IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

AMAZON.COM, INC., and
AMAZON WEB SERVICES, INC.,

Petitioners,

v.

DIVX, LLC,

Patent Owner.

Case: IPR2025-01223

U.S. Patent No. 11,611,785

PETITION FOR *INTER PARTES* REVIEW OF U.S. PATENT NO. 11,611,785

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EXHIBIT LIST (37 C.F.R. § 42.63(e))

Ex. No.	Description
1001	U.S. Patent No. 11,611,785 ("the 785 patent")
1002	Excerpts of Prosecution File History for the 785 patent
1003	Declaration of Hari Kalva, Ph.D.
1004	Curriculum Vitae of Hari Kalva, Ph.D.
1005	Ozer, Jan et al., Video compression for Flash, Apple Devices, and HTML 5, 2011
1006	U.S. Patent No. 9,9832,540 ("Liao")
1007	U.S. Patent. No. 8,396,114 ("Gu")
1008	U.S. Patent Pub. No. 2011/0246616 ("Ronca")
1009	De Cicco, Luca et al., Feedback Control for Adaptive Live Video Streaming (2011)
1010	U.S. Patent No. 5,956,729 ("Goetz")
1011	Apple HTTP Live Streaming Overview, April 1, 2011
1012	IIS Smooth Streaming Technical Overview, Windows Server Internet Information Services 7.0
1013	Reed, Eric C. et al., Optimal Multidimensional Bit-Rate Control for Video Communication, IEEE Transactions on Image Processing, Vol. 11, No. 8, August 2002
1014	Hervouet, G. et al., Video Quality Optimization Multi-rate Video Encoding, July 2010
1015	U.S. Patent Application Pub. No. 2011/0255535 ("Tinsman")
1016	U.S. Patent Application Pub. No. 2011/0302319 ("Ha")

Ex. No.	Description
1017	Definition of adaptive bitrate streaming, https://en.wikipedia.org/wiki/Adaptive_bitrate_streaming
1018	Information technology - MPEG systems technologies - Part 6: Dynamic adaptive streaming over HTTP (DASH), Draft International Standard ISO/IEC DIS 23001-6, 2011
1019	The History of Streaming Told Through Protocols, Servers.com
1020	Definition of Container, https://www.afterdawn.com/glossary/term.cfm/container
1021	Cermak, G. et al., The Relationship Among Video Quality, Screen Resolution, and Bit Rate, IEEE Transactions on Broadcasting, Vol. 57, No. 2, June 2011
1022	Panthos, R., HTTP Live Streaming, http://tools.ietf.org/html/draft-panthos-http-live-streaming-04, June 5, 2010
1023	Declaration of Sylvia D. Hall-Ellis, Ph.D.
1024	MARC record regarding Exhibit 1005
1025	Library of Congress subject heading sh93007921
1026	Library of Congress subject heading sh85058659
1027	Library of Congress subject heading sh96009077
1028	Library of Congress subject heading sh2005005237
1029	Library of Congress subject heading sh99000996
1030	Library of Congress subject heading sh97008674
1031	Declaration of Mina Chung
1032	Curriculum Vitae of Sylvia D. Hall-Ellis, Ph.D.

Ex. No.	Description
1033	Jan Ozer, The Essential Key to Producing High Quality Streaming Video, https://streaminglearningcenter.com/blogs/the-essential-key-to-producing-high-quality-streaming-video.html, June 4, 2011
1034	Wikipedia, Structural similarity index measure, https://en.wikipedia.org/wiki/Structural_similarity_index_measure
1035	Zhou Wang *et al*., Image Quality Assessment: From Error Visibility to Structural Similarity, April 2004
1036	Federal Agencies Digitization Guidelines Initiative, Pixel Aspect Ratio (PAR), https://www.digitizationguidelines.gov/term.php?term=par

Pursuant to 35 U.S.C. § 311 and 37 C.F.R. § 42.100, Amazon.com, Inc. and Amazon Web Services, Inc. ("Petitioner") requests *Inter Partes* Review ("IPR") of claims 1-4, 6-14, and 16-19 (the "Challenged Claims") of U.S. Patent No. 11,611,785 (the "785 patent"), assigned to DivX, LLC. The Challenged Claims are obvious over the prior art. Accordingly, the Patent Trial and Appeal Board should institute review of the Challenged Claims.

I. REQUIREMENTS FOR IPR UNDER 37 C.F.R. § 42.104

A. Standing (37 C.F.R. § 42.104(a))

Petitioner certifies that the 785 patent is available for IPR and that Petitioner is not barred or estopped from requesting IPR of the Challenged Claims.

B. Identification of Challenge (37 C.F.R. § 42.104(b))

In view of the prior art and evidence presented, the Challenged Claims are unpatentable and should be cancelled. 37 C.F.R. § 42.104(b)(1). Based on the prior art identified below, IPR of the Challenged Claims should be instituted. 37 C.F.R. § 42.104(b)(2).

Proposed Grounds of Unpatentability	
Ground 1	Ozer in view of Liao and General Knowledge of a POSITA renders claims 1-4, 7-14, 17-19 obvious under pre-AIA §103.
Ground 2	Ozer in view of Liao, Gu, and General Knowledge of a POSITA renders claims 6 and 16 obvious under pre-AIA §103.
Ground 3	Ronca in view of Liao and General Knowledge of a POSITA renders claims 1-4, 7, 9-14, 17, 19 obvious under pre-AIA §103.

Proposed Grounds of Unpatentability	
Ground 4	Ronca in view of Liao, Gu, and General Knowledge of a POSITA renders claims 6 and 16 obvious under pre-AIA §103.

Section IV identifies where each element of the Challenged Claims is found in the prior art. 37 C.F.R. § 42.104(b)(4). The exhibit numbers of the evidence relied on to support the challenges are provided above and the relevance of the evidence to the challenges raised are provided in Sections II-III. 37 C.F.R. § 42.104(b)(5). Exhibits 1001 to 1036 are attached.

C. Claim Construction (37 C.F.R. § 42.104(b)(3))

For the purposes of this Petition, all claims are interpreted with their ordinary and customary meaning as understood from the perspective of a person of ordinary skill in the art ("POSITA").[1]

II. OVERVIEW OF THE 785 PATENT

A. Priority Date

The 785 patent claims priority to Provisional Application No. 61/529,201 filed on August 30, 2011. EX1001; EX1003, ¶30. For purposes of this IPR only, Petitioner does not dispute this priority date.

[1] Petitioner reserves the right to offer different claim constructions in other forums.

B. Technical Background

1. Introduction to Adaptive Bitrate Streaming

Streaming is the ability of a client device to play video content over the Internet without having to first download the entire video file. EX1009, 1; EX1003, ¶31; *see also* EX1010, 2:32-37. Before streaming, a client device had to download the entire video file to a device before it could begin playing the video. EX1010, 2:20-31. This process could take a long time depending on the Internet connection of the client device and the length of the video. EX1010, 2:20-31; *see also* EX1012, 5-7. With streaming, sequential portions of a video file can be delivered in a continuous stream of data, enabling immediate playback once the first portion is retrieved. EX1010, 2:32-37; *see also* EX1012, 5-7; EX1005, 18.

The amount of data contained in an encoded video is described in terms of data per second of video—also known as a bitrate. EX1012, 5-6; EX1005, 16. Video data, having a given bitrate, is delivered to the device at a specific transmission rate. EX1005, 18; *see also* EX1013, 873; EX1003, ¶32. To avoid disruptions to the stream, the transmission rate should be lower than the current network capacity (e.g., network bandwidth) and available resources of the client device (e.g., buffer capacity), but not so low that video is transmitted slower than it is being played. EX1005, 18; EX1013, 873. Because both network capacity and the

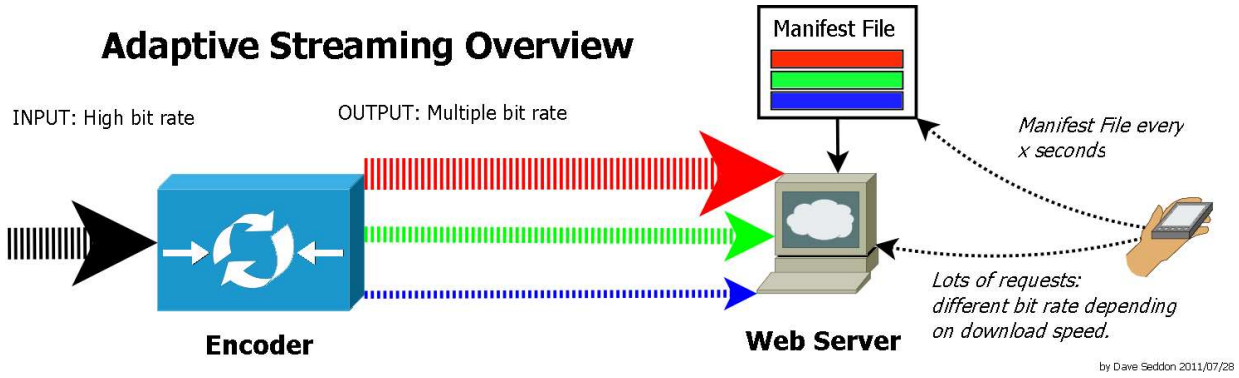
available resources of the client device vary over time, the transmission rate of the stream needs to be adjusted. EX1009, 1; *see also* EX1014, 3-4. Adjusting the transmission rate changes the amount of video data that can be transmitted. EX1012, 5-6; EX1005, 19; EX1003, ¶31. For example, a high transmission rate can be used to transmit a video encoded at higher bitrate, while a lower transmission rate can be used to transmit a video encoded at a lower bitrate. EX1012, 5-6; EX1005, 19; EX1003, ¶33.

Adaptive bitrate streaming was developed to allow client devices to dynamically adjust between streams encoded at a higher bitrate and a lower bitrate. EX1009, 1-2; EX1003, ¶¶33-35; *see also* EX1012, 7-9. If the network capacity decreases, a client device can switch to a lower bitrate stream at a lower transmission rate. EX1015, ¶¶155-57; *see also* EX1016, ¶45-51; EX1009, 1-2. Once the network capacity increases, the client device can switch back to a high bitrate stream at a higher transmission rate. EX1015, ¶¶155-57; *see also* EX1016, ¶45-51; EX1009, 1-2.

2. How to Encode, Store, and Index Videos for Adaptive Bitrate Streaming

To allow switching between different streams, a single source video needs to be encoded into multiple encodings with different bitrates and resolutions. EX1016, ¶¶45-46, Fig. 1; EX1014, 3; EX1003, ¶36; *see also* EX1015, ¶¶156-57; EX1005,

115-18. These multiple encodings help to facilitate streaming across a broad range of network bandwidths, screen sizes, and aspect ratios. *Id.* The image below illustrates this process.

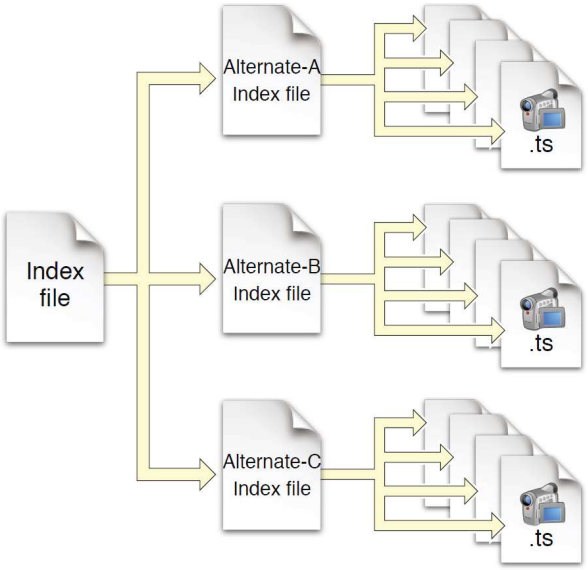


EX1017, 1; *see also* EX1016, Fig. 1. In this image, an encoder receives a source video with a high bitrate (INPUT). EX1017, 1; EX1003, ¶37. The encoder then encodes the source video into multiple versions (OUTPUT), each with a different bitrate. EX1016, ¶¶45-46, Fig. 1; EX1003, ¶¶37-39; *see also* EX1015, ¶¶156-57; EX1005, 115-18. The red, green, and blue arrows represent the different versions of the encoded video, with the red arrow having the highest bitrate and the blue arrow having the lowest bitrate. EX1017, 1; EX1003, ¶37. The multiple versions of the video encodings are then sent to a web server or a network of servers, known as a content delivery network (CDN), for storage. EX1017, 1; EX1003, ¶40; *see also* EX1016, ¶47; EX1015, ¶157; EX1005, 115-18. Each version of the encoded video

is stored as multiple video files containing 2-10 second chunks of video. EX1012, 7-9; *see also* EX1005, 115-18.

Along with storing the video files, the web server or CDN stores a file that includes information describing each of the different video encodings. EX1017, 1; EX1003, ¶¶41-42; *see also* EX1016, ¶47; EX1015, ¶158; EX1005, 115-18. This file is shown in the above image as a "Manifest File," but is widely referred to as an index file. EX1017, 1; EX1011, 16-17; EX1003 ¶41. A visual representation of the index file is shown in the image below. EX1011, Fig. 2-1. The index file identifies the alternative versions of the video source file (Alternate-A, Alternate-B, and Alternate-C) encoded at a given bitrate and resolution. EX1011, 11-12, 16-18, Fig. 2-1; EX1005, 117-18, 127-31; EX1003, ¶42. The index file also identifies the 2-10 second chunks of video (".ts" transport stream) for each alternate version of the video. EX1011, 16-18, 30, Fig. 2-1; EX1005, 117-18, 120.

Figure 2-1 Stream alternates



EX1011, 16, Fig. 2-1.

As shown in the image titled "Adaptive Streaming Overview" provided above, when a client device wants to initiate playback of a video it first obtains a "Manifest File" from the web server or CDN. EX1017, 1; *see also* EX1016, ¶47; EX1015, ¶158; EX1005, 115-18; EX1003, ¶¶43-44. The client device uses this index to request chunks encoded at a given bitrate and resolution, depending on its network capacity and resources. EX1016, ¶¶47-50, 155; *see also* EX1015, ¶¶156, 158. For example, if the network capacity and/or available resources of the client device decreases, a client device will look at the index, identify a lower bitrate stream, and send a request to the web server or CDN for video chunks from that

lower bitrate stream. EX1016, ¶¶48-50, Fig. 1; *see also* EX1015, ¶¶155-56, 158; EX1005, 115-18.

3. Selecting the Bitrate and Resolution for the Different Streams Used in Adaptive Bitrate Streaming

Streaming protocols define how video data is streamed across the Internet to client devices. EX1019, 5; EX1003, ¶45. One commonly used streaming protocol introduced in 2009 was Apple's HTTP Live Streaming ("HLS"). EX1019, 5; EX1003, ¶45; EX1022; *see also* EX1005, 118-21. Like other streaming protocols, HLS provides tables (e.g., Table 2-1 below) that recommend the encoder settings (e.g., the resolutions and bitrates) for the multiple alternative streams. EX1011, Table 2-1. Each row represents one alternative stream and includes a recommended bitrate and resolution (dimensions). EX1003, ¶46.

Table 2-1 Encoder settings for iPhone, iPod touch, iPad, and Apple TV, 16:9 aspect ratio

Connection	Dimensions	Total bit rate	Video bit rate	Keyframes
Cellular	480 x 320	64 kpbs	audio only	none
Cellular	480 x 224	150 kpbs	110 kbps	30
Cellular	480 x 224	240 kpbs	200 kbps	45
Cellular	480 x 224	440 kpbs	400 kbps	90
WiFi	640 x 360	640 kpbs	600 kbps	90

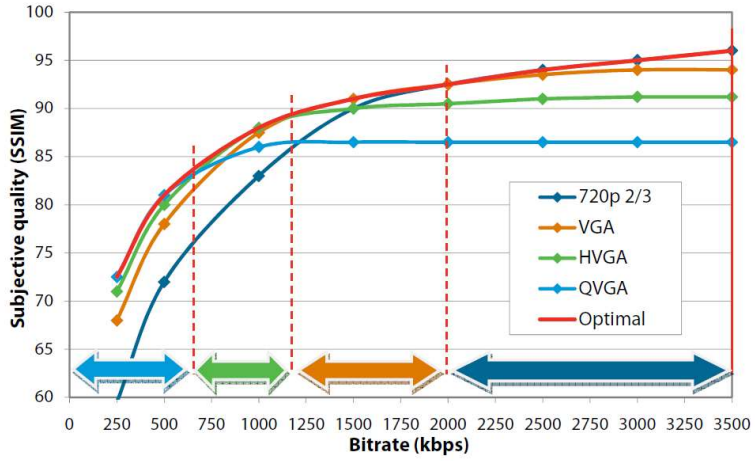
EX1011, Table 2-1 (annotated).[2] Several of the streams (highlighted above in red) share the same resolution (480x224) but have different video bitrates (110, 200, 440 kbps). *Id.* Encoder settings factor into the video bitrate. EX1003, ¶47. In general, lower resolution video can be represented by less data and thus a lower bitrate. EX1015, ¶¶155-57; *see also* EX1006, 7:62-8:9. For encoded videos having the same resolution though, the level of compression used to encode the video can affect the bitrate as well—with higher compression resulting in lower bitrates than lower compression. EX1015, ¶¶155-57; *see also* EX1006, 7:62-8:9; *see generally* EX1014; EX1011, 16-18; EX1005, 127-131; EX1003, ¶47.

Customizing encoder settings often involves fine-tuning the selected bitrate and resolution for each of the streams to maximize perceived quality across a broad range of content, network bandwidths, screen sizes, and aspect ratios. EX1014, 3-4; EX1003, ¶48; *see also* EX1015, ¶155; EX1005, 127-131. Combinations of resolution and bitrate that optimize video quality are commonly determined by experimentation—encoding a video source file using multiple combinations of bitrates and resolutions and then comparing those encodings using various quality metrics. EX1014, 5-8; EX1021, 258; EX1005, 17, 127-131; EX1003, ¶¶49, 51. One

[2] The "total bit rate" reflects the audio bitrate plus the video bitrate. EX1003, ¶71 & n.4.

such metric is a structural similarity index ("SSIM"), a "quality and fidelity metric that measures the similarity between the original image and the same image after processing." EX1014, 5-6; *see also* EX1006, 8:37-9:16. SSIM was invented in 2004 and widely used in digital video coding and processing by 2009. EX1003, ¶50.

An example of bitrate selection based on SSIM is shown in the below graph. EX1003, ¶52. The graph shows the same video encoded with four different resolutions (480x720, 640x480, 480x320, and 320x240). EX1014, 6-7, Figs. 1, 2; EX1003, ¶52. Each of the four encodings (having a different resolution) is then repeatedly reencoded at different bitrates (e.g., 250, 500, 1000 kbps), with each resulting encoding being evaluated using SSIM. EX1014, 7-8, Figs. 1, 2.



Resolution Label	Dimensions (pixels)
QCIF	176x144
QVGA	320x240
HVGA	480x 320
VGA	640x480

Figure 2. Optimal resolution for the sequence "Public Television" at various bit rates

EX1014, 7-8, Figs. 1-2 (annotated).

The SSIM of the 320x240 resolution encoding (QVGA [light blue]) is highest amongst the alternative encodings at 600 kbps, while the SSIM of the 480x320 resolution encoding (HVGA [green]) is the highest amongst the alternative encodings at 1000 kbps. EX1014, 8, Fig. 2. Based on this quality evaluation, a content provider would select a first alternative stream having a resolution of 320x240 and a bitrate of 600 kbps, and a second alternative stream having a resolution of 480x320 and a bitrate of 1000 kbps. EX1003, ¶52. It was therefore known well before the priority date of the 785 patent to evaluate the quality of video streams at different resolutions and bitrates and make selections based on that evaluation. EX1003, ¶¶52-53.

C. Patent Description

The 785 patent is directed to well-known, conventional techniques for encoding videos for adaptive bitrate streaming. EX1001, 1:22-27, 1:39-42; EX1003, ¶¶54-63. As explained in the Background section, adaptive bitrate streaming on a playback device requires encoding a source video into several alternative streams. EX1001, 1:43-47. Each alternate "stream is typically stored in one or more container files." *Id*. During streaming, a "top level index" pointing to these alternative streams is used to "adjust[] the quality of the streamed media" based on "present streaming conditions (e.g., user's network bandwidth and CPU capacity)." *Id.*, 1:34-47.

During prosecution, the Applicant highlighted that the purported novelty of the claims was "evaluating quality of each of the multiple encodings" and "selecting a plurality of resolution and target bitrate combinations . . . based on the evaluated quality." EX1002, 116. As explained above, POSITAs knew about and used quality evaluation to select alternative streams encoded at different resolutions and bitrates long before the priority date of the 785 patent. EX1003, ¶¶52-53

D. Level of Ordinary Skill in the Art

A POSITA would have a bachelor's or master's degree in electrical engineering, computer engineering, or a related field, with specialized training or coursework in digital video coding and processing and related technologies. The individual would have at least four years of practical experience in digital video coding and processing, including software and/or hardware architectures used to perform digital video coding and processing. A person could also have qualified, as a POSITA, with more formal education and less technical experience, or vice versa. EX1003, ¶¶64-67.

III. PRIOR ART OVERVIEW

A. Ozer

"Video Compression for Flash, Apple Devices and HTML5" is a printed publication written by Jan Ozer published on May 11, 2011 ("Ozer," EX1005).

EX1003, ¶68; EX1023. Ozer is prior art under at least 35 U.S.C. § 102(a). Ozer was not disclosed to the Patent Office during prosecution of the 785 patent.

Ozer explains that "[a]daptive streaming technologies make multiple video streams available to . . . viewers and dynamically switch streams to adapt to changing connection speeds, CPU use statistics and other heuristics." EX1005, 115; EX1003, ¶69. To allow for this adaptive streaming, Ozer teaches encoding a source video to produce multiple alternative streams. EX1005, 116, Fig. 7-1. This is shown in Figure 7-1 where an encoder (shown in blue below) encodes the source video (shown in red below) into multiple alternative streams (shown in green below). *Id.*; EX1003, ¶70. These streams are then uploaded and stored on a CDN where they are made available to playback devices (shown in purple below) for streaming. EX1005, 116, Fig. 7-1; EX1003, ¶70.

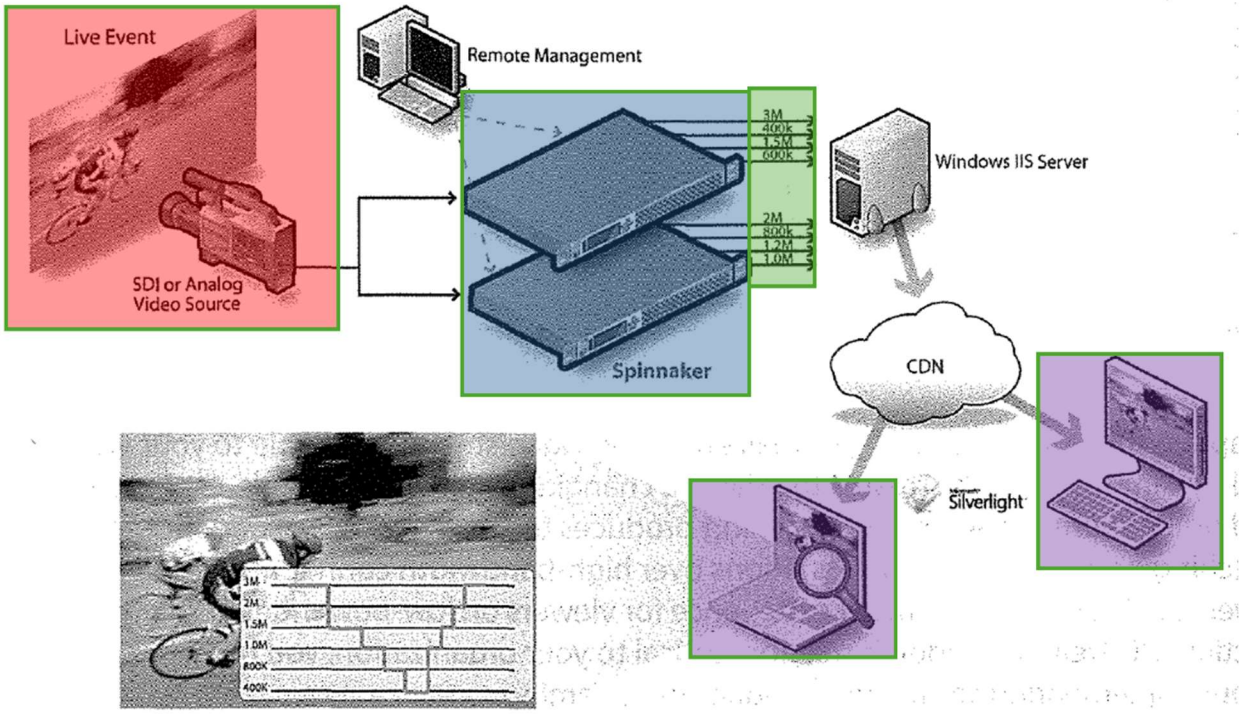


Figure 7-1. Using Inlet Technologies' Spinnaker encoder to produce multiple streams for a Microsoft Smooth Streaming event. Usage courtesy Inlet Technologies.

Id., 116, Fig. 7-1 (annotated).

Each of the alternative streams is encoded using a pre-specified resolution and video bitrate. EX1005, 16, 127-129; EX1003, ¶71. The table below shows a recommendation for alternative streams each having a resolution (picture size), video bitrate (V), audio bitrate (A), and total bitrate (AV). EX1005, 129, Fig. 7-4; EX1003, ¶71.

16x9				
Stream #	Picture Size	V	A	AV
1	256x144	150	64	214
2	256x144	250	64	314
3	512x288	450	64	514
4	512x288	600	64	664
5	512x288	800	64	864
6	512x288	1200	64	1264
7	768x432	1400	64	1464
8	1280x720	1700	64	1764
9	1280x720	2500	64	2564
10	1280x720	3500	64	3564

EX1005, Fig. 7-4, 129. When encoding a stream, Ozer suggests "choos[ing] the desired resolution, then output[ing] at the data rate necessary to produce acceptable quality at that resolution." *Id.*, 17; EX1003, ¶¶72-74. As shown in the above table, for example, a picture resolution of 1280x720 can be encoded using three different bitrates 1700, 2500, and 3500. EX1005, Fig. 7-4. The quality of each of these streams can then be evaluated and a bitrate selected. *Id.*, 154, 156; EX1003, ¶74.

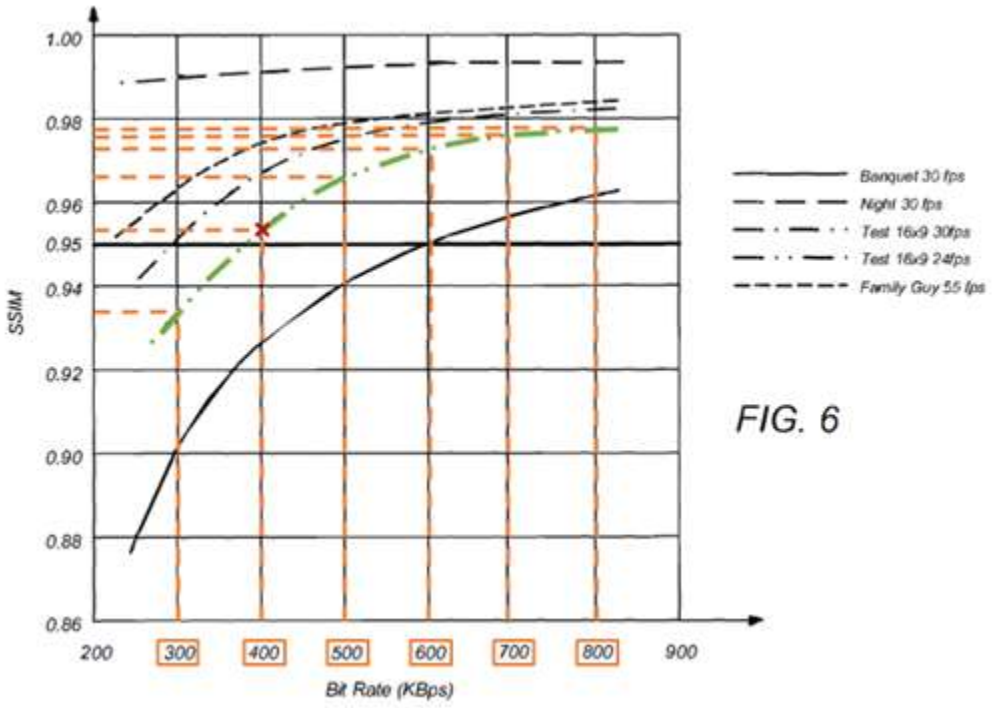
The resulting encodings are split into 2-10 second chunks of video and stored in the CDN. EX1005, 118; EX1003, ¶75. A manifest file, which Ozer also calls an index file, identifies the location of the chunks in the CDN. EX1005, 118. The playback device uses this index file to retrieve the chunks from the CDN and play them for the user. EX1005, 118; EX1003, ¶¶76-77.

B. Liao

U.S. Patent No. 9,832,540 B1 to Yupeng Liao et al., titled "Method and Apparatus for Hybrid Transcoding of a Media Program," was filed on December 15, 2010 and published on June 21, 2012 ("Liao"). EX1006; EX1003, ¶78. Liao is prior art under at least 35 U.S.C. § 102(e). Liao was not disclosed to the Patent Office during prosecution of the 785 patent.

Liao discloses a method of encoding source media to produce a constant video quality. *See generally* EX1006; EX1003, ¶79. In particular, Liao discloses encoding different versions of a media program "with a different resolution, typically 480p, 360p, 288p or 240p." EX1006, 7:63-8:9; EX1003, ¶80. To account for the "different characteristics" of each different media program (e.g., an action movie versus a cartoon) while maintaining video quality, Liao teaches determining the appropriate bitrate for the encodings. EX1006, 8:10-26, Fig. 6; EX1003, ¶81. To determine the appropriate bitrate, Liao employs SSIM to evaluate the quality of the encodings. EX1006, 8:38-9:16, Fig. 6; EX1003, ¶82. Figure 6 below illustrates an example of Liao's quality evaluation. EX1006, 9:7-16, Fig. 6 (annotated); EX1003, ¶83. A TEST media program (shown below in green) is encoded multiple times at different bitrates ranging from 300 to 800 kbps, and an SSIM is calculated for each of the different bitrates (ranging from 0.93 to 0.98). EX1003, ¶84. Liao then teaches

selecting the encoding having the lowest bitrate that achieves a minimum SSIM of 0.95. *Id.* As shown in the below figure, a bitrate of 400 kbps achieves this minimum SSIM. *Id.* A lower bitrate encoding of 300 kbps does not achieve this minimum SSIM of 0.95, while higher bitrate encodings of 500, 600, 700, and 800 kbps require more resources than needed to achieve a minimum SSIM. EX1006, 9:13-16, Fig. 6.



EX1006, Fig. 6 (annotated).

C. Gu

U.S. Patent No. 8,396,114 to Chuang Gu et al., titled "Multiple Bit Rate Video Encoding Using Variable Bit Rate and Dynamic Resolution for Adaptive Video Streaming," was filed on January 29, 2009, and published on July 29, 2010 ("Gu").

EX1007; EX1003, ¶85. Gu is prior art under at least 35 U.S.C. § 102(a), (b), and (e). Gu was disclosed to the PTO during prosecution of the 785 patent, but was not individually addressed by the Examiner during prosecution.

Gu discloses a video encoding system for multiple bitrate video streaming. EX1007, 2:18-35; EX1003, ¶¶86-87. Specifically, Gu explains that the target bitrates for alternative streams should "decrease progressively in a proportional, logarithmic or other decreasing manner." EX1007, 7:58-61. For example, Gu recommends that the target bitrate of each alternate stream is iteratively "decreased proportionally" by "¼" (25%). EX1007, 7:61-67.

D. Ronca

U.S. Patent Pub. No. 2011/0246616 A1 to David Ronca et al., titled "Dynamic Virtual Chunking of Streaming Media Content," was filed on April 2, 2010, and published on October 6, 2011 ("Ronca"). EX1008; EX1003, ¶88. Ronca is prior art under at least 35 U.S.C. § 102(e). Ronca was not disclosed to the Patent Office during prosecution of the 785 patent.

Ronca describes encoding, storing, and distributing video content for adaptive streaming. EX1008, Abstract, ¶¶24, 38-39, 42; EX1003, ¶89. An "encoding tool" is used to "generate multiple video (and potentially audio) encodings of the same media presentation, each encoded at different bitrates." EX1008, ¶¶38-39. This

creates a "number of different alternate streams containing the same material encoded at a variety of data rates." *Id.*, ¶24. Each encoded stream is uploaded to a content delivery network for storage. *Id.*, ¶29. A client device then receives a header with a top-level index that identifies a location for the chunks of each stream. *Id.*, ¶¶22, 41-42, 60-61; EX1003, ¶90. This index is used by the client device to request and playback chunks of video. EX1008, ¶¶22, 60-62, Fig. 8.

IV. THE CHALLENGED CLAIMS ARE OBVIOUS

A. Ground 1: Claims 1-4, 7-14, 17-19

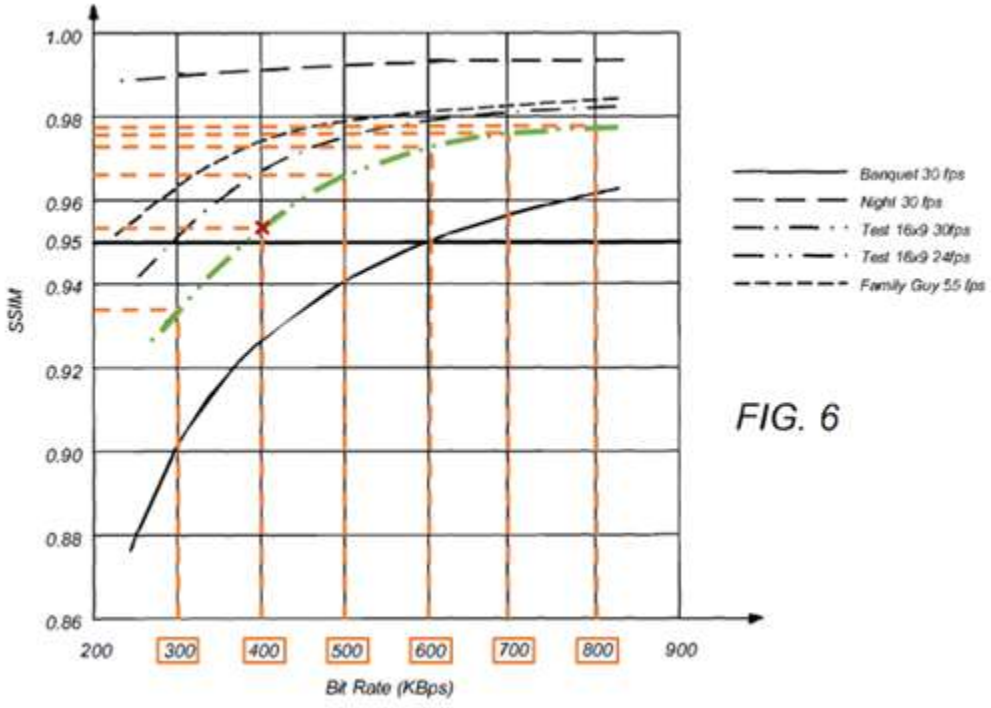
1. A POSITA would have combined Ozer with Liao

A POSITA would have been motivated to combine Ozer with Liao. EX1003, ¶¶91-100. Specifically, a POSITA would have sought to combine the encoding, indexing, and streaming of Ozer with the quality evaluation of Liao. *See* EX1005, 115-144; EX1006, 7:63-8:26.

Both Ozer and Liao teach video streaming and encoding multiple versions of a media program or a source video. EX1006, 7:63-8:9; EX1005, 115-116; EX1003, ¶92. To ensure video quality, Ozer explains that it is important to select appropriate bitrates for the alternative streams. EX1005, 15-17, 126-127. As noted in Ozer, "choosing a data rate [bitrate] is largely a cost/quality trade-off." *Id.*, 15. The "cost" is the increased network resources needed to transmit the stream at a higher bitrate,

while the "quality" is the improved video quality that generally results from having a higher bitrate stream. *Id*., 15-17, 126-127.

Liao teaches a way to optimize this cost/quality tradeoff. EX1003, ¶93. In particular, Liao teaches using SSIM to evaluate the quality of encodings at multiple different bitrates. EX1006, 8:38-9:16. For example, Liao teaches encoding a given TEST media program at different target bitrates (300, 400, 500, 600, 700, and 800 kbps) and evaluating SSIM for each of these encodings. *Id.*, 8:38-40, Fig. 6 (annotated). Liao then teaches selecting the lowest bitrate that meets a minimum SSIM, such as 0.95. *Id.*, 9:13-16, Fig. 6 (annotated).



EX1006, Fig. 6 (annotated).

As shown in the above figure, Liao's quality evaluation results in the selection of a 400 kbps bitrate encoding. *Id.*, 9:13-16, Fig. 6; EX1003, ¶93. This is because the lower bitrate encoding (300 kbps) does not achieve a minimum SSIM of 0.95, while the higher bitrate encodings (500, 600, 700, 800 kbps) require more resources than needed to achieve a minimum SSIM of 0.95. *Id.*, 9:13-16, Fig. 6; EX1003, ¶93. Accordingly, combining Liao's quality evaluation with Ozer's teachings will result in the selection of the optimal encoding, which is the lowest bitrate encoding for each resolution that achieves a minimum video quality. EX1003, ¶94.

A POSITA combining the teachings of Ozer and Liao would have had a reasonable expectation of success. EX1003, ¶¶95-100. This combination would simply require using the quality evaluation and selection of resolution-bitrate combinations, as taught by Liao, to determine the settings for the adaptive streaming encoder, as taught by Ozer. *Id.* Indeed, Ozer teaches that encoder settings for the encoders used in adaptive bitrate streaming are customizable for specific streaming protocols or implementations, such as that described in Liao. EX1005, 118. Having Ozer's encoder implement Liao's quality evaluation would ensure that each alternative stream is encoded at a desired quality without expending unnecessary resources (using more bitrates than needed) to achieve that quality. EX1003, ¶100. A POSITA would therefore know how to combine the encoding, indexing, and

streaming of Ozer with the quality evaluation of Liao with minimal design impact. *Id.*

2. Claim 1

(1) [1.pre] "A method for encoding source content as a plurality of alternative video streams and adaptively streaming the plurality of alternative video streams, each having a bitrate, the method comprising:"

To the extent the preamble is limiting, Ozer in view of Liao and general knowledge of a POSITA teaches the preamble. EX1003, ¶¶110-112. Ozer describes that "[a]daptive streaming technologies make multiple video streams available to your viewers." EX1005, 115-16. Viewers can then "dynamically switch" between the alternative "streams to adapt to changing connection speeds, CPU use statistics and other heuristics." *Id.* As shown in the below image, to facilitate "[a]daptive streaming," Ozer encodes a video source (shown in red) using an encoder (shown in blue) into multiple streams (shown in green) each having a given bitrate (e.g., 3 Mbps, 400 kbps, 1.5 Mbps, 600 kpbs).

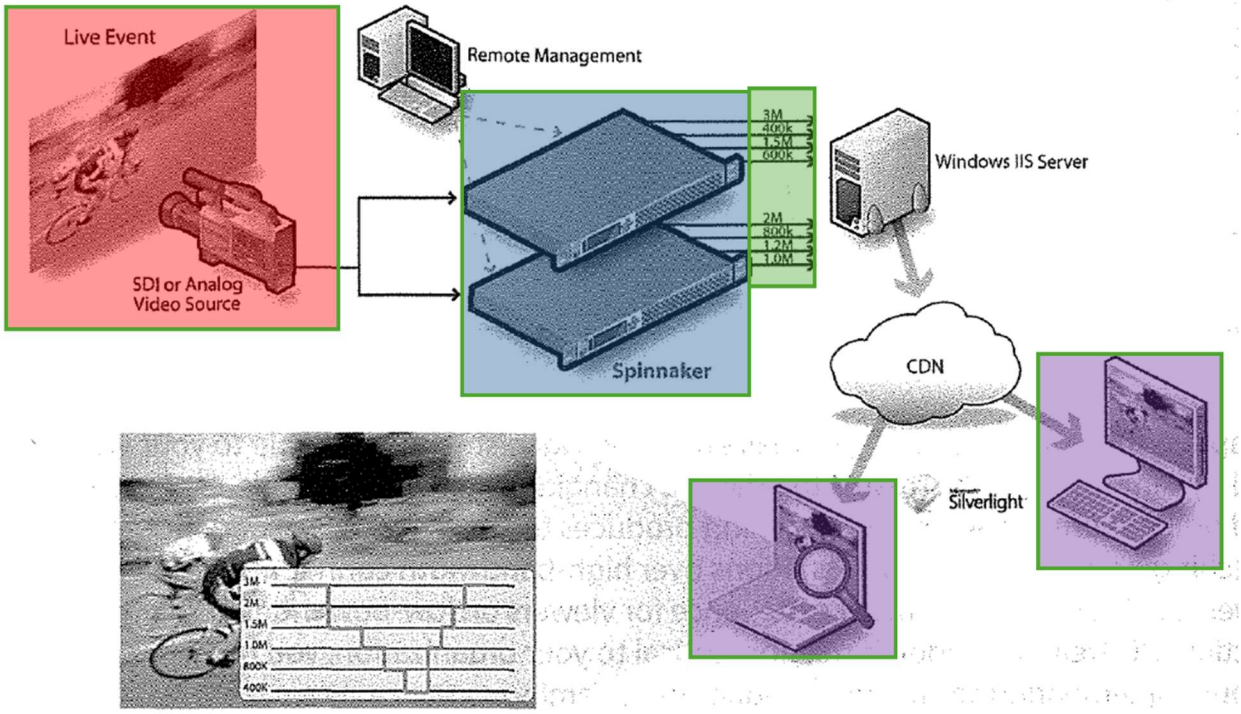


Figure 7-1. Using Inlet Technologies' Spinnaker encoder to produce multiple streams for a Microsoft Smooth Streaming event. Usage courtesy Inlet Technologies.

EX1005, 116, Fig. 7-1 (annotated).

(2) [1.a] "identifying source video content;"

Ozer in view of Liao and general knowledge of a POSITA teaches claim limitation [1.a]. EX1003, ¶¶113-114. Specifically, Ozer discloses identifying a "Live Event" sourced from an "SDI [serial digital interface]" or "Analog Video Source." EX1005, 115-116, Fig. 7-1. As noted by Ozer, the same method of delivering the "Live Event" (source video content) can also be used to deliver "on-demand video files" as source video content. EX1005, 116.

(3) [1.b] "identifying a plurality of resolutions for encoding of video content;"

Ozer in view of Liao and general knowledge of a POSITA teaches claim limitation [1.b]. EX1003, ¶¶115-119. Specifically, Ozer explains that a video source can be encoded using multiple video resolutions. EX1005, 128-130. Having a plurality of encodings at different resolutions is a standard feature of adaptive streaming. *Id.*; EX1003, ¶¶36-44, 116. Because there "will inevitably be some switching between streams with different frame sizes" (resolutions) in adaptive streaming, Ozer advises clustering the alternative streams around a smaller set of resolutions to avoid too many switches between resolutions, which could degrade the viewing experience. EX1005, 128-29. An example is provided below in Figure 7-4, where four resolutions (picture sizes) are identified for encoding video content: 256x144, 512x288, 768x432, and 1280x720. *Id.*, 128-29, Fig. 7-4; EX1003, ¶117.

16x9				
Stream #	Picture Size	V	A	AV
1	256x144	150	64	214
2	256x144	250	64	314
3	512x288	450	64	514
4	512x288	600	64	664
5	512x288	800	64	864
6	512x288	1200	64	1264
7	768x432	1400	64	1464
8	1280x720	1700	64	1764
9	1280x720	2500	64	2564
10	1280x720	3500	64	3564

Figure 7-4. Adobe's Levkov recommends clustering your streams around certain frame sizes.

EX1005, 129, Fig. 7-4 (annotated).

In another example, Table 7-3 shows three resolutions identified for encoding video content: 512x288, 768x432, and 1280x720. *Id.*, 128-29, Table 7-3; EX1003, ¶¶118-19.

Preset	Resolution	Video bitrate	Profile	Key Frame	Audio bitrate	Channels
Phone and Table, 3G, 16x9	512x288	300 kbps	Baseline	72	48 kbps	Stereo
Phone and Table, Low, 16x9	512x288	450 kbps	Baseline	72	48 kbps	Stereo
Phone and Table, WiFi, 16x9	512x288	650 kbps	Baseline	72	48 kbps	Stereo
PC & TV, SD, Med, 16x9	768x432	1,140 kbps	Main	72	64 kbps	Stereo
PC & TV, SD, High, 16x9	768x432	1,140 kbps	Main	72	64 kbps	Stereo
PC & TV, HD, Low, 16x9	1280x720	2,440 kbps	High	72	64 kbps	Stereo
PC & TV, HD, High, 16x9	1280x720	3,440 kbps	High	72	64 kbps	Stereo

Table 7-3. The configurations of adaptive streaming presets released by Adobe in late 2010.

EX1005, 129, Table 7-3 (annotated).

(4) [1.c(i)] "for each particular resolution of the plurality of resolutions: encoding at least a portion of the source video content multiple times using the particular resolution and multiple different target bitrates for the particular resolution; and"

Ozer in view of Liao and general knowledge of a POSITA teaches claim limitation [1.c(i)]. EX1003, ¶¶120-125. Ozer discloses "identifying a plurality of resolutions for encoding of video content." *Supra* § IV.A.2(3).

Figure 7-4 of Ozer, shown below, illustrates encoding a plurality of alternative encodings or streams at multiple "targeted bit[]rates." EX1005, 128-29, Fig. 7-4; *see also id.*, Table 7-3; EX1003, ¶¶121-22. Specifically, Ozer teaches a video source being encoded into ten different alternative "streams" at the same four resolutions (picture size): 256x144, 512x288, 768x432, and 1280x720. EX1005, 128-29, Fig. 7-4 (annotated). Streams 3-6 are encoded at the same (particular) resolution of 512x288 using multiple different "targeted bit rates:" 450 kbps, 600 kbps, 800 kbps, and 1200 kbps. EX1005, 128-29, Fig. 7-4 (annotated). Similarly, streams 1 and 2 are encoded at the same resolution of 256x144 using "targeted bit rates" of 150 kbps and 250 kbps, while streams 8-10 are encoded at the same resolution of 1280x720 using "targeted bit rates" of 1700 kbps, 2500 kbps, and 3500 kbps. EX1005, 128-29, Fig. 7-4 (annotated).

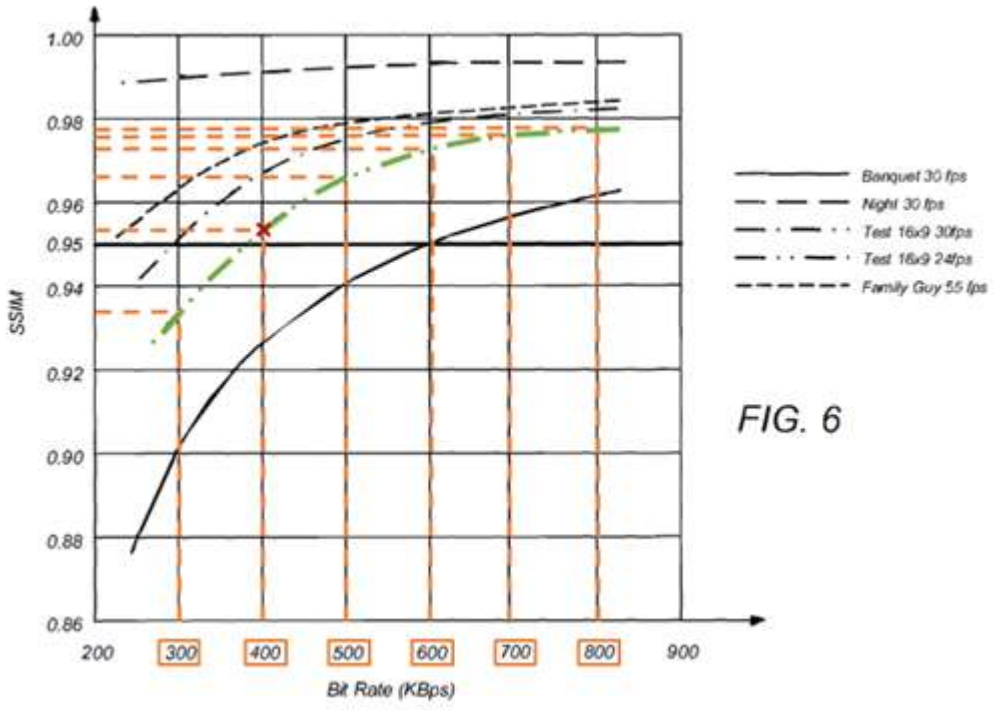
16x9				
Stream #	Picture Size	V	A	AV
1	256x144	150	64	214
2	256x144	250	64	314
3	512x288	450	64	514
4	512x288	600	64	664
5	512x288	800	64	864
6	512x288	1200	64	1264
7	768x432	1400	64	1464
8	1280x720	1700	64	1764
9	1280x720	2500	64	2564
10	1280x720	3500	64	3564

Figure 7-4. Adobe's Levkov recommends clustering your streams around certain frame sizes.

EX1005, Fig. 7-4 (annotated). Given the teachings of Ozer, it would have been obvious to a POSITA that ***each*** particular resolution can be encoded using multiple target bitrates. EX1005, Fig. 7-3; EX1003, ¶¶36-44, 52, 123 (citing EX1014, 3-4, 7-8). Indeed, as Ozer explains, because "streams of identical resolution switch most smoothly," it is helpful to have multiple encodings each with different target bitrates per resolution. EX1005, 128-29. This is shown above in Figure 7-4 where each of the streams 1-2, 3-6, and 8-10 of Ozer having a particular resolution are encoded using multiple different bitrates. *Id.*, Fig. 7-4 (annotated).

Similar to Ozer, Liao discloses claim limitation [1.c(i)]; EX1003, ¶124. Specifically, Liao teaches that "[s]ince customers' Internet service varies widely in

bandwidth, different versions of the media program can be generated, each with a different resolution, typically 480p, 360p, 288p or 240p." EX1006, 7:67-8:6. Each of these different versions "should be encoded with different bit rates." EX1006, 8:17-22, 8:38-40. An example is shown in Figure 6, where a version of TEST media program (shown below in green) is encoded at multiple target bitrates: 300 kbps, 400 kbps, 500 kbps, 600 kbps, 700 kbps, and 800 kbps. *Id.*, 8:38-67, Fig. 6 (annotated).



EX1006, Fig. 6 (annotated).

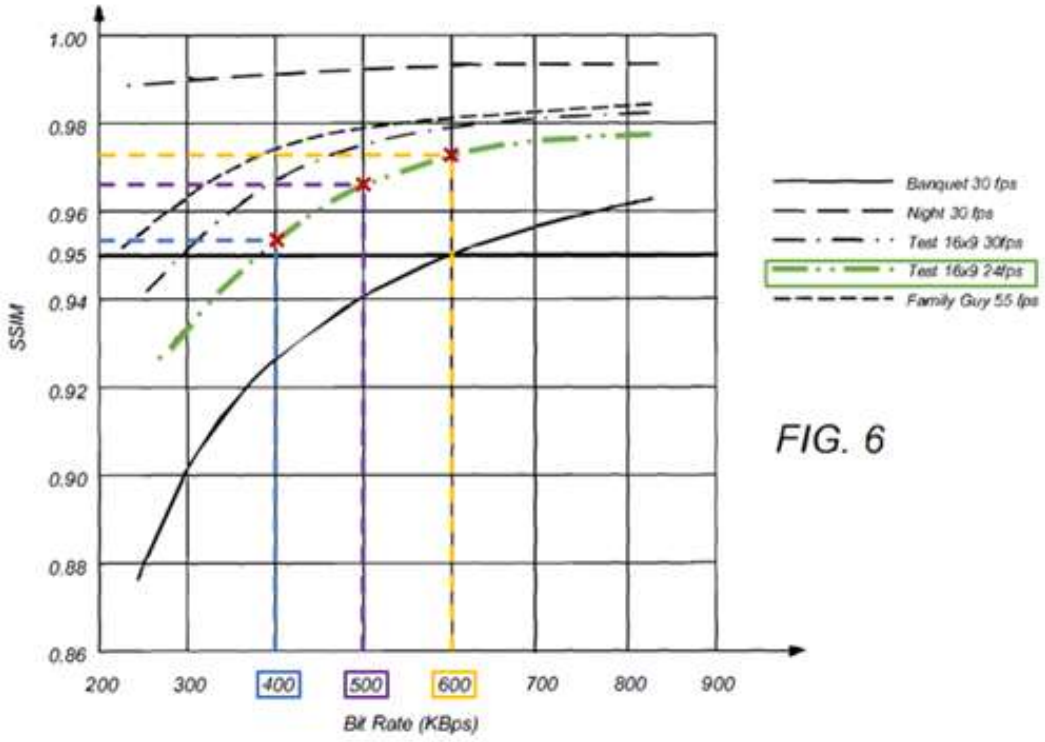
Accordingly, both Ozer and Liao disclose this claim limitation. EX1003, ¶125.

(5) [1.c(ii)] "for each particular resolution of the plurality of resolutions: . . . evaluating quality for each of the multiple encodings"

Ozer in view of Liao and general knowledge of a POSITA teaches claim limitation [1.c(ii)]. EX1003, ¶¶126-132. Ozer and Liao both disclose encoding a source media program at different resolutions using multiple target bitrates for each. *Supra* § IV.A.2(4). Ozer discloses the importance of ensuring the quality of the video stream without having to expend unnecessary resources. EX1005, 127-28; EX1003, ¶128.

Liao teaches a way to evaluate the quality of each encoding using SSIM—a metric that measures the quality of an encoded video by comparing how similar it is to a reference video. EX1006, 8:40-67; EX1003, ¶128. As shown below in Figure 6, Liao measures the "relationship between video quality and bitrate for different" versions of a media program. EX1006, 8:38-40; EX1003, ¶¶129-130. For example, Figure 6 illustrates a quality evaluation of a TEST media program (shown below in green) encoded at multiple target bitrates (300, 400, 500, 600, 700, and 800 kbps). The TEST media program encoded at a bitrate of 400 kbps has an evaluated quality between 0.95 and 0.96 SSIM (shown as a blue dashed line). EX1006, 8:1-2, Fig. 6 (annotated). That same media program encoded at a bitrate of 500 kbps has an evaluated quality between 0.96 and 0.97 SSIM (shown as a purple dashed line), and

at 600 kbps has an evaluated quality between 0.97 and 0.98 SSIM (shown as a yellow dashed line). *Id.*, Fig. 6 (annotated).



EX1006, Fig. 6 (annotated).

It would have been obvious to a POSITA to use this quality evaluation for each of the "different versions of the media program . . . each [encoded] with a different resolution, typically 480p, 360p, 288p or 240p." EX1006, 7:67-8:6; EX1003, ¶¶131-32 (citing EX1014, 3-4, 7-8). Determining an optimal bitrate for a given stream based on a quality evaluation avoids having to expend unnecessary resources on transmitting streams at a higher bitrate. EX1003, ¶¶131-32, 135 (citing EX1014, 3-4, 7-8). Repeating this for each of the "different versions of the media

program . . . each [encoded] with a different resolution" would amplify these benefits and achieve greater resource savings. EX1003, ¶¶131-32 (citing EX1014, 3-4, 7-8). Accordingly, the combination of Ozer and Liao teaches "evaluating quality for each of the multiple encodings" using SSIM for each of the plurality of resolutions.

(6) [1.d] "selecting a plurality of resolution and target bitrate combinations for a plurality of alternative streams based on the evaluated quality of each of the multiple encodings;"

Ozer in view of Liao and general knowledge of a POSITA teaches claim limitation [1.d]. EX1003, ¶¶133-137. Ozer and Liao teach "a plurality of alternative streams" that are each encoded at a particular resolution and target bitrate, and "evaluating [the] quality for each of the multiple encodings." *Supra* §§ IV.A.2(4)-(5). The result of the quality evaluation of Liao is a ***selection*** of a "plurality of alternative streams and target bitrate combinations" based on SSIM. EX1003, ¶134.

Liao discloses selecting a particular resolution and bitrate for an encoding based on a quality evaluation. EX1006, 9:7-16; EX1003, ¶135. For example, Liao teaches evaluating the quality of a media program encoded at multiple bitrates (300, 400, 500, 600, 700, and 800 kbps) and selecting a target bitrate of 400 kbps that achieves a minimum SSIM of 0.95. EX1006, 9:7-16. It would have been obvious for a POSITA to select a target bitrate based on this quality evaluation for each of the "different versions of the media program…each with a different resolution,

typically 480p, 360p, 288p or 240p." *Id.*, 8:1-3, Fig. 6; EX1003, ¶136 (citing EX1014, 3-4, 7-8). Performing this quality evaluation and selection for each ensures that the lowest bitrate stream of acceptable quality is chosen for each resolution, without having to expend additional resources on encoding videos at higher bitrates. *Supra* § IV.A.1; EX1003, ¶136. Accordingly, the combination of Ozer and Liao teaches selecting a plurality of resolutions (e.g., 480p, 360p, 288p, and 240p) and target bitrate (e.g., 400 kbps) combinations for a plurality of alternative streams (different versions) of a media program based on the evaluated quality (minimum SSIM of 0.95) of each of the multiple encodings. EX1003, ¶137.

(7) [1.e] "uploading encodings of a plurality of sections of the source video content at each of the selected plurality of resolution and target bitrate combinations for the plurality of alternative streams to a set of servers that form part of a content distribution system;"

Ozer in view of Liao and general knowledge of a POSITA teaches claim limitation [1.e]. EX1003, ¶¶138-142. Ozer and Liao teach "select[ing a] plurality of resolution and target bitrate combinations for the plurality of alternative streams." *Supra* § IV.A.2(6).

Ozer further discloses uploading the plurality of encoded alternative streams to a CDN. EX1005, 115-16, 128; EX1003, ¶140. This is shown in Figure 7-1 of Ozer, where the source video content (shown in red below) is encoded into a plurality of alternative streams (shown in green below) and uploaded to a CDN (shown in

yellow below). EX1005, 115-16. The source video content is split into chunks (a plurality of sections) representing 2-10 seconds of video. *Id.*, 116-17, 136.

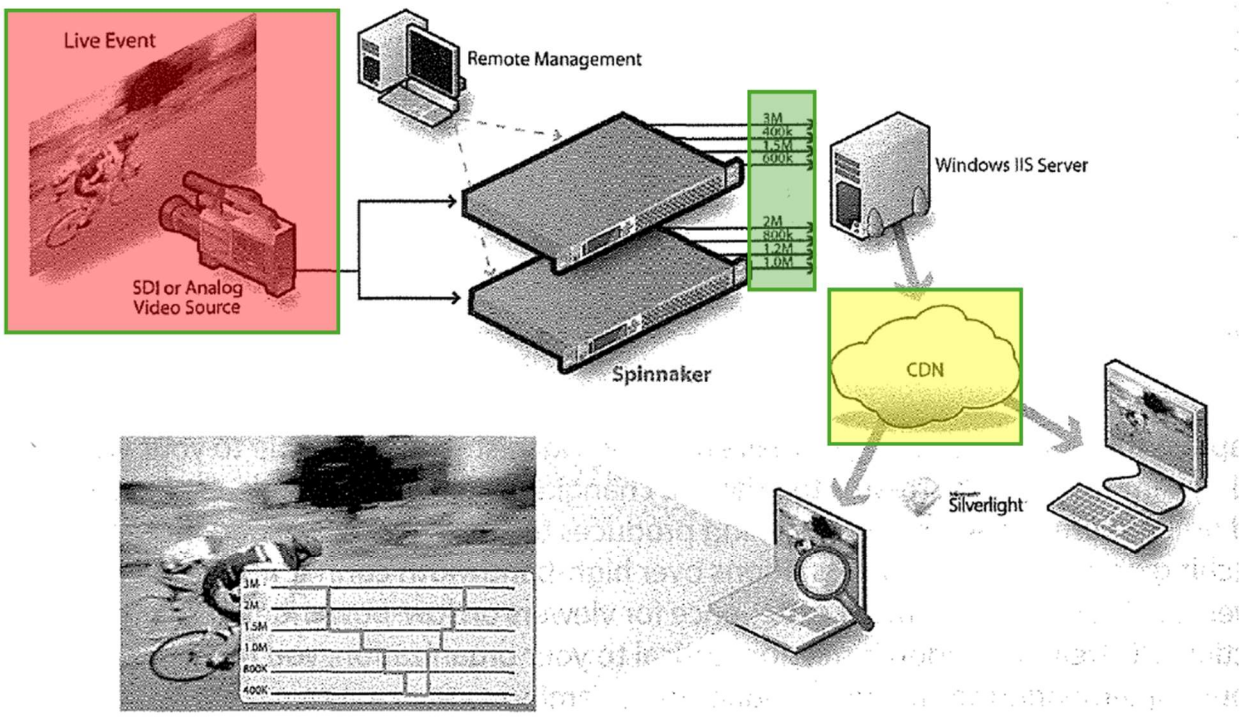


Figure 7-1. Using Inlet Technologies' Spinnaker encoder to produce multiple streams for a Microsoft Smooth Streaming event. Usage courtesy Inlet Technologies.

EX1005, 116, Fig. 7-1 (annotated). The CDN is formed using a set of servers. EX1006, 136-37; EX1003, ¶141. One example of a CDN disclosed in Ozer is an Akamai HTTP Network composed of a plurality of servers, as shown in Figure 7-9. EX1006, 136-37; EX1003, ¶141. Accordingly, the combination of Liao and Ozer teaches this limitation. EX1003, ¶142.

(8) [1.f] "generating entries in a top level index describing at least one of the plurality of alternative streams;"

Ozer in view of Liao and general knowledge of a POSITA teaches claim limitation [1.f]. EX1003, ¶¶143-145. As noted above for claim limitations [1.e], Ozer and Liao teach uploading plurality of alternative streams—each representing a different combination of resolution and bitrate—to a CDN. *Supra* § IV.A.2(7). To appropriately catalog the plurality of alternative streams uploaded to the CDN, Ozer teaches generating entries in a top level index that "identifies the available files and their locations on the [CDN] and refers to specific chunks of each stream." EX1005, 118; *see also id.* 136-37. This file containing a top level index is stored in the CDN. *Id.*, 136. An example of a top level index ("Index File.m3u8") is shown in Figure 7-2 of Ozer that describes a "Low" level stream, "Mid" level stream, and a "Hi[gh]" level stream. *Id.*, Fig. 7-2, 117-18, 136-37.

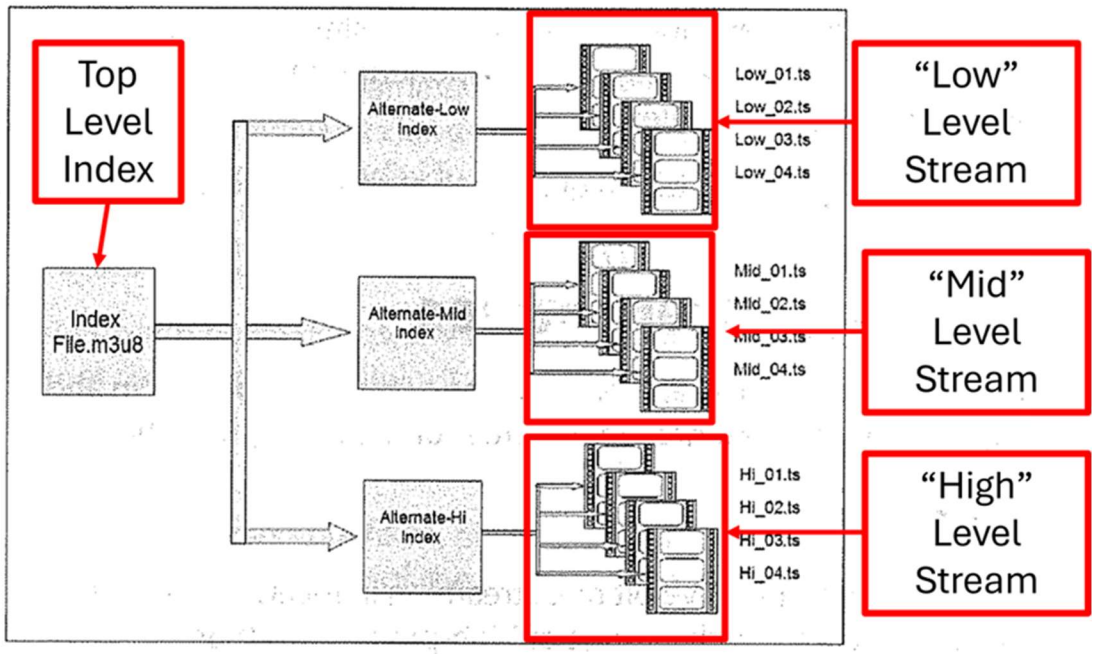


Figure 7-2. The manifest file identifies the different files and their locations. From an article that I wrote for Millimeter *Magazine, and usage is courtesy* Millimeter.

EX1005, Fig. 7-2 (annotated).

(9) [1.g] "providing the generated top level index from the content distribution system to a one or more playback devices capable of performing adaptive streaming using the encodings of the plurality of sections; and"

Ozer in view of Liao and general knowledge of a POSITA teaches claim limitation [1.g]. EX1003, ¶¶146-149. Ozer and Liao teach generating a "top level index" that describes the plurality of alternative streams and "uploading encodings of a plurality of sections of the source video content" to a CDN. *Supra* §§ IV.A.2(7)-(8).

As explained in Ozer, "[a]daptive streaming technologies make multiple video streams available to your viewers and dynamically switch streams to adapt to

changing connection speeds, CPU use statistics and other heuristics." EX1005, 115; EX1003, ¶¶148-149. To switch between these streams, and perform adaptive streaming, a device must "check the manifest file for the next chunk," meaning that the device must use the "top level index" from the CDN to adaptively stream chunks (plurality of sections) of video content. EX1005, 117-18, 136. Ozer teaches providing the "top level index" to the device so that it can perform adaptive streaming. *Id.* Accordingly, Ozer and Liao disclose this limitation.

(10) [1.h] "responding to requests from the one or more playback devices, where the requests include requests for specific encodings from the encodings of the plurality of sections."

Ozer in view of Liao and general knowledge of a POSITA teaches claim limitation [1.h]. EX1003, ¶¶150-153. Ozer and Liao disclose "providing the generated top level index" to the viewer's device to "perform[] adaptive streaming using the encodings of the plurality of sections." *Supra* § IV.A.2(9). In response "to changing connection speeds, CPU use statistics and other heuristics," the viewer's device (playback device) requests chunks of a specific encoding or stream having a given target bitrate and resolution. EX1005, 115, 118. For example, Ozer discloses that the playback device "might start out playing the lowest quality stream (Low_01.ts), but if it determines that it can handle a higher-quality stream, it would check the manifest file for the next chunk of a higher-quality stream (say, Mid_02.ts)

and retrieve and play that chunk." EX1005, 117. This "retriev[al]" of the requested "next chunk" is a response to the device's request for specific encodings. *Id.*, 118. As such, the combination of Ozer and Liao teaches "responding to requests from the one or more playback devices, where the requests include requests for specific encodings from the encodings of the plurality of sections."

3. Claim 11

(1) [11.pre] "A non-transitory machine readable medium containing processor instructions for encoding source content as a plurality of alternative video streams and adaptively streaming the plurality of alternative video streams, each having a bitrate, where execution of the instructions by a processor causes the processor to perform a process that comprises:"

To the extent the preamble is limiting, Ozer in view of Liao and general knowledge of a POSITA discloses the preamble. EX1003, ¶183. Because the preamble of system claim 11 is substantively identical to the preamble of method claim [1.pre], Ozer in view of Liao discloses the preamble of system claim 11 for the same reasons stated above. *Supra* § IV.A.2(1). Further, Ozer and Liao teach a processor for encoding source content and adaptively streaming the plurality of streams. For example, Ozer discloses multi-thread encoding using an exemplary "3.33 GHz Xeon processor[]," and Liao discloses encoders with a "special purpose processor." EX1005, 173-176; EX1006, 8:27-37. A POSITA would have also

understood that the servers described in Ozer Figure 7-9, which make up the CDN, include processors. *See, e.g.*, EX1005, Fig. 7-9; EX1003, ¶183.

(2) [11.a] "identifying source video content;"

Ozer in view of Liao and general knowledge of a POSITA teaches claim limitation [11.a]. EX1003, ¶184. Because claim limitation [11.a] is substantively identical to limitation [1.a], Ozer in view of Liao discloses the limitation [11.a] for the same reasons stated above. *Supra* § IV.A.2(2).

(3) [11.b] "identifying a plurality of resolutions for encoding of video content;"

Ozer in view of Liao and general knowledge of a POSITA teaches claim limitation [11.b]. EX1003, ¶185. Because claim limitation [11.b] is substantively identical to limitation [1.b], Ozer in view of Liao discloses the limitation [11.b] for the same reasons stated above. *Supra* § IV.A.2(3).

(4) [11.c(i)] "for each particular resolution of the plurality of resolutions: encoding at least a portion of the source video content multiple times using the particular resolution and multiple different target bitrates for the particular resolution; and"

Ozer in view of Liao and general knowledge of a POSITA teaches claim limitation [11.c(i)]. EX1003, ¶186. Because claim limitation [11.c(i)] is substantively identical to limitation [1.c(i)], Ozer in view of Liao discloses the limitation [11.c(i)] for the same reasons stated above. *Supra* § IV.A.2(4).

(5) [11.c(ii)] "for each particular resolution of the plurality of resolutions: . . . evaluating quality for each of the multiple encodings;"

Ozer in view of Liao and general knowledge of a POSITA teaches claim limitation [11.c(ii)]. EX1003, ¶187. Because claim limitation [11.c(ii)] is substantively identical to limitation [1.c(ii)], Ozer in view of Liao discloses the limitation [11.c(ii)] for the same reasons stated above. *Supra* § IV.A.2(5).

(6) [11.d] "selecting a plurality of resolution and target bitrate combinations for a plurality of alternative streams based on the evaluated quality of each of the multiple encodings;"

Ozer in view of Liao and general knowledge of a POSITA teaches claim limitation [11.d]. EX1003, ¶188. Because claim limitation [11.d] is substantively identical to limitation [1.d], Ozer in view of Liao discloses the limitation [11.d] for the same reasons stated above. *Supra* § IV.A.2(6).

(7) [11.e] "uploading encodings of a plurality of sections of the source video content at each of the selected plurality of resolution and target bitrate combinations for the plurality of alternative streams to a set of servers that form part of a content distribution system;"

Ozer in view of Liao and general knowledge of a POSITA teaches claim limitation [11.e]. EX1003, ¶189. Because claim limitation [11.e] is substantively identical to limitation [1.e], Ozer in view of Liao discloses the limitation [11.e] for the same reasons stated above. *Supra* § IV.A.2(7).

(8) [11.f] "generating entries in a top level index describing at least one of the plurality of alternative streams;"

Ozer in view of Liao and general knowledge of a POSITA teaches claim limitation [11.f]. EX1003, ¶190. Because claim limitation [11.f] is substantively identical to limitation [1.f], Ozer in view of Liao discloses the limitation [11.f] for the same reasons stated above. *Supra* § IV.A.2(8).

(9) [11.g] "providing the generated top level index from the content distribution system to one or more playback devices capable of performing adaptive streaming using the encodings of the plurality of sections; and"

Ozer in view of Liao and general knowledge of a POSITA teaches claim limitation [11.g]. EX1003, ¶191. Because claim limitation [11.g] is substantively identical to limitation [1.g], Ozer in view of Liao discloses the limitation [11.g] for the same reasons stated above. *Supra* § IV.A.2(9).

(10) [11.h] "responding to requests from the one or more playback devices, where the requests include requests for specific encodings from the encodings of the plurality of sections."

Ozer in view of Liao and general knowledge of a POSITA teaches claim limitation [11.h]. EX1003, ¶192. Because claim limitation [11.h] is substantively identical to limitation [1.h], Ozer in view of Liao discloses the limitation [11.h] for the same reasons stated above. *Supra* § IV.A.2(10).

4. Claims 2 and 12: "[The method of claim 1 further comprising / The non-transitory machine readable medium of claim 11, wherein the process further comprises] assembling the encodings of the plurality of sections for a given alternative stream into a video container file."

In addition to teaching all the limitations of claims 1 and 11, Ozer in view of Liao and general knowledge of a POSITA discloses claims 2 and 12. EX1003, ¶¶154-158, 193. Ozer and Liao teach encoding a plurality of sections (chunks) of alternative streams. *Supra* §IV.A.2(9). As Ozer explains, "[a]ll HTTP-based adaptive technologies split their files into 2 to 10-seconds chunks, which are the video chunks on the right in []Figure 7-2 (Hi_01.ts, Hi_02.ts, etc.)." EX1005, 118. A POSITA would understand that each of Ozer's "files" is a container file that includes a plurality of assembled sections (chunks). *Id.*, 118; EX1003, ¶¶ 156-57. Figure 7-2 of Ozer illustrates container files for three alternative streams: a container file for a "Hi[gh]" stream (blue shaded box), a container file for "Mid" stream (red shaded box), and a container file for a "Low" stream (yellow shaded box). EX1005, Fig. 7-2 (annotated).

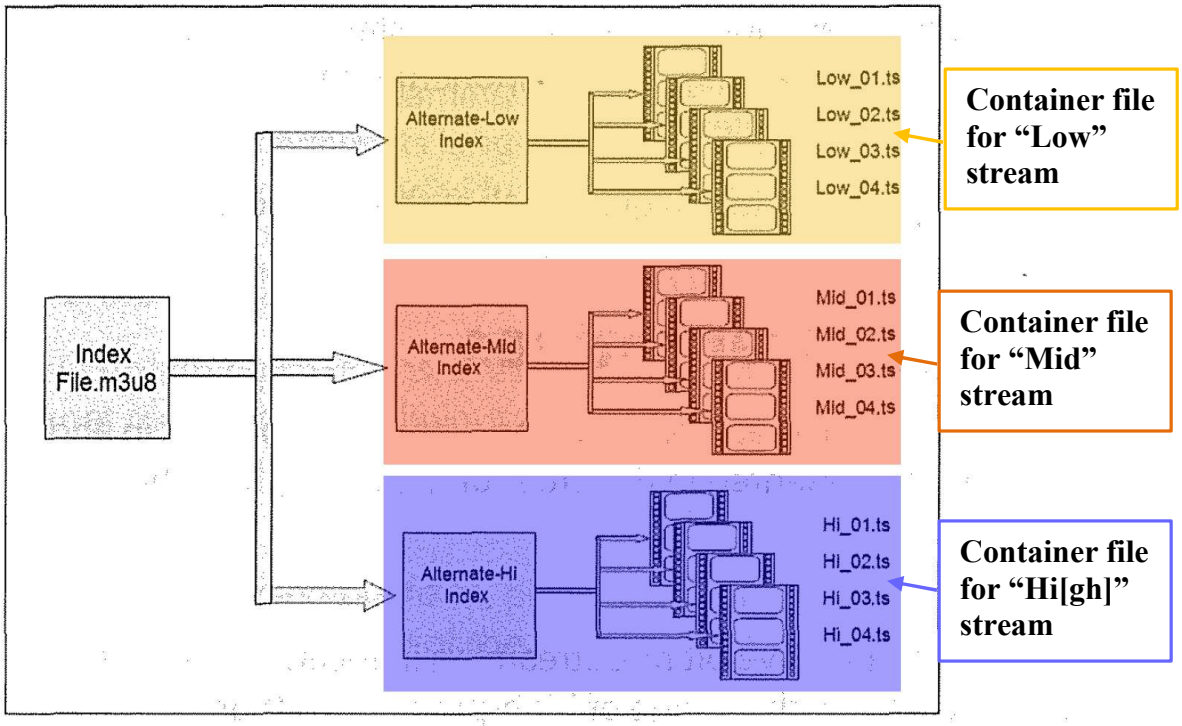


Figure 7-2. The manifest file identifies the different files and their locations. From an article that I wrote for Millimeter *Magazine, and usage is courtesy* Millimeter.

EX1005, 118, Fig. 7-2 (annotated). This disclosure is consistent with the "container files" that "contain the actual video and audio data" described in the Background section of the 785 patent. EX1001, 1:45-47.

5. Claims 3 and 13: "[The method of claim 2 further comprising / The non-transitory machine readable medium of claim 12, wherein the process further comprises] generating entries in a container index within each container file indicating sizes of portions of the given alternative stream within the video container file."

In addition to teaching all the limitations of claims 1, 2, 11, and 12, Ozer in view of Liao and general knowledge of a POSITA discloses claims 3 and 13.

EX1003, ¶¶159-163, 194. As explained above, Ozer and Liao teach encoding and assembling a plurality of sections (chunks) for a given alternative stream into one or more video container files. *Supra* §§ IV.A.2-3. Ozer further teaches that each container file has a container index that describes the chunks of an alternative stream, including the size of each chunk. EX1005, 117-18, Fig. 7-2; EX1003, ¶160. As shown below in Figure 7-2, each container file has a container index (e.g., "Alternate-Hi Index") that points to the chunks of video located in the different streams ("Hi[gh]" stream [blue shaded box], "Mid" stream [red shaded box] and "Low" stream [yellow shaded box]). EX1005, 117-18, Fig. 7-2. The index includes information about the size of each of the chunks for the alternative streams. EX1005, 117-18, Fig. 7-2; EX1003, ¶¶161-62. The size of the chunk is represented in the form of time entries indicating the duration (2-10 seconds) of each chunk. EX1003, ¶¶159-163, 194 (citing EX1022, 6-7). As Ozer explains, "the video chunks on the right in the Figure 7-2 (Hi_01.ts, Hi_02.ts, etc.)" represent "2 to 10-second chunks." EX1005, 118.

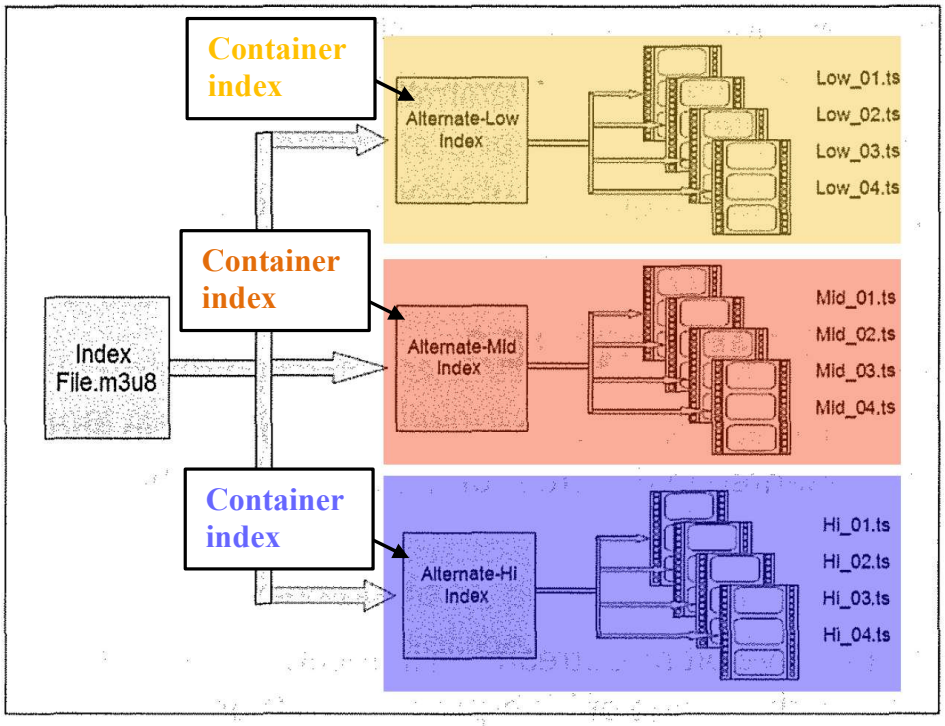


Figure 7-2. The manifest file identifies the different files and their locations. From an article that I wrote for Millimeter *Magazine, and usage is courtesy* Millimeter.

EX1005, Fig. 7-2 (annotated).

6. Claims 4 and 14: "[The method of claim 1 / The non-transitory machine readable medium of claim 11], wherein adaptively streaming the encodings comprises receiving at least one request for an encoded section of one of the plurality of alternative streams from the one or more playback devices based on the generated top level index."

In addition to teaching all the limitations of claims 1 and 11, Ozer in view of Liao and general knowledge of a POSITA teaches claims 4 and 14. EX1003, ¶¶164-166, 195. Ozer and Liao disclose "providing the generated top level index" to the viewer's device, "performing adaptive streaming using the encodings of the plurality

of sections," and "responding to request from the one or more playback devices." *Supra* § IV.A.2. Ozer teaches that this request is based on the top level index. EX1005, 117; EX1003, ¶165. Specifically, Ozer discloses that the playback device "might start out playing the lowest quality stream (Low_01.ts), but if it determines that it can handle a higher-quality stream, it would ***check the manifest file*** for the next chunk of a higher-quality stream (say, Mid_02.ts) and retrieve and play that chunk." EX1005, 117 (emphasis added). This "retriev[al]" of the requested "next chunk" based on "check[ing] the manifest file" (top level index) involves the CDN receiving a request for an encoded section (chunk) of the plurality of alternative streams and responding with the requested chunk. *Id.*

7. Claims 7 and 17: "[The method of claim 1 / The non-transitory machine readable medium of claim 11], wherein both a width and a height of each resolution of the plurality of resolutions have an integer number of pixels."

In addition to teaching all the limitations of claims 1 and 11, Ozer in view of Liao and general knowledge of a POSITA teaches claims 7 and 17. EX1003, ¶¶167-171, 196. Ozer discloses "identifying a plurality of resolutions for encoding of video content." *Supra* § IV.A.2(3). Ozer discloses that a "[r]esolution is the height and width of the video in pixels." EX1005, 17. For example, a "320x240 video has 76,800 pixels in each frame," with both 320 (width) and 240 (height) being an integer number of pixels. *Id.*; EX1003, ¶¶ 167-71. Another example is shown in

Figure 7-4 of Ozer where the identified resolutions, in integer pixels, ("Picture Size[s]") are listed using a width and height (256x144, 512x288, 768x432, and 1280x720). EX1005, Fig. 7-4 (annotated); *see also id.*, Table 7-3 (same).

8. Claims 8 and 18: "[The method of claim 1 / The non-transitory machine readable medium of claim 11], wherein each resolution of the plurality of resolutions has a same display aspect ratio and at least two resolutions of the plurality of resolutions have different sample aspect ratios."

In addition to teaching all the limitations of claims 1 and 11, Ozer in view of Liao and general knowledge of a POSITA teaches claims 8 and 18. EX1003, ¶¶172-176, 197. Each video is encoded and stored at a specific resolution, such as 1280x720, identifying the width and height of each video frame in pixels. *See supra* § IV.A.2(3). POSITAs were also aware of two other width and height relationships used to display an encoded video: display aspect ratio and sample aspect ratio. EX1003, ¶173; *see, e.g.*, EX1001, 6:28-32, 10:8-11. Display aspect ratio is the proportion between the width and height of a device's display. *See, e.g.*, EX1001, 6:28-32. Sample aspect ratio is the proportion between the width and height of the pixels in each frame of video. *See, e.g.*, *id.*, 10:8-11.

Discrepancies between a video's resolution and these ratios, if not addressed, may result in distortion during playback. EX1005, 24-26; EX1003, ¶172. A POSITA would have understood that creating video encodings with different

combinations of these characteristics—resolution, sample aspect ratio, and display aspect ratio—would help to avoid potential distortions. EX1003, ¶172. For example, a POSITA would have known to encode a video with one display aspect ratio using different resolutions with different sample aspect ratios. *Id.*

Ozer teaches that "each resolution of the plurality of resolutions has a same display aspect ratio." *Id.*, ¶173; EX1005, Table 7-3 (annotated); *see also* EX1005, Table 7-4 (same). This is shown at least in Table 7-3, where each resolution has the same display aspect ratio of 16x9 (shaded yellow box below).

Preset	Resolution	Video bitrate	Profile	Key Frame	Audio bitrate	Channels
Phone and Table, 3G, 16x9	512x288	300 kbps	Baseline	72	48 kbps	Stereo
Phone and Table, Low, 16x9	512x288	450 kbps	Baseline	72	48 kbps	Stereo
Phone and Table, WiFi, 16x9	512x288	650 kbps	Baseline	72	48 kbps	Stereo
PC & TV, SD, Med, 16x9	768x432	1,140 kbps	Main	72	64 kbps	Stereo
PC & TV, SD, High, 16x9	768x432	1,140 kbps	Main	72	64 kbps	Stereo
PC & TV, HD, Low, 16x9	1280x720	2,440 kbps	High	72	64 kbps	Stereo
PC & TV, HD, High, 16x9	1280x720	3,440 kbps	High	72	64 kbps	Stereo

Table 7-3. The configurations of adaptive streaming presets released by Adobe in late 2010.

Id., Table 7-3 (annotated).

Ozer also teaches that "at least two resolutions of the plurality of resolutions have different sample aspect ratios." EX1003, ¶174. As Ozer explains, video "designed to be viewed on a television set has a fundamentally different aspect ratio when viewed on a computer." EX1005, 24. Specifically, the "frame is horizontally

squeezed by 10% when displayed on a tv set," resulting in a distorted image as shown in Fig. 1-10 below.

Figure 1-10. SD video displays differently on computers and TV sets.

Id., Fig. 1-10. This is because different devices may have different pixel dimensions and resolutions that may not match the dimensions of the encoded video. *See id.*, 24-26. To scale the video for these different displays and avoid distortion, Ozer recommends having encodings with different sample aspect ratios to accommodate different types of client devices (e.g., tvs and computers) with the same display aspect ratios. *Id.*, 25, 129, Table 5-13; EX1003, ¶174.

Ozer provides another reason for using different sample aspect ratios and the same display aspect ratio: the different width-to-height ratios of stored encodings. Table 5-13 of Ozer shown below discloses alternate encodings at multiple resolutions with width-to-height ratios of 16:9 and 4:3. EX1003, ¶175. When these encodings of different ratios are played back on devices with the same display aspect ratio, the sample aspect ratio of at least one of the encodings must be adjusted to

avoid distortion. *Id*. For example, displaying the 16:9 encoding in Table 7-3 on a device having a display aspect ratio of 16x9 requires a sample aspect ratio of 1:1. EX1005, 24-25; EX1003, ¶175. Displaying the 4:3 encoding in Table 7-3 on the same device requires a sample aspect ratio of 4:3 to avoid distortions. EX1005, 24-25; EX1003, ¶175. A POSITA would have understood that using a different sample aspect ratio would allow playback of the alternate encodings on each of the displays without distortion. EX1003, ¶175.

30 fps		Low Motion		High Motion	
Width	Height	Data Rate (kbps)	Bits per Pixel	Data Rate (kbps)	Bits per Pixel
16:9					
320	180	244,376	0.14	366,564	0.21
480	270	448,948	0.12	673,421	0.17
640	**360**	**691,200**	**0.10**	**1,036,800**	**0.15**
853	480	1,063,860	0.09	1,595,790	0.13
1280	720	1,955,009	0.07	2,932,513	0.11
1920	1080	3,591,581	0.06	5,387,371	0.09
4:3					
320	240	325,835	0.14	488,752	0.21
400	300	455,368	0.13	683,052	0.19
480	360	598,597	0.12	897,895	0.17
640	**480**	**921,600**	**0.10**	**1,382,400**	**0.15**

Table 5-13. Recommended data rates and bits-per-pixel values for video produced at 30 fps.

EX1005, Table 5-13 (annotated).

9. Claims 9 and 19: "[The method of claim 1 / The non-transitory machine readable medium of claim 11], wherein the target bitrate for each resolution is determined using a formula."

In addition to teaching all the limitations of claims 1 and 11, Ozer in view of Liao and general knowledge of a POSITA discloses claims 9 and 19. EX1003,

¶¶177-180, 198. Ozer teaches using a "Power of .75 rule" (formula) to determine the target bitrate for each resolution. EX1005, 94; EX1003, ¶178. For example, based on a "target bitrate" of 691.2 kbps (shown below in yellow) at a resolution of 640x360, a POSITA would know to calculate the target bitrate for a resolution of 1280x720 as follows:

$$target\ bitrate = \frac{(1280 \times 720)^{.75}}{(640 \times 360)} \times 691.2\ kbps$$

EX1005, 94-95; EX1003, ¶178. The resulting target bitrate is 1,955.009 kbps (shown below in green). EX1005, Table 5-13 (annotated). This formula is used to determine the bitrate at each of the resolutions shown in Table 5-13. *Id.*; EX1003, ¶179.

30 fps		Low Motion		High Motion	
Width	Height	Data Rate (kbps)	Bits per Pixel	Data Rate (kbps)	Bits per Pixel
16:9					
320	180	244,376	0.14	366,564	0.21
480	270	448,948	0.12	673,421	0.17
640	360	691,200	0.10	1,036,800	0.15
853	480	1,063,860	0.09	1,595,790	0.13
1280	720	1,955,009	0.07	2,932,513	0.11
1920	1080	3,591,581	0.06	5,387,371	0.09
4:3					
320	240	325,835	0.14	488,752	0.21
400	300	455,368	0.13	683,052	0.19
480	360	598,597	0.12	897,895	0.17
640	480	921,600	0.10	1,382,400	0.15

Table 5-13. Recommended data rates and bits-per-pixel values for video produced at 30 fps.

EX1005, Table 5-13 (annotated).

10. Claim 10: "The method of claim 1, wherein the target bitrate of a given resolution is determined using experimentation.

In addition to teaching all the limitations of claim 1, Ozer in view of Liao and general knowledge of a POSITA discloses claim 10. EX1003, ¶¶¶181-182. As discussed above, Ozer in view of Liao teaches repeatedly encoding source video content, evaluating each resulting video encoding for quality using the SSIM heuristic, and selecting resolution and target bitrate combinations for a plurality of alternative streams based on the evaluated quality of each of the encodings. *Supra* § IV.A.2. A POSITA would have understood this quality evaluation of multiple encodings shown at least in Figure 6 of Liao to constitute a form of experimentation. EX1003, ¶¶45-53, 181-182.

B. Ground 2: Claims 6 and 16

1. A POSITA would have combined Ozer, Liao, and Gu

A POSITA would have combined the encoding, indexing, and streaming of Ozer with the quality evaluation of Liao to achieve an optimal quality level for each video stream, without having to expend unnecessary resources on transmitting a higher bitrate stream. *Supra* § IV.A.1. A POSITA would also have been motivated to incorporate Gu's teachings of choosing combinations of resolution and multiple different target bitrates to Ozer and Liao. EX1003, ¶¶101-103.

Ozer teaches a need to identify the optimal number of streams and target bitrates at which to encode a source video to assure a good viewing experience. EX1005, 127-28, 130-31; EX1003, ¶102. As Ozer explains, "keeping too many bitrates close to one another could result in too many stream switches, even with smaller bandwidth fluctuations." EX1005, 130. On the other hand, "encoding too few streams with a huge gap in bitrates would not provide the best…stream for a particular bandwidth environment," resulting in noticeable and distracting stream changes for the viewer. *Id.*

Gu teaches a way to determine a reasonable "gap" between bitrates and their corresponding streams. EX1003, ¶103. Specifically, Gu describes that the target bitrates for alternative streams should "decrease progressively in a proportional, logarithmic or other decreasing manner." EX1007, 7:58-61. For example, Gu recommends that the target bitrate of each alternate stream is "decreased proportionally" by "¼" (25%) from the highest selected bitrate. EX1007, 7:61-64. A POSITA would have looked to Gu's teaching of 25% as an example of a reasonable "gap" between the streams and target bitrates taught in Ozer. EX1003, ¶103. And as noted above, a POSITA would have used the teachings of Liao to ensure the quality of the video stream without having to expend unnecessary resources. *Id*. A POSITA combining the teachings of Ozer, Liao, and Gu would

have had a reasonable expectation of success to implement these well-known encoding techniques. *Id*.

2. Claims 6 and 16: "[The method of claim 1 / The non-transitory machine readable medium of claim 11], wherein identifying a plurality of resolutions comprises identifying resolutions with target bitrates within a predetermined percentage of a bitrate associated with an alternative stream of the plurality of alternative streams."

The combination of Ozer, Liao, Gu, and general knowledge of a POSITA teaches the method of Claims 6 and 16. EX1003, ¶¶199-202. As discussed above, Ozer in view of Liao teaches every limitation of claims 1 and 11, including identifying a plurality of resolutions with target bitrates, encoding a source video content using each resolution at multiple target bitrates, and selecting a plurality of alternative streams. *See supra* §§ IV.A.2-3. Ozer describes a need to find a reasonable "gap" between the target bitrates of corresponding streams, each having a particular resolution. EX1005, 127-131; EX1003, ¶201. To identify a reasonable "gap," a POSITA would have looked to the teachings of Gu. EX1003, ¶201. Gu teaches proportionally decreasing the target bitrates of alternative streams by a predetermined proportion of ¼, which a POSITA would have understood to be a predetermined percentage of 25%. EX1007, 7:54-67. Doing so would achieve the reasonable "gap" between the bitrates of the alternative streams taught in Ozer. *Id.*

C. Ground 3: Claims 1-4, 7, 9-14, 17, and 19

1. A POSITA would have combined Ronca with Liao

A POSITA would have been motivated to combine Ronca with Liao. EX1003, ¶¶104-06. Specifically, a POSITA would have sought to combine the encoding, indexing, and streaming of Ronca with the encoding and quality evaluation of Liao. *See* EX1008, ¶¶24, 38-39, 42; EX1006, 7:63-8:26.

Both Ronca and Liao teach encoding multiple versions of a media program or a source video to be used in adaptive streaming. EX1008, ¶38; EX1006, 7:63-8:9. To ensure the quality of each video stream of Ronca without having to expend unnecessary resources, a POSITA would have looked to the quality evaluation teachings of Liao. *Supra* § III.B; EX1003, ¶105. Specifically, Liao teaches evaluating the quality (SSIM) of each of the different streams at different target bitrates, and selecting a resolution and bitrate combination based on that evaluated quality. EX1006, 9:13-16, Fig. 6; EX1003, ¶105; *supra* § III.B.

A POSITA combining the teachings of Ronca and Liao would have had a reasonable expectation of success. EX1003, ¶106. The combination simply requires using the quality evaluation of Liao to select from the multiple video encodings generated by the adaptive streaming encoder of Ronca. *Id*. Indeed, Ronca's encoder is adaptable "for a broad variety of streaming media protocols." EX1008, ¶27.

Ronca also already discloses an encoder used to generate multiple video encodings or streams of the same media file having different bitrates. *Id.*, ¶38. A POSITA would simply incorporate Liao's quality evaluation (SSIM) to compare these encodings at different bitrates and resolutions to select an optimal bitrate for each of the alternative streams. EX1003, ¶106; EX1006, 8:38-9:16.

2. Claim 1

(1) [1.pre] "A method for encoding source content as a plurality of alternative video streams and adaptively streaming the plurality of alternative video streams, each having a bitrate, the method comprising:"

To the extent the preamble is limiting, Ronca in view of Liao and general knowledge of a POSITA teaches the preamble. EX1003, ¶¶205-07. Ronca discloses an encoder that "generate[s] multiple video…encodings" or streams of the "same media presentation." EX1008, ¶38. A client device can then adaptively select between these "different alternate streams" based on "an available data rate" of the device's network. *Id.*, ¶24; *see also id.*, Fig. 9.

(2) [1.a] "identifying source video content"

Ronca in view of Liao and general knowledge of a POSITA teaches claim limitation [1.a]. EX1003, ¶¶208-10. Ronca explains that each stream provides a digital version of source video content, such as "a movie, a television program, a sporting event, a staged or live event captured by recorded video, etc." EX1008, ¶4.

This source video content is formatted as an "elementary video stream file" and processed by an encoder. *Id.*, ¶¶4, 38.

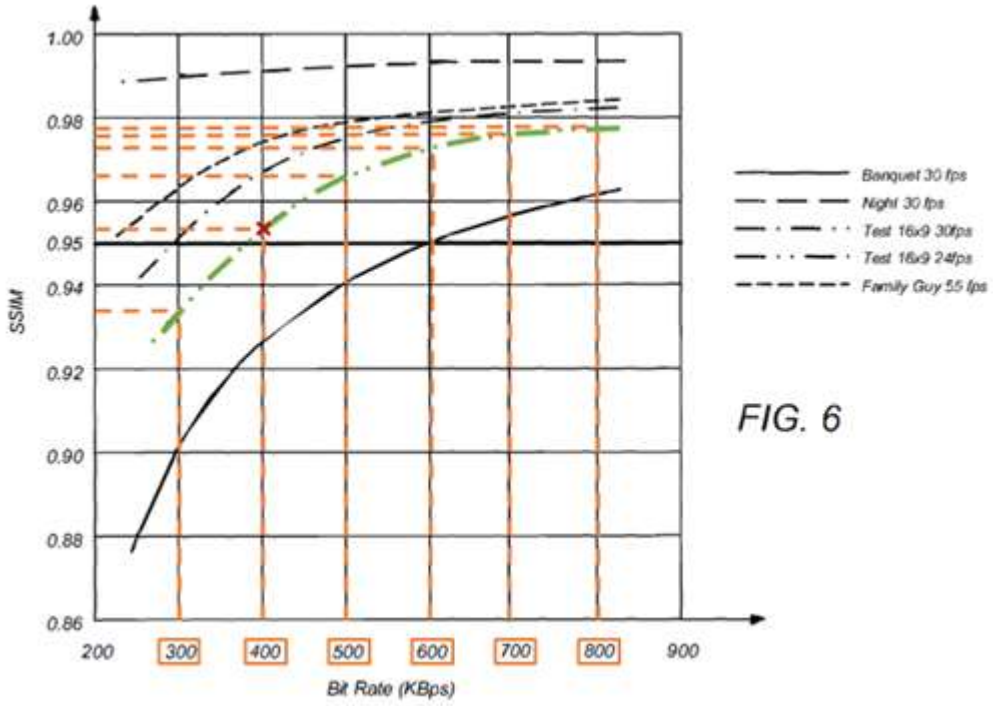
(3) [1.b] "identifying a plurality of resolutions for encoding of video content;"

Ronca in view of Liao and general knowledge of a POSITA teaches claim limitation [1.b]. EX1003, ¶¶211-214. Both Ronca and Liao describe having multiple encodings of the same video content for adaptive bitrate streaming. EX1008, ¶¶24, 38; EX1006, 7:67-8:6. Specifically, Ronca has an encoder that "generat[es] multiple video…encodings of the same media presentation, each encoded at different bit rates" to be used in adaptive streaming. EX1008, ¶¶24, 38. Liao teaches that in addition to "different bit rates," each of these encodings should have "a different resolution, typically 480p, 360p, 288p, 240p" to account for variation in "customers' Internet service" during adaptive streaming. EX1006, 7:67-8:6, 8:17-22, 8:38-40. Accordingly, the combination of Ronca and Liao teaches this limitation.

(4) [1.c(i)] "for each particular resolution of the plurality of resolutions: encoding at least a portion of the source video content multiple times using the particular resolution and multiple different target bitrates for the particular resolution; and"

Ronca in view of Liao and general knowledge of a POSITA renders claim limitation [1.c(i)] obvious. EX1003, ¶¶215-16. The combination of Ronca and Liao

teaches identifying a plurality of resolutions for encoding video content. *Supra* § IV.C.2(3). Liao further teaches encoding each of these particular resolutions at ***multiple*** different target bitrates. EX1006, Fig. 6; EX1003 ¶¶215-216. An example is shown in Figure 6, where a version of TEST media program (shown below in green) is encoded at multiple target bitrates: 300 kbps, 400 kbps, 500 kbps, 600 kbps, 700 kbps, and 800 kbps. EX1006, 8:27-37, Fig. 6 (annotated).



EX1006, Fig. 6 (annotated). Accordingly, the combination of Ronca and Liao teaches for each particular resolution "encoding at least a portion of the source video content multiple times using the particular resolution and multiple different target bitrates for the particular resolution."

(5) [1.c(ii)] "for each particular resolution of the plurality of resolutions…evaluating quality for each of the multiple encodings;"

Ronca in view of Liao and general knowledge of a POSITA teaches claim limitation [1.c(ii)]. EX1003, ¶¶217-20. Ronca and Liao teach encoding a source media program at different resolutions using multiple target bitrates for each. *Supra* § IV.C.2(4). A POSITA would have looked to Liao's quality evaluation to select the proper bitrate for each resolution. EX1003, ¶217. Specifically, Liao teaches a way to evaluate the quality of each encoding using SSIM. EX1006, 8:38-67. As shown below in Figure 6, Liao measures the "relationship between video quality and bitrate for different" versions of a media program. *Id.*, 8:38-40. For example, TEST media program (shown below in green) is encoded at multiple target bitrates (300, 400, 500, 600, 700, and 800 kbps). *Id.*, Fig. 6 (annotated). Liao teaches evaluating the quality of each of these encodings at multiple target bitrates. EX1006, 8:38-40; EX1003, ¶217. The TEST media program encoded at a bitrate of 400 kbps has an evaluated quality between 0.95 and 0.96 SSIM (shown as a blue dashed line). EX1006, 8:1-2, Fig. 6 (annotated); EX1003, ¶218. That same media program encoded at a bitrate of 500 kbps has an evaluated quality between 0.96 and 0.97 SSIM (shown as a purple dashed line), and at 600 kbps has an evaluated quality between 0.97 and 0.98 SSIM (shown as a yellow dashed line). EX1006, Fig. 6 (annotated).

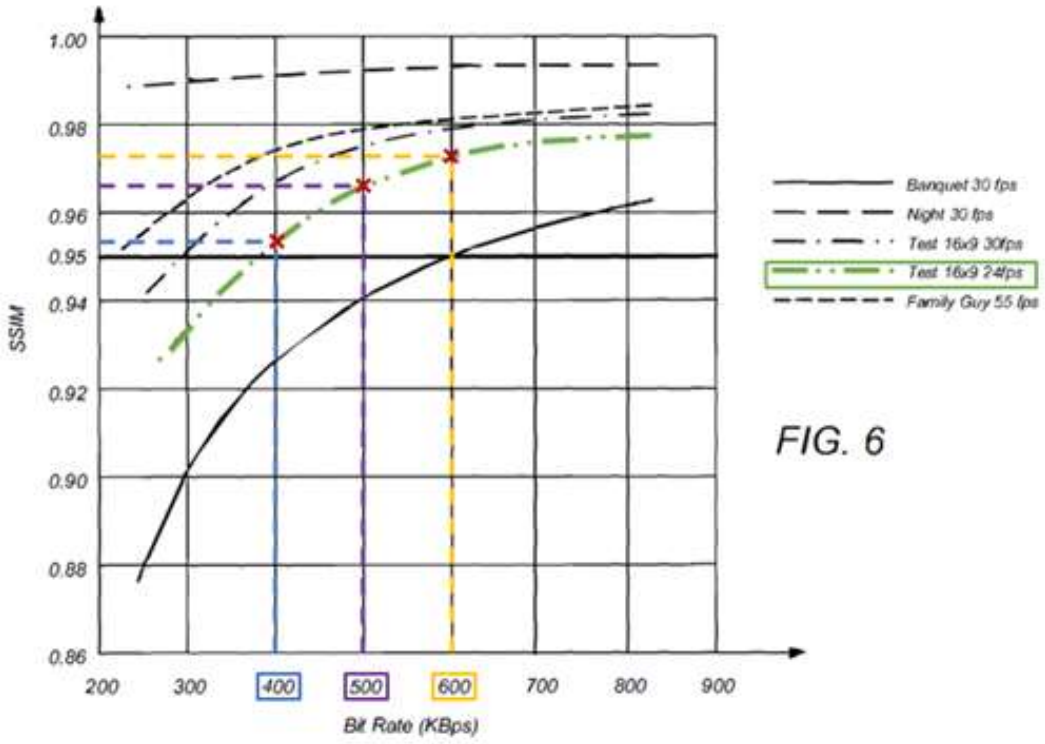


FIG. 6

EX1006, Fig. 6 (annotated). It would have been obvious to a POSITA to use this quality evaluation for each of the "different versions of the media program…each [encoded] with a different resolution, typically 480p, 360p, 288p or 240p." EX1006, 7:67-8:6. EX1003, ¶219 (citing EX1014, 3-4, 7-8). Determining an optimal bitrate for a given stream based on a quality evaluation avoids having to expend unnecessary resources on transmitting higher bitrate streams. EX1003, ¶219. Repeating this quality evaluation for each of the "different versions of the media program . . . each [encoded] with a different resolution" would amplify these resource savings and provide greater benefit. *Id*. Accordingly, the combination of

Ronca and Liao teaches "evaluating quality for each of the multiple encodings" using SSIM for each of the plurality of resolutions.

(6) [1.d] "selecting a plurality of resolution and target bitrate combinations for a plurality of alternative streams based on the evaluated quality of each of the multiple encodings;"

Ronca in view of Liao and general knowledge of a POSITA teaches claim limitation [1.d]. EX1003, ¶¶221-224. Ronca and Liao teaches encoding source video content at a plurality of resolutions and target bitrates, and "evaluating [the] quality for each of the multiple encodings." *Supra* §§ IV.C.2(4)-(5). The result of the quality evaluation of Liao is a ***selection*** of a "plurality of resolution and target bitrate combinations" based on SSIM to be used as alternative streams in adaptive streaming. EX1003, ¶221.

Liao discloses selecting a particular resolution and bitrate for an encoding based on a quality evaluation. EX1006, 9:7-16; EX1003, ¶222-23. For example, Liao teaches evaluating the quality of a media program encoded at multiple bitrates (300, 400, 500, 600, 700, and 800 kbps) and selecting a target bitrate of 400 kbps that achieves a minimum SSIM of 0.95. EX1006, 9:7-16, Fig. 6. It would have been obvious for a POSITA to select a target bitrate based on this quality evaluation for each of the "different versions of the media program…each with a different resolution, typically 480p, 360p, 288p or 240p." *Id.*, 8:1-3, Fig. 6; EX1003, ¶222-

23 (citing EX1014, 3-4, 7-8). Performing this quality evaluation and selection for each alternative stream achieves an optimal quality across the streams without having to expending unnecessary resources on transmitting higher bitrate encodings. EX1003, ¶105; *see also* ¶223 (citing EX1014, 3-4, 7-8); *supra* § III.B. Accordingly, the combination of Ronca and Liao teaches selecting a plurality of resolution (one of 480p, 360p, 288p or 240p) and target bitrate (e.g., 400 kbps) combinations for a plurality of alternative streams (different versions) of a media program based on the evaluated quality (minimum SSIM of 0.95) of each of the multiple encodings. *Id.*

(7) [1.e] "uploading encodings of a plurality of sections of the source video content at each of the selected plurality of resolution and target bitrate combinations for the plurality of alternative streams to a set of servers that form part of a content distribution system;"

Ronca in view of Liao and general knowledge of a POSITA teaches claim limitation [1.e]. EX1003, ¶¶225-226. Ronca and Liao teach "select[ing a] plurality of resolution and target bitrate combinations for the plurality of alternative streams." *Supra* § IV.C.2(6). Ronca teaches that these multiple video encodings, composed of a plurality of sections, are uploaded or transmitted through data communications network 108 to a content delivery network (CDN) 104. EX1008, ¶¶7-9, 28-38, Figs. 1-2. The CDN 104 includes "one or more" servers 102, 106 and is part of a content distribution system 100. *Id.*, ¶¶28-29, Fig. 1. Accordingly, the combination of Ronca and Liao teach "uploading encodings of a plurality of sections of the source

video content at each of the selected plurality of resolution and target bitrate combinations for the plurality of alternative streams to a set of servers that form part of a content distribution system."

(8) [1.f] "generating entries in a top level index describing at least one of the plurality of alternative streams;"

Ronca in view of Liao and general knowledge of a POSITA teaches claim limitation [1.f]. EX1003, ¶¶227-228. As described for claim limitation [1.e], Ronca and Liao teach uploading a plurality of alternative streams—each representing a different combination of resolution and bitrate—to a CDN. *Supra* § IV.C.2(7). Ronca also teaches that when these alternative streams are created during encoding, a "multiplexer may generate an index/header" (top level index) "describing the layout of a given AV stream" so that the CDN may appropriately catalog each stream. EX1008, ¶¶7, 39, 43-44, 60. Specifically, the header "includes an index object[,]" wherein each "index object" includes "index entries" that "may correspond to one of the chunks" making up the stream. *Id.*, ¶44. Accordingly, Ronca in view of Liao teaches this limitation.

(9) [1.g] "providing the generated top level index from the content distribution system to a one or more playback devices capable of performing adaptive streaming using the encodings of the plurality of sections; and"

Ronca in view of Liao and general knowledge of a POSITA teaches claim limitation [1.g]. EX1003, ¶¶229-232. Ronca and Liao teach generating a "top level

index" that describes the plurality of alternative streams and "uploading encodings of a plurality of sections of the source video content" to a content distribution network/system. *Supra* §§ IV.C.2(7)-(8). As explained in Ronca, a client device that adaptively selects between "different alternate stream[s]" is provided with a header that includes the "top level index" from the content distribution system (CDN). EX1008, ¶¶7, 51, 54, 60, Fig. 8, cl. 1. Accordingly, Ronca and Liao disclose "providing the generated top level index from the content distribution system to a one or more playback devices capable of performing adaptive streaming using the encodings of the plurality of sections."

(10) [1.h] "responding to requests from the one or more playback devices, where the requests include requests for specific encodings from the encodings of the plurality of sections."

Ronca in view of Liao and general knowledge of a POSITA teaches claim limitation [1.h]. EX1003, ¶¶233-235. Ronca and Liao teach "providing the generated top level index" to the viewer to "perform[ ]adaptive streaming using the encodings of the plurality of sections." *Supra* § IV.C.2(9). To begin streaming the plurality of sections from the specific encodings, Ronca explains that "the client device receives a user selection of a media title." EX1008, ¶60. Ronca then describes that "[i]n response, the client device requests" chunks (sections) of a particular

encoding. *Id.*, ¶¶60-64, Figs. 8-9. Thus, the combination of Ronca and Liao teaches this limitation.

3. Claim 11

(11) [11.pre] "A non-transitory machine readable medium containing processor instructions for encoding source content as a plurality of alternative video streams and adaptively streaming the plurality of alternative video streams, each having a bitrate, where execution of the instructions by a processor causes the processor to perform a process that comprises:"

To the extent the preamble is limiting, Ronca in view of Liao and general knowledge of a POSITA discloses the preamble. EX1003, ¶258. Because the preamble of system claim 11 is substantively identical to the preamble of method claim 11, Ronca in view of Liao discloses the preamble of system claim 11 for the same reasons stated above. *Supra* §IV.C.2(1). Ronca and Liao further teach that an encoder and content distribution system, which includes the CDN, has "a central processing unit" (processor). EX1008, ¶34, Fig. 1-2; *see also* EX1006, 8:27-37 (disclosing encoders with a "special purpose processor"); EX1003, ¶258.

(12) [11.a] "identifying source video content;"

Ronca in view of Liao and general knowledge of a POSITA teaches claim limitation [11.a]. EX1003, ¶259. Because claim limitation [11.a] is substantively identical to limitation [1.a], Ronca in view of Liao discloses the limitation [11.a] for the same reasons stated above. *Supra* § IV.C.2(2).

(13) [11.b] "identifying a plurality of resolutions for encoding of video content;"

Ronca in view of Liao and general knowledge of a POSITA teaches claim limitation [11.b]. EX1003, ¶260. Because claim limitation [11.b] is substantively identical to limitation [1.b], Ronca in view of Liao discloses the limitation [11.b] for the same reasons stated above. *Supra* § IV.C.2(3).

(14) [11.c(i)] "for each particular resolution of the plurality of resolutions: encoding at least a portion of the source video content multiple times using the particular resolution and multiple different target bitrates for the particular resolution; and"

Ronca in view of Liao and general knowledge of a POSITA teaches claim limitation [11.c(i)]. EX1003, ¶261. Because claim limitation [11.c(i)] is substantively identical to limitation [1.c(i)], Ronca in view of Liao discloses the limitation [11.c(i)] for the same reasons stated above. *Supra* § IV.C.2(4).

(15) [11.c(ii)] "for each particular resolution of the plurality of resolutions: . . . evaluating quality for each of the multiple encodings;"

Ronca in view of Liao and general knowledge of a POSITA teaches claim limitation [11.c(ii)]. EX1003, ¶262. Because claim limitation [11.c(ii)] is substantively identical to limitation [1.c(ii)], Ronca in view of Liao discloses the limitation [11.c(ii)] for the same reasons stated above. *Supra* § IV.C.2(5).

(16) [11.d] "selecting a plurality of resolution and target bitrate combinations for a plurality of alternative streams based on the evaluated quality of each of the multiple encodings;"

Ronca in view of Liao and general knowledge of a POSITA teaches claim limitation [11.d]. EX1003, ¶263. Because claim limitation [11.d] is substantively identical to limitation [1.d], Ronca in view of Liao discloses the limitation [11.d] for the same reasons stated above. *Supra* § IV.C.2(6).

(17) [11.e] "uploading encodings of a plurality of sections of the source video content at each of the selected plurality of resolution and target bitrate combinations for the plurality of alternative streams to a set of servers that form part of a content distribution system;"

Ronca in view of Liao and general knowledge of a POSITA teaches claim limitation [11.e]. EX1003, ¶264. Because claim limitation [11.e] is substantively identical to limitation [1.e], Ronca in view of Liao discloses the limitation [11.e] for the same reasons stated above. *Supra* § IV.C.2(7).

(18) [11.f] "generating entries in a top level index describing at least one of the plurality of alternative streams;"

Ronca in view of Liao and general knowledge of a POSITA teaches claim limitation [11.f]. EX1003, ¶265. Because claim limitation [11.f] is substantively identical to limitation [1.f], Ronca in view of Liao discloses the limitation [11.f] for the same reasons stated above. *Supra* § IV.C.2(8).

(19) [11.g] "providing the generated top level index from the content distribution system to one or more playback devices capable of performing adaptive streaming using the encodings of the plurality of sections; and"

Ronca in view of Liao and general knowledge of a POSITA teaches claim limitation [11.g]. EX1003, ¶266. Because claim limitation [11.g] is substantively identical to limitation [1.g], Ronca in view of Liao discloses the limitation [11.g] for the same reasons stated above. *Supra* § IV.C.2(9).

(20) [11.h] "responding to requests from the one or more playback devices, where the requests include requests for specific encodings from the encodings of the plurality of sections."

Ronca in view of Liao and general knowledge of a POSITA teaches claim limitation [11.h]. EX1003, ¶267. Because claim limitation [11.h] is substantively identical to limitation [1.h], Ronca in view of Liao discloses the limitation [11.h] for the same reasons stated above. *Supra* § IV.C.2(10).

4. Claims 2 and 12: "[The method of claim 1 further comprising / The non-transitory machine readable medium of claim 11, wherein the process further comprises] assembling the encodings of the plurality of sections for a given alternative stream into a video container file."

In addition to teaching all the limitations of claims 1 and 11, Ronca in view of Liao and general knowledge of a POSITA teaches claims 2 and 12. EX1003, ¶¶236-237, 268. Ronca discloses "uploading encodings of a plurality of sections of the source video content . . . for the plurality of alternative streams." *Supra* § IV.C.2(7). Before uploading, Ronca teaches assembling the plurality of sections of

the multiple encodings into a video container file. Specifically, Ronca discloses an encoding tool 245 "configured to format" the data in the "video streams 265[$_{1\text{-}N}$]" composed of a plurality of sections into an "MPEG-2 complaint [sic] storage transport stream container" (video container file). EX1008, ¶39. "[V]ideo streams 265[$_{1\text{-}N}$]" represents "a copy of the same general media file, encoded at a different bit rate," meaning that Ronca teaches assembling each of the alternative video streams or encodings into a container file. EX1008, ¶¶36, 39; EX1003, ¶237. The alternative streams are then uploaded to the CDN in these MPEG-2 container files. EX1008, ¶¶36, 39; EX1003, ¶237. Accordingly, Ronca in view of Liao teaches claims 2 and 12.

5. Claims 3 and 13: "[The method of claim 2 further comprising / The non-transitory machine readable medium of claim 12, wherein the process further comprises] generating entries in a container index within each container file indicating sizes of portions of the given alternative stream within the video container file."

In addition to teaching all the limitations of claims 1, 2, 11, and 12, Ronca in view of Liao and general knowledge of a POSITA teaches claims 3 and 13. EX1003, ¶¶238-244, 269. Ronca in view of Liao discloses "generating entries in a top level index describing at least one of the plurality of alternative streams" and "assembling the encodings of the plurality of sections for a given alternative stream into a video container file." *Supra* §§ IV.C.2(7), IV.C.4. Ronca teaches that its top level index

can include "additional sub-playlists[/indexes], each corresponding to a media file on the server encoded at a different bit rate." EX1008, ¶55; EX1003, ¶240. Table I, below, provides an example of this sub-playlist (container index) that includes uniform resource locators (URLs) for at least three encodings or streams located within a video container file (orange shaded boxes). EX1008, Table I (annotated), ¶¶54-55. Each of these container indexes point to a portion of the high bitrate stream. *Id.* This high bitrate stream is one of "three [alternative] streams ('low' 'mid' 'high' stream)" described in Ronca.

TABLE I

M3U8 Multiplexed AV Streams Playlist Example

```
#EXTM3U
#EXT-X-MEDIA-SEQUENCE:1
#EXT-X-TARGETDURATION:6
#EXT-X-KEY:METHOD=AES-128,URI="keys/crypt0.key"
#EXTINF:6,
http://ehub.netflix.com/high.ts/range/00001-1000000
#EXTINF:6,
http://ehub.netflix.com/high.ts/range/1000001-2000000
#EXTINF:6,
http://ehub.netflix.com/high.ts/range/2000001-3000000
...
```

EX1008, ¶¶54-55.

Ronca also teaches that the sub-playlist (container index) indicates sizes of the portions of the given alternative stream within the video container file. EX1003,

¶¶241-243. Each of the URLs in the above container index indicate the byte range (00001-1000000, 1000001-2000000, and 2000001-3000000 [shown in blue boxes]) representing the number of bytes (size) of a portion of the high stream. EX1008, Table I, ¶¶54-55; *see also, id.*, ¶¶9, 42. Accordingly, the combination of Ronca and Liao teaches claims 3 and 13.

6. Claims 4 and 14: "[The method of claim 1 / The non-transitory machine readable medium of claim 11], wherein adaptively streaming the encodings comprises receiving at least one request for an encoded section of one of the plurality of alternative streams from the one or more playback devices based on the generated top level index."

In addition to teaching all the limitations of claims 1 and 11, Ronca in view of Liao and general knowledge of a POSITA discloses claims 4 and 14. EX1003, ¶¶245-249, 270. Ronca and Liao disclose "providing the generated top level index" to the viewer's device, "performing adaptive streaming using the encodings of the plurality of sections," and "responding to request from the one or more playback devices." *Supra* §§ IV.C.2(9)-(10). Ronca teaches that this request is based on the generated top level index. EX1003, ¶247. Specifically, Ronca teaches that a client device uses the top-level index to generate a playlist describing each chunk of the alternative stream as a sequence of URLs, "where each URL refers to the chunks . . . as though they were present on the server as a collection of discrete files." EX1008, ¶¶45, 61, Fig. 8. Using the playlist, the client device requests chunks

(sections) of the alternative streams. *Id.*; EX1003, ¶248. The content distribution system then "sends, in response to [the] request" chunk files for one of the alternate streams. EX1008, ¶¶58, 61, Fig. 8.

7. Claims 7 and 17: "[The method of claim 1 / The non-transitory machine readable medium of claim 11], wherein both a width and a height of each resolution of the plurality of resolutions have an integer number of pixels."

In addition to teaching all the limitations of claims 1 and 11, Ozer in view of Liao and general knowledge of a POSITA teaches claims 7 and 17. EX1003, ¶¶250-252, 271. Liao discloses that "different versions of the media program can be generated, each with a different resolution, typically 480p, 360p, 288p or 240p." EX1006, 7:48-8:9. A POSITA would have understood that "480p, 360p, 288p or 240p" are resolutions with "both a width and a height" representing "an integer number of pixels." EX1003, ¶251. For example, the resolution "480p," stated in terms of width and height in pixels, is 854 (width) pixels x 480 (height) pixels. EX1006, 7:63-8:9, Fig. 6; EX1003, ¶251 (citing EX1005, 17).

8. Claims 9 and 19: "[The method of claim 1 / The non-transitory machine readable medium of claim 11], wherein the target bitrate for each resolution is determined using a formula."

In addition to teaching all the limitations of claims 1 and 11, Ronca in view of Liao and general knowledge of a POSITA discloses claims 9 and 19. EX1003,

¶¶253-255, 272. Liao discloses selecting a target bitrate for each resolution that meets a minimum SSIM. *Supra* § IV.A.2(7). And the SSIM is calculated using the below formula. EX1006, 8:38-67. Accordingly, this formula is used to select (determine) a target bitrate that meets a minimum SSIM level.

$$SSIM(x, y) = \frac{(2\mu_x\mu_y + c_1)(2\sigma_{xy} + c_2)}{(\mu_x^2 + \mu_y^2 + c_1)(\sigma_x^2 + \sigma_y^2 + c_2)}$$

wherein:
μ_x=the average of x;
μ_y=the average of y;
σ_x^2=the variance of x;
ρ_y^2=the variance of y;
σ_{xy}=the covariance of x and y;
$c_1=(k_1L)^2$, $c_2=(k_2L)^2$ two variables to stabilize the division with weak denominator;
L=dynamic range of the pixel values

$$\left(\text{typically } 2^{\frac{\#bits}{pixel}} - 1\right);$$

k_1=0.01; and
k_2=0.03.

Id., 8:38-67.

9. Claim 10: "The method of claim 1, wherein the target bitrate of a given resolution is determined using experimentation.

In addition to teaching all the limitations of claim 1, Ronca in view of Liao and general knowledge of a POSITA discloses claim 10. EX1003, ¶¶256-257. Ronca in view of Liao teaches repeatedly encoding source video content, evaluating

each resulting video encoding for quality using the SSIM heuristic, and selecting resolution and target bitrate combinations for a plurality of alternative streams based on the evaluated quality of each of the encodings. *Supra* § IV.C.2. A POSITA would have understood this quality evaluation of multiple encodings shown at least in Figure 6 of Liao to constitute a form of experimentation. EX1003, ¶257.

D. Ground 4: Claims 6 and 16

1. A POSITA would have combined Ronca, Liao, and Gu

A POSITA would have combined the encoding, indexing, and streaming of Ronca with the encoding and quality evaluation of Liao to achieve an optimal quality level for each video stream. *Supra* § IV.C.1. A POSITA would also have been motivated to include Gu's teachings of choosing initial combinations of resolution and multiple different target bitrates to the combination of Ronca and Liao. EX1003, ¶¶107-109.

Both Ronca and Liao teach encoding multiple versions of a media program or a source video to be used in adaptive streaming. EX1008, ¶38; EX1006, 7:63-8:9; EX1003, ¶108. Ronca teaches using an encoder to "generat[e] multiple video…encodings of the same media presentation, each encoded at different bit rates" for adaptive streaming. EX1008, ¶¶24, 38. While Liao teaches that in addition to "different bit rates," each of these encodings should have "a different

resolution, typically 480p, 360p, 288p, 240p" to account for variation in "customers' Internet service" during adaptive streaming. EX1006, 7:67-8:6, 8:17-22, 8:38-40. Gu describes a way to determine reasonable spacing between these different bitrates. EX1003, ¶¶107-109.

Specifically, Gu describes that the target bitrates for alternative streams should "decrease progressively in a proportional, logarithmic or other decreasing manner." EX1007, 7:58-61; EX1003, ¶109. For example, Gu recommends that the target bitrate of each alternate stream is "decreased proportionally" by "¼" (25%) from the highest selected bitrate. EX1007, 7:61-64. A POSITA would have looked to Gu's teaching of 25% as an example of reasonable spacing between the streams and target bitrates taught by Ronca and Liao. EX1003, ¶¶107-109. A POSITA combining the teachings of Ronca, Liao, and Gu would have had a reasonable expectation of success to implement these well-known encoding techniques. *Id.*

2. Claims 6 and 16: "[The method of claim 1 / The non-transitory machine readable medium of claim 11], wherein identifying a plurality of resolutions comprises identifying resolutions with target bitrates within a predetermined percentage of a bitrate associated with an alternative stream of the plurality of alternative streams."

The combination of Ronca, Liao, Gu, and general knowledge of a POSITA teaches Claims 6 and 16. EX1003, ¶¶273-279. Ronca in view of Liao teaches every limitation of claims 1 and 11, including identifying a plurality of resolutions with

target bitrates, encoding a source video content using each resolution at multiple target bitrates, and selecting a plurality of alternative streams. *See supra* §§ IV.C.2-3. When selecting encoder settings for alternative streams, a POSITA would have recognized the need to find a reasonable spacing or "gap" between the target bitrates of corresponding streams, each having a particular resolution. EX1003, ¶¶275-76 (citing EX1005, 127-131). Gu teaches this reasonable spacing by proportionally decreasing the target bitrates of alternative streams by a predetermined proportion of ¼, which a POSITA would have understood to be a predetermined percentage of 25%. EX1007, 7:54-67. Doing so would achieve a reasonable space or "gap" between the bitrates of the alternative streams as taught in Ronca and Liao. EX1003, ¶¶275-76. Accordingly, a POSITA would have understood that the combination of Ronca, Liao, and Gu teaches claims 6 and 16. EX1003, ¶¶275-77.

V. CONCLUSION

For these reasons, Petitioner requests *inter partes* review and cancellation of the challenged claims. EX1003, ¶280.

VI. MANDATORY NOTICES AND FEES

A. Real Party-in-Interest

Petitioner is the real party-in-interest. No other party directed, controlled, or funded this IPR proceeding.

B. Related Matters

Petitioner is aware of the following additional related matters involving the 785 patent and/or related patents:

Case Caption	Forum	Patents
DivX, LLC v. Amazon.com, Inc., 24-cv-02061-CMH-LRV	U.S. District Court, Eastern District of Virginia	U.S. Patent Nos. 10,412,141; 10,715,806; 9,955,195; 11,611,785; 10,542,303; 11,245,938; and 12,184,943

C. Lead and Backup Counsel

Pursuant to 37 C.F.R. § 42.8(b)(3) and 42.10(a), Petitioner designates J. David Hadden, Reg. No. 40,629, as lead counsel, and Saina Shamilov, Reg. No. 48,266, and Allen Wang, Reg. No. 68,456, as back-up counsel, each of Fenwick & West LLP.

D. Service Information

Petitioner consents to service by electronic mail at:

DivX-IPR@fenwick.com.

Petitioner's counsel may also be served by mail or hand delivery at Fenwick & West LLP, 801 California Street, Mountain View, California 94041. Petitioner's counsel may be reached by telephone at (650) 988-8500.

E. Fees

The Office is authorized to charge fees for this Petition to Deposit Account 19-2555.

Dated: June 30, 2025

FENWICK & WEST LLP

/J. David Hadden/
J. David Hadden
Reg. No. 40,629

Attorney for Petitioner
Amazon.com, Inc. and
Amazon Web Services, Inc.

CERTIFICATION OF WORD COUNT

The undersigned certifies pursuant to 37 C.F.R. § 42.24 that the foregoing Petition for *Inter Partes* Review, excluding any table of contents, mandatory notices under 37 C.F.R. § 42.8, certificates of service or word count, or appendix of exhibits, contains 13,707 words according to the word-processing program used to prepare this document (Microsoft Word).

Dated: June 30, 2025

FENWICK & WEST LLP

/J. David Hadden/
J. David Hadden
Reg. No. 40,629

Attorney for Petitioner
Amazon.com, Inc. and
Amazon Web Services, Inc.

CERTIFICATE OF SERVICE ON PATENT OWNER UNDER 37 C.F.R. § 42.105

I hereby certify, pursuant to 37 C.F.R. Sections 42.6 and 42.105, that a complete copy of the attached **PETITION FOR INTER PARTES REVIEW OF U.S. PATENT NO. 11,611,785,** including all exhibits (Nos. 1001-1036), is being served via Federal Express on June 30, 2025, upon Patent Owner by serving the correspondence address of record with the USPTO as follows:

71897 - KPPB LLP
3780 Kilroy Airport Way, Suite 320
Long Beach, CA 90806

The foregoing was also served via Federal Express upon counsel of record for Patent Owner in the litigation pending before the U.S. District Court for the Eastern District of Virginia entitled *DivX, LLC v. Amazon.com, Inc., and Amazon Web Services, Inc.*, No. 1:24-cv-020610CMH-LRV as follows:

Charles B. Molster, III
The Law Offices Of Charles B. Molster, III PLLC
2141 Wisconsin Avenue, N.W., Suite M
Washington, D.C. 20007

Dated: June 30, 2025

FENWICK & WEST LLP

/J. David Hadden/
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Attorney for Petitioner
Amazon.com, Inc. and
Amazon Web Services, Inc.

APPENDIX: LIST OF CHALLENGED CLAIMS

785 patent, Claim 1	
1(pre)	A method for encoding source content as a plurality of alternative video streams and adaptively streaming the plurality of alternative video streams, each having a bitrate, the method comprising:
1(a)	identifying source video content;
1(b)	identifying a plurality of resolutions for encoding of video content;
1(c(i))	for each particular resolution of the plurality of resolutions: encoding at least a portion of the source video content multiple times using the particular resolution and multiple different target bitrates for the particular resolution; and
1(c(ii))	for each particular resolution of the plurality of resolutions . . . evaluating quality for each of the multiple encodings;
1(d)	selecting a plurality of resolution and target bitrate combinations for a plurality of alternative streams based on the evaluated quality of each of the multiple encodings;
1(e)	uploading encodings of a plurality of sections of the source video content at each of the selected plurality of resolution and target bitrate combinations for the plurality of alternative streams to a set of servers that form part of a content distribution system;
1(f)	generating entries in a top level index describing at least one of the plurality of alternative streams;
1(g)	providing the generated top level index from the content distribution system to a one or more playback devices capable of performing adaptive streaming using the encodings of the plurality of sections; and

1(h)	responding to requests from the one or more playback devices, where the requests include requests for specific encodings from the encodings of the plurality of sections.
785 patent, Claim 2	
2	The method of claim 1 further comprising assembling the encodings of the plurality of sections for a given alternative stream into a video container file.
785 patent, Claim 3	
3	The method of claim 2 further comprising generating entries in a container index within each container file indicating sizes of portions of the given alternative stream within the video container file.
785 patent, Claim 4	
4	The method of claim 1, wherein adaptively streaming the encodings comprises receiving at least one request for an encoded section of one of the plurality of alternative streams from the one or more playback devices based on the generated top level index.
785 patent, Claim 6	
6	The method of claim 1, wherein identifying a plurality of resolutions comprises identifying resolutions with target bitrates within a predetermined percentage of a bitrate associated with an alternative stream of the plurality of alternative streams.
785 patent, Claim 7	
7	The method of claim 1, wherein both a width and a height of each resolution of the plurality of resolutions have an integer number of pixels.

785 patent, Claim 8	
8	The method of claim 1, wherein each resolution of the plurality of resolutions has a same display aspect ratio and at least two resolutions of the plurality of resolutions have different sample aspect ratios.
785 patent, Claim 9	
9	The method of claim 1, wherein the target bitrate for each resolution is determined using a formula.
785 patent, Claim 10	
10	The method of claim 1, wherein the target bitrate of a given resolution is determined using experimentation.
785 patent, Claim 11	
11(pre)	A non-transitory machine readable medium containing processor instructions for encoding source content as a plurality of alternative video streams and adaptively streaming the plurality of alternative video streams, each having a bitrate, where execution of the instructions by a processor causes the processor to perform a process that comprises:
11(a)	identifying source video content;
11(b)	identifying a plurality of resolutions for encoding of video content;
11(c(i))	for each particular resolution of the plurality of resolutions: encoding at least a portion of the source video content multiple times using the particular resolution and multiple different target bitrates for the particular resolution; and
11(c(ii))	for each particular resolution of the plurality of resolutions . . . evaluating quality for each of the multiple encodings;
11(d)	selecting a plurality of resolution and target bitrate combinations for a plurality of alternative streams based on the evaluated quality of each of the multiple encodings;

11(e)	uploading encodings of a plurality of sections of the source video content at each of the selected plurality of resolution and target bitrate combinations for the plurality of alternative streams to a set of servers that form part of a content distribution system;
11(f)	generating entries in a top level index describing at least one of the plurality of alternative streams;
11(g)	providing the generated top level index from the content distribution system to one or more playback devices capable of performing adaptive streaming using the encodings of the plurality of sections; and
11(h)	responding to requests from the one or more playback devices, where the requests include requests for specific encodings from the encodings of the plurality of sections.
785 patent, Claim 12	
12	The non-transitory machine readable medium of claim 11, wherein the process further comprises assembling the encodings of the plurality of sections for a given alternative stream into a video container file.
785 patent, Claim 13	
13	The non-transitory machine readable medium of claim 12, wherein the process further comprises generating entries in a container index within each container file indicating sizes of portions of the given alternative stream within the video container file.
785 patent, Claim 14	
14	The non-transitory machine readable medium of claim 11, wherein adaptively streaming the encodings comprises receiving at least one request for an encoded section of one of the plurality of alternative streams from the one or more playback devices based on the generated top level index.

785 patent, Claim 16	
16	The non-transitory machine readable medium of claim 11, wherein identifying a plurality of resolutions comprises identifying resolutions with target bitrates within a predetermined percentage of a bitrate associated with an alternative stream of the plurality of alternative streams.
785 patent, Claim 17	
17	The non-transitory machine readable medium of claim 11, wherein both a width and a height of each resolution of the plurality of resolutions have an integer number of pixels.
785 patent, Claim 18	
18	The non-transitory machine readable medium of claim 11, wherein each resolution of the plurality of resolutions has a same display aspect ratio and at least two resolutions of the plurality of resolutions have different sample aspect ratios.
785 patent, Claim 19	
19	The non-transitory machine readable medium of claim 11, wherein the target bitrate for each resolution is determined using a formula.