

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

COMCAST CABLE COMMUNICATIONS, LLC,
Petitioner,

v.

ENTROPIC COMMUNICATIONS, LLC,
Patent Owner.

Case IPR2024-00446
Patent 8,223,775

EXHIBIT 2008

SECOND DECLARATION OF SAMUEL H. RUSS, PH.D.

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I. INTRODUCTION

1. My name is Samuel H. Russ. I have been retained as an expert witness to provide my independent opinion in regard to the matters at issue in *inter partes* review of U.S. Patent No. 8,223,775 (“the ’775 patent”) in IPR2024-00446. I have been retained by Entropic Communications, LLC (“Entropic”), the Patent Owner in this proceeding. Petitioner is Comcast Cable Communications LLC (“Comcast” or “Petitioner”).

2. I am being compensated \$450 per hour for my time spent working in connection with this case. My compensation is in no way related to the outcome of this litigation. If called as a witness, I would testify as to the statements and opinions contained in this report.

3. I am not a legal expert and offer no opinions on the law. However, I have been informed by counsel of the various legal standards that apply, and I have applied those standards in arriving at my conclusions.

II. QUALIFICATIONS

4. I have more than 20 years of experience in the fields of broadband cable networks and communications engineering. My professional career has been dedicated to issues relating to signal integrity, communication systems, and home networking more generally.

5. I received a Bachelor of Science in Electrical Engineering with Highest Honors from Georgia Institute of Technology in 1986 and a Ph.D. in Electrical Engineering from Georgia Institute of Technology in 1991. My Ph.D. dissertation was titled “An Information-Theoretic Approach to Analysis of Computer Architectures and Compression of Instruction Memory Usage.”

6. I am currently an Associate Professor in the Department of Electrical and Computer Engineering at the University of South Alabama. I joined the Electrical and Computer Engineering faculty in 2007. I have taught a number of classes including classes in signal integrity, embedded systems, and the design of high-speed digital systems. During that time, I won awards for excellent teaching and have been actively publishing research in signal integrity, home networking, and digital video recording (DVR) technologies.

7. I also have significant industry experience. From 1994 to 1999, I served on the faculty of Mississippi State University as an Assistant Professor in the Department of Electrical & Computer Engineering. I taught circuit board design and two-way interactive video classes, among other topics.

8. From 2000 to 2007, I was the manager in the Advanced Technologies R&D group for Scientific-Atlanta (later Cisco, now Technicolor). As part of this work, I explored major new technologies including home networking and multi-room video distribution and managed a cable set-top box (STB) design group that

designed four STB models for the cable television industry, including the Explorer 4200 (non-DVR) and 8300 (DVR) models. Both models were produced in high volumes and sold several million units. As the design-group manager, I was responsible for managing the design and prototyping activities of the group and for interfacing with other groups (especially integrated circuit design, procurement, software developers, the factory where prototypes were built, and product managers). I also maintained the hardware and mechanical development schedule.

9. While at Scientific-Atlanta, I became a staff expert in home networking, and conducted demonstrations of wireless video technology. My group explored adding home-networking features to cable set-top boxes, such as adding an Ethernet interface to the Explorer 4200. Note that the Explorer 4200 was the first Scientific-Atlanta set-top box to incorporate the DOCSIS standard, and we sold the set-top in large volumes (millions of units) to Cablevision because it supported DOCSIS. Our group also implemented a phone-line interface that could add HomePNA capability to a set-top box. I also became the company's point of contact to CableLabs as their "CableHome" standard was being developed. I also managed a group that developed a new coaxial home networking system, named "Multi-Room DVR" that routed video to multiple set-top boxes in a home over existing coaxial wiring. This coaxial system won a Technology and Engineering Emmy Award in 2013. Further, I was a staff expert in digital video

recorder (DVR) reliability, and led a team that improved the software, hardware, repair, and manufacturing processes.

10. I am the author of *Signal Integrity: Applied Electromagnetics and Professional Practice*, Springer, 1st ed. 2016, 2nd ed. 2022. I have also researched and written about video storage, multimedia broadcasting over networks, embedded systems, consumer electronics, set-top boxes, access of stored video from peer devices in a local network, electronic manufacturing systems, and other topics in video and image processing. I have authored or co-authored 32 journal articles and conference papers in these areas of video storage, video networking and consumer electronics. One of my conference papers on digital video recording won second place in a “Best Paper” competition at the 2011 International Conference on Consumer Electronics in Las Vegas, Nevada.

11. I am a named inventor on 51 patent applications that were filed while I was at Scientific-Atlanta, many of which focus on cable technology. These applications have led to 29 issued U.S. patents and 9 as European patents, including U.S. Patent No. 7,908,625 (“Networked Multimedia System”).

12. A detailed record of my professional qualifications is set forth in the attached Exhibit A, which is my *curriculum vitae*, including a list of publications, awards, research grants, and professional activities. My *curriculum vitae* also lists the matters in which I have served as an expert.

III. BASES OF OPINIONS

13. In the course of conducting my analysis and forming my opinions, I have reviewed materials including those listed below:

- i. U.S. Patent No. 8,223,775 (Ex. 1001) (“the ’775 patent”);
- ii. The Declaration signed by Dr. Sayfe Kiaei in IPR2024-00446 (Ex. 1002) (the “Kiaei Declaration”);
- iii. The prosecution history of the ’775 Patent (Ex. 1004)
- iv. The Petition by Comcast in IPR2024-00446;
- v. U.S. Pub. No. 2002/0006137 (“Rabenko”) (Ex. 1005);
- vi. U.S. Pub. No. 2004/0004974 (“Gaspar”) (Ex. 1006);
- vii. U.S. Pub. No. 2002/0091861 (“Kim”) (Ex. 1007);
- viii. Harry Newton, *Newton’s Telecom Dictionary*, (CMP Books, 18th ed. Feb. 2002) (Ex. 1008);
- ix. U.S. Pub. No. 2004/0125754 (“Johnson”) (Ex. 1009);
- x. U.S. Pub. No. 2002/0065935 (“Koperda”) (Ex. 1010);
- xi. Entropic Communications, LLC v. Charter Communications Inc., No. 2:22-cv-00125-JRG (E.D. Tex. June 26, 2023) (Claim Construction Memorandum Opinion and Order) (Ex. 1011);
- xii. U.S. Pub. No. 2002/0078249 (“Lu”) (Ex. 1012);
- xiii. U.S. Pub. No. 2002/0012343 (“Holloway”) (Ex. 1013);

- xiv. Andrew S. Tanenbaum, Computer Networks, (4th ed. 2003) (Ex. 1014);
- xv. U.S. Pub. No. 2002/0138678 (“Kim ’678”) (Ex. 1015);
- xvi. U.S. Pub. No. 2004/0019765 (“Klein”) (Ex. 1016);
- xvii. The Institution Decision in IPR2024-00446;
- xviii. The exhibits and other documents cited herein.

IV. APPLICABLE LEGAL STANDARDS

A. Level Of Ordinary Skill In The Art

14. My opinions in this declaration are based on the understandings of a person of ordinary skill in the art, which I understand is sometimes referred to as an “ordinary artisan” or by the acronyms “POSITA” or “PHOSITA,” as of the time of the invention, which I understand is here assumed to be the filing date (September 30, 2003) of the ’775 patent. I understand that the person of ordinary skill in the art is a hypothetical person who is presumed to have known the relevant art at the time of the invention. By “relevant,” I mean relevant to the challenged claims of the ’775 patent.

15. I understand that factual indicators of the level of ordinary skill in the art include the various prior art approaches employed, the types of problems encountered in the art, the rapidity with which innovations are made, the sophistication of the technology involved, and the educational background of those

actively working in the field. I understand that, in assessing the level of skill of a person of ordinary skill in the art, one should consider the type of problems encountered in the art, the prior solutions to those problems found in the prior art references, the rapidity with which innovations are made, the sophistication of the technology, the level of education of active workers in the field, and my own experience working with those of skill in the art at the time of the invention.

16. In this case, Mr. Kiaei has asserted in his declaration that a person of ordinary skill in the art as of the time of the '775 patent would have had:

a degree in computer or electrical engineering, computer science, information systems, or a similar discipline, along with three-to-four years of experience with the design and/or implementation of cable modems within network-based content delivery systems. Additional education may substitute for professional experience, and significant work experience may substitute for formal education.

Ex. 1002 [Kiaei-Decl.] ¶ 43.

17. For the purposes of this declaration, I accept Mr. Kiaei's proposed qualifications of a POSITA.

18. As further discussed below, my opinions as stated in this declaration are valid even if the Board adopts a slightly different level of ordinary skill in the art. For example, as will be discussed throughout my report, even a person with the level of knowledge or experience described by Mr. Kiaei or adopted by the

Board would not have a reasonable expectation of success in implementing certain aspects of the proposed combination as of the priority date of the '775 patent.

B. My Understanding Of Legal Standards

19. When considering the '775 patent and stating my opinions, I rely on the following legal standards as described to me by the attorneys for Entropic.

20. I understand that a patent claim is unpatentable if the claimed invention was anticipated by a prior art reference or would have been obvious to a person of ordinary skill in the art at the time of the purported invention.

21. I understand that anticipation requires that every limitation of the claim at issue be disclosed, either expressly or under principles of inherency, in a single prior art reference.

22. I understand that inherency may not be established by probabilities or possibilities. The mere fact that a certain thing may result from a given set of circumstances is not sufficient. Instead, it must be proven that the claim limitation not expressly found in the reference necessarily follows from what is found there.

23. I understand that an obviousness analysis involves comparing a claim to the prior art to determine whether the claimed invention would have been obvious to a person of ordinary skill in the art at the time of the invention in view of the prior art and in light of the general knowledge in the art as a whole. I also understand that obviousness is ultimately a legal conclusion based on underlying

facts of four general types, all of which must be considered: (1) the scope and content of the prior art; (2) the level of ordinary skill in the art; (3) the differences between the claimed invention and the prior art; and (4) any objective indicia of non-obviousness, including any praise of the invention.

24. I also understand that obviousness may be established under certain circumstances by combining or modifying the teachings of the prior art. Specific teachings, suggestions, or motivations to combine any first prior art reference with a second prior art reference can be explicit or implicit, but must have existed before the date of purported invention. I understand that prior art references themselves may be one source of a specific teaching or suggestion to combine features of the prior art, but that such suggestions or motivations to combine art may come from the knowledge that a person of ordinary skill in the art would have had.

25. I understand that a reference may be relied upon for all that it teaches, including uses beyond its primary purpose, but also including teachings that lead away from the invention. I understand that a reference may be said to teach away when a person of ordinary skill, upon reading the reference, would be discouraged from following the path set out in the reference, although the mere disclosure of alternative designs does not teach away.

26. I further understand that whether there is a reasonable expectation of success in combining references in a particular way is also relevant to the analysis.

27. I understand that it is improper to use hindsight to combine references or elements of references to reconstruct the invention using the claims as a guide. My analysis of the prior art is made from the perspective of a person of ordinary skill in the art at the time of the invention.

28. I understand that in order to be eligible as prior art and therefore form a reference in one of the instituted grounds, a reference must be analogous art to the '775 patent. I also understand that it is Petitioner's burden to prove that their asserted references are analogous art to the '775 patent. I am informed that in order to determine whether a reference is analogous art to the '775 patent, a two-part test is applied as follows:

Two separate tests define the scope of analogous prior art: (1) whether the art is from the same field of endeavor, regardless of the problem addressed and, (2) if the reference is not within the field of the inventor's endeavor, whether the reference still is reasonably pertinent to the particular problem with which the inventor is involved.

In re Bigio, 381 F.3d 1320, 1325 (Fed. Cir. 2004); *see also In re Clay*, 966 F.2d 656, 658 (Fed. Cir. 1992). I have been informed and understand that to discern the field of endeavor, courts have looked to the specifications of the patent and the alleged prior art reference and particularly to the respective "background of

Invention” and/or “field of the invention” sections. *See, e.g., In re Wood*, 599 F.2d 1032, 1036 (CCPA 1979) (determining field of endeavor based on “Background of Invention”); *Wyers v. Master Lock Co.*, 616 F.3d 1231, 1237-38 (Fed. Cir. 2010) (finding reference concerning padlocks to be in the same field of endeavor where the “patent itself refers to ‘the prior art padlock’ in the background of the invention”); *Airbus S.A.S. v. Firepass Corp.*, 941 F.3d 1374, 1381 n. 8 (Fed. Cir. 2019) (“[T]he specification of each reference includes a ‘Field of the Invention’ section that distinctly describes each applicable field of endeavor.”).

29. I am not offering any legal opinions in this declaration nor am I qualified to do so. I only consider such legal standards in framing my opinions and conclusions as well as placing assertions made by Petitioner in the Petition into the proper context. Additionally, from a subject matter perspective, I understand that the petitioner always has the burden of persuasion regarding a challenge of patentability of an invention under an inter partes review.

V. CLAIMS-AT-ISSUE (CLAIMS 1-20)

30. I understand that Petitioner has challenged the claims as follows:

- Claims 1-7, 10, 12, 14-15, 18-20 based on obviousness over Rabenko (Ground A);
- Claims 1-7, 10, 12, 14-15, 18-20 based on obviousness over Rabenko in view of Gaspar (Ground B);

- Claims 1-7, 10, 12, 14-15, 18-20 based on obviousness over Rabenko in view of Kim (Ground C);
- Claims 1-7, 10, 12, 14-15, 18-20 based on obviousness over Rabenko in view of Gaspar and further in view of Kim (Ground D);
- Claims 1-7, 10, 12, 14-15 based on obviousness over each of Grounds A-D, above, further in view of Lu (Grounds E-H);
- Claim 12 based on obviousness over each of Grounds A-H, above, further in view of Klein and further in view of Kim '678 (Grounds I-P);
- Claim 8 based on obviousness over each of Grounds A-H, above, further in view of Koperda (Grounds Q-X);
- Claim 9 based on obviousness over each of Grounds Q-X, above, further in view of Johnson (Grounds Y-FF); and
- Claims 11, 13, 16-17 based on obviousness over each of Grounds A-H, above, further in view of Johnson (Grounds GG-NN).

VI. OPINIONS

A. The '775 Patent's Disclosures And Advantages Are Distinct From Rabenko.

31. The '775 patent consists of three independent claims: claims 1, 14, and 18, each of which have limitations substantially similar to each other for

purposes of the subject matter I discuss in this declaration. The limitations I discuss herein with respect to claim 18 are similarly disclosed in claims 1 and 14 as far as the arguments to which I am responding are concerned, and so my opinions with respect to the disclosures of the '775 patent and the references as they apply to claim 18 also applies to independent claims 1 and 14 as well. I note that Petitioner presents arguments as to claim 18, then relies on those same arguments as to the other two independent claims, specifically, discussing claim 18 at pages 13-39, independent claim 1 at pages 41-49, and independent claim 14 at pages 61-63.

32. The '775 patent describes a “future **gateway cable modem** (CM).” Ex. 1001 ['775] 1:13-15. This future “gateway cable modem will incorporate a variety of functions beyond the traditional cable modem...” *Id.*, 1:20-22. As the '775 patent then observes, when it comes to this gateway cable modem of the future,

[p]artitioning these functions along with other cable modem functions among different computational agents is an essential issue in designing a gateway cable modem.

Id. 1:27-29. The '775 patent further teaches that a “major challenge in designing” the future gateway cable modem is “integrat[ing]” the data networking and VoIP services with “basic cable modem functionality in an efficient and cost-effective [manner].” *Id.*, 1:16-18. To address this challenge, the '775 patent identifies

certain “objectives” that must be met by the inventive architecture, including flexibility:

Flexib[i]lity. The architecture of the gateway cable modem should be flexible enough to allow independent software development and field-upgrade of gateway value-added services and basic DOCSIS cable modem services.

Id., 1:30-33, *see also id.*, 1:33-40. It discusses detailed targets to provide benefits in the areas of “Performance,” “Cost,” and “Software Re-Use.” *Id.*, 1:41-55. The ’775 patent then explains that its novel disclosed architecture achieves these various goals:

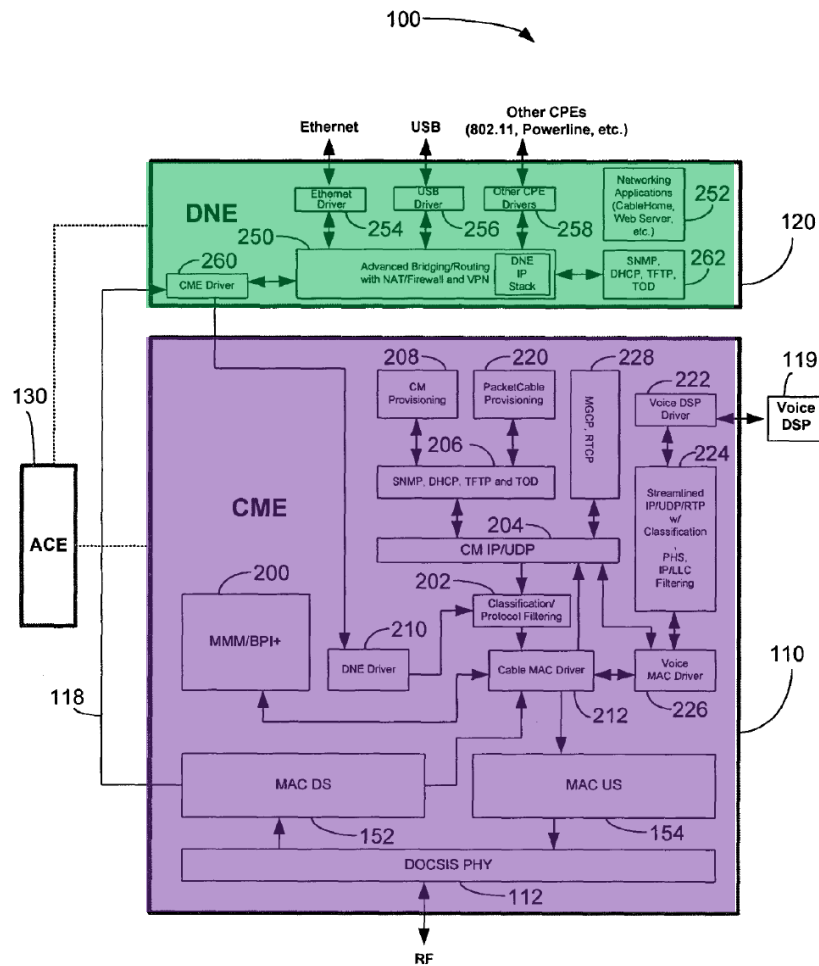
The present invention provides a gateway cable modem architecture that ***meets all of these objectives***.

Id., 1:56-57.

33. To meet these objectives, the ’775 patent’s inventive gateway modem architecture is centrally based on separate “engines” that are functionally partitioned from one another and in separate circuits. First is a data networking engine (“DNE”) in a first circuit responsible for the home networking functions—in short, for the part of the cable modem that will interface into networks on-premises. Second is a cable modem engine (“CME”) in a second circuit responsible for the cable modem functions—the interface to communication outside the premises to the cable operator and on to the internet. This interface is

expected to implement the DOCSIS set of standards, and the CME includes both a DOCSIS MAC processor and a DOCSIS controller. *See, e.g.*, Ex. 1001 ['775] Fig. 2, 1:66-2:4.

34. As previously mentioned, each of the DNE and CME are implemented in respective circuits, which in turn each include at least one processor. The DNE and CME are functionally partitioned from each other as claimed, “the cable modem functions performed by the cable modem engine [CME] are completely partitioned from the home networking functions performed by the data networking engine [DNE].” *E.g.*, Ex. 1001 ['775] cl. 18. This partitioning is accompanied by independent software upgradeability as claimed, “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...” *Id.*, 8:13-16. Indeed, insofar as I see in the record and am aware of outside the record, it is the '775 patent that disclosed that this decoupling and implementation with different processors of “the data networking and cable modem functions” is what makes “independent software upgrading and maintenance of these functions . . . feasible.” *Id.*, 3:58-62, 4:25-40. The '775 patent’s careful decision to partition functions is reflected in Figure 2, which shows the claimed functions of the gateway cable modem partitioned into DNE and CME:



Id., Fig. 2 (annotated).

35. The '775 patent's CME comprises a "DOCSIS MAC processor" and a "DOCSIS controller," for carrying out or controlling different portions of the functionality relating to DOCSIS-based communication. Exemplary DOCSIS MAC functions in the CME are represented in Figure 2 as blocks 152 and 154. Ex. 1001 ['775] 3:19-20. Exemplary DOCSIS controller functions in the CME are blocks 200-212. *Id.*, 3:26-27.

36. The inventive architecture also allows for the DOCSIS MAC processor to forward downstream packets directly to the DNE without the involvement of the DOCSIS controller, to boost downstream throughput. Ex. 1001 [’775] 3:11-17, 8:18-22. This is illustrated in Fig. 2 of the ’775 patent by path 118, over which downstream packets may flow from downstream DOCSIS MAC 152 to the DNE without passing through any other component of the CME. *Id.*, 3:14-16, Fig. 2. This partitioned system results in “enhanc[ed]” “performance” (*id.*, 4:43-55), independent software development and upgrades (*id.*, 4:25-40), better partitioning of specific complex functions (*id.*, 4:13-24), and less delay and jitter (*id.*), among other benefits.

37. The ’775 patent, thus, focuses on partitioning or, broadly speaking, decoupling, as a major aspect of its system, which it indicates is necessary to provide several of its recited benefits to future cable modem systems.

**B. A “Cable Modem Engine Including A DOCSIS Controller”
(Limitations 1[c]/14[c]/18[e], All Claims, All Grounds).**

38. Each of the independent claims require a “cable modem engine including a DOCSIS controller.” Ex. 1001 [’775] cls. 1[c], 14[c], 18[e].

Limitation 18[e] requires “the cable modem engine including a DOCSIS controller and a DOCSIS MAC processor.”

Limitation 1[c] requires “...the cable modem engine including a DOCSIS PHY layer, a DOCSIS controller, and a DOCSIS controller...”

Limitation 14[c] requires “...wherein the cable modem engine includes a DOCSIS PHY layer, a DOCSIS controller and a DOCSIS controller;”

39. Petitioner argues that Rabenko’s “voice and data processor 136/213” is a DOCSIS controller:

As discussed above in Section VI.A.1.c, Rabenko’s cable modem engine includes voice and data processor 136/213 (“DOCSIS controller”) and DOCSIS MAC 134/212 (“DOCSIS MAC processor”). Ex. 1002, ¶¶134-139. Like the “DOCSIS controller” of the ’775 Patent, Rabenko’s voice and data processor 136/213 is used for processing and transporting voice over packet based networks. Ex. 1005, [0074], [0085], [0087]. Rabenko discloses limitation [18E].

Pet., 31. I disagree.

40. I understand that the Board found that Petitioner had a reasonable likelihood of prevailing as to this limitation, apparently based on the misapprehension that my understanding of “DOCSIS controller” is that it must carry out all the specific functions identified in the specification. ID, 34-35. I respectfully disagree, and my position is not and never has been that a “DOCSIS controller” must carry out all of the listed function. Rather, my position is that a “DOCSIS controller” must control some DOCSIS functions, of which the listed

functions are examples. My position is based on the plain meaning of the claims as well as the intrinsic and extrinsic record.

1. Petitioner Fails To Prove That Rabenko’s Voice And Data Processor Is A “DOCSIS Controller.”

41. As an initial matter, I see no explanation from Petitioner or Dr. Kiaei of why Rabenko’s voice and data processor is a “DOCSIS controller.” See Pet., 31; Ex. 1002 [Kiaei-Decl.] ¶ 134-139.

42. Instead, Dr. Kiaei argues that ’775 Patent describes a function of the DOCSIS controller—‘a DOCSIS controller implementing VoIP [(Voice over IP)] functionality.’” Ex. 1002 [Kiaei-Decl.] ¶ 137 (citing Ex. 1001 [’775] 2:10-11). But I do not believe that one area of potential overlap is enough to suggest that Rabenko’s voice and data processor is a “DOCSIS controller.” This is especially true when critical areas, such as DOCSIS functions, do not overlap, as I further explain below. Moreover, even if, for the sake of argument, a “DOCSIS controller” includes a processor that is merely a voice and data processor as Petitioner contends, a VoIP system such as a wired ethernet or cellular system could have a “DOCSIS controller”—despite having nothing to do with DOCSIS.

2. A “DOCSIS Controller” Must Control At Least One Or More DOCSIS Functions.

43. As the name “DOCSIS controller” itself indicates, a “DOCSIS controller” controls DOCSIS functions. “DOCSIS” stands for “Data Over Cable Service Interface Specifications.” *E.g.*, Ex. 1001 [’775] 1:24-26. DOCSIS is the

“standard for broadband cable transmission of IP data services” and “enable[s] bidirectional communications between a cable modem termination system (CMTS) in the cable headend and a subscriber’s cable modem (CM).” Ex. 2010 [Rohde-Schwarz] 1.

44. The ’775 patent’s disclosure relating to the “DOCSIS controller” is entirely consistent with the plain meaning and further confirms that a “DOCSIS controller” must control DOCSIS functions. The exemplary DOCSIS controller described in the specification “implements the following DOCSIS (blocks 200-212) functions” and then lists several examples of possible DOCSIS functions. Ex. 1001 [’775] 3:26-38. These functions may include “MAC management message (MMM) processing ..., ICMP, MAC address learning, classification, US protocol filtering ... and CM IP stack and software downloading.” *Id.* These are all typical DOCSIS functions. *E.g.*, Ex. 2011 [DOCSIS-2.0] 7, 16, 286 (describing MAC management messaging); Ex. 2009 [Kiaei-Depo.] 24:12-27:11 (all functions listed in blocks 200-212 relate to functions “that are carried out in the DOCSIS protocol”). Thus, controlling/implementing “DOCSIS functions” is what makes a “DOCSIS controller” a DOCSIS controller. The examples provided in the specification are, in this regard, examples of DOCSIS functions that may be controlled by the “DOCSIS controller.”

45. Again, I reiterate that it is not my position that a “DOCSIS controller” must perform all of the specific functions listed in the ’775 patent’s specification. Rather, my position is simply that the DOCSIS controller must control DOCSIS functions—not that it must control all DOCSIS functions or all the listed DOCSIS functions.

46. Moreover, as I explained above, Dr. Kiaei seems to argue that because Rabenko’s voice and data processor allegedly implements VoIP functionality, it is a DOCSIS controller. I disagree.

47. VoIP is not a DOCSIS function. Indeed, the DOCSIS specification does not define or provide for any VoIP functionality. *See* Ex. 2011 [DOCSIS-Standard] *generally*. There may be DOCSIS networks—such as a typical home cable television network—that have no VoIP services. Similarly, there may be VoIP networks—such as a wired ethernet network—that does not use the DOCSIS protocol. Put simply, DOCSIS and VoIP are simply two different protocols with different functions.

48. While the ’775 patent does describe that the “DOCSIS controller implement[s] VoIP functionality” (*id.*, 2:6-11), it distinguishes between DOCSIS and VoIP functionality and specifies that “**DOCSIS and** VoIP functionality is provided by a cable modem engine” which the DOCSIS controller is a part of (*id.*, 2:21-24). And, as can be seen throughout the specification, the DOCSIS controller

may implement **both** DOCSIS functions **and** VoIP functions. *Id.*, 3:26-38 (listing “DOCSIS functions” performed by the DOCSIS controller), 3:39-41 (DOCSIS controller “**also** implements all PacketCable functionality”); 4:19-21 (similar). But, what makes the DOCSIS controller a DOCSIS controller is not its VOIP functionality but, rather, its control of DOCSIS functions. Consequently, simply “processing and transporting voice over packet based networks” as Petitioner alleges (Pet., 31) without also implementing DOCSIS functionality is not enough to teach a “DOCSIS controller.”

49. Thus, in my opinion, VoIP functions are different from DOCSIS functions, and alleged implementation of VoIP functions does not demonstrate control of DOCSIS functions.

3. Petitioner Fails To Prove That Rabenko’s Voice And Data Processor Performs Any DOCSIS Functions.

50. Again, I do not see any argument from Petitioner that Rabenko’s voice and data processor controls any DOCSIS functions. And for good reason.

51. Rabenko’s voice and data processor has nothing to do with DOCSIS functions. Rather, as can be seen in the figure below, Rabenko’s **voice and data processor** communicates with the “**POTS telephone 108** via the **[subscriber line interface circuit] 109**”:

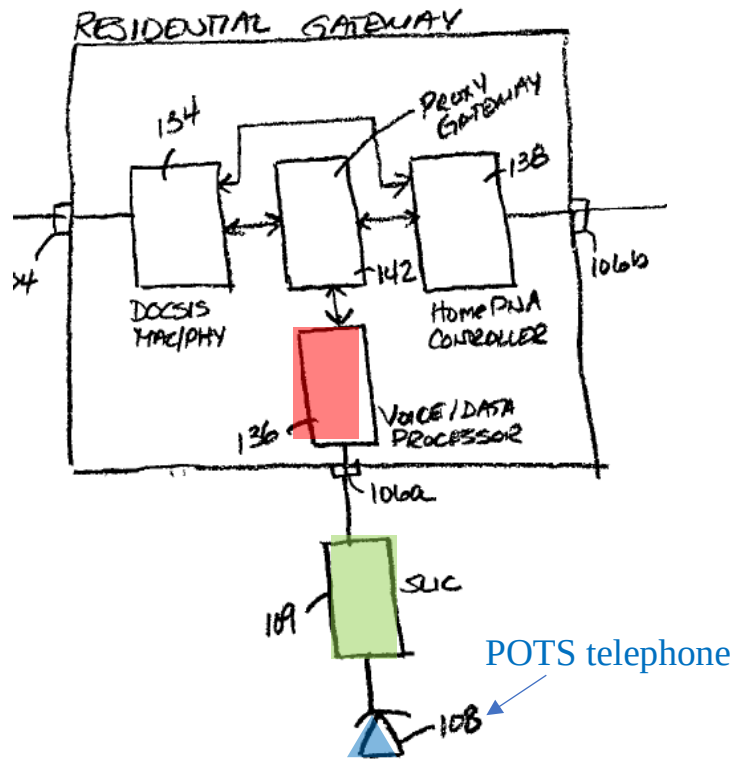


FIG. 1b

Ex. 1005 [Rabenko] Fig. 1b (annotated), [0045].

52. Rabenko’s voice and data processor 136 is not used for any DOCSIS functionality. Rather, it is used to process the POTS signals to and from a conventional telephone. Ex. 1005 [Rabenko] Fig. 1b, [0032], [0034], [0045]. Specifically, the voice and data processor receives “packets ... **destined for the POTS telephone**,” “decompress[es] and depacketiz[es]” those packets, and “generates an analog voice signal” for the POTS telephone. Ex. 1005 [Rabenko]

[0045], [0034]. These functions are not DOCSIS functions. *Compare id. with* Ex. 1001 [’775] 3:26-38; *see* Ex. 2009 [Kiaei-Depo.] 63:6-14 (POTS refers to “conventional telephone system that is a twisted pair”).

53. POTS and DOCSIS relate to entirely different technologies. POTS refers to the system used for conventional telephone calls and dial-up internet and is much older than the cable systems for which DOCSIS is used. *See* Ex. 1005 [Rabenko] [0032]. Indeed, POTS typically use twisted-pair wires which could only physically support narrow bandwidths at low frequencies. *See* Ex. 2009 [Kiaei-Depo.] 63:6-14 (POTS refers to “conventional telephone system that is a twisted pair”); 65:15-22 (“conventional phones are phones that” receive signals over “a twisted pair in a -- in an analog form.”); Ex. 2012 [Signal-Integrity] 107, 112-115, 121. By contrast, DOCSIS is used for modern cable systems which support cable television and broadband internet. This is because coaxial cables can physically transmit large amounts of data over wide bandwidths at higher frequencies. Ex. 2012 [Signal-Integrity] 82.

54. I note that the Board appears to find that Rabenko’s voice and data processor is related to DOCSIS functionality because Rabenko’s residential gateway is DOCSIS compliant. ID, 34-35. I respectfully disagree. That Rabenko’s residential gateway may overall be DOCSIS compliant does not indicate that its voice and data processor—a single component within it—controls

any DOCSIS functions. Nor is there any reason to believe that the voice and data processor has anything to do with DOCSIS.

55. Rabenko's voice and data processor processes telephonic signals for conventional telephone calls rather than data packets destined for transmission over the Home LAN. Indeed, Rabenko's purpose is to separate multiple types of signals entering a house and direct each one to its respective destination, including the home LAN and the conventional telephone. Rabenko's overall system deals with data destined for a variety of different types of endpoints (which can process different types of signals), including packetized data meant for media terminal adaptors over a home LAN as well as data that is converted into signals that a Plain Old Telephone System (POTS), or conventional telephone, can process. This is because Rabenko addresses issues when "existing in home wiring is limited in many cases to a single wire pair," and it is "both expensive" and "disruptive" to install additional wires. Ex. 1005 [Rabenko] [0003]. As a solution, Rabenko teaches a "telecommunications system" "to support telephony and other services in the home using existing wire pairs already installed in the home." *Id.*, [0031].

56. To process the variety of network services meant for various terminals entering the home, Rabenko uses a "residential gateway." Ex. 1005 [Rabenko] [0032]. The residential gateway processes DOCSIS signals in addition to telephonic signals, and "convert[s] the physical media and protocols used for the IP

network to the physical media and protocols used on the home wire pairs.” *Id.*, [0033]. These protocols include DOCSIS “for delivery of broadband services ... to the network port” **and** “a baseband protocol to deliver POTS [(Plain Old Telephone Service)] to a conventional telephone 108.” *Id.*, [0033]-[0034].

57. Thus, as can be seen in the figure below, the residential gateway processes, separates, and directs incoming **DOCSIS** and **POTS** services to their intended destinations—media terminals via the home LAN or the conventional telephone.

Rabenko Only Routes POTS Signals—Not DOCSIS Signals—Through Its Voice And Data Processor To A POTS Telephone

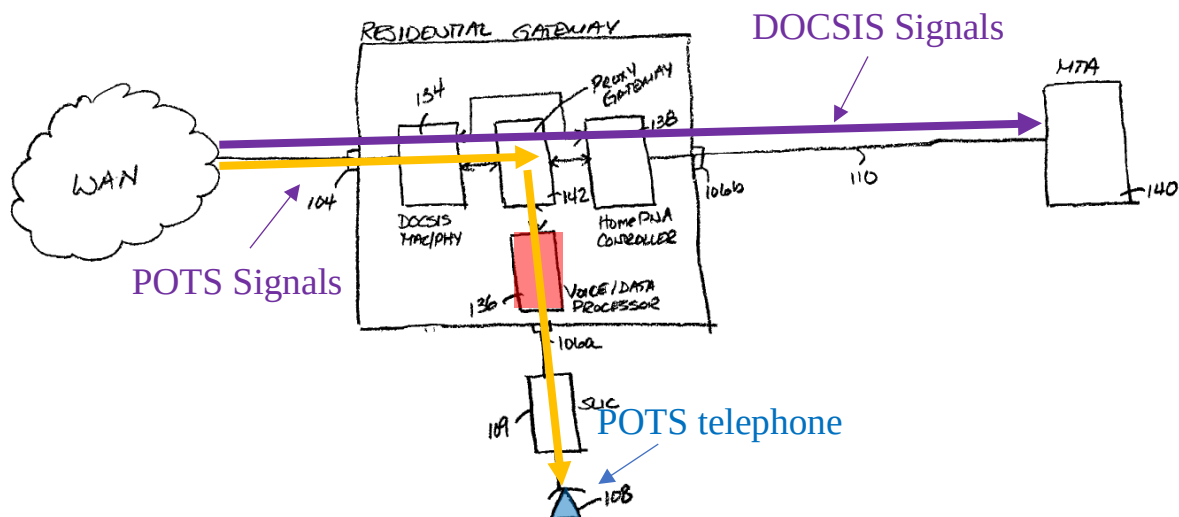


FIG. 1b

Ex. 1005 [Rabenko] Fig. 1b (annotated). As can be seen above, the **voice and data processor 136** processes signals intended for the POTS telephone rather than the home LAN. In other words, Rabenko's voice and data processor is on an entirely separate path from DOCSIS signals and thus is irrelevant to DOCSIS. Indeed, it could be removed entirely and the DOCSIS path would continue to function normally.

58. Thus, in my opinion, Petitioner and Dr. Kiaei fail to demonstrate that Rabenko discloses a "DOCSIS controller."

C. The DNE And CME On "Separate" "First" And "Second Circuit[s]" With "Completely Partitioned" Respective Functions (All Claims, All Grounds).

59. The independent claims require:

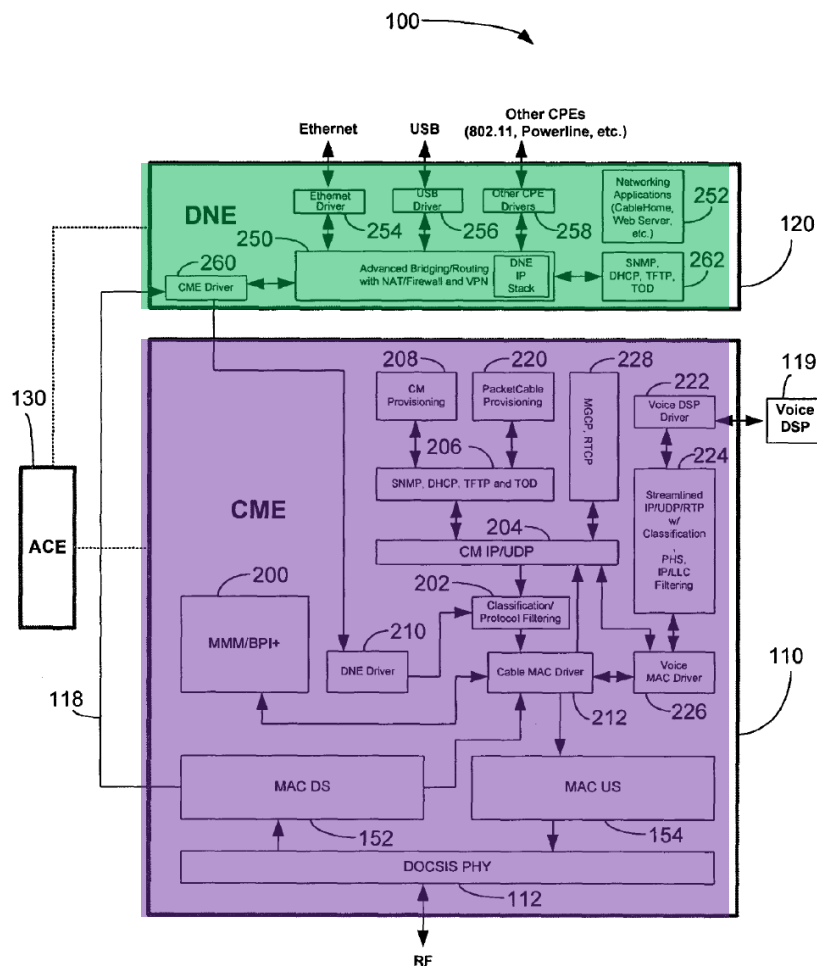
- Limitation 18[b], to which limitation 1[b] and 14[b] are substantially similar, recites "a data networking engine implemented in a first circuit that includes at least one processor, the data networking engine programmed with software that when executed by the at least one processor of the first circuit causes the data networking engine to perform home networking functions including interfacing with customer provided equipment;"
- Limitation 18[c], to which limitation 1[c] and 14[c] are substantially similar, recites "a cable modem engine implemented in a second circuit that includes at least one processor, the second circuit being separate from the first circuit, 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, the cable modem functions including interfacing with cable media, and”

60. Petitioner relies solely on Rabenko for the aspects of the above-referenced limitations concerning a “first circuit” and “second circuit.” I note Petitioner only asserts that Rabenko discloses these aspects of the above-discussed limitations and does not make any assertions that it would be obvious to modify Rabenko for the previously mentioned aspects of these limitations. In my opinion, Petitioner has failed to show Rabenko discloses these limitations.

61. Again, I note that the ’775 patent, in significant part, is directed towards a sharp and clear division between data networking functions and cable modem functions. This division is reflected in the claims which require a “data networking engine” (“DNE”) implemented in a “first circuit” and a “cable modem engine” (“CME”) implemented in a “second circuit,” “the second circuit being **separate** from the first circuit.” Ex. 1001 [’775] cls. 1[b]-[c], 14[b]-[c], 18[b]-[c].

62. These claim elements are clearly reflected in the ’775 patent’s disclosure which clearly illustrates a **DNE implemented in a first circuit** that is separate and partitioned from a **CME implemented in a second circuit**. This is particularly clear in the ’775 patent’s Figure 2:



Ex. 1001 [’775] Fig. 2 (annotated).

63. In the Figure 2 embodiment of the ’775 patent, the CME and DNE are implemented in separate processors 110 and 120, respectively. *Id.*, 4:17-19, 4:25-27. In accord, the ’775 patent further makes clear that that the CME and DNE are separate and partitioned. *Id.*, 2:24-27 (“The data networking engine is partitioned from the cable modem engine so that the data and home networking functionality is completely decoupled from the DOCSIS and VoIP functionality.”); Abstract (“A cable modem engine performs all cable modem functions, and a data networking

engine performs all data and home networking functions. The cable modem engine is completely partitioned from the data networking engine.”); 4:13-19 (“Cable modem 100 completely partitions data networking functions ... from DOCSIS cable modem functionality. This is accomplished by localizing data networking functions in the data networking engine processor and localizing cable modem functions in the cable modem engine processor.”); 4:25-27 (“Since the data networking and cable modem functions are decoupled and implemented in different processors 110 and 120, independent software upgrading and maintenance of these functions is feasible.”).

64. Thus, the exemplary Figure 2 and its corresponding written description unmistakably discloses a CME on a separate circuit from a DNE and, indeed, implemented on separate processors 110 and 120.

65. Whereas the ’775 patent clearly identifies a DNE in one circuit that is separate and partitioned from a CME implemented in a second circuit, there is no such delineation in Rabenko. Rabenko discloses neither a DNE nor a CME much less a DNE and CME implemented in separate circuits with the cable modem functions completely partitioned from the data networking functions.

66. It appears that, without any express disclosure in Rabenko of a DNE in one circuit separate from a CME implemented in another circuit partitioned from the first, Petitioner arbitrarily identifies certain elements of Rabenko and

proclaims them to be a DNE and CME, respectively. Specifically, Petitioner argues that “Rabenko discloses HomePNA controller 138 [] that, along with AFE 226, functions as the” DNE and “are the claimed ‘first circuit.’” Pet., 14, 16. Petitioner then argues that “Rabenko discloses that DOCSIS MAC 134/212 [], a proxy gateway 142 and voice/data processor 136/213 [] which are implemented in a second circuit performing cable modem functions according to the CableLabs Data Over Cable Service Interface Specification (DOCSIS).” *Id.*, 21. Petitioner seemingly argues that the circuits are separate because they have separate components. *Id.*, 23. I see, however, no disclosure in Rabenko of whether HomePNA controller 138 and AFE 226 form a circuit or a data networking engine. Nor do I see any disclosure in Rabenko identifying the DOCSIS MAC 134/212, proxy gateway, and voice and data processor as forming a second circuit or a cable modem engine.

67. Indeed, I am unsure of what foundation Petitioner and Dr. Kiaei are relying upon to reach their conclusions, as I do not see any criteria by which they were able to identify which components comprise each “circuit.” Nor do I see any coherent explanation of why a POSITA would identify the separate circuits Petitioner and Dr. Kiaei have both identified. Petitioner and Dr. Kiaei’s explanation of why circuits are separate is similarly lacking.

68. Under Dr. Kiaei's initial interpretation of "separate" "circuit[s]," wherein circuits are considered separate when having separate components, any combination of components could be a circuit separate from the remaining components. Indeed, each component, being already separate from the other components, could be its own circuit, separate from the other component-circuits in Rabenko's Figure 2. Under this interpretation, therefore, Rabenko's Figure 2 would depict thousands upon thousands of possible separate circuits. This simply makes no sense and renders the recited "separate" "circuit[s]" meaningless.

69. I also note that during deposition, Dr. Kiaei testified that as used in the '775 patent's claims, a "circuit could include a processor, a software, and other components that perform[] the functions required" and that circuits are separate when "they are functionally separate." Ex. 2009 [Kiaei-Depo.] 96:10-97:12. This is inconsistent with his declaration testimony implying that circuits are separate merely when they have separate components. *Compare with* Ex. 1002 [Kiaei-Decl.] ¶ 114. Moreover, this interpretation would indicate that Rabenko's voice and data processor is not part of the second circuit, but is rather part of yet another separate circuit.

70. Petitioner and Dr. Kiaei contend that Rabenko's voice and data processor and the DOCSIS MAC/PHY constitute a circuit but the DOCSIS

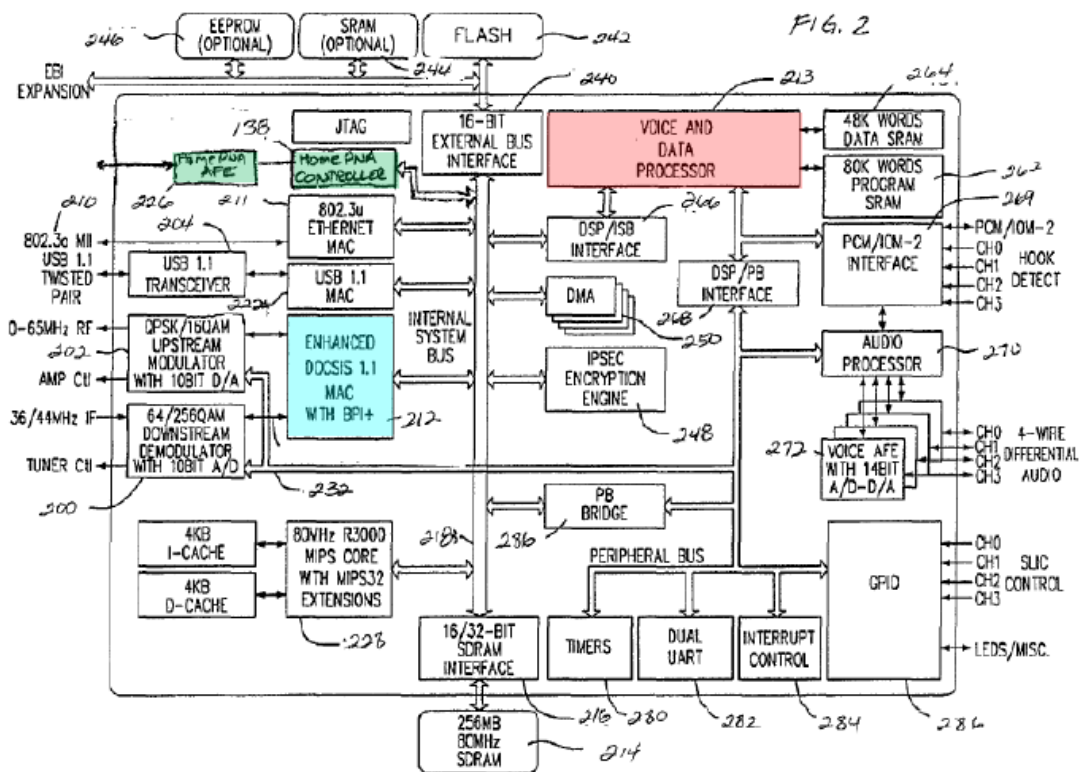
MAC/PHY and the voice and data processor implement different and unrelated functions.

71. Rabenko’s DOCSIS MAC/PHY “implements” both the “downstream” and “upstream portions of the DOCSIS protocol.” Ex. 1005 [Rabenko] [0053], [0055]. These include “baseline privacy encryption and decryption as well as robust frame acquisition and multiplexing with MPEG2-TS compliant video and audio streams,” “extract[ing] DOCSIS MAC frames from MPEG-2 frames, process[ing] MAC headers, and filter[ing] and process[ing] messages and data.” *Id.*, [0053].

72. By contrast, the voice and data processor, as I explained earlier, processes signals for a POTS telephone. *Id.*, [0045]. In accord, Rabenko’s voice and data processor does not implement portions of the DOCSIS protocol, but rather “decompress[es] and depacketiz[es]” voice packets to generate an “analog signal” for a POTS telephone. *Id.*, [0044]; *contrast with* Ex. 2011 [DOCSIS-2.0-Standard] (not mentioning analog or POTS) *generally*. Consequently, Rabenko’s DOCSIS MAC/PHY and voice and data processor are functionally separate and thus are in separate circuits under Dr. Kiaei’s interpretation.

73. Rabenko’s architecture is illustrated in the Figure 2 system block diagram, which Petitioner heavily relies upon. *See, e.g.*, Pet., 24, 35, 46, 47, 51, 52, 74. Neither Rabenko’s Figure 2 nor its attendant description (*see* Ex. 1005

[Rabenko] [0009], [0050]-[0070]), however, disclose a CME in one circuit or a DNE in another, separate circuit. Petitioner and Dr. Kiaei provide the following annotated version of Figure 2 identifying (in part) the alleged circuits:



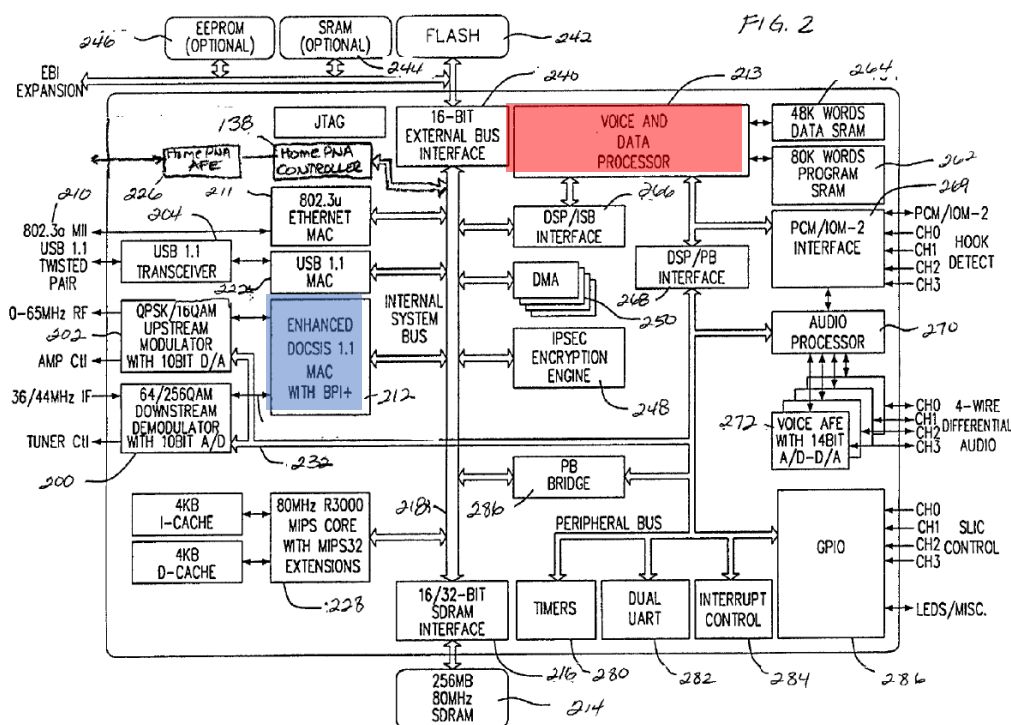
Ex. 1005, Fig. 2 (annotated)

Pet., 23-24 (“Rabenko discloses that DOCSIS MAC 134/212 (**blue**), proxy gateway 142, and voice/data processor 136/213 (**red**) (“second circuit”) are separate components from HomePNA controller 138 and AFE 226 [(**green**)] (“first circuit”).”).

74. Petitioner contends that the DOCSIS MAC (**blue**) and voice data processor (**red**) elements comprise the CME, but these elements are not depicted as

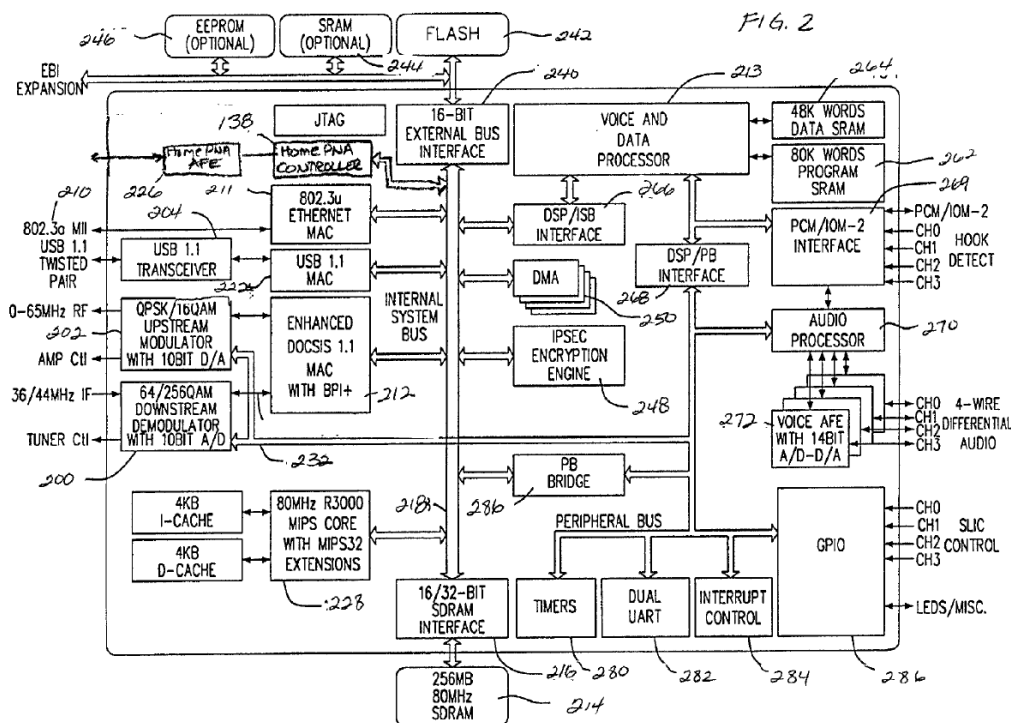
being related and, indeed, are on separate sides of the internal system bus. I do not see how a POSITA reviewing Rabenko's Figure 2 would understand that these elements comprise a circuit:

**Figure 2 Simply Does Not Suggest That The DOCSIS MAC/PHY
And The Voice And Data Processor Form A Circuit**



Ex. 1005 [Rabenko] Fig. 2 (annotated). This is particularly so as, previously discussed, the DOCSIS MAC/PHY (processing DOCSIS signals) and the voice and data processor (processing POTS telephone signals) perform entirely different and separate functions. See ¶ 56, *supra*. And, again, the DOCSIS signals never even enter the voice and data processor. See ¶ 57, *supra*.

Kiaei are merely after-the-fact identifications not rooted in the actual figure or its attendant description:



Ex. 1005 [Rabenko] Fig. 2.

77. I also note that during deposition, Dr. Kiaei was unable to identify how many circuits were present in the Figure 2 system block diagram because it allegedly did not necessarily illustrate hardware and instead could represent “purely [] software.” See Ex. 2009 [Kiaei-Depo.] 39:8-40:12, 40:24-41:9.

78. Dr. Kiaei was unable to identify how many circuits were present in the Figure 2 system block diagram because it allegedly did not necessarily illustrate hardware and instead could represent “purely [] software.” See Ex. 2009 [Kiaei-Depo.] 39:8-40:12, 40:24-41:9. I respectfully disagree with Dr. Kiaei’s

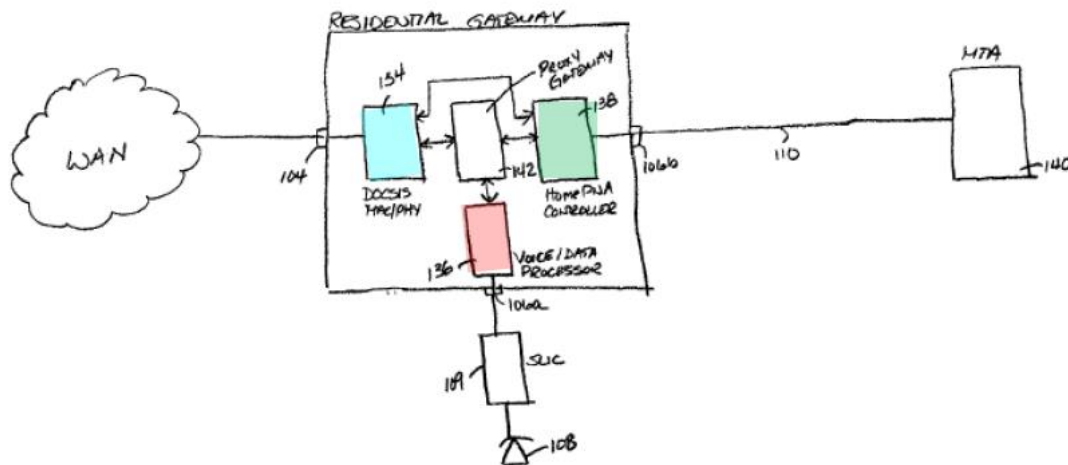
deposition testimony that Rabenko’s Figure 2 could represent “purely [] software.” Among other things, it clearly depicts hardware components such as “16-bit external bus interface 240,” “802.3u Ethernet MAC 211,” “USB 1.1 MAC 222,” “enhanced DOCSIS 1.1 MAC with BPI+ 212,” and “80 MHz R3000 MIPS core with MIPS32 extensions 228” that are not software. Ex. 1005 [Rabenko] Fig. 2.

79. And, even if Figure 2 did represent “purely [] software,” it would not support a conclusion that a CME and DNE are implemented in separate circuits. As the Board rightly found in the IPR2024-00579 noninstitution decision, a figure merely showing a logical separation of software would not show separate circuits. Ex. 2013 [579-DDI] 22 (“disclosure ... of a logical separation, that is a separation in software” does not “teach[] or suggest[] ‘the second circuit being *separate* from the first circuit’ (emphasis added).”). Consequently, Rabenko’s Figure 2 is similarly deficient, and the Board should rejection Petitioner’s Rabenko arguments for the same reasons.

80. Petitioner also relies upon Rabenko’s Figure 1b to illustrate its mapping. *E.g.*, Pet., 21.

81. As with Figure 2, Rabenko’s Figure 1b too does not depict a CME on one circuit and a DNE on a separate circuit. Petitioner contends that the **HomePNA controller 138** is part of the first circuit while the **DOCSIS**

MAC/PHY 134, proxy gateway 142, and **voice/data processor 136** are on a second circuit:



Ex. 1005, Fig. 1b (annotated)

Pet., 21. But again, it is clear that the alleged circuits are merely after-the-fact identifications. As we can see from the figure above, there is a direct connection between the DOCSIS MAC (allegedly a part of the CME) and both the HomePNA controller (allegedly a part of the DNE). Why would a POSITA conclude these elements are on separate circuits that are partitioned from one another in view of these direct connections? Petitioner does not explain.

82. Why too would a POSITA conclude that the DOCSIS MAC forms a circuit with the voice and data processor that is “separate” from the HomePNA controller when both the DOCSIS MAC and the HomePNA controller are indirectly connected to the voice and data processor through the proxy gateway?

In this regard there is a direct connection between the DOCSIS MAC/PHY (allegedly a part of the CME) and the HomePNA controller (allegedly a part of the DNE) while there is only an indirect connection between the DOCSIS MAC/PHY and the voice and data processor (which collectively allegedly comprise the CME) that runs directly through the proxy gateway. Here too, there is no explanation.

83. If anything, by placing each of the HomePNA controller, DOCSIS MAC, proxy gateway, and voice and data processor in the residential gateway of Figure 1b, Rabenko, if anything, indicates that these elements are not separate or functionally partitioned from one another. Petitioner and Dr. Kiaei's identification of circuits is, thus, at best arbitrary and if anything, seems contrary to what Rabenko's Figures 1b and 2 actually suggest.

84. Rabenko, again, has an entirely different goal from the '775 patent's goal of a functionally partitioned architecture. Rather, Rabenko discloses a gateway configured to exchange voice and data packets between a network and multiple media terminal adapters in a home over a telephone line. Ex. 1005 [Rabenko] [0004], [0033]. Thus, Rabenko focuses upon "supporting multiple voice channels" on "a single wire pair." *Id.*, Title, [0003]-[0005], [0036], [0041]. Rabenko simply lacks the partitioning that is critical to the claimed inventions.

85. Thus, in my opinion, Petitioner and Dr. Kiaei fail to demonstrate a DNE implemented in a “first circuit” and a CME implemented in a “second circuit,” “the second circuit being separate from the first circuit.”

D. A CME “Configured To Enable Upgrades To Its Software In A Manner That Is Independent Of Upgrades To The Software Of The” DNE (1[d]/14[c]/18[d], All Claims, All Grounds).

86. Each of the independent claims require “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.” Ex. 1001 [’775] cls. 1, 14, 18:

Limitations 1[d], 14[c], and 18[d] recite “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.”

87. I understand Board preliminarily found in the Institution Decision that, “for the purposes of institution,” this limitation was “taught by the combined teachings of Rabenko and Kim and Petitioner has provided sufficient reasoning to combine those teachings.” I respectfully disagree with the Board and note that at the institution stage, the arguments primarily focused on whether replacing hardware could constitute upgrading software in the abstract. None of Petitioner’s arguments demonstrate a “*cable modem engine configured to enable upgrades to its software* in a manner that is independent of upgrades to the data networking engine.”

1. Petitioner's Rabenko-Kim Combinations.

88. I understand that Petitioner argues that adding Kim to Rabenko or Rabenko-Gaspar (addressed later below) would render it obvious to add “upgrades to [the CME’s] software in a manner that is independent of upgrades to the software of the [DNE].” Pet., 28. I disagree for several reasons: (1) Kim has nothing to do with a CME or replacing any element of a CME, (2) I see no explanation for how Rabenko would be modified in view of Kim to render obvious a CME “configured to enable upgrades to its software,” (3) Kim is about replacing hardware and has nothing to do with “upgrading” software, and (4) even if Kim somehow suggested replacing some element of the hardware in Rabenko’s CME, nothing in Kim suggests modifying Rabenko’s CME such that it is “configured” to “enable upgrades to its software.”

89. Kim involves replacing modular pieces of hardware potentially associated with a DNE, not the CME. Specifically, Kim teaches potentially replacing a modular HomePNA controller (allegedly a part of a DNE) and a modular ADSL controller (which has nothing to do with a DNE or a CME). Ex. 1007 [Kim] [0001] (“either the modular-type HomePNA controller or ADSL controller is replaced, thereby improving the total performance of the home gateway device.”), [0008] (similar), [0026] (similar). Thus, Kim’s teachings do

not relate to the components comprising the CME and suggest nothing with respect to any alleged CME.

90. Despite Kim’s lack of teaching with respect to a CME, I see no explanation from Petitioner of how Rabenko would be modified in view of Kim to render obvious a CME “configured to enable upgrades to its software.” Pet., 28-31. Rather, Petitioner only argues that “Rabenko’s *HomePNA controller* is independently upgradeable from other components (as taught in Kim), such as the DOCSIS MAC/PHY, proxy gateway, and voice/data processor.” *Id.* Again, the HomePNA controller is only a component in the alleged DNE and that it is purportedly “independently upgradeable from other components” does not suggest that components in the alleged *CME* are similarly independently upgradeable from the components in the DNE. Thus, Petitioner’s combination only includes a DNE that can be upgraded independently from the CME, and a CME “configured to enable upgrades to its software in a manner independent of upgrades to the” DNE.

91. Moreover, I disagree that Kim’s teachings have anything to do with “upgrad[ing]” software. Again, Kim teaches replacing a modular HomePNA controller and a modular ADSL controller, two hardware components that have nothing to do with Rabenko’s alleged CME. Indeed, I only see two mentions of “software” in Kim, both relating to a “software reset signal” in connection with a “system reset part 116.” See Ex. 1007 [Kim] Fig. 4 (referencing “Software reset

signal”); [0048] (“A system reset part 116 generates power starting reset signal, a hardware reset signal, and a software reset signal, and transmits them to the CPU 111.”). Thus, the only mention of software I see in Kim relates to a system reset, not “upgrade[s].”

92. Importantly, I see no suggestion in Kim that replacing modular hardware would result in changed software, much less “upgrade[d]” software. *See* Ex. 1007 [Kim] *generally*. I see no disclosure of software that would be included on or corresponding to the new replacement hardware. Nor is there any suggestion that any new software would be an “upgrade[]” to the software previously part of the alleged engine. To put it simply, even if replacing a hardware component could in theory teach a “software upgrade,” there is no suggestion that Kim’s hardware replacements would or could be used for such a purpose. Thus, in my opinion, Kim has nothing to do with “upgrades to [] software.” Indeed, in my opinion, replacing hardware as a method of upgrading teaches against a software upgrade – why perform a software upgrade at all if a hardware replacement is easily carried out?

93. Moreover, the limitations requires “cable modem engine ***configured to*** enable upgrades to ***its*** software.” In other words, the claim requires that cable modem engine hardware—whose software is being upgraded—itself be configured to enable such an upgrade. The limitation does not merely require a

CME that may be replaced (in whole or in part) and wherein, as a by-product of that replacement, the software is somehow “upgraded.”

94. And if Kim suggests **replacing** the CME in order to carry out the claimed upgrade, in my opinion, it logically follows that the **CME** is **not** “configured to enable upgrades to **its** software” or to do anything else—the CME is instead physically removed and replaced with a different piece of hardware. In fact, if the CME were “configured to enable upgrades to its software” as claimed, there would be no need to physically replace its components, as Kim suggests, because the CME would itself be capable of carrying out the upgrade. As I further explain below, this is in fundamental contrast to the ’775 patent which teaches that its system can “independently provision, maintain and upgrade revenue-producing gateway services and basic broadband access services ... with minimum impact on the cable modem.” Ex. 1001 [’775] 1:37-1:40.

95. Moreover, Petitioner’s proposed combination at most amounts to replacing software. But replacing software via new hardware results in new software on new hardware, not “**upgrades to its** software.” I also do not see any contention from Petitioner that Rabenko’s CME is configured or programmed or designed to enable upgrades to its **own** software. And I do not see any indication that replacing the hardware of the CME in some undefined way would result in a

CME that is “configured to” enable upgrades to its software. Thus, in my opinion, replacing software by replacing hardware simply does not meet the claims.

96. This distinction between replacing hardware and configuring a CME to upgrade its software is consistent with the ’775 patent’s specification.

97. The claims require that the CME be “***configured to enable upgrades to its software*** in a manner that is independent of upgrades to the software of the data networking engine.” Ex. 1001 [’775] cls. 1, 14, 18. This feature allows for flexibility so that upgrades can be implemented with minimum impact on the overall system. *Id.*, 4:10-57. Specifically, independent upgradability of the software of the DNE and CME is “highly desirable” because it allows the system to “independently provision, maintain and upgrade revenue-producing gateway services and basic broadband access services ... with minimum impact on the cable modem.” *Id.*, 1:37-1:40.

98. The ’775 patent explains that “flexibility” means that “independent software upgrading and maintenance” of the data networking and cable modem functions “is feasible.” Ex. 1001 [’775] 4:25-28. More specifically, the inventive systems can use “different software-partnering models, such as complete in-house development, software-components licensing and [original equipment manufacturer (‘OEM’)] vendor-differentiating design.” *Id.*, 4:28-32. In other words, the software on the gateway cable modem can be easily upgraded by a

variety of parties without involvement from the cable modem provider, including outside third-party software companies. *See also id.*, 4:32-36 (“In particular, data networking engine 120 provides third parties and OEMs with a dedicated computational platform to develop advanced services outside of the baseline cable modem and VoIP/PacketCable services, minimizing their support dependency on the cable modem provider.”). If upgrading software were achieved through replacing components, it would prevent third-party vendors from easily providing software upgrades, as those vendors would need to replace the hardware component in each cable modem—even if the hardware itself does not need to be changed. Consequently, consistent with the claim language, the configuration of the CME to enable upgrades to its software does not encompass merely physically replacing the CME or its components.

99. Thus, in my opinion, even if Rabenko were modified in view of Kim to replace certain hardware in the CME, that would not teach, suggest, or render obvious a CME “configured to enable upgrades to its software.”

2. Petitioner’s Rabenko Arguments.

100. I understand that Petitioner also argues that Rabenko alone renders obvious configuring the alleged CME to “**enable upgrades** to its software ... **independent of upgrades** to the software of the” DNE. Pet., 26-27. I note that Petitioner concedes that “Rabenko does not explicitly teach that any of DOCSIS

MAC 134/212, proxy gateway 142, or voice/data processor 136/213 is configured to enable upgrades to its software in a manner that is independent of upgrades to the software of the HomePNA controller 138 and AFE 226.” *Id.*, 26. Rather, Petitioner relies upon Rabenko boilerplate stating “[s]killed artisans recognize the interchangeability of hardware and software under these circumstances, and how best to implement the described functionality for each particular application,” to argue:

A POSITA would have understood that it would have been obvious to try because, when faced with implementing the upgradability of Rabenko’s data networking engine and cable modem engine, there are only a few finite options: to configure them to be updated together or separately. A POSITA would recognize that these options are equally obvious to try. A POSITA, recognizing these are different, partitioned circuits, would have understood that upgrades to software of any of DOCSIS MAC 134/212, proxy gateway 142, or voice/data processor 136/213 would be independent of upgrades to software of the HomePNA controller 138 and AFE 226. Ex. 1002, ¶¶122-123. Thus, Rabenko renders obvious that “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.” *Id.*

Pet., 27. I disagree.

101. I see no citations to Rabenko other than its boilerplate statements that its system “may be implemented in any number of ways including electronic

hardware, computer software, or combinations of both ... depend[ing] upon the particular application and design constraints imposed on the overall system” and that “[s]killed artisans recognize the interchangeability of hardware and software.” Pet., 26-27 (citing Ex. 1005 [Rabenko] [0268]). But this boilerplate does not suggest upgrading the software of either the CME or the DNE, much less upgrading the software independently.

102. This lack of evidence is especially deficient in light of the fact that this independent software upgrade limitation goes to the heart of the invention. As I previously explained, this feature allows for flexibility so that upgrades can be implemented with minimum impact on the overall system. Ex. 1001 [’775] 4:10-57. Specifically, independent upgradability of the software of the DNE and CME is “highly desirable” because it allows the system to “independently provision, maintain and upgrade revenue-producing gateway services and basic broadband access services ... with minimum impact on the cable modem.” *Id.*, 1:37-1:40; *see also* 4:25-40 (independent upgradability of software allows for “flexibility” through “different software-partnering models”).

103. Moreover, I do not believe there is any reasonable expectation of success in adding this independent upgradability based on Rabenko’s teachings.

104. Rabenko discloses that the voice and data processor and the proxy gateway of the purported CME, use “embedded software.” *E.g.*, Ex. 1005

[Rabenko] [0074] (“The **voice and data processor 213** may be implemented with a variety of technologies including ... **embedded communications software**”), [0075] (“The **embedded communications software** is preferably run on a programmable digital signal processor (DSP).”), [0089] (“An **exemplary voice and data processor** may be implemented...”), [0091] (“The exemplary programmable DSP is effectively hidden within the **embedded communications software layer**.”), [0097] (“the proxy gateway function is implemented with **embedded software**”), [0122] (“The interaction of an **exemplary embedded MTA call client** and the MTA 140 ...”). Indeed, Petitioner itself refers to Rabenko’s voice and data processor as being implemented with “embedded communications software.” Pet., 25.

105. It was well-known that upgrading “embedded” software (at least without changing the hardware that is used) generally is impossible or at least difficult. For instance, “key features of embedded systems” may include the following:

For their lifetime, they **perform the same duty**. For example, an MP3 player will only play MP3s.

...

Users are **unable to change or update embedded systems**. They must have good dependability and stability ratings. The user shouldn’t have any problems using them for extended periods.

Ex. 2005 [IoT].

106. Such “embedded” software is generally rigid and fixed, incapable of being upgraded without replacing or modifying the accompanying hardware. Ex. 2005 [IoT] (“An embedded system is an integration of programmable software and hardware that may have *fixed capabilities*.”); Ex. 2004 [Monarch] (“Once an embedded system is developed [y]ou are *not able to alter, enhance or upgrade*.”). Ex. 2005 [IoT] (“Because embedded systems are sometimes related to certain hardware platforms, *upgrading the system without changing the hardware can be difficult*.”). Upgrading embedded software would require a facility for accessing, verifying, extracting, and installing the upgraded software. At the time, these facilities required another processor and other software, or possibly special hardware or a specialized software “bootloader.” Such upgrades generally interrupt normal operation of the software in question while they occur and require careful design and testing.

107. Any modification to Rabenko such that it would no longer use embedded components would require substituting new hardware instead of upgrading the software independently of it. There is no reason a POSITA would have had a reason to do this. Embedded systems offer many advantages over other types of systems, which Petitioner does not acknowledge, let alone address. Ex. 2005 [IoT] (Embedded systems “may be less expensive,” “can be very small and compact,” “can be very trustworthy,” “they are energy-efficient,” and are

customizable (*i.e.* “are adaptable to the particular needs of the application”)); see Ex. 2004 [Monarch] (“An embedded system is a specialized computer system designed to perform dedicated functions within a larger system” and “are often optimized for low power consumption, compact size, and high reliability to meet the requirements of their intended applications.”); *id.* (“Because an embedded system generally plays a role ***that does not change its requirements***, the requirements for an operating system ***aren’t as burdensome***”). Given these advantages, any changes to Rabenko’s embedded software may have unforeseen consequences to the performance of the rest of Rabenko’s system.

108. Thus, in my opinion, Petitioner fails to demonstrate that Rabenko alone teaches the limitation.

3. Petitioner’s Rabenko-Gaspar Combinations.

109. Finally, I understand that Petitioner argues that it was obvious to try adding independently upgradeable software in view of Rabenko in light of Gaspar. Pet., 27-28. Specifically, Petitioner argues:

Moreover, Rabenko teaches that its HomePNA controller complies with the HomePNA protocol, which “is described in the HomePNA Specification Version 2.0, the contents of which is expressly incorporated herein by reference as though set forth in full.” Ex. 1005, [0034]. A POSITA would have understood that a standard-compliant device would have to be frequently updated or replaced to maintain compliance with evolving standards. See, e.g., Ex. 1006, [0005] (“as

protocols change or standards evolve, the HPNA controller must be upgraded.”). A POSITA would have known that such frequent upgrades could be “costly and time-consuming” and thus, when designing a system that includes a HomePNA controller, a POSITA would have recognized the need to “enable convenient modifications” of the controller. Ex. 1006, [0005]-[0006]. Thus, a POSITA would have found it obvious that the partitioned components in Rabenko (DOCSIS MAC/PHY, proxy gateway, voice/data processor on the one hand, and HomePNA controller and AFE 226 on the other) be independently modifiable. Ex. 1006, [0014] (teaching that components of a Home PNA controller should be partitioned so that each component can be independently debugged or upgraded). Ex. 1002, ¶125.

Id.

110. Petitioner appears to use Gaspar to provide a “motivation to modify” Rabenko to enable upgradability of the **HomePNA controller**, a component of the DNE. *See* Pet., 27-28. Even if, for the sake of argument, Gaspar’s teachings were applied to Rabenko, they only address upgrading the HomePNA controller of the DNE, not the CME, and there is no indication that its teachings could be applied to the CME. Gaspar does not teach altering the alleged CME components (*e.g.*, voice and data processor or DOCSIS MAC/PHY) such that they are upgradable, much less teach that components be configured to be independently upgradable from other components in a system. Gaspar solely concerns partitioning the HomePNA

controller itself “[b]y partitioning the MAC and PHY circuits” and independently upgrading those portions of it. Ex. 1006 [Gaspar] [0014].

111. Moreover, Gaspar does not teach upgrading the HomePNA controller in a manner independent from the software of a CME. Rather, Gaspar teaches “partitioning the MAC and PHY circuits” in its “HPNA controller” so “the controller circuit can be debugged or upgraded by modifying the MAC circuit, leaving the PHY circuit intact.” Ex. 1006 [Gaspar] [0014]. But this is at most a teaching about upgrading different parts of one component of the DNE independently, not upgrading the software of the CME independently from that of the DNE as claimed.

112. Additionally, Petitioner misapprehends Gaspar. Gaspar teaches that the MAC function can be implemented in an FPGA and that the PHY can incorporate a DSP. Ex. 1006 [Gaspar] [0014], [0023]. Neither of these disclosures teach upgradable software to a POSITA.

113. Consider first the FPGA, a field programmable gate array. Even though it contains “field programmable” in the name, a POSITA would know that an FPGA’s programming is almost never altered in the field. FPGAs are an array of programmable hardware blocks, and their programming consists of configuring hardware. Not only is this very risky to change in the field, its configuration is not actually software. It is a hardware configuration. Stated differently, even if one

were to assume that its programming is somehow alterable, it does not meet the “software” claim limitation.

114. Consider the DSP. A DSP for performing a fixed function, such as a HomePNA PHY, would not normally be considered field upgradable. Consider, for example, the DSPs that manage the WiFi in my laptop. There is no practical way to reprogram them, nor is there a need to; the WiFi standard they support has been published and will not change. Absent a specific teaching from Gaspar, a POSITA would understand the DSP not to be upgradable in the field.

115. Gaspar does address modifications, but nowhere does it discuss performing these modifications on units shipped into the field. The modifications it discusses are of the type that would be carried out after the circuit board has been laid out but before the product ships to customers. The advantages conferred by the FPGA arrangement are that the design can change without having to modify the circuit board. I often valued this type of modification when I managed hardware design projects because it was much easier and faster than changing a circuit board. Again, absent a specific disclosure from Gaspar (and there is none), there is no reason to conclude that it teaches performing upgrades in the field.

116. Thus, in my opinion, Gaspar too does not teach a CME “configured to enable upgrades to its software in a manner independent of upgrades” to a DNE.

E. “All DOCSIS Functions Are Localized In The Cable Modem Engine” (Claims 2, 19, Grounds A-D).

117. Claims 2 and 19 require:

Claims 2 & 19: “wherein all DOCSIS functions are localized in the cable modem engine.”

118. Petitioner argues that Rabenko teaches this limitation because:

The claimed “all DOCSIS functions” are the functions performed by the components of the cable modem engine in Rabenko. As described above in Section VI.A.1.c, Rabenko’s DOCSIS MAC 134/212 performs cable modem functions according to the CableLabs DOCSIS. Ex. 1005, [0034], [0044]. Rabenko describes that “[t]he DOCSIS MAC/PHY 134 *translates* the packet format from DOCSIS to an internal format that, at least in some embodiments, is protocol independent.” Ex. 1005, [0044] (emphasis added). Translation of the packet format is one “DOCSIS function” performed by the DOCSIS MAC 134/212 in Rabenko’s cable modem engine.

In addition, Rabenko describes that, “[i]n the downstream direction, the DOCSIS MAC/PHY 134 determines whether the packet payload is voice or data.” Ex. 1005, [0045]. This also is a “DOCSIS function” performed by the DOCSIS MAC 134/212 in Rabenko. Translation of the packet format and determination of whether a packet payload is voice or data are the claimed “all DOCSIS functions.” These functions are both performed by DOCSIS MAC 134/212 and are localized in Rabenko’s cable modem engine.

Like the “DOCSIS controller” of the ’775 Patent, Rabenko’s voice and data processor 136/213 is used for processing and transporting voice over packet based networks. Ex. 1005, [0074], [0085], [0087]. Rabenko’s HomePNA controller 138 performs no DOCSIS functions.

Pet., 39-40. I disagree.

119. Even assuming, for the sake of argument, that all of Petitioner’s listed functions are “DOCSIS functions,” I do not see how simply showing that the functions performed by the CME components are DOCSIS functions and that a subset of Rabenko’s other components do not perform DOCSIS functions is not enough to show that “all DOCSIS functions are localized in the cable modem engine,” as the claims require. Indeed, as further explained below, there are components in Rabenko’s residential gateway that Petitioner has failed to account for. Simply showing that the functions performed by the CME components are DOCSIS functions and that a subset of Rabenko’s other components do not perform DOCSIS functions is not enough to show that “all DOCSIS functions are localized in the cable modem engine,” as the claims require.

120. Rabenko’s QPSK out of band downstream demodulator 206 performs DOCSIS functions. As discussed, DOCSIS is the standard for transmitting data between the cable head-and a cable modem inside a residence. Ex. 2011 [DOCSIS] 1; *see also* Ex. 1005 [Rabenko] [0050] (“DOCSIS was developed to ensure that cable modem equipment built by a variety of manufacturers is

compatible”). As Dr. Kiaei testified, DOCSIS functions at least relate to the DOCSIS specification. Ex. 2009 [Kiaei-Depo.] 24:12-27:11. Consistent with this, Rabenko’s “QPSK out of band downstream demodulator 206 is configured to receive out of band MPEG-2 encoded message from the cable head end.” Ex. 1005 [Rabenko] [0050]; Ex. 2011 [DOCSIS-2.0] 13 (defining QPSK), 62 (discussing using QPSK modulation), 72 (similar). Note that this comports with my design of DOCSIS-enabled set-top boxes – the QPSK demodulator functions as a control path by which the CMTS can send information to the cable modem without requiring the use of the “in-band” path normally reserved for Internet traffic. Thus, Rabenko’s QPSK out of band downstream demodulator 206 performs DOCSIS functions. Notably, neither Petitioner nor Dr. Kiaei allege that the QPSK out of band downstream demodulator 206 is part of the alleged CME. See Pet., 21-26.

121. In my opinion, Petitioner and Dr. Kiaei thus fail to account for Rabenko’s QPSK out of band demodulator, and thus fail to demonstrate that Rabenko teaches that “all DOCSIS functions are localized in the cable modem engine.”

F. “The DOCSIS MAC Processor Is An ARM9TDMI-Based RISC Processor” And “The DOCSIS Controller Is An ARM940-Based RISC Processor” (Claim 12, Grounds I-P).

122. Claim 12 requires:

Claim 12: “wherein the DOCSIS MAC processor is an ARM9TDMI-based RISC processor, and wherein the DOCSIS controller is an ARM940-based RISC processor.”

123. I note that the Board observed that “Petitioner acknowledges ‘none of Rabenko, Gaspar, [or] Kim . . . specifically recite an ARM9TDMI-based or an ARM940-based RISC processor.’” ID, 41 (quoting Pet., 56). Petitioner instead argues that “a POSITA would have found it obvious to implement the functions of the DOCSIS MAC processor and DOCSIS controller” using the recited processors. Pet., 56-57. I disagree. Alternatively, Petitioner argues that “[i]t would have been obvious for a POSITA to implement the DOCSIS MAC functions of Rabenko using an ARM9TDMI-based RISC processor as taught by Klein and the DOCSIS controller functions of Rabenko using an ARM940-based RISC processor as taught by Kim ’678.” *Id.*, 60. I also disagree. Indeed, I note that the Board “question[ed] whether Petitioner has sufficiently demonstrated that the further recitation in claim 12 would have been an obvious design choice in view of the teachings of Rabenko, Gaspar, Kim, and Lu.” ID, 41.

124. I see no identification from Petitioner of any DOCSIS MAC processor implemented as an ARM9TDMI-based RISC processor in the art. *See* Pet., 56-62. I similarly see no evidence of a DOCSIS controller implemented as an ARM940-based RISC processor in the art. *Id.* Indeed, my experience while I was

at Scientific-Atlanta was that much cable equipment was implemented using MIPS or SPARC processors.

125. Petitioner points to Rabenko’s boilerplate language that its “various illustrative logical blocks, modules, circuits, and algorithm steps” “may be implemented in any number of way[s] including electronic hardware, computer software, or combinations of both” to conclude that implementing Rabenko’s DOCSIS MAC/PHY and DOCSIS controller in “a specific commercially-available RISC processor[] would have been an obvious design choice.” Pet., 57-58 (citing Ex. 1005 [Rabenko] [0268]). But the cited boilerplate does not teach that its system may be implemented by just any hardware—let alone the specific ARM9TDMI-based RISC processor and ARM940-based RISC processor recited in the claim. Rather, Rabenko merely states that certain functions may be implemented by hardware and/or software. Ex. 1005 [Rabenko] [0268]. I do not see anything in Rabenko’s boilerplate indicating that using an ARM9TDMI-based RISC processor for the DOCSIS MAC/PHY or an ARM940-based RISC processor for the DOCSIS controller would be an obvious design choice.

126. Petitioner also relies on Klein and Kim ’678 as teaching the required processors. But I do not believe that either reference is analogous art under the two-part test explained to be by counsel for Entropic.

127. The '775 patent's field is "a cable modem system having a functionally partitioned and flexible architecture." Ex. 1001 ['775] 1:5-10. By contrast, Klein's field is "semiconductor digital circuitry implementing a pipelined dynamically reconfigurable instruction set processor (Ex. 1016, [0002]), and Kim '678's field is "systems integrated on a semiconductor chip" (Ex. 1015, [0001]-[0002]). Thus, in my opinion, neither Kim nor Klein '678 share the same field of endeavor as the '775 patent.

128. Neither Kim nor Klein '678 are reasonably pertinent to the problem the '775 patent seeks to address as well. The '775 patent is directed towards "[t]he major challenge in designing" a gateway cable modem integrating "a wide range of data networking and VoIP services" "with the basic cable modem functionality in an efficient and cost-effective [manner]." Ex. 1001 ['775] 1:13-18. On the other hand, Klein seeks to address "the limitations of ASICs, FPGAs, and CPUs" as the "conflicting design goals have strained the capabilities of traditional semiconductor technologies and chip architectures." Ex. 1016 [Klein] [0003]-[0008]. Similarly, Kim '678 addresses "inefficiencies" in prior art schemes for system on a chip arbitration. Ex. 1015 [Kim '678] [0012]-[0014], [0045].

129. Moreover, Petitioner fails to demonstrate that a POSITA would have been motivated to combine Rabenko and Klein and Kim '678 as proposed. I see no proof that Klein or Kim '678 are appropriate to perform the functions needed in

Rabenko. *See* Pet., 59-61. Klein and Kim '678 do not teach DOCSIS MAC processor or a DOCSIS controller. *See* Exs. 1015, 1016. Indeed, Klein and Kim '678 are directed toward generic processors that have nothing to do with DOCSIS or cable modems at all.

130. Thus, in my opinion, Petitioner fails to demonstrate that its combinations teach that “the DOCSIS MAC processor is an ARM9TDMI-based RISC processor” and that “the DOCSIS controller is an ARM940-based RISC processor.”

VII. CONCLUSION

131. Although my complete opinions are set forth above, for convenience I summarize several points of my opinions in conclusion. For the foregoing reasons, based on my expertise and experience and the record of this case that I have reviewed, it is my opinion that:

- Claims 1-7, 10, 12, 14-15, 18-20 are not obvious over Rabenko;
- Claims 1-7, 10, 12, 14-15, 18-20 are not obvious over Rabenko in view of Gaspar;
- Claims 1-7, 10, 12, 14-15, 18-20 are not obvious over Rabenko in view of Kim;
- Claims 1-7, 10, 12, 14-15, 18-20 are not obvious over Rabenko in view of Gaspar and further in view of Kim;

- Claims 1-7, 10, 12, 14-15 are not obvious over each of Grounds A-D, above, further in view of Lu;
- Claim 12 are not obvious over each of Grounds A-H, above, further in view of Klein and further in view of Kim '678;
- Claim 8 are not obvious over each of Grounds A-H, above, further in view of Koperda;
- Claim 9 are not obvious over each of Grounds Q-X, above, further in view of Johnson;
- Claims 11, 13, 16-17 are not obvious over each of Grounds A-H, above, further in view of Johnson.

132. I understand that my opinions discussed above support a legal conclusion that claims 1-20 are nonobvious.

In signing this declaration, I recognize that the declaration will be filed as evidence in a contested case before the Patent Trial and Appeal Board of the United States Patent and Trademark Office. I also recognize that I may be subject to cross-examination in the case and that cross-examination will take place within the United States. If cross-examination is required, I will appear for cross-examination within the United States during the time allotted.

I hereby declare that all statements made herein of my own knowledge are true and all statements made herein on information and belief were and are believed by me to be true, and that all statements herein were and are made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under section 1001 of Title 18 of the United States Code and that any such willful false statements may jeopardize the validity of the application or any patents issued thereon.

Respectfully submitted,

Dated: December 10, 2024



Samuel H. Russ, Ph.D.

EXHIBIT A

Curriculum Vitae of Dr. Samuel H. Russ

Personal

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Phone: (251) 461-1378
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Citizenship: U.S.

Education

Ph.D. in Electrical Engineering, Georgia Institute of Technology, 1991.
Thesis Title: *An Information-Theoretic Approach to Analysis of Computer Architectures and Compression of Instruction Memory Usage*
Thesis Advisor: Dr. Cecil O. Alford
Bachelor's of Electrical Engineering (with Highest Honor), Georgia Institute of Technology, 1986.

Employment

University of South Alabama

2007 – Present

Interim Chair, Department of Electrical and Computer Engineering (2015-2016)

Associate Professor, Department of Electrical and Computer Engineering (2011-present)

Assistant Professor, Department of Electrical and Computer Engineering

Developing new class in signal integrity, developing cross-disciplinary collaborative research efforts, updating labs and class materials, teaching both undergraduate and graduate classes.

Scientific-Atlanta (Later Cisco, Now Technicolor)

2000 - 2007

Manager, Advanced Technologies R&D, Explored major new technologies including home networking and multi-room video distribution; oversaw construction of prototypes and demonstrations; demonstrated technologies at trade shows and to stock analysts; managed group of approximately 10 designing set-top boxes for the cable television industry including all phases of high-volume electronic design including layout, high-speed digital design, emissions considerations, gate array conversion, and designing with custom ASICs; supervised cross-functional team to increase hard drive reliability; wrote numerous patent applications. Products deployed widely, including Time Warner Cable and Cablevision.

IVI Checkmate (Now Ingenico)

1999 – 2000

Matrix Manager, Electrical Engineering, Supervised staff of approximately 6 electrical engineers, oversaw assignments, allocated time across multiple projects, worked to coordinate project schedules with priorities, assisted in sales and other customer communications.

Staff Electrical Engineer, Oversaw major design overhaul of touch-pad payment system including embedded-systems design, power-system design, and system layout and schematic capture. System deployed widely at Wal-Mart, Home Depot, and others.

Mississippi State University

1994 - 1999

Thrust Leader, Computing Systems Research Thrust and Systems Integration Group, NSF Engineering Research Center -- Coordinate research plans and NSF reporting for 6 faculty and 3 full-time staff, assist in development of strategic plans and pursuit of funding opportunities, oversight of development of the ERC-wide integrated testbed. Managed multi-year research project in distributed computing that included 11 students and 5 faculty.

Assistant Professor, Department of Electrical & Computer Engineering -- Developed all-new graduate class in circuit board design, authored textbook chapter, developing new undergraduate lab, pioneered teaching classes over 2-way interactive video.

Dickerson Vision Technologies (Now Cognex)

1992 - 1994

Director of Manufacturing--Oversaw the development and implementation of a manufacturing plan for the company.

Senior Applications Engineer--Developed firmware and user-interface software for the company's proprietary hardware, Assisted in development of machine vision system hardware, Assisted in sales duties.

Georgia Institute of Technology

1987 - 1991

Graduate Research Assistant--Helped design five VLSI chips while developing two custom CPU's, Silicon-compiler-based computer chip design, including initial design, full functional simulation, size and timing optimization, and manufacturing test development.

Publications

Books

1. Samuel H. Russ, *Signal Integrity: Applied Electromagnetics and Professional Practice*, Springer, 2016. (Textbook)
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3. S. H. Russ and J. Gatlin, "Ways to hack a printed circuit board: PCB production is an underappreciated vulnerability in the global supply chain," *IEEE Spectrum*, vol. 57, no. 9, pp. 38-43, Sept. 2020.
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8. Samuel H. Russ and Sasan Haghani, "802.11g Packet-Loss Behavior at High Sustained Bit Rates

in the Home”, *IEEE Transactions on Consumer Electronics*, Vol. 55, No. 2, May 2009, pp. 788-791.

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11. Roger L. King, Samuel H. Russ, Aric B. Lambert, Donna S. Reese, “An artificial immune system model for intelligent agents”, *Future Generation Computer Systems*, Volume 17, Issue 4, pp. 335 - 343 (January 2001).
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2. U.S. Patent Number 7,181,010, “Apparatus for entitling remote client devices”, Samuel Russ, Michael Gaul, Anthony Wasilewski, and Howard Pinder, February 20, 2007.
3. U.S. Patent Number 7,360,233, “Broadcast carousel system access for remote home communication terminal”, Samuel Russ, Michael Gaul, and Anthony Wasilewski, April 15, 2008.
4. U.S. Patent Number 7,360,235, “Systems and methods for operating a peripheral record/playback device in a networked multimedia system”, David Davies, Samuel Russ, and Irvan Krantzler, April 15, 2008.
5. U.S. Patent Number 7,499,822, “Analog set-top calibration patterns in manufacturing”, Leo Montreuil, Wayne B. Williams, Samuel H. Russ, and Robert Kriete, March 3, 2009
6. U.S. Patent Number 7,505,592, “Apparatus for entitling and transmitting service instances to remote client devices”, Samuel H. Russ, Michael Gaul, Anthony Wasilewski, and Howard Pinder, March 17, 2009
7. U.S. Patent Number 7,516,470, “Locally-updated interactive program guide”, Samuel H. Russ and Michael Gaul, April 7, 2009
8. U.S. Patent Number 7,826,711, “Digital Video Disc (DVD) Player or Digital Video Recorder (DVR) Playback with Memory”, Samuel H. Russ, Nov. 2, 2010.
9. U.S. Patent Number 7,849,486, “Networked subscriber television distribution”, Samuel H. Russ, David Lett, Jonathan Robinson, and Michael Gaul, Dec. 7, 2010.
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16. U.S. Patent Number 7,961,780, "Generated set top calibration patterns in manufacturing", Leo Montreuil, Wayne B. Williams, Samuel H. Russ, and Robert Kriete, Jun. 14, 2011.
17. U.S. Patent Number 7,978,720, "Digital media device having media content transfer capability", Samuel H. Russ, Christopher L. Stallings, July 12, 2011.
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19. U.S. Patent Number 8,127,236, "Proximity detection using wireless connectivity in a communications system", Paul J. Claussen, Ajith N. Nair, and Samuel H. Russ, Feb. 28, 2012.
20. U.S. Patent Number 8,181,205, "PVR Channel and PVR IPG Information", Samuel H. Russ, Michael A. Gaul, and Dariusz S. Kaminski, May 15, 2012.
21. U.S. Patent Number 8,208,796, "Systems and methods for prioritizing the storage location of media data", Bohdan Prus and Samuel H. Russ, June 26, 2012.
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28. U.S. Patent Number 9,762,970, "Access of stored video from peer devices in a local network," David B. Davies, Samuel H. Russ, and Irvan J. Krantzler, September 12, 2017.
29. U.S. Patent Number 10,412,439, "PVR Channel and PVR IPG Information", Samuel H. Russ, Michael A. Gaul, and Dariusz S. Kaminski, Sep. 10, 2019.

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2. European Patent Number EP1673937B1, "Proximity detection using wireless connectivity in a communications system", Paul Claussen, Ajith Nair, and Samuel Russ, April 21, 2010.
3. European Patent Number EP1604523B1, "Method for determining the encryption of a service content depending on the fidelity of the reformatting of said content", Samuel Russ, Michael Gaul, Anthony Wasilewski, and Howard Pinder, Nov. 21, 2012.
4. European Patent Number EP1552699B1, "Networked multimedia system", Neil Robertson, David Lett, Samuel Russ, Bohdan Prus, Michael Gaul, and Ajith Nair, Dec. 18, 2013.
5. European Patent Number EP1334617B1, "Networked Subscriber Television Distribution", Samuel Russ, David Lett, Jonathan Robinson, and Michael Gaul, April 1, 2015.

6. European Patent Number EP1920601B1, "Multiroom Point of Deployment Module," William Wall and Samuel Russ, May 4, 2016.
7. European Patent Number EP1510033B1, "Apparatus for Entitling Remote Client Devices," Samuel H. Russ, Michael Gaul, Anthony Wasilewski, and Howard Pinder, April 26, 2017.
8. European Patent Number EP1540946B1, "Broadcast Carousel System Access for Remote Home Communications Terminal via a Gateway Device," Samuel Russ, Michael Gaul, and Anthony Wasilewski, April 18, 2018.
9. European Patent Number EP2008280B1, "Method and Device for Prioritizing the Storage Location of Media Data," Bohdan Prus and Samuel Russ, September 26, 2018.

Conference Papers

1. S.H. Russ, M. Khan, S. Latif, "Surreptitiously Adding a WLAN Antenna to a Printed Circuit Board" 2022 IEEE Physical Assurance and Inspection of Electronics (PAINE), Huntsville, AL, USA, 2022.
2. J. Todd McDonald, Rebecca C. Clark, Lee M. Hively, and Samuel H. Russ. 2022. "Phase space power analysis for PC-based rootkit detection." In *Proceedings of the 2022 ACM Southeast Conference (ACM SE '22)*. Association for Computing Machinery, New York, NY, USA, 82–90. <https://doi.org/10.1145/3476883.3520212>
3. S. H. Russ, " Surreptitiously Adding a Microcontroller to a Printed Circuit Board," 2021 IEEE Physical Assurance and Inspection of Electronics (PAINE), Washington, DC, USA, 2021.
4. S.H. Russ, "Circuit Board Security Vulnerabilities and Counteractions", IPC APEX EXPO 2021.
5. S. H. Russ, "Techniques to Thwart Surreptitiously Altered PCBs," 2020 IEEE Physical Assurance and Inspection of Electronics (PAINE), Washington, DC, USA, 2020, pp. 1-4.
6. S. H. Russ, E. Spencer, T. Scroggins, and S. Latif, "Power-Efficient Software Architecture for a CubeSat System", *2020 SoutheastCon*, Raleigh, NC, USA, 2020, pp. 1-6.
7. A. Russ, S. H. Russ, E. Spencer and M. Frank, "Motor Controller and Reaction Wheel for CubeSat," *2019 SoutheastCon*, Huntsville, AL, USA, 2019, pp. 1-3.
8. F. Lorenzo, J. T. McDonald, T. R. Andel, W. B. Glisson and S. Russ, "Evaluating Side Channel Resilience in iPhone 5c Unlock Scenarios," *2019 SoutheastCon*, Huntsville, AL, USA, 2019, pp. 1-7
9. E. Spencer, D. Clark, S. Russ, *et al.*, "First results from a time domain impedance probe for measuring plasma properties in the ionosphere," 2017 IEEE 60th International Midwest Symposium on Circuits and Systems (MWSCAS), Boston, MA, 2017, pp. 1284-1287.
10. E. Spencer, D. Clark, R. Gollapalli, S. Russ and B. Kerrigan, "A System On Chip design for fast time domain impedance spectroscopy," 2017 IEEE 60th International Midwest Symposium on Circuits and Systems (MWSCAS), Boston, MA, 2017, pp. 124-127.
11. Ramya Manikyam, J. Todd McDonald, William R. Mahoney, Todd R. Andel, and Samuel H. Russ, "Comparing the effectiveness of commercial obfuscators against MATE attacks," *Proceedings of the 6th Workshop on Software Security, Protection, and Reverse Engineering (SSPREW '16)*, 2016, Article 8. DOI: <https://doi.org/10.1145/3015135.3015143>
12. Samuel Russ, Tho Ha, and Jonathan Shapiro, "Simulation of Digital Video Recording to Maximize Solid-State Disk Lifetime," *Proceedings of the 2014 International Conference on Consumer Electronics*, Jan. 10-13, 2014, pp. 562-563.
13. Thomas Thomas, Cade Cashen, and Samuel Russ, "Leveraging Smart Grid Technology for Home Health Care", *Proceedings of the 2013 International Conference on Consumer Electronics*, Jan. 11-14, 2013, pp. 276-277.
14. Cade Cashen, Samuel Russ, and Thomas Thomas, "Using a Wireless LAN to Perform Motion Detection", *Proceedings of the 2013 International Conference on Consumer Electronics*, Jan. 11-14, 2013, pp. 63-64.
15. Nicklaus Thomas, David Evans, and Samuel Russ, "A Markovian Algorithm for Creating

- Immersive Public-Speaking Audiences”, *Proceedings of the 2013 International Conference on Consumer Electronics*, Jan. 11-14, 2013, pp. 384-385.
16. Samuel H. Russ, “Podcasting to Improve Software Usage”, *Proceedings of the 2012 ASEE Southeastern Section Conference*, April 1-3 2012, Starkville, MS, Paper ID 605.
 17. Samuel H. Russ, “Using Student ID Numbers to Create Customized Homework Problems”, *Proceedings of the 2012 ASEE Southeastern Section Conference*, April 1-3 2012, Starkville, MS, Paper ID 606.
 18. Samuel H. Russ and Ramesh Nallur, “Digital Video Recording Onto Solid-State Disks”, *2011 Digest of Technical Papers, 2011 International Conference on Consumer Electronics*, pp. 495-496. (2nd place in best paper contest, 2011.)
 19. Mohammad Mushtaq, Samuel H. Russ, and Mohammad S. Alam, “Variable FEC to Reduce ECC Overhead in Digital Video Transmission”, *2011 Digest of Technical Papers, 2011 International Conference on Consumer Electronics*, pp. 215-216.
 20. Samuel H. Russ and Salim Alsharif, “Behavior of HomePlug AV Traffic At High Sustained Bit Rates in the Home”, *2011 Digest of Technical Papers, 2011 International Conference on Consumer Electronics*, pp. 682-683.
 21. Samuel H. Russ, Viswakalyan Perepa, Silas Leavesly, and Bret Webb, “Novel Low-Cost Salinity Sensor for Embedded Environmental Monitoring”, *Proceedings of IEEE Southeastcon 2010*, March 18-21, 2010, pp. 53-56.
 22. Samuel H. Russ and Kung-Hsien Chen, “Thermally Conductive Circuit Boards”, *Proceedings of the 59th Electronic Components and Technology Conference (ECTC 2009)*, May 2009, pp. 465-468.
 23. Samuel H. Russ and Sasan Haghani, “Behavior of 802.11g Traffic at High Sustained Bit Rates in the Home”, *2009 Digest of Technical Papers, 2009 International Conference on Consumer Electronics, Jan. 2009*, pp. 423-424.
 24. Samuel H. Russ, and Ramesh Nallur, “A Framework for Calculating Fundamental DVR Performance Limits”, *2009 Digest of Technical Papers, 2009 International Conference on Consumer Electronics, Jan. 2009*, pp. 51-52.
 25. Samuel H. Russ, “Home Networking: Extending Cable’s Reach”, *The Complete Technical Paper Proceedings from NCTA*, 2001, pp. 160-165.
 26. Samuel H. Russ, Rashid Jean-Baptiste, Tangirala Shailendra Krishna Kumar, and Marion G. Harmon, “Transparent Real-Time Monitoring in MPI”, *IPPS/SPDP Workshops 1999*, in *Parallel and Distributed Processing*, Lecture Notes in Computer Science, vol. 1586, Springer-Verlag, 1999, pp. 1327-1334.
 27. Roger L. King, Aric B. Lambert, Samuel H. Russ, and Donna S. Reese, “The Biological Basis of the Immune System as a Model for Intelligent Agents”, *IPPS/SPDP Workshops 1999*, in *Parallel and Distributed Processing*, Lecture Notes in Computer Science, vol. 1586, Springer-Verlag, 1999, pp. 156-164.
 28. Aric Lambert, Roger King, Sam Russ, and Donna Reese, “Intelligent Control Agents for Resource Management of Heterogeneous Parallel Computing”, *Computational Intelligence for Modeling, Control, and Automation (CIMCA 98) in Concurrent Systems Series*, vol. 55, IOS Press, 1999, pp. 116-121.
 29. Samuel H. Russ and Adam Gaither, “Developing An Integrated Environment for Computational Field Simulation”, *Object-Oriented Methods for Inter-Operable Scientific and Engineering Computing: Proceedings of the 1998 SIAM Workshop*, pp. 50-57.
 30. Samuel H. Russ, Ioana Banicescu, Sheikh Ghafoor, Bharathi Janapareddi, Jonathan Robinson, and Rong Lu, “Hectiling: An Integration of Fine and Coarse-Grained Load-Balancing Strategies”, *Proceedings of the Seventh International Symposium on High Performance Distributed Computing*, August 1998, IEEE Computer Society, pp. 106-113.

31. Samuel H. Russ, "An Architecture for Rapid Distributed Fault Tolerance", 3rd International Workshop on Embedded High-Performance Computing, in J. Rolim, Editor, *Parallel and Distributed Processing*, Lecture Notes in Computer Science, vol. 1388, Springer-Verlag, 1998, pp. 925-930.
32. Dr. Samuel H. Russ, Brad Meyers, Jonathan Robinson, Matt Gleeson, Laxman Rajagopalan, Chun-Heong Tan, and Bjørn Heckel, "User-Transparent Run-Time Performance Optimization", *Proceedings of the 2nd International Workshop on Embedded HPC Systems and Applications*, Geneva, April 1997.
33. J. Robinson, S.H. Russ, B. Flachs, and B. Heckel, "A Task Migration Implementation of the Message-Passing Interface", *Proceedings of the 5th High Performance Distributed Computing Conference (HPDC-5)*, August 1996, IEEE Computer Society, pp. 61-68.
34. S.H. Russ, B. Flachs, J. Robinson, and B. Heckel, "Hector: Automated Task Allocation for MPI", *Proceedings of the 10th International Parallel Processing Symposium*, April, 1996, IEEE Computer Society, pp. 344-348.
35. W.S. Tan, C.O. Alford, and S.H. Russ, "GT-EP: A Novel High-Performance Real-Time Architecture", *Proceedings of the 18th International Symposium on Computer Architecture*, May 1991, pp. 12-21.

Reports

1. Aric B. Lambert, Roger L. King, Samuel H. Russ, Donna S. Reese, "Adaptive Analysis for the Design of Hardware Agents Using the Artificial Immune System Model for Resource Management of Heterogeneous Systems", Miss. State Technical Report No. MSSU-COE-ERC-98-10, Aug. 1998.
2. Daniel H. Linder, Robert B. Reese, Jon Robinson, and Samuel H. Russ, "JavaCADD: A Java-based Server and GUI for Providing Distributed ECAD Services", Mississippi State University Technical Report No. MSSU-COE-ERC-98-07, May 1998.
3. Samuel H. Russ, "Using Hector in an Architecture for Rapid Distributed Fault Tolerance", Mississippi State Technical Report No. MSSU-EIRS-ERC-97-17, December 1997.
4. Samuel H. Russ, Jonathan Robinson, Matt Gleeson, and Jose Figueroa, "Dynamic Communication Mechanism Switching in Hector", Mississippi State Technical Report No. MSSU-EIRS-ERC-97-8, September 1997.
5. Samuel H. Russ, Brian Flachs, Jonathan Robinson, and Bjorn Heckel, "Hector: Automated Task Allocation for MPI", Mississippi State Technical Report No. MSSU-EIRS-ERC-95-6, September, 1995.

Funded Grants and Contracts

University of South Alabama

1. National Space Grant Foundation, Aug. 2018-May 2019, "Automation Infrastructure for Gateway Biological Laboratory," PI, \$28,062.
2. Nfina (Local Mobile Company), March 2018 – March 2019, "Redhawk", PI, \$119,881.
3. NASA, May 2016 – Present, "Spatially Resolved Measurements Of Plasma Density Irregularities In The Ionosphere F Region For Scintillation Studies", Co-I, \$100,000.
4. Marine Environmental Science Consortium (GRI), Jan. 2011-Dec. 2011, "Conductivity Based In-Situ Hydrocarbon Sensor", PI, \$9,338.
5. University of South Alabama Research Council (USARC), Feb. 2008 – Feb. 2009, "Instrumentation of Hurricane Forecast Models for Performance Optimization", \$5,000 for one year.

Mississippi State University

1. National Science Foundation, April 1998-March 1999, "An ERC-CREST Partnership in Distributed and Computational Systems", PI, \$100,000/year, renewable for 5 years.
2. Office of Naval Research, Nov. 1996-Nov. 1998, "Distributed Visualization and Virtual Environments for Oceanography and Meteorology", Co-PI, \$200,000.
3. U.S. Army Waterways Experiment Station, July 1996-July 1999, "Efficient Parallel Wave Modeling", PI, \$200,000, Funded under CHSSI (Common HPC Scalable Software Initiative) of the DoD. (\$50,000 actually funded.)
4. NSF Engineering Research Center for Computational Field Simulation, April 1995- May 1999, "Heterogeneous Computing Testbed (CA 8)", PI, By year: \$34,983/\$70,111/\$55,916. Funded through NSF Engineering Research Center.

Dickerson Vision Technology

1. Small Business Innovations Research Program of the NSF, Division of Industrial Interface, September 1993 - February 1994, Award No. III-9260914. (\$50,000 Phase I contract conducted at Dickerson Vision Technologies.)

Technology Transfer and Licensing

Hector Distributed Run-Time Environment licensed by MPI Software Technology, Inc., Starkville, MS in June 1998 (while at Mississippi State University)

Students Advised (Major Professor)

Level	At USA	At MSU
Ph.D.	--	0
Masters	3	9

Courses Created and Enhanced

University of South Alabama

EE 264 Microprocessor Systems and Interfacing – Replaced 68HC11 with Freescale 9S12 architecture and redesigned the entire course, Introduced use of 68HC11 simulator and accompanying podcast to enhance student's ability to visualize microprocessor operation

EE 268 Digital Logic Design Lab – Updated one lab experiment

EE 368 Microprocessor Systems Lab – Developed all-new sequence to tie EE 368 to senior projects with hands-on experiments like motors, photocells, and servomotors.

EE 401 Introduction to ECE Design – Completely overhauled the first-semester senior project course. Added lectures on professionalism, career development, and legal aspects of engineering. Structured the course so that reports would lead up to their senior-project reports.

EE 404 ECE Design – Completely overhauled the second-semester senior project course by requiring better projects and adding material on giving effective presentations. Obtained very enthusiastic response from the department's Industrial Advisory Board.

EE 446 – Obtained donation of boards from Freescale and redesigned all of the experiments to develop more interesting demonstrations and to switch from assembly language to C.

EE 457/557 – Developing series of podcasts to augment in-class lectures with materials related to embedded systems and professional development.

EE 469/569 Advanced Digital System Design – Developed all-new course in high-speed circuit board design from an electromagnetics perspective, and authored a textbook for the course. Added a lab experience in 2009.

EE 560 Advanced Computer Architecture – Selected new textbook for the class and developed lecture materials to match

EG 101 – Developed systematic curriculum shared by all sections including “checklists” for instructors, handouts, and lecture materials. Introduced motors project, which has become the most popular EG 101 project.

Mississippi State University

EE 8993 High Speed Digital Design -- Offered on video nationwide, it features pioneering treatment of high-speed circuit board design from an electromagnetics perspective. Material from the class has been included in one of the best-known electromagnetics textbooks, and it continues to be one of the most popular graduate classes in the department.

EE 4743 Computer Aided Digital Design -- Added breakthrough educational technology to permit remote access to logic synthesis capabilities. Offered on live two-way video starting Fall 1998.

Courses Taught

University of South Alabama

EE 220, Circuit Analysis I, 1 course.
EE 263, Digital Logic Design, 2 courses.
EE 264, Microprocessor Sys-Interfacing, 4 courses.
EE 268, Digital Logic Design Lab, 1 course.
EE 368, Microprocessor Sys Interf Lab, 14 courses.
EE 401, Intro Elec and CpE Design - W, 7 courses.
EE 404, Elec and Comp Eng Designs-W, 7 courses.
EE 440, HDL Logic Synthesis, 1 course.
EE 446, Embedded System Design Lab, 2 courses.
EE 457, Embedded System Design, 10 courses.
EE 469, Signal Integrity, 5 courses.
EE 534, VLSI Design Systems, 1 course.
EE 540, HDL Logic Synthesis, 1 course.
EE 548, Computer-Network Security, 5 courses.
EE 557, Adv. Embedded System Design, 8 courses.
EE 560, Adv Computer Architecture, 3 courses.
EE 569, Signal Integrity, 5 courses.
EG 101, Intro to Engineering & Design, 5 courses.
EG 231, Intro to Ethics and Economics, 2 courses.

Mississippi State University

Number Description	Class Description
EE 2111 Electrical Lab I	Accompanies introductory digital class
EE 2713 Digital Devices	Introductory digital class
EE 4723 Microcomputers II	Microcontroller interfacing
EE 4743 Computer Aided Digital Design	VHDL, logic design, and synthesis
EE 8993 High-Speed Digital Design	Signal integrity and high-speed design

Honors and Awards

University of South Alabama College of Engineering “Teacher of the Year” 2015

Mobile Area Council on Engineering “Engineering Educator of the Year” 2015

Technology and Engineering Emmy® Award, 2012, for “Pioneering Development of Multi-Room DVR.” Awarded to Cisco. I managed the groups that built the first prototypes, gave public demonstrations, wrote numerous patent applications, and developed the first mass-production set-top containing Multi-Room DVR.

2nd Place in “Best Paper – Storage Category” at ICCE 2011. The paper is “Digital Video Recording Onto Solid-State Disks” as noted in Conference publications above.

Attendee, “Top Prof” Banquet – University of South Alabama chapter of Mortar Board, 2009,2010

Tau Beta Pi Engineering Professor of the Year – University of South Alabama chapter of Tau Beta Pi, 2008. One of two highest awards in the College of Engineering for teaching, and the only award voted on by honor students in the College.

Finalist, 53rd International Science and Engineering Fair, 1983, Albuquerque, NM.

Professional Activities

Expert Witness Engagements

Case	Jurisdiction and Case Number	Year(s)	Witness for	Expert Reports	Dep.	Trial	IPR* Rep.
WNE Holdings v. Rockwell Automat.	Southern District of Alabama	2011	Plaintiff	1	0	0	0
Personalized Media Corp. (PMC) v. Echostar	Eastern District of Texas	2010-2015	Plaintiff	2	3	0	0
Pegasus v. DirecTV et al.	Delaware	2011-13	Plaintiff	1	0	0	0
Apple v. Samsung	Int’l Trade Commission 337-TA-796	2012	Respondent	4	1	1	0
EON v. MobiTV et al.	Delaware	2013	Defendant	1	1	0	0
PMC v. Zynga	Eastern District of Texas	2013	Plaintiff	1	5	0	4
OpenTV v. Netflix	Delaware	2014	Defendant	0	0	0	0
Kaplan v. OnForce	N.D. California	2014	Defendant	0	0	0	1
Intellectual Ventures v. J.P. Morgan Chase	Southern District of New York	2013-2019	Defendant	2	2	0	0
PMC v. Amazon	Delaware	2014-2015	Plaintiff	1	9	0	5
Better Mouse Corp. v. Steelseries et al.	Eastern District of Texas	2015-2016	Plaintiff	2	0	1	0
SyncPoint v. Nintendo et al.	Eastern District of Texas	2015	Plaintiff	2	1	0	0
TQ Beta v. Dish	USPTO (IPR)	2016	Defendant	1	1	0	0
Script v. ADT et al.	Eastern District of Texas	2016	Plaintiff	2	2	0	0
Sony v. Pace	USPTO (IPR)	2016	Defendant	0	1	0	4
PMC v. Apple	EDTX and USPTO (IPR)	2016-Now	Patent Owner	2	1	1	2

Case	Jurisdiction and Case Number	Year(s)	Witness for	Expert Reports	Dep.	Trial	IPR* Rep.
PMC v. Samsung	Eastern District of Texas	2016	Patent Owner	2	0	0	0
Music Choice v. Stingray	Eastern District of Texas	2016-now	Plaintiff	2	2	0	4
Broadcom v. AMD	USPTO (IPR)	2016	Petitioner	0	0	0	1
Tech Pharmacy v. Alixa et al.	Eastern District of Texas	2017	Plaintiff	2	2	1	0
Rovi v. PMC	Eastern District of Texas, Arbitration	2017	Defendant	0	1	0	0
Implicit v. Trend Micro	Eastern District of Texas	2017	Defendant	2	1	0	0
Implicit v. Palo Alto	Eastern District of Texas	2018	Defendant	1	1	0	0
Invensas v. Samsung	Eastern District of Texas	2018	Plaintiff	2	1	0	0
Selective Signals v. Palo Alto	USPTO (IPR)	2018-Now	Petitioner	0	1	0	1
Rovi Tivo v. Various	Canada	2018-Now	Plaintiff	0	0	0	0
Implicit v. Netscout	Eastern District of Texas	2018-Now	Defendant	0	0	0	0
Rovi Tivo v. Comcast	USPTO (IPR)	2019-2020	Plaintiff	0	4	0	5
Rovi Tivo v. Comcast	ITC	2019-2020	Petitioner	2	1	1	0
American Patents v. Various	Eastern District of Texas	2019-Now	Plaintiff	0	0	0	0
BBiTV v. OpenTV	California	2019	Defendant	0	0	0	0
Roku v UEI	USPTO (IPR)	2019-Now	Petitioner	0	6	0	8
MV3 v Roku	Western District of Texas	2019-2020	Defendant	2	2	1	0
BBiTV v Dish	USPTO (IPR)	2019-2020	Petitioner	0	3	0	6
PMC v Google	Eastern District of Texas	2020	Plaintiff	1	1	0	0
PMC v Netflix	Southern District of New York	2020-Now	Plaintiff	2	0	0	0
UEI v Roku <i>et al.</i>	ITC	2020-2021	Respondent	1	1	1	0
BBiTV v Dish	Western District of Texas	2020-2021	Defendant	1	5	0	6
Flexiworld v Amazon <i>et al.</i>	Western District of Texas	2020-Now	Defendant	0	0	0	0
Flexiworld v Roku	Western District of Texas	2021-2022	Defendant	2	0	0	0
Roku v UEI <i>et al.</i>	ITC	2021-	Complain.	1	0	1	0

Case	Jurisdiction and Case Number	Year(s)	Witness for	Expert Reports	Dep.	Trial	IPR* Rep.
		2022					
Roku v DivX	USPTO (IPR)	2021-Now	Petitioner	0	0	0	1
Apple v Identity	USPTO (IPR), Ex Parte Re-Exam, Western District of Texas	2022-Now	Patent Owner	2	1	0	6
Audi v Aprese	USPTO (IPR)	2022-Now	Petitioner	0	0	0	2
paSafeShare	Ex Parte Re-Exam, Western District of Texas	2021-Now	Patent Owner, Plaintiff	0	0	0	3
PerfectVision v PPC Broadband	USPTO (IPR)	2022-Now	Petitioner	0	0	0	1
Google v Nobots	USPTO (IPR)	2022-Now	Patent Owner	0	2	0	4
Fall Line v Various	Eastern District of Texas	2022-Now	Plaintiff	2	1	0	0
Assa Abloy v CPC	USPTO (IPR)	2023-Now	Patent Owner	0	2	0	4
IOENGINE v Roku	Western District of Texas	2023-Now	Defendant	5	2	0	0
Gratuity v Toast	USPTO (IPR)	2023-Now	Petitioner	0	0	0	1

* Includes reports submitted for IPRs, CBMRs, and Re-Exams

Invited Lectures

“Real-time Monitoring in MPI”, Florida A&M University, Tallahassee, FL, August 1998

Consulting

Consulted with various investment firms concerning telecommunications market, 2007 – ongoing
Cox Communications – DVR Reliability – 2015

Society Memberships

Institute of Electrical and Electronic Engineers (Senior Member), IEEE Consumer Electronics Society, IEEE Computer Society, Eta Kappa Nu, Tau Beta Pi, Phi Kappa Phi, Gamma Beta Phi
Secretary, Northeast Mississippi Subsection of the IEEE, 1994-95

Article Reviewer

Computers and Electrical Engineering, Supercomputing '94, IEE Transactions, Concurrency: Practice and Experience, International Parallel Processing Symposium, IEEE Transactions on Education, IEEE Transactions on Parallel and Distributed Systems, ICT 2012, ICAEE 2012

Proposal Reviewer

Army Research Office, National Science Foundation, U.S. Department of Energy

University Service

Chair, Search Committee, ECE Department – Search for Assistant Professor positions, 2008-now (chair since 2011)

Member, ECE Department Undergraduate Affairs Committee, 2015-now
Member, College of Engineering Academic Standards Committee, 2016-now
Member, Search Committee, College of Engineering – Search for 2 Associate Dean positions, 2015
Member, Search Committee, College of Engineering – Search for Associate Dean positions, 2008-09
Member, University of South Alabama Council on International Education, 2008-15
Chairman, ECE Department “Open House” Committee, 2008-09
Conducted open house and other demonstrations for the department, 2008-now
Chairman, ECE Department Recruiting and Retention Committee, 2007-08
Updated and conducted experiment for ACE program, 2007
Member, Hearin Undergraduate Committee, 1998
Department Coordinator, United Way Campaign, 1995
Award Referee, 1995 Instructional Paper Award, MSU College of Engineering