

UNITED STATES INTERNATIONAL TRADE COMMISSION  
WASHINGTON, D.C.

In the Matter of

CERTAIN DIGITAL VIDEO RECEIVERS,  
BROADBAND GATEWAYS, AND  
RELATED HARDWARE AND  
SOFTWARE COMPONENTS

Investigation No. 337-TA-\_\_\_\_

**VERIFIED COMPLAINT UNDER SECTION 337  
OF THE TARIFF ACT OF 1930, AS AMENDED**

**Complainants:**

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2	U.S. Patent No. 7,779,445 (certified copy) (ROVI_CMPL-ITC00013993 - ROVI_CMPL-ITC00014051)
3	U.S. Patent No. 7,386,871 B1 (certified copy) (ROVI_CMPL-ITC00014052 - ROVI_CMPL-ITC00014100)
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5	U.S. Patent No. 8,156,528 (certified copy) (ROVI_CMPL-ITC00014105 - ROVI_CMPL-ITC00014151)
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14	Declaration of Rolan Sargis [public version]
15	Rovi Form 10-K, 2016
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17	Identification of Current Rovi IP Licenses Pursuant to 19 CFR § 210.12(a)(9)(iii) [public version]
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19	U.S. Patent No. 7,779,445 Claim Chart for Infringement of Representative Independent Claims 1 and 15
20	U.S. Patent No. 7,386,871 Claim Chart for Infringement of Representative Independent Claims 1, 23, and 34
21	U.S. Patent No. 8,156,528 Claim Chart for Infringement of Representative Independent Claims 1, 17, 27, and 32
22	U.S. Patent No. 7,301,900 Claim Chart for Infringement of Representative Independent Claims 1, 8, 17, and 23
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33	Foreign Patents Equivalents Chart
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99	Comcast's Consolidated and Updated Statement of Disputed and Undisputed Material Facts Regarding Sale After Importation, <i>Certain Digital Video Receivers and Related Hardware and Software Components</i> , Inv. No. 337-TA-1103, Docket ID No. 664584

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100	U.S. Patent No. 8,001,564 Claim Chart for Technical Domestic Industry Applying Representative Independent Claims 1 and 12 to Next-Gen Platform [no public version available]
101	U.S. Patent No. 8,001,564 Claim Chart for Technical Domestic Industry Applying Representative Independent Claims 1 and 12 to i-Guide
102	U.S. Patent No. 8,001,564 Claim Chart for Technical Domestic Industry Applying Representative Independent Claims 1 and 12 to Passport
103	U.S. Patent No. 8,001,564 Claim Chart for Technical Domestic Industry Applying Representative Independent Claims 1 and 12 to DISH
104	U.S. Patent No. 8,001,564 Claim Chart for Technical Domestic Industry Applying Representative Independent Claims 1 and 12 to Cox
105	U.S. Patent No. 7,779,445 Claim Chart for Technical Domestic Industry Applying Representative Independent Claims 1 and 15 to Next-Gen Platform [no public version available]
106	U.S. Patent No. 7,386,871 Claim Chart for Technical Domestic Industry Applying Representative Independent Claims 1 and 23 to Next-Gen Platform [no public version available]
107	U.S. Patent No. 7,386,871 Claim Chart for Technical Domestic Industry Applying Representative Independent Claims 1, 23, and 34 to DISH
108	U.S. Patent No. 7,386,871 Claim Chart for Technical Domestic Industry Applying Representative Independent Claims 1, 23, and 34 to Cox
109	U.S. Patent No. 8,156,528 Claim Chart for Technical Domestic Industry Applying Representative Independent Claims 1, 17, 27, and 32 to Next-Gen Platform [no public version available]
110	U.S. Patent No. 8,156,528 Claim Chart for Technical Domestic Industry Applying Representative Independent Claim 1 to i-Guide
111	U.S. Patent No. 8,156,528 Claim Chart for Technical Domestic Industry Applying Representative Independent Claim 1 to Passport
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113	U.S. Patent No. 8,156,528 Claim Chart for Technical Domestic Industry Applying Representative Independent Claims 1, 17, 27, and 32 to Cox

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115	U.S. Patent No. 7,301,900 Claim Chart for Technical Domestic Industry Applying Representative Independent Claims 1, 8, 17, and 23 to DISH
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119	U.S. Patent No. 7,200,855 Claim Chart for Technical Domestic Industry Applying Representative Independent Claims 1, 18, 28, 37, and 53 to Cox
120	Rovi and TSI Agreement effective July 1, 2013 [no public version available]
121	Rovi and TSI Joint Development Agreement [no public version available]
122	Interactive Program Guide License Agreement between CoxCom, Inc. and Rovi Guides, Inc., dated July 1, 2010 [no public version available]
123	Amendment to Interactive Program Guide License Agreement between CoxCom, Inc. and Rovi Guides, Inc., dated December 27, 2013 [no public version available]
124	Amendment to Interactive Program Guide License Agreement between CoxCom, Inc. and Rovi Guides, Inc., dated August 1, 2018 [no public version available]
125	<i>Comcast in Talks to License Technology to Cox – Sources</i> , REUTERS (Jan. 28, 2014), <a href="https://www.reuters.com/article/comcast-cox/comcast-in-talks-to-license-technology-to-cox-sources-idUSL2N0L11YV20140128">https://www.reuters.com/article/comcast-cox/comcast-in-talks-to-license-technology-to-cox-sources-idUSL2N0L11YV20140128</a>
126	<i>Comcast, Cox in X1 Licensing Talks</i> , MULTICHANNEL NEWS (Jan. 28, 2014), <a href="https://www.multichannel.com/news/comcast-cox-x1-licensing-talks-356361">https://www.multichannel.com/news/comcast-cox-x1-licensing-talks-356361</a>
127	<i>Comcast Finds More Work for X1</i> , LIGHTREADING (Dec. 7, 2018), <a href="https://www.lightreading.com/video/video-services/comcast-finds-more-work-for-x1-/d/d-id/748126">https://www.lightreading.com/video/video-services/comcast-finds-more-work-for-x1-/d/d-id/748126</a>

128	<i>Cox Inks National X1 Deal with Comcast</i> , MULTICHANNEL NEWS (Nov. 11, 2015), <a href="https://www.multichannel.com/news/cox-inks-national-x1-deal-comcast-395239">https://www.multichannel.com/news/cox-inks-national-x1-deal-comcast-395239</a>
129	<i>Cox: 1M Subs Now on X1-Powered 'Contour' TV Product</i> , MULTICHANNEL NEWS (Oct. 4, 2017), <a href="https://www.multichannel.com/news/cox-1m-subs-now-x1-powered-contour-tv-product-415689">https://www.multichannel.com/news/cox-1m-subs-now-x1-powered-contour-tv-product-415689</a>
130	<i>Cox Integrates YouTube Kids, NPR One Into Contour TV</i> , MULTICHANNEL NEWS (Oct. 4, 2018), <a href="https://www.multichannel.com/news/cox-integrates-youtube-kids-npr-one-into-contour-tv">https://www.multichannel.com/news/cox-integrates-youtube-kids-npr-one-into-contour-tv</a>
131	<i>Contour 2: Overview</i> , COX, <a href="https://www.cox.com/residential/education-center/tv/intro-new-contour.html">https://www.cox.com/residential/education-center/tv/intro-new-contour.html</a> (last visited Apr. 23, 2019)
132	<i>Watch TV Online – On Any Device</i> , COX, <a href="https://www.cox.com/residential/tv/watch-tv-online.html">https://www.cox.com/residential/tv/watch-tv-online.html</a> (last visited Apr. 23, 2019)
133	<i>Cox Communications Fact Sheet</i> , COX, <a href="http://newsroom.cox.com/company-overview">http://newsroom.cox.com/company-overview</a> (last visited Apr. 23, 2019)
134	<i>Major Pay-TV Providers Lost About 975,000 Subscribers in 3Q 2018</i> , LEICHTMAN RESEARCH GROUP (Nov. 13, 2018), <a href="https://www.leichtmanresearch.com/major-pay-tv-providers-lost-about-975000-subscribers-in-3q-2018/">https://www.leichtmanresearch.com/major-pay-tv-providers-lost-about-975000-subscribers-in-3q-2018/</a>
135	<i>Cox Consumer Sales: Sales at Cox Communications</i> , COX ENTERPRISES, <a href="https://jobs.coxenterprises.com/Cox-Communications/Cox-Consumer-Sales">https://jobs.coxenterprises.com/Cox-Communications/Cox-Consumer-Sales</a> (last visited Apr. 23, 2019)
136	<i>Job Details   Cox Enterprises: Call Center Customer Service Work from Home Representative (Account Services)</i> , COX ENTERPRISES, <a href="https://jobs.coxenterprises.com/ShowJob/JobId/252586/Call-Center-Customer-Service-Work-from-Home-Representative-(Account-Services)">https://jobs.coxenterprises.com/ShowJob/JobId/252586/Call-Center-Customer-Service-Work-from-Home-Representative-(Account-Services)</a> (last visited Apr. 23, 2019)
137	<i>Job Details   Cox Enterprises: Call Center Collections Specialist (Bilingual-Spanish)</i> , COX ENTERPRISES, <a href="https://jobs.coxenterprises.com/ShowJob/JobId/231367/Call-Center-Collections-Specialist-(Bilingual-Spanish)">https://jobs.coxenterprises.com/ShowJob/JobId/231367/Call-Center-Collections-Specialist-(Bilingual-Spanish)</a> (last visited Apr. 24, 2019)



## PUBLIC VERSION

138	<i>Job Details   Cox Enterprises: Call Center Customer Service Representative (Technical Support)</i> , COX ENTERPRISES, <a href="https://jobs.coxenterprises.com/ShowJob/JobId/252060/Call-Center-Customer-Service-Representative-(Technical-Support)">https://jobs.coxenterprises.com/ShowJob/JobId/252060/Call-Center-Customer-Service-Representative-(Technical-Support)</a> (last visited Apr. 24, 2019)
139	<i>Cox Call Center: Be the Voice of Our Brand</i> , COX ENTERPRISES, <a href="https://jobs.coxenterprises.com/Cox-Communications/Cox-Call-Center">https://jobs.coxenterprises.com/Cox-Communications/Cox-Call-Center</a> (last visited Apr. 23, 2019)
140	<i>Jennifer Barnette</i> , LINKEDIN, <a href="https://www.linkedin.com/in/jenniferbarnette/">https://www.linkedin.com/in/jenniferbarnette/</a> (last visited Apr. 23, 2019)
141	<i>Kelly Williams</i> , LINKEDIN, <a href="https://www.linkedin.com/in/kellywilliams3/?locale=de_DE">https://www.linkedin.com/in/kellywilliams3/?locale=de_DE</a> (last visited Apr. 23, 2019)
142	<i>Next Generation Version Of Contour Launches In San Diego</i> , COX (Nov. 11, 2015), <a href="https://newsroom.cox.com/2015-11-11-Next-Generation-Version-Of-Contour-Launches-In-San-Diego">https://newsroom.cox.com/2015-11-11-Next-Generation-Version-Of-Contour-Launches-In-San-Diego</a>
143	<i>Contact Us</i> , COX, <a href="https://www.cox.com/residential/contactus.html#stores">https://www.cox.com/residential/contactus.html#stores</a> (last visited Apr. 23, 2019) (map showing nine stores in or near Oklahoma City, OK)
144	<i>Contact Us</i> , COX, <a href="https://www.cox.com/residential/contactus.html#stores">https://www.cox.com/residential/contactus.html#stores</a> (last visited Apr. 23, 2019) (map showing seven stores in or near Tulsa, OK)
145	<i>Contact Us</i> , COX, <a href="https://www.cox.com/residential/contactus.html#stores">https://www.cox.com/residential/contactus.html#stores</a> (last visited Apr. 23, 2019) (map showing eight stores in or near Wichita, KS)
146	<i>Contact Us</i> , COX, <a href="https://www.cox.com/residential/contactus.html#stores">https://www.cox.com/residential/contactus.html#stores</a> (last visited Apr. 23, 2019) (map showing seven stores in or near Omaha, NE)
147	<i>Contact Us</i> , COX, <a href="https://www.cox.com/residential/contactus.html#stores">https://www.cox.com/residential/contactus.html#stores</a> (last visited Apr. 23, 2019) (map showing 14 stores in or near Lafayette, LA; Baton Rouge, LA; New Orleans, LA; and Pensacola, FL)
148	<i>Contact Us</i> , COX, <a href="https://www.cox.com/residential/contactus.html#stores">https://www.cox.com/residential/contactus.html#stores</a> (last visited Apr. 23, 2019) (map showing 13 stores in or near Newport News, VA, and Norfolk, VA)
149	Rovi and DISH Agreement effective August 19, 2016 [no public version available]

## PUBLIC VERSION

150	DISH Network Corporation Form 10-K for Fiscal Year Ended December 31, 2018
151	<i>Comcast Expands X1 Syndication Empire, Enlists Canada's Videotron</i> , FIERCEVIDEO (Aug. 30, 2017), <a href="https://www.fiercevideo.com/cable/comcast-expands-x1-syndication-empire-enlists-canada-s-videotron">https://www.fiercevideo.com/cable/comcast-expands-x1-syndication-empire-enlists-canada-s-videotron</a>

CONFIDENTIAL EXHIBITS	
EX. NO.	DESCRIPTION
14C	Declaration of Rolan Sargis
17C	Identification of Current Rovi IP Licenses Pursuant to 19 CFR § 210.12(a)(9)(iii)
100C	U.S. Patent No. 8,001,564 Claim Chart for Technical Domestic Industry Applying Representative Independent Claims to Next-Gen Platform
105C	U.S. Patent No. 7,779,445 Claim Chart for Technical Domestic Industry Applying Representative Independent Claims to Next-Gen Platform
106C	U.S. Patent No. 7,386,871 Claim Chart for Technical Domestic Industry Applying Representative Independent Claims to Next-Gen Platform
109C	U.S. Patent No. 8,156,528 Claim Chart for Technical Domestic Industry Applying Representative Independent Claims to Next-Gen Platform
114C	U.S. Patent No. 7,301,900 Claim Chart for Technical Domestic Industry Applying Representative Independent Claims to Next-Gen Platform
117C	U.S. Patent No. 7,200,855 Claim Chart for Technical Domestic Industry Applying Representative Independent Claims to Next-Gen Platform
120C	Rovi and TSI Agreement effective July 1, 2013
121C	Rovi and TSI Joint Development Agreement
122C	Interactive Program Guide License Agreement between CoxCom, Inc. and Rovi Guides, Inc., dated July 1, 2010
123C	Amendment to Interactive Program Guide License Agreement between CoxCom, Inc. and Rovi Guides, Inc., dated December 27, 2013

PUBLIC VERSION

<b>CONFIDENTIAL EXHIBITS</b>	
<b>EX. NO.</b>	<b>DESCRIPTION</b>
124C	Amendment to Interactive Program Guide License Agreement between CoxCom, Inc. and Rovi Guides, Inc., dated August 1, 2018
149C	Rovi and DISH Agreement effective August 19, 2016

<b>APPENDICES</b>	
<b>APPENDIX</b>	<b>DESCRIPTION</b>
A	Certified copy of the prosecution history of U.S. Patent No. 8,001,564 and copies of each technical reference identified therein
B	Certified copy of the prosecution history of U.S. Patent No. 7,779,445 and copies of each technical reference identified therein
C	Certified copy of the prosecution history of U.S. Patent No. 7,386,871 and copies of each technical reference identified therein
D	Certified copy of the prosecution history of U.S. Patent No. 8,156,528 and copies of each technical reference identified therein
E	Certified copy of the prosecution history of U.S. Patent No. 7,301,900 and copies of each technical reference identified therein
F	Certified copy of the prosecution history of U.S. Patent No. 7,200,855 and copies of each technical reference identified therein

**I. INTRODUCTION**

1. Rovi Corporation and Rovi Guides, Inc. (together, Rovi or Complainant) file this Complaint under Section 337 of the Tariff Act of 1930, as amended, 19 U.S.C. § 1337. Rovi respectfully asks that the International Trade Commission (the Commission or ITC) institute an investigation relating to the unlawful importation into the United States, re-importation into the United States, and sale within the United States after importation, of certain digital video receivers, broadband gateways, and related hardware and software components (the Accused Products) that infringe the following United States Patents (collectively, the Asserted Patents), all of which Rovi Guides, Inc., owns:

<b>Patent Number</b>	<b>Claims Infringed</b>	<b>Abbreviated Reference</b>	<b>Title</b>
8,001,564	1-4, 12-15	the '564 Patent	Electronic Program Guide with Digital Storage Directory
7,779,445	1-11, 15-24	the '445 Patent	Interactive Television Systems with Digital Video Recording and Adjustable Reminders
7,386,871	1-19, 21-29, 31-36, 38-43, 45-53, 55, 56	the '871 Patent	Program Guide System with Real-Time Data Sources
8,156,528	1-3, 6, 11-18, 20, 23-24, 26-27, 29-32, 34-36	the '528 Patent	Personal Video Recorder Systems and Methods
7,301,900	1, 3, 4, 8, 10, 11, 17, 19, 23, 25, 26	the '900 Patent	Method and Apparatus for Hub-Based Network Access Via a Multimedia System
7,200,855	1-63	the '855 Patent	Method and Apparatus of Multiplexing a Plurality of Channels in a Multimedia System

74. The '900 Patent is the subject of certain licenses. A list of licensees under the '900 Patent is included in Ex. 17C.<sup>5</sup> There is no other known license relating to the '900 Patent.

**(2) Non-Technical Description of the Patented Invention**

75. The '900 Patent describes, among other things, a multimedia system and methods for client use of the multimedia system. The methods for using the '900 Patent's multimedia system include such things as receiving communications from clients wishing to access a network, determining whether a network application is already active for the client, and, in response, either: (1) opening a network application for the client (if a network application is not already open for the client), or (2) acting on behalf of the client through and by the already active network application. Various protocols, methods, and systems are described for accomplishing these and other objects of the inventions claimed in the '900 Patent.

**F. The '855 Patent**

**(1) Identification of the Patent and Ownership**

76. United States Patent No. 7,200,855 is entitled "Method and Apparatus of Multiplexing a Plurality of Channels in a Multimedia System" and issued on April 3, 2007. The '855 Patent expires on July 11, 2024, and is based on U.S. Patent Application No. 09/864,602 filed on May 24, 2001. *See* Ex. 7.

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<sup>5</sup> With respect to Ex. 17C, Rovi's licenses generally include all patents in its guidance portfolio, including the Asserted Patents in specified fields-of-use and in specified regions.

77. Rovi Guides, Inc., owns, by assignment, all right, title, and interest in and to the '855 Patent. The inventor of the '855 Patent, Indra Laksono, assigned his rights in the '855 Patent to ViXS. ViXS in turn assigned its rights to Rovi Corporation. Rovi Corporation assigned its rights to Rovi Technologies Corporation, which assigned them to Rovi Guides, Inc. Certified copies of the assignments and related agreements are attached as Ex. 13.

78. A certified copy of the '855 Patent has been submitted as Ex. 7. A certified copy of the U.S. Patent and Trademark Office file history for the '855 Patent and copies of each technical reference mentioned in the file history are submitted with this Complaint as Appendix F.

79. The '855 Patent is the subject of certain licenses. A list of licensees under the '855 Patent is included in Ex. 17C. There is no other known license relating to the '855 Patent.

## **(2) Non-Technical Description of the Patented Invention**

80. The '855 Patent describes, among other things, a multimedia system and methods for use of the multimedia system. The '855 Patent describes a multimedia system that includes clients, at least one multimedia server, and sources of multimedia content. Clients make use of the system to perform actions such as changing channels, adjusting the volume, performing trick play actions, and activating other features common to television and multimedia systems. The system is designed such that channel selection requests and commands are received and transmitted, in part, by a shared bus. Various aspects and methods related to the multimedia system are described and claimed in the '855 Patent.

# EXHIBIT 23

**EXHIBIT 23**  
**UNITED STATES PATENT NO. 7,200,855**  
**CLAIM CHART FOR INFRINGEMENT OF REPRESENTATIVE INDEPENDENT CLAIMS 1, 18, 28, 37, AND 53**























U.S. PATENT NO. 7,200,855	APPLICATION TO COMCAST'S X1 PLATFORM <sup>1</sup>
<p>1. A method of multiplexing a plurality of channels in a multimedia system, the method comprises:</p>	<p>Comcast's X1 Platform performs a method of multiplexing a plurality of channels in a multimedia system. Comcast's X1 Platform should be understood throughout to also refer to and include Comcast's Broadband Platform as used in conjunction with or as part of Comcast's X1 Platform.</p> <p>For example, Comcast's X1 Platform multiplexes a plurality of channels including linear QAM channels, video on demand, programs recorded in the cloud, third party application content, and others via a network's connection to the Comcast backend over a network connection such as a DOCSIS connection. Channels and other content are multiplexed from Comcast's X1 Platform's gateway and broadband servers throughout the home to "satellite" devices.</p>

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<sup>1</sup> This analysis is preliminary, and Rovi's investigation is ongoing. Rovi reserves the right to amend or supplement these charts after further investigation and discovery, claim construction, or other meriting circumstances. Such supplemental information may include, but is not limited to, source code, data sheets, design specifications, deposition testimony, testing information, reference designs implementation and utilization information, and/or schematics.



**EXHIBIT 23**  
**UNITED STATES PATENT NO. 7,200,855**  
**CLAIM CHART FOR INFRINGEMENT OF REPRESENTATIVE INDEPENDENT CLAIMS 1, 18, 28, 37, AND 53**

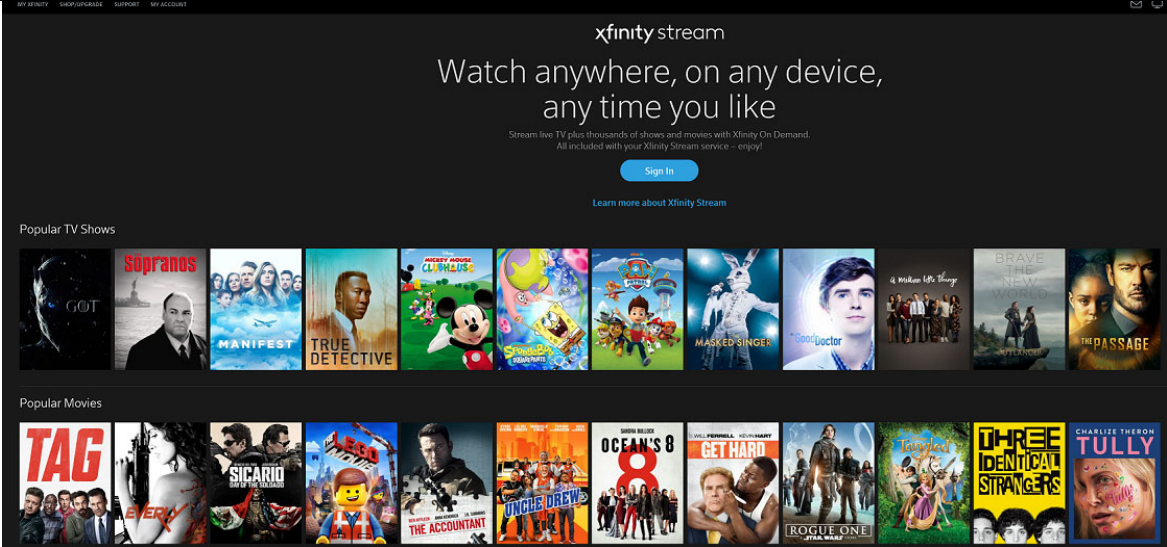
U.S. PATENT NO. 7,200,855	APPLICATION TO COMCAST'S X1 PLATFORM <sup>1</sup>						
	View Test	<input type="checkbox"/> LIMITED BASIC/INTERNET PLUS 10+	<input type="checkbox"/> ECONOMY 100+	<input type="checkbox"/> STARTER 140+	<input type="checkbox"/> PREFERRED 220+	<input type="checkbox"/> PREFERRED PLUS 230+	<input type="checkbox"/> PREMIER 260+
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Source: *X1 Platform channel lineup*, XFINITY; <https://www.xfinity.com/learn/channel-lineup> (last visited Feb. 7, 2019).

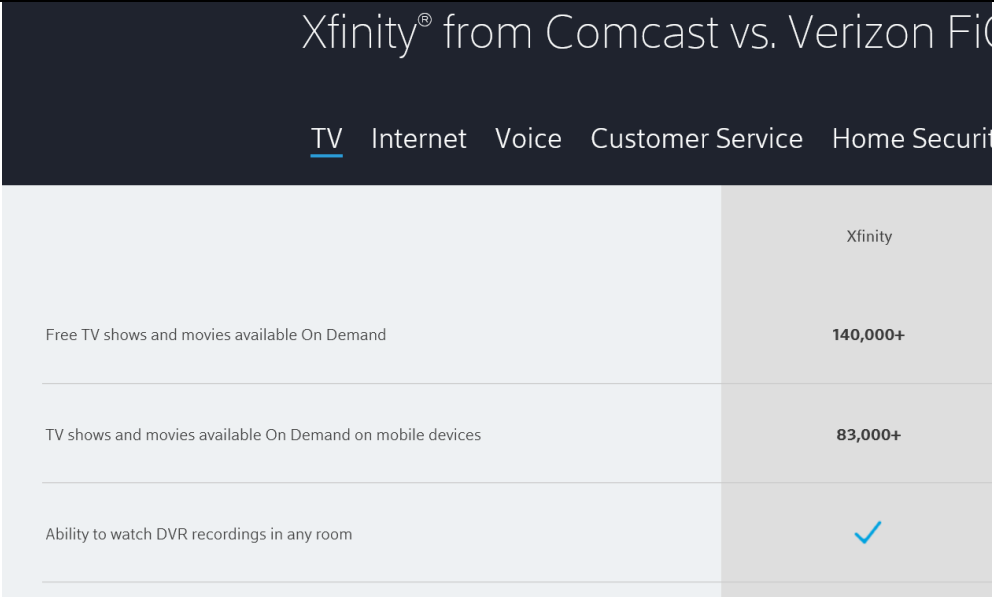
**EXHIBIT 23**  
**UNITED STATES PATENT NO. 7,200,855**  
**CLAIM CHART FOR INFRINGEMENT OF REPRESENTATIVE INDEPENDENT CLAIMS 1, 18, 28, 37, AND 53**

U.S. PATENT NO. 7,200,855	APPLICATION TO COMCAST’S X1 PLATFORM <sup>1</sup>
	<p>Premium and Multiplex Channels Available from Comcast</p> <p>Looking for HBO or Showtime? They’re just some of the Comcast premium channels you can add to your subscription.</p> <p>How it works</p> <p>Premium channels on Comcast include related multiplex channels at no additional cost. When you subscribe to a Premium channel, the multiplexes become part of your TV listing and you’ll have access to that premium channel’s On Demand programming.</p> <p>Comcast premium channels and multiplexes:</p> <p><u>HBO</u></p> <ul style="list-style-type: none"> <li>• HBO Comedy</li> <li>• HBO Family</li> <li>• HBO Latino</li> <li>• HBO Signature</li> <li>• HBO Zone</li> <li>• HBO2</li> </ul> <p>Source: <i>Premium and Multiplex Channels Available from Comcast</i>, XFINITY, <a href="https://www.xfinity.com/support/articles/premium-channels">https://www.xfinity.com/support/articles/premium-channels</a> (last visited Apr. 18, 2019).</p> <p>Xfinity Stream Portal shows selected “popular” TV shows and movies that are available for streaming on “any device” on Comcast’s X1 Platform.</p>

**EXHIBIT 23**  
**UNITED STATES PATENT NO. 7,200,855**  
**CLAIM CHART FOR INFRINGEMENT OF REPRESENTATIVE INDEPENDENT CLAIMS 1, 18, 28, 37, AND 53**

U.S. PATENT NO. 7,200,855	APPLICATION TO COMCAST'S X1 PLATFORM <sup>1</sup>
	 <p>Source: <i>Xfinity Stream</i>, XFINITY, <a href="https://www.xfinity.com/stream/">https://www.xfinity.com/stream/</a> (last visited Apr. 24, 2019).</p> <p>Comcast's X1 Platform provides access to a large library of shows that can be streamed on demand upon selection by a user.</p>

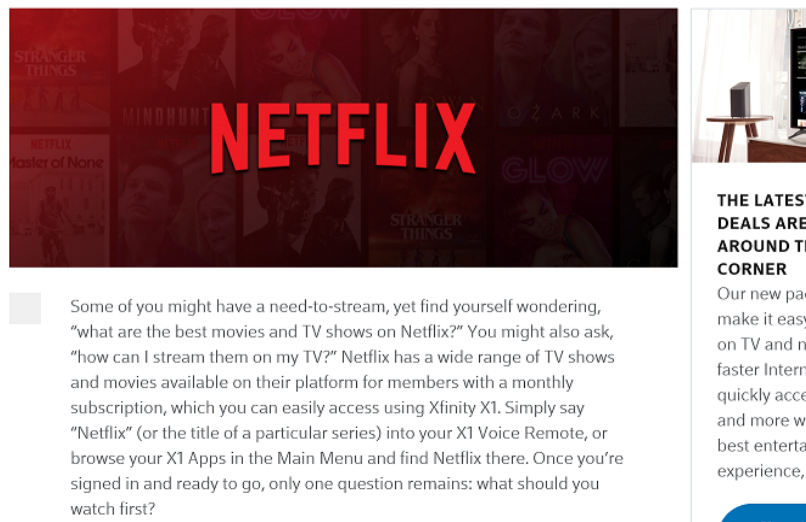
**EXHIBIT 23**  
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U.S. PATENT NO. 7,200,855	APPLICATION TO COMCAST'S X1 PLATFORM <sup>1</sup>
	 <p>Source: <i>Xfinity from Comcast vs. Verizon FiOS, XFINITY,</i>  <a href="https://www.xfinity.com/compare/comcast-xfinity-vs-verizon-fios">https://www.xfinity.com/compare/comcast-xfinity-vs-verizon-fios</a> (last visited Apr. 18, 2019).</p> <p>The X1 Platform's Cloud DVR system streams recorded programs to set-top boxes and other user devices when playing back such recordings.</p>

**EXHIBIT 23**  
**UNITED STATES PATENT NO. 7,200,855**  
**CLAIM CHART FOR INFRINGEMENT OF REPRESENTATIVE INDEPENDENT CLAIMS 1, 18, 28, 37, AND 53**

U.S. PATENT NO. 7,200,855	APPLICATION TO COMCAST'S X1 PLATFORM <sup>1</sup>
	<p><b>Recording TV</b></p> <p><b>The Xfinity X1 DVR lets you record up to six shows at once</b> from anywhere in your home. This works by employing one master DVR and additional cable boxes that interconnect throughout your house. Then you can control your DVR from any room with a TV connected to an X1 box.</p> <p>With the X1, you can start and stop recordings, access recorded and on-demand programs, and even start a show in one room and finish it in another.</p> <p>Unlike traditional DVRs, the X1 Cloud DVR stores all your recorded programs on cloud technology, not on a hard disk inside the machine. The trade-off for all that space is that when you watch recorded programs, you're technically streaming them, so you'll need an internet connection. If you're worried about buffering, download your shows ahead of time to watch later.</p> <p>Source: <i>The Definitive Review of the Xfinity X1 from Comcast</i>, CABLETV.COM, <a href="https://www.cabletv.com/blog/xfinity-x1-review/">https://www.cabletv.com/blog/xfinity-x1-review/</a> (last visited Apr. 18, 2019).</p> <p>Comcast's X1 Platform streams Netflix programs upon user selection.</p>

### CLAIM CHART FOR INFRINGEMENT OF REPRESENTATIVE INDEPENDENT CLAIMS 1, 18, 28, 37, AND 53

U.S. PATENT NO. 7,200,855	APPLICATION TO COMCAST'S X1 PLATFORM <sup>1</sup>
	<p data-bbox="657 282 831 302">DECEMBER 20, 2018</p> <h1 data-bbox="657 318 1457 414">Using Xfinity X1 to Stream the Best Movies &amp; Shows on Netflix</h1> <div data-bbox="657 440 1457 959">  <p data-bbox="718 735 1274 954">Some of you might have a need-to-stream, yet find yourself wondering, “what are the best movies and TV shows on Netflix?” You might also ask, “how can I stream them on my TV?” Netflix has a wide range of TV shows and movies available on their platform for members with a monthly subscription, which you can easily access using Xfinity X1. Simply say “Netflix” (or the title of a particular series) into your X1 Voice Remote, or browse your X1 Apps in the Main Menu and find Netflix there. Once you’re signed in and ready to go, only one question remains: what should you watch first?</p> <p data-bbox="1362 628 1457 714"><b>THE LATEST DEALS ARE AROUND THE CORNER</b></p> <p data-bbox="1362 719 1457 914">Our new package make it easy on TV and no faster Internet quickly access and more wi best entertainment experience,</p> </div> <p data-bbox="657 969 1858 1036">Source: <i>Using Xfinity X1 to Stream the Best Movies &amp; Shows on Netflix</i>, XFINITY, <a href="https://www.xfinity.com/hub/tv-video/netflix-on-x1">https://www.xfinity.com/hub/tv-video/netflix-on-x1</a> (last visited Apr. 18, 2019).</p> <p data-bbox="657 1076 1858 1214">Comcast’s X1 Platform gateway set-top boxes are capable of receiving multiplexed channel data over linear QAM channels and a DOCSIS “IP” connection. See <i>Comcast’s Network Architecture</i>, SLIDEPLAYER, <a href="https://slideplayer.com/slide/11325893/">https://slideplayer.com/slide/11325893/</a> (last visited Apr. 18, 2019) (Presentation authored by Jorge Salinger of Comcast Cable).</p>

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	<p>DOCSIS 3.1 assumes Orthogonal Frequency Division Multiplexing (OFDM) downstream signals and Orthogonal Frequency Division Multiple Access (OFDMA) upstream signals to achieve robust operation and provide more efficient use of the spectrum than previous DOCSIS versions. In order to reach the target service goal in the upstream direction, plant changes on the upstream/downstream spectrum split are expected. The DOCSIS 3.1 system will have options of several split configurations that can be exercised based on traffic demand, services offered and the capability of the cable plant. In the downstream direction, HFC plant spectrum extended beyond the current 1002 MHz is expected.</p> <p>The DOCSIS 3.0 systems and earlier versions are sometimes referred to in this document as single carrier QAM (SC-QAM) systems in contrast to the multicarrier DOCSIS 3.1 OFDM/OFDMA system.</p> <p>The OFDM downstream multicarrier system is composed of a large number of subcarriers that have either 25 kHz or 50 kHz spacing. These subcarriers are grouped into independently configurable OFDM channels each occupying a spectrum of up to 192 MHz in the downstream, totaling 7680 25 kHz subcarriers or 3840 50 kHz subcarriers; of which up to 7600 (25 kHz) or 3800 (50 kHz) active subcarriers span 190 MHz. The OFDMA upstream multicarrier system is also composed of either 25 kHz or 50 kHz subcarriers. In the upstream, the subcarriers are grouped into independently configurable OFDMA channels each of up to 95 MHz encompassed spectrum, totaling 3800 25 kHz spaced subcarriers or 1900 50 kHz spaced subcarriers or 1920 50 kHz spaced subcarriers. Many parameters of these channels can be independently configured thereby optimizing configuration based on channel conditions.</p> <p>The cable topologies have been evolving to smaller node architectures with fewer amplifiers in cascade. This natural cable network evolution and gradual reduction in node sizes bring a corresponding improvement in channel conditions. A DOCSIS 3.1 goal is to leverage the expected network improvements and achieve higher efficiency levels corresponding to improvement in channel conditions. In the downstream and in the upstream directions, profiles can be defined to match the transmission configuration to the channel conditions with greater granularity. DOCSIS 3.1 technology is able to operate in classic cable network topologies, but those networks may not be able to achieve full capabilities of DOCSIS 3.1 bandwidth efficiencies.</p> <p>An assumption in the topology configuration of DOCSIS 3.1 is that the CM is predominantly placed in a gateway architecture configuration. Specifically the CM is located either at the drop-home boundary or after the first two-Source: <i>Data-Over-Cable Service Interface Specifications DOCSIS®</i>, Physical Layer Specification, 3.1CM-SP-PHYv3.1-I15-180926, Section 5.1.</p>
[a] receiving a plurality of channels from a multimedia source;	<p>Comcast's X1 Platform receives a plurality of channels from a multimedia source.</p> <p>For example, Comcast's X1 Platform comprises a headend that receives channels and programming from a plurality of sources. Comcast's X1 Platform further comprises X1 gateway set-top boxes that receive a plurality of channels including linear QAM channels, VOD programming, programs recorded in the cloud, and other channels like Netflix via a DOCSIS</p>

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	<p>connection. X1 gateway set-top boxes include XG1v2, XG1v3, XG1v4, and XG2v2 set-top boxes.</p> <p>Feature Comparison</p> <table><tr><th>Feature</th><th>XG1</th><th>XG1v4</th><th>XG2</th><th>RNG150N</th></tr><tr><td>DVR</td><td>Yes</td><td>Yes</td><td>No</td><td>No</td></tr><tr><td>Tuners</td><td>Up to 6*</td><td>6</td><td>4</td><td>1</td></tr><tr><td>Pause and Rewind Live TV</td><td>Yes, up to 60 minutes</td><td>Yes, up to 60 minutes</td><td>Yes, up to 25 minutes</td><td>No</td></tr><tr><td>Pause and Rewind Xfinity On Demand</td><td>Yes</td><td>Yes</td><td>Yes</td><td>Yes</td></tr><tr><td>Supports AnyRoom DVR</td><td>Yes</td><td>Yes</td><td>Yes</td><td>Yes</td></tr><tr><td>Schedule and Manage DVR Recordings</td><td>Yes</td><td>Yes</td><td>Yes</td><td>Yes</td></tr><tr><td>RF Remote Control Functionality</td><td>Yes</td><td>Yes</td><td>Yes</td><td>No</td></tr><tr><td>X1 Voice Remote Support</td><td>Yes</td><td>Yes</td><td>Yes</td><td>No</td></tr><tr><td>X1 Apps</td><td>Yes</td><td>Yes</td><td>Yes</td><td>Yes (Internet apps not supported)</td></tr><tr><td>Front Panel Clock</td><td>Yes</td><td>No</td><td>No</td><td>No</td></tr><tr><td>Device Light Dimming</td><td>Yes</td><td>Yes</td><td>Yes</td><td>No</td></tr><tr><td>HDMI Connector</td><td>Yes</td><td>Yes</td><td>Yes</td><td>Yes</td></tr><tr><td>Digital Audio (Optical) Connector</td><td>Yes</td><td>No</td><td>Yes</td><td>Yes</td></tr><tr><td>Component Video</td><td>Yes (Pace XG1v1 only)</td><td>No</td><td>No</td><td>Yes</td></tr><tr><td>Composite Video</td><td>Yes</td><td>No</td><td>Yes</td><td>Yes</td></tr><tr><td>RF Out</td><td>Yes</td><td>Yes</td><td>Yes</td><td>Yes</td></tr><tr><td>Supports Ultra HD 4K Netflix Content (Requires compatible Netflix plan)</td><td>No</td><td>Yes</td><td>No</td><td>No</td></tr><tr><td>Supports 4K YouTube Content</td><td>No</td><td>Yes</td><td>No</td><td>No</td></tr></table> <p>Source: <i>X1 TV Box Comparison – DVR vs. Non-DVR</i>, XFINITY, <a href="https://www.xfinity.com/support/articles/x1-hub-vs-companion-box">https://www.xfinity.com/support/articles/x1-hub-vs-companion-box</a> (last visited Apr. 18, 2019).</p> <p>For example, the XG1v4 includes a DOCSIS 2.1+ cable modem that provides DOCSIS Set-topGateway (DSG) capabilities.</p>	Feature	XG1	XG1v4	XG2	RNG150N	DVR	Yes	Yes	No	No	Tuners	Up to 6*	6	4	1	Pause and Rewind Live TV	Yes, up to 60 minutes	Yes, up to 60 minutes	Yes, up to 25 minutes	No	Pause and Rewind Xfinity On Demand	Yes	Yes	Yes	Yes	Supports AnyRoom DVR	Yes	Yes	Yes	Yes	Schedule and Manage DVR Recordings	Yes	Yes	Yes	Yes	RF Remote Control Functionality	Yes	Yes	Yes	No	X1 Voice Remote Support	Yes	Yes	Yes	No	X1 Apps	Yes	Yes	Yes	Yes (Internet apps not supported)	Front Panel Clock	Yes	No	No	No	Device Light Dimming	Yes	Yes	Yes	No	HDMI Connector	Yes	Yes	Yes	Yes	Digital Audio (Optical) Connector	Yes	No	Yes	Yes	Component Video	Yes (Pace XG1v1 only)	No	No	Yes	Composite Video	Yes	No	Yes	Yes	RF Out	Yes	Yes	Yes	Yes	Supports Ultra HD 4K Netflix Content (Requires compatible Netflix plan)	No	Yes	No	No	Supports 4K YouTube Content	No	Yes	No	No
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	<p data-bbox="657 285 1178 310"><b>3.4 Product description and theory of operation</b></p> <hr/> <p data-bbox="657 345 1759 461">The Arris XG1v4 is an IP Video Gateway (next-gen, set-top technology) with 4K video capability. It is a 4K set-top with multiple 1 GHz tuners that support both MPEG-2 and MPEG-4 AVC services. The all-digital XG1v4 includes the latest audio and video output interfaces, including 4K HDMI video, Award-winning Dolby Digital Plus audio and Dolby Volume Leveling. With the included MoCA home networking, the XG1v4 provides the flexibility to serve as a multimedia client for accessing content from other compatible devices at home. An embedded DOCSIS 2.0+ cable modem provides support for DSG and downstream channel bonding.</p> <p data-bbox="657 483 1913 548">Source: <i>XG1V4 Set-Top Box Test Report ARRIS Group, Inc.</i>, FCC, <a href="https://fccid.io/ACQ-XG1V4/Test-Report/Test-Report-3375616">https://fccid.io/ACQ-XG1V4/Test-Report/Test-Report-3375616</a> (last visited Apr. 18, 2019).</p> <p data-bbox="657 591 1913 696">The embedded DOCSIS cable modem in each X1 gateway set-top box provides access to numerous services through the Comcast cable network, including VOD TV shows and movies, programs recorded in the cloud, and other channels like Netflix.</p> <p data-bbox="657 732 1843 818">The intended service will allow transparent uni-directional and bi-directional transport of Out-Of-Band messaging over Internet Protocol (IP), between the cable system headend and customer locations, over an all-coaxial or hybrid-fiber/coax (HFC) cable network. This is shown in simplified form in Figure 1–1.</p> <div data-bbox="711 834 1793 1127"> <pre> graph LR     A[Set-top Controller] &lt;--&gt; B((Regional or Wide Area IP Network))     B &lt;--&gt; C[Cable Modem Termination System CMTS]     C &lt;--&gt; D((Cable Network))     D &lt;--&gt; E[Set-top Device with an Embedded Cable Modem]     A &lt;--&gt; E   </pre> </div> <p data-bbox="919 1146 1591 1170" style="text-align: center;"><b>Figure 1–1 - Transparent Out-Of-Band Messaging Via DOCSIS</b></p> <p data-bbox="657 1232 1852 1377">The transmission path over the cable system is realized at the headend by a Set-top Controller that is responsible for managing the Set-top Devices, a regional or wide area IP network connecting the Set-top Controller to the Cable Modem Termination System (CMTS), and, at each customer location, a Set-top Device with an embedded Cable Modem. At the headend (or hub), the interface to the data-over-cable system is called the Cable Modem Termination System - Network-Side Interface [DOCSIS-CMTS-NSI].</p> <p data-bbox="657 1395 1902 1425">Source: <i>DOCSIS Set-top Gateway (DSG) Interface Specification</i>, CM-SP-DSG-I25-170906, at 1.</p>

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[b] receiving a plurality of channel selection commands by:	<p>Comcast's X1 Platform receives a plurality of channel selection commands, including by the limitations below.</p> <p><i>See evidence cited infra.</i></p>
[c] receiving, from a plurality of clients, a plurality of channel selection requests; and	<p>Comcast's X1 Platform receives, from a plurality of clients, a plurality of channel selection requests.</p> <p>For example, Comcast's X1 Platform comprises set-top boxes which are capable of receiving, from a plurality of clients, a plurality of channel selection requests. These requests may be received, for example, by various communications including over a local network including MoCA, Ethernet, Wi-Fi, and/or IR.</p> <p>Set-top boxes such as XiD, Xi5, and Xi6 devices may receive channel selection requests from users in various ways including from remote controls and apps. In addition, the gateway set-top boxes may receive channel selection requests from other set-top boxes, including XiD, Xi5, and Xi6 set-top boxes. <i>See X1 TV Box Comparison - DVR vs. Non-DVR</i>, XFINITY, <a href="https://www.xfinity.com/support/articles/x1-hub-vs-companion-box">https://www.xfinity.com/support/articles/x1-hub-vs-companion-box</a> (last visited Apr. 23, 2019).</p> <p>In the case of the Xi5 or Xi6, the local network may include an RDK-B capable modem, e.g., XB6 or xFi gateway, and xFi pods between the X1 gateway set-top box and the Xi5 or Xi6 set-topbox. See below. Other clients, such as user devices with the Comcast App installed, can also communicate through the X1 Broadband modem.</p> <p><b>What are the requirements to have the Xi5 device?</b></p> <p>To have a Wireless TV box in your home, you'll need XFINITY TV service, at least one additional X1 TV box to act as the primary X1 device on your account and XFINITY Internet with a Wireless Gateway 3 (with RDK-B firmware) to stream video over the Xi5's WiFi connection.</p> <p>Source: <i>What is the Xfinity Xi5 TV Box?</i>, XFINITY COMMUNITY FORUM, <a href="https://forums.xfinity.com/t5/TV/ANSWERED-What-is-the-Xfinity-Xi5-TV-Box/ta-p/2940258">https://forums.xfinity.com/t5/TV/ANSWERED-What-is-the-Xfinity-Xi5-TV-Box/ta-p/2940258</a> (last visited Apr. 18, 2019).</p>

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	<p>The XB6 advanced wireless gateways are capable of receiving selection requests from Xi5 and Xi6 set-top boxes via WiFi and/or Ethernet and passing those selections on to the X1 gateway set-top box via MoCA.</p> <p><b>Description</b></p> <p>This is a DOCSIS cable gateway device including the following functionalities:</p> <ul style="list-style-type: none"> <li>• DOCSIS 3.1 Cable Modem</li> <li>• PacketCable 2.0 eDVA</li> <li>• 2 port Gigabit Ethernet switch with advanced routing capability</li> <li>• 802.11n WiFi interface at 2.4GHz</li> <li>• 802.11ac WiFi interface at 5GHz</li> <li>• Zigbee radio interface</li> <li>• Bluetooth Smart radio interface</li> <li>• Thread radio interface</li> <li>• 2 FXS ports</li> <li>• Internal PSU</li> <li>• eMTA supporting PacketCable 2.0</li> <li>• IPv4/IPv6 router</li> <li>• Remote management capabilities (SNMP, TR069, HNAP)</li> </ul> <p>Source: <i>Technicolor CGM4140COM DOCSIS Cable Gateway User Manual</i>, May 4, 2017, Rev. 0.1,  <a href="https://apps.fcc.gov/oetcf/eas/reports/ViewExhibitReport.cfm?mode=Exhibits&amp;RequestTimeout=500&amp;calledFromFrame=Y&amp;application_id=wgINnsrRwq7yag7o9aTlwA%3D%3D&amp;fcc_id=G95CGM414X">https://apps.fcc.gov/oetcf/eas/reports/ViewExhibitReport.cfm?mode=Exhibits&amp;RequestTimeout=500&amp;calledFromFrame=Y&amp;application_id=wgINnsrRwq7yag7o9aTlwA%3D%3D&amp;fcc_id=G95CGM414X</a> (last visited Apr. 23, 2019).</p>

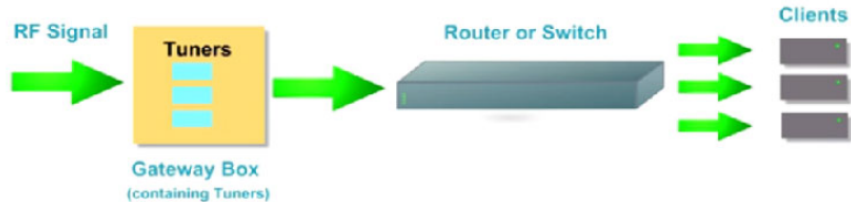
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	<p><b>Features</b></p> <ul style="list-style-type: none"> <li>• High speed DOCSIS 3.1 interface <ul style="list-style-type: none"> <li>○ Supports Gigabit internet connectivity</li> </ul> </li> <li>• High speed wireless interface <ul style="list-style-type: none"> <li>○ Supports whole-home coverage with state-of-the-art radio technology</li> </ul> </li> <li>• Voice performance <ul style="list-style-type: none"> <li>○ PacketCable 2.0 compliant and equipped with basic and extended CLASS features such as caller ID and call-waiting</li> </ul> </li> <li>• Advanced Security <ul style="list-style-type: none"> <li>○ The integrated firewall provides Stateful Packet Inspection (SPI), and an integrated Intrusion Detection and Prevention System (IDS) engine monitors a wide range of attack patterns, and logs potential security breaches to a local cache or remote server. To secure data exchange between the gateways and the cable operators' servers, BPI+ communications privacy is used.</li> </ul> </li> <li>• WPS <ul style="list-style-type: none"> <li>○ With Wi-Fi Protected Setup (WPS) users can easily connect to the wireless network by simply pushing a button or entering a PIN code. It allows home users to easily connect to a secure network without any complex configuration and eliminates the need to remember or store their security information in an unsafe way.</li> </ul> </li> <li>• Easy to Use <ul style="list-style-type: none"> <li>○ This is an easy-to-use/easy-to-install gateway. For convenience of the end user, the easy-to-access multi-colored LEDs provide a clear indication of start-up sequence and connectivity status. Multiple integrated web pages allow direct access to the status and settings, including privacy and security information.</li> </ul> </li> </ul> <p>Source: <i>Technicolor CGM4140COM DOCSIS Cable Gateway User Manual</i>, May 4, 2017, Rev. 0.1, <a href="https://apps.fcc.gov/oetcf/eas/reports/ViewExhibitReport.cfm?mode=Exhibits&amp;RequestTimeout=500&amp;calledFromFrame=Y&amp;application_id=wgINnsrRwq7yag7o9aTlwA%3D%3D&amp;fcc_id=G95CGM414X">https://apps.fcc.gov/oetcf/eas/reports/ViewExhibitReport.cfm?mode=Exhibits&amp;RequestTimeout=500&amp;calledFromFrame=Y&amp;application_id=wgINnsrRwq7yag7o9aTlwA%3D%3D&amp;fcc_id=G95CGM414X</a> (last visited Apr. 23, 2019).</p>

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	<p><b>Technical Specifications</b></p> <div style="display: flex; justify-content: space-between;"> <div style="width: 48%;"> <p><u>Cable Certifications</u></p> <ul style="list-style-type: none"> <li>• Data</li> <li>• Voice</li> <li>• CMTS interoperability</li> <li>• DOCSIS 3.1</li> <li>• PacketCable 2.0</li> </ul> <p><u>Hardware Specifications</u></p> <ul style="list-style-type: none"> <li>• WAN Interface 1 RF F-type</li> <li>• LAN interface 2-port wired ethernet RJ45, WiFi IEEE 802.11 2.4/5GHz, MoCA</li> <li>• Interfaces other WPS button, reset button</li> <li>• Power supply 120-240VAC 50-60Hz</li> <li>• Operating Temperature 0 to 40 degC</li> <li>• Operating humidity 20-90% non-condensing</li> <li>• Storage temperature -20-70 degC</li> </ul> <p><u>Receiver Specifications</u></p> <ul style="list-style-type: none"> <li>• Downstream modulation QAM, OFDM</li> <li>• Downstream Frequency Range 54-1002 MHz</li> <li>• Input signal level range -15 / +15dBmV</li> <li>• Input impedance 75 ohm</li> </ul> </div> <div style="width: 48%;"> <p><u>Transmitter Specifications</u></p> <ul style="list-style-type: none"> <li>• Upstream Modulation QPSK, QAM, OFDM</li> <li>• Upstream Frequency Range 5-42 MHz</li> <li>• Output Impedance 75 ohm</li> </ul> <p><u>Wireless Specifications</u></p> <ul style="list-style-type: none"> <li>• WiFi IEEE 802.11a/b/g/n/ac</li> <li>• WiFi Protected Setup</li> </ul> </div> </div> <p>Source: <i>Technicolor CGM4140COM DOCSIS Cable Gateway User Manual</i>, May 4, 2017, Rev. 0.1, <a href="https://apps.fcc.gov/oetcf/eas/reports/ViewExhibitReport.cfm?mode=Exhibits&amp;RequestTimeOut=500&amp;calledFromFrame=Y&amp;application_id=wgINnsrRwq7yag7o9aTlwA%3D%3D&amp;fcc_id=">https://apps.fcc.gov/oetcf/eas/reports/ViewExhibitReport.cfm?mode=Exhibits&amp;RequestTimeOut=500&amp;calledFromFrame=Y&amp;application_id=wgINnsrRwq7yag7o9aTlwA%3D%3D&amp;fcc_id=</a></p>

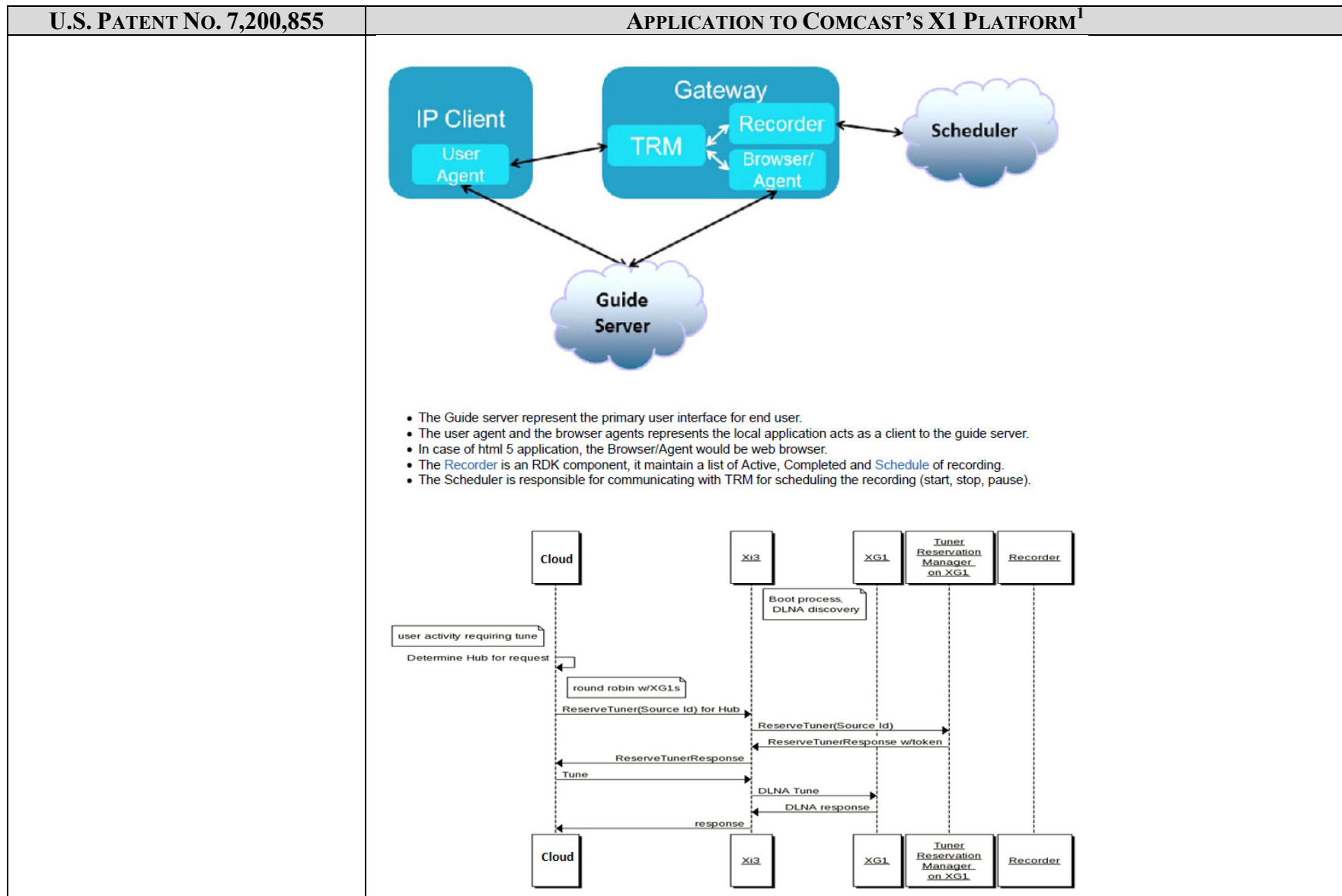
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	<p>G95CGM414X (last visited Apr. 23, 2019).</p> <p>Comcast's X1 set-top boxes use the Reference Design Kit (RDK) which includes a Tuner Reservation Manager (TRM) to allow request access to a tuner for selection of programs from linear QAM channels.</p> <p><b>TRM</b></p> <p><small>Created by Pradeepta Kumar Das, last modified by Lakshmi Priya P on Jan 23, 2019</small></p> <p><b>Summary</b></p> <p>Tuner Reservation Manager (TRM) coordinates the usage of tuners on the device for the connected clients on Gateway device and it is specific to Gateway devices only. TRM uses messages for communicating between Gateway and Client device to reserve, cancel, status retrieval, etc.</p>  <pre> graph LR     RF[RF Signal] --&gt; Gateway[Gateway Box&lt;br/&gt;(containing Tuners)]     Gateway --&gt; Router[Router or Switch]     Router --&gt; Clients[Clients]   </pre> <ul style="list-style-type: none"> <li>• The Gateway box contains multiple tuners (example, Gateway box having 6 tuner connected to it)</li> <li>• The Gateway box connected with the incoming RF signal and it is also connected to client boxes through the MOCA/Router devices.</li> <li>• TRM application runs on a gateway device and coordinates the usage of tuners on the device for its connecting clients based on the types of the request.</li> <li>• Reserve a tuner for specified usage (Live playback, Record, Hybrid, or EAS), start time, end time and content (locator).</li> <li>• Detect conflicts with existing tuner reservations and resolve.</li> </ul>

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	<p><b>How TRM works</b></p> <p>Client requests a tuner through URL(http, dvr, live), TRM server receives the request and checks for the valid reservation and reserves the tuner so that the client is provided with the service requested. Client also can extend or delete the reservation. It is also possible for a client to request a list of the active reservations.</p> <p>Usually Xg1 boxes have multiple tuners (in Xg1v3 box has 6 tuners (configurable)) &amp; each tuners can have following states:</p> <table border="1" data-bbox="669 431 1262 649"> <thead> <tr> <th>State</th><th>Meaning</th></tr> </thead> <tbody> <tr> <td>Free</td><td>The <a href="#">Tuner</a> is available for allocation.</td></tr> <tr> <td>Live</td><td>Currently tuned to a service and in use for viewing the live TV channel.</td></tr> <tr> <td>Record</td><td>Currently tuned to a service and recording a program.</td></tr> <tr> <td>Hybrid</td><td>Live view of recording in progress.</td></tr> <tr> <td>EAS</td><td>Emergency Alert <a href="#">Service</a>.</td></tr> </tbody> </table> <p><b>TRM Consumer</b></p> <p>This diagram depicts the different element interact with TRM.</p>	State	Meaning	Free	The <a href="#">Tuner</a> is available for allocation.	Live	Currently tuned to a service and in use for viewing the live TV channel.	Record	Currently tuned to a service and recording a program.	Hybrid	Live view of recording in progress.	EAS	Emergency Alert <a href="#">Service</a> .
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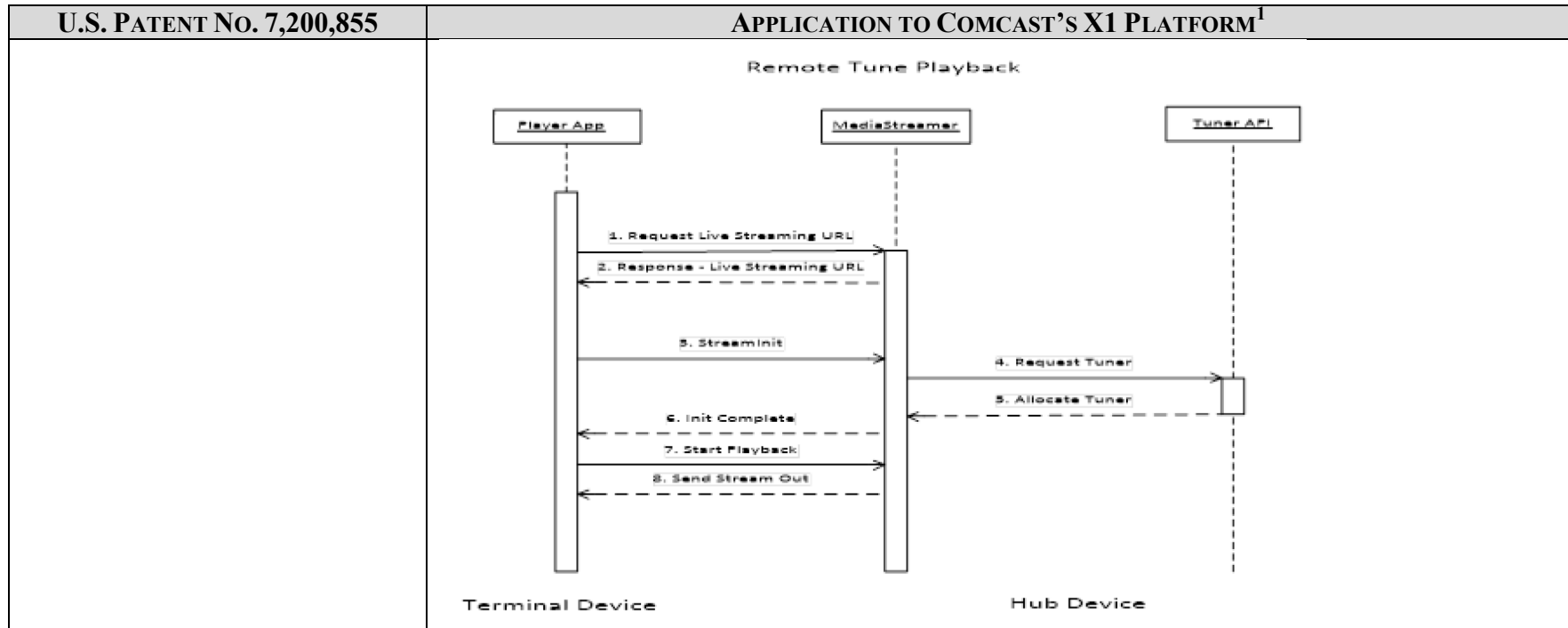




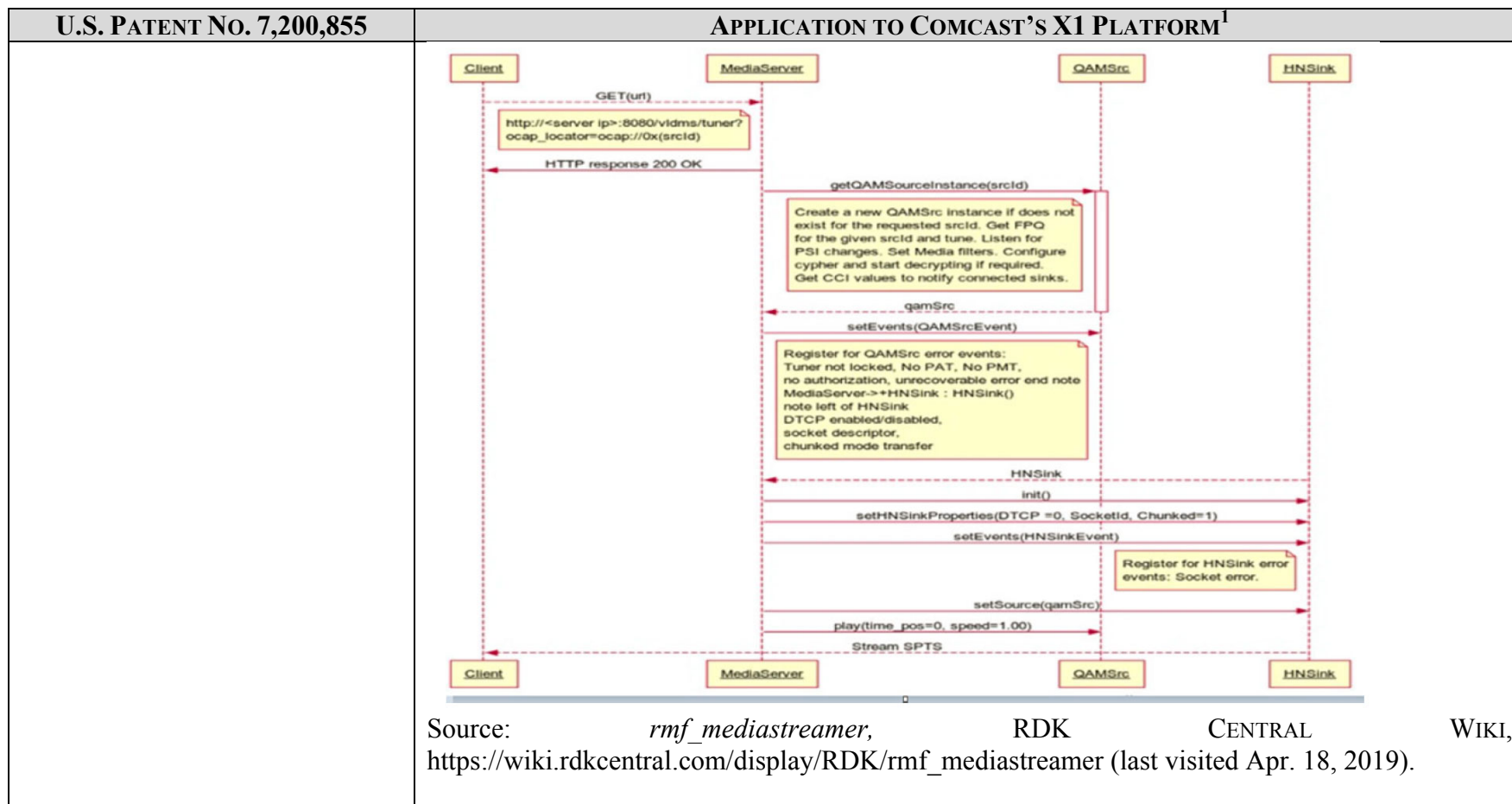
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**CLAIM CHART FOR INFRINGEMENT OF REPRESENTATIVE INDEPENDENT CLAIMS 1, 18, 28, 37, AND 53**

U.S. PATENT NO. 7,200,855	APPLICATION TO COMCAST'S X1 PLATFORM <sup>1</sup>
	<p>Source: <i>TRM</i>, RDK CENTRAL WIKI, <a href="https://wiki.rdkcentral.com/display/RDK/TRM">https://wiki.rdkcentral.com/display/RDK/TRM</a> (last visited Apr. 18, 2019).</p> <p>As another example, Comcast's X1 Platform gateway set-top boxes, including the XG1 and XG2 set-top boxes, receive channel selection requests for streaming video from client set-top boxes, including XiD, Xi5, and Xi6 set-top boxes.</p> <p><b>Overview</b></p> <p>Media Streamer is a resident of gateway devices and it is responsible for streaming content from all supported sources to the local sinks (local video/audio sink devices) and the HN sink (for remote streaming via DLNA or other remote streaming protocol)</p> <p>Media Streamer provides public interfaces to do service selection, tuner reservation etc. Internally it determines what kind of pipeline need to be created, which Media Framework components need to be created to accomplish the task. For example if service selection is coming from Media Player process on a Gateway device for a QAM service, Media Server is responsible for creating a instance of Media Source (QAM) and Local Sink. It then programs media source and media sink and initialize them. Initialization takes care of pipeline creation. Programming source means setting service locator, tuner token (for QAM) and other properties needed by source to initialize the source device.</p> <p>Media Server is an application responsible for following operations</p> <ul style="list-style-type: none"> <li>• Stream Live, Recorded, VOD and IP contents to remote DLNA and non-DLNA compatible client devices in Home Network</li> <li>• Publishes as a OCAP-HN device in home network for DLNA compatible devices</li> <li>• Publish recorded contents for DLNA devices</li> <li>• Starts HTTP Server for listening streaming request from client devices on port 8080</li> <li>• Parse HTTP request header and url</li> <li>• Create source properties and sink properties from HTTP header and url</li> <li>• Connect Source &amp; Sink RMF elements and stream the content to client device</li> <li>• Handle events from the RMF elements and manage sessions</li> <li>• Handle streaming request from multiple client devices simultaneously</li> </ul>

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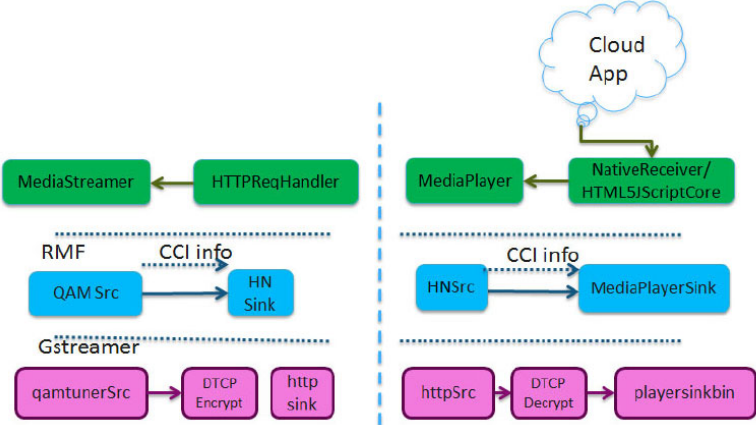
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	<p><b>RDK-V Use Cases</b></p> <p>Created by Pradeepta Kumar Das, last modified on Dec 22, 2017</p> <p>All streaming will be done by the Media Streamer in the Gateway (Hybrid) device. The RMF source element in the Client box will receive the data and do the processing.</p> <p><b>Use case for live streaming</b></p> <p>Here all the data is streamed from the media streamer through Home networking sink. HNSrc in the Client will receive the data from HNSink and playback using the RMF pipeline.</p> <div data-bbox="667 574 1423 737"> <pre> graph LR     subgraph Media_Server [Media Server]         QAM_Source[QAM Source] --&gt; HN_Sink[HN Sink]     end     subgraph Media_Client [Media Client]         HN_Source[HN Source] --&gt; Media_Player_Sink[Media Player Sink]     end     HN_Sink &lt;--&gt;  IP  HN_Source             </pre> </div> <ul style="list-style-type: none"> <li>• Here SPTS (Single Program Transport Stream) data is streamed from the media streamer through Home networking sink. HN Src in the Client device will receive the data from HN sink and playback using the RMF pipeline.</li> <li>• After receiving the request URI, the media server creates an RMFQAM source element and HN Sink element. RMFQAM source tunes to a particular program, starts pumping clear SPTS stream.</li> <li>• Media Server connects the QAM Source to the HN Sink. HN Source receives the media at the client side for play out.</li> <li>• In the case of encrypted media play out, the stream data is decrypted using the POD manager which is invoked by the QAM source. QAM Source sends the clear SPTS to the HN Sink.</li> <li>• Media server registers to get events from QAM Source. Through the event mechanism QAM Source will send user authorization related information to the Media Server and the Media Server sends this information to client device.</li> <li>• DTCP encryption and decryption are used for protecting contents over network.</li> </ul>

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	 <p>Source: <i>RDk-V Use Cases</i>, RDk CENTRAL WIKI, <a href="https://wiki.rdkcentral.com/display/RDK/RDK-V+Use+Cases">https://wiki.rdkcentral.com/display/RDK/RDK-V+Use+Cases</a> (last visited Apr. 18, 2019).</p> <p>Comcast's X1 Platform set-top boxes are MoCA, WiFi, and/or Ethernet interoperable. On information and belief, Comcast's X1 Platform set-top boxes are MoCA, WiFi, and/or Ethernet interoperable as shown by the fact that these products communicate with each other using at least one of the MoCA, WiFi, and/or Ethernet protocol via the coaxial cable connections, WiFi modems, and/or via their Ethernet ports. <i>See AnyRoom DVR - What it is and How it Works</i>, Xfinity, <a href="https://www.xfinity.com/support/articles/using-anyroom-dvr">https://www.xfinity.com/support/articles/using-anyroom-dvr</a> (last visited Apr. 18, 2019); <i>See also Deploying Enhanced Media Services with MoCA</i>, SCTE IMPLICATION PAPER, <a href="http://www.mocalliance.org/marketing/whitepapers/Branded_Implication_Paper_MoCA.pdf">http://www.mocalliance.org/marketing/whitepapers/Branded_Implication_Paper_MoCA.pdf</a> (last visited Apr. 18, 2019) (explaining that "The primary goal of MoCA is to develop a high-performance, high-capacity home networking technology suitable for transporting multiple streams of high-definition multimedia content that leverages existing residential coaxial cabling and coexists with the services currently using the cable plant.").</p>

## CLAIM CHART FOR INFRINGEMENT OF REPRESENTATIVE INDEPENDENT CLAIMS 1, 18, 28, 37, AND 53

**U.S. PATENT NO. 7,200,855**

**APPLICATION TO COMCAST'S X1 PLATFORM<sup>1</sup>**

**REAR PANEL**

**CABLE IN**  
From cable service-provider

**CABLE OUT**  
RF output to TV (or VCR)

**ETHERNET**  
For connection to a home network

**AUDIO OUT**  
Audio outputs (stereo, L and R)

**SD VIDEO OUT**  
Composite video output for SDTV

**HDMI OUT**  
HDMI video and audio output

**POWER**  
(Make this connection last of all)

**DIGITAL AUDIO OUT**  
Optical S/PDIF audio output

**HDMI IN**  
HDMI<sup>®</sup> video and audio input




**eSATA**  
For connection to an optional external hard disk

**CableCARD™ module**  
(behind cover) Removal will interrupt your service

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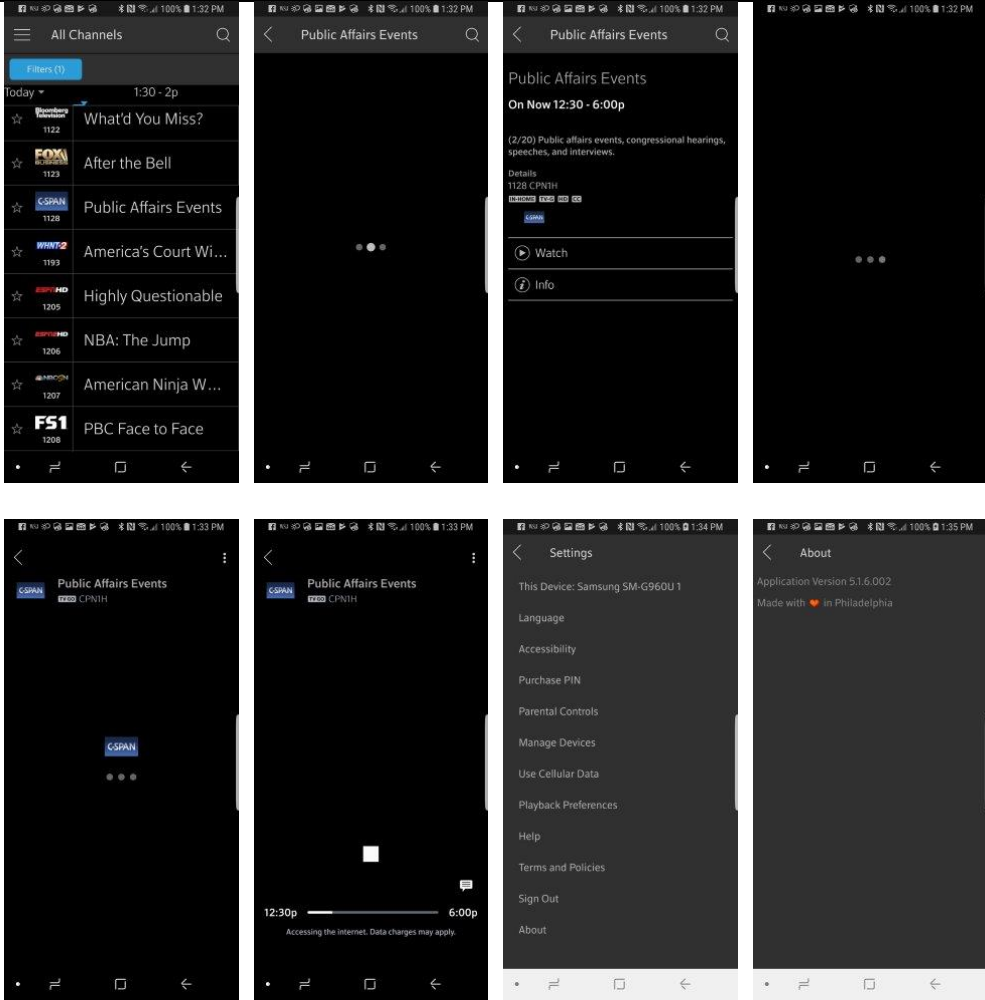
U.S. PATENT NO. 7,200,855	APPLICATION TO COMCAST'S X1 PLATFORM <sup>1</sup>
	 <p>1  CC S/N: CCSN12345678</p> <p>2  CC UA: 001-23456-78901-200</p> <p>3  Serial No: PAD200000001</p> <p>4  eSTB MAC: 12:34:56:78:90:12</p> <p>5  DOCSIS MAC: 11:22:33:44:55:66</p>

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U.S. PATENT NO. 7,200,855	APPLICATION TO COMCAST'S X1 PLATFORM <sup>1</sup>																								
	<table border="0"> <tr> <td><b>CABLE IN</b></td><td>Connect the cable service here.</td></tr> <tr> <td><b>CABLE OUT</b></td><td>Connect to the RF/antenna input on your TV or VCR (optional).</td></tr> <tr> <td><b>ETHERNET</b></td><td>Connect your set-top box into an Ethernet home network (optional).</td></tr> <tr> <td><b>AUDIO OUT</b></td><td>Connect to the L and R audio inputs on your stereo TV, stereo VCR, or optional stereo amplifier.</td></tr> <tr> <td><b>SD VIDEO OUT</b></td><td>Connect to the composite video input on your VCR (or a standard TV).</td></tr> <tr> <td><b>DIGITAL AUDIO OUT</b></td><td>Connect to the <b>optical</b> digital audio input on optional digital audio equipment, such as an audio decoder or home theater receiver.</td></tr> <tr> <td><b>HDMI OUT</b></td><td>Connect to the HDMI input on your HDTV.</td></tr> <tr> <td><b>HDMI IN</b></td><td>Connect another optional HDMI device (allowing the device's output to loop through the set-top box to the TV).</td></tr> <tr> <td><b>eSATA</b></td><td>Connect an optional external hard disk.</td></tr> <tr> <td> <b>USB</b></td><td>Connect to compatible optional equipment that supports a USB 2.0 interface.</td></tr> <tr> <td><b>Power</b></td><td>Connect your set-top box's power supply unit here. <b>Make this connection last of all.</b></td></tr> <tr> <td><b>CableCARD module</b></td><td>Removal will interrupt your service.</td></tr> </table> <p>Source: <i>Pace PX013ANX [Comcast XG1] User Guide</i>, at 3, available at <a href="https://fccid.io/NQ8PX013ANM/User-Manual/User-manual-2251584">https://fccid.io/NQ8PX013ANM/User-Manual/User-manual-2251584</a> (last visited Apr. 18, 2019).</p> <p>Comcast's X1 Platform, in certain circumstances and for particular types of content, may also receive a plurality of channel selection requests in the headend from a plurality of gateway and client set-top boxes as they request cloud DVR programs, on demand programs, and/or Internet services and also from a plurality of mobile devices and computers using Xfinity Stream web portals or apps. The headend systems and processes are depicted in figures above as the "Cloud," "Cloud App," "Scheduler," and "Guide Server."</p> <p>The Comcast Xfinity Stream app is used on mobile devices and computers by users to send channel selection requests to the Comcast headend.</p> <p>For example, the screenshots below depict selection of C-SPAN for live TV viewing from Orange County, California using a Comcast account addressed in Madison County, Alabama. These screenshots were taken on Feb. 20, 2019, using the Xfinity Stream App on a Samsung Galaxy S9 Android phone.</p>	<b>CABLE IN</b>	Connect the cable service here.	<b>CABLE OUT</b>	Connect to the RF/antenna input on your TV or VCR (optional).	<b>ETHERNET</b>	Connect your set-top box into an Ethernet home network (optional).	<b>AUDIO OUT</b>	Connect to the L and R audio inputs on your stereo TV, stereo VCR, or optional stereo amplifier.	<b>SD VIDEO OUT</b>	Connect to the composite video input on your VCR (or a standard TV).	<b>DIGITAL AUDIO OUT</b>	Connect to the <b>optical</b> digital audio input on optional digital audio equipment, such as an audio decoder or home theater receiver.	<b>HDMI OUT</b>	Connect to the HDMI input on your HDTV.	<b>HDMI IN</b>	Connect another optional HDMI device (allowing the device's output to loop through the set-top box to the TV).	<b>eSATA</b>	Connect an optional external hard disk.	 <b>USB</b>	Connect to compatible optional equipment that supports a USB 2.0 interface.	<b>Power</b>	Connect your set-top box's power supply unit here. <b>Make this connection last of all.</b>	<b>CableCARD module</b>	Removal will interrupt your service.
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	 <p>Source: Screenshots of the Xfinity Stream App (showing: 1) “All channels” guide, 2) after selecting channel, 3) information screen, 4) after selecting watch, 5) waiting, 6) selected channel begins to air (copy protection precluded shots of video), 7) Setting shows phone model number, 8) About screen shows Xfinity Stream app version and “Made with [love] in Philadelphia”).</p>

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<p>[d] processing the plurality of channel selection requests to produce the plurality of channel selection commands, wherein the each of the plurality of channel selection commands includes at least one of: last channel selection command, next channel selection command, previous channel selection command, favorite channel selection command, and select channel from user define list;</p>	<p>Comcast's X1 Platform processes the plurality of channel selection requests to produce the plurality of channel selection commands, wherein the each of the plurality of channel selection commands includes at least one of: last channel selection command, next channel selection command, previous channel selection command, favorite channel selection command, and select channel from user define list.</p> <p>For example, Comcast's X1 Platform includes set-top boxes such as XiD, Xi5, and Xi6 devices that process the received channel selection requests with internal processors. In addition, Comcast's X1 Platform gateway set-top boxes, including the XG1v4 set-top box, contain processors that also may, at least in part, process the plurality of channel selection requests.</p> <p><b>About the XG1</b> The ARRIS XG1 is the next-generation gateway behind the Comcast X1 experience. It's designed to be the hub of the new IP-connected home, combining powerful hardware and software to deliver multiscreen, DVR, cool apps, and more, while reducing energy use and maintenance. These features are becoming increasingly relevant in the face of new global media consumption trends.</p> <p>Source: <i>ARRIS XG1 Gateway to Deliver Comcast X1 Experience</i>, CISTON PR NEWSWIRE (Jun. 10, 2013), <a href="https://www.prnewswire.com/news-releases/arris-xg1-gateway-to-deliver-comcast-x1-experience-210864921.html">https://www.prnewswire.com/news-releases/arris-xg1-gateway-to-deliver-comcast-x1-experience-210864921.html</a> (last visited Apr. 23, 2019).</p> <p><u>Device Specifications:</u></p> <p>Manufacturer: Arris  Model Number: AX014ANM; AX014ANG  Device Type: Digital Video Recorder  Device Dimensions: 10.63 in W x 6.34 in D x 1.18 in H</p> <div style="display: flex; justify-content: space-around; align-items: center;">   </div> <div style="display: flex; justify-content: space-around; margin-top: 5px;"> <span>Front</span> <span>Rear</span> </div>

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	<p>Source: <i>Xfinity 4k - XG1v4 Cable Box Availability</i>, XFINITY COMMUNITY FORUM, <a href="http://forums.xfinity.com/t5/X1/XG1v4-TV-Box/td-p/2907630">http://forums.xfinity.com/t5/X1/XG1v4-TV-Box/td-p/2907630</a> (last visited Apr. 18, 2019); <i>see also ACQ XG1v4</i>, FCC, <a href="https://fccid.io/ACQ-XG1V4/Internal-Photos/Internal-Photos-3375529.pdf">https://fccid.io/ACQ-XG1V4/Internal-Photos/Internal-Photos-3375529.pdf</a> (last visited Apr. 18, 2019).</p> <p>In the case of the Xi5 or Xi6, the local network may include, for example, an XB6 between the X1 gateway set-top box and the Xi5 or Xi6 set-top box. The Arris TG3482G (i.e., XB6 Wireless Gateway) broadband gateway includes a processing module that also may process channel selection requests.</p>

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	<div data-bbox="655 285 1623 1089"> <p>The Device is currently in Bridge Mode.</p> <p><b>xfinity</b> <span>Hi admin • <a href="#">Logout</a> • <a href="#">Change Password</a></span></p> <p>0% <span>Internet</span> <span>Wi-Fi</span> <span>MoCA</span> <span>Low Security</span></p> <div> <div> Gateway At a Glance Connection Software Hardware System Hardware Battery LAN Wireless Connected Devices Advanced Troubleshooting </div> <div> <h3>Gateway &gt; Hardware &gt; System Hardware</h3> <p>View information about the Gateway's hardware. <a href="#">more</a></p> <div> <div>System Hardware</div> <div>Model: TG3482G</div> <div>Vendor: ARRIS Group, Inc.</div> <div>Hardware Revision: 9</div> <div>Serial Number: <span></span></div> <div>Processor Speed: 3999.70 MHz</div> <div>DRAM Total Memory: 670 MB</div> <div>DRAM Used Memory: 375 MB</div> <div>DRAM Available Memory: 295 MB</div> <div>Flash Total Memory: 467 MB</div> <div>Flash Used Memory: 429 MB</div> <div>Flash Available Memory: 38 MB</div> </div> </div> </div> <p>Xfinity.com • customerCentral • User Guide</p> </div> <p>Source: <i>Bridge mode on Arris TG3482G</i>, XFINITY COMMUNITY FORUM, <a href="https://forums.xfinity.com/t5/Your-Home-Network/Bridge-mode-on-Arris-TG3482G/td-p/2900827">https://forums.xfinity.com/t5/Your-Home-Network/Bridge-mode-on-Arris-TG3482G/td-p/2900827</a> (last visited Apr. 18, 2019).</p> <p>Comcast's X1 Platform, in certain circumstances for certain types of content, also includes backend servers that may process channel selection requests.</p> <p>Comcast's X1 Platform as described above processes the channel selection requests from the clients to produce channel and/or streaming video selection commands each including at least one</p>

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of: last channel selection command, next channel selection command, previous channel selection command, favorite channel selection command, and select channel from user define list. These commands are used to tune the tuners in the gateway set-top boxes. These set-top boxes, including the XG1 and XG2 set-top boxes, contain tuners and ultimately receive channel and/or streaming video selection commands produced by the processing of the channel selection requests.

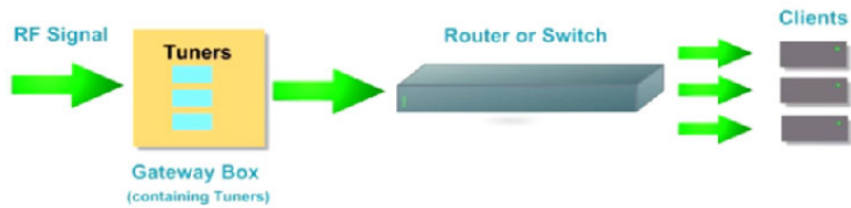
Feature Comparison

Feature	XG1	XG1v4	XG2	RNG150N
DVR	Yes	Yes	No	No
Tuners	Up to 6*	6	4	1
Pause and Rewind Live TV	Yes, up to 60 minutes	Yes, up to 60 minutes	Yes, up to 25 minutes	No
Pause and Rewind Xfinity On Demand	Yes	Yes	Yes	Yes
Supports AnyRoom DVR	Yes	Yes	Yes	Yes
Schedule and Manage DVR Recordings	Yes	Yes	Yes	Yes
RF Remote Control Functionality	Yes	Yes	Yes	No
X1 Voice Remote Support	Yes	Yes	Yes	No
X1 Apps	Yes	Yes	Yes	Yes (Internet apps not supported)
Front Panel Clock	Yes	No	No	No
Device Light Dimming	Yes	Yes	Yes	No
HDMI Connector	Yes	Yes	Yes	Yes
Digital Audio (Optical) Connector	Yes	No	Yes	Yes
Component Video	Yes (Pace XG1v1 only)	No	No	Yes
Composite Video	Yes	No	Yes	Yes
RF Out	Yes	Yes	Yes	Yes
Supports Ultra HD 4K Netflix Content (Requires compatible Netflix plan)	No	Yes	No	No
Supports 4K YouTube Content	No	Yes	No	No

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	Feature	Xi3 (HDMI Only)	XiD (HD and SD)	Xi5 (Wireless)	Xi6 (Wireless)
	DVR	No	No	No	No
	Tuners	None	None	None	None
	Pause and Rewind Live TV	Yes, up to 25 minutes	Yes, up to 25 minutes	Yes, up to 25 minutes	Yes, up to 25 minutes
	Pause and Rewind Xfinity On Demand	Yes	Yes	Yes	Yes
	Supports AnyRoom DVR	Yes	Yes	Yes	Yes
	Schedule and Manage DVR Recordings	Yes	Yes	Yes	Yes
	RF Remote Control Functionality	Yes	Yes	Yes	Yes
	X1 Voice Remote Support	Yes	Yes	Yes	Yes
	X1 Apps	Yes	Yes	Yes	Yes
	Front Panel Clock	No	No	No	No
	Device Light Dimming	Yes	Yes	Yes	Yes
	HDMI Connector	Yes	Yes	Yes	Yes
	Digital Audio (Optical) Connector	No	No	No	No
	Component Video	No	No	No	No
	Composite Video	No	No	No	No
	RF Out	No	Yes	No	No
	Supports Ultra HD 4K Netflix Content (Requires compatible Netflix plan)	No	No	No	Yes
	Supports 4K YouTube Content	No	No	No	Yes
	Source: <i>X1 TV Box Comparison – DVR vs. Non-DVR</i> , XFINITY, <a href="https://www.xfinity.com/support/articles/x1-hub-vs-companion-box">https://www.xfinity.com/support/articles/x1-hub-vs-companion-box</a> (last visited Apr. 18, 2019).				

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**CLAIM CHART FOR INFRINGEMENT OF REPRESENTATIVE INDEPENDENT CLAIMS 1, 18, 28, 37, AND 53**


U.S. PATENT NO. 7,200,855	APPLICATION TO COMCAST'S X1 PLATFORM <sup>1</sup>												
	<p><b>TRM</b></p> <p>Created by Pradeepta Kumar Das, last modified by Lakshmi Priya P on Jan 23, 2019</p> <p><b>Summary</b></p> <p>Tuner Reservation Manager (TRM) coordinates the usage of tuners on the device for the connected clients on Gateway device and it is specific to Gateway devices only. TRM uses messages for communicating between Gateway and Client device to reserve, cancel, status retrieval, etc.</p>  <pre> graph LR     RF[RF Signal] --&gt; Gateway[Gateway Box&lt;br/&gt;(containing Tuners)]     Gateway --&gt; Router[Router or Switch]     Router --&gt; Clients[Clients]   </pre> <ul style="list-style-type: none"> <li>• The Gateway box contains multiple tuners (example, Gateway box having 6 tuner connected to it)</li> <li>• The Gateway box connected with the incoming RF signal and it is also connected to client boxes through the MOCA/Router devices.</li> <li>• TRM application runs on a gateway device and coordinates the usage of tuners on the device for its connecting clients based on the types of the request.</li> <li>• Reserve a tuner for specified usage (Live playback, Record, Hybrid, or EAS), start time, end time and content (locator).</li> <li>• Detect conflicts with existing tuner reservations and resolve.</li> </ul> <p><b>How TRM works</b></p> <p>Client requests a tuner through URL(http, dvr, live), TRM server receives the request and checks for the valid reservation and reserves the tuner so that the client is provided with the service requested. Client also can extend or delete the reservation. It is also possible for a client to request a list of the active reservations.</p> <p>Usually Xg1 boxes have multiple tuners (in Xg1v3 box has 6 tuners (configurable)) &amp; each tuners can have following states:</p> <table border="1" data-bbox="667 1015 1260 1234"> <thead> <tr> <th>State</th><th>Meaning</th></tr> </thead> <tbody> <tr> <td>Free</td><td>The <a href="#">Tuner</a> is available for allocation.</td></tr> <tr> <td>Live</td><td>Currently tuned to a service and in use for viewing the live TV channel.</td></tr> <tr> <td>Record</td><td>Currently tuned to a service and recording a program.</td></tr> <tr> <td>Hybrid</td><td>Live view of recording in progress.</td></tr> <tr> <td>EAS</td><td>Emergency Alert <a href="#">Service</a>.</td></tr> </tbody> </table> <p><b>TRM Consumer</b></p> <p>This diagram depicts the different element interact with TRM.</p>	State	Meaning	Free	The <a href="#">Tuner</a> is available for allocation.	Live	Currently tuned to a service and in use for viewing the live TV channel.	Record	Currently tuned to a service and recording a program.	Hybrid	Live view of recording in progress.	EAS	Emergency Alert <a href="#">Service</a> .
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	<div data-bbox="667 354 1549 755" data-label="Diagram"> <pre> graph LR     subgraph IP_Client [IP Client]         UA[User Agent]     end     subgraph Gateway         TRM[TRM]         subgraph Recorder_Browser_Agent [Recorder / Browser / Agent]             Recorder[Recorder]             Browser_Agent[Browser / Agent]         end     end     subgraph Scheduler_Cloud ([Scheduler])     end     subgraph Guide_Server_Cloud ([Guide Server])     end      UA &lt;--&gt; TRM     TRM &lt;--&gt; Recorder     TRM &lt;--&gt; Browser_Agent     Recorder &lt;--&gt; Scheduler_Cloud     Browser_Agent &lt;--&gt; Guide_Server_Cloud     UA &lt;--&gt; Guide_Server_Cloud     </pre> <p>The diagram illustrates the X1 Platform architecture. It features an IP Client (containing a User Agent) connected to a Gateway (containing TRM, Recorder, and Browser/Agent). The Gateway is connected to a Scheduler and a Guide Server. The User Agent is also connected to the Guide Server. The Recorder is connected to the Scheduler. The Browser/Agent is connected to the Guide Server.</p> </div> <div data-bbox="695 805 1514 909" data-label="List-Group"> <ul style="list-style-type: none"> <li>• The Guide server represent the primary user interface for end user.</li> <li>• The user agent and the browser agents represents the local application acts as a client to the guide server.</li> <li>• In case of html 5 application, the Browser/Agent would be web browser.</li> <li>• The Recorder is an RDK component, it maintain a list of Active, Completed and Schedule of recording.</li> <li>• The Scheduler is responsible for communicating with TRM for scheduling the recording (start, stop, pause).</li> </ul> </div> <div data-bbox="653 933 1911 1006" data-label="Text"> <p>Source: <i>TRM</i>, RDK CENTRAL WIKI, <a href="https://wiki.rdkcentral.com/display/RDK/TRM">https://wiki.rdkcentral.com/display/RDK/TRM</a> (last visited Apr. 18, 2019).</p> </div> <div data-bbox="653 1042 1911 1187" data-label="Text"> <p>The figure above depicts the IP Client (in the client set-top box) to Guide Server connection from the application layer viewpoint, as the actual connection takes place through the gateway set-top box using the client's home network connection to the gateway and the gateway's DOCSIS connection to the Guide Server.</p> </div> <div data-bbox="653 1224 1911 1369" data-label="Text"> <p>The X1 user interface, or Xfinity Guide, is generated and controlled using a combination of "agents" (sometimes referred to as "native receivers," or just "receiver") in the gateway and client set-top boxes along with a "guide server" (sometimes referred to as "XRE server") in the X1 Cloud.</p> </div>



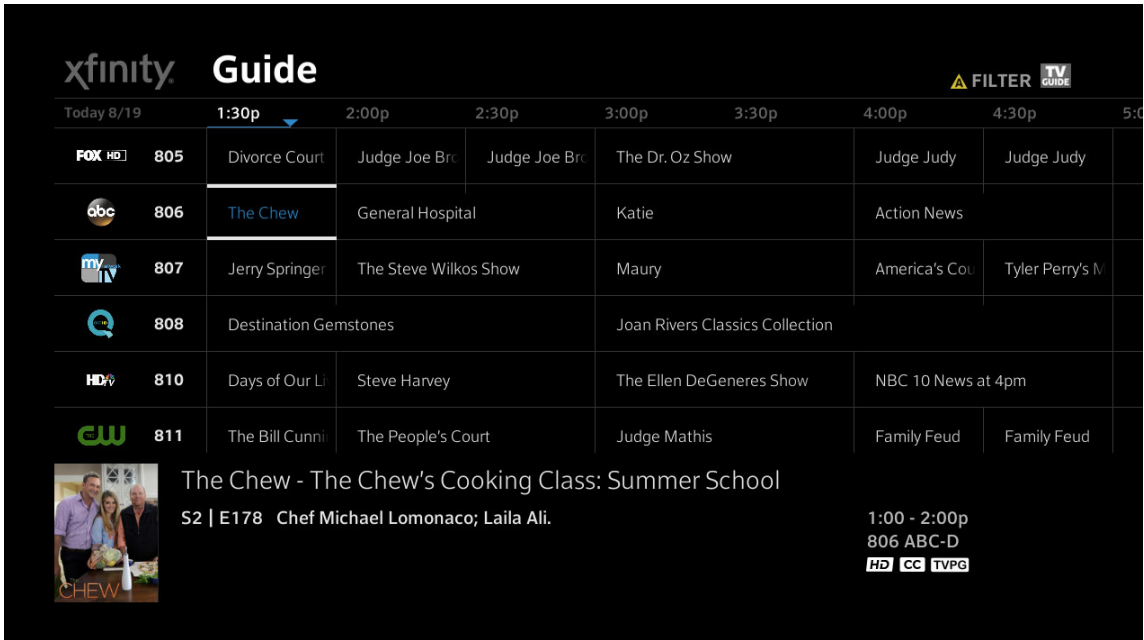
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	 <p>The screenshot displays the 'About XFINITY TV' interface. At the top, it shows 'Remote Battery Level' at 100%. Below this, a list of system details is provided:</p> <ul style="list-style-type: none"> <li>Release Version: xappl-XRE.78P7</li> <li>XRE Server Version: 1.78.07 09/05/2017 16:07</li> <li>XRE Protocol Version: 2.8.0</li> <li>Receiver: Native version: 2.12.0</li> <li>STB Timestamp: Fri Aug 25 04:35:11 2017</li> <li>eCM MAC: CC:65:AD:C6:C6:9B</li> <li>STB Version: MX011AN_2.12p4s1_PROD_sey</li> <li>Device ID: 990209507664641809</li> <li>Device Name: DVR Den</li> <li>Environment: aw-et</li> </ul> <p>At the bottom, there is a red heart icon followed by the text 'Made with love in Philadelphia'.</p> <p>Source: <i>Cable Box stuck in "Booting"...again</i>, XFINITY COMMUNITY FORUM (Oct. 24, 2017), <a href="https://forums.xfinity.com/t5/X1/Cable-Box-stuck-in-quot-Booting-quot-again/td-p/2987640">https://forums.xfinity.com/t5/X1/Cable-Box-stuck-in-quot-Booting-quot-again/td-p/2987640</a> (last visited Apr. 23, 2019).</p> <p>For example, the XG1v4 includes a DOCSIS 2.1+ cable modem that provides DOCSIS set-top Gateway (DSG) capabilities.</p>

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	<p data-bbox="657 285 1230 313"><b>3.4 Product description and theory of operation</b></p> <hr/> <p data-bbox="657 354 1877 483">The Arris XG1v4 is an IP Video Gateway (next-gen, set-top technology) with 4K video capability. It is a 4K set-top with multiple 1 GHz tuners that support both MPEG-2 and MPEG-4 AVC services. The all-digital XG1v4 includes the latest audio and video output interfaces, including 4K HDMI video, Award-winning Dolby Digital Plus audio and Dolby Volume Leveling. With the included MoCA home networking, the XG1v4 provides the flexibility to serve as a multimedia client for accessing content from other compatible devices at home. An embedded DOCSIS 2.0+ cable modem provides support for DSG and downstream channel bonding.</p> <p data-bbox="657 505 1906 573">Source: <i>XG1v4 Set-Top Box Test Report ARRIS Group, Inc.</i>, FCC, <a href="https://fccid.io/ACQ-XG1V4/Test-Report/Test-Report-3375616">https://fccid.io/ACQ-XG1V4/Test-Report/Test-Report-3375616</a> (last visited Apr. 18, 2019).</p> <p data-bbox="657 613 1906 682">The embedded DOCSIS cable modem in each X1 gateway set-top box provides access to the Guide Server, among other connections in the X1 Cloud and beyond.</p> <p data-bbox="657 722 1843 803">The intended service will allow transparent uni-directional and bi-directional transport of Out-Of-Band messaging over Internet Protocol (IP), between the cable system headend and customer locations, over an all-coaxial or hybrid-fiber/coax (HFC) cable network. This is shown in simplified form in Figure 1-1.</p> <div data-bbox="711 821 1793 1114"> <pre> graph LR     A[Set-top Controller] --&gt; B((Regional or Wide Area IP Network))     B --&gt; C[Cable Modem Termination System CMTS]     C --&gt; D((Cable Network))     D --&gt; E[Set-top Device with an Embedded Cable Modem]     A &lt;--&gt; E   </pre> </div> <p data-bbox="919 1133 1591 1157"><b>Figure 1-1 - Transparent Out-Of-Band Messaging Via DOCSIS</b></p> <p data-bbox="657 1222 1852 1360">The transmission path over the cable system is realized at the headend by a Set-top Controller that is responsible for managing the Set-top Devices, a regional or wide area IP network connecting the Set-top Controller to the Cable Modem Termination System (CMTS), and, at each customer location, a Set-top Device with an embedded Cable Modem. At the headend (or hub), the interface to the data-over-cable system is called the Cable Modem Termination System - Network-Side Interface [DOCSIS-CMTS-NSI].</p> <hr/> <p data-bbox="657 1382 1486 1411">Source: <i>DOCSIS Set-top Gateway (DSG) Interface Specification</i>.</p>

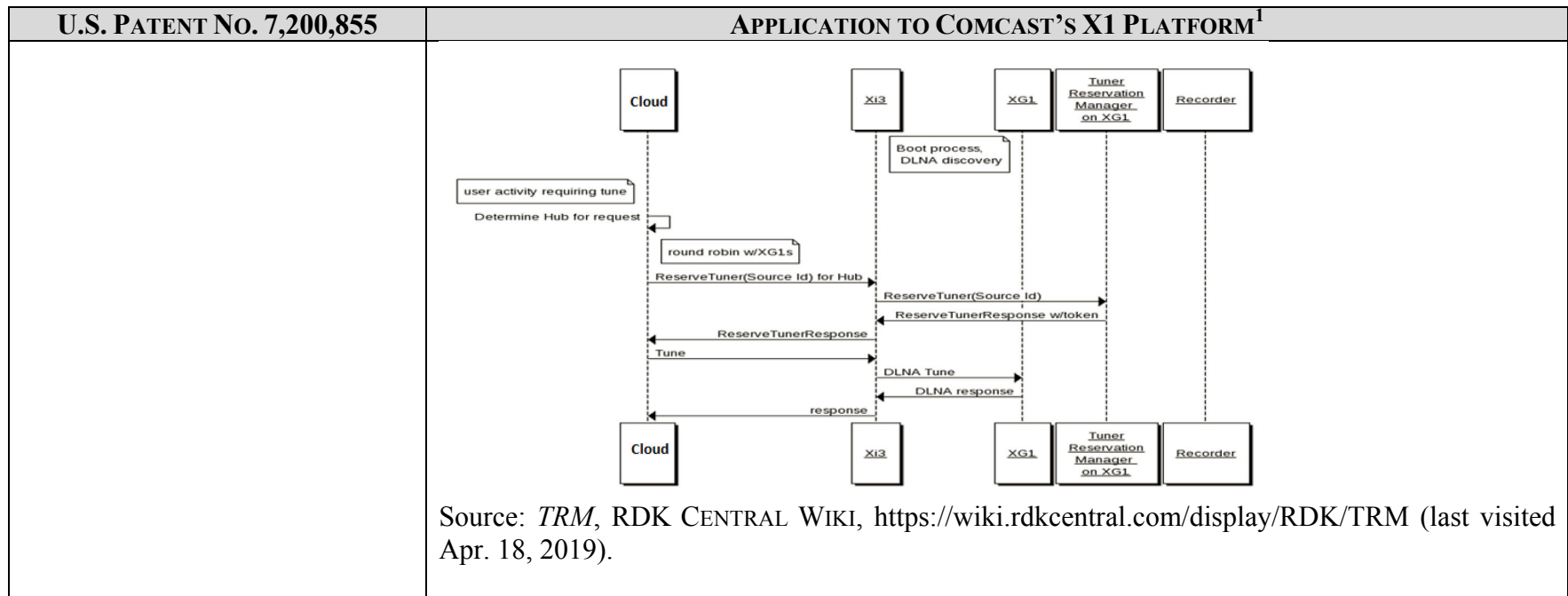
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	<p data-bbox="655 284 1906 354"><i>CM-SP-DSG-125-170906</i>, CABLELABS, <a href="https://specification-search.cablelabs.com/CM-SP-DSG">https://specification-search.cablelabs.com/CM-SP-DSG</a> (last visited Apr. 18, 2019).</p> <p data-bbox="655 391 1906 537">Comcast's X1 Platform provides access to TV and movies on demand over the DOCSIS network connection. The Guide Server along with the agent in each set-top box work together to generate user interface displays for the users such as the examples shown below. These include various ways to navigate channels, including favorites, just recorded and recently watched.</p> <div data-bbox="655 570 1791 1206">  <p>The screenshot shows the Xfinity Guide interface. At the top, it says 'xfinity Guide' with a 'FILTER' button and a 'TV GUIDE' icon. Below this is a timeline for 'Today 8/19' with time slots from 1:30p to 5:00p. The main part of the screen is a grid of TV channels and their programs. The channels listed are FOX HD 805, abc 806, my 807, Q 808, HD 810, and CW 811. The programs listed include 'Divorce Court', 'Judge Joe Brown', 'The Dr. Oz Show', 'Judge Judy', 'The Chew', 'General Hospital', 'Katie', 'Action News', 'Jerry Springer', 'The Steve Wilkos Show', 'Maury', 'America's Court', 'Tyler Perry's Mom', 'Destination Gemstones', 'Joan Rivers Classics Collection', 'Days of Our Lives', 'Steve Harvey', 'The Ellen DeGeneres Show', 'NBC 10 News at 4pm', 'The Bill Cunningham', 'The People's Court', 'Judge Mathis', 'Family Feud', and 'The Chew'. A detailed view of 'The Chew' is shown at the bottom, including a photo of the hosts and the text 'The Chew - The Chew's Cooking Class: Summer School', 'S2   E178 Chef Michael Lomonaco; Laila Ali.', and the time '1:00 - 2:00p' on '806 ABC-D' with 'HD CC TVPG' ratings.</p> </div> <p data-bbox="655 1211 1906 1281">Source: <i>X1 Overview and Use Guide</i>, XFINITY, <a href="https://www.xfinity.com/support/articles/xfinity-tv-on-the-x1-platform">https://www.xfinity.com/support/articles/xfinity-tv-on-the-x1-platform</a> (last visited Apr. 18, 2019).</p>

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	<div data-bbox="699 318 1749 930" data-label="Image"> </div> <p data-bbox="657 971 1919 1040">Source: <i>Xfinity Equipment</i>, XFINITY, <a href="https://www.xfinity.com/learn/digital-cable-tv/x1/equipment">https://www.xfinity.com/learn/digital-cable-tv/x1/equipment</a> (last visited Apr. 18, 2019).</p> <p data-bbox="657 1081 1919 1187">The guide interaction of the user may lead to a “user activity requiring tune” as shown in the figure below that leads to a sequence of controls between the cloud, client set-top box, and gateway set-top box.</p>

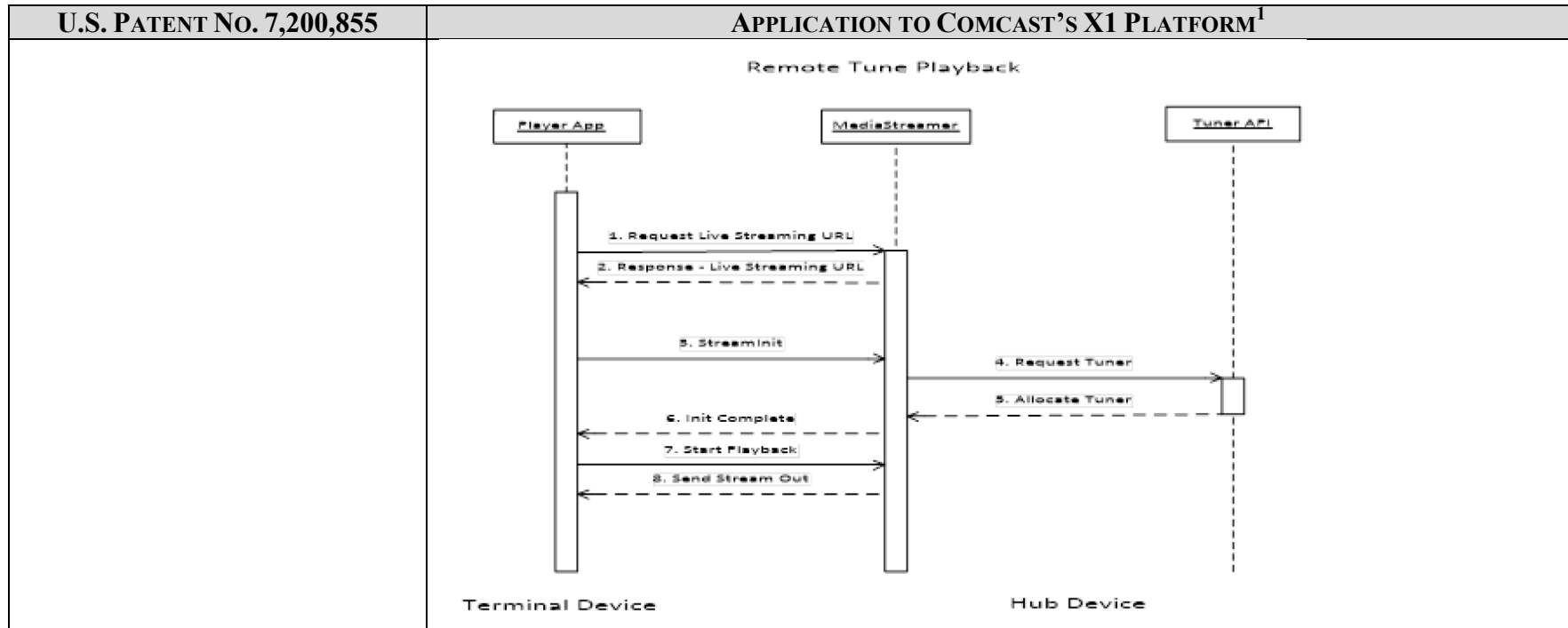
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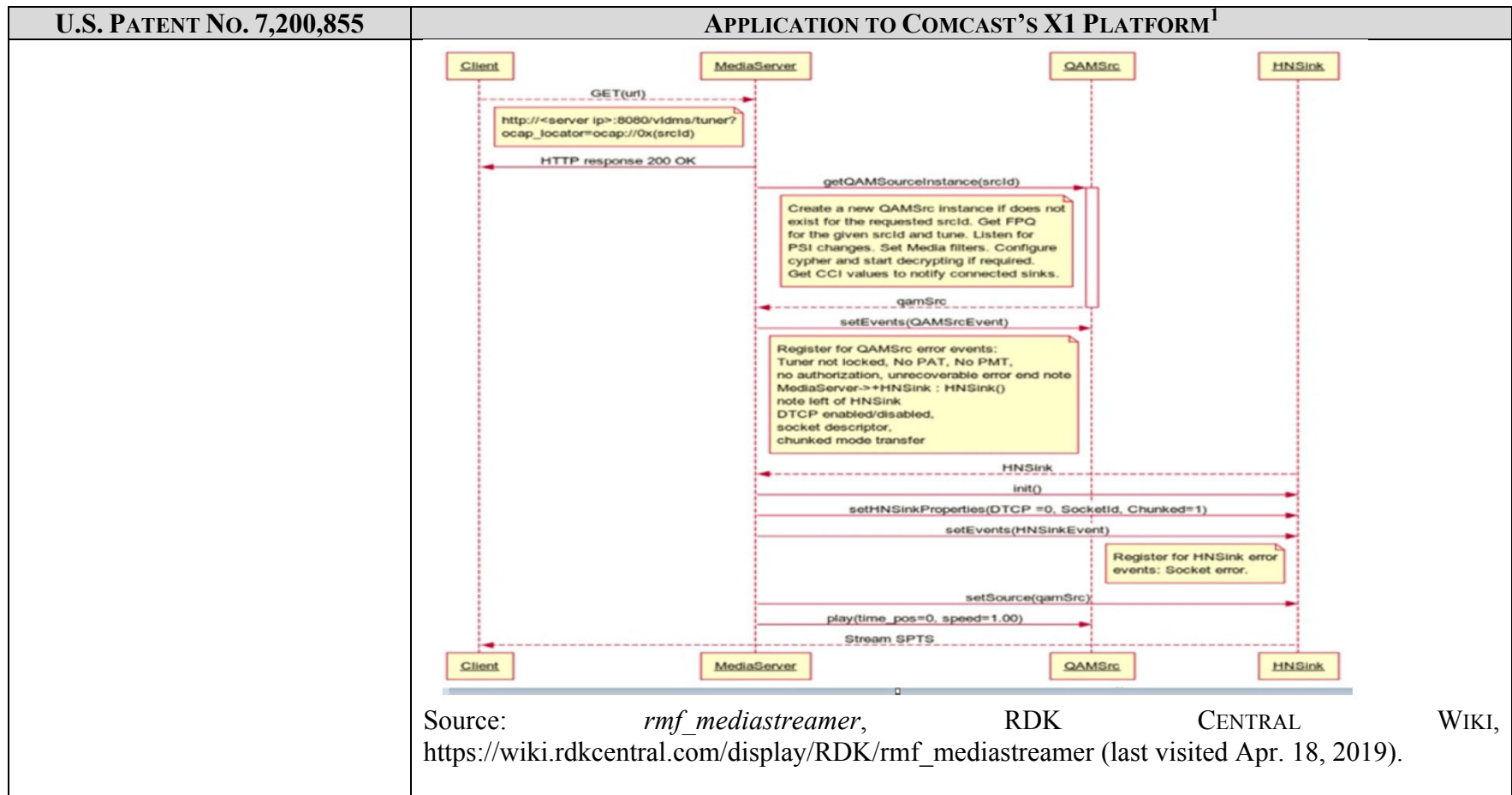
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	<p><b>Overview</b></p> <p>Media Streamer is a resident of gateway devices and it is responsible for streaming content from all supported sources to the local sinks (local video/audio sink devices) and the HN sink (for remote streaming via DLNA or other remote streaming protocol)</p> <p>Media Streamer provides public interfaces to do service selection, tuner reservation etc. Internally it determines what kind of pipeline need to be created, which Media Framework components need to be created to accomplish the task. For example if service selection is coming from Media Player process on a Gateway device for a QAM service, Media Server is responsible for creating a instance of Media Source (QAM) and Local Sink. It then programs media source and media sink and initialize them. Initialization takes care of pipeline creation. Programming source means setting service locator, tuner token (for QAM) and other properties needed by source to initialize the source device.</p> <p>Media Server is an application responsible for following operations</p> <ul style="list-style-type: none"> <li>• Stream Live, Recorded, VOD and IP contents to remote DLNA and non-DLNA compatible client devices in Home Network</li> <li>• Publishes as a OCAP-HN device in home network for DLNA compatible devices</li> <li>• Publish recorded contents for DLNA devices</li> <li>• Starts HTTP Server for listening streaming request from client devices on port 8080</li> <li>• Parse HTTP request header and url</li> <li>• Create source properties and sink properties from HTTP header and url</li> <li>• Connect Source &amp; Sink RMF elements and stream the content to client device</li> <li>• Handle events from the RMF elements and manage sessions</li> <li>• Handle streaming request from multiple client devices simultaneously</li> </ul>

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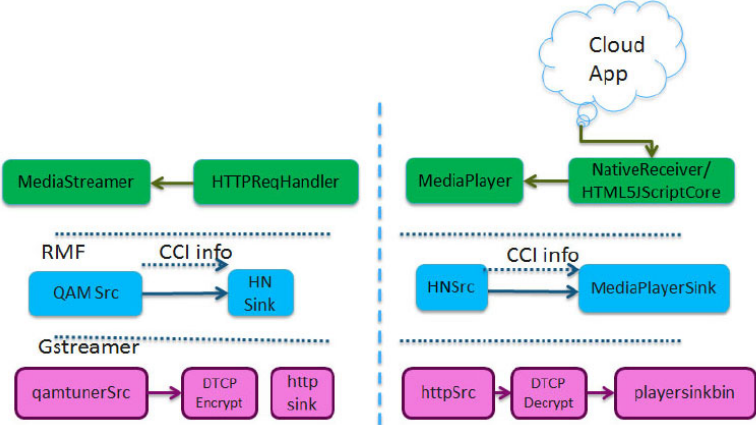




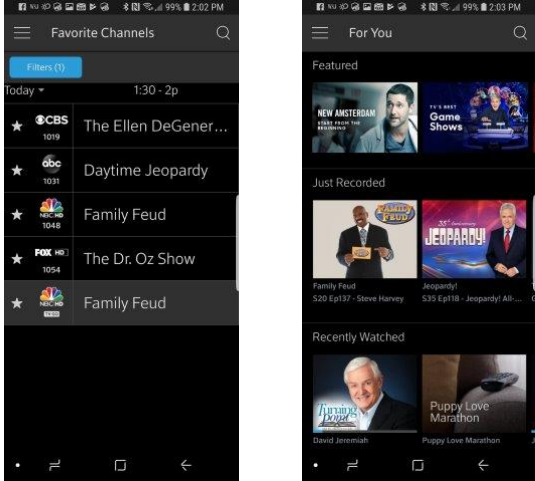
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	<p><b>RDK-V Use Cases</b></p> <p>Created by Pradeepta Kumar Das, last modified on Dec 22, 2017</p> <p>All streaming will be done by the Media Streamer in the Gateway (Hybrid) device. The RMF source element in the Client box will receive the data and do the processing.</p> <p><b>Use case for live streaming</b></p> <p>Here all the data is streamed from the media streamer through Home networking sink. HNSrc in the Client will receive the data from HNSink and playback using the RMF pipeline.</p> <div data-bbox="667 574 1423 737"> <pre> graph LR     subgraph Media_Server [Media Server]         QAM_Source[QAM Source] --&gt; HN_Sink[HN Sink]     end     subgraph Media_Client [Media Client]         HN_Source[HN Source] --&gt; Media_Player_Sink[Media Player Sink]     end     HN_Sink &lt;--&gt;  IP  HN_Source </pre> </div> <ul style="list-style-type: none"> <li>• Here SPTS (Single Program Transport Stream) data is streamed from the media streamer through Home networking sink. HN Src in the Client device will receive the data from HN sink and playback using the RMF pipeline.</li> <li>• After receiving the request URI, the media server creates an RMFQAM source element and HN Sink element. RMFQAM source tunes to a particular program, starts pumping clear SPTS stream.</li> <li>• Media Server connects the QAM Source to the HN Sink. HN Source receives the media at the client side for play out.</li> <li>• In the case of encrypted media play out, the stream data is decrypted using the POD manager which is invoked by the QAM source. QAM Source sends the clear SPTS to the HN Sink.</li> <li>• Media server registers to get events from QAM Source. Through the event mechanism QAM Source will send user authorization related information to the Media Server and the Media Server sends this information to client device.</li> <li>• DTCP encryption and decryption are used for protecting contents over network.</li> </ul>

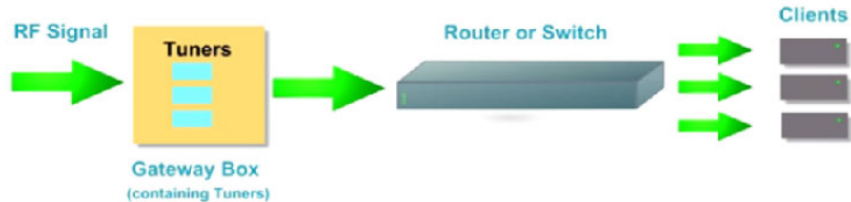
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	 <p>Source: <i>RDK-V Use Cases</i>, RDK CENTRAL WIKI, <a href="https://wiki.rdkcentral.com/display/RDK/RDK-V+Use+Cases">https://wiki.rdkcentral.com/display/RDK/RDK-V+Use+Cases</a> (last visited Apr. 18, 2019).</p> <p>Comcast's X1 Platform, in certain circumstances for different types of content, may also process the plurality of channel selection requests in the headend from a plurality of gateway and client set-top boxes as they request cloud DVR programs, on demand programs, and/or Internet services and also from a plurality of mobile devices and computers using Xfinity Stream web portals or apps. This headend processing produces channel selection commands that each include at least one of: last channel selection command, next channel selection command, previous channel selection command, favorite channel selection command, and select channel from user define list.</p> <p>For example, the screenshots below depict channel selection options for the Xfinity Stream app. These screenshots were taken on Feb. 20, 2019 using the Xfinity Stream App on a Samsung Galaxy S9 Android phone.</p>

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	 <p>Source: <i>Screenshots of the Xfinity Stream App</i> (showing 1) “Favorite Channels” guide screen and 2) “For You” guide screen with “Featured,” “Just Recorded,” and “Recently Watched” categories for channel selection).</p>
<p>[e] wherein the receiving the plurality of channel selection commands further includes monitoring a shared bus at specific time intervals, identifying a data frame at one of the specific time intervals that contains at least a portion of one or the plurality of channel selection commands, and decoding, based on a data conveyance protocol of the multimedia system, the data frame to recapture the at least a portion of the one of the plurality of channel selection commands;</p>	<p>Comcast's X1 Platform performs a method wherein receiving the plurality of channel selection commands further includes monitoring a shared bus at specific time intervals, identifying a data frame at one of the specific time intervals that contains at least a portion of one or the plurality of channel selection commands, and decoding, based on a data conveyance protocol of the multimedia system, the data frame to recapture the at least a portion of the one of the plurality of channel selection commands.</p> <p>For example, Comcast's X1 Platform gateway set-top boxes, including the XG1 and XG2 set-top boxes, monitoring a shared bus present in the MoCA and/or other local network, or buses connected thereto, at specific time intervals, identify a data frame at one of the specific time intervals that contains at least a portion of one or the plurality of channel selection commands, and decode, based on a data conveyance protocol of the multimedia system, the data frame to recapture the at least a portion of the one of the plurality of channel selection commands. In the case of the gateway set-top box monitoring for an Xi5 or Xi6 client, an additional Xfinity gateway, such as an XB6 or xFi, is connected between the gateway and client set-top box.</p>

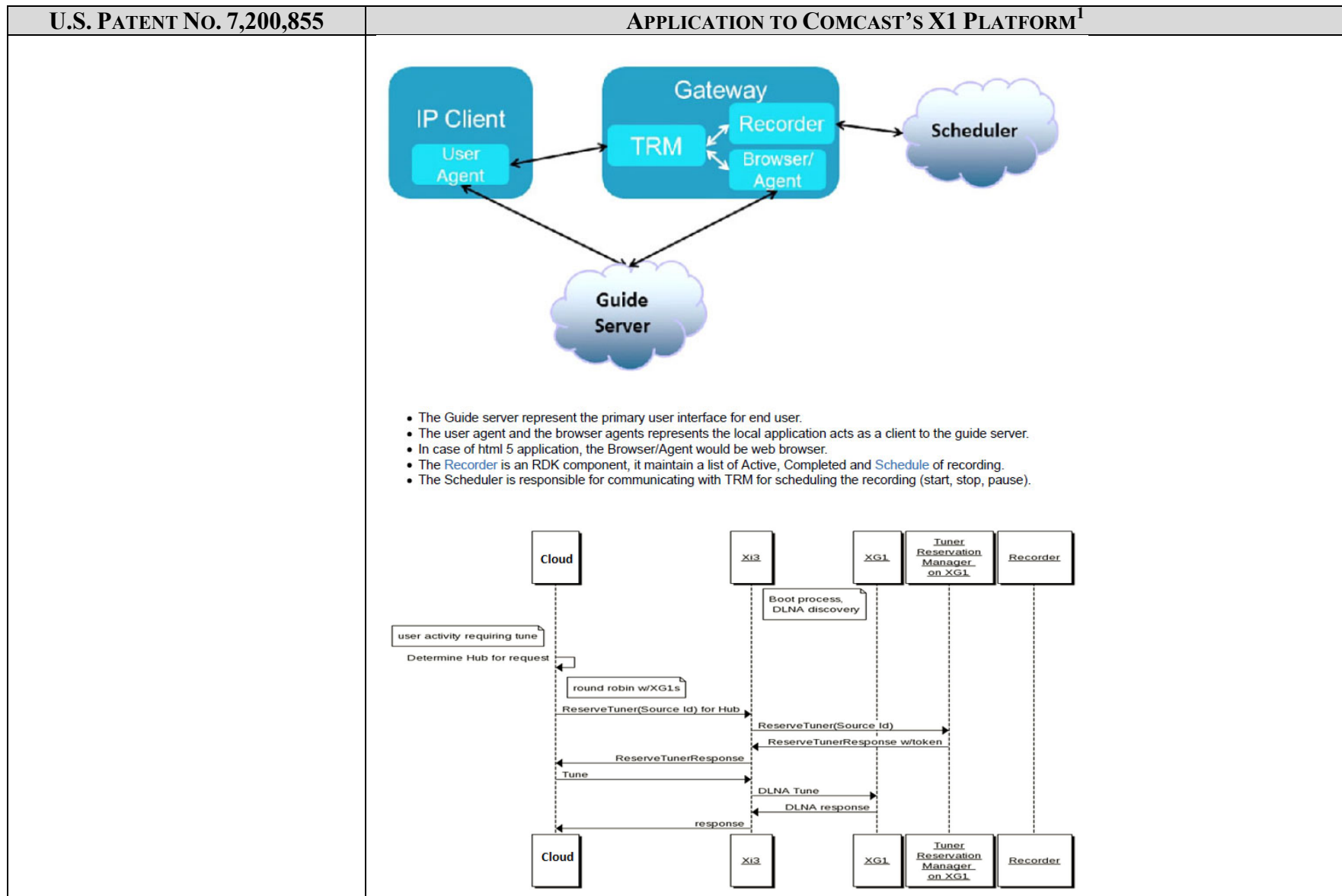
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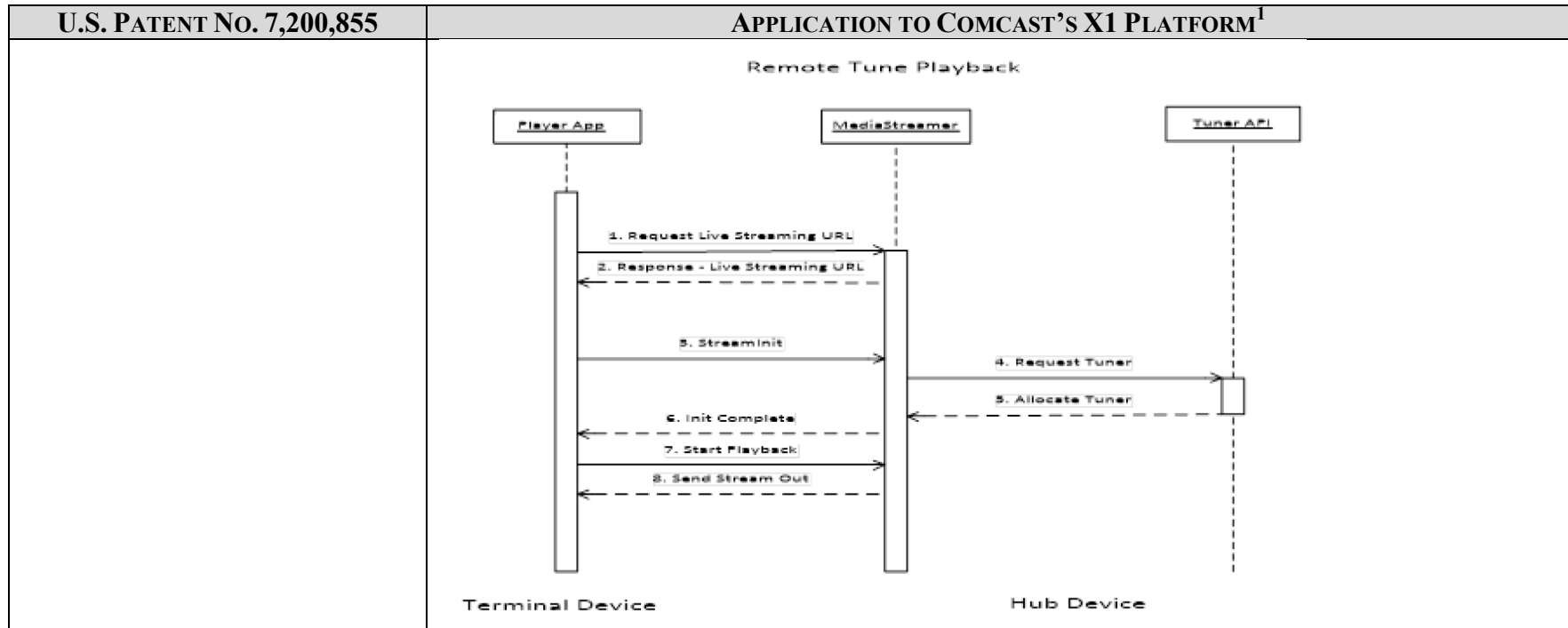
**EXHIBIT 23**  
**UNITED STATES PATENT NO. 7,200,855**  
**CLAIM CHART FOR INFRINGEMENT OF REPRESENTATIVE INDEPENDENT CLAIMS 1, 18, 28, 37, AND 53**



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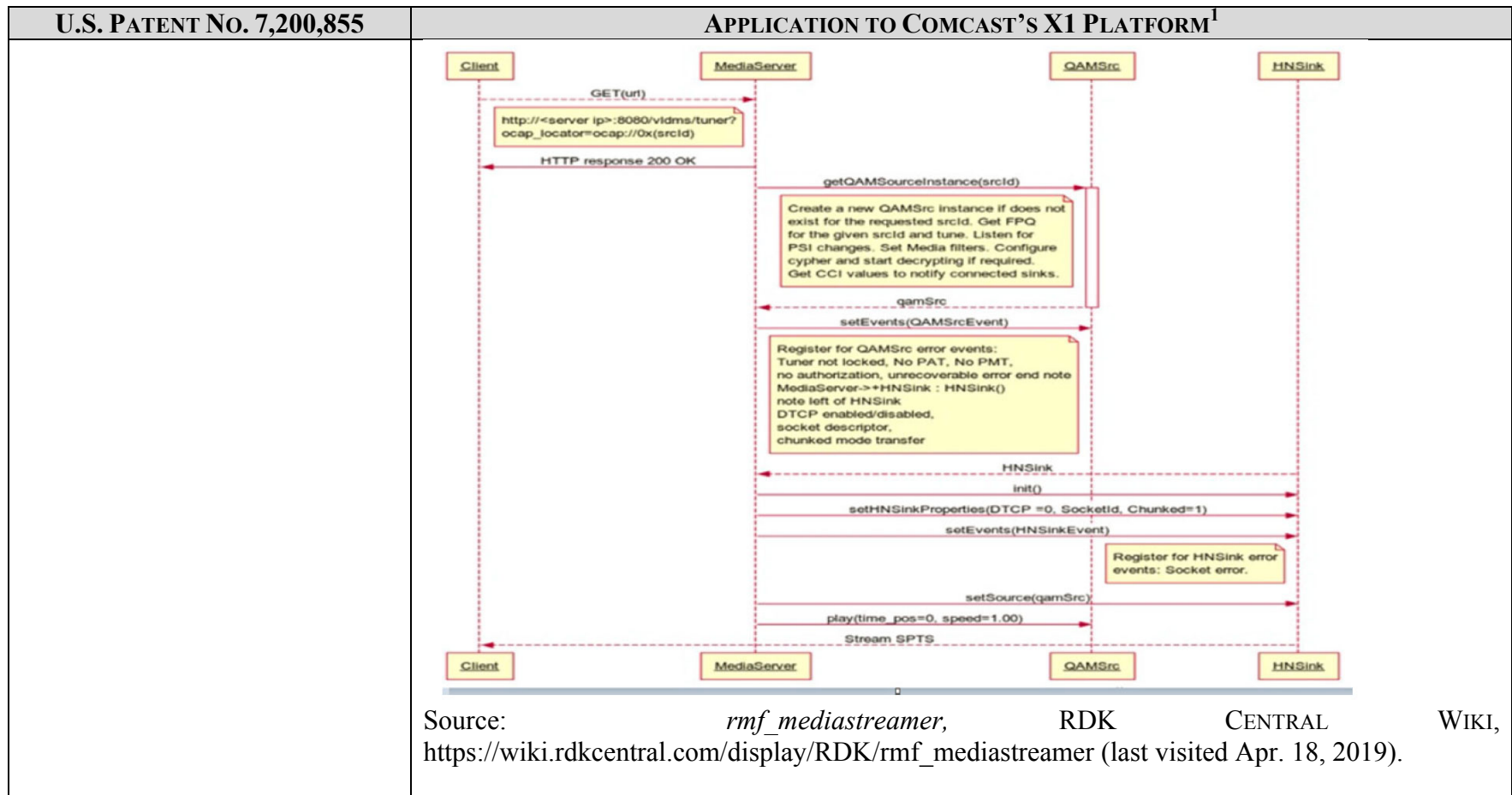
U.S. PATENT NO. 7,200,855	APPLICATION TO COMCAST'S X1 PLATFORM <sup>1</sup>
	<p>Source: <i>TRM</i>, RDK CENTRAL WIKI, <a href="https://wiki.rdkcentral.com/display/RDK/TRM">https://wiki.rdkcentral.com/display/RDK/TRM</a> (last visited Apr. 18, 2019).</p> <p><b>Overview</b></p> <p>Media Streamer is a resident of gateway devices and it is responsible for streaming content from all supported sources to the local sinks (local video/audio sink devices) and the HN sink (for remote streaming via DLNA or other remote streaming protocol)</p> <p>Media Streamer provides public interfaces to do service selection, tuner reservation etc. Internally it determines what kind of pipeline need to be created, which Media Framework components need to be created to accomplish the task. For example if service selection is coming from Media Player process on a Gateway device for a QAM service, Media Server is responsible for creating a instance of Media Source (QAM) and Local Sink. It then programs media source and media sink and initialize them. Initialization takes care of pipeline creation. Programming source means setting service locator, tuner token (for QAM) and other properties needed by source to initialize the source device.</p> <p>Media Server is an application responsible for following operations</p> <ul style="list-style-type: none"> <li>• Stream Live, Recorded, VOD and IP contents to remote DLNA and non-DLNA compatible client devices in Home Network</li> <li>• Publishes as a OCAP-HN device in home network for DLNA compatible devices</li> <li>• Publish recorded contents for DLNA devices</li> <li>• Starts HTTP Server for listening streaming request from client devices on port 8080</li> <li>• Parse HTTP request header and url</li> <li>• Create source properties and sink properties from HTTP header and url</li> <li>• Connect Source &amp; Sink RMF elements and stream the content to client device</li> <li>• Handle events from the RMF elements and manage sessions</li> <li>• Handle streaming request from multiple client devices simultaneously</li> </ul>

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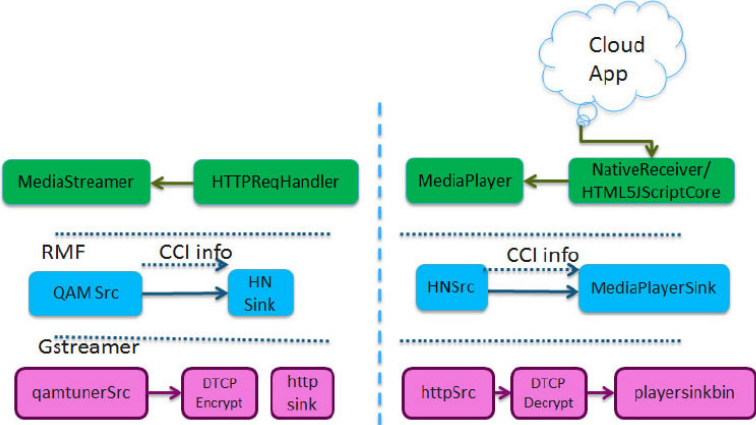
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U.S. PATENT NO. 7,200,855	APPLICATION TO COMCAST'S X1 PLATFORM <sup>1</sup>
	<p><b>RDK-V Use Cases</b></p> <p>Created by Pradeepta Kumar Das, last modified on Dec 22, 2017</p> <p>All streaming will be done by the Media Streamer in the Gateway (Hybrid) device. The RMF source element in the Client box will receive the data and do the processing.</p> <p><b>Use case for live streaming</b></p> <p>Here all the data is streamed from the media streamer through Home networking sink. HNSrc in the Client will receive the data from HNSink and playback using the RMF pipeline.</p> <div data-bbox="667 574 1423 737"> <pre> graph LR     subgraph Media_Server [Media Server]         QAM_Source[QAM Source] --&gt; HN_Sink[HN Sink]     end     subgraph Media_Client [Media Client]         HN_Source[HN Source] --&gt; Media_Player_Sink[Media Player Sink]     end     HN_Sink &lt;--&gt;  IP  HN_Source </pre> </div> <ul style="list-style-type: none"> <li>• Here SPTS (Single Program Transport Stream) data is streamed from the media streamer through Home networking sink. HN Src in the Client device will receive the data from HN sink and playback using the RMF pipeline.</li> <li>• After receiving the request URI, the media server creates an RMFQAM source element and HN Sink element. RMFQAM source tunes to a particular program, starts pumping clear SPTS stream.</li> <li>• Media Server connects the QAM Source to the HN Sink. HN Source receives the media at the client side for play out.</li> <li>• In the case of encrypted media play out, the stream data is decrypted using the POD manager which is invoked by the QAM source. QAM Source sends the clear SPTS to the HN Sink.</li> <li>• Media server registers to get events from QAM Source. Through the event mechanism QAM Source will send user authorization related information to the Media Server and the Media Server sends this information to client device.</li> <li>• DTCP encryption and decryption are used for protecting contents over network.</li> </ul>

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	 <p>Source: <i>RDK-V Use Cases, RDK CENTRAL WIKI</i>,  <a href="https://wiki.rdkcentral.com/display/RDK/RDK-V+Use+Cases">https://wiki.rdkcentral.com/display/RDK/RDK-V+Use+Cases</a> (last visited Apr. 18, 2019).</p> <p>Comcast's X1 Platform set-top boxes are MoCA and Ethernet interoperable.</p>

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	<div data-bbox="657 289 1478 854">  <p><b>MoCA® Interoperability Certificate</b></p> <p><b>MoCA 2.0</b></p> <p>Certificate Number: MIC0203  Certificate Date: October 27 2015  Company: ARRIS  Device Description: IP settop box  Model Number: XG1v3  Hardware Version: PPR2  Driver Software Version: MOXI 7.2.1s.78  Device Classification: Profile A OSP  Features:  MoCA Interface ID: 1 of 1  Certified Operating Bands/Channels: Extended D (full)  Bands Requiring External Filters: None</p> </div> <p>Source: <i>MoCA Interoperability Certificate</i>, <a href="http://www.mocalliance.org/products/certificates/MIC0203-ARRIS.pdf">http://www.mocalliance.org/products/certificates/MIC0203-ARRIS.pdf</a> (last visited Apr. 18, 2019). On information and belief, Comcast's X1 Platform set-top boxes are MoCA, WiFi, and/or Ethernet interoperable as shown by the fact that these products communicate with each other using at least one of the MoCA, WiFi, and/or Ethernet protocol via the coaxial cable connections, WiFi modems, and/or via their Ethernet ports. <i>See AnyRoom DVR - What it is and How it Works</i>, XFINITY, <a href="https://www.xfinity.com/support/articles/using-anyroom-dvr">https://www.xfinity.com/support/articles/using-anyroom-dvr</a> (last visited Apr. 18, 2019); <i>see also Deploying Enhanced Media Services with MoCA</i>, SCTE IMPLICATION PAPER, <a href="http://www.mocalliance.org/marketing/whitepapers/Branded_Implication_Paper_MoCA.pdf">http://www.mocalliance.org/marketing/whitepapers/Branded_Implication_Paper_MoCA.pdf</a> (last visited Apr. 18, 2019) (explaining that "[t]he primary goal of MoCA is to develop a high-performance, high-capacity home networking technology suitable for transporting multiple streams of high-definition multimedia content that leverages existing residential coaxial cabling and coexists with the services currently using the cable plant").</p> <p>Comcast's X1 Platform's headend processing, in certain circumstances for different types of</p>

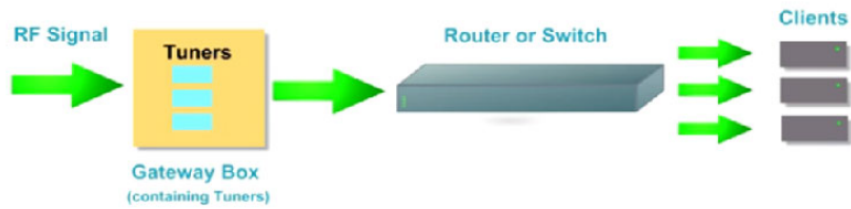
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	content, may also monitor a shared bus at specific time intervals, identify a data frame at one of the specific time intervals that contains at least a portion of one or the plurality of channel selection commands, and decode, based on a data conveyance protocol of the multimedia system, the data frame to recapture the at least a portion of the one of the plurality of channel selection commands.																																																																																															
[f] selecting a channel of the plurality of channels per channel selection command of the plurality of channel selection commands to produce selected channels; and	<p>Comcast’s X1 Platform selects a channel of the plurality of channels per channel selection command of the plurality of channel selection commands to produce selected channels.</p> <p>For example, Comcast’s X1 Platform gateway set-top boxes, including the XG1 and XG2 set-top boxes, use RDK. These set-top boxes contain tuners and Comcast’s X1 Platform selects a channel of the plurality of channels per channel selection command of the plurality of channel selection commands to produce selected channels.</p> <p>Feature Comparison</p> <table><tr><th>Feature</th><th>XG1</th><th>XG1v4</th><th>XG2</th><th>RNG150N</th></tr><tr><td>DVR</td><td>Yes</td><td>Yes</td><td>No</td><td>No</td></tr><tr><td>Tuners</td><td>Up to 6*</td><td>6</td><td>4</td><td>1</td></tr><tr><td>Pause and Rewind Live TV</td><td>Yes, up to 60 minutes</td><td>Yes, up to 60 minutes</td><td>Yes, up to 25 minutes</td><td>No</td></tr><tr><td>Pause and Rewind Xfinity On Demand</td><td>Yes</td><td>Yes</td><td>Yes</td><td>Yes</td></tr><tr><td>Supports AnyRoom DVR</td><td>Yes</td><td>Yes</td><td>Yes</td><td>Yes</td></tr><tr><td>Schedule and Manage DVR Recordings</td><td>Yes</td><td>Yes</td><td>Yes</td><td>Yes</td></tr><tr><td>RF Remote Control Functionality</td><td>Yes</td><td>Yes</td><td>Yes</td><td>No</td></tr><tr><td>X1 Voice Remote Support</td><td>Yes</td><td>Yes</td><td>Yes</td><td>No</td></tr><tr><td>X1 Apps</td><td>Yes</td><td>Yes</td><td>Yes</td><td>Yes (Internet apps not supported)</td></tr><tr><td>Front Panel Clock</td><td>Yes</td><td>No</td><td>No</td><td>No</td></tr><tr><td>Device Light Dimming</td><td>Yes</td><td>Yes</td><td>Yes</td><td>No</td></tr><tr><td>HDMI Connector</td><td>Yes</td><td>Yes</td><td>Yes</td><td>Yes</td></tr><tr><td>Digital Audio (Optical) Connector</td><td>Yes</td><td>No</td><td>Yes</td><td>Yes</td></tr><tr><td>Component Video</td><td>Yes (Pace XG1v1 only)</td><td>No</td><td>No</td><td>Yes</td></tr><tr><td>Composite Video</td><td>Yes</td><td>No</td><td>Yes</td><td>Yes</td></tr><tr><td>RF Out</td><td>Yes</td><td>Yes</td><td>Yes</td><td>Yes</td></tr><tr><td>Supports Ultra HD 4K Netflix Content (Requires compatible Netflix plan)</td><td>No</td><td>Yes</td><td>No</td><td>No</td></tr><tr><td>Supports 4K YouTube Content</td><td>No</td><td>Yes</td><td>No</td><td>No</td></tr></table>	Feature	XG1	XG1v4	XG2	RNG150N	DVR	Yes	Yes	No	No	Tuners	Up to 6*	6	4	1	Pause and Rewind Live TV	Yes, up to 60 minutes	Yes, up to 60 minutes	Yes, up to 25 minutes	No	Pause and Rewind Xfinity On Demand	Yes	Yes	Yes	Yes	Supports AnyRoom DVR	Yes	Yes	Yes	Yes	Schedule and Manage DVR Recordings	Yes	Yes	Yes	Yes	RF Remote Control Functionality	Yes	Yes	Yes	No	X1 Voice Remote Support	Yes	Yes	Yes	No	X1 Apps	Yes	Yes	Yes	Yes (Internet apps not supported)	Front Panel Clock	Yes	No	No	No	Device Light Dimming	Yes	Yes	Yes	No	HDMI Connector	Yes	Yes	Yes	Yes	Digital Audio (Optical) Connector	Yes	No	Yes	Yes	Component Video	Yes (Pace XG1v1 only)	No	No	Yes	Composite Video	Yes	No	Yes	Yes	RF Out	Yes	Yes	Yes	Yes	Supports Ultra HD 4K Netflix Content (Requires compatible Netflix plan)	No	Yes	No	No	Supports 4K YouTube Content	No	Yes	No	No
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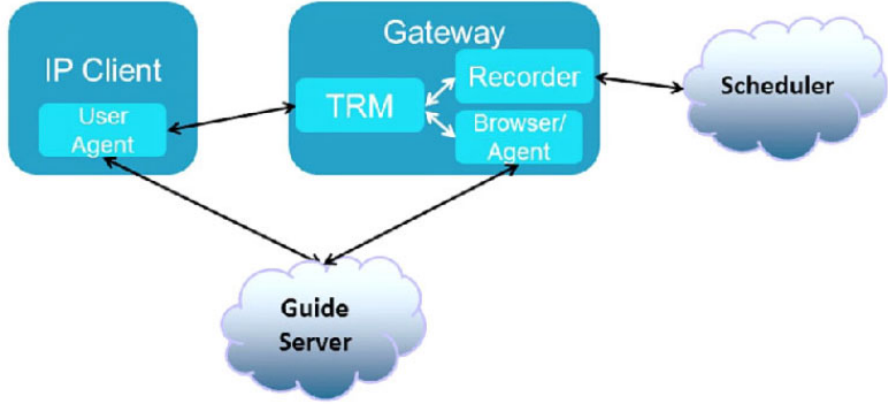
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	Feature	Xi3 (HDMI Only)	XiD (HD and SD)	Xi5 (Wireless)	Xi6 (Wireless)
	DVR	No	No	No	No
	Tuners	None	None	None	None
	Pause and Rewind Live TV	Yes, up to 25 minutes	Yes, up to 25 minutes	Yes, up to 25 minutes	Yes, up to 25 minutes
	Pause and Rewind Xfinity On Demand	Yes	Yes	Yes	Yes
	Supports AnyRoom DVR	Yes	Yes	Yes	Yes
	Schedule and Manage DVR Recordings	Yes	Yes	Yes	Yes
	RF Remote Control Functionality	Yes	Yes	Yes	Yes
	X1 Voice Remote Support	Yes	Yes	Yes	Yes
	X1 Apps	Yes	Yes	Yes	Yes
	Front Panel Clock	No	No	No	No
	Device Light Dimming	Yes	Yes	Yes	Yes
	HDMI Connector	Yes	Yes	Yes	Yes
	Digital Audio (Optical) Connector	No	No	No	No
	Component Video	No	No	No	No
	Composite Video	No	No	No	No
	RF Out	No	Yes	No	No
	Supports Ultra HD 4K Netflix Content (Requires compatible Netflix plan)	No	No	No	Yes
	Supports 4K YouTube Content	No	No	No	Yes
	Source: <i>X1 TV Box Comparison - DVR vs. Non-DVR</i> , XFINITY, <a href="https://www.xfinity.com/support/articles/x1-hub-vs-companion-box">https://www.xfinity.com/support/articles/x1-hub-vs-companion-box</a> (last visited Apr. 18, 2019).				

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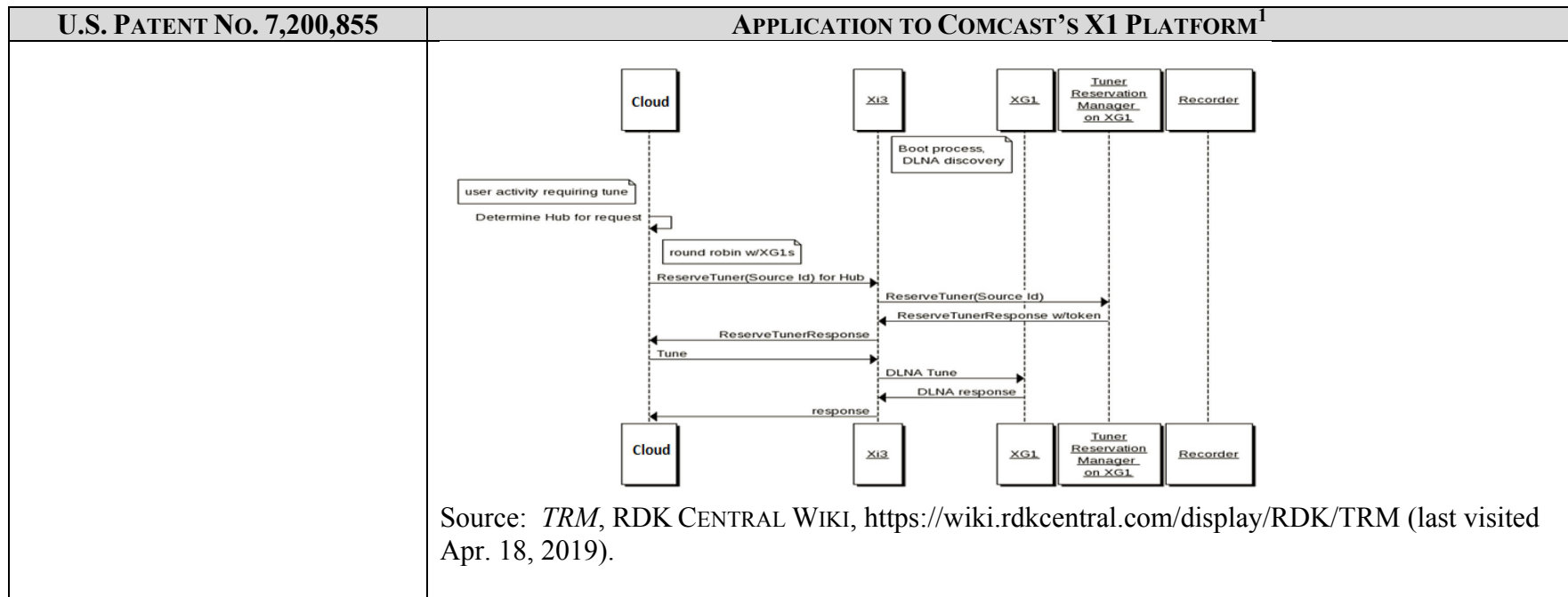
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	<p><b>TRM</b></p> <p>Created by Pradeeptha Kumar Das, last modified by Lakshmi Priya P on Jan 23, 2019</p> <p><b>Summary</b></p> <p>Tuner Reservation Manager (TRM) coordinates the usage of tuners on the device for the connected clients on Gateway device and it is specific to Gateway devices only. TRM uses messages for communicating between Gateway and Client device to reserve, cancel, status retrieval, etc.</p>  <pre> graph LR     RF[RF Signal] --&gt; Gateway[Gateway Box&lt;br/&gt;(containing Tuners)]     Gateway --&gt; Router[Router or Switch]     Router --&gt; Clients[Clients]   </pre> <ul style="list-style-type: none"> <li>• The Gateway box contains multiple tuners (example, Gateway box having 6 tuner connected to it)</li> <li>• The Gateway box connected with the incoming RF signal and it is also connected to client boxes through the MOCA/Router devices.</li> <li>• TRM application runs on a gateway device and coordinates the usage of tuners on the device for its connecting clients based on the types of the request.</li> <li>• Reserve a tuner for specified usage (Live playback, Record, Hybrid, or EAS), start time, end time and content (locator).</li> <li>• Detect conflicts with existing tuner reservations and resolve.</li> </ul> <p><b>How TRM works</b></p> <p>Client requests a tuner through URL(http, dvr, live), TRM server receives the request and checks for the valid reservation and reserves the tuner so that the client is provided with the service requested. Client also can extend or delete the reservation. It is also possible for a client to request a list of the active reservations.</p> <p>Usually Xg1 boxes have multiple tuners (in Xg1v3 box has 6 tuners (configurable)) &amp; each tuners can have following states:</p> <table border="1" data-bbox="667 1015 1260 1234"> <thead> <tr> <th>State</th><th>Meaning</th></tr> </thead> <tbody> <tr> <td>Free</td><td>The <a href="#">Tuner</a> is available for allocation.</td></tr> <tr> <td>Live</td><td>Currently tuned to a service and in use for viewing the live TV channel.</td></tr> <tr> <td>Record</td><td>Currently tuned to a service and recording a program.</td></tr> <tr> <td>Hybrid</td><td>Live view of recording in progress.</td></tr> <tr> <td>EAS</td><td>Emergency Alert <a href="#">Service</a>.</td></tr> </tbody> </table> <p><b>TRM Consumer</b></p> <p>This diagram depicts the different element interact with TRM.</p>	State	Meaning	Free	The <a href="#">Tuner</a> is available for allocation.	Live	Currently tuned to a service and in use for viewing the live TV channel.	Record	Currently tuned to a service and recording a program.	Hybrid	Live view of recording in progress.	EAS	Emergency Alert <a href="#">Service</a> .
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	 <pre> graph LR     subgraph IP_Client [IP Client]         UA[User Agent]     end     subgraph Gateway         TRM[TRM]         Recorder[Recorder]         BA[Browser/Agent]     end     Scheduler((Scheduler))     Guide_Server((Guide Server))      UA &lt;--&gt; TRM     TRM &lt;--&gt; Recorder     TRM &lt;--&gt; BA     Recorder &lt;--&gt; Scheduler     UA --&gt; Guide_Server     BA --&gt; Guide_Server     </pre> <ul style="list-style-type: none"> <li>• The Guide server represent the primary user interface for end user.</li> <li>• The user agent and the browser agents represents the local application acts as a client to the guide server.</li> <li>• In case of html 5 application, the Browser/Agent would be web browser.</li> <li>• The Recorder is an RDK component, it maintain a list of Active, Completed and Schedule of recording.</li> <li>• The Scheduler is responsible for communicating with TRM for scheduling the recording (start, stop, pause).</li> </ul>



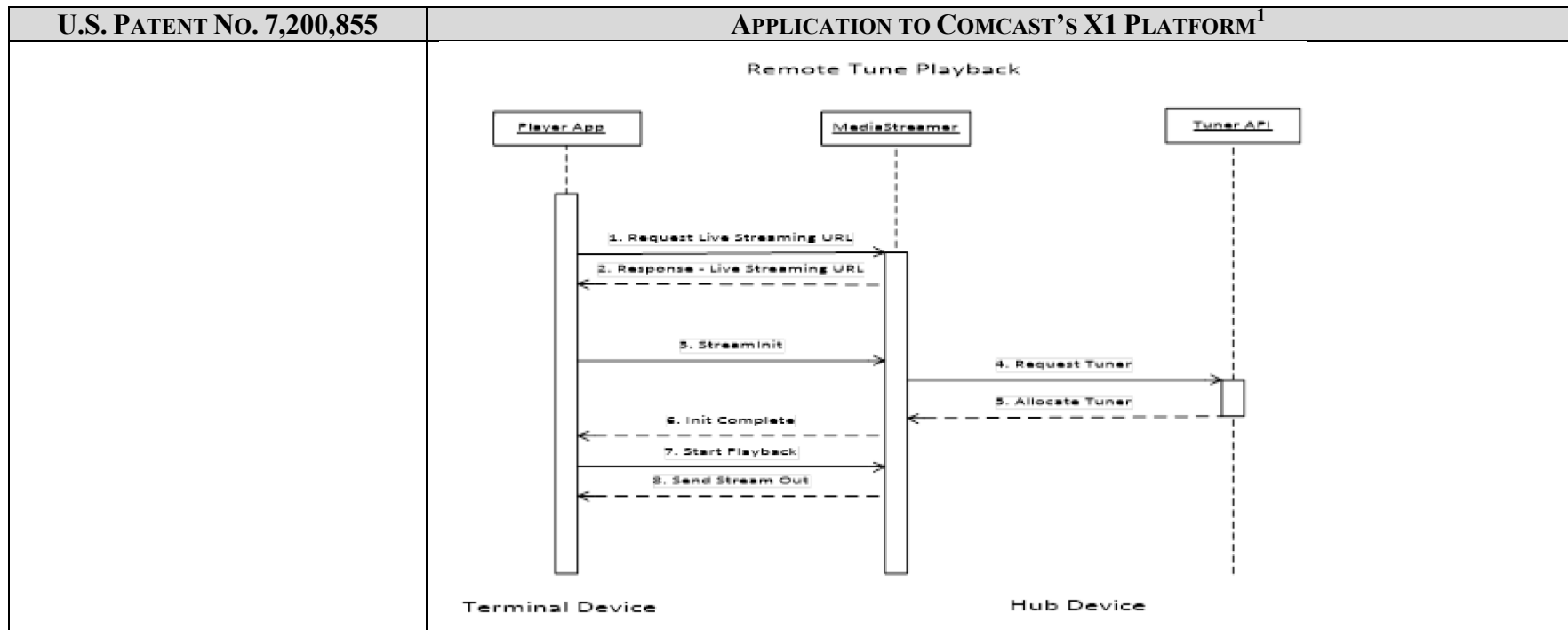
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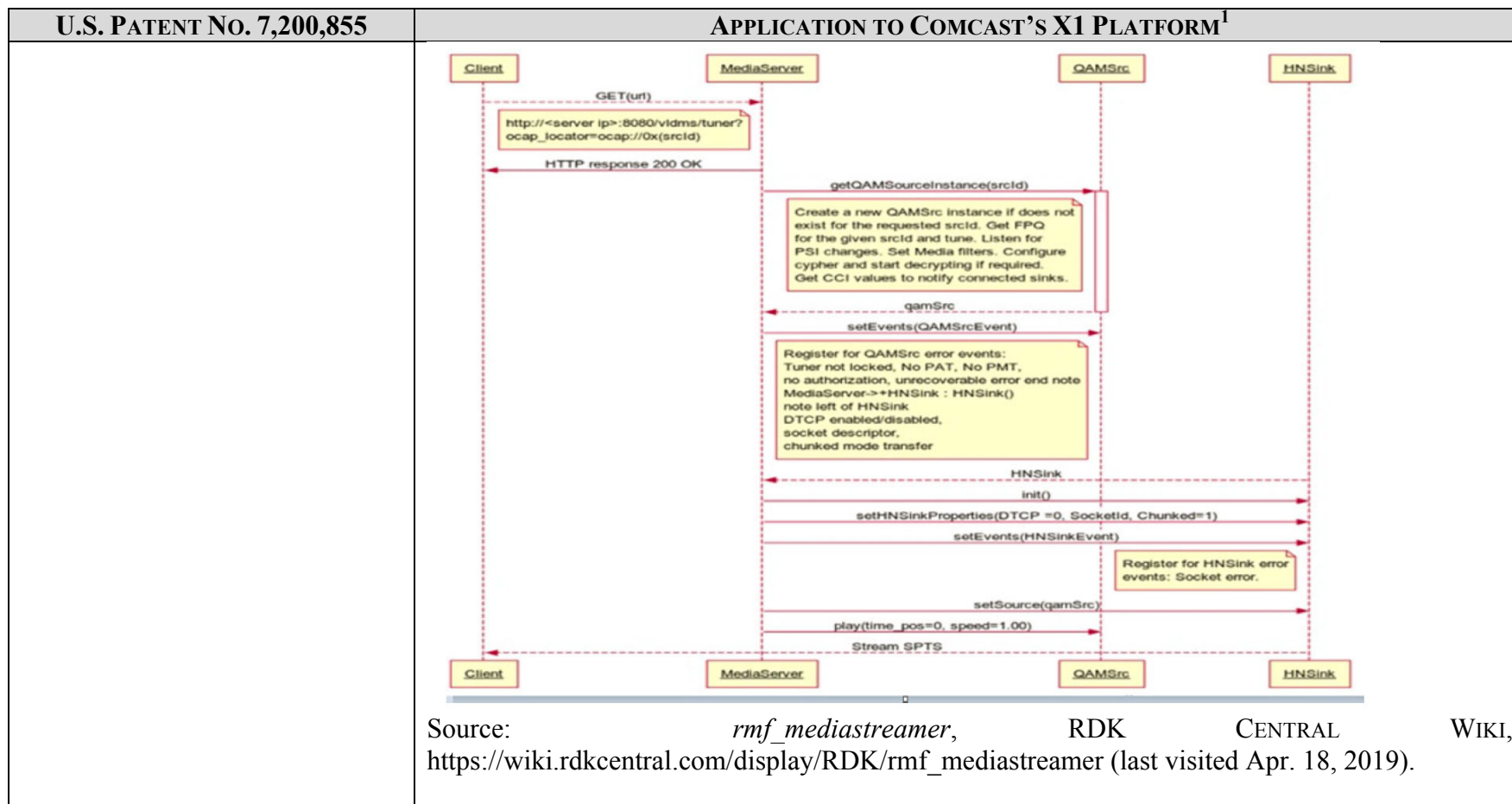
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	<p><b>Overview</b></p> <p>Media Streamer is a resident of gateway devices and it is responsible for streaming content from all supported sources to the local sinks (local video/audio sink devices) and the HN sink (for remote streaming via DLNA or other remote streaming protocol)</p> <p>Media Streamer provides public interfaces to do service selection, tuner reservation etc. Internally it determines what kind of pipeline need to be created, which Media Framework components need to be created to accomplish the task. For example if service selection is coming from Media Player process on a Gateway device for a QAM service, Media Server is responsible for creating a instance of Media Source (QAM) and Local Sink. It then programs media source and media sink and initialize them. Initialization takes care of pipeline creation. Programming source means setting service locator, tuner token (for QAM) and other properties needed by source to initialize the source device.</p> <p>Media Server is an application responsible for following operations</p> <ul style="list-style-type: none"> <li>• Stream Live, Recorded, VOD and IP contents to remote DLNA and non-DLNA compatible client devices in Home Network</li> <li>• Publishes as a OCAP-HN device in home network for DLNA compatible devices</li> <li>• Publish recorded contents for DLNA devices</li> <li>• Starts HTTP Server for listening streaming request from client devices on port 8080</li> <li>• Parse HTTP request header and url</li> <li>• Create source properties and sink properties from HTTP header and url</li> <li>• Connect Source &amp; Sink RMF elements and stream the content to client device</li> <li>• Handle events from the RMF elements and manage sessions</li> <li>• Handle streaming request from multiple client devices simultaneously</li> </ul>

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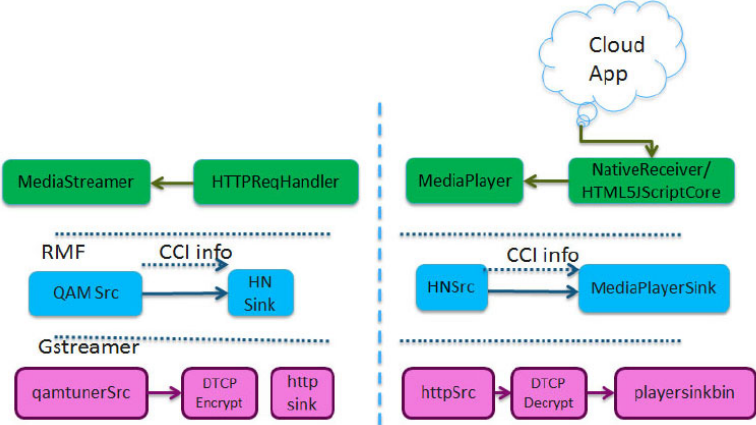
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U.S. PATENT NO. 7,200,855	APPLICATION TO COMCAST'S X1 PLATFORM <sup>1</sup>
	<p><b>RDK-V Use Cases</b></p> <p>Created by Pradeepta Kumar Das, last modified on Dec 22, 2017</p> <p>All streaming will be done by the Media Streamer in the Gateway (Hybrid) device. The RMF source element in the Client box will receive the data and do the processing.</p> <p><b>Use case for live streaming</b></p> <p>Here all the data is streamed from the media streamer through Home networking sink. HNSrc in the Client will receive the data from HNSink and playback using the RMF pipeline.</p> <div data-bbox="667 574 1423 737"> <pre> graph LR     subgraph Media_Server [Media Server]         QAM_Source[QAM Source] --&gt; HN_Sink[HN Sink]     end     subgraph Media_Client [Media Client]         HN_Source[HN Source] --&gt; Media_Player_Sink[Media Player Sink]     end     HN_Sink &lt;--&gt;  IP  HN_Source             </pre> </div> <ul style="list-style-type: none"> <li>• Here SPTS (Single Program Transport Stream) data is streamed from the media streamer through Home networking sink. HN Src in the Client device will receive the data from HN sink and playback using the RMF pipeline.</li> <li>• After receiving the request URI, the media server creates an RMFQAM source element and HN Sink element. RMFQAM source tunes to a particular program, starts pumping clear SPTS stream.</li> <li>• Media Server connects the QAM Source to the HN Sink. HN Source receives the media at the client side for play out.</li> <li>• In the case of encrypted media play out, the stream data is decrypted using the POD manager which is invoked by the QAM source. QAM Source sends the clear SPTS to the HN Sink.</li> <li>• Media server registers to get events from QAM Source. Through the event mechanism QAM Source will send user authorization related information to the Media Server and the Media Server sends this information to client device.</li> <li>• DTCP encryption and decryption are used for protecting contents over network.</li> </ul>

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	 <p>Source: <i>RDK-V Use Cases</i>, RDK CENTRAL WIKI, <a href="https://wiki.rdkcentral.com/display/RDK/RDK-V+Use+Cases">https://wiki.rdkcentral.com/display/RDK/RDK-V+Use+Cases</a> (last visited Apr. 18, 2019).</p> <p>Comcast's X1 Platform, in certain circumstances for different types of content, may also perform a method in the headend (for those selections, for example, made directly to the headend) wherein selecting a channel of the plurality of channels per channel selection command of the plurality of channel selection commands to produce selected channels.</p>
<p>[g] encoding each of the selected channels based on the data conveyance protocol of the multimedia system to produce a set of encoded channel data.</p>	<p>Comcast's X1 Platform encodes each of the selected channels based on the data conveyance protocol of the multimedia system to produce a set of encoded channel data.</p> <p>For example, Comcast's X1 Platform gateway set-top boxes, including the XG1 and XG2 set-top boxes, encode each of the selected channels based on the data conveyance protocol of the multimedia system, such as, for example, MoCA, Ethernet, or Wi-Fi, to produce a set of encoded channel data. In the case of the gateway set-top box conveying data to a requesting Xi5 or Xi6 client, an additional Xfinity gateway, such as an XB6 or xFi, is connected between the gateway and client set-top box.</p> <p>On information and belief, the Comcast X1 Platform encodes each of the selected channels based</p>

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	<p>on the MoCA, WiFi, and/or Ethernet protocol to produce a set of encoded channel data. Each Comcast X1 Platform set-top boxes is MoCA, WiFi, and/or Ethernet interoperable as shown by the fact that these products communicate with each other using at least one of the MoCA, WiFi, and/or Ethernet protocol via the coaxial cable connections, WiFi modems, and/or via their Ethernet ports. <i>See AnyRoom DVR - What it is and How it Works</i>, XFINITY, <a href="https://www.xfinity.com/support/articles/using-anyroom-dvr">https://www.xfinity.com/support/articles/using-anyroom-dvr</a> (last visited Apr. 18, 2019); <i>see also Deploying Enhanced Media Services with MoCA</i>, SCTE IMPLICATION PAPER, <a href="http://www.mocalliance.org/marketing/whitepapers/Branded_Implication_Paper_MoCA.pdf">http://www.mocalliance.org/marketing/whitepapers/Branded_Implication_Paper_MoCA.pdf</a> (last visited Apr. 18, 2019) (explaining that “The primary goal of MoCA is to develop a high-performance, high-capacity home networking technology suitable for transporting multiple streams of high-definition multimedia content that leverages existing residential coaxial cabling and coexists with the services currently using the cable plant.”).</p> <p>Comcast’s X1 Platform headend also encodes each of the selected channels (from those selections made directly to the headend) based on the data conveyance protocol of the multimedia system to produce a set of encoded channel data. For example, the headend encodes channels using the IP protocols, adaptive bitrate streaming protocols, and in the case of set-top boxes, the DOCSIS protocols, for conveyance to the requesting set-top boxes, mobile devices, or computers.</p>
18. A method of multiplexing channels in a multimedia system the method comprises:	<p>Comcast’s X1 Platform performs a method of multiplexing channels in a multimedia system.</p> <p><i>See evidence for corresponding limitations in claim 1.</i></p>
[a] receiving a channel from each of a plurality of sources to produce a plurality of channels;	<p>Comcast’s X1 Platform receives a channel from each of a plurality of sources to produce a plurality of channels.</p> <p>Comcast’s X1 Platform receives channels from multiple sources including but not limited to linear QAM channels, third party OTT channels—such as Netflix, HBO, YouTube—and VOD channels.</p> <p><i>See evidence for corresponding limitation in claim element 1[a].</i></p>
[b] receiving a plurality of channel selection commands by	Comcast’s X1 Platform receives a plurality of channel selection commands by monitoring a shared bus at specific time intervals, identifying a data frame at one of the specific time intervals

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<p>monitoring a shared bus at specific time intervals, identifying a data frame at one of the specific time intervals that contains at least a portion of one of the plurality of channel selection commands, and decoding, based on a data conveyance protocol of the multimedia system, the at least one packet to recapture the at least a portion of the one of the plurality of channel selection commands;</p>	<p>that contains at least a portion of one of the plurality of channel selection commands, and decoding, based on a data conveyance protocol of the multimedia system, the at least one packet to recapture the at least a portion of the one of the plurality of channel selection commands.</p> <p><i>See evidence for corresponding limitation in claim element 1[e].</i></p>
<p>[c] selecting a channel of the plurality of channels per channel selection command of the plurality of channel selection command to produce selected channels; and</p>	<p>Comcast's X1 Platform selects a channel of the plurality of channels per channel selection command of the plurality of channel selection command to produce selected channels.</p> <p><i>See evidence for corresponding limitation in claim element 1[f].</i></p>
<p>[d] encoding each of the selected channels based on the data conveyance protocol of the multimedia system to produce a set of encoded channel data by packetizing data of each of the selected channels into a packet that includes a header section and a data section, wherein the header section includes at least one of: identity the selected channel, type of data of the selected channel,</p>	<p>Comcast's X1 Platform encodes each of the selected channels based on the data conveyance protocol of the multimedia system to produce a set of encoded channel data by packetizing data of each of the selected channels into a packet that includes a header section and a data section, wherein the header section includes at least one of: identity the selected channel, type of data of the selected channel, identity of the multimedia source, encryption enable/disable, type of encryption, compression enable/disable, type of compression, and packet sequence number.</p> <p><i>See evidence for corresponding limitation in claim element 1[g].</i></p>



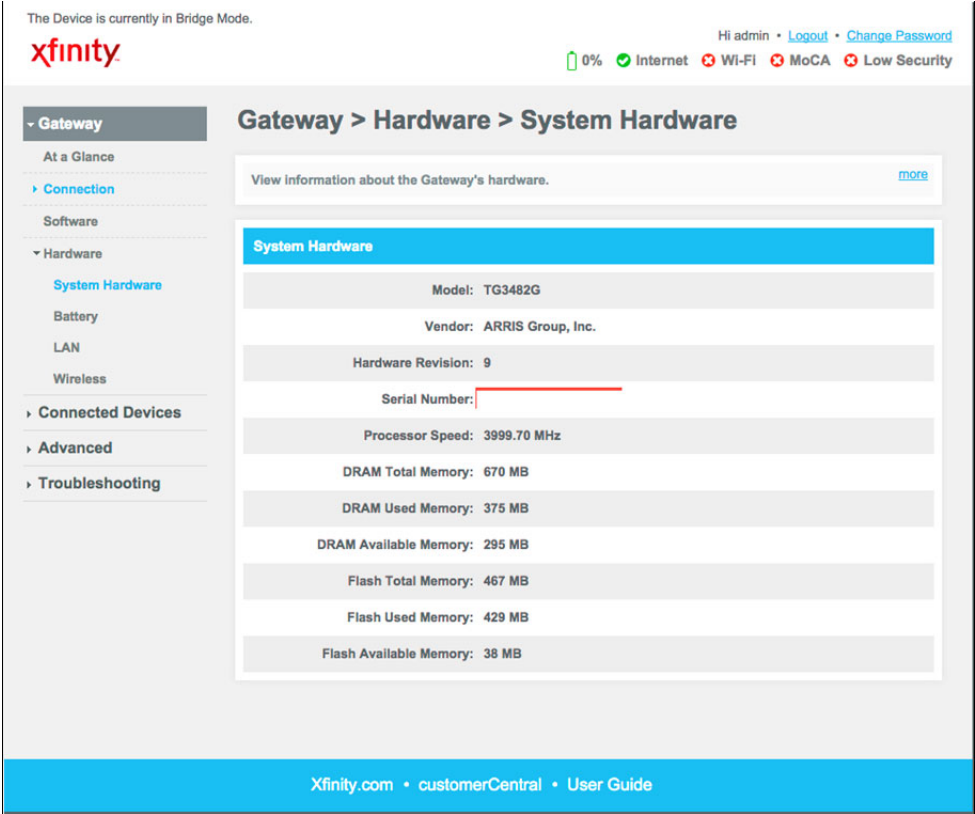
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identity of the multimedia source, encryption enable/disable, type of encryption, compression enable/disable, type of compression, and packet sequence number.	
28. A tuning module for using in multimedia system the tuning module comprises:	Comcast's X1 Platform comprises a tuning module for using in a multimedia system.
[a] plurality of selectors, wherein each of the plurality of selectors is operably coupled to receive a plurality of channels, wherein each of the plurality of selectors outputs a channel of the plurality of channels based on a respective one of a plurality of channel selection commands to produce selected channels;	Comcast's X1 Platform comprises a plurality of selectors, wherein each of the plurality of selectors is operably coupled to receive a plurality of channels, wherein each of the plurality of selectors outputs a channel of the plurality of channels based on a respective one of a plurality of channel selection commands to produce selected channels.  <i>See evidence for corresponding limitations in claim elements 1[a], 1[b], 1[c], and 1[d].</i>
[b] encoding module operably coupled to encode the selected channels based on a data conveyance protocol of the multimedia system to produce encoded channel data; and	Comcast's X1 Platform comprises an encoding module operably coupled to encode the selected channels based on a data conveyance protocol of the multimedia system to produce encoded channel data.  <i>See evidence for corresponding limitation in claim element 1[g].</i>
[c] bus interface module operably coupled transmit the encoded channel data in accordance with the data conveyance protocol, the bus interface module including a receiving module that is operably coupled to monitor packets from a shared bus at specific time intervals and to identity at least one of the packets at one of the specific time intervals, that contains at least a portion of one of the plurality of channel selection commands to produce an identified packet, wherein the receiving module comprising decoding module to	Comcast's X1 Platform comprises a bus interface module operably coupled to transmit the encoded channel data in accordance with the data conveyance protocol, the bus interface module including a receiving module that is operably coupled to monitor packets from a shared bus at specific time intervals and to identity at least one of the packets at one of the specific time intervals, that contains at least a portion of one of the plurality of channel selection commands to produce an identified packet, wherein the receiving module comprising decoding module to

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coupled to monitor packets from a shared bus at specific time intervals and to identify at least one of the packets at one of the specific time intervals, that contains at least a portion of one of the plurality of channel selection commands to produce an identified packet, wherein the receiving module comprising decoding module to decode the identified packet, based on the data conveyance protocol, to recapture at least a portion of the one of the plurality of channel selection commands.	<p>decode the identified packet, based on the data conveyance protocol, to recapture at least a portion of the one of the plurality of channel selection commands.</p> <p><i>See evidence for corresponding limitations in claim elements 1[d] and 1[e].</i></p>
37. An apparatus for multiplexing a plurality of channels in a multimedia system, the apparatus comprises:	<p>Comcast's X1 Platform comprises an apparatus for multiplexing a plurality of channels in a multimedia system.</p> <p><i>See evidence cited for claim 1[pre].</i></p>
[a] processing module; and	<p>Comcast's X1 Platform comprises a processing module.</p> <p><i>See evidence for corresponding limitation in claim element 1[d].</i></p>
[b] memory operably coupled to the processing module, wherein the memory includes operational instructions that cause the processing module to:	<p>Comcast's X1 Platform comprises memory operably coupled to the processing module.</p> <p>Comcast's X1 Platform includes memory coupled to the processing module containing operational instructions. <i>See FCC internal photographs of XG1v4</i>, FCC ID, <a href="https://fccid.io/ACQ-XG1V4/Internal-Photos/Internal-Photos-3375529">https://fccid.io/ACQ-XG1V4/Internal-Photos/Internal-Photos-3375529</a>; <i>FCC internal photographs of XG2v2</i>, FCC ID, <a href="https://fccid.io/NQ8PX022ANX/Internal-Photos/Internal-Photos-2542127">https://fccid.io/NQ8PX022ANX/Internal-Photos/Internal-Photos-2542127</a> (last visited Apr. 18, 2019); <i>FCC internal photographs of XG1v3</i>, FCC ID, <a href="https://fccid.io/NQ8PX013ANM/Internal-Photos/Internal-photos-4-2251588">https://fccid.io/NQ8PX013ANM/Internal-Photos/Internal-photos-4-2251588</a> (last visited Apr. 18, 2019).</p>

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	<p>In the case of interfacing to the Xi5 or Xi6, the local network may include, e.g., an XB6 between the X1 gateway set-top box and the Xi5 or Xi6 client set-top box. The Arris TG3482G (i.e, XB6 Wireless Gateway) broadband gateway includes a processing module;</p> <p>See evidence for corresponding limitation in claim element 1[d].</p>  <p>The screenshot shows the Xfinity Gateway management interface. At the top, it states 'The Device is currently in Bridge Mode.' and shows the user 'Hi admin' with links for 'Logout' and 'Change Password'. Below this, there's a status bar with '0%' signal strength, 'Internet' status, and 'Wi-Fi', 'MoCA', and 'Low Security' indicators. The left sidebar has a 'Gateway' section with sub-items: 'At a Glance', 'Connection', 'Software', 'Hardware' (selected), 'Connected Devices', 'Advanced', and 'Troubleshooting'. The 'Hardware' section is further divided into 'System Hardware', 'Battery', 'LAN', and 'Wireless'. The main content area is titled 'Gateway &gt; Hardware &gt; System Hardware' and contains a table of system hardware information:</p> <table border="1"> <thead> <tr> <th colspan="2">System Hardware</th> </tr> </thead> <tbody> <tr> <td>Model:</td> <td>TG3482G</td> </tr> <tr> <td>Vendor:</td> <td>ARRIS Group, Inc.</td> </tr> <tr> <td>Hardware Revision:</td> <td>9</td> </tr> <tr> <td>Serial Number:</td> <td>[REDACTED]</td> </tr> <tr> <td>Processor Speed:</td> <td>3999.70 MHz</td> </tr> <tr> <td>DRAM Total Memory:</td> <td>670 MB</td> </tr> <tr> <td>DRAM Used Memory:</td> <td>375 MB</td> </tr> <tr> <td>DRAM Available Memory:</td> <td>295 MB</td> </tr> <tr> <td>Flash Total Memory:</td> <td>467 MB</td> </tr> <tr> <td>Flash Used Memory:</td> <td>429 MB</td> </tr> <tr> <td>Flash Available Memory:</td> <td>38 MB</td> </tr> </tbody> </table> <p>At the bottom of the page, there are links for 'Xfinity.com', 'customerCentral', and 'User Guide'.</p> <p>Source: <i>Bridge Mode on ARRIS TG3482G</i>, XFINITY COMMUNITY FORUM, <a href="https://forums.xfinity.com/t5/Your-Home-Network/Bridge-mode-on-Arris-TG3482G/td-">https://forums.xfinity.com/t5/Your-Home-Network/Bridge-mode-on-Arris-TG3482G/td-</a></p>	System Hardware		Model:	TG3482G	Vendor:	ARRIS Group, Inc.	Hardware Revision:	9	Serial Number:	[REDACTED]	Processor Speed:	3999.70 MHz	DRAM Total Memory:	670 MB	DRAM Used Memory:	375 MB	DRAM Available Memory:	295 MB	Flash Total Memory:	467 MB	Flash Used Memory:	429 MB	Flash Available Memory:	38 MB
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	p/2900827 (last visited Apr. 18, 2019).
[c] receive a plurality of channels from a multimedia source;	Comcast's X1 Platform comprises memory operably coupled to the processing module, wherein the memory includes operational instructions that cause the processing module to: receive a plurality of channels from a multimedia source.  <i>See evidence for corresponding limitation in claim element 1[a].</i>
[d] receive a plurality of channel selection commands by: monitoring a shared bus at specific time intervals; and	Comcast's X1 Platform comprises memory operably coupled to the processing module, wherein the memory includes operational instructions that cause the processing module to: receive a plurality of channel selection commands by: monitoring a shared bus at specific time intervals.  <i>See evidence for corresponding limitations in claim elements 1[b], 1[c] 1[d], and 1[e].</i>
[e] identifying a data frame at one of the specific time intervals that contains at least a portion of one of the plurality of channel selection commands; decode, based on a data conveyance protocol of the multimedia system, the data frame to recapture the at least a portion of the one of the plurality of channel selection commands;	Comcast's X1 Platform comprises memory operably coupled to the processing module, wherein the memory includes operational instructions that cause the processing module to: identify a data frame at one of the specific time intervals that contains at least a portion of one of the plurality of channel selection commands; decode, based on a data conveyance protocol of the multimedia system, the data frame to recapture the at least a portion of the one of the plurality of channel selection commands.  <i>See evidence for corresponding limitation in claim element 1[e].</i>
[f] select a channel of the plurality of channels per channel selection command of the plurality of channel selection commands to produce selected channels; and	Comcast's X1 Platform comprises memory operably coupled to the processing module, wherein the memory includes operational instructions that cause the processing module to: select a channel of the plurality of channels per channel selection command of the plurality of channel selection commands to produce selected channels.  <i>See evidence for corresponding limitation in claim element 1[f].</i>
[g] encode each of the selected channels based on a the data conveyance protocol of the	Comcast's X1 Platform comprises memory operably coupled to the processing module, wherein the memory includes operational instructions that cause the processing module to: encode each of the selected channels based on the data conveyance protocol of the multimedia system to produce

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multimedia system to produce a set of encoded channel data.	a set of encoded channel data.  <i>See evidence for corresponding limitation in claim element 1[g].</i>
53. An apparatus for multiplexing channels in a multimedia system, the apparatus comprises:	Comcast's X1 Platform comprises apparatus for multiplexing channels in a multimedia system.  <i>See evidence for claim 37[pre].</i>
[a] processing module; and	Comcast's X1 Platform comprises a processing module.  <i>See evidence for corresponding limitation in claim element 37[a].</i>
[b] memory operably coupled to the processing module, wherein the memory includes operational instructions that cause the processing module to:	Comcast's X1 Platform comprises memory operably coupled to the processing module.  <i>See evidence for corresponding limitation in claim element 37[b].</i>
[c] receiving a channel from each of a plurality of sources to produce a plurality of channels;	Comcast's X1 Platform comprises memory operably coupled to the processing module, wherein the memory includes operational instructions that cause the processing module to: receiving a channel from each of a plurality of sources to produce a plurality of channels.  <i>See evidence for corresponding limitation in claim element 37[c].</i>
[d] receiving, from a plurality of clients, a plurality of channel selection requests by monitoring shared bus at specific time intervals, identifying a data frame at one of the specific time intervals that contains at least a portion of one of the plurality of channel selection requests, decoding, based on a data conveyance protocol of the multimedia system, the data	Comcast's X1 Platform comprises memory operably coupled to the processing module, wherein the memory includes operational instructions that cause the processing module to: receiving, from a plurality of clients, a plurality of channel selection requests by monitoring shared bus at specific time intervals, identifying a data frame at one of the specific time intervals that contains at least a portion of one of the plurality of channel selection requests, decoding, based on a data conveyance protocol of the multimedia system, the data frame to recapture the at least a portion of the one of the plurality of channel selection requests.  <i>See evidence for corresponding limitations in claim elements 1[b], 1[c], 1[d], and 1[e].</i>

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frame to recapture the at least a portion of the one of the plurality of channel selection requests; and	
[e] processing the plurality of channel selection requests to determine whether the request can supported, and, if so, producing a plurality of channel selection commands, wherein each of the plurality of channel selection commands includes an identity of one of the plurality of sources, and an identity of the channel;	<p>Comcast's X1 Platform comprises memory operably coupled to the processing module, wherein the memory includes operational instructions that cause the processing module to: processing the plurality of channel selection requests to determine whether the request can supported, and, if so, producing a plurality of channel selection commands, wherein each of the plurality of channel selection commands includes an identity of one of the plurality of sources, and an identity of the channel.</p> <p><i>See evidence for corresponding limitations in claim elements 1[b] and 1[c].</i></p>
[f] selecting a channel of the plurality of channels per channel selection command of the plurality of channel selection command to produce selected channels; and	<p>Comcast's X1 Platform comprises memory operably coupled to the processing module, wherein the memory includes operational instructions that cause the processing module to: selecting a channel of the plurality of channels per channel selection command of the plurality of channel selection command to produce selected channels.</p> <p><i>See evidence for corresponding limitation in claim element 1[f].</i></p>
[g] encoding each of the selected channels based on the data conveyance protocol of the multimedia system to produce a set of encoded channel data.	<p>Comcast's X1 Platform comprises memory operably coupled to the processing module, wherein the memory includes operational instructions that cause the processing module to: encoding each of the selected channels based on the data conveyance protocol of the multimedia system to produce a set of encoded channel data.</p> <p><i>See evidence for corresponding limitation in claim element 1[g].</i></p>