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Audio Quality	Sampling Rate (kHz)	Bits/Sample	Data Rate
DVD-A	96	24	2.304Mbps
DVD-A	48	24	1.152Mbps
CD-A	44.1	16	706Kbps
Telephone quality	8	8	64Kbps

## VII. Overview of the '357 Patent

### A. The '357 Patent

65. The '357 Patent is titled "Obtaining content from remote source for playback." The '357 Patent issued on December 12, 2015, from U.S. Patent Application No. 14/516,867, filed on October 17, 2014, and claiming to be a continuation of Application No. 13/297,000, filed on Nov. 15, 2011, which claims to be a continuation of Application No. 10/816,217, filed on Apr. 1, 2004, now Pat.

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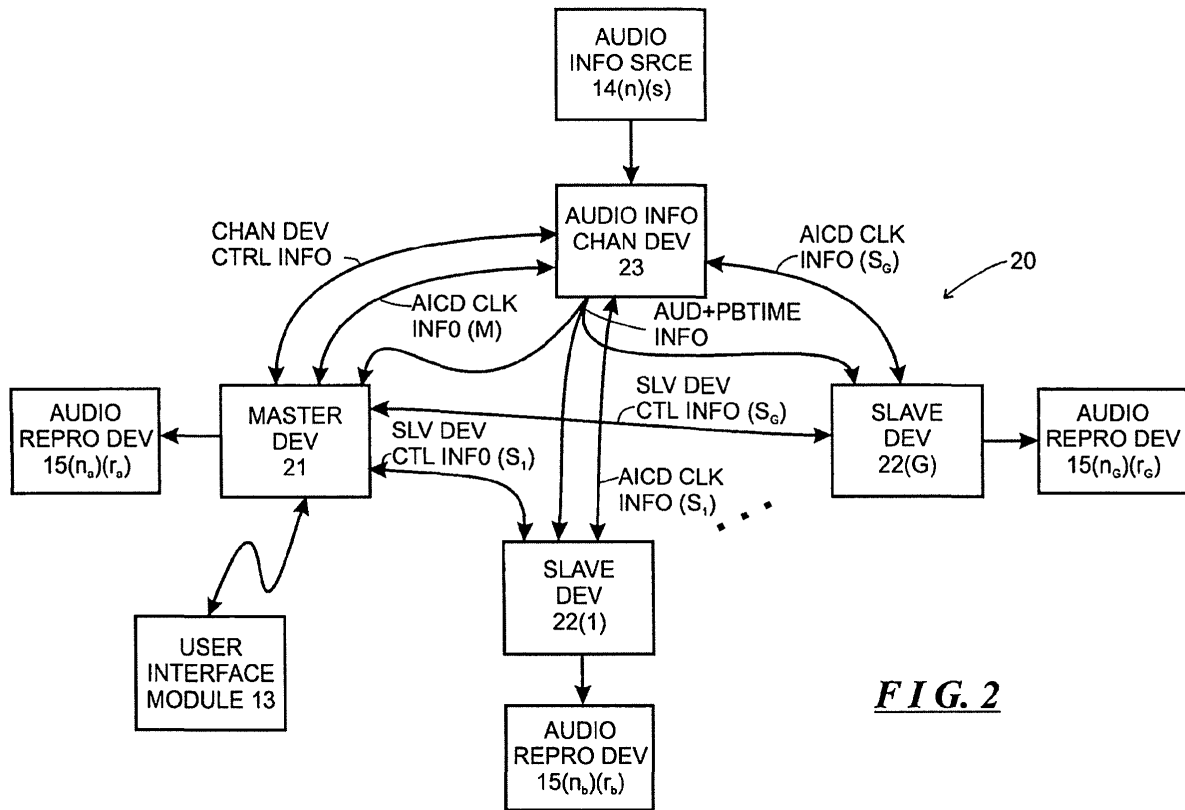
<sup>33</sup> See e.g., EX1034 (Chapter 22, The Scientist and Engineer's Guide to Digital Signal Processing, Steven W. Smith, January 1, 1997) (available at <https://www.dspguide.com/>).

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No. 8,234,395, which claims priority to Provisional Application No. 60/490,768, filed on Jul. 28, 2003.

66. The '357 Patent describes “a plurality of audio playback devices that receive digital audio information that is to be played back in synchrony.” (EX1001, 3:38-40.) The '357 Patent describes that a first device assigns tasks “associated with a timestamp” for execution by the other devices. (EX1001, 3:53-55.) Then, the first device periodically indicates the current time of its clock, which the other devices use to execute the task at the correct time. (EX1001, 1:56-62.)

67. The '357 Patent applies this to audio playback by assigning different playback devices as at least one of an “audio information channel device 23,” a “master playback device 21,” and one or more “slave playback devices 22.” According to the '357 Patent, the audio information channel device 23 is a centralized hub that coordinates audio information between an audio information source outside the LAN and the playback devices on the LAN. (EX1001, 7:51-17:53, FIG. 2.)



**FIG. 2**

68. Specifically, the '357 Patent describes audio information channel device 23 to obtain the audio information for the audio program from the audio information source, add playback timing information, and distributes the combined audio and playback timing information to the other playback devices. (EX1001, 7:66-8:4.) The audio information channel device then also transmits “clock timing information” to “enable[] the master device 21 and slave devices 22(g) of the synchrony group 20 to play the audio information simultaneously.” (EX1001, 8:5-11). To achieve the “simultaneous” playback of each timestamp, the '357 Patent explains that the audio information channel sends “clock time information to the

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master device 21 and each of the slave devices 22(g) individually over network 12 using a highly accurate clock time information transmission methodology.” (EX1001, 11:25-29) The ’357 Patent then explains that “clock time information” can be distributed using the “well-known SNTP protocol.” (EX1001, 11:35-47, 12:39-45, 16:40-44, 17:34-39, 22:65-23:6, 24:32-38, 25:58-66.) Although the audio information channel device 23 and the master playback device 21 are preferably different devices, the ’357 Patent discloses that, in some implementations, the audio information channel device 23 and the master playback device 21 may be the same device. (EX1001, 8:39-55) (EX1001, 7:60-66.)

**B. Priority Date of the ’357 Patent**

69. The ’357 Patent has a U.S. filing date of October 17, 2014, and claims to be a continuation of Application No. 13/297,000, filed on Nov. 15, 2011, which claims to be a continuation of Application No. 10/816,217, filed on Apr. 1, 2004, now Pat. No. 8,234,395, which claims priority to Provisional Application No. 60/490,768, filed on Jul. 28, 2003. I further understand that Patent Owner has asserted that the invention date of the ’357 Patent was at least by April 25, 2003.

70. I have not been asked to opine on the ’357 Patent’s entitlement to any date earlier than October 17, 2014, which I can readily do if asked later.

**C. File History of the ’357 Patent**

71. In the first Office Action on the merits, the Examiner rejected claims 1-

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20 as being unpatentable under pre-AIA 35 U.S.C. 103(a) over combinations of U.S. Pat. App. No. 2007/0142944A1 to Goldberg *et al.* (“Goldberg”), U.S. Pat. App. No. 2005/0027821A1 to Alexander *et al.* (“Alexander”), and U.S. Pat. App. No. 2003/0073432A1 to Meade *et al.* (“Meade”). (EX1002, 347-51.) After an interview where agreement could not be reached, Patent Owner responded to the rejections with amendments and arguments, arguing that the prior art lacked control information regarding the second playback device. (EX1002, 321-325.)

On March 9, 2015, the Examiner issued a Final Office Action rejecting claims 1-20 over Goldberg in view of Meade alone. (EX1002, 279.) In response, on May 11, 2015, Patent Owner conducted an interview to propose amending the play back element to be “based at least in part on the playback timing information associated with the audio information and the clock information of the first playback device.” (EX1002, 167, 161.) In the interview summary, Patent Owner argued this should place the claims in condition for allowance because “none of the cited references teach that playback is based on the clock information.” (EX1002, 160.) Examiner disagreed and explained that it was essential for the amendment to explain how device clock information was incorporated into play back.

Examiner advised to replace "based at least in part on" with a limitation that would provide specificity as to how playback timing information and clock information are incorporated into play back of the audio information. Examiner stated that providing this information in the claim is **essential for allowability because this is the core of the**

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***inventive concept***. Applicant's Attorneys indicated that such feature would be too specific for the Client to find acceptable. No agreement was reached on allowability of any of the pending claims.<sup>34</sup>

72. After the interview and on the same date, Patent Owner filed an After Final Consideration Program Request and amended the independent claims to include the first playback device transmitting to the second device “the audio information, playback timing information associated with the audio information, and device clock information of the first playback device” (as appears in the issued claims) and playing back “in synchrony with the second playback device by using the playback timing information associated with the audio information to play back the audio information.” (EX1002, 169-175.)

73. After two more interviews, and a Request For Continued Examination, on November 4, 2015, the Examiner issued a Notice of Allowance noting none of the prior art, alone or in combination disclose or suggested the amended claims’ “playing back, by the first playback device, the audio information in synchrony with the second playback device by using the timing information associated with the audio information and the device clock time information of the first playback device to play back the audio information, wherein the first and second playback devices remain independently clocked during synchronous playback of the audio

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<sup>34</sup> EX1002, 160 (emphasis added).



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synchronization of media synch players using a time server and Gray teaches a media server timestamping audio information, but that Blank teaches Gray's timestamp being used to time synchronize the server and player clocks, not for the required synchronized playback.

Because the proposed combination of Blank and Gray requires that Gray's timestamping feature be used to perform a different function than taught by Blank, the Final Office Action's assertions that the proposed combinations and modifications "would yield predictable results," "could be achieved with a reasonable expectation of success," "wouldn't require undue experimentation," "would not be overly complicated," and that Blank incorporates Gray by reference are not sufficient to support the legal conclusion that the claims are obvious in view of Blank and Gray. MPEP 2143(1)(A).<sup>35</sup>

Patent Owner further cited to litigation documents regarding previous defendant D+M's internal operations in 2011-2013 as evidence of secondary indicia of non-obviousness. (EX1004, 267-79.)

77. In an advisory action issued June 11, 2018, the Examiner affirmed the rejections, leading to Patent Owner's Notice of Appeal July 16, 2018. (EX1004, 222.) On May 31, 2019, the Board reversed the Examiner's rejections based on the conclusions of indicia of non-obviousness. (EX1004, 32.)

#### **E. Interpretation of the '357 Patent Challenged Claims**

78. I understand that in this proceeding, the claims should be construed in

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<sup>35</sup> EX1004, 261-62.











































































































































































































































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tuner driver 271 directs the tuner hardware (see, e.g., tuner 910 in FIG.9 described below) to tune to the specified channel. The tuner driver also communicates with the conditional access subsystem (see, e.g., module 930 in FIG.9) to determine whether the user has the right to view the particular channel (e.g., the channel may be a Subscription based channel such as HBO).

<sup>110</sup>

352. Accordingly it is my opinion that Chatterton discloses or suggests this element.

**5. [1.2.2] (ii) transmitting, by the first playback device to a second playback device, the audio information, playback timing information associated with the audio information, and device clock information of the first playback device; and**

353. Chatterton discloses or suggests this element.

354. As explained above in Section VII.E, I understand that “playback timing information” and “device clock information of the first playback device” have been previously construed.

355. Specifically, I understand that “*playback timing information*” has been construed as “information indicating when the audio information [content] is to be played back.” It is my opinion that the subject matter would have been disclosed and suggested regardless of whether this term is construed as it has previously or according to its plain and ordinary meaning.

356. Additionally, I understand that “*clock information/device clock*

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<sup>110</sup> EX1009, 8:18-35.

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*information of the first playback device*” has been construed as “information representing a time value indicated by a device’s clock.” It is my opinion that the subject matter would have been disclosed and suggested regardless of whether this term is construed as it has previously or according to its plain and ordinary meaning.

357. Chatterton discloses that home media server 110 (*“first playback device”*) distributes audio and video content (*“audio information”*) as a stream with timestamps for playback (*“playback timing information”*) and transmits a resynchronization signal 1616 (*“device clock information of the first playback device”*) to devices 160-163 and multimedia nodes 150 and 151 (any of them can be a *“second playback device”* depending on the specific application). Chatterton further discloses the use of RTP for its transport stream, which additionally provides for RTCP sender report packets with NTP timestamps and RTP timestamps (*“device clock information of the first playback device”*).

358. As described above regarding element [1.1.1], Chatterton discloses that home media server 110 distributes media content on home media network 140. Chatterton further discloses that home media server 110 converts media stream formats to ensure they can be played back on the home media network 140 devices.

More particularly, the invention relates to a system and method for converting digital multimedia streams from a first format playable on a first type of system to a second format playable on a second type of system.<sup>111</sup>

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<sup>111</sup> EX1009, 1:8-11.

359. Chatterton expressly discloses that the media streams (audio or video) are created “using the RTP/RTSP protocol.”

If the user has access rights, then the tuner server module 252 creates video stream for the specified broadcast channel and feeds the stream to the multimedia node 151. In one embodiment, the tuner server module 602 creates the stream using the RTP/RTSP protocol (i.e., by communicating with the RTP/RTSP module 251). The media node receives the stream through the local TV tuning application 601 and decodes the stream using a codec embedded within the media toolkit 260 (various additional encoding features of the system are set forth below). Once decoded, the video image is generated on the video display.<sup>112</sup>

The jukebox server module 604 then creates the audio stream for the specified files and feeds the stream to the multimedia node 150. In one embodiment, the tuner server module 252 uses the RTP/RTSP protocol to create the stream (e.g., through communication with the RTP/RTSP module 251). The multimedia node 150 receives the stream through its jukebox application 601 and decodes the stream using a codec embedded within the media toolkit 260. Once decoded, the music tracks are reproduced on a set of speakers.<sup>113</sup>

360. Chatterton explains that different formats use different spacing between playback timestamps. Specifically, Chatterton points to “System Clock Reference” timestamps compared to “Program Clock Reference” timestamps, and explains a method for generating PCR timestamps to include for transmission.

A method for converting a program stream to a transport stream is described comprising: reading program stream packets from a digital versatile disk (“DVD”) based on user selections and navigation

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<sup>112</sup> EX1009, 8:36-47.

<sup>113</sup> EX1009, 8:54-67.

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metadata contained on the DVD; extracting audio and video content packetized within the program stream packets; reading system clock reference (“SCR”) timestamps from the program stream packets, the SCR timestamps indicating relative times at which the audio and video should be rendered; determining a point within consecutively read program stream packets at which the SCR timestamps are non-consecutive; converting the SCR timestamps to program clock reference (“PCR”) timestamps interpretable by a transport stream decoder; and generating a transport stream of transport stream packets containing the audio and video content and using the PCR timestamps to provide for decode timing at the transport stream decoder; and generating a resynchronization signal causing the transport stream decoder to resynchronize with the transport stream when it receives corresponding non-consecutive PCR timestamps associated with the non-consecutive SCR timestamps.<sup>114</sup>

361. Chatterton discloses that the transport stream playback timing timestamps (“*playback timing information*”) may be provided on headers of the data streams (“*associated with audio information*”) by home media server 110 (“*first playback device*”) according to RTP/RTSP protocol.

In one embodiment, the home media server **110** is configured with support for the realtime transport protocol (“RTP”) and the realtime streaming protocol (“RTSP”) (see, e.g., RTP/RTSP module **251**). Briefly, RTP is an IP protocol which supports real time transmission of voice and video. An RTP packet typically resides on top of a user datagram protocol (“UDP”) and includes timestamping and synchronization information in its header for proper reassembly at the receiving end.<sup>115</sup>

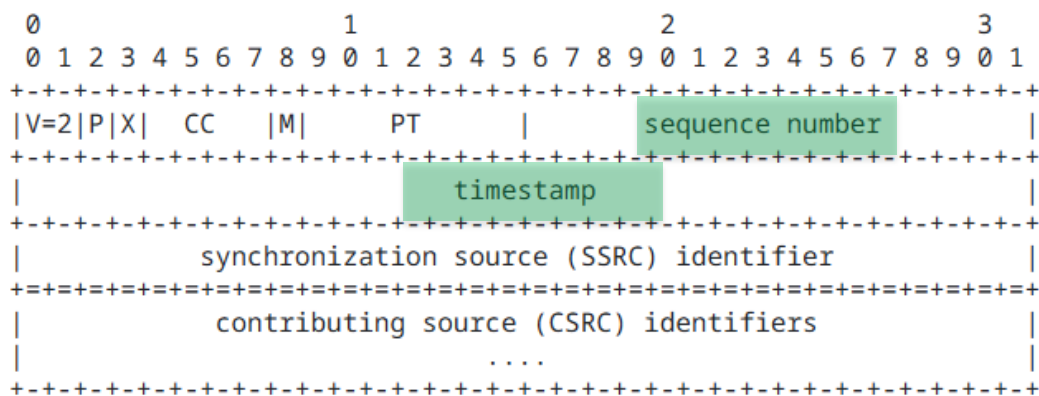
362. A POSITA would recognize or at least find it obvious these

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<sup>114</sup> EX1009, Abstract.

<sup>115</sup> EX1009, 5:38-46.

timestamps disclosed by Chatterton for media transmissions are inherently implemented in headers consistent with the RTP standards, as described by RFC 1889 (EX1009). As shown in green, the header contains a sampling timestamp and sequence number to identify its order amongst other packets in the stream (“*playback timing information associated with audio information*”).<sup>116</sup>



363. A POSITA would understand that with the specific formatting of each transmission required by the RTP protocol, the sequence number of the packet will be used to calculate a time to play a packet based on the intervals between the packets and the sampling frequency. It is my opinion that Chatterton discloses timestamps, such as those in the RTP header, are “*playback timing information*” regardless of whether the previous construction is applied or the term is read according to its plain and ordinary meaning.

364. Chatterton further explains that home media network 140 devices,

<sup>116</sup> EX1010, 10.

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including devices 160-163 and multimedia nodes 150 and 151 (any of them can be a “*second playback device*”) can use their stream decoders to synchronize with the home media server 110 (“*first playback device*”) when it sends a resynchronization signal 1616 from its content conversion module (“*device clock information*”).

In addition, in one embodiment, a resynchronization signal **1616** is generated by the content conversion module **1610** to cause the transport stream decoder **1620** to resynchronize with the converted DVD content **1612** under certain conditions, described in detail below.<sup>117</sup>

Accordingly, in one embodiment, at 1650, when the stream processing logic 1681 detects a non-consecutive jump in the SCR/PCR timestamps, it will activate the resynchronization signal 1616, directing the transport stream decoder to resynchronize itself to the new PCR timeline.<sup>118</sup>

365. A POSITA would understand that in order for Chatterton’s resynchronization signal to achieve their stated purpose within Chatterton of “proper reassembly at the receiving end”<sup>119</sup> when the playback timing timestamps are non-consecutive, it must include some type of information about the home media server 110’s clock, and that it suggests the inclusion of at least a current time value. Accordingly, it is my opinion that resynchronization signal 1616 constitutes “*device clock information of the first playback device*” regardless using the previous construction or its plain and ordinary meaning.

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<sup>117</sup> EX1009, 26:47-52.

<sup>118</sup> EX1009, 28:42-47.

<sup>119</sup> EX1009, 5:38-46.









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back by decoding it and outputting it, e.g., through audio amplifiers and speakers. A POSITA would have understood the audio information is played back on home media server 110 and the receiving device are *in synchrony* because the realtime nature of the data sharing and the synchronization information contained in the data for the receiving end to synchronize with the home media server 110. Therefore, a POSITA would have understood that Chatterton discloses the home media server 110 and the receiving device play back the audio information in synchrony (“*playing back, by the first playback device, the audio information in synchrony with the second playback device*”).

373. To any extent Chatterton does not explicitly disclose synchronized playback on multiple devices, it is my further opinion that it at least suggests it based on its teachings and applications. For example, Chatterton discloses the use of home media server to provide simultaneous streams at once, including one or more video streams and several audio streams. A POSITA would understand that the simultaneous distribution of realtime streams of the same content to different devices is for the devices to playback the content simultaneously, in synchrony.

The transmitter 430 (as well as the LAN 390, if one is installed) allows the home media server 110 to simultaneously transmit multimedia content and other types of data to the various media devices 150–151, 160–166 over the home media network 140 (e.g., at least one MPEG-2 video stream and several audio streams).<sup>126</sup>

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<sup>126</sup> EX1009, 5:53-62.

374. Chatterton further discloses the use of wide-screen and high definition televisions sets and audio systems.

Distributed multimedia nodes **150** and **151** illustrated in FIG. 1 provide an interface to the home media network **140** for audio systems **170** (e.g., audio amplifiers and speakers) and/or video systems **171** (e.g., standard television sets, wide screen television sets, high definition television (“HDTV”) sets, or any other device capable of displaying video).<sup>127</sup>

A POSITA would recognize that based on these disclosures, Chatterton discloses an application of home media server 110 to stream content to home theatres and surround sound devices. A POSITA would be familiar with typical audio stream formatting for surround sound and home theatre environments include synchronized streams for multiple speakers. Accordingly, it is my opinion that Chatterton discloses or suggests the application of synchronized playback between home media server 110, the first playback device and second media playback devices.

375. Accordingly, it is my opinion that Chatterton discloses or suggests this element.

***7. [1.2.4] wherein the first and second playback devices remain independently clocked during synchronous playback of the audio information.***

376. Chatterton discloses or suggests this element. I understand

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<sup>127</sup> EX1009, 6:64-7:3.

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“*independently clocked*” has been construed as “operating in accordance with their own respective clocks during synchronous playback.” It is my opinion that the subject matter would have been disclosed and suggested regardless of whether this term is construed as it has previously or according to its plain and ordinary meaning

377. As disclosed above, Chatterton discloses the use of a resynchronization signal 1616 from home media server 110 to synchronize playback with devices on network 140.

378. A POSITA would recognize that in order for the separate devices on network 140 to exist in an unsynchronized state, they must include their own clocking components for playback. For example, Chatterton discloses the inclusion of a decoder 1620 that receives the multimedia signal and processes it for playback.<sup>128</sup> A POSITA would understand this decoder to be or include a digital-to-analog converter and that such devices commonly include a crystal oscillator or other clocking circuit to run its processing in accordance with.

379. Accordingly, based on the ability for devices to go out of synch and the disclosed components and their functions, it is my opinion that regardless of the claim construction applied, a POSITA would understand Chatterton to disclose or suggest that the home media server 110 (“*first playback device*”) and devices 160-

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<sup>128</sup> EX1009, 26:47-52.

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163 and multimedia nodes 150 and 151 (any one of them can be a “*second playback device*”) are “*independently clocked*.”

380. Accordingly, it is my opinion that Chatterton discloses or suggests this element.

381. Accordingly, it is my further opinion that Chatterton anticipates or renders obvious claim 1.

**B. Dependent Claim 2: The method of claim 1, further comprising: after receiving the control information, additionally (i) generating, by the first playback device, the playback timing information associated with the audio information; and (ii) generating, by the first playback device, the device clock information of the first playback device.**

382. Chatterton discloses or suggests the additional subject matter of this claim. As described above with respect to element [1.2.2], Chatterton discloses or suggests, home media server 110 (“*first playback server*”) creates audio streams (“*audio information*”) and associated RTP headers (“*playback timing information*”) and clock information in resynchronization signal 1616, or otherwise in RTCP sender reports, such as in the form of NTP timestamp, and RTP timestamp (“*device clock information*”).

383. Chatterton expressly discloses that the media streams (audio or video) are generated by the home media server 110 “using the RTP/RTSP protocol.”

If the user has access rights, then the tuner server module 252 creates video stream for the specified broadcast channel and feeds the stream to the multimedia node 151. In one embodiment, the tuner server module 602 creates

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the stream using the RTP/RTSP protocol (i.e., by communicating with the RTP/RTSP module 251). The media node receives the stream through the local TV tuning application 601 and decodes the stream using a codec embedded within the media toolkit 260 (various additional encoding features of the system are set forth below). Once decoded, the video image is generated on the video display.<sup>129</sup>

The jukebox server module 604 then creates the audio stream for the specified files and feeds the stream to the multimedia node 150. In one embodiment, the tuner server module 252 uses the RTP/RTSP protocol to create the stream (e.g., through communication with the RTP/RTSP module 251). The multimedia node 150 receives the stream through its jukebox application 601 and decodes the stream using a codec embedded within the media toolkit 260. Once decoded, the music tracks are reproduced on a set of speakers.<sup>130</sup>

384. As described in more details above with respect to element [1.2.2], Chatterton discloses, explicitly or inherently, the generated media streams include audio and video content (“*audio information*”) with timestamps for playback, such as timestamps in associated RTP headers (“*playback timing information*”), and a resynchronization signal 1616 and/or device clock time information, e.g., in the form of both a NTP timestamp and an RTP timestamp (“*device clock information*”), generated according to the RTP/RTSP/RTCP protocols, as described by RFC 1889.

385. For example, Chatterton discloses that home media server 110 generates the resynchronization signal 1616 with content conversion module 1610 (“*device clock information*”).

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<sup>129</sup> EX1009, 8:36-47.

<sup>130</sup> EX1009, 8:36-47.

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In addition, in one embodiment, a resynchronization signal **1616** is generated by the content conversion module **1610** to cause the transport stream decoder **1620** to resynchronize with the converted DVD content **1612** under certain conditions, described in detail below.<sup>131</sup>

Accordingly, it is my opinion that Chatterton discloses or suggests the additional subject matter of this claim.

386. Accordingly, it is my further opinion that Chatterton anticipates or renders obvious claim 2.

**C. Dependent Claim 3: The method of claim 1, wherein the control information further comprises one or more instructions for the first playback device and the second playback device to playback audio information.**

387. Chatterton discloses or suggests alone or in view of RFC 1889 the additional subject matter of this claim. Chatterton discloses that commands for home media network 140 includes commands to play back media. As discussed for [1.1.1], the control information includes commands to home media server 110 can identify specific audio to be obtained from specific locations and played back. as further discussed for [1.2.1]-[1.2.4], such commands cause home media server 110 (“*first playback device*”) to play back the audio information obtained by encoding and distributing to receiving devices, e.g., multimedia nodes (“*second playback device*”) and cause the receiving devices to decode and output to user, e.g., via speakers.

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<sup>131</sup> EX1009, 26:47-52.

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Therefore, a POSITA would have understood the control information to include “instructions for the first playback device and the second playback device to playback audio information.”

388. Further, Chatterton discloses the use of RTSP for playback.<sup>132</sup> A POSITA would be familiar with RTSP, including its ability to issue commands for playback control over a network. To any extent Chatterton does not expressly disclose the use of control information to instruct playback on home media network 140 devices, a POSITA would understand it to be disclosed or suggested consistent with RTSP.

389. Accordingly, it is my opinion that Chatterton discloses or suggests the additional subject matter of this claim.

390. Accordingly, it is my further opinion that Chatterton anticipates or renders obvious claim 3.

**D. Dependent Claim 4: The method of claim 3, wherein the first and second playback devices are members of a synchrony group, and wherein the method further comprises: transmitting, by the first playback device to the network device, status information that comprises a status of the synchrony group.**

391. Chatterton discloses or suggests the additional subject matter of this claim. Chatterton discloses or suggests that home media server 110 (“*first playback*

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<sup>132</sup> EX1009, 5:38-46

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*device*”) can be monitored (“*transmit status information*”) by remote control unit 532 and computers 160/163 (“*network devices*”) about network operations (“*status of a synchrony group*”).

392. As described above with respect to element [1.2.3], Chatterton discloses or suggests that home media server 110 (“*first playback device*”) and the devices 160-163 and multimedia nodes 150 and 151 (any one of them a “*second playback device*”) may play back audio in synchrony. A POSITA would understand that devices playing audio back in synchrony would constitute a “*synchrony group.*”

393. Chatterton discloses that the Home Media Server 110 can be monitored by the user anywhere in the world by a monitoring device such as NOC 180 and “the home media server 110 periodically transmits a status update to the” monitoring device (“*status information*”).

The NOC 180 monitors the home media server to ensure that it is operating within normal parameters. In one embodiment, the home media server 110 periodically transmits a status update to the NOC 180, indicating whether any particular services are required and/or whether any problems have arisen.<sup>133</sup>

As described briefly above, the home media server 110 may poll the NOC 180 periodically (e.g., every few seconds) and transmit a status update.<sup>134</sup>

394. Additionally, Chatterton discloses that users may monitor home media network 140, including home media server 110 and home systems remotely through

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<sup>133</sup> EX1009, 9:10-15.

<sup>134</sup> EX1009, 12:8-10.

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a browser.

Accordingly, users of this embodiment are able to monitor and control home appliances and systems from anywhere in the world. In one embodiment this includes the ability to select broadcast listings and direct the home media server **110** to make recordings (e.g., based on date/time or broadcast ID code).<sup>135</sup>

395. While NOC 180 is generally described by Chatterton as a remote control device connected to home media server 110 over the Internet for a user in a remote location to “monitor and control” the home media server 110 remotely, a POSITA would have understood or at least found it obvious that the monitoring functionalities disclosed by Chatterton on NOC 180 can be readily implemented on any local control device on the home media network 140, such as both remote control unit 532 and computers 160-163 (“*network device*”) also disclosed by Chatterton. Accordingly, it is my opinion that POSITA would understand that Chatterton discloses or at least found it obvious in light of Chatterton’s disclosures that the home media server 110 (“*first playback device*”) transmits status information to a control device (“*network device*”) on the home media network 140

396. Chatterton further discloses that other devices on the home media network 140 can communicate with the home media server 110 to provide their status information for the home media server 110 to relay to the monitoring device

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<sup>135</sup> EX1009, 15:5-12.

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on a periodic basis.<sup>136</sup> Chatterton also discloses that among the status information transmitted includes the identities of “home media server 110 and related home network devices 150-151 and 160-166,” which the home media server 110 transmits to the monitoring device for certification, registration, or authentication.

In one embodiment, when a user purchases a new device, such as a new telephone, the device may automatically identify itself to the home media server 110 (e.g., via USB, IEEE 1394 or other device identification technology). The home media server 110 will then determine whether the device is supported by the system and, if so, query the NOC 180 for the latest driver.<sup>137</sup>

In addition, the home media server 110 may check the NOC 180 to determine whether the home network device has been certified by the NOC 180 as meeting some minimum level of quality and/or performance. In one embodiment, device drivers will be downloaded and installed on the system only if the device has been certified. In this manner, a minimum quality of service may be maintained for all devices employed on the system.<sup>138</sup>

In one embodiment, users may be required to register with the NOC 180 upon purchasing a home media server 110 and related network devices 150–151, 160–166.<sup>139</sup>

397. In light of the above, it is my opinion that a POSITA would understand that that Chatterton further discloses or at least found it obvious in light of Chatterton’s disclosures that the home media server 110 (“*first playback device*”)

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<sup>136</sup> EX1009, 9:27-33.

<sup>137</sup> EX1009, 9:54-61.

<sup>138</sup> EX1009, 10:3-10.

<sup>139</sup> EX1009, 11:17-21.

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transmits status information of playback devices, such as their identifications, (“*status information of the synchrony group*”) on the network to the control device (“*network device*”).

398. Accordingly, it is my opinion that Chatterton discloses or suggests the additional subject matter of this claim.

399. Accordingly, it is my further opinion that Chatterton anticipates or renders obvious alone claim 4.

**E. Dependent Claim 5: The method of claim 4, wherein the status information further comprises an identification of each playback device in the synchrony group.**

400. Chatterton discloses or suggests the additional subject matter of this claim. As described with respect to [1.2.3] and claim 4, Chatterton discloses or suggests that home media server 110 provide status information of multiple playback devices that can play back in synchrony (“*synchrony group*”) to a monitoring device.

401. Chatterton explicitly discloses that among the status information transmitted from the home media server 110 to the monitoring device includes the identifications of “home media server 110 and related home network devices 150-151 and 160-166” (“*an identification of each playback device in the synchrony group*”).

In one embodiment, when a user purchases a new device, such as a new telephone, the device may automatically identify itself to the home media server 110 (e.g., via USB, IEEE 1394 or other device

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identification technology). The home media server 110 will then determine whether the device is supported by the system and, if so, query the NOC 180 for the latest driver.<sup>140</sup>

In addition, the home media server 110 may check the NOC 180 to determine whether the home network device has been certified by the NOC 180 as meeting some minimum level of quality and/or performance. In one embodiment, device drivers will be downloaded and installed on the system only if the device has been certified. In this manner, a minimum quality of service may be maintained for all devices employed on the system.<sup>141</sup>

In one embodiment, users may be required to register with the NOC 180 upon purchasing a home media server 110 and related network devices 150–151, 160–166.<sup>142</sup>

402. Accordingly, it is my opinion that Chatterton discloses or suggests the additional subject matter of this claim.

403. Accordingly, it is my further opinion that Chatterton anticipates or renders obvious claim 5.

**F. Dependent Claim 6: The method of claim 5, wherein the status information further comprises an identification of a master playback device of the synchrony group.**

404. Chatterton discloses or suggests the additional subject matter of this claim. As described above with regard to element [1.2.2] and [1.2.3], home media server 110 provides the master playback timing and clock information to other

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<sup>140</sup> EX1009, 9:54-61.

<sup>141</sup> EX1009, 10:3-10.

<sup>142</sup> EX1009, 11:17-21.

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playback devices on home media network 140, and the other playback devices on the receiving end use the master's playback timing and clock information to "reassemble" the data to play back in synchrony. It is my opinion that a POSITA would understand home media server 110 to be the master playback device based on these functions. A POSITA therefore would have found it obvious that any status information including the home media server 110 would include its identification as a master.

405. Accordingly it is my opinion that Chatterton discloses or suggests the additional subject matter of this claim.

406. Accordingly, it is my further opinion that Chatterton anticipates or renders obvious claim 6.

**G. Dependent Claim 7: The method of claim 6, wherein the first playback device is the master playback device of the synchrony group.**

407. Chatterton discloses or suggests the additional subject matter of this claim. As described in claim 6, Chatterton discloses or suggests that home media server 110 is the master playback device and a POSITA would recognize so.

408. Accordingly, it is my opinion that Chatterton discloses or suggests the additional subject matter of this claim.

409. Accordingly, it is my further opinion that Chatterton anticipates or renders obvious claim 7.

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**H. Independent Claim 8:**

**1. [8.P]: A tangible non-transitory computer-readable medium having instructions stored thereon that, when executed, cause a first playback device to:**

410. To the extent that it is limiting, Chatterton discloses or suggests the subject matter described in this element.

411. Chatterton discloses that home media server 110 includes a central processing unit 200, main memory 201, and an application-specific integrated circuit (“ASIC”) 210.

As illustrated in FIG. 2 *a*, one embodiment of a home media server **110** computing architecture includes a central processing unit **200** capable of processing data and multimedia content stored in main memory **201** and a mass storage device **230** for storing data and multimedia content. In one embodiment, the central processing unit **200** is a Pentium®-class processor such as a Pentium III® operating at a 1 GHz or faster clock frequency. It should be noted, however, that the underlying principles of the invention are not limited to any particular processor speed or processor type. The main memory **201** may be a random access memory or any other dynamic storage medium (e.g., SDRAM, DDRAM, RD-RAM, . . . etc.). The mass storage device **230** of one embodiment is capable of storing hundreds, or even thousands of hours of multimedia content (e.g., movies, digital audio, . . . etc.) as well as other types of digital data (e.g., computer programs, word processing documents, . . . etc.). . .

An application-specific integrated circuit (“ASIC”) **210** coordinates communication between the various system components and offloads certain designated processing tasks from the CPU. The ASIC may be custom built based on the requirements of the home media server **110** or may be built using gate arrays, standard cells or programmable logic devices.<sup>143</sup>

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<sup>143</sup> EX1009, 4:4-34.

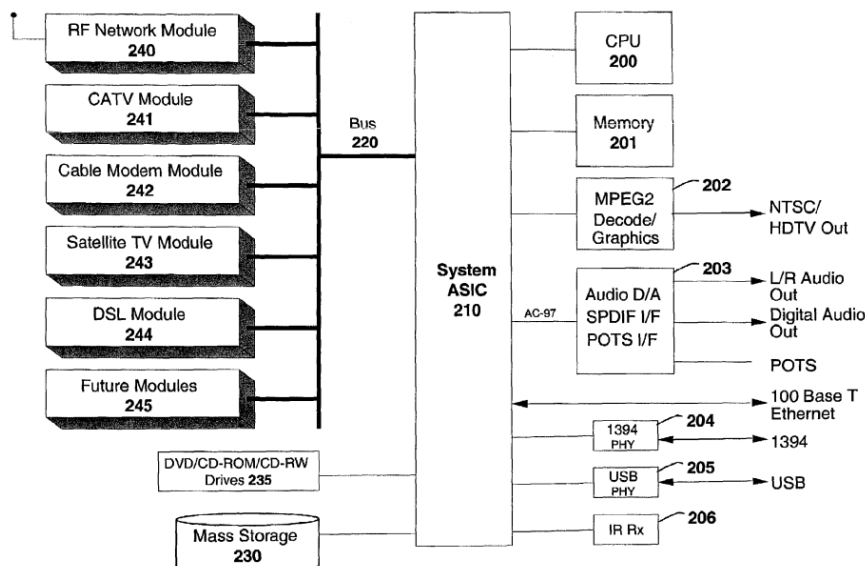


FIG. 2a

412. A POSITA would recognize that processing unit 200, memory 201, and ASIC 210 to store and execute the necessary instructions to implement the disclosed methods of Chatterton.

413. Accordingly, it is my opinion that Chatterton discloses or suggests this element.

**2. [8.1.1]: receive, from a network device configured to control the first playback device and communicatively coupled to the first playback device over a local area network (LAN), control information comprising an address identifying a location of audio information available at an audio information source, [8.1.2] wherein the audio information source is outside of the LAN; and**

414. To the extent that it is limiting, Chatterton discloses or suggests the subject matter described in this element. The subject matter in this element corresponds to the subject matter described in element [1.1.1]-[1.1.2] Accordingly,

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based on the same analysis detailed above, it is my opinion that Chatterton discloses or suggests this element.

**3. [8.2.1]: after receiving the control information, (i) obtain, from the audio information source outside of the LAN, the audio information; [8.2.2] (ii) transmit, to a second playback device, the audio information, playback timing information associated with the audio information, and clock time information for the first playback device; and [8.2.3] (iii) play back the audio information in synchrony with the second playback device by using the playback timing information associated with the audio information and the clock time information of the first playback device to play back the audio information, [8.2.4] wherein the first and second playback devices remain independently clocked during synchronous playback of the audio information.**

415. To the extent that it is limiting, Chatterton discloses or suggests the subject matter described in this element. The subject matter in this element corresponds to the subject matter described in elements [1.2.1]-[1.2.4]. Accordingly, based on the same analysis detailed above, it is my opinion that Chatterton discloses or suggests this element.

416. Accordingly, it is my further opinion that Chatterton anticipates or renders obvious claim 8.

**I. Independent Claim 9:**

**1. [9.P]: A first playback device comprising:**

417. To the extent that it is limiting, Chatterton discloses or suggests home media server 110 as a first playback device, for reasons discussed for [1.1.1].

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418. Accordingly, it is my opinion that Chatterton discloses or suggests this element.

**2. [9.1]: one or more processors;**

419. Chatterton discloses or suggests the subject matter described in this element. The subject matter in this element overlaps with the subject matter described in element [8.P]. Accordingly, based on the same analysis detailed above, it is my opinion that Chatterton discloses or alone suggests this element.

**3. [9.2]: a network interface; and**

420. Chatterton discloses or suggests the subject matter described in this element.

421. Chatterton discloses that home media server 110 includes various network interfaces including exemplary RF network module 240, a DSL module 244, ethernet port, infrared port 206, firewire port 204, and other optional interfaces.

In the particular embodiment illustrated in FIG. 2 a, the communication modules 240–245 electrically coupled to the system bus 220 include an RF network module 240 for communicating over the home media network 140 (i.e., via a wireless RF channel), a cable TV module 241 for receiving broadcast cable channels, a cable modem module 242 for providing Internet access via a cable system (i.e., using the TCP/IP protocol), a satellite TV module 243 for receiving satellite broadcasts, and a DSL module 244 for DSL Internet access. Moreover, a virtually unlimited number of new modules may be added as necessary to support new or existing communication channels/protocols (as indicated by module 245)....Other components within the home media server **110** architecture include an MPEG-2 decode module **202** (and/or other decode modules such as AC3, MPEG-1, . . .

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etc.); an audio module **203** comprised of a digital-to-analog converter, a Sony-Philips Digital Interconnect Format (“SP-DIF”) interface and a standard telephony interface for providing digital and analog audio and standard telephone service to external audio/telephony devices; an Ethernet port provided directly the system ASIC **210** (as indicated by the “100 Base-T Ethernet” designation); a Firewire (IEEE 1394) port **204**; a Universal Serial Bus (“USB”) port **205**; and an infrared port **206**. Various other communication interfaces may be configured in the system, either directly on the primary home media server architecture **110** (e.g., on the media server **110** “motherboard”), or as an add-on module **240–245**. Moreover, the communication modules (e.g., **202–206**), the CPU **200** and/or the memory **201** may be incorporated within the system ASIC **210**, rather than as separate modules as illustrated in FIG. 2 *a*.<sup>144</sup>

422. Accordingly, it is my opinion that Chatterton discloses or suggests this element.

***4. [9.3]: tangible, non-transitory computer-readable memory comprising program instructions that, when executed by the one or more processors, cause the first playback device to:***

423. To the extent that it is limiting, Chatterton discloses or suggests the subject matter described in this element.

424. The subject matter in this element overlaps with the subject matter described in element [8.P].

425. Accordingly, based on the same analysis detailed above, it is my opinion that Chatterton discloses or suggests this element.

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<sup>144</sup> EX1009, 4:43-5:7.

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**5. [9.3.1]: receive, via the network interface from a network device configured to control the first playback device and communicatively coupled to the first playback device over a local area network (LAN), control information comprising an address identifying a network location of audio information available at an audio information source, wherein the audio information source is outside of the LAN; and**

426. Chatterton discloses or suggests the subject matter described in this element.

427. The subject matter in this element overlaps with the subject matter described in elements [1.1.1]-[1.1.2]. Accordingly, based on the same analysis detailed above, it is my opinion that Chatterton discloses or suggests this element.

**6. [9.3.2]: after receiving the control information, (i) obtain, via the network interface from the audio information source outside of the LAN, the audio information; (ii) transmit, via the network interface of the first playback device to a second playback device, the audio information, playback timing information associated with the audio information, and device clock information of the first playback device; and (iii) play back the audio information in synchrony with the second playback device by using the playback timing information associated with the audio information and the device clock information of the first playback device to play back the audio information, wherein the first and second playback devices remain independently clocked during synchronous playback of the audio information.**

428. Chatterton discloses or suggests alone or in view of RFC 1889 the subject matter described in this element. The subject matter in this element corresponds to the subject matter described in elements [1.2.1]-[1.2.4]. Accordingly, based on the same analysis detailed above, it is my opinion that Chatterton discloses

or suggests this element.

**J. Dependent Claim 10: The first playback device of claim 9, wherein the program instructions, when executed by the one or more processors, further cause the first playback device to: generate the playback timing information associated with the audio information; and generate the device clock information of the first playback device.**

429. Chatterton discloses or suggests the additional subject matter of this claim. The additional subject matter in this claim corresponds to the subject matter described in claim 2. Accordingly, based on the same analysis detailed above, it is my opinion that Chatterton discloses or suggests the additional subject matter of this claim.

430. Accordingly, it is my further opinion that Chatterton anticipates or renders obvious claim 10.

**K. Dependent Claim 11: The first playback device of claim 9, wherein the control information further comprises one or more instructions for the first playback device and the second playback device to playback audio information.**

431. Chatterton discloses or suggests the additional subject matter of this claim. The additional subject matter in this claim corresponds to the subject matter described in claim 3. Accordingly, based on the same analysis detailed above, it is my opinion that Chatterton discloses or suggests the additional subject matter of this claim.

432. Accordingly, it is my further opinion that Chatterton anticipates or

renders obvious alone claim 11.

**L. Dependent Claim 12: The first playback device of claim 11, wherein the first and second playback devices are members of a synchrony group, and wherein the program instructions, when executed by the one or more processors, further cause the first playback device to: transmit, to the network device, status information that comprises a status of the synchrony group.**

433. Chatterton discloses or suggests the additional subject matter of this claim. The additional subject matter in this claim corresponds to the subject matter described in claim 4. Accordingly, based on the same analysis detailed above, it is my opinion that Chatterton discloses or suggests the additional subject matter of this claim.

434. Accordingly, it is my further opinion that Chatterton anticipates or renders obvious claim 12.

**M. Dependent Claim 13: The first playback device of claim 12, wherein the status information further comprises an identification of each playback device in the synchrony group.**

435. Chatterton discloses or suggests the additional subject matter of this claim. The additional subject matter in this claim corresponds to the subject matter described in claim 5. Accordingly, based on the same analysis detailed above, it is my opinion that Chatterton discloses or suggests the additional subject matter of this claim.

436. Accordingly, it is my further opinion that Chatterton anticipates or

renders obvious claim 13.

**N. Dependent Claim 14: The first playback device of claim 12, wherein the status information further comprises an identification of a master playback device of the synchrony group.**

437. Chatterton discloses or suggests the additional subject matter of this claim. The additional subject matter in this claim corresponds to the subject matter described in claim 6. Accordingly, based on the same analysis detailed above, it is my opinion that Chatterton discloses or suggests the additional subject matter of this claim.

438. Accordingly, it is my further opinion that Chatterton anticipates or renders obvious claim 14.

**O. Dependent Claim 15: The first playback device of claim 14, wherein the first playback device is the master playback device of the synchrony group.**

439. Chatterton discloses or suggests the additional subject matter of this claim. The additional subject matter in this claim corresponds to the subject matter described in claim 7. Accordingly, based on the same analysis detailed above, it is my opinion that Chatterton discloses or suggests the additional subject matter of this claim.

440. Accordingly, it is my further opinion that Chatterton anticipates or renders obvious claim 15.

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**P. Dependent Claim 16: The first playback device of claim 12, wherein the status information further comprises an identification of one or more slave playback devices in the synchrony group, and wherein the second playback device is one of the one or more slave playback devices in the synchrony group.**

441. Chatterton discloses or suggests the additional subject matter of this claim.

442. As described above with regard to element [1.2.2] and [1.2.3], home media server 110 provides the master playback timing and clock information to other playback devices on home media network 140, and the other playback devices on the receiving end use the master's playback timing and clock information to "reassemble" the data to play back in synchrony. It is my opinion that a POSITA would understand home media server 110 to be the master playback device based on these functions, and accordingly, the playback devices, such as multimedia nodes 150-151 and computers 160-163, that receive the master playback timing and clock information from the home media server 110 (any of them a "*second playback device*") are slave playback devices.

443. As discussed with respect to claim 5, Chatterton explicitly discloses that among the status information transmitted from the home media server 110 to the monitoring device includes the identifications of "home media server 110 and related home network devices 150-151 and 160-166" ("*an identification of each playback device in the synchrony group*"). A POSITA therefore would understand

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that Chatterton discloses or suggests that the status information includes an identification of one or more slave playback devices (e.g., multimedia nodes 150-151 and computers 160-163).

444. Accordingly it is my opinion that Chatterton discloses or suggests the additional subject matter of this claim.

445. Accordingly, it is my further opinion that Chatterton anticipates or renders obvious claim 16.

**Q. Dependent Claim 17: The first playback device of claim 16, wherein the instructions, when executed by the one or more processors, further cause the first playback device to: generate a plurality of frames, wherein an individual frame comprises at least a portion of the audio information and the playback timing information associated with the audio information, and wherein the first playback device transmitting to the second playback device the audio information, playback timing information, and device clock information of the first playback device comprises transmitting the plurality of frames to the second playback device.**

446. Chatterton discloses or suggests the additional subject matter of this claim.

447. Chatterton discloses that home media server 110 generate streams including frames (“*plurality of frames*”) to transmit media (“*audio information*”) to devices 160-163 and multimedia nodes 150 (“*second playback devices*”).

448. As described above with respect to claim 1, Chatterton describes transmitting media in a transport stream to devices on a home media network 140.

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Chatterton further provides that the streams can be comprised of frames, with each frame containing portions of content (“*audio information*”).<sup>145</sup>

449. Accordingly, it is my opinion that Chatterton discloses or suggests the additional subject matter of this claim.

450. Accordingly, it is my further opinion that Chatterton anticipates or renders obvious claim 17.

**R. Dependent Claim 18: The first playback device of claim 9, wherein the audio information comprises one of audio files or packetized streaming audio information.**

451. Chatterton discloses or suggests the additional subject matter of this claim.

452. Chatterton describes home media server 110’s media content (“*audio information*”) includes both files and packetized streams.

A jukebox server module **604** executed on the home media server **110** receives the request and forwards the request to the media server file system **606** (through the media toolkit **260**), which retrieves the music files from the mass storage device **230**. The jukebox server module **604** then creates the audio stream for the specified files and feeds the stream to the multimedia node **150**.<sup>146</sup>

For example, cable and satellite companies transmit the MPEG-encoded channels within a multiplexed “transport streams” comprising transport packets of a fixed 188 bytes in length.<sup>147</sup>

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<sup>145</sup> See, e.g., EX1009, 24:10-35, 29:9-24, Figs. 20-22.

<sup>146</sup> EX1009, 8:54-58.

<sup>147</sup> EX1009, 1:26-30; see also, 24:39-49.

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453. Accordingly, it is my opinion that Chatterton discloses or suggests the additional subject matter of this claim.

454. Accordingly, it is my further opinion that Chatterton anticipates or renders obvious claim 18.

**S. Dependent Claim 19: The first playback device of claim 9, wherein the audio information source outside of the LAN is an Internet-accessible audio information source, and wherein obtaining, from the audio information source outside of the LAN, the audio information, comprises obtaining the audio information from the Internet-accessible audio information source.**

455. Chatterton discloses or suggests the additional subject matter of this claim. Chatterton further describes that home media server 110 can retrieve audio content (“*audio information*”) from the Internet, i.e., websites (“*internet-accessible audio information source*”).<sup>148</sup> As another example, Chatterton further explains home media server can be used to perform the processing intensive functions of other network devices.<sup>149</sup> Such a function might include the disclosed use of multimedia node 150 accessing specific webpages to download content (“*audio information from the Internet-accessible audio information source*”).

In addition, support for the hypertext markup language (“HTML”) and/or the extensible markup language (“XML”) are included in one multimedia node **150** embodiment, allowing users to download, view and modify various types of Internet content (e.g., Web pages).<sup>150</sup>

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<sup>148</sup> EX1009, 14:19-22; 12:55-59.

<sup>149</sup> EX1009, 6:30-41.

<sup>150</sup> EX1009, 8:4-8.

456. Accordingly, it is my opinion that Chatterton discloses or suggests the additional subject matter of this claim.

457. Accordingly, it is my further opinion that Chatterton anticipates or renders obvious claim 19.

**T. Dependent Claim 20: The first playback device of claim 9, wherein obtaining, from the audio information source outside of the LAN, the audio information, comprises sending, to the audio information source, a request for the audio information.**

458. Chatterton discloses or suggests the additional subject matter of this claim. Chatterton discloses home media server 110 making requests for media content. For example, Chatterton discloses that home media server may request “pay-per-view” content (“*a request for the audio information*”) from various cable/satellite operators (“*audio information sources*”).

For example, the NOC **180** may forward pay-per-view requests transmitted from the home media server **110** to the various cable/satellite operators, and perform the back-end processing (e.g., authentication, billing) required for the pay-per-view transaction.<sup>151</sup>

459. Chatterton discloses an exemplary embodiment where home media server makes such a request for audio information by tuning to a particular broadcast channel (e.g., cable, satellite broadcast).

A user initially selects a particular channel (e.g., via a remote control device)

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<sup>151</sup> EX1009, 11:35-39.

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to be viewed at the local multimedia node 151. The command is received by the local TV tuning application 601 executed on the multimedia node 151, which sends a tuning request to the home media server 110 over the home media network 140. A tuner server module 602 executed on the home media server 110 receives the request and forwards the request to the tuner driver 271 (e.g., through the media toolkit 260). In response to the command, the tuner driver 271 directs the tuner hardware (see, e.g., tuner 910 in FIG. 9 described below) to tune to the specified channel.<sup>152</sup>

460. As explained above with regard to claims 1 and 19, Chatterton further discloses home media server obtaining audio from the Internet. A POSITA would recognize that internet protocols are comprised of “Requests” and “Responses,” and that in order to obtain selected content from the internet, home media server 110 would need to make at least one request sent to the audio information source.

461. Accordingly, it is my opinion that Chatterton discloses or suggests the additional subject matter of this claim.

462. Accordingly, it is my further opinion that Chatterton anticipates or renders obvious claim 20.

## **XI. Additional Remarks**

463. I currently hold the opinions expressed in this declaration. But my analysis may continue, and I may acquire additional information and/or attain supplemental insights that may result in added observations.

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<sup>152</sup> EX1009, 8:18-35.

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

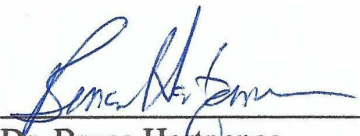
465. I have reviewed the accompanying Petition for *Inter Partes* Review of the '357 Patent and, given the information set forth in this declaration, I agree with the reasoning and conclusions of the grounds of challenge in the petition. Based on my own analysis, I agree that: (1) Richenstein anticipates claims 1-20; (2) Richenstein renders obvious claims 1-20; (3) Richenstein in view of MOST-2.0 renders obvious claims 4-7 and 12-17; (4) Chatterton anticipates claims 1-20; (5) Chatterton renders obvious claims 1-20; and (6) Chatterton in view of RFC1889 renders obvious claims 1-20

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I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true. I further declare that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of the Title 18 of the United States Code and that such willful false statements may jeopardize the validity of this proceeding.

Dated: 2-2-25

By:   
\_\_\_\_\_  
Dr. Bruce Hartpence  
Rochester, NY

# APPENDIX A

# BRUCE HARTPENCE

ISCHOOL, GCCIS, RIT, Rochester, NY 14623  
bhics@rit.edu

## A. Professional Preparation

- Finger Lakes Community College, Canandaigua, NY, Computer Science, A.S., 1993
- Rochester Inst of Technology, Rochester, NY, Information Technology, B.S., 1996
- Rochester Inst of Technology, Rochester, NY, Information Technology, M.S., 1998
- Rochester Inst of Technology, Rochester, NY, Computing and Info Sci, Ph.D., 2020

## B. Appointments

2016-present Professor, ISCHOOL, GCCIS, RIT  
Rochester Institute of Technology, Rochester, NY

2007-2015 Associate Professor, NSSA/IST Departments, RIT  
Rochester Institute of Technology, Rochester, NY

1998-2007 Assistant Professor, NSSA/IST Departments, RIT  
Rochester Institute of Technology, Rochester, NY

1990-1994 Electrical Technician  
Mobil Chemical, Macedon, NY

1984-1990 Nuclear Electrician  
U.S. Navy, U.S.S. Enterprise (CVN-65)

## C. Products

Recent Publications:

1. B. Hartpence, D. Johnson, B. Stackpole and A. Kwasinski, "RIT Network and Security Dataset Collections," 2024 International Symposium on Networks, Computers and Communications (ISNCC), Washington DC, DC, USA, 2024, pp. 1-6, doi: 10.1109/ISNCC62547.2024.10759040.
2. B. Hartpence, D. Johnson, B. Stackpole and A. Kwasinski, "RIT Network and Security Dataset Collections," 2024 International Symposium on Networks, Computers and Communications (ISNCC), Washington DC, DC, USA, 2024, pp. 1-6, doi: 10.1109/ISNCC62547.2024.10759040.
3. Hartpence, Bruce, and Andres Kwasinski. "CNN and MLP Neural Network Ensembles for Packet Classification and Adversary Defense." 2021 Intelligent and Converged Networks, IEEE, 2021.
4. Hartpence, Bruce. Neural Network Architectures and Ensembles for Packet Classification: Addressing Visibility, Security and Quality of Service Challenges in Communication Networks. Rochester Institute of Technology, 2020.

5. Hartpence, Bruce, and Andres Kwasinski. "A Convolutional Neural Network Approach to Improving Network Visibility." 2020 29th Wireless and Optical Communications Conference (WOCC). IEEE, 2020.
6. Hartpence, Bruce, Andres Kwasinski, "Combating TCP Port Scan Attacks Using Sequential Neural Networks", IEEE ICNC, 2020.
7. Hartpence, Bruce, Andres Kwasinski, "Considering the Blackbox: An Investigation of Optimization Techniques with Completely Balanced Datasets of Packet Traffic", IEEE Big Data, 2019.

Other significant publications:

1. Hartpence, Bruce, and Rossi Rosario. "Software Defined Networking for Systems and Network Administration Programs." The USENIX Journal of Education in System Administration (2016): 12.
2. Sharma, et al., "Performance of Meshed Tree Protocols for Loop Avoidance in Switched Networks", Sharma et al., ICNS 2014
3. Hartpence, Bruce, Kwasinski, A., "Fast Internet Packet and Flow Classification Based on Artificial Neural Networks", IEEE Southeastcon, 2019.
4. Hartpence, Bruce, "Performance Evaluation of Networks with Physical and Virtual Links", IEEE Global Information Infrastructure and Networking Symposium (GIIS), 2015.
5. Hartpence, Bruce. "Curricular and performance measurement challenges in cloud environments." Proceedings of the 15th Annual Conference on Information technology education. 2014.
6. Hartpence, Bruce, "The Packet Guide to Voice over IP", O'Reilly Publishing, 2013.
7. Hartpence, Bruce, "The Packet Guide to Routing and Switching", O'Reilly Publishing, 2011.
8. Hartpence, Bruce, "The Packet Guide to Core Network Protocols", O'Reilly Publishing, 2010.

## D. Synergistic Activities

1. RIT Network and Security Research Project: Data Science and Machine Learning for Network Challenges and DNS Security, 2023-present.
2. Standards work: IEEE project 1910.1 - Standard for Meshed Tree Bridging with Loop Free Forwarding (2015-2021)
3. Rochester Institute of Technology Software Defined Network testbed construction and dataset creation. This was a virtualization cluster and physical network testbed deploying Open Daylight controllers and the OpenFlow protocol. (2017-2019)
4. Meshed Tree Protocol Design: This project seeks to improve upon convergence times for layer networks experiencing outages or looped topologies. This foundational work resulted in the formation of an IEEE working group under 802.1. (2012-2013)
5. Virtualization cluster and SAN construction: A major goal of the grant work is to disseminate network and security curricula and ideas to schools named in the grant. This project has resulted in the creation of several smaller projects and papers including the creation of several small clusters based on VMWare ESXi, course development work and security competition architectures. (2010-2013)
6. UNCF Special Programs Corporation (UNCFSP) entitled, "Implementation of a Student Technical Assistance Need-based Developmental Undergraduate Program (STANDUP)", for the NASA Administrator's Fellowship Project (NAFP) Research Award. Oakwood College, Roper, E. (2010)

**Bruce Hartpence**  
**ischool, GCCIS, RIT**  
**Rochester, New York 14424**  
[bhhics@rit.edu](mailto:bhhics@rit.edu)

### **CV Addendum**

#### **1. History of employment/consulting in expert field**

a. Network and VoIP Training and Material Creation (2008-2014)

These were a lengthy series of both on-site and on campus training programs. They incorporated a wide variety of topics ranging from basic networking and protocols to Voice over IP.

Microwave Data Systems

Harris RF (includes license agreement for materials)

Wegmans Food Markets

b. Trocaire College Program Review (2010-2011)

This was a complete review of the existing program, students and the local job market. The final report included recommendations for the future of the program and modifications to be made.

c. Liban (now Vnomics) Wireless Site Survey and System Research (2010-2011)

I was engaged to assist in the development of an intelligent system for monitoring onboard trucking systems. This also included wireless site survey at proposed deployment locations.

d. IEEE 1910.1 Standards Creation (2015-2020)

2. **Expert Witness History:** A listing of cases in which you've been retained as an expert within the last five years.

NA

3. **Patent History**

NA