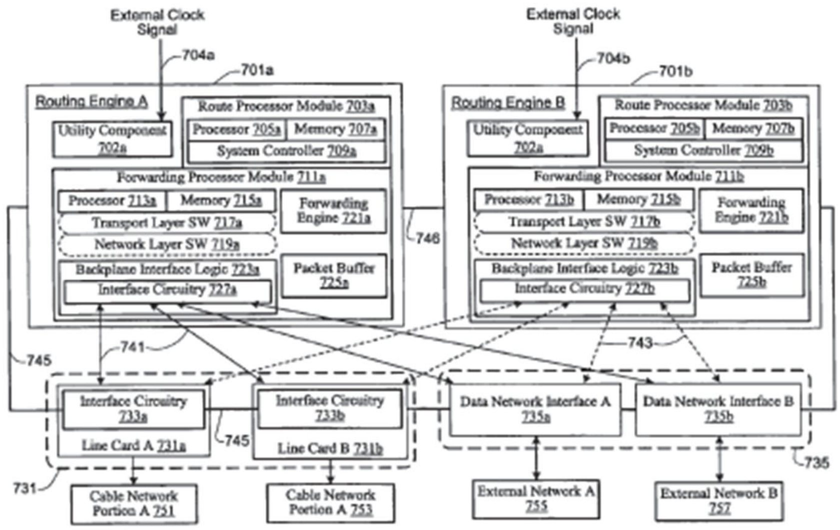


Figure 7 700

143. The data network interface 735a and 735b on line card 735 "may include hardware and software for interfacing to various networks" and "may be implemented on a line card as part of a conventional router for a packet-switched network." *Id.* at 15:58-62.

144. The various networks interfaced with by the data network interface 735a may connect with "wireless transmitting/receiving devices. For example, a satellite dish 952 may be used to communicate with the Head End 920 via the uplink and downlink channels. The satellite dish may, in turn, be connected to a local area network (LAN) 930 which, may be further connected to one or more computer systems 932. Another wireless device may be a portable/wireless computer system 954, which is able to transmit and receive information to the Head End via uplink and downlink channels 907 and 909. Other wireless devices

956 may include, for example, wireless telephones, handheld computing devices, etc." *Id.* at 22:12-22.

145. By facilitating the connection between the CMTS and a network, which connects to equipment such as a computer system when executed by the processor, the software on the data network interface 735a causes the line card 735 to interface with the customer provided equipment.

146. A POSITA would be motivated to modify the MPEG logic of Perlman based on the teachings of Crocker related to line cards 735 because the MPEG logic and line cards 735 are similar in that they have similar home networking functions, and are thus analogous components. Further, modifying the MPEG logic of Perlman to interface with customer provided equipment as done by the line cards 735 in Crocker would increase efficiency of the system, which is a goal of both Perlman and Crocker. Ex. 1007 at ¶ 10-11; Ex. 1008 at 3:42-45.

147. Thus, it is my opinion that Perlman in view of Crocker makes claim 18b obvious.

d. *Claim 18c – "a cable modem engine implemented in a second circuit that includes at least one processor,"*

148. Perlman describes "DOCSIS logic 235 for processing packetized data according to the DOCSIS standard." Ex. 1007 at ¶ 23. Based on this DOCSIS-compliant processing of data packets in the multimedia system of Perlman, it is my

opinion that the DOCSIS logic is a cable modem engine.

149. Perlman also discloses "software executed by the CPU 225" which is configured to select the DOCSIS logic when appropriate. Ex. 1007 at ¶ 28. A POSITA would understand a CPU to be a processor. Thus, it is my opinion that the DOCSIS engine has at least one processor.

150. To the extent this element is not disclosed by Perlman, it is my opinion that it is disclosed by Crocker.

151. Crocker described line cards 731 which "may correspond to radio-frequency (RF) line cards which have been configured or designed for use in a cable network." Id. at 15:46-48. Interface circuitry 733a and 733b runs on line cards 731 and connects to cable network portions 751 and 753. *Id.* at 14:48; Figure 7.

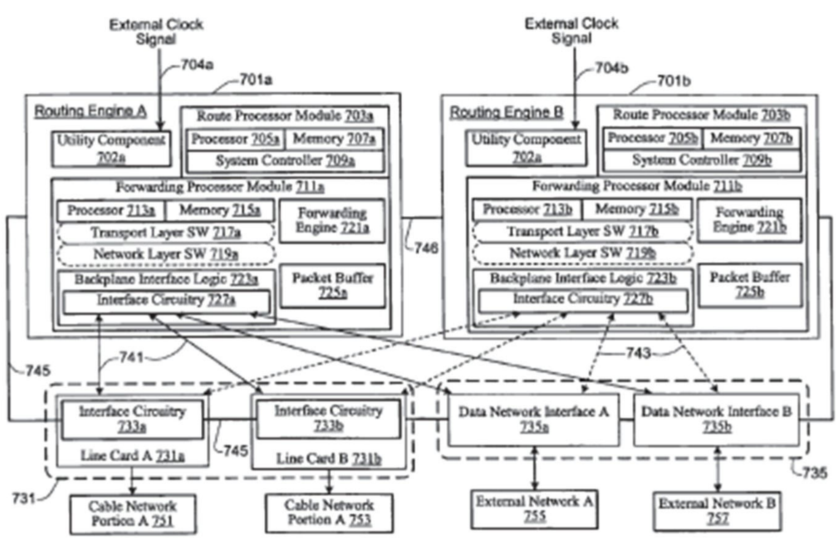


Figure 7 700

152. A POSITA would consider line cards 731 to be a cable modem engine based on this functionality.

153. A POSITA would know that line card 731 is a circuit.

154. As shown in Crocker Figure 8, a line card for interfacing with a cable network potion, which is line card 731, includes a processor.

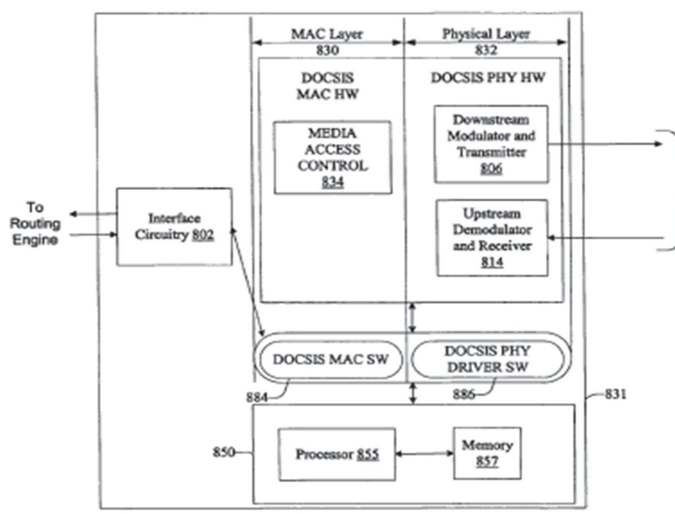


Figure 8

155. A POSITA would be motivated to modify the DOCSIS logic of Perlman with the line cards 731 of Crocker such that the DOCSIS logic is implemented in a second circuit that includes at least one processor. This is because the DOCSIS logic and line cards 731 have similar functionality and operate in accordance with the same standard, DOCSIS.

156. Further, it is my opinion that the configuration of the line cards 731 on a first circuit that includes at least one processor would increase the flexibility of

the system described in Perlman, which is one of Perlman's stated goals, as well as a goal of Crocker. Ex. 1007 at ¶ 10-11; Ex. 1008.

157. Configuring the DOCSIS logic of Perlman and the line cards 731 of Crocker on a separate circuit with at least one processor would lead to a more flexible system because the separation of the DOCSIS logic or line cards 731 on a circuit that is not shared with other components would mean that the DOCSIS logic or line cards 731 could be modified or updated without effecting any other components of the system. Thus, the system would be more flexible because making any updates or modifications would be easier and quicker. Similar to my earlier explanation as to the economic benefit to system designs that leverage emerging and accessible MPEG technology chipsets and circuitry, a POSITA would be aware of the awareness and potential of the 'triple play' that was viewed at that time period as a significant step for the telecommunications and cable industry.[4]

158. Thus, it is my opinion that Perlman in view of Crocker makes claim 18c obvious. More generally, it is my opinion that a POSITA taught by Perlman

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[4] Triple Play, Wikipedia, available online at https://en.wikipedia.org/wiki/Triple_play_(telecommunications)

along with common engineering design patterns driven by economics and disseminated broadly in forms ranging from Undergraduate Engineering Programs to the employment demands of the telecom industry, would expect this modification to be successful.

e. *Claim 18d – "the second circuit being separate from the first circuit,"*

159. Perlman shows describes MPEG-2 logic and DOCSIS logic as two separate components with different functionality, stating "MPEG-2 logic 234 for processing multimedia cable/television channels and DOCSIS logic 235 for processing packetized data according to the DOCSIS Standard." Ex. 1007 at ¶ 23.

160. Perlman also shows the MPEG-2 logic and DOCSIS logic as separate components, as demonstrated by Perlman Figure 2a, which I have annotated to point out the separate of the relevant components below.

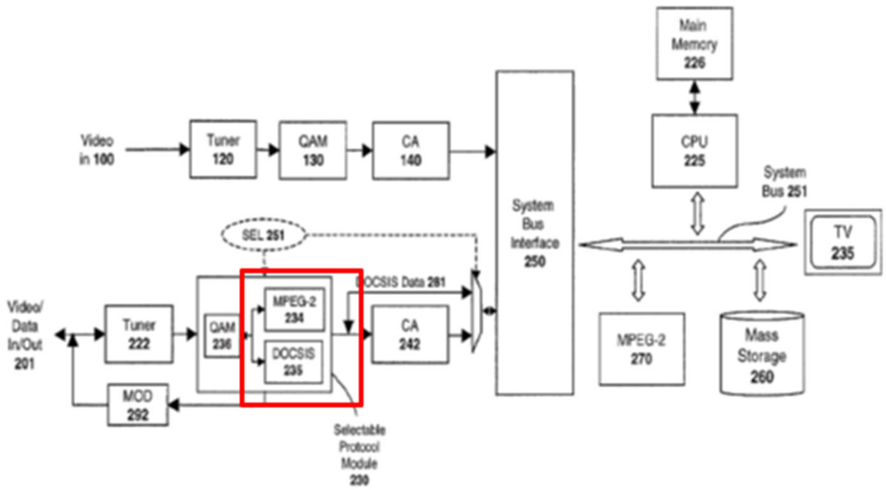

FIG. 2a

161. Because the MPEG-2 logic and DOCSIS logic are two separate components, it is my opinion that a POSITA would know that they could be implemented on separate circuits.

162. To the extent that this element is not disclosed by Perlman, it is disclosed by Crocker, which describes and shows line cards 735 as separate from line cards 731. Ex. 1008 at Figure 7.

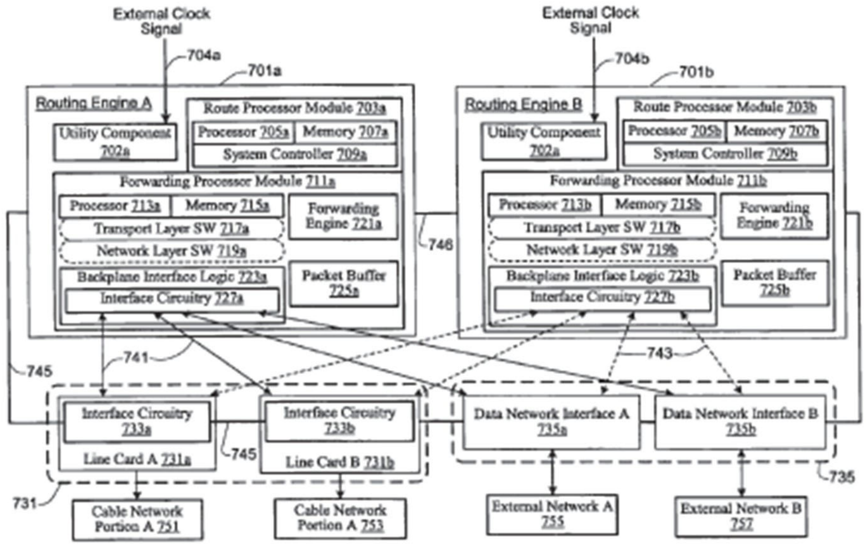

Figure 7 700

163. Crocker states that "the plurality of line cards may include different types of line cards which have been specifically configured to perform specific functions. For example, line cards 731 may correspond to radio-frequency (RF) line cards which have been configured or designed for use in a cable network. Additionally, line cards 735 may correspond to network interface cards which have been configured or designed to interface with different types of external networks (e.g. WANs, LANs.) utilizing different types of communication protocols." Ex. 1008 at 15:43-52. Thus, the line cards 735 are described as different and separate from line cards 731.

164. Crocker also shows line cards 735 as separate from line cards 731. *Id.* at Figure 7.

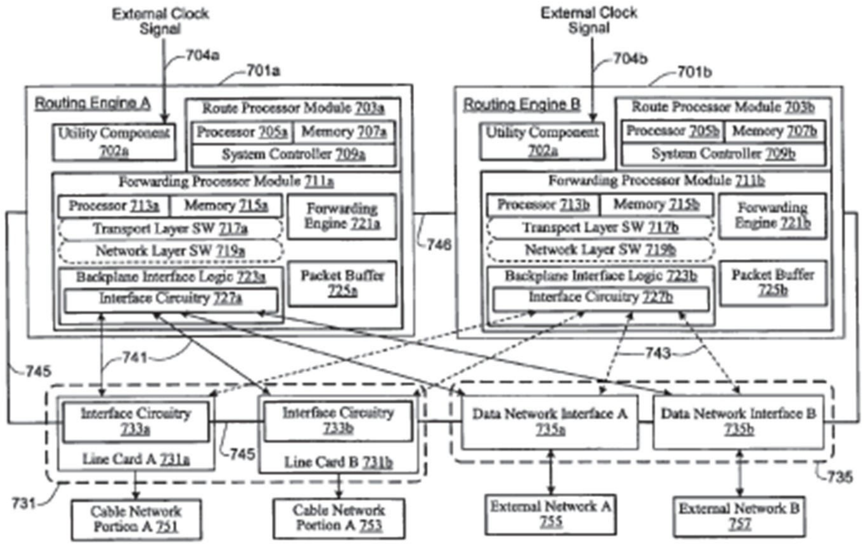

Figure 7 700

165. The second circuit, line card 731, is therefore separate from the first circuit, line card 735.

166. In my opinion, a POSITA would be motivated to modify the system in Perlman such that there is a first circuit separate from the second circuit as in Crocker. The data networking engines and cable modem engines of Perlman and Crocker both have distinct functionalities, and are shown as separate parts of the claimed systems. Implementing the data networking engine and cable modem engine of Perlman on fully separate circuits would help create a more flexible system, which is a goal of both Perlman and Crocker. Ex. 1007 at ¶ 10-11; Ex. 1008 at 3:42-45. Thus, it is my opinion that a POSITA would be motivated modify Perlman based on Crocker to create the more flexible system both references

desire. Thus, it is my opinion that Perlman and Crocker make claim 18d obvious.

f. *Claim 18e – "the cable modem engine programmed with software that when executed by the at least one processor of the second circuit causes the cable modem engine to perform cable modem functions other than the home networking functions performed by the data networking engine,"*

167. Perlman states that the DOCSIS logic "process[es] packetized data according to the DOCSIS Standard." Ex. 1007 at ¶ 23. In my opinion, this is cable modem functionality that is distinct from the functions performed by the data networking engine.

168. Perlman further discloses "software executed by the CPU 225" which is configured to select DOCSIS logic based on the actions of the user. Ex. 1007 at ¶ 28. Thus, when software is executed by the CPU, a processor, the DOCSIS logic performs cable modem functions.

169. To the extent that this element is not disclosed by Perlman, it is my opinion that it is disclosed by Crocker. Crocker states that "line cards 731 may correspond to radio-frequency (RF) line cards which have been configured or designed for use in a cable network." Ex. 1008 at 15:46-48.

170. The line cards 731 are on a CMTS, in a system where there are "the plurality of nodes [that] represent[] a plurality of cable modems that communicate with at least one CMTS at the centralized termination system using at least one

shared access upstream and downstream channel." *Id.* at 21:25-29.

171. The line cards 731 are shown as the component that interacts with the cable network portions 741 and 753. *Id.* at Figure 7.

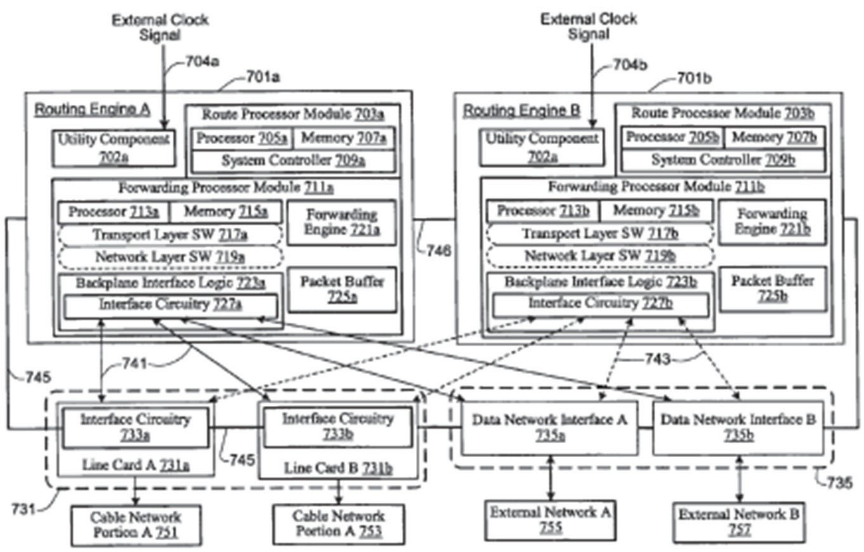

Figure 7

172. Thus, the line cards 731 thereby cause the CMTS to interact with and receive information from cable networks. In my opinion, these ideas are applicable to Cable Modem Systems, and consequently teach a POSITA that the DOCSIS logic of Perlman should perform cable networking functions separate from the home networking functions performed by line cards 735 of Crocker or the MPEG logic of Perlman.

173. It is my opinion that a POSITA would be motivated to modify the DOCSIS logic of Perlman based on the line cards 731 of Crocker such that the

DOCSIS logic is programmed with software that when executed by the at least one processor of the second circuit causes the cable modem engine to perform cable modem functions other than the home networking functions performed by the data networking engine.

174. This is because the DOCSIS logic and line cards 731 perform similar functions and both operate in accordance with DOCSIS. In my opinion, because the two both operate in accordance with the same standard, the interoperability of their functions would be similar. Further, the systems in which the DOCSIS logic and line cards 731 are components are similar, both dealing with data in cable networks.

175. Further, it is my opinion that including the functionality of the line card 731 in Crocker in the DOCSIS logic of Perlman would create a more efficient system, which is a goal of both Perlman and Crocker. Ex. 1007 at ¶ 10-11; Ex. 1008 at 3:42-45. POSITA would therefore be motivated to modify Perlman in light of Crocker so as to attain similar benefits as described above in paragraphs 163 and 164.

176. Thus, it is my opinion that Crocker, with the knowledge of a POSITA, makes claim 18e obvious.

g. *Claim 18f – "the cable modem functions including interfacing with cable media, and"*

177. Perlman states that "if the user chooses to browse Web pages on the Internet, send an email or perform any other data transactions while watching a cable channel via tuner 120, the selection logic 251 will select the DOCSIS module 235 for communicating DOCSIS-formatted data over the cable provider's network using the modulator unit 292 and the tuner 222 (for transmitting and receiving data, respectively)." Ex. 1007 at ¶ 25. Perlman uses the term DOCSIS module as interchangeable with the DOCSIS logic 235. Thus, the DOCSIS logic interfaces with cable media.

178. To the extent that "the cable modem functions including interfacing with cable media" is not disclosed by Perlman, it is disclosed by Crocker.

179. Crocker states that "[c]ommunication between the Head End Complex 102 and fiber node 106 a is typically implemented using modulated optical signals which travel over fiber optic cables. More specifically, during the transmission of modulated optical signals, multiple optical frequencies are modulated with data and transmitted over optical fibers such as, for example, optical fiber links 105 a and 105 b of FIG. 1, which are typically referred to as "RF fibers". As shown in FIG. 1, the modulated optical signals transmitted from the Head End Complex 102 eventually terminate at the fiber node 106a. The fiber nodes maintain the signal modulation while converting from the fiber media to the coax media and back. Each of the fiber nodes 106 is connected by a coaxial cable 107 to a respective

group of cable modems 112 a residing at subscriber premises 110 a-d." *Id*. at 2:16-30; *see also* Figure 1. Although Figure 1 is referred to as "prior art," Crocker does not claim to be improving the manner of media by which a CMTS and cable modems are connected (i.e., via a combination of coaxial cables and fiber optic pathways).

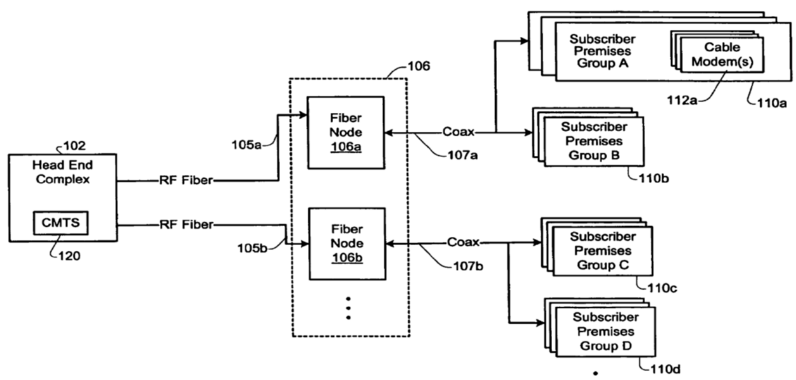

Fig. 1
(Prior Art)
100

180. A POSITA would understand "cable media" to include physical media such as coaxial cabling and fiber optics.

181. In my opinion, a POSITA would be motivated to modify the DOCSIS logic of Perlman to include the functionality of the line card 731 in Crocker, such that the DOCSIS logic functionality includes interfacing with cable media. This is because the DOCSIS logic and line cards have similar functionalities, operate in accordance with the same standard (DOCSIS), and are implemented in analogous systems for transmission of data in cable networks.

182. It is my opinion that the combination of the DOCSIS logic of Perlman with the line cards 731 of Crocker such that the DOCSIS logic interfaces with cable media would increase the efficiency of the system, which is a goal of both Perlman and Crocker. Ex. 1007 at ¶ 10-11; Ex. 1008 3:42-45. Further, a POSITA would be motivated to modify Perlman in light of Crocker so as to attain similar benefits as described above in paragraphs 163 and 164. Thus, a POSITA would have motivated to modify Perlman based on Crocker.

183. Therefore, it is my opinion that Perlman in view of Crocker makes claim 18f obvious.

h. *Claim 18g – "the cable modem engine configured to enable upgrades to its software in a manner that is independent of upgrades to the software of the data networking engine,"*

184. Perlman describes "selection logic 250 [that] switches between MPEG-2 logic 232 for receiving multimedia content and DOCSIS logic 233 for processing packetized DOCSIS data/content." Ex. 1007 at ¶27. This enables the system in Perlman to "provide[] two separate communication channels (one unidirectional channel and one two-way channel) which process content and data under the DOCSIS standard when selected by selection logic 250-251. *Id.*

185. In my opinion, a POSITA would know that this separation between the communication channels and functionality of the MPEG-2 logic and DOCSIS

logic would mean that the MPEG-2 logic 232 and DOCSIS logic 233 can be independently upgraded.

186. To the extent that this element is not disclosed by Perlman, it is my opinion that it is disclosed by Crocker and Fox.

187. In Crocker, the line cards 731 and line cards 735 are on physically separate circuits. *Id*. at Figure 7.

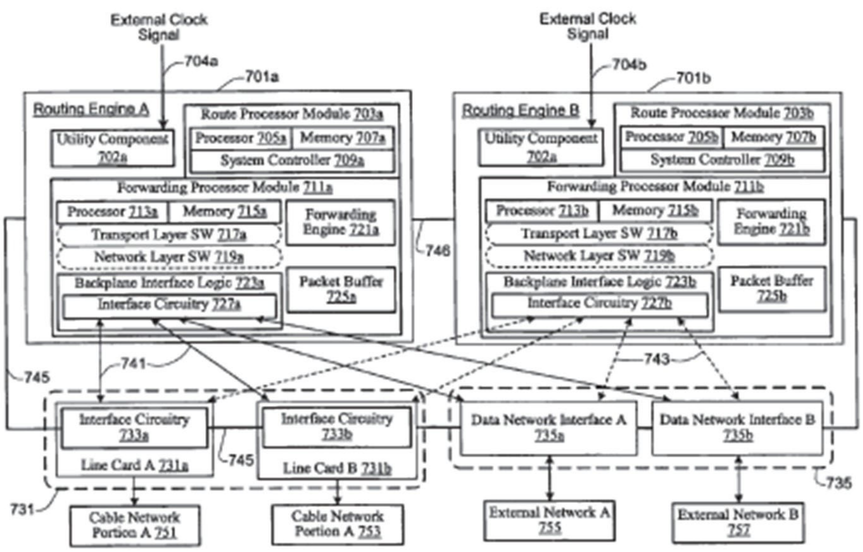

Figure 7

188. Because the two are physically separate, a POSITA would understand that the software on the two could be upgraded separately, at the very least by physically replacing one circuit but not the other.

189. Further, it is my opinion that the functionality of separate upgrades for separate engines was well known at the time of the purported invention of the '775

Patent. Indeed, Fox describes a "modular software architecture that solves some of the more common scenarios seen in existing architectures when software is upgraded or new features are deployed." Ex. 1009 at 4:34-36. Further, Fox states that "software applications may be upgraded and downgraded independent of each other and without having to reboot the computer system." Ex. 1009 at Claim 1.

190. It is my opinion that a POSITA would have been motivated to use independent upgrades as described in Fox in a cable modem system as described in Perlman in view of Crocker. Fox explains that being able to separately upgrade different components helps avoid Internet outages and other interruptions. Ex. 1009 at 1:6-7, 8:43-56. Thus, a POSITA would have been motivated to modify the cable modem system of Perlman in view of Crocker to include independent software upgrades to allow one engine to execute seamlessly while the other engine is being upgraded.

191. Thus, it is my opinion that Crocker in combination with Perlman and Fox makes claim 18g obvious.

i. *Claim 18h – "the cable modem engine including a DOCSIS controller and a DOCSIS MAC processor,"*

192. Perlman describes "DOCSIS logic 233 for processing packetized DOCSIS data/content." Ex. 1007 at ¶27. To the extent that the DOCSIS logic does not include a DOCSIS controller and DOCSIS MAC processor, this is disclosed by

Crocker.

193. When describing line card 731, Crocker states that "MAC layer 830 includes a MAC hardware portion 834 and a MAC software portion 884. The MAC layer software portion may include software relating to DOCSIS MAC functionality, etc. The MAC layer hardware and software portions operate together to provide the above-described DOCSIS MAC functionality. In a preferred embodiment, MAC controller 834 is dedicated to performing some MAC layer functions, and is distinct from processor 855." *Id*. at 18:29-36, Figure 8.

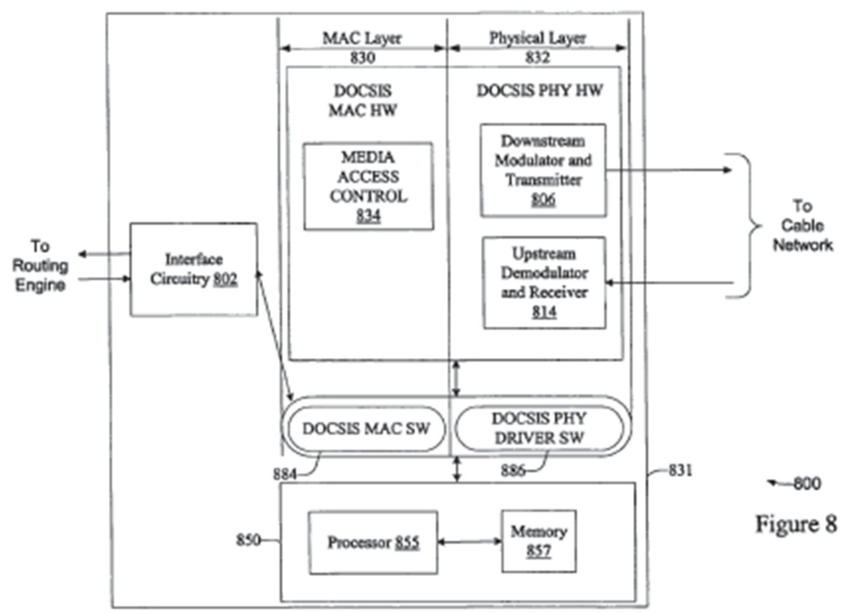

Figure 8

194. Line card 731 thus has a DOCSIS controller and a DOCSIS MAC processor as recited in claim 18h.

195. In my opinion, the controller and processor described in 18h was

conventional and well known at the time. Thus, a POSITA would have been motivated to include these conventional components in the DOCSIS component of Perlman in order to process the data more effectively.

196. It is therefore my opinion that Perlman in view of Crocker makes claim 18h obvious.

j. *Claim 18i – "the DOCSIS MAC processor configured to process downstream PDU packets and forward the processed packets directly to the data networking engine without the involvement of the DOCSIS controller in order to boost downstream throughput; and"*

197. Perlman states that the DOCSIS logic 233 [is] for processing packetized DOCSIS data/content." Ex. 1007 at ¶27.

198. Further, Crocker discloses that a "processor 705a may also be configured or designed to perform configuration management functions of the routing engine 701a, and to communicate with neighboring peer, standby, and/or backup routers to exchange protocol data units used to construct the routing tables in accordance with conventional routing algorithms." *Id.* at 14:35-46.

199. Crocker also states that the "primary purpose of MAC layer 830 is to encapsulate, with MAC headers, downstream packets and decapsulate, of MAC headers, upstream packets." *Id*. at 18:18-20. A POSITA would understand that this means process downstream packets as in claim 18i, and that the downstream packets are protocol data unit (PDU) packets.

200. Crocker also states that "packets are forwarded by the forwarding engine to a data network interface 735a." *Id*. at 14:66-15:2. Crocker thus discloses forwarding the PDU packets directly to the data networking engine. Although the forwarding engine is not pictured as part of the line card 731, in my opinion it would be a trivial modification to have the DOCSIS processor 855 of the line card 731 perform this function.

201. A POSITA would understand that, as this process is described by Crocker, it does not involve the DOCSIS controller. Indeed, Crocker recognizes a need to create a more efficient system. Ex. 1008 3:42-45. Further, a POSITA would be well aware of the goal of minimizing path lengths to minimize latencies in a system. Minimizing latencies would create a more efficient system, because there would be less delay in the system. The DOCSIS controller of Crocker performs functions that is separate from that of the DOCSIS MAC processor. Thus, including this unrelated component in the forwarding of PDU packets would unnecessarily create a longer path for the data packets, leading to more latency and a less efficient system. Thus, a POSITA would know that the DOCSIS controller of Crocker should not be involved in the forwarding of PDUs.

202. It is my opinion that a POSITA would be motivated to modify Perlman in light of Crocker such that the DOCSIS MAC processor is configured to process downstream PDU packets and forward the processed packets directly to

the data networking engine without the involvement of the DOCSIS controller in order to boost downstream throughput. Both Perlman and Crocker have analogous components, the DOCSIS logic and line cards 731, which are configured to process data packets. Including the functionality of Crocker in the system of Perlman would create a more efficient system that would, in my opinion, motivate a POSITA to perform this modification.

203. It is therefore my opinion that Perlman and Crocker makes claim 18i obvious.

k. *Claim 18j – "a data bus that connects the data networking engine to the cable modem engine,"*

204. Perlman shows a connection between the DOCSIS logic and MPEG-2 logic, which a POSITA would understand to be a data bus. See Ex. 1007 at Figure 2a.

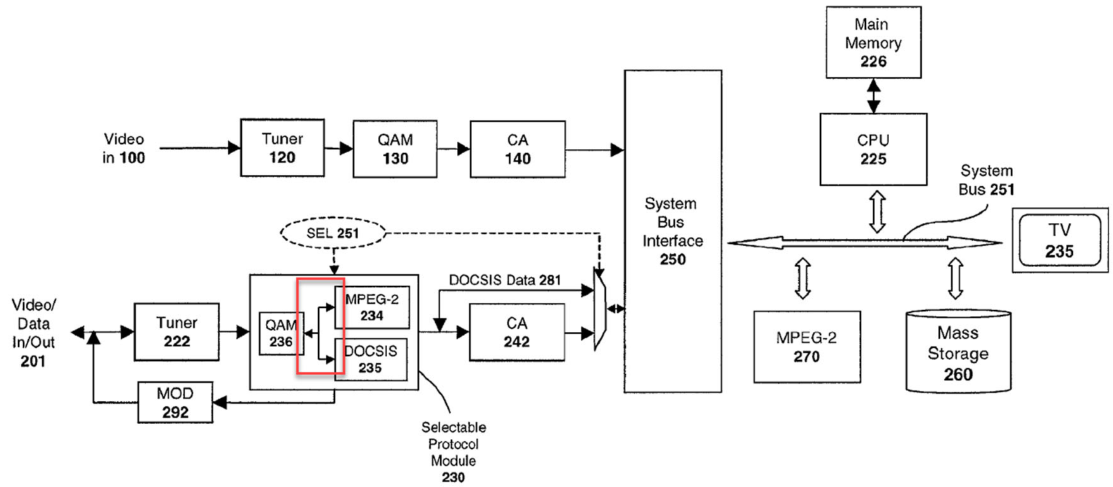

FIG. 2a

205. Similarly, Crocker states that "[a]ccording to one embodiment, all or selected lines cards, routing engines and/or data network interfaces may be configured to use at least one common dedicated line or back plane (e.g. 745)." *Id.* at 16:33-36.

206. As shown in Figure 7, line cards 731 and line cards 735 use a common dedicated line or back plane 745.

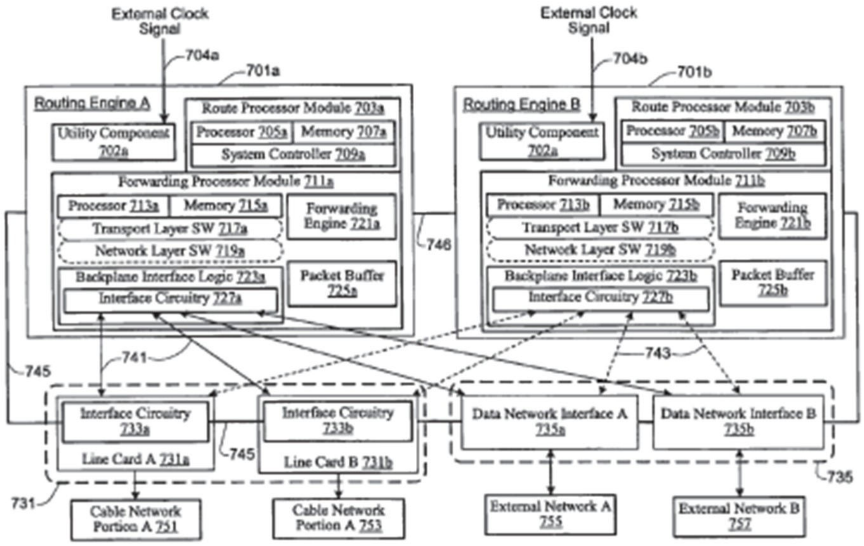

Figure 7

207. Crocker further states that "[a]ccording to a specific implementation, Routing Engine A 701a may be connected to Routing Engine B 701b via at least one link 746, Such as, for example, a backplane line or system bus." *Id.* at 15:15-18. Thus, a POSITA would understand that a backplane line connects components and is a type of bus.

208. Because line cards 731 and line cards 735 are connected by back plane 745, the two components are connected by a data bus.

209. A data bus was, in my opinion, conventional at the time of the purported invention of the '775 Patent. Thus, it is my opinion that a POSITA would have been motivated to connect the engines of Perlman and Crocker with such a conventional means so that data could be passed between the two.

210. Thus, it is my opinion that Perlman and Crocker make claim 18j obvious.

l. *Claim 18k – "wherein the cable modem functions performed by the cable modem engine are completely partitioned from the home networking functions performed by the data networking engine."*

211. Perlman describes the MPEG-2 logic and DOCSIS logic as separate components which different functionalities, where each is configured to process a different type of content, stating that "selection logic 250 switches between MPEG-2 logic 232 for receiving multimedia content and DOCSIS logic 233 for processing packetized DOCSIS data/content." Ex. 1007 at ¶27.

212. Further, the MPEG-2 logic and DOCSIS logic are shown as separate components in Perlman. *See* Figure 2a.

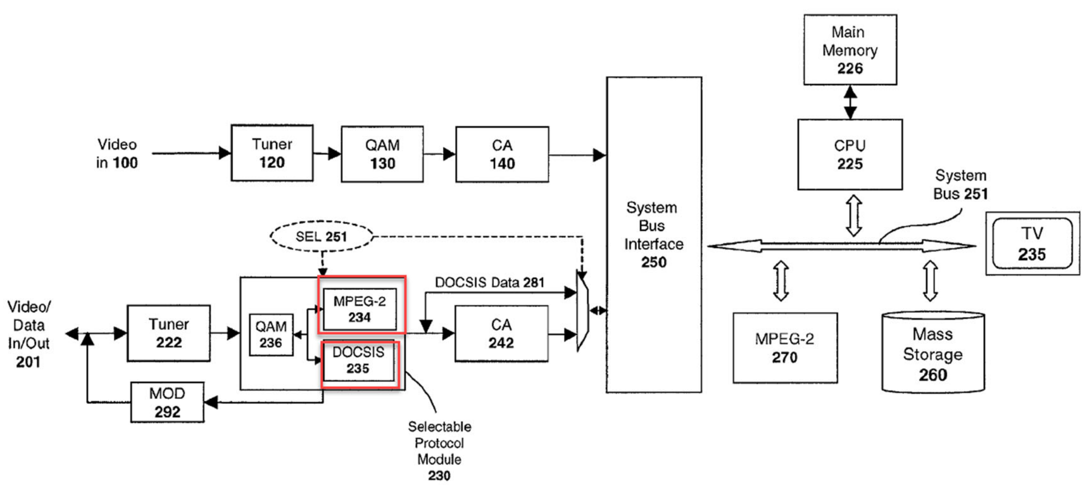

FIG. 2a

213. It is my opinion that configured to perform different functions and process different content, the two are completely partitioned and perform their respective functions independently.

214. Further, to the extent this element is not disclosed by Perlman, it is disclosed by Crocker. Crocker states that "the plurality of line cards may include different types of line cards which have been specifically configured to perform specific functions. For example, line cards 731 may correspond to radio-frequency (RF) line cards which have been configured or designed for use in a cable network. Additionally, line cards 735 may correspond to network interface cards which have been configured or designed to interface with different types of external networks (e.g. WANs, LANs.) utilizing different types of communication protocols." *Id.* at 15:43-52.

215. In my opinion, line cards 731 and line cards 735 are thus separate components with completely different functionality.

216. Line cards 731 and line cards 735 are shown as separate components that interface with different types of networks. *Id.* at Figure 7. Line cards 731 interface with cable network portions 751 and 752, while line cards 735 interface with external networks 755 and 757. *Id.*

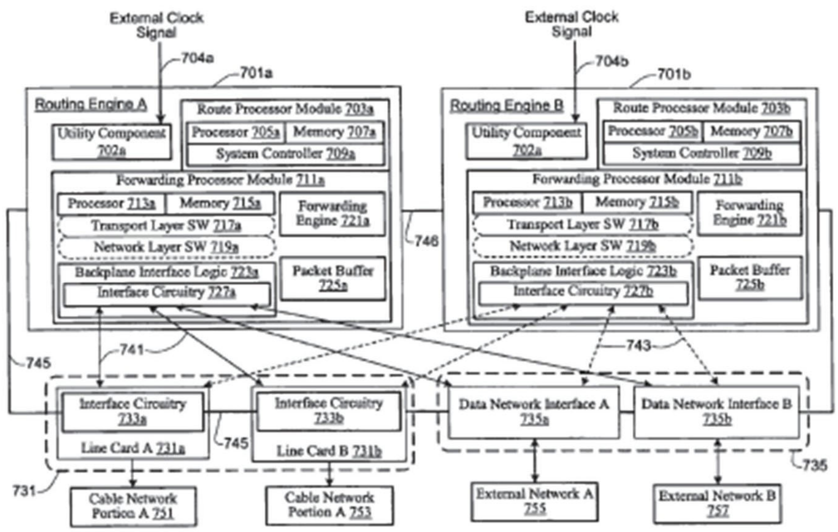

Figure 7 700

217. Because line cards 731 and 735 are separate components, with separate functionalities, that interface with separate networks, a POSITA would understand them to be completely partitioned.

218. In my opinion, a POSITA would be motivated to modify Perlman in light of Crocker so that the two engines are completely partitioned. Indeed, Perlman describes the advantages of different modules being able to execute separately, stating that "[i]n operation, if a user is watching a first cable channel via tuner 120 and decides to concurrently record a second cable channel or watch the second channel on a separate display or picture-in-picture window, the second tuner 222 will lock on to the second channel responsive to the user's request and the selection logic 251 will select the MPEG-2 logic 234 and the QAM logic 236 for processing the incoming multimedia content from the second channel."

219. Because of the stated advantages of separation as described in Perlman, a POSITA would be motivated to fully partition the MPEG-2 logic and DOCSIS logic in Perlman as in Crocker.

220. Thus, it is my opinion that Perlman and Crocker make claim 18k obvious.

2. *Dependent claim 19 – "A cable modem system as claimed in claim 18, wherein all DOCSIS functions are localized in the cable modem engine."*

221. Perlman states that "selection logic 250 switches between MPEG-2 logic 232 for receiving multimedia content and DOCSIS logic 233 for processing packetized DOCSIS data/content." Ex. 1007 at ¶27. Further, in Perlman, "a communication channel [is] configured to switch between a first mode in which the communication channel receives and decodes a first multimedia signal using MPEG logic, and a second mode in which the communication channel transmits and receives data and/or multimedia content according to the Data Over Cable Service Interface Specification ("DOCSIS) standard. Ex. 1007 at Abstract,

222. Thus, as the DOCSIS functionality is described in Perlman, it is all in the DOCSIS logic.

223. To the extent this claim is not disclosed by Perlman, it is disclosed by Crocker. Crocker states that "line cards 731 may correspond to radio-frequency (RF) line cards which have been configured or designed for use in a cable

network." *Id.* at 15:46-48.

224. Crocker also states that "the Data Over Cable System Interface Specification (DOCSIS) . . . standard has been publicly presented by Cable Television Laboratories, Inc. (Louisville, Colo.), in a document entitled, Radio Frequency Interface Specification. *Id.* at 2:7-14.

225. Because the line cards 731 are for RF communications and DOCSIS is for RF interfacing, line cards 731 are for performing DOCSIS functions.

226. Line cards 735 "correspond to network interface cards which have been configured or designed to interface with different types of external networks (e.g. WANs, LANs.) utilizing different types of communication protocols." Id. at 15:49-52. Thus, line cards 735 do not perform any functions related to DOCSIS.

227. It is therefore my opinion that all DOCSIS functions are located in line cards 731.

228. A POSITA would be motivated to modify Perlman in light of Crocker because the two have analogous systems and components. Indeed, the DOCSIS logic of Perlman and the line cards 731 in Crocker both perform similar functionality in accordance with the same standard, DOCSIS.

229. Therefore, it is my opinion that Perlman in view of Crocker makes claim 19 obvious.

I declare under penalty of perjury that the foregoing Declaration is true and correct.

Dated: 02/15/2024

Dr. James Martin