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7
8 **UNITED STATES DISTRICT COURT**
9 **CENTRAL DISTRICT OF CALIFORNIA**
10 **SANTA ANA DIVISION**

11
12 ENTROPIC COMMUNICATIONS,
13 LLC,

14 Plaintiff,

15 v.

16 COMCAST CORPORATION;
17 COMCAST CABLE
COMMUNICATIONS, LLC; AND
18 COMCAST CABLE
COMMUNICATIONS
MANAGEMENT, LLC,

19 Defendants.
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22
23
24
25
26
27

No. 2:23-cv-1049-JWH-KES (Lead Case)
No. 2:23-cv-1050-JWH-KES (Related Case)

Assigned to Hon. John W. Holcomb

Declaration of Dr. Sandeep Chatterjee
Regarding Claim Construction

Declaration of Dr. Sandeep Chatterjee Regarding Claim Construction
CASE NO.: 2:23-CV-01050-JWH-KES

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TABLE OF EXHIBITS

Exhibit	Description
A	File History of U.S. Patent No. 10,135,682 (ENTROPIC_COMCAST_021445-627)
B	File History of U.S. Patent No. 9,866,438 (ENTROPIC_COMCAST_018261– 452)
C	U.S. Patent No. 11,381,866
D	File History of U.S. Patent No. 9,419,858 (ENTROPIC_COMCAST_018600)
E	Claim Construction Memorandum Opinion and Order in <i>Entropic Communications, LLC v. Charter Communications, Inc.</i> , 2:22-CV-00125-JRG
F	Curriculum vitae of Dr. Sandeep Chatterjee
G	List of documents or other information reviewed
H	U.S. Patent No. 9,100,622
I	U.S. Patent N. 9,866,438
J	U.S. Patent No. 9577886
K	U.S. Patent No. 9,419,858 (ENTROPIC_COMCAST_018600 – 849)
L	U.S. Patent Application 61/674742
M	Ciciora, Modern Cable Television Technology, 2nd ed. (2004), (DEF_ENTROPIC_PRIOR_ART_00000018 – 1110)
N	U.S. Patent No. 10,135,682
O	DOCSIS 3.0 MAC and Upper Layer Protocols Interface Specification, CM-SP-MULPIv3.0-I15-110210 (Feb. 10, 2011), (DEF_ENTROPIC_PRIOR_ART_00010196 – 945)
P	DOCSIS 3.0 Physical Layer Specification, CM-SP-PHYv3.0-I10-111117 (Feb. 10, 2011), (DEF_ENTROPIC_PRIOR_ART_00010196 – 945)
Q	DOCSIS 2.0 Radio Frequency Interface Specification, CM-SP-RFIV2.0-I11-060602 (June 2, 2006), (DEF_ENTROPIC_PRIOR_ART_00067588 – 68123)
R	Riddel, PacketCable Implementation (2007), (COMCAST_ENTROPIC00039048-173)

Exhibit	Description
S	Excerpts from Newton's Telecom Dictionary, 26th ed. (2011) (COMCAST_ENTROPIC00043291 – 310)
T	Evans, Digital Telephony Over Cable (2001) (COMCAST_ENTROPIC00039256 – 860)
U	Cisco UBR 10K Data Sheet (COMCAST_ENTROPIC00043399 – 404)
V	Cisco uBR-MC3GX60V Cable Interface Line Card Hardware Installation Guide, (COMCAST_ENTROPIC00043279 – 86)
W	ARRIS Unveils E6000 Converged Edge Router (COMCAST_ENTROPIC00042965 – 66)
X	ARRIS C4 24U CAM Data Sheet (COMCAST_ENTROPIC00042990 – 91)
Y	DOCSIS Downstream External PHY Interface Specification, CM-SP- DEPI-I08-100611 (June 11, 2010) (COMCAST_ENTROPIC00043127 – 278)
Z	ARRIS C4 CMTS Release 8.1 Data Sheet (COMCAST_ENTROPIC00042992 – 93)
AA	Patent App 13/948,401
BB	U.S. Patent Publication No. 2014/0022926A1
CC	Keiser & Strange, Digital Telephony and Network Integration (1985) (COMCAST_ENTROPIC00043287 – 90)
DD	Saadawi, Fundamentals of Telecommunication Networks (1994) (COMCAST_ENTROPIC00043382 – 85)
EE	Subscriber Drop Wiring For Interactive Services – Part 2 (COMCAST_ENTROPIC00042967 – 69)
FF	CM-GL-PNMP-V02-110623 (Proactive Network Maintenance Using Pre-equalization) (COMCAST_ENTROPIC00042994 – 3126)

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Declaration of Dr. Sandeep Chatterjee Regarding Claim Construction
CASE NO.: 2:23-CV-01049-JWH-KES

1 **I. INTRODUCTION**

2 1. My name is Dr. Sandeep Chatterjee. I have been retained as an expert by
3 Defendants Comcast Corporation, Comcast Cable Communication, LLC, and Comcast
4 Cable Communication Management, LLC (collectively, “Comcast”) in connection with
5 *Entropic Communications LLC v. Comcast Corp.*, Case No. 2:23-cv-01050-JWH (C.D.
6 Cal.).

7 2. I understand that Entropic Communications, LLC (“Entropic”) has asserted
8 eight patents¹ in this action: U.S. Patent Nos. 8,223,775 (“the ’775 patent”); 8,284,690
9 (“the ’690 patent”); 9,210,362 (“the ’362 patent”); 11,381,866 (“the ’866 patent”);
10 11,399,206 (“the ’206 patent”); 8,792,008 (“the ’008 patent”); 9,825,826 (“the ’826
11 patent”); and 10,135,682 (“the ’682 patent”). In this declaration, I will refer to these
12 eight patents collectively as the “asserted patents.”

13 3. In this declaration I offer opinions about claim terms the parties seek to
14 construe in the ’682 patent. I understand that Entropic has asserted claims 1-5 and 9 of
15 the ’682 patent.

16 4. I understand that Entropic does not contend that the ’682 patent is entitled
17 to an invention date earlier than the filing dates of the earliest applications on the face of
18 the ’682 patent. The ’682 patent ultimately claims priority to a provisional application
19 filed on July 23, 2012. For purposes of the opinions in this declaration, I have assumed
20 the filing date of the provisional application is the priority date.

21 5. I have reviewed the ’682 patent, its prosecution history (Ex. A), and
22 prosecution histories of related patents, including U.S. Patent Nos. 9,866,438 (Ex. B),
23 9,577,886 (Ex. C), and 9,419,858 (Ex. D).

24 6. I have been informed that the ’682 patent was previously asserted in

25 ¹ I understand that Entropic expects to assert U.S. Patent Nos. 9,866,438 (“the ’438
26 patent”) and 11,785,275 (“the ’275 patent”) in this case, but that those patents are not
27 yet the subject of the claim construction process in this case.

1 *Entropic Communications, LLC v. Charter Communications, Inc.*, 2:23-cv-00052 (E.D.
2 Tex). I also understand that some claim terms of the '682 patent were construed in the
3 *Charter* case. *See* Ex. E (EDTX construction order).

4 7. In this declaration, I have set forth my opinions about various technical
5 issues relating to whether and how persons of ordinary skill in the relevant technical
6 field would have understood these claims in view of the specifications and file history
7 of the '682 Patent. I make this declaration based on my own personal knowledge and
8 experience. If asked to testify, I would testify competently to these matters.

9 8. This declaration, including the exhibits hereto, includes my opinions to
10 date. I reserve the right to supplement this declaration if I receive additional relevant
11 information or to respond to any expert opinion offered by Entropic. I may rely on
12 demonstrative exhibits, including pictures, figures, and drawings that appear in this
13 declaration and the referenced exhibits and materials in any testimony I provide before
14 the Court.

15 9. If I testify before the Court, I may also provide background on relevant
16 communications technology, including data transmission over coaxial wires and cable
17 networks, the hybrid fiber-coaxial cable network, the Data Over Cable Service Interface
18 Specification ("DOCSIS") standard and related cable technology standards (e.g., the
19 PacketCable standard), the simple network management protocol (SNMP), and any
20 other relevant standard or protocol. I would also expect to provide an overview of the
21 '682 Patent, any relevant related patents, and relevant file histories. I may also discuss
22 the knowledge of a person of ordinary skill in the art as of the earliest claimed priority
23 date, or the state of the art as of the earliest claimed priority date, to help explain my
24 opinions. I may also explain developments in technology since the earliest claimed
25 priority date of the alleged inventions in the asserted patents to demonstrate its evolution
26 over time, and to assist the Court in extracting hindsight from its view of the claim
27

1 terms at the time of purported invention.

2 **II. PERSONAL BACKGROUND**

3 **A. Professional Qualifications**

4 10. My qualifications and professional experience are described in my
5 curriculum vitae, a copy of which is Exhibit F to this declaration. The below
6 summarizes my relevant qualifications and professional experience.

7 11. I am the Chief Executive Officer of Experantis LLC, a technology consulting
8 company. Previously, I was the Executive Vice President and Chief Technology Officer
9 of SourceTrace Systems, Inc., a technology and services company enabling the delivery
10 of secure remote electronic services over landline and wireless telecommunications
11 networks.

12 12. I received my Bachelor's degree in Electrical Engineering and Computer
13 Science from the University of California, Berkeley in 1995. I received my master's
14 degree in Computer Science from the Massachusetts Institute of Technology (MIT) in
15 1997, and my doctorate in Computer Science from MIT in 2001. I received a certificate
16 of completion for an executive education program on global leadership from Harvard
17 University in 2011.

18 13. My doctoral dissertation at MIT, entitled "Composable System Resources
19 for Networked Systems," involving networked client architectures and systems, was
20 selected as one of the top inventions in the history of MIT's Laboratory for Computer
21 Science. This invention is showcased in a time capsule at the Museum of Science in
22 Boston, Massachusetts. Other recipients of this honor include Bill Gates, the founder of
23 Microsoft, and Tim Berners-Lee, the inventor of the World Wide Web.

24 14. My Master's dissertation at MIT, entitled "Asynchronous Event Handling,"
25 was directed to efficient event handling and communications in a parallel computing
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1 environment where the computing nodes are interconnected by a bidirectional 3-D mesh
2 network.

3 15. In 2011, I was named a Young Global Leader. This honor, bestowed each
4 year by the World Economic Forum, recognizes and acknowledges the top leaders—all
5 below the age of 40—from around the world for their professional accomplishments,
6 commitment to society, and potential to contribute to shaping the future of the world. In
7 2016, I was appointed to the World Economic Forum’s expert network as an expert in
8 technology and innovation.

9 16. From 1997, I was the Entrepreneur-in-Residence at FidelityCAPITAL, the
10 venture capital arm of Fidelity Investments. In 1999, I founded and served as President
11 and Chief Technology Officer (CTO) of Satora Networks, which developed tools and
12 technologies for building appliances and services for the Internet using wireless and other
13 technologies to extend it beyond the desktop.

14 17. In 2001, I joined Bluestone Software’s Mobile Middleware Labs as a Senior
15 Engineer developing applications and systems infrastructure for enterprise Java/J2EE,
16 Web services, and enterprise mobile solutions. After the completion of Hewlett-Packard’s
17 (“HP”) acquisition of Bluestone, I became a Senior Member of the Technical Staff at
18 HP’s Middleware Division. I was responsible for architecting and developing the
19 company’s next-generation Web services platform for enterprise as well as mobile
20 environments, known as the Web Services Mediator.

21 18. I was part of the Expert Group that developed the JSR-00172 J2ME (Java 2
22 Platform, Micro Edition) Web Services Specification,² the worldwide industry standard
23 for mobile Web services. I am the co-author, with James Webber, of the book
24 “Developing Enterprise Web Services: An Architect’s Guide” (published by Prentice-

25 ² See JSR 172: J2ME™ Web Services Specification, *available at*
26 <https://jcp.org/en/jsr/detail?id=172>

1 Hall in 2004).³ This book has been adopted by over 100 universities and colleges around
2 the world, and has been translated or reprinted in a number of countries around the world.

3 19. I have extensive experience in architecting, developing, optimizing,
4 deploying and managing computing and networking systems, including mobile,
5 messaging/communications, and multimedia computing systems, including hardware and
6 software for these systems. For example, through a contract between Hewlett-Packard
7 and the United States Agency for International Development (USAID), I architected and
8 led the development of one of the first mobile banking solutions. This system enabled
9 customers to use their mobile phones and other wireless handsets to connect with the core
10 banking systems of banks and other financial institutions, and perform transactions
11 without having to travel to bank branches. This system supported many banking
12 transactions, including loan applications, loan disbursement and loan repayments.

13 20. Later, after SourceTrace Systems' acquisition of this technology, I led the
14 expansion of this solution into multiple countries and into multiple industries. Banks and
15 other financial services companies utilized this technology to make their tellers more
16 efficient, to provide self-service kiosks within branches, and to provide remote access to
17 banking services. Additionally, through our licensing agreement with Telefonica, one of
18 the largest cellular and telecommunications companies in the world, this solution was
19 deployed in various other industries, including logistics and asset management and
20 customer relationship management. Bloomberg Television selected the company I had
21 co-founded to commercialize this technology on Bloomberg TV's "Bloomberg
22 Innovators" program.

23 21. My doctoral research and dissertation involved networked computing
24 hardware and software components that could be used in intelligent environments, e.g.,
25

26 ³ See S. Chatterjee and J. Webber, *Developing Enterprise Web Services: An Architect's*
27 *Guide* (New Jersey: Prentice Hall PTR, 2004).

1 smart homes. These components could be used with consumer electronic devices, e.g.,
2 televisions, set-top boxes, refrigerators, digital picture frames, and children's toys, to
3 enable communications and coordination between different devices. At any one consumer
4 electronic device, a number of these hardware components, including computing
5 resources and peripheral resources, could be connected together and connected to the
6 consumer electronic device itself using a bus architecture. One of the applications that I
7 developed as part of my dissertation work was an intelligent television set. These
8 hardware and software components were connected to the television set and would
9 receive and process key presses from a remote control, e.g., power on and channel up.
10 The system would learn the user's television watching patterns to automate and facilitate
11 the user's interactions with the television. This could include turning the television on at
12 a particular time on a particular day and setting the television to a specific channel. These
13 applications could also stream video and audio content to and between various devices.
14 The technology underlying my doctoral dissertation work was spun out of MIT's
15 Laboratory for Computer Science into a start-up company that developed and
16 commercialized a number of applications of the technology, including intelligent toys and
17 digital picture frames.

18 22. I have been developing hardware and software, including for communication
19 and networking systems, for nearly thirty years. I have been familiar with cable data
20 technologies, including the DOCSIS protocol and cable network infrastructure (e.g.,
21 hybrid-fiber coax networks, CMTSs, and cable modems) since the late 1990's.

22 23. I have been a retained expert witness for various disputes that involved
23 significant technology issues, and I have been qualified as a technology expert by U.S.
24 District and State Courts, including in California, Delaware, Florida and Texas and at the
25 US International Trade Commission in technology areas that are relevant to this case. I
26
27

1 have previously testified through declaration or expert report, at deposition and at trial in
2 numerous intellectual property and commercial litigation matters, including for patent
3 litigation, copyright and trade secret misappropriation litigation, and contract dispute
4 cases.

5 **B. Compensation**

6 24. Experantis LLC is being compensated for my time on this matter at my
7 standard hourly rate of \$950 per hour, and I am reimbursed for any expenses that I incur
8 related to my work in this matter. Neither Experantis nor I have any financial interest in
9 the outcome of this matter, and I will be paid for my time regardless of the outcome of
10 this matter. My compensation does not depend on the outcome of this case and in no
11 way affects the substance of my statements in this declaration.

12 **C. Materials Reviewed**

13 25. Exhibit G is a list of documents or other information that I have relied on in
14 forming my opinions.

15 **III. RELEVANT LEGAL STANDARDS OF CLAIM CONSTRUCTION**

16 26. The legal principles set forth in this section were provided to me by
17 counsel for Comcast.

18 **A. Claim Construction in District Court (the *Phillips* Standard)**

19 27. I have been informed that during the claim construction process, a court
20 must determine the proper meaning and scope of the claims. Claim construction is a
21 matter of law that is decided by the judge who presides over the litigation.

22 28. I understand that patent claims are to be construed in view of the intrinsic
23 record of the patent, which includes: the language of the claims; the specification,
24 including the drawings, of the patent; and the prosecution history of the patent. This
25 evidence is known as “intrinsic evidence.”
26
27

1 29. I understand that in the intrinsic evidence, the inventors of a patent may
2 expressly define certain terms. It has been explained to me that this is known as the
3 inventors acting as “lexicographers.” I understand that where the inventors acted as their
4 own lexicographers, those definitions control the meaning of the defined terms in the
5 claims.

6 30. I understand that the prosecution history provides evidence of how the
7 patentee and the examiner viewed the patent, and that the public has a right to rely on
8 the patent applicant’s remarks made during prosecution in determining the scope of the
9 claimed invention. For example, arguments and amendments made during prosecution
10 may provide an explanation of the meaning of a claim term, or narrow a claim term that
11 is used more broadly in the specification. In some instances, when an applicant
12 explicitly states that some breadth of a term is excluded from their invention, they may
13 disclaim claim scope through statements, or by making specific arguments
14 distinguishing the claimed invention over cited prior art, during prosecution.

15 31. I understand that, absent lexicography or disavowal, claims are given their
16 ordinary and customary meaning in light of the specification.

17 32. I understand that the ordinary and customary meaning is the meaning that
18 the term would have to a person of ordinary skill in the art at the time of the invention.

19 33. I have been informed that the Court may also consider additional evidence
20 outside the patent and prosecution history. This type of evidence is known as “extrinsic”
21 evidence. Extrinsic evidence can include expert opinion (including opinions about what
22 one of ordinary skill in the art would have known or understood), dictionaries, treatises,
23 and testimony. As some examples, extrinsic evidence can be useful to provide
24 background on the technology at issue, explain how an invention works, ensure that the
25 Court’s understanding of the technical aspects of the patent aligns with that of a person
26 of ordinary skill in the art, or establish that a particular term in the patent or the prior art
27

1 has a particular meaning in the pertinent field. I understand that extrinsic evidence must
2 be considered in the context of the intrinsic evidence and cannot be used to change the
3 meaning of a claim term to contradict the intrinsic evidence.

4 **B. Indefiniteness**

5 34. I understand that there is a requirement in patent law that a claim must
6 particularly point out and distinctly claim the subject matter which the patentee regards
7 as the invention. I also understand that a claim fails to satisfy this requirement and is
8 thus invalid as indefinite if the claim, read in light of the intrinsic evidence, fails to
9 inform, with reasonable certainty, those skilled in the art about the scope of the
10 invention. I understand that the claim must be clear enough for a person of ordinary skill
11 in the art to reasonably determine the metes and bounds of the claim (i.e., understand
12 what falls within or outside the scope of the claim).

13 **C. The Person of Ordinary Skill in the Art**

14 35. I understand that the level of ordinary skill may be reflected by the state of
15 the art at the time of the invention, including the prior art of record. I also understand
16 that a person of ordinary skill in the art would have the capability of understanding the
17 scientific and engineering principles applicable to the pertinent art and the claimed
18 subject matter. I understand that one of ordinary skill in the art has ordinary creativity
19 and is not an automaton.

20 36. I understand there are multiple factors relevant to determining the level of
21 ordinary skill in the pertinent art, including (1) the levels of education and experience of
22 persons working in the field at the time of the invention; (2) the sophistication of the
23 technology; (3) the types of problems encountered in the field; and (4) the prior art
24 solutions to those problems.

25 37. As discussed above and detailed in my *curriculum vitae*, I am very familiar
26 with the communications art that is pertinent to the asserted patents. I am also aware of
27

1 the state of the art as of the earliest claimed priority date. My experience in the field,
2 with colleagues from academia, and with engineers practicing in the industry during the
3 relevant timeframe allowed me to become personally familiar with the knowledge and
4 capabilities of a person of ordinary skill in the art.

5 38. A person of ordinary skill in the art in the field of the '682 patent, as of the
6 earliest claimed priority date, would have had at least a degree in computer or electrical
7 engineering, computer science, information systems, or a similar discipline, along with
8 at least three to four years of experience with the design and/or implementation of
9 network-based content delivery systems. I was a person of skill in the art as of the
10 earliest claimed priority date of the '682 patent.

11 39. Unless otherwise stated, when I provide my understanding and analysis
12 below, it adheres to the level of a person of ordinary skill in the art as of the earliest
13 claimed priority date of the Asserted Patents.

14 **IV. EVALUATION OF THE DISPUTED TERMS AND PHRASES OF THE** 15 **ASSERTED '682 PATENT**

16 **A. The '682 Patent**

17 40. U.S. Patent No. 10,135,682 ("the '682 patent") issued on November 20,
18 2018, from an application filed on January 9, 2018. The '682 patent claims priority to
19 unasserted U.S. Patent No. 9,100,622 ("the '622 Patent") Ex. H, which claims priority
20 to unasserted U.S. Patent No. 9,866,438 ("the '438 patent") Ex. I, which claims priority
21 to unasserted U.S. Patent No. 9,577,886 ("the '886 patent") Ex. J, which claims priority
22 to unasserted U.S. Patent No. 9,419,858 ("the '858 patent") Ex. K, which issued from a
23 non-provisional application filed on July 23, 2013, and which claims priority to a
24 provisional application (App. No. 61/674,742) filed on July 23, 2012. Ex. L.

25 41. The asserted claims of the '682 patent are directed to methods in which a
26 cable modem termination system (CMTS) utilizes an SNR profile related to connected
27

1 cable modems, groups the connected cable modems into service groups based on SNR
2 profiles, and selects communication parameters for the service groups to use when
3 communicating with the service groups based on composite SNR profiles of the service
4 groups. Ex. N ('682 patent), claims 1-5, 9; *see also id.* Abstract, FIG. 3A, 5:28-57.

5 42. During prosecution of the '682 patent, the examiner first rejected the
6 claims for non-statutory double patenting over patents in its priority chain, but stated the
7 claims would otherwise be allowable if the double patenting rejections were overcome.
8 Ex. A ('682 file history) at ENTROPIC_COMCAST_021505-533. The applicants
9 responded by filing terminal disclaimers to the priority patents. *Id.* at
10 ENTROPIC_COMCAST_021505-533. The examiner then allowed the claims. *Id.* at
11 ENTROPIC_COMCAST_021578-580. The double patenting rejection over U.S. Patent
12 No. 9,577,886 is relevant to the terms being construed here because the examiner
13 provided claim charts comparing the '682 patent claim language with the language of
14 claims of the earlier patents.

15 43. I understand that Entropic asserts claims 1-5 and 9 of the '682 patent.

16 44. In this declaration, I offer my opinions about the following claim terms:

Term(s), Phrase(s), and/or Clause(s)	Patent(s) and Claim(s)
"cable modem termination system (CMTS)"	'682 patent, claims 1, 3-5, and 9
"SNR-related metric"	'682 patent, claims 1 and 9

21 **B. Cable modem termination system (CMTS) ('682 Patent)**

22 45. I understand that the parties have proposed the constructions below for
23 "cable modem termination system (CMTS)":
24
25
26
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Comcast's Proposed Construction	Entropic's Proposed Construction
equipment at which the cable modem's connection to the hybrid fiber coaxial network terminates	Plain and ordinary meaning

46. It is my opinion that Comcast's proposed construction of "cable modem termination system" to mean "equipment at which the cable modem's connection to the hybrid-fiber coaxial network terminates" reflects the ordinary and customary meaning that a person of ordinary skill in the art would attribute to the meaning of "cable modem termination system" at the time of the alleged invention (i.e., the claimed priority date of July 23, 2012).

47. A person of ordinary skill in the art reviewing the intrinsic evidence, including the '682 patent's specification and relevant prosecution histories, would understand that a CMTS is equipment at which the cable modem's connection to the hybrid fiber coaxial network terminates.

48. For example, Figure 1 of the '682 patent depicts an exemplary cable DOCSIS network with a CMTS 102 and several cable modems (112₁-112₅). Figure 1 shows that the cable modems connect to the CMTS through several components, including fiber node 104, fiber optic cable 103, coaxial cables 105, amplifiers 106, couplers 108, interfaces 109, and splitters 110. The patent explains that, collectively, these components "between the CMTS and the CMs may be referred to as a hybrid fiber coaxial (HFC) network." *Id.*, 3:47-50." The HFC network runs from the CMs to the CMTS and connects the two. Thus, the CMTS (102) is equipment at which the cable modems' (112₁-112₅) connection to the hybrid-fiber coaxial network (103, 104, 105, 106, 107, 108, 109, 110) terminates.

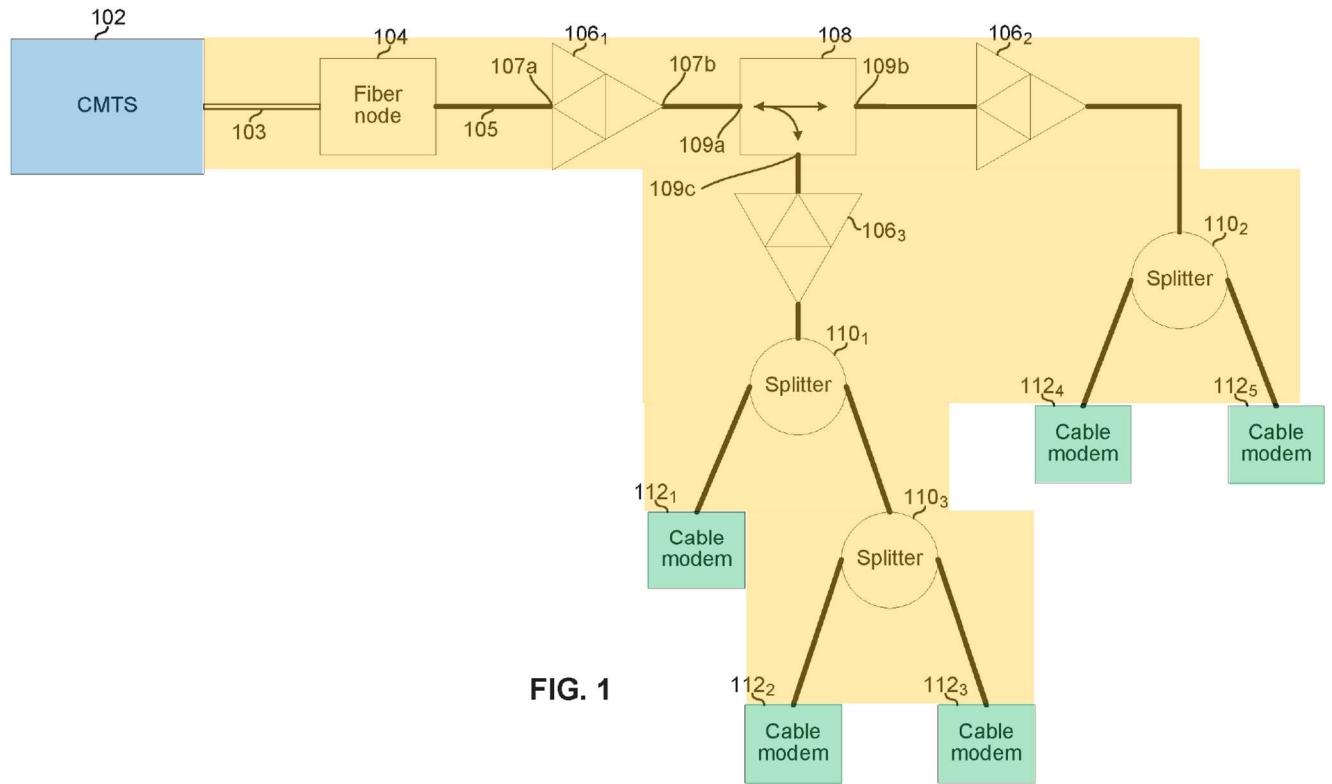


FIG. 1

Ex. N ('682 patent), Fig. 1 (CMTS highlighted in blue, HFC highlighted in yellow, cable modems highlighted in green).

49. Figure 2A also shows that the HFC network sits between the CMTS and the cable modem. *See* Ex. N ('682 patent), 3:53-4:2.⁴ The cable modem's connection to the HFC network ends at the CMTS. Thus, the CMTS (102) is equipment at which the cable modem's (112x's) connection to the hybrid-fiber coaxial network (HFC network cloud shape) terminates.

⁴ The description of Fig. 2A also explains that the box drawn as 202 is intended to be a packet sent from the CMTS to the cable modem, which is sent over the HFC network. Ex. N ('682 patent) at 3:53-63 ("FIG. 2A depicts an example method of determining locations of CMs within the HFC network. As shown in FIG. 2A, to determine one or more measured performance metric(s) (e.g., an SNR-related metric such as SNR at a particular frequency or SNR over a range of frequencies (an SNR profile), noise levels, strength of desired signals, and/or the like) for any particular CM 112x, the CMTS 102 may transmit, at time 1, a message 202 that is destined (unicast, multicast, or broadcast) for the CM 112x and that functions as a probe to enable determination of the metric(s) for the CM 112x.").

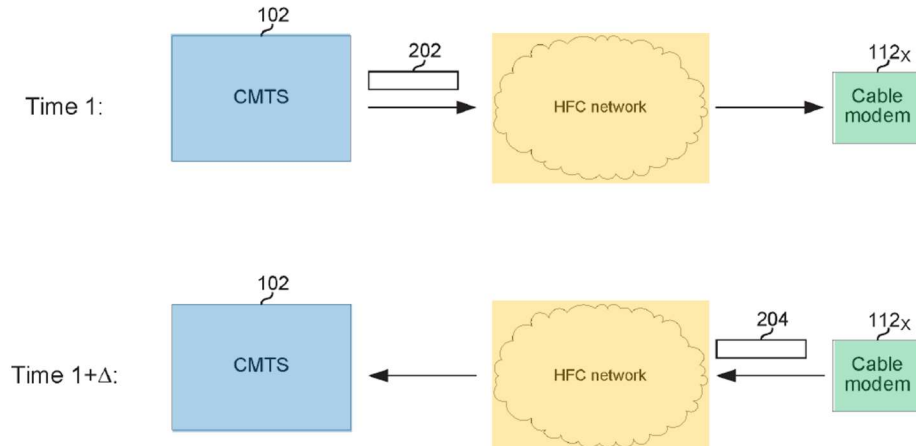


FIG. 2A

Ex. N ('682 patent), Fig. 2A (CMTS highlighted in blue, HFC highlighted in yellow, cable modems highlighted in green).

50. The disclosures of the '682 Patent are consistent with contemporaneous technical documents that define and reference CMTS.

51. Comcast's construction is also consistent with contemporaneous technical documents that define and reference CMTS.

52. The cable-industry standard DOCSIS supports construction of CMTS as equipment at which the cable modem's connection to the hybrid-fiber coaxial network terminates. DOCSIS was developed in the late 1990s, when a group of cable television operators and CableLabs jointly developed a set of purchase specifications as a procurement standard for cable modems. Ex. M (Ciciora book), 194. The formal name of these specifications was Data Over Cable Service Interface Specifications. The specification of the '682 patent makes clear that the cable network described and depicted in the patent is a DOCSIS network. Ex. N ('682 patent), 2:56-57, 3:42-45, 5:28-30, 6:7-8.

1 53. DOCSIS standard specifications define “cable modem termination system
2 (CMTS).” One example of DOCSIS’s definition can be found in the “DOCSIS 3.0
3 MAC and Upper Layer Protocols Interface Specification,” released February 10, 2011.
4 That document defined “Cable Modem Termination System” as “Cable modem
5 termination system, located at the cable television system head-end or distribution hub,
6 which provides complementary functionality to the cable modems to enable data
7 connectivity to a wide-area network.” Ex. O (DOCSIS MAC spec), 10. A head-end or
8 distribution hub is the facility that receives signals (such as cable television signals) and
9 distributes those signals through the hybrid fiber coaxial network to cable modems. A
10 person of ordinary skill in the art at the time of the alleged invention would have
11 understood that, because the CMTS is “located at” the head-end or distribution hub, the
12 CMTS of the DOCSIS definition is equipment. Further, Figure 1.1 of Ex. O (DOCSIS
13 MAC spec) illustrates that cable modems (labeled “CM”) connect to the cable modem
14 termination system (labeled “CMTS”) via a hybrid fiber coaxial network (labeled
15 “HFC”) such that the cable modem’s connection to the HFC terminates at the CMTS.

1.2.2 DOCSIS Network and System Architecture

The elements that participate in the provisioning of DOCSIS services are shown in Figure :

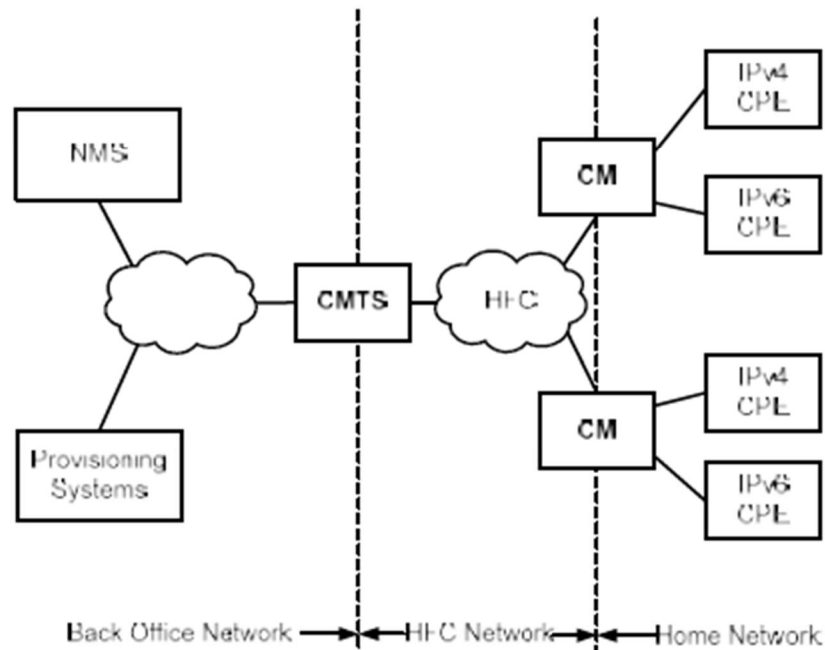


Figure 1-1 - The DOCSIS Network

Ex. O. (DOCSIS MAC spec), 1. The DOCSIS 3.0 MAC and Upper Layer Protocols Interface Specification thus shows that the cable-modem termination system is equipment with a physical location (i.e. the head-end) and is where the cable modem's connection to the hybrid fiber coaxial network terminates.

54. The "DOCSIS 3.0 Physical Layer Specification" from November 17, 2011, contains the same definition as the DOCSIS 3.0 MAC and Upper Layer Protocols Interface Specification. Ex. P (DOCSIS PHY spec), 9. So does the "DOCSIS 2.0 Radio Frequency Interface Specification" from June 2, 2006. Ex. Q (DOCSIS RFI spec), 12.

55. Contemporaneous books show that a person of skill in the art would have understood DOCSIS to define "cable modem termination system" (CMTS). For

example, a book published by Cisco, titled PacketCable Implementation, in 2007 stated that “the CMTS is defined in the DOCSIS specification.” Ex. R (Cisco book), 34.

56. DOCSIS’s reference architecture also supports construction of CMTS as equipment at which the cable modem’s connection to the hybrid-fiber coaxial network terminates. The textbook Modern Cable Television Technology from 2004 depicted and described the DOCSIS reference architecture. Ex. M (Ciciora). Specifically, Ciciora Figures 5.6 and 5.7 depict the reference architecture. I have highlighted relevant components of Ciciora Figures 5.6 and 5.7, including the “cable modem” (highlighted in green), the “Cable modem termination system (CMTS)” (highlighted in blue), and the connecting hardware between the two (highlighted in yellow), called the hybrid fiber coaxial network or “HFC” network:

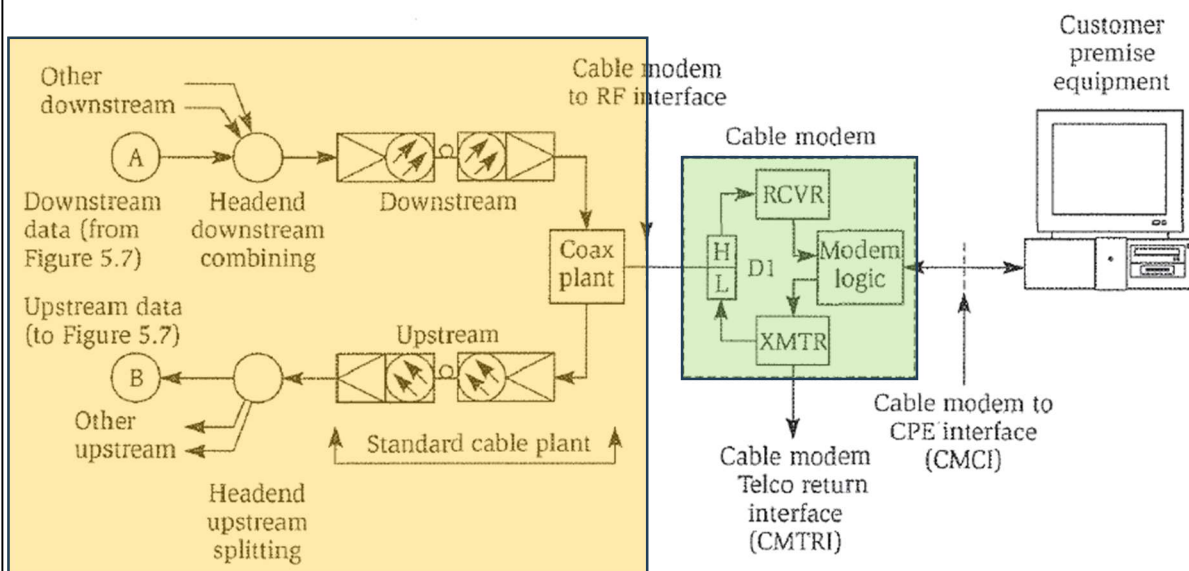


Figure 5.6 DOCSIS reference architecture, headend to home.

Ex. M (Ciciora), 194.

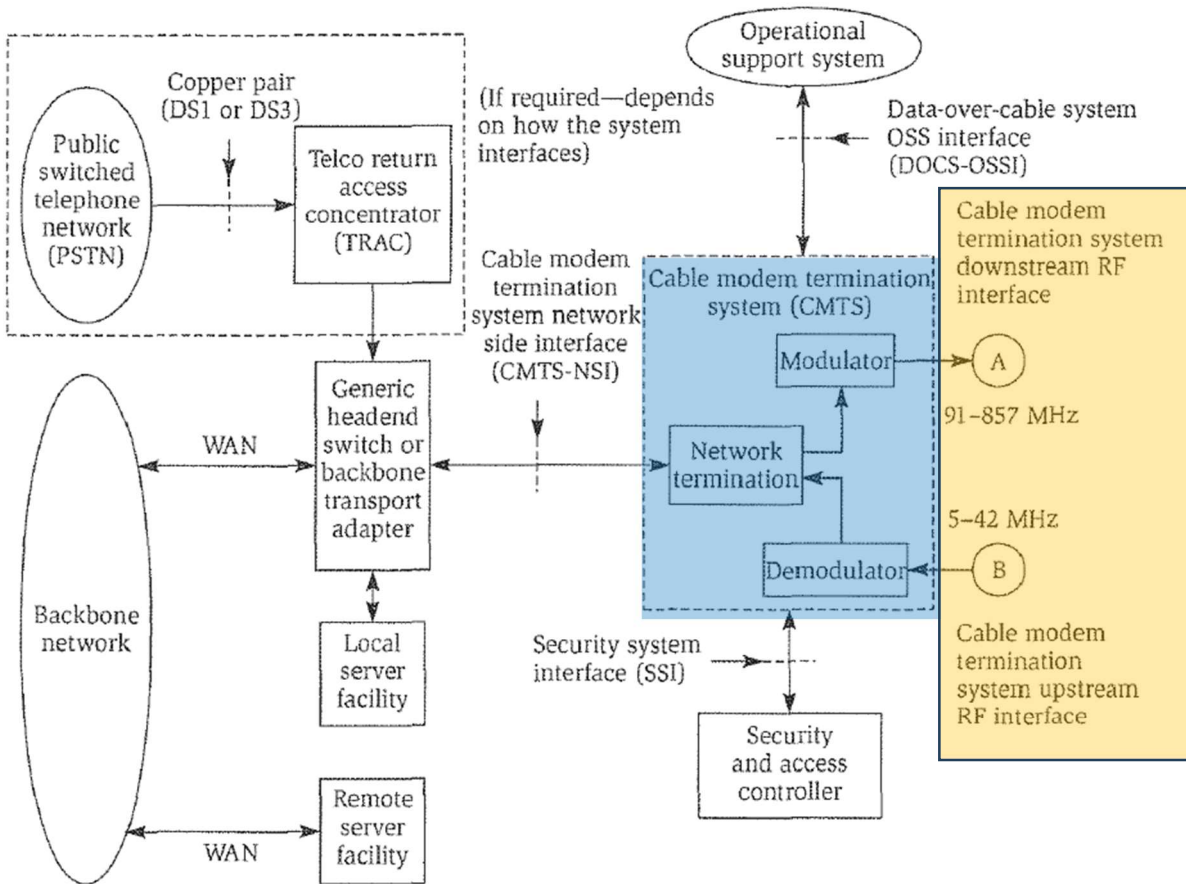


Figure 5.7 DOCSIS reference architecture, headend.

Ex. M (Ciciora), 196. Ciciora explains:

Figure 5.6 illustrates the headend-to-home portion of the DOCSIS reference architecture. ... In the downstream direction, the data signals, bubble A, are coupled with other downstream signals and supplied to the downstream HFC network Figure 5.7 illustrates the headend portion of the reference architecture. Bubbles A and B correspond to the same bubbles in the previous figure. The cable modem termination system (CMTS) includes the demodulator and modulator, which interface to the cable system. It also includes the interface to the network. Several options are defined for interfacing with the Internet backbone, either locally or (probably more commonly) by reaching a

remote Internet backbone point of presence via a wide area network.

Ex. M (Ciciora), 194-195.

57. The Ciciora depiction of the DOCSIS reference architecture, and its description of that architecture, confirm that the CMTS is equipment, including a modulator and demodulator, that is the termination point in the headend for the hybrid fiber coaxial network that connects to the cable modems in the customer's premise.

58. The 26th edition of Newton's Telecom Dictionary from 2011 also supports construction of CMTS as equipment at which the cable modem's connection to the hybrid-fiber coaxial network terminates. Newton's Telecom Dictionary defines CMTS as:

Cable modem termination system CMTS. A piece of hardware located in a cable operator's local network (generally in a "headend") that acts as the gateway to the Internet for cable modems in a particular geographic area. A simple way to think of the CMTS is as a router with interfaces on one side leading to the Internet and interfaces on the other connecting to optical nodes and then customers. To deliver data services over a cable network, one six-MHz television channel (in the 50-750 MHz range) is typically allocated for downstream traffic to homes and another channel (in the 5-42 MHz band) is used to carry upstream signals. A head end CMTS communicates through these channels with cable modems located in subscriber homes to create a virtual LAN connection. See also cable modem, CableLabs Certified, and DOCSIS.

Ex. S (Newton's), 232. Newton's definition confirms that the CMTS is equipment located in the cable operator's local network, generally in the headend. Newton's definition also confirms that the CMTS connects on one side to optical nodes (the HFC network) that connect to customers. A person of skill in the art at the time of the alleged invention would have understood that the connection to "customers" consists of a

connection to a cable modem at a customer premises. Thus, Newton's definition supports that the CMTS is equipment at which the cable modem's connection to the HFC network terminates.

59. The textbook *Digital Telephony Over Cable* from 2001 also supports construction of CMTS as equipment at which the cable modem's connection to the hybrid-fiber coaxial network terminates. Ex. T (Evans). Evans described the delivery of telephony services through a standard called PacketCable that was built on top of DOCSIS. Ex. T (Evans), 17. Figure 1-6 of Evans depicts a home connected to an HFC network that terminates at a CMTS:

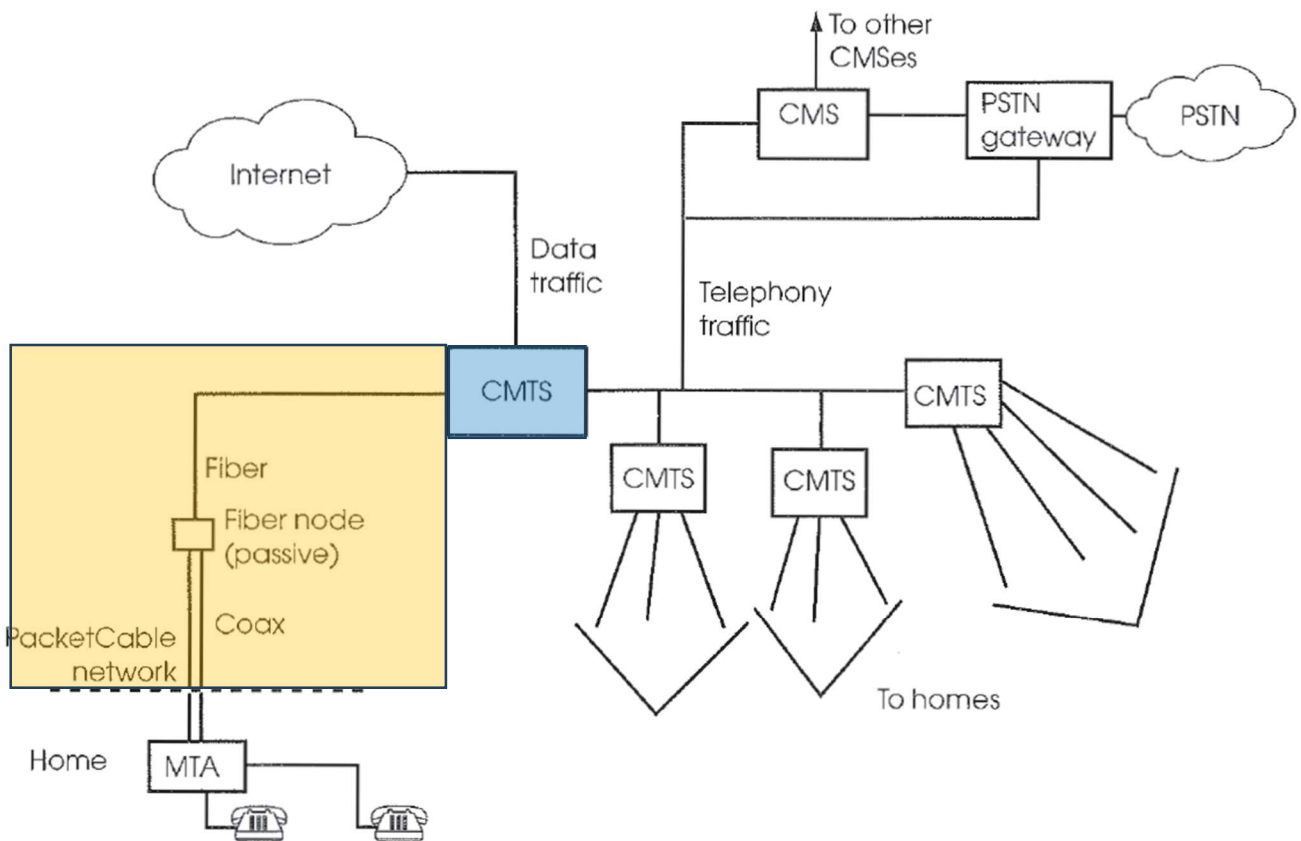


Figure 1-6 Basic PacketCable Telephony Network Architecture

Ex. T (Evans), 17 (CMTS highlighted in blue, HFC highlighted in yellow).

1 60. The MTA in Figure 1-6 combines a DOCSIS cable modem and analog
2 telephone adapter (ATA) in one unit. Evans explains:

3 In the MSO's headend, the access network is terminated in a
4 Cable Modem Termination System (CMTS). ... Unlike analog
5 modem systems, where the two ends of the link are peers, CMs
6 act as clients to CMTSes, which instruct them exactly how to
7 operate (see Chapter 3). The fact that the cable portion of the
8 HFC network is a relatively low bandwidth resource that must be
shared among many users is at the root of many of the difficulties
in deploying digital telephony over such networks.

9 Ex. T (Evans), 17. A person of ordinary skill in the art at the time of the alleged invention
10 would have understood that the CMs referenced in Evans are located at the home
11 depicted in Figure 1-6. A person of ordinary skill in the art would further understand that
12 the referenced "access network" that Evans describes as being "terminated" at the CMTS
13 is an HFC network that connects to the individual cable modems/MTAs (i.e., the network
14 highlighted in Yellow in Figure 1-6). The HFC network connects the CMs to the CMTS,
15 where the connection to the HFC terminates.

16 61. Although the Evans and Cicora books were published in 2001 and 2004
17 respectively, their definitions of CMTS reflect a long-standing understanding of the
18 term that is consistent with the DOCSIS specification (*supra* ¶ 53) and CMTS
19 equipment (*infra* ¶¶ 62-64) sold in 2012, the claimed priority date of the '682 patent.

20 62. Ciciora's drawings and text, the definition of CMTS in the DOCSIS
21 specification, Newton's dictionary, and the discussion in Evans's textbook also track the
22 description of CMTS in the Cisco PacketCable book mentioned above. Besides pointing
23 to DOCSIS for the definition of CMTS, the Cisco PacketCable book also stated that
24 "[t]he CMTS is typically located in the MSO's headend or distribution hub," and that
25 "[t]he CMTS provides the DOCSIS connectivity to the cable modems and IP
26

connectivity to the service provider's backbone via some sort of WAN interface." Ex. R (Cisco book), 34.

63. Ciciora's drawings and text, the definition of CMTS in the DOCSIS specification, Newton's dictionary, the discussion in Evans's textbook, and the discussion in the Cisco PacketCable book also track my own personal recollections from this time frame.

64. The CMTSs sold in or before July 2012 further support Comcast's construction. Cisco Systems, Inc. and ARRIS Group Ltd. were major vendors of CMTSs in the 2012 timeframe. The primary CMTS that Cisco provided in 2012 was the uBR10012 Universal Broadband Router ("uBR 10k"). *See* Exs. U, V. ARRIS provided the C4 CMTS.⁵ *See* Ex. X and Y. An image of a uBR 10k and ARRIS C4 are provided below.



Cisco UBR 10k



ARRIS C4

⁵ ARRIS also introduced the E6000 in October 2012. *See* Ex. W ("ARRIS Unveils E6000 Converged Edge Router," Oct. 16, 2012).

Ex. U (UBR 10K Data Sheet) at 2; Ex. X (C4 CMTS Release 8.1) at 1.

65. All of these CMTSs terminated a cable modem's connection to the HFC. For example, these Cisco and ARRIS CMTSs contained an upstream line card to which the HFC interconnected, and the upstream connection from the cable modem terminated.



Cisco UBR 10k – MC20X20V

ARRIS C4 - 24U CAM

Ex. V (MC20x20V Data Sheet) at 2; Ex. X (C4 24U CAM Data Sheet) at 1.

66. At the time of the alleged invention, downstream transmissions (from the CMTS to the cable modems) could be provided from the CMTS chassis alone (called an Integrated CMTS configuration), or in combination with a device called an Edge QAM device that sat external to the CMTS chassis (called a Modular CMTS configuration).⁶ But upstream transmissions from the cable modem in this timeframe always terminated

⁶ See Ex. U (UBR 10K Data Sheet) at 2 (“In addition to increasing the bandwidth available on the downstream, Cisco wideband also reduces the cost. It does this using inexpensive, field-proven edge quadrature amplitude modulation (QAM) modulators such as the Cisco RFGW-1 and RFGW-10 models in order to increase the downstream capacity of the Cisco uBR10012 and reduce RF downstream costs. This enables cable operators to use the lower edge QAM port prices and to add new downstream without adding additional upstreams at the same time.”); Ex. V (uBR-MC3GX60V Cable Interface Line Card Hardware Installation Guide) at 2 (“The GE interfaces connect to an external Edge Quadrature Amplitude Modulation (EQAM) device and provide M-CMTS compliant Downstream External PHY Interface (DEPI) data.”); see also Ex. Y (DOCSIS External PHY spec, CM-SP-DEPI-I08-100611 at 1 (“This document defines an interface known as the Downstream External PHY Interface (DEPI) and associated protocol requirements for the transport of downstream user data between the ‘M-CMTS Core’ and the EQAM”); *id.* at Fig. 6; Ex. Q (CM-SP-RFIV2.0-I11-060602) at Fig. 5-2 (showing modular CMTS and upstream connections from cable modem terminating at CMTS).

1 in the CMTS. The relevant DOCSIS standards for supporting Edge QAM, called DEPI,
2 only supported downstream. Ex. Y (DOCSIS External PHY spec, CM-SP-DEPI-I08-
3 100611.

4 67. I understand that Entropic proposes that “cable modem termination
5 system” should be given its “plain and ordinary meaning.” I also understand that until
6 the morning of April 19, Entropic proposed that this term should be construed as “plain
7 and ordinary meaning, wherein the CMTS may be realized in hardware, software, or a
8 combination of hardware and software, and may be realized in a centralized or
9 distributed fashion.” Any suggestion by Entropic that the “plain and ordinary meaning”
10 of the claimed “cable modem termination system” implies that it can be implemented
11 using software or in a distributed fashion is inconsistent with the disclosure of the ’682
12 patent.

13 68. Claim 7 of the ’682 patent, which depends from claim 1, recites “assigning
14 said cable modems among said plurality of service groups based on respective distances
15 between said CMTS and said cable modems.” ’682 at 8:7-9 (Claim 1) and 8:62-65
16 (Claim 7). Claim 1 also recites “assigning, by said CMTS, each cable modem among a
17 plurality of service groups based on a respective corresponding SNR-related metric.”
18 Both claims show that the recited CMTS assigns cable modems to service groups, and
19 claim 7 shows that the distance from the CMTS to the cable modem can be used to
20 determine assignment. A person of ordinary skill would understand that there could
21 only be a “distance” between the CMTS and a cable modem if the CMTS is a piece of
22 hardware with a specific spatial position, and not solely “software,” which could be
23 executed at an unspecific spatial position. Similarly, the “CMTS” of the ’682 patent
24 cannot be “distributed” hardware because the ’682 patent provides no guidance
25 regarding which portion of that distributed system would be used to calculate the
26 distance between the “CMTS” and the cable modem as required by claim 7.

1 69. The '682 patent also describes that the CMTS “may comprise circuitry
2 operable to manage connections” to the cable modems. '682 at 2:61-62. Such circuitry
3 supports Comcast’s construction that when the '682 patent refers to a CMTS, it is
4 referring to hardware equipment, not software. Similarly, a person of ordinary skill
5 would understand consistent with the DOCSIS specification, textbooks, and real world
6 equipment discussed above, that a CMTS would manage the cable modems to which it
7 is connected by the HFC.

8 70. The '682 patent never refers to the CMTS as being “distributed.” The
9 patent only describes CMTS as a singular piece of equipment, both in the figures (*e.g.*,
10 Figures 1 and 2A) and in the description (*e.g.*, 2:61-62, 3:47-50).

11 71. During prosecution of U.S. Patent No. 9,419,858 (the “’858 patent”), which
12 is a parent to the '682 patent the applicant argued that the alleged invention did not
13 relate to a generic or general-purpose computer in order to overcome a Section 101
14 rejection. The applicant stated that a CMTS is a particular type of computing device:

15 Each of claims 1 and 12 recites significantly more than
16 “manipulating information using mathematical relationships” at
17 least because it recites that the alleged “manipulating information
18 using mathematical relationships” is applied with a particular
19 machine, namely a cable modem termination system (CMTS).

20 Contrary to the Office's findings, a CMTS is certainly not a
21 “generic computer.” It is a specific set of hardware and software
22 configured for the very specific purpose of managing and
23 communicating with cable modems over a hybrid fiber coaxial
24 (HFC) network. Thus, each of claims 1 and 12 does not attempt
25 the preempt every possible use of generating a composite SNR
26 related metric, but instead only claims the use of such a metric
27 by the very particular machine of a CMTS for the specific
 purpose of assigning cable modems among service groups. For
 at least this reason, each of claims 1 and 12 claims significantly

1 more than “manipulating information using mathematical
2 relationships,” and the § 101 rejection should be withdrawn.

3
4 Ex. D ('858 File History) at ENTROPIC_COMCAST_018798. The applicant's
5 statements during prosecution confirm that, at the time of the alleged invention, a person
6 of skill would understand that the CMTS is a specific set of hardware (*supra* ¶¶ 53-64)
7 that a person of skill would understand to be the equipment at which the cable modem's
8 connection to the HFC terminates.

9 72. The '682 specification states the following:

10 Accordingly, the present invention may be realized in hardware,
11 software, or a combination of hardware and software. The
12 present invention may be realized in a centralized fashion in at
13 least one computing system, or in a distributed fashion where
14 different elements are spread across several interconnected
15 computing systems. Any kind of computing system or other
16 apparatus adapted for carrying out the methods described herein
17 is suited. A typical combination of hardware and software may
18 be a general-purpose computing system with a program or other
19 code that, when being loaded and executed, controls the
20 computing system such that it carries out the methods described
21 herein. Another typical implementation may comprise an
22 application specific integrated circuit or chip.

23 Ex. N ('682 patent), 7:31-44.

24 73. But this generalized discussion does not discuss any aspects of a CMTS,
25 and does not even mention the terms “cable modem termination system” or “CMTS.”
26 To the contrary, the “accordingly,” refers back to the previous paragraph, which
27 references “other embodiments.”

74. A person of ordinary skill in the art at the time of the alleged invention
would not understand the '682 specification's disclosures (at 7:33-44) as stating that a
CMTS can be “any kind of computing system or apparatus” that is “realized in

hardware, software, or a combination of hardware and software,” or a “general-purpose computing system.” That would be inconsistent with the use of the term in the patent and the meaning of CMTS to a person of ordinary skill in the art at the time of the alleged invention, and the patent does not purport to redefine CMTS or to disclose a new type of CMTS consistent with that definition.

75. Similarly, a person of ordinary skill in the art at the time of the alleged invention would not understand the ’682 specification’s disclosures (at 7:33-44) to be stating that a CMTS may be either centralized or distributed. That would be inconsistent with the use of the term in the patent and the meaning of CMTS to a person of ordinary skill in the art at the time of the alleged invention, and the patent does not purport to redefine CMTS or disclose a new type of CMTS consistent with that definition.

76. Because both the intrinsic and extrinsic evidence supports construing “cable modem termination system” as “equipment at which the cable modem’s connection to the hybrid-fiber coaxial network terminates,” it is my opinion that Comcast’s proposed construction is correct.

C. SNR-related metric (’682 Patent)

77. I understand that the parties have proposed the constructions below for “SNR-related metric”:

Comcast’s Proposed Construction	Entropic’s Proposed Construction
Indefinite	Plain and Ordinary Meaning

78. It is my opinion that “SNR-related metric” is indefinite.

79. When viewed in light of the specification and prosecution history, “SNR-related metric” fails to inform those skilled in the art about the scope of the claim with reasonable certainty. While signal-to-noise ratio, commonly referred to as “SNR,” is a well-known term, “SNR-metric” and “SNR-related-metric” had no established or

1 reasonably certain meaning to a person of ordinary skill in the art at the time of the
2 alleged invention. The claims, specification, and the file history of the '682 patent fail to
3 inform, with reasonable certainty, a person of ordinary skill in the art about the scope of
4 the term.

5 80. The term "SNR-related metric" is not a term of art, and has no known
6 meaning to a person of skill in the art. I have not found a dictionary definition for
7 "SNR-related metric."

8 81. The '682 specification suggests that an "SNR-related metric" is an example
9 of a "measured performance metric," but it does not delineate the scope of the term:

10 As shown in FIG. 2A, to determine one or more measured
11 performance metric(s) (*e.g., an SNR-related metric such as*
12 *SNR at a particular frequency or SNR over a range of*
13 *frequencies (an SNR profile), noise levels, strength of desired*
14 *signals, and/or the like)* for any particular CM 112_x, the CMTS
15 102 may transmit, at time 1, a message 202 that is destined
16 (unicast, multicast, or broadcast) for the CM 112_x and that
functions as a probe to enable determination of the metric(s) for
the CM 112_x.

17 Ex. N ('682 patent), 3:54-63 (emphasis added).

18 82. A person of ordinary skill in the art would understand that the patent's
19 reference to "an SNR-related metric such as SNR at a particular frequency or SNR over
20 a range of frequencies (an SNR profile), noise levels, strength of desired signals, and/or
21 the like)" sets forth four examples of SNR-related metrics: strength of desired signals,
22 noise levels, and the two closely related metrics of SNR at a particular frequency and
23 SNR over a range of frequencies. SNR at a particular frequency and SNR at a range of
24 frequencies incorporate SNR itself. "Noise levels" and "strength of desired signals" are
25 the two variables used to compute SNR. However, the parenthetical goes on to say that
26 an "SNR-related metric" can be something "such as" any of these four examples "and/or
27

1 *the like,”* without any explanation of what is sufficiently “like” the four examples to
2 constitute an “SNR-related metric.”

3 83. A person of ordinary skill in the art would not know with reasonable
4 certainty what additional metrics are sufficiently “like” the four listed metrics (which
5 either incorporate SNR or are the figures used to calculate SNR) to constitute “SNR-
6 related metrics,” and the ’682 patent offers no guidance as to how to determine what
7 other metrics may be “SNR-related metric[s].”

8 84. The failure of the intrinsic record to provide reasonable certainty is clear in
9 view of U.S. Patent Application No. 13/948,401 (which is incorporated by reference in
10 the ’682 patent). That application states:

11 A measured performance metric may be, for example, an SNR-
12 related metric such as noise levels, strength of received desired
13 signals, SNR at a particular frequency, SNR over a range of
14 frequencies (an SNR profile), bit error rate, symbol error rate,
and/or the like.

15 Ex. AA (401 Patent App.) at ¶ 24.

16 It thus identifies two additional “SNR-related metrics” besides those set forth in the ’682
17 Patent: “bit error rate” and “symbol rate.” U.S. Patent Pub. No. 2014/0022926 (issuing
18 from Application No. 13/948,401) at ¶ 30. Ex. BB. And, like the passage at 3:54-63 of
19 the ’682 patent, it includes the phrase “*and/or the like*,” which indicates still other metrics
20 may be SNR-related. These additional examples thus suggest that SNR-related metrics
21 are not necessarily limited to those that incorporate SNR and/or the components used to
22 calculate SNR. But the application provides no further guidance for determining whether
23 a particular additional metric is SNR-related.

24 85. Claims of other related patents further add to the uncertainty as to what is,
25 and is not, an “SNR-related metric.” For example, claim 1 of U.S. Patent No. 9,577,886
26 (“the ’886 patent”), a parent to the ’682 patent, contains claims with similar limitations.
27

1 But claim 1 of the '886 patent recites “a corresponding plurality of signal-to-noise ratio
2 (SNR) related metrics comprising SNR versus frequency profiles.” Ex. A ('682 file
3 history) at ENTROPIC_COMCAST_021509. The difference in claim language makes
4 clear that there is a further distinction between “SNR versus frequency profiles.” Yet,
5 that is the only way an “SNR-related metric” is described in the specification. The
6 specification discusses “an SNR-related metric such as SNR at a particular frequency or
7 SNR over a range of frequencies,” and both of these examples are “SNR versus
8 frequency profiles.” *See* Ex. T ('682 patent), at 3:54-64. Thus, nothing in the
9 specification, or the knowledge of a person of ordinary skill in the art, would inform a
10 person of skill in the art what more an “SNR-related metric” comprises beyond “SNR
11 versus frequency profiles.”

12 86. As of the earliest claimed priority date (2012), a person of skill in the art
13 would have no understanding of how to determine whether a given metric is an “SNR-
14 related metric,” within the meaning of the patent. A wide range of additional metrics
15 may, in theory, impact SNR or be impacted by SNR. In a given system, however, not all
16 of those metrics impact or are impacted by SNR. A person of ordinary skill in the art at
17 the time of the alleged invention would not have known whether “SNR-related metric”
18 refers to any metric having a theoretical relationship to SNR, or a metric observed to
19 have a relationship to SNR in some other system, such as an allegedly infringing
20 system. These alternative measures of relatedness would have materially different
21 outcomes for the claim’s boundaries such that a method that might infringe the claim
22 under one meaning might not infringe under another other. In other words, a person of
23 ordinary skill in the art cannot reasonably determine when infringement occurs and
24 when it does not.

25 87. Latency is an example of a metric that is sometimes impacted by SNR and
26 at other times not impacted by SNR. Latency is a metric comprising the “waiting time
27

1 or time delay” for network communications. Ex. L (Newton’s), 674-675 (“latency”). A
2 person of skill would understand that a decrease in SNR *could in some systems and*
3 *circumstances* lead to an increase in latency, because lower SNR could result in
4 additional need to retransmit packets, increasing transmission delay and thus latency. A
5 person of skill would further understand that a decrease in SNR *could in some systems*
6 *and circumstances* lead to an increase in latency because of the need to assess
7 additional errors and request re-transmission, increasing processing delay and thus
8 latency. But a person of ordinary skill would also understand that changes in SNR
9 could also have no affect or relationship to latency at all in a given system. That is
10 because numerous other factors, including the transmission protocol, encoding, and the
11 speed of the receiving equipment would determine what impact, *if any*, a change in SNR
12 would have on latency.

13 88. Importantly, latency is one degree removed from bit error rate, which is
14 discussed as a SNR-related metric in one of the applications incorporated into the ’682
15 patent. A decrease in SNR could impact bit error rate, and depending on the degree of
16 impact on bit error rate, and multiple other factors, an increased bit error rate could also
17 lead to an increase in latency due to the need for additional processing or packet
18 retransmission. But nothing in the ’682 specification would help a person of skill
19 understand whether the mere potential relationship between SNR and latency would
20 make latency an “SNR-related metric.” *See also* Ex. CC (Keiser & Strange) (“There are
21 several characteristics of transmission systems which degrade the quality of signals.
22 Among these are noise, loss, amplitude/frequency distortion, crosstalk, echo, and delay
23 distortion.”).

24 89. A similar issue is presented by the metric “throughput,” which is “[t]he
25 actual amount of useful and non-redundant information which is transmitted or
26 processed” i.e., “the end result of a data call.” Ex. L (Newton’s), 1157 (“throughput”);
27

1 *see also* Ex. DD (Saadavi) (“[T]he average throughput is defined as the ratio of the
2 number of packets that are successfully transmitted in a very long interval to the
3 maximum number of packets that could have been transmitted with continuous
4 transmission on the channel.”). Like latency, throughput may sometimes be impacted by
5 SNR and may sometimes not be. That is, throughput could or could not be related to
6 SNR. As the signal-to-noise ratio of a system improves, it could provide more
7 throughput, but SNR could also have no affect on throughput. That is because
8 numerous other factors, including network transmission technique (e.g., TDM or FDM),
9 transmission protocol, transmission bottlenecks, network topology, and equipment
10 speed will determine what, if any, relation that SNR will have on throughput.

11 90. Beyond these networking metrics, environmental factors may have impacts
12 on SNR. For example, the presence of water around a coaxial cable could impact SNR.
13 Ex. EE (Subscriber Drop, July 1997) at 2; Ex. FF (CM-GL-PNMP-V02-110623) at 85-
14 87. Similarly, the ambient heat surrounding a cable could impact SNR, because heat
15 adds energy, which appears as noise, and also because heat can change the effective
16 length of the cable. *See* Ex. FF (CM-GL-PNMP-V02-110623) at 13, 52-53. Similarly,
17 the ambient heat in a subscriber’s home, or the heat within the cable modem itself can
18 impact SNR. But for each of these environmental factors, numerous additional factors
19 will determine whether a change in the metric actually affects SNR. The ’682 patent
20 provides no guidance on whether such variables, which may or may not affect SNR in
21 practice, are “SNR-related metrics” within the meaning of the patent. A person of skill
22 in the art would thus not know whether these fall within, or outside, the scope of the
23 claims.

24 91. The specification of the ’682 patent also creates further confusion
25 regarding the boundaries of the term “SNR-related metric.” For instance, it describes the
26 distance between a cable modem and a CMTS as a “performance metric.” Ex. N (’682
27

1 patent), 6:66-7:6. But it does not describe distance as an “SNR-related metric,” although
2 the distance that data is transmitted from the CMTS to the cable modem can affect SNR.
3 Similarly, it describes the “number of coupling elements” between the CMTS and a
4 cable modem as a “performance metric.” Ex. N (’682 patent), 6:46–61. But it does not
5 describe the “number of coupling elements” as an “SNR-related metric,” even though
6 the specification itself acknowledges that the “number of coupling elements” may
7 impact SNR. Ex. N (’682 patent), 6:46–61 (“e.g., the extra device in the path between
8 CMTS 102 and CMs 111₂ and 112₃ may cause CMs 112₂ and 112₃ to have significantly
9 poorer SNR”). As a result, a person of ordinary skill in the art cannot determine whether
10 other environmental conditions that impact SNR, such as moisture or heat, are “SNR-
11 related metrics” or not. There is no disclosure regarding how much correlation must
12 exist between a metric and SNR for it to be an “SNR-related metric,” and this disclosure
13 simply creates confusion regarding the outer bounds of the term “SNR-related metric.”

14 92. For the above discussed reasons, it is my opinion that a person of ordinary
15 skill in the art at the time of the alleged invention would not understand the bounds of
16 an “SNR-related metric,” and that the term is therefore indefinite.

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21 Sandeep Chatterjee, Ph.D.
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