Infringement Contentions for U.S. Patent No. 10,986,403 v. Hulu

Plaintiff Piranha Media Distribution, LLC ("Piranha") accuses Defendant Hulu LLC ("Hulu") of making, using, offering for sale, selling in (including licensing) and/or importing into the United States Hulu's platform on any Hulu supported devices, including, but not limited to, Hulu.com on any supported web browsers like Chrome, Explorer, Firefox; the Hulu mobile application available for Apple iOS devices (including Apple TV, iPads, iPhones and iPod Touch) on Apple's App Store and Android devices (including phones and tablets) on Google Play; set-top boxes (e.g., Apple TV and Android TV); smart TVs (e.g., Samsung, Vizio, LG); Nintendo Playstation; Nintendo Switch; Xbox; Xfinity Flex and X1 TV Boxes; Xumo TV and XiOne Box; Chromecast; Echo Show; Contour 2 and Stream Player Boxes; and/or other client devices as well and related server-side software and servers, that include Hulu's ad insertion technology (collectively, the "Accused Instrumentalities"). *See, e.g.*, "Hulu Supported Devices," *available at* https://help.hulu.com/article/hulu-supported-devices (last visited June 27, 2024).

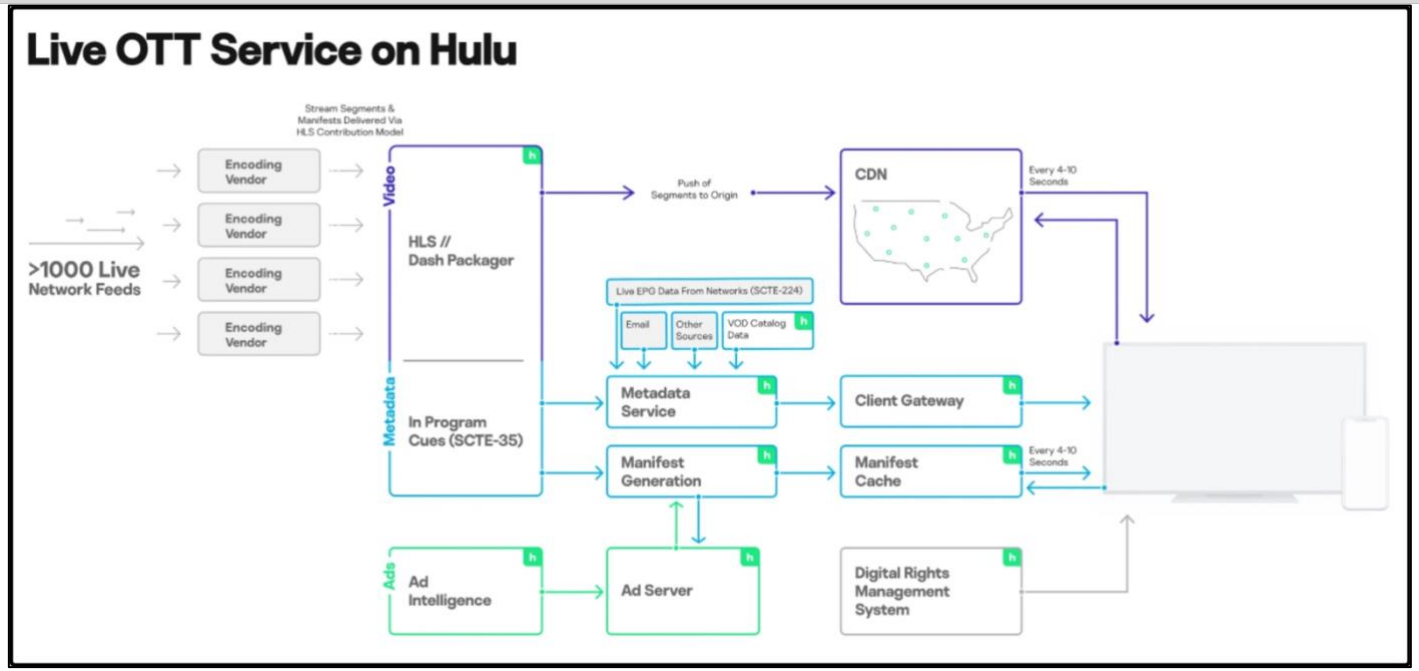
Hulu directly infringes the asserted claims of the '403 patent by performing each and every step of the claims, as shown below. Hulu also directly infringes the asserted claims of the '403 patent to the extent Hulu contracted with or directed a third-party to perform any of the steps of the asserted claims. Hulu also directly infringes the asserted claims to the extent it conditions participation in an activity or receipt of a benefit upon performance of a step or steps of a patented method and establishes the manner or timing of that performance.

In addition, Hulu induces infringement of the asserted claims of the '403 patent by actively providing Hulu's clients, customers, and end users with access to the Accused Instrumentality and directing them to use the Accused Instrumentality in an infringing manner. For example, Hulu provides support services for the Accused Products, including providing instructions, guides, and online materials. See, e.g., "Ads on Hulu" available at https://help.hulu.com/article/hulu-ads-on-hulu (last visited June 27, 2024). Hulu's clients, customers, and end users direct or otherwise cause the performance each and every element of the claims, as shown below. For example, as demonstrated in connection with claims 1, 17, 21, and 22 and their dependent claims, Hulu clients, customers, and end users exercise control over and benefit from the use of Hulu's ad insertion technology by using Hulu's technology. Hulu is thereby liable for induced infringement of the asserted claims of the '403 patent under 35 U.S.C. § 271(b).

Hulu also contributes to infringement of the '403 patent by offering to sell, selling (including licensing) and importing into the United States the Accused Instrumentality, which is especially made or adapted for use in an infringement of the '403 patent. The Accused Instrumentality is a material component for use in practicing the '403 patent and is not a staple article of commerce suitable for substantial non-infringing use. For example, Hulu's platform, including Hulu.com, the Hulu mobile application, and related software and servers constitute a material portion of the invention and has no substantial non-infringing uses. Hulu's clients, customers, and end users direct or otherwise cause the performance each and every element of the claims, as shown below. For example, as demonstrated in connection with claim 1, Hulu clients, customers and end users exercise control over and benefit from the use of Hulu's ad insertion technology. Hulu is thereby liable for contributory infringement of the asserted claims of the '403 patent under 35 U.S.C. § 271(c).

An analysis of Hulu's documentation and/or source code may be necessary to fully and accurately describe all infringing features and functionality of the Accused Products and, accordingly, Plaintiff reserves the right to supplement these contentions once such information is made available to Plaintiff. Furthermore, Plaintiff reserves the right to revise these contentions, including as discovery in the case progresses, in view of any non-infringement arguments Hulu may make (e.g., to allege infringement under the doctrine of equivalents), in view of the Court's final claim construction in this action and in connection with the provision of expert reports.

U.S. Patent No. 10,986,403	Hulu
[1a] A digital media player device for controlling digital media presentations, the digital media player device comprising:	The Accused Instrumentalities implement a digital media player device for controlling digital media presentations. For example, Hulu's system for providing ad-supported streaming service is an Over-The-Top ("OTT") system that is distributed over the server-side and client-side. Among other things, it is a digital media player device for controlling digital media presentations. Hulu's OTT system controls the real-world experience for an end user, based on user interaction with the digital media presentation, through adaptively selecting alternative sequenced insertion points for presenting the data blocks of the digital media content and digital advertising content. Hulu's system for providing ad-supported streaming service is an OTT system that is distributed over the server-side and client-side. Hulu's system for providing ad-supported streaming service is implemented based on DASH interoperability guidelines and the MPEG-DASH streaming standard ("DASH Standard"), which it helped to write. (See Kelly Capizzi, *Hulu Migrates to DASH*, InterDigital (July 9, 2015), https://www.interdigital.com/post/hulu-migrates-to-dash (last visited January 6, 2024)). For example, in a presentation given at the Demuxed 2019 Conference, Zachary Cava, who was Video Platform Architect at Hulu at that time, stated, "In our [Hulu's] service, we primarily use DASH streaming." Zachary Cava, *Scalable Per-User Ad Insertion in Live OTT*, YouTube (Dec. 12, 2019), https://www.youtube.com/watch?v=LFHEko3vC98 ("Demuxed Presentation") at the 00:42 to 00:46 mark (last visited July 9, 2024). The diagram below from the Hulu Tech Blog shows how Hulu implements its digital media player device for controlling digital media presentations.

U.S. Patent No. 10,986,403	Hulu
	 *The Anatomy of a Live OTT Service*, Hulu Tech blog, Medium (Sept. 18, 2018), https://medium.com/hulu-tech-blog/the-anatomy-of-a-live-ott-service-c8f6078b24d3, (last visited July 1, 2024) ("Hulu Tech Blog"). The manifest generation block in the Hulu Tech Blog diagram above controls digital media presentations. Figure 1 of the DASH Standard further depicts the configuration of Hulu's digital media player device for controlling digital media presentations:

U.S. Patent No. 10,986,403	Hulu

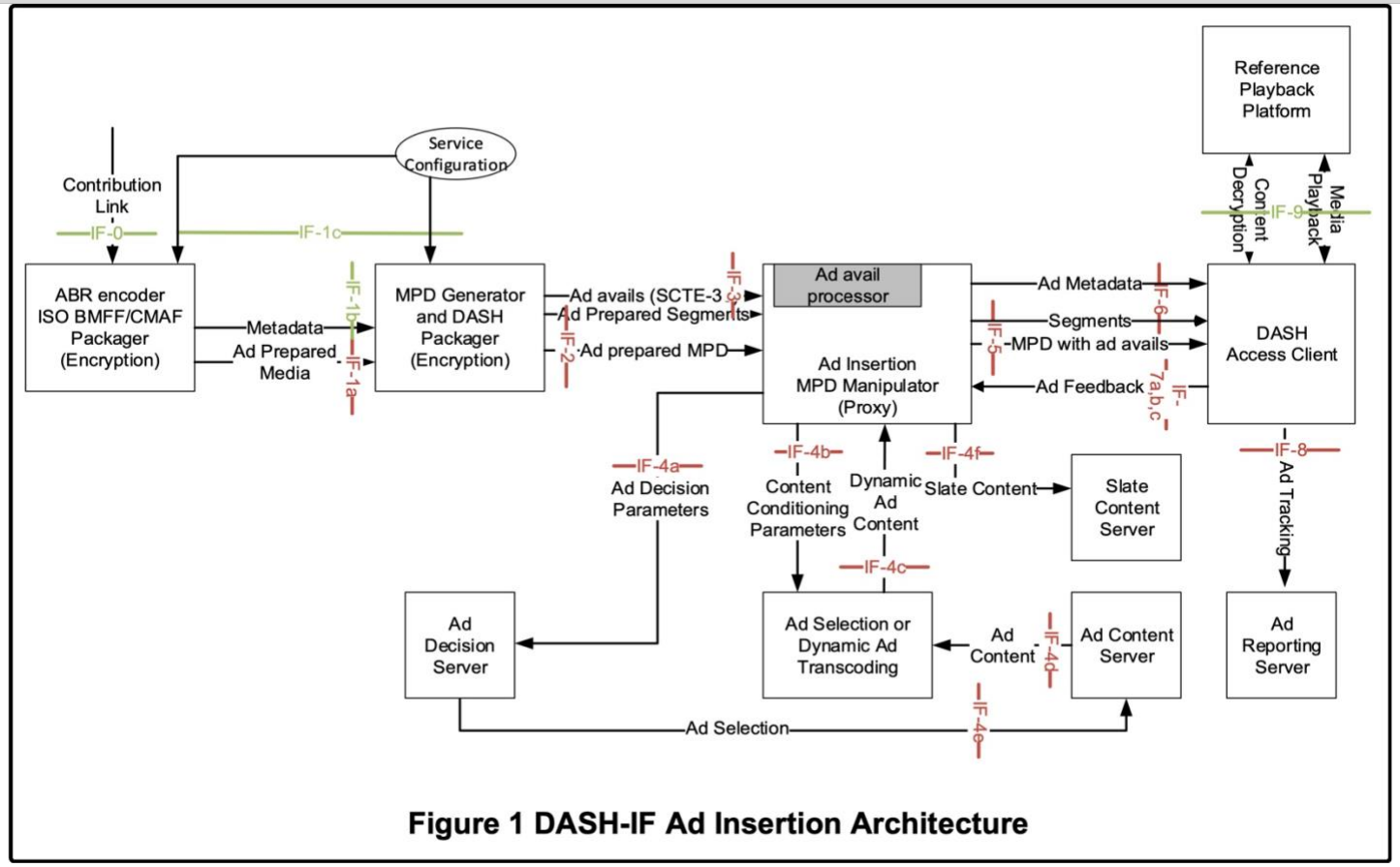
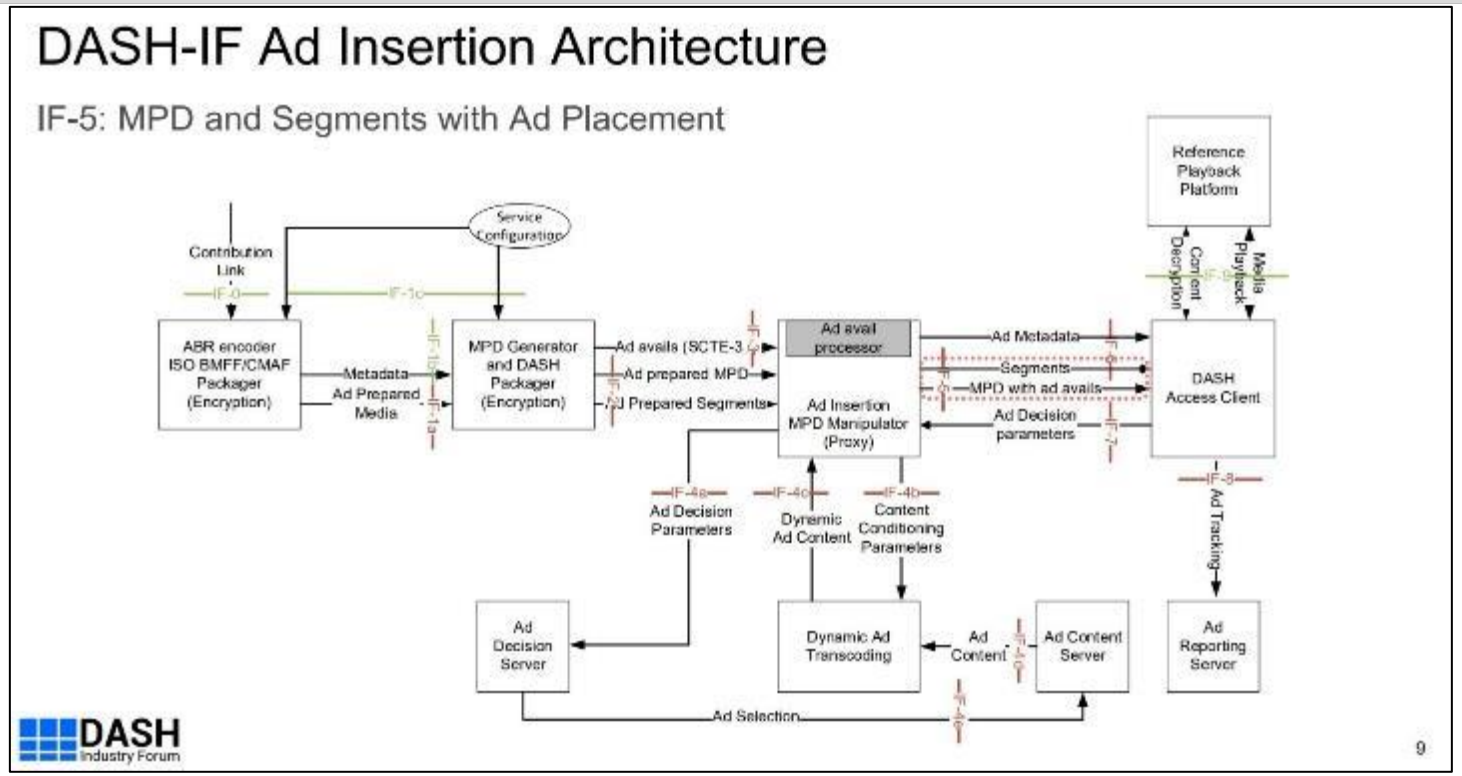


Figure 1 DASH-IF Ad Insertion Architecture

DASH-IF IOP-5 V5.0.0, DASH-IF Interoperability Points; Part 5: Ad Insertion in DASH (Nov. 29, 2021), https://dashif.org/docs/IOP-Guidelines/DASH-IF-IOP-Part5-v5.0.0.pdf ("DASH Part 5") at Figure 1 DASH-IF Ad Insertion Architecture ("DASH diagram"). In this figure, the functionality of the manifest generation block is represented by the functional block "Ad Insertion MPD Manipulator (Proxy)."

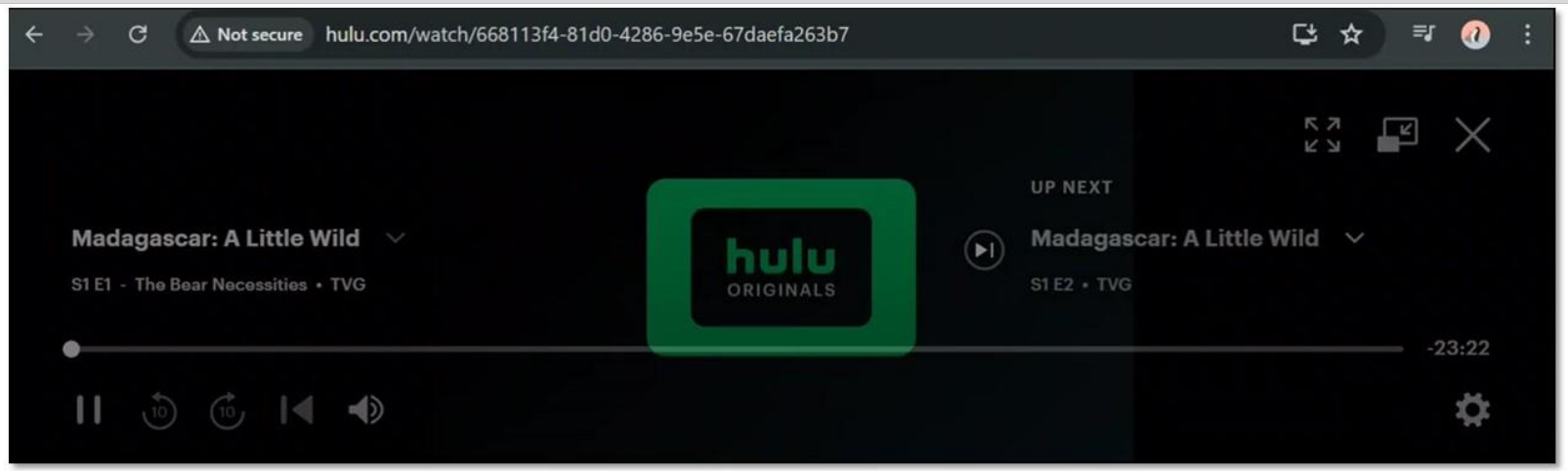
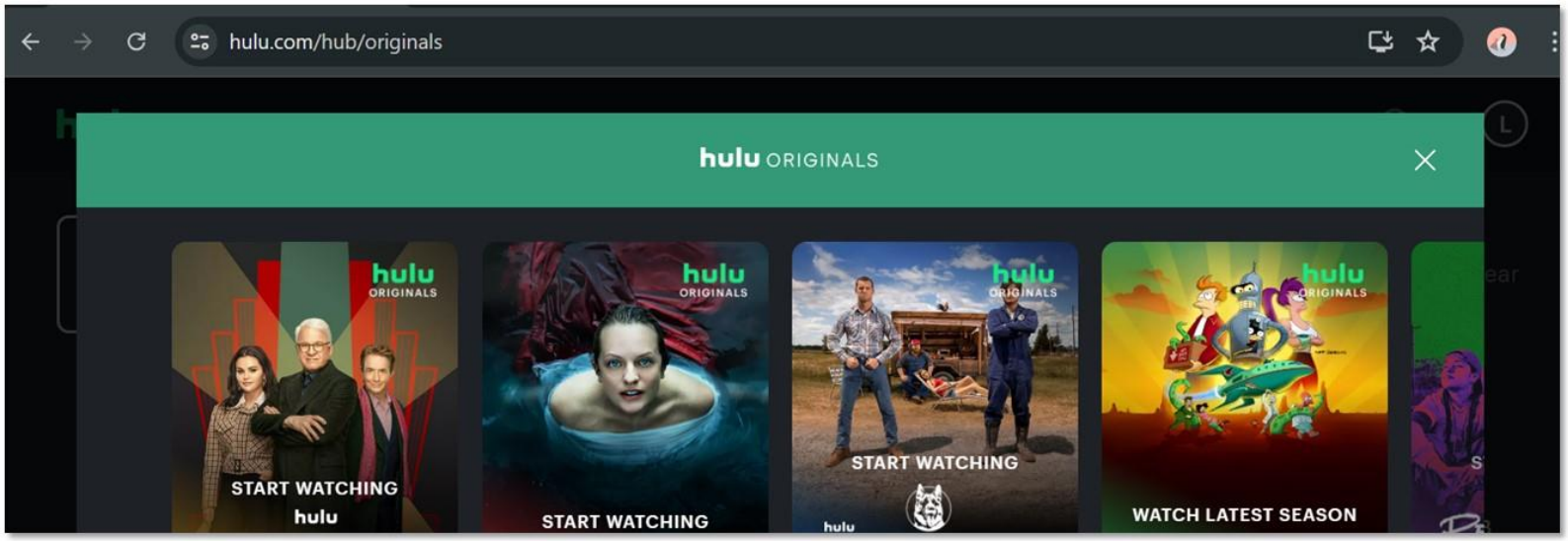
In a March 31, 2020 presentation as part of the DVB World Webinar, Zachary Cava, Video Platform Architect at Hulu, explained how OTT systems, like Hulu's, use digital media player devices to control digital media presentations, by explaining a series of Interfaces (abbreviated to "IF") from DASH Part 5.

U.S. Patent No. 10,986,403	Hulu



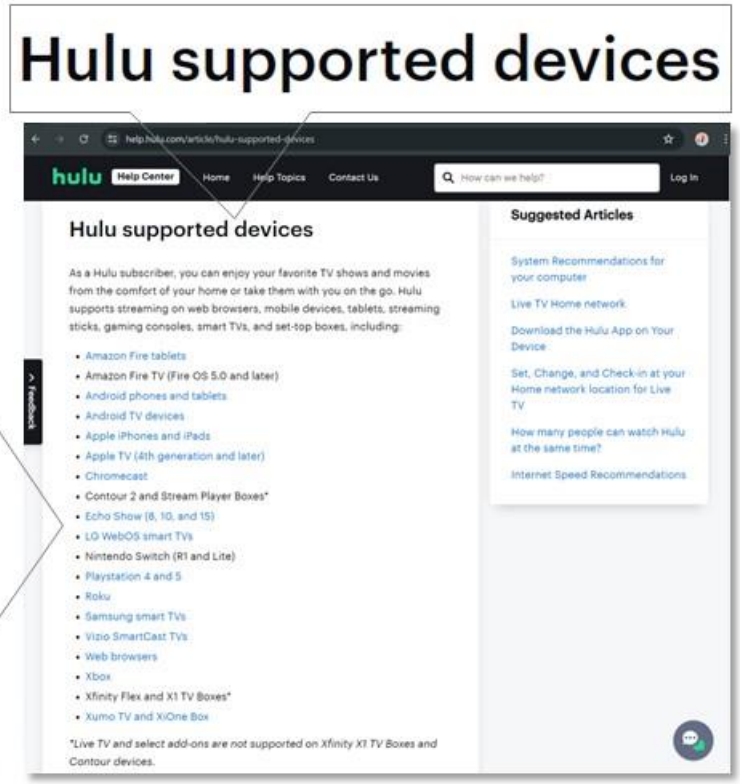
DVB webinar: DASH – from on-demand to large scale live for premium services, (Mar. 31, 2020), https://www.youtube.com/watch?v=1EwqPZF9LDk ("Ad Insertion in Live Content" presentation by Zachary Cava ("Cava Presentation") at the 28:10 mark to the 43:20 mark) (last visited July 7, 2024).

Hulu's digital media player device for controlling digital media presentations is visible to an end user through interaction with the Hulu user interface displayed on the end user's personal device. Hulu's OTT system controls the presentation of the digital media content presented in the user interface.

U.S. Patent No. 10,986,403	Hulu
	 Screenshot of Hulu user interface on web browser, hulu.com.  Screenshot of Hulu user interface on web browser, hulu.com. When an end user selects a thumbnail representing digital media content they want to watch, the Hulu OTT system controls the presentation of that digital media through the Hulu user interface.

U.S. Patent No. 10,986,403	Hulu
	Hulu's website identifies "Hulu supported devices" that support the Hulu OTT system and are part of the claimed "digital media player device":

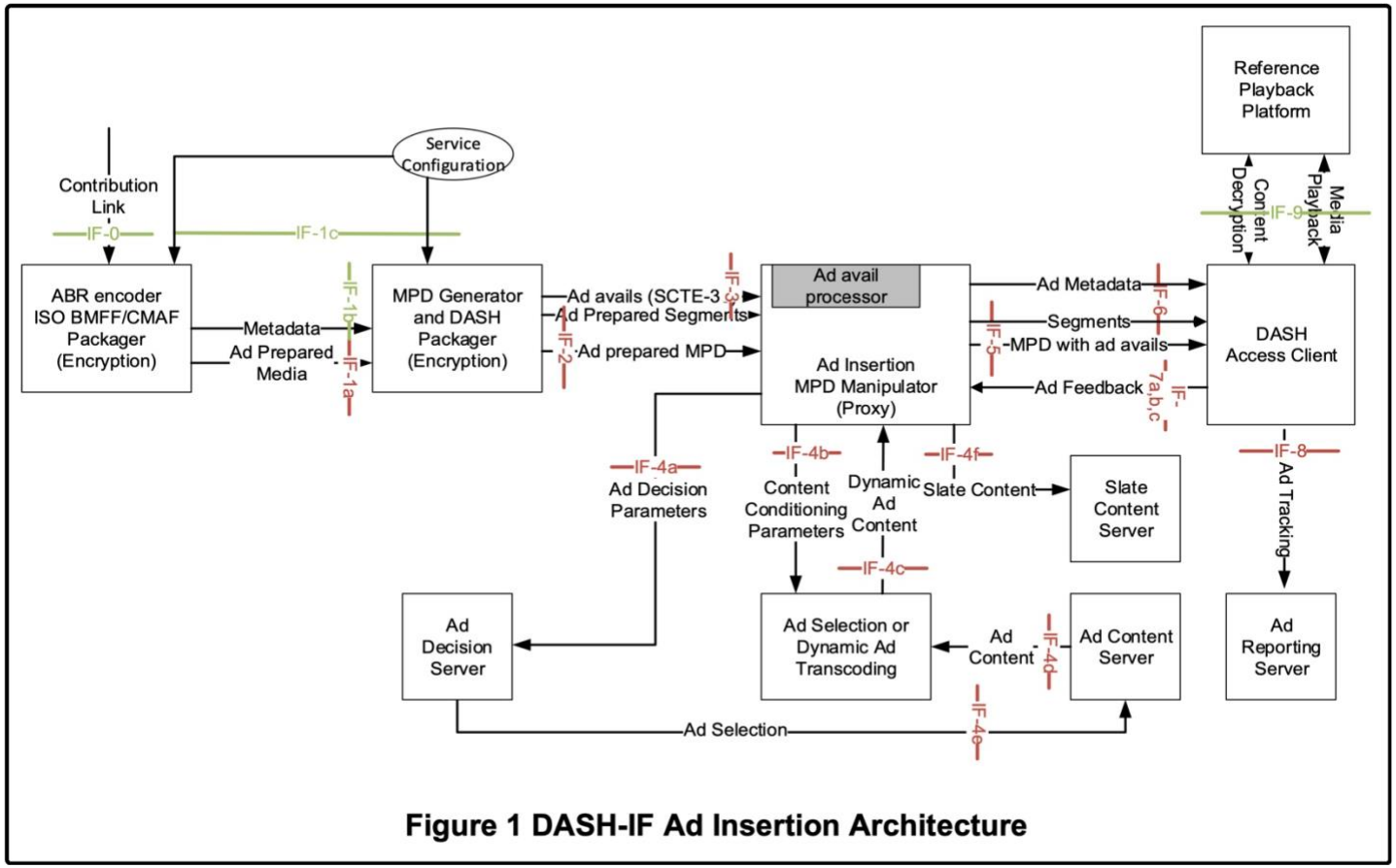
Amazon Fire tablets
Amazon Fire TV (Fire OS 5.0 and later)
Android phones and tablets
Android TV devices
Apple iPhones and iPads
Apple TV (4th generation and later)
Chromecast
Contour 2 and Stream Player Boxes*
Echo Show (8, 10, and 15)
LG WebOS smart TVs
Nintendo Switch (R1 and Lite)
Playstation 4 and 5
Roku
Samsung smart TVs
Vizio SmartCast TVs
Web browsers
Xbox
Xfinity Flex and X1 TV Boxes*
Xumo TV and XiOne Box



Hulu supported devices, HULU, https://help.hulu.com/article/hulu-supported-devices (last visited July 10, 2024).

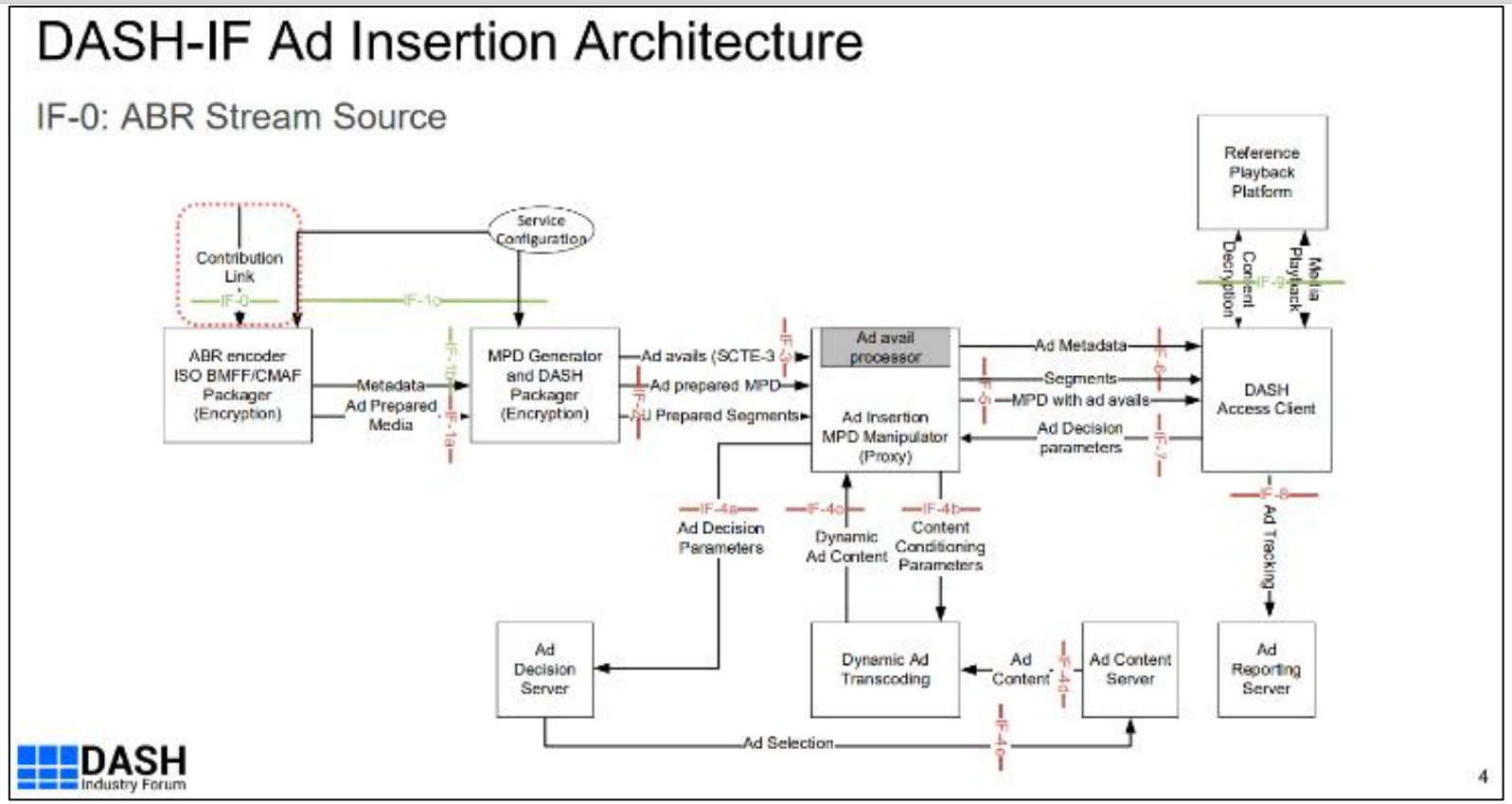
Each of these devices implements Hulu's Accused Instrumentalities in a substantially identical manner for purposes of these infringement contentions, such that proof of infringement with respect to one listed device applies equally to all listed devices.

An analysis of proprietary backend systems and/or source code may be necessary to fully and accurately describe the functionality of the Accused Instrumentalities with respect to this limitation and, accordingly, Plaintiff reserves the right to supplement these

U.S. Patent No. 10,986,403	Hulu
	infringement contentions once such information is made available to Plaintiff.
[1b.1] one or more processors for	The Accused Instrumentalities utilize one or more processors. Hulu's digital media player device for controlling digital media presentations includes one or more processors. For example, Figure 1 of the DASH Standard identifies an "Ad Insertion MPD Manipulator" that is part of a digital media player system on the server side. Figure 1 includes multiple servers, for example, each of which includes at least one processor.  DASH Part 5 at Figure 1 DASH-IF Ad Insertion Architecture ("DASH diagram").

U.S. Patent No. 10,986,403	Hulu
	Within the "Ad Insertion MPD Manipulator (Proxy)," Figure 1 of the DASH Standard identifies an "Ad avail processor." The DASH Standard defines the "ad avail processor" as: **ad avail processor** – logical service that, given cue data, determines the placement of advertisement content within a stream and describes the necessary ad decision service communications DASH Standard at § 3.1. As a result, Hulu's digital media player device for controlling digital media presentations includes at least one processor. The DASH Standard identifies additional structures that utilize one or more processors. For example, in Figure 1 presented above, the "MPD Generator and DASH Packager (Encryption)" and "Ad Content Server" are part of a remote system that transmits media content and digital advertising content, which would, necessarily, require the use of one or more processors. As set forth above, the Accused Instrumentalities include additional processors that they use to control digital media presentations. An analysis of proprietary backend systems and/or source code may be necessary to fully and accurately describe the functionality of the Accused Instrumentalities with respect to this limitation and, accordingly, Plaintiff reserves the right to supplement these infringement contentions once such information is made available to Plaintiff.
[1b.2] receiving data comprising digital media content and digital advertising content;	The Accused Instrumentalities receive data comprising digital media content and digital advertising content. Zachary Cava, Video Platform Architect at Hulu, gave a presentation at the March 31, 2020 DVB World Webinar entitled, "Ad Insertion in Live Content." Cava Presentation at the 28:10 mark to the 43:20 mark (last visited July 7, 2024). In that presentation, as part of his explanation of IF-0 in the DASH Standard, Mr. Cava stated, "Starting from the very beginning of a Live Stream source, you have a Contribution Link, which is giving you your mezzanine video and audio, that's being fed into an ABR encoder, which is going to be producing well-formed CMAF content out to the DASH Packager."

U.S. Patent No. 10,986,403	Hulu



Cava Presentation at 32:33 to 32:53 mark. Thus, a remote system transmits data comprising digital media content and digital advertising content to the Accused Instrumentalities. As Mr. Cava goes on to explain, after some processing, this data, comprising digital media content and digital advertising content, is passed on to Hulu's digital media player device. Cava Presentation at 32:53 to 33:20 mark.

Another example of Hulu's digital media player device receiving data comprising digital media content and digital advertising content is shown in Figure 1 of the DASH Standard, where the "DASH Packager" and "Ad Content Server" are part of a remote system and respectively transmit media content and digital advertising content. The Ad Insertion MPD Manipulator is part of a digital media player system on the server side.

U.S. Patent No. 10,986,403	Hulu

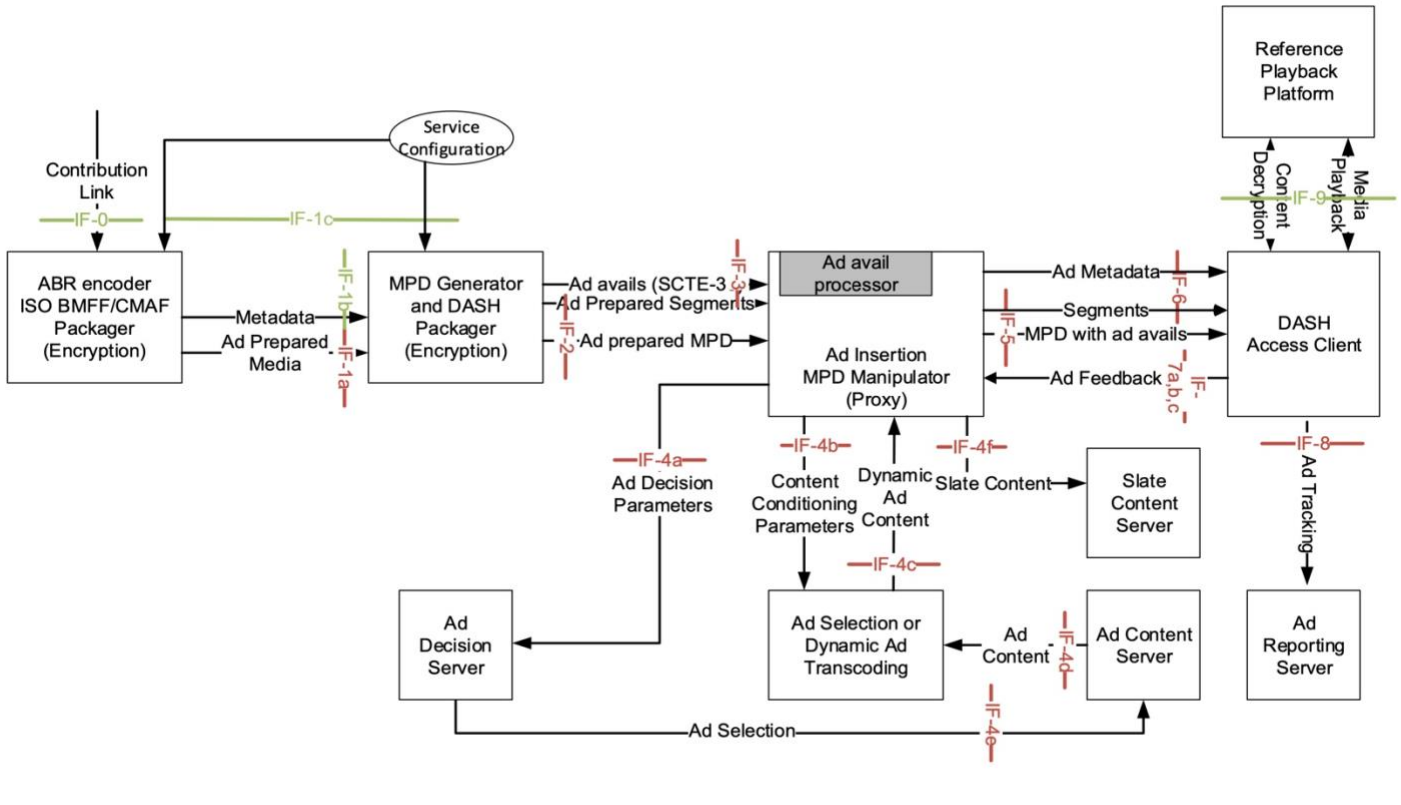


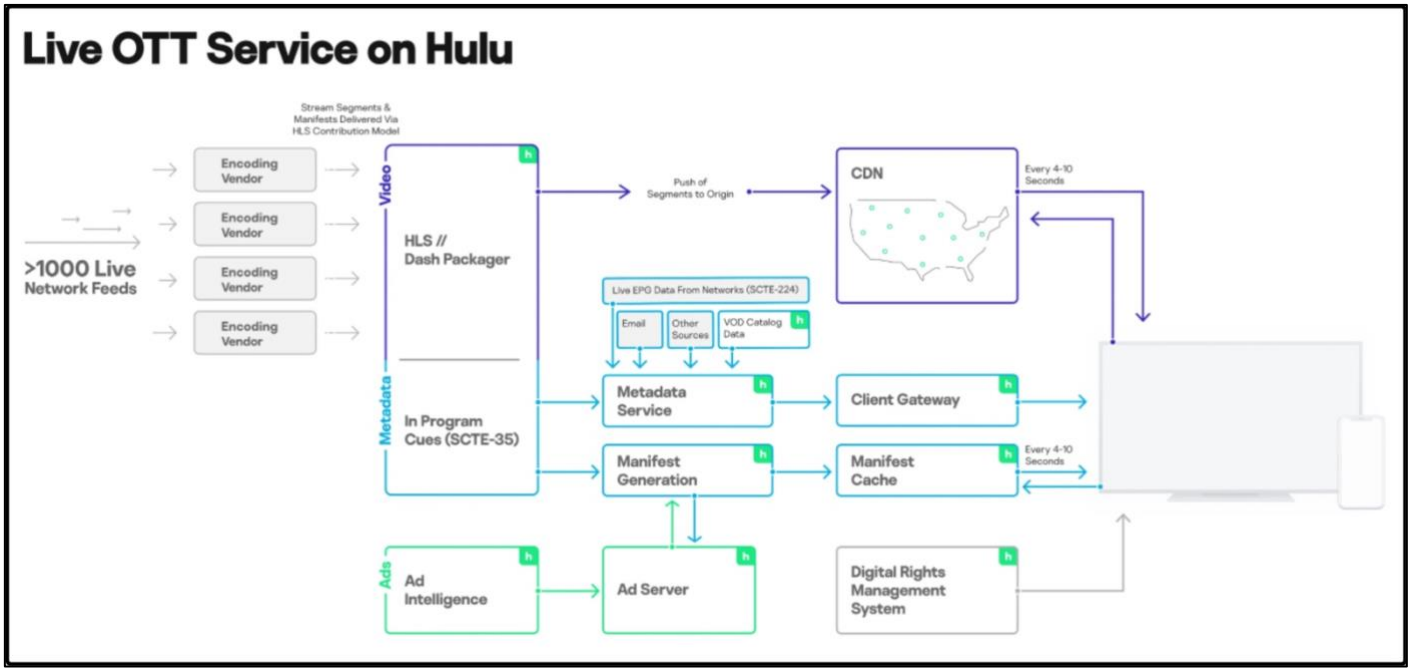
Figure 1 DASH-IF Ad Insertion Architecture

DASH Part 5 at Figure 1 DASH-IF Ad Insertion Architecture.

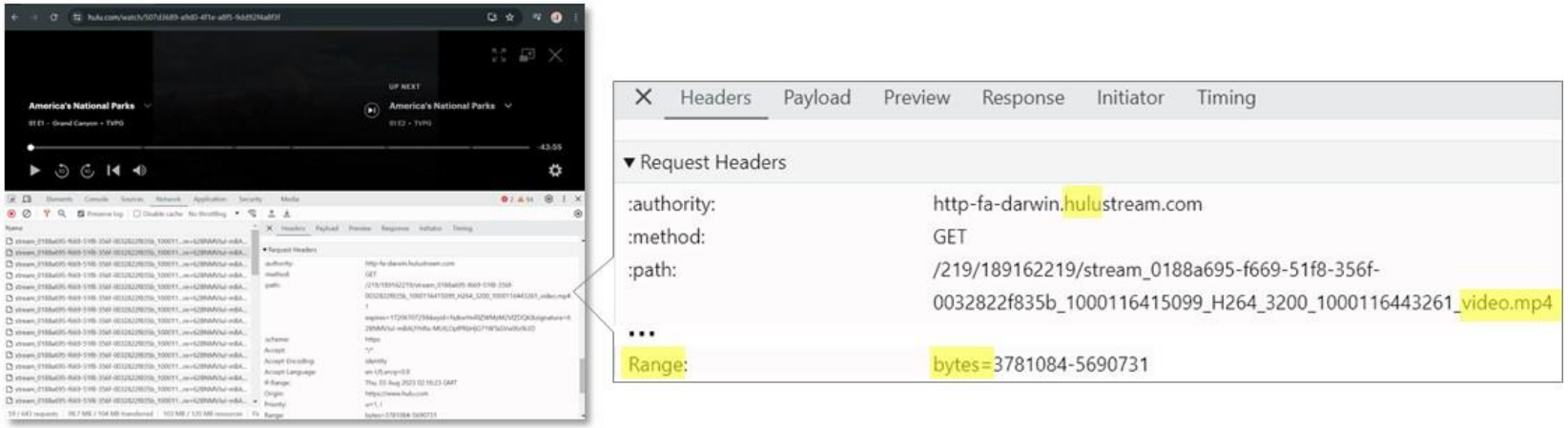
The DASH Standard, with reference to the DASH diagram above, provides further detail:

> An Ad Insertion MPD Manipulator uses the inputs of IF-2 and IF-3 to generate a DASH presentation that is a mixture of content and advertisements. In the SSAI architecture, the manipulator uses IF-4 to ask an Ad Decisioning / Content

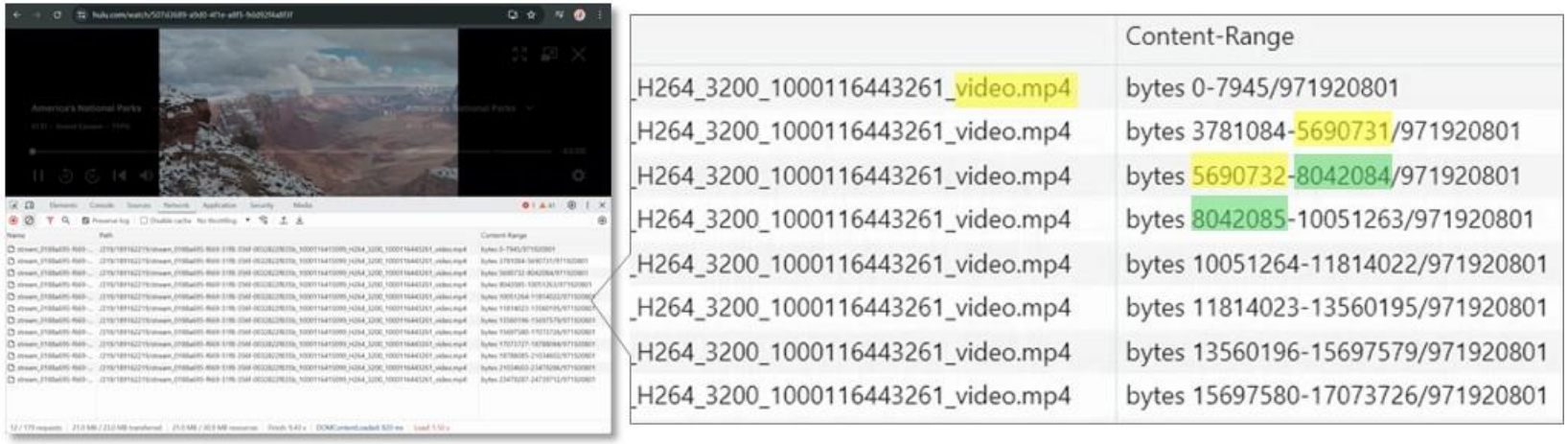
DASH Part 5 at § 4.3. As a result, the Accused Instrumentalities include a digital media player device that controls the presentation of digital media and receives, by at least one remote system, data comprising digital media content and digital advertising content.

U.S. Patent No. 10,986,403	Hulu
	Likewise, the Hulu Tech Blog shows that the remote "Dash Packager" and "Ad Server" provide digital media content and digital advertising content, respectively, to the Hulu digital media player system.  *The Anatomy of a Live OTT Service*, Hulu Tech blog, Medium (Sept. 18, 2018), https://medium.com/hulu-tech-blog/the-anatomy-of-a-live-ott-service-c8f6078b24d3, (last visited July 1, 2024) ("Hulu Tech Blog"). For example, the Hulu client, running on a browser, requests video.mp4 files, in byte ranges, using GET requests.

U.S. Patent No. 10,986,403	Hulu



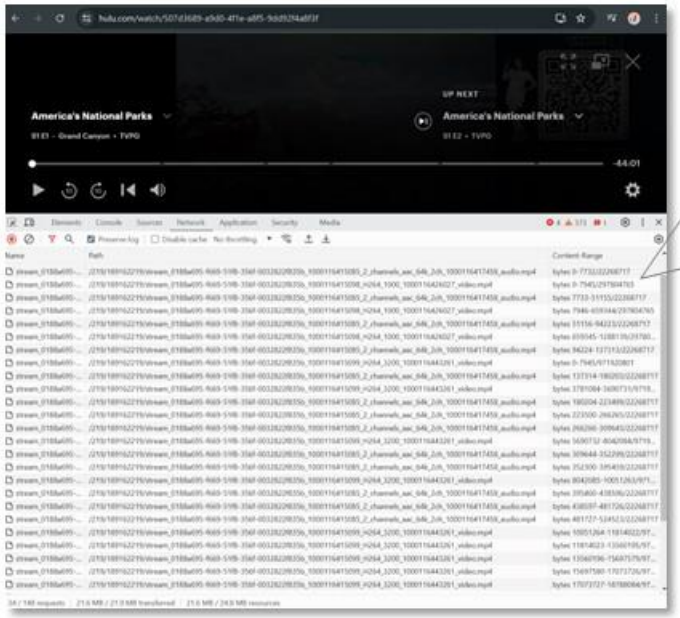
Screenshot of Hulu user interface on web browser, hulu.com, with debugger tool showing network traffic.

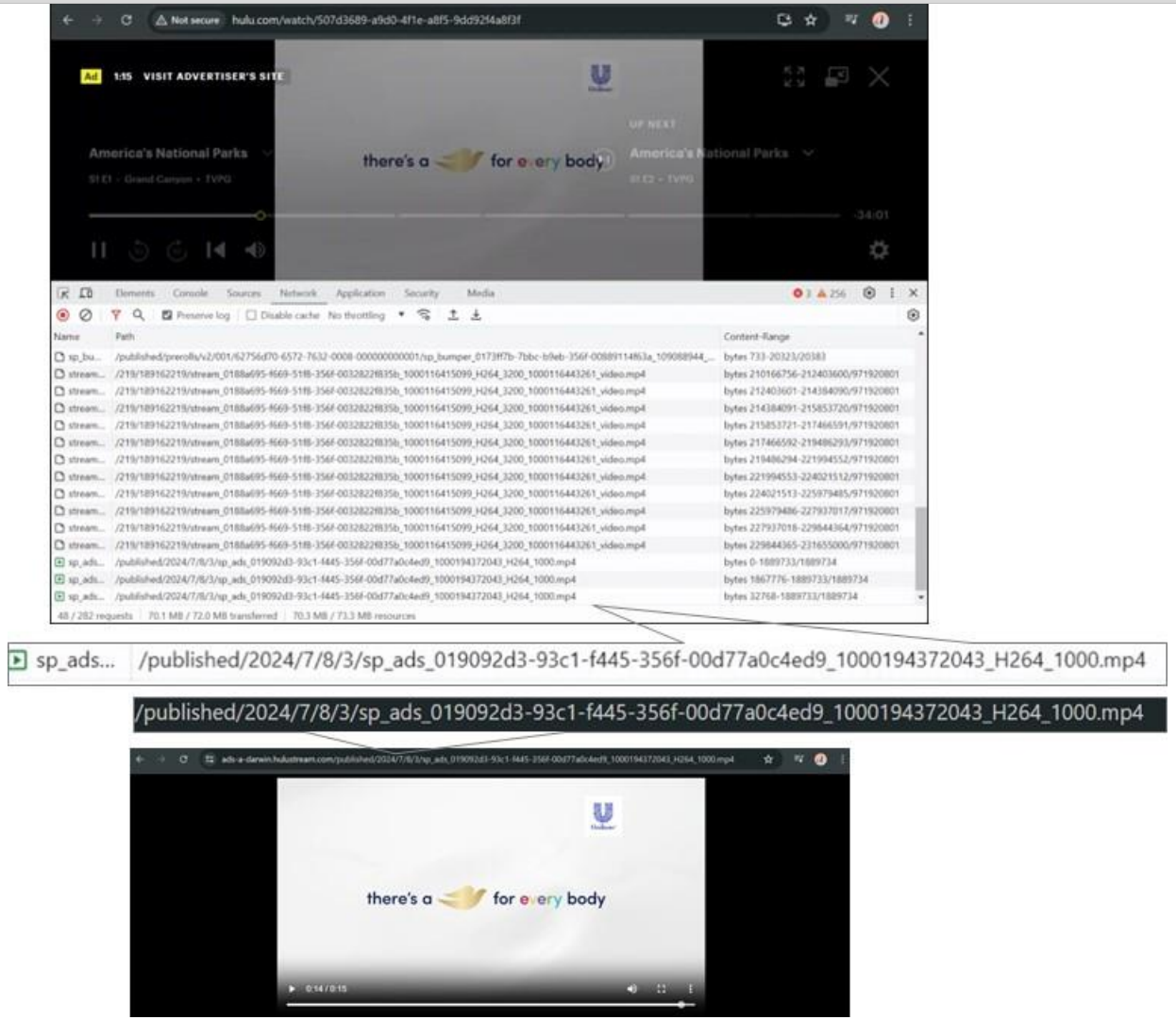


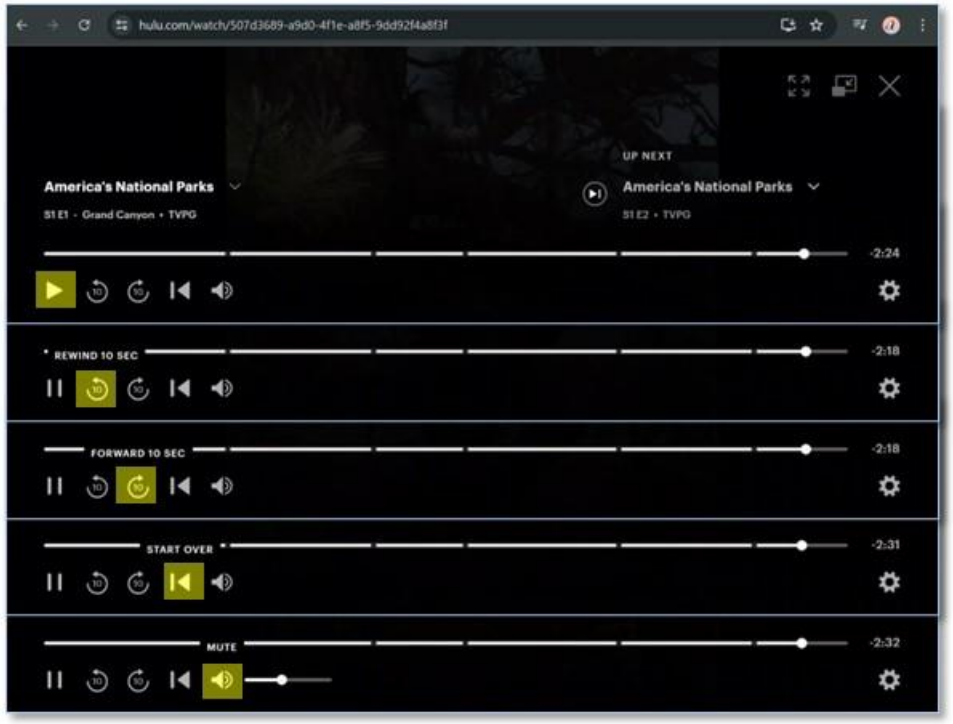
	Content-Range
_H264_3200_1000116443261_video.mp4	bytes 0-7945/971920801
_H264_3200_1000116443261_video.mp4	bytes 3781084-5690731/971920801
_H264_3200_1000116443261_video.mp4	bytes 5690732-8042084/971920801
_H264_3200_1000116443261_video.mp4	bytes 8042085-10051263/971920801
_H264_3200_1000116443261_video.mp4	bytes 10051264-11814022/971920801
_H264_3200_1000116443261_video.mp4	bytes 11814023-13560195/971920801
_H264_3200_1000116443261_video.mp4	bytes 13560196-15697579/971920801
_H264_3200_1000116443261_video.mp4	bytes 15697580-17073726/971920801

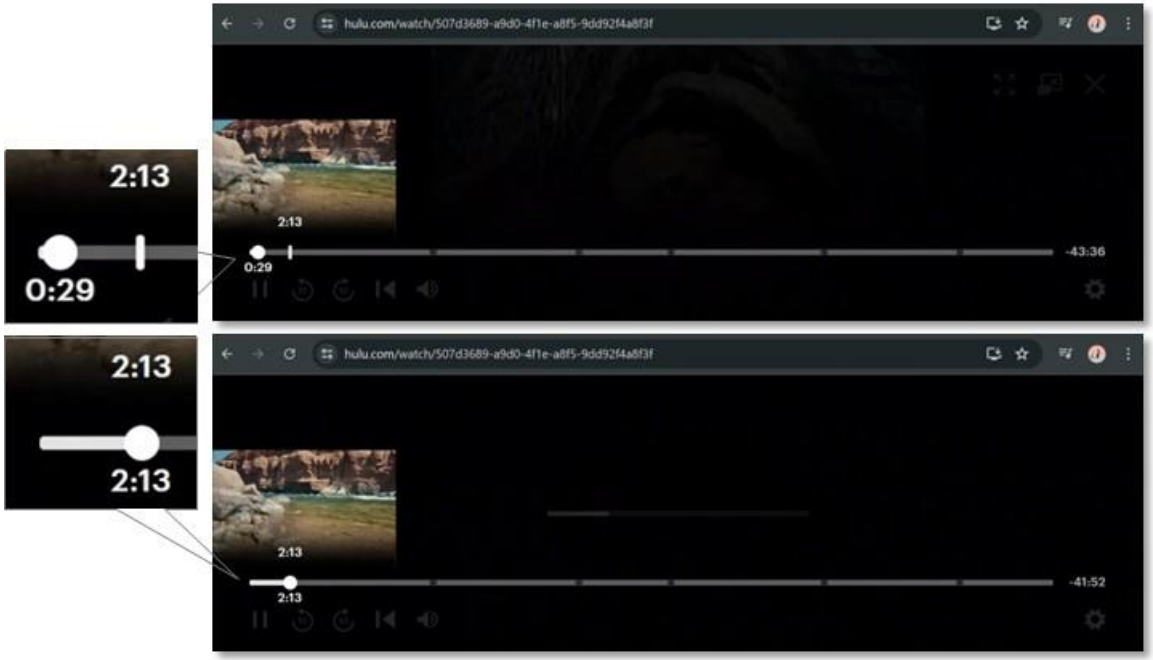
Screenshot of Hulu user interface on web browser, hulu.com, with debugger tool showing network traffic.

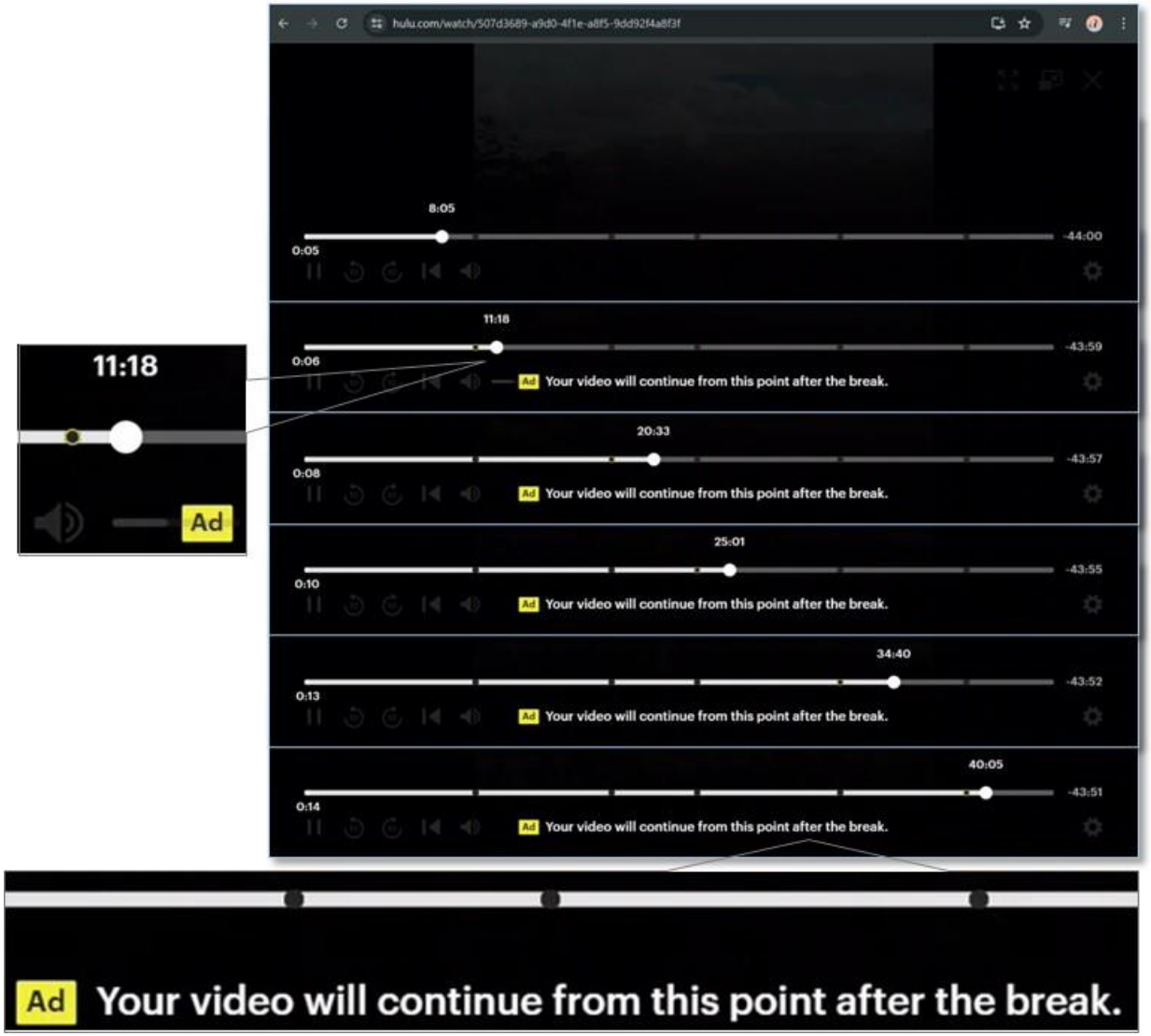
The same is true for audio files. The Hulu client requests audio .mp4 files that correspond to the video .mp4 files, in byte ranges. In the example shown below, the Hulu client requests byte ranges 0-7732 of an audio .mp4 file, and in the next request for that audio file, requests a byte range starting with the next byte (i.e., 7733). Similarly, the Hulu client requests byte ranges 0-7945 of a video file, and in the next request for that video file, requests a byte range starting with the next byte (i.e., 7946).

U.S. Patent No. 10,986,403	Hulu
	 Content-Range x_2ch_1000116417458_audio.mp4 bytes 0-7732/22268717 6426027_video.mp4 bytes 0-7945/297804765 x_2ch_1000116417458_audio.mp4 bytes 7733-51155/22268717 6426027_video.mp4 bytes 7946-659344/297804765 Screenshot of Hulu user interface on web browser, hulu.com, with debugger tool showing network traffic. The same is also true for advertisements. In this example, the Hulu client displays an advertisement that is an .mp4 file retrieved from a URL that is publicly accessible.

U.S. Patent No. 10,986,403	Hulu
	 Screenshot of Hulu user interface on web browser, hulu.com, with debugger tool showing network traffic. An analysis of proprietary backend systems and/or source code may be necessary to fully and accurately describe the functionality of the Accused Instrumentalities with respect to this limitation and, accordingly, Plaintiff reserves the right to supplement these infringement contentions once such information is made available to Plaintiff.

U.S. Patent No. 10,986,403	Hulu
[1c] a user interface input for allowing a user to control a course of presentation of the digital media content received;	The Accused Instrumentalities present a user interface input for allowing a user to control a course of presentation of the digital media content received. For example, the Hulu client, which is part of Hulu's digital media player system, has a user interface configured to allow a user to control a course of presentation of the digital media content received. The Hulu user interface allows user control of content by, among other things, playing, pausing, and moving the playback position in the time bar to jump back and forward through content.  Screenshot of Hulu user interface on web browser, hulu.com. For example, the ▶ user interface input allows the user to move the play position forward in the content if it has been paused. Pressing this toggles between playing and pausing content. The ⟲ user interface input allows the user to move the play position backward 10 seconds from the current position. The ⟳ user interface input allows the user to move the play position forward 10

U.S. Patent No. 10,986,403	Hulu
	seconds from the current position. The user interface input allows the user to move the play position back to the beginning of the content. The user interface input allows the user to increase or decrease the volume or mute the audio. Another user interface input that allows a user to control the course of presentation of digital media content is the ability to drag the play position (the white dot on the timeline) forward or backward along the timeline. In the example below, the user jumps from 0:29 to 2:13.  Screenshot of Hulu user interface on web browser, hulu.com. If the user advances far enough in advance on the timeline, Hulu may require the user to watch ads before the content continues, for example, at predetermined ad break points (shown as small yellow circles in the timeline).

U.S. Patent No. 10,986,403	Hulu
	 Screenshot of Hulu user interface on web browser, hulu.com. An analysis of proprietary backend systems and/or source code may be necessary to fully and accurately describe the functionality of the Accused Instrumentalities with respect to this limitation and, accordingly, Plaintiff reserves the right to supplement these

U.S. Patent No. 10,986,403	Hulu
	infringement contentions once such information is made available to Plaintiff.
[1d.1] an intersplicer for controlling one or more insertion points of the digital advertising content into the digital media content thereby sequencing the digital media content and the digital advertising content,	The Accused Instrumentalities have an intersplicer for controlling one or more insertion points of the digital advertising content into the digital media content thereby sequencing the digital media content and the digital advertising content. For example, the functional block Ad Insertion MPD Manipulator is an intersplicer for controlling one or more insertion points of the digital advertising content into the digital media content. The DASH Standard's definition of the "ad insertion MPD manipulator" confirms that it can change a DASH MPD by controlling where advertisements are inserted into digital media content. **ad insertion MPD manipulator** – functional entity that proxies a DASH MPD and may change it to insert the ad creative in the streaming presentation. It may also embed other ad related metadata, or remove ad related metadata in the MPD DASH Standard at § 3.1. The MPD generated by the Ad Insertion MPD Manipulator is a manifest that sets forth the sequence in which the digital media content is played. Likewise, Figure 1 from the DASH Standard shows that the "Ad Insertion MPD Manipulator" is an intersplicer for controlling one or more insertion points of digital advertising content into the digital media content by showing that the Ad Insertion MPD Manipulator receives inputs from, among others, the "DASH Packager" and "Ad Content Server" and outputs, among other things, an "MPD with ad avails" to the DASH Access Client.

U.S. Patent No. 10,986,403	Hulu

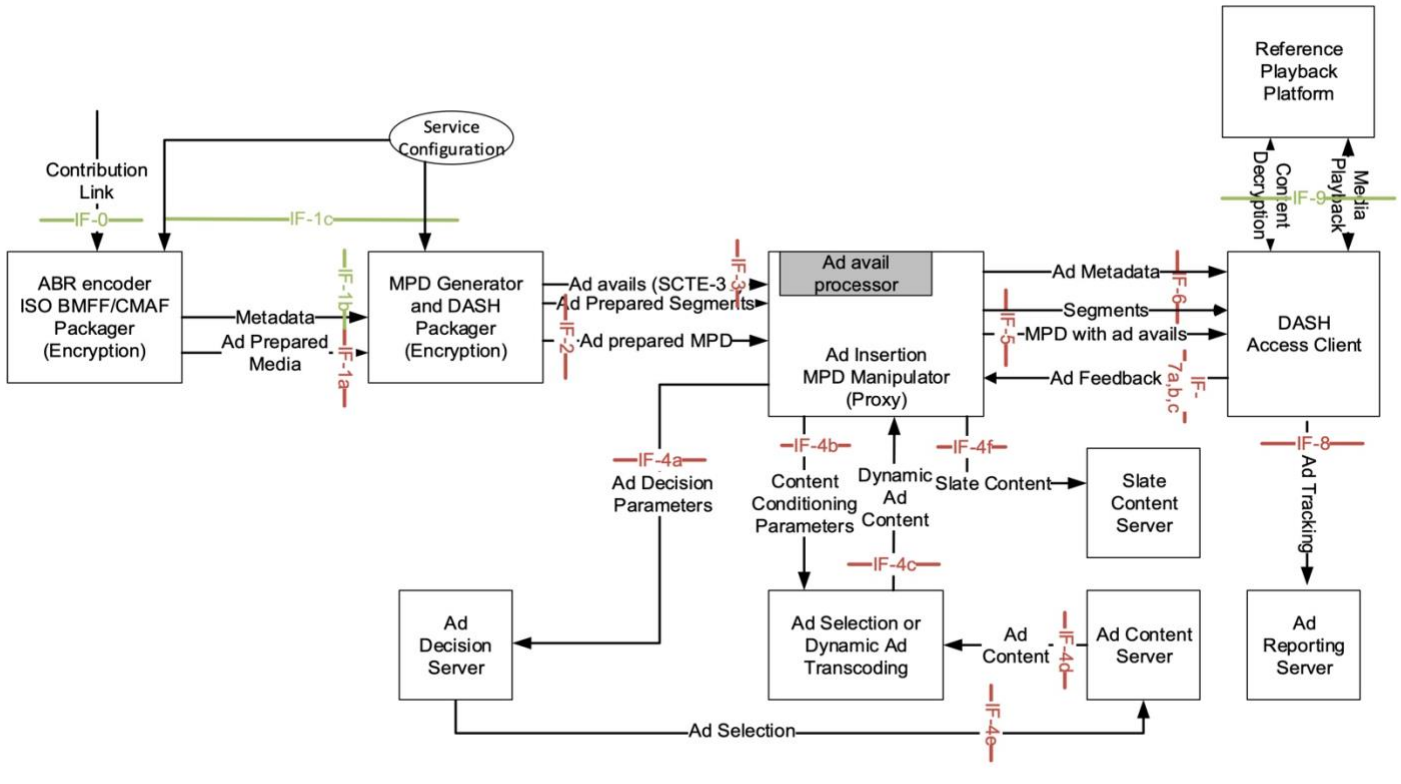
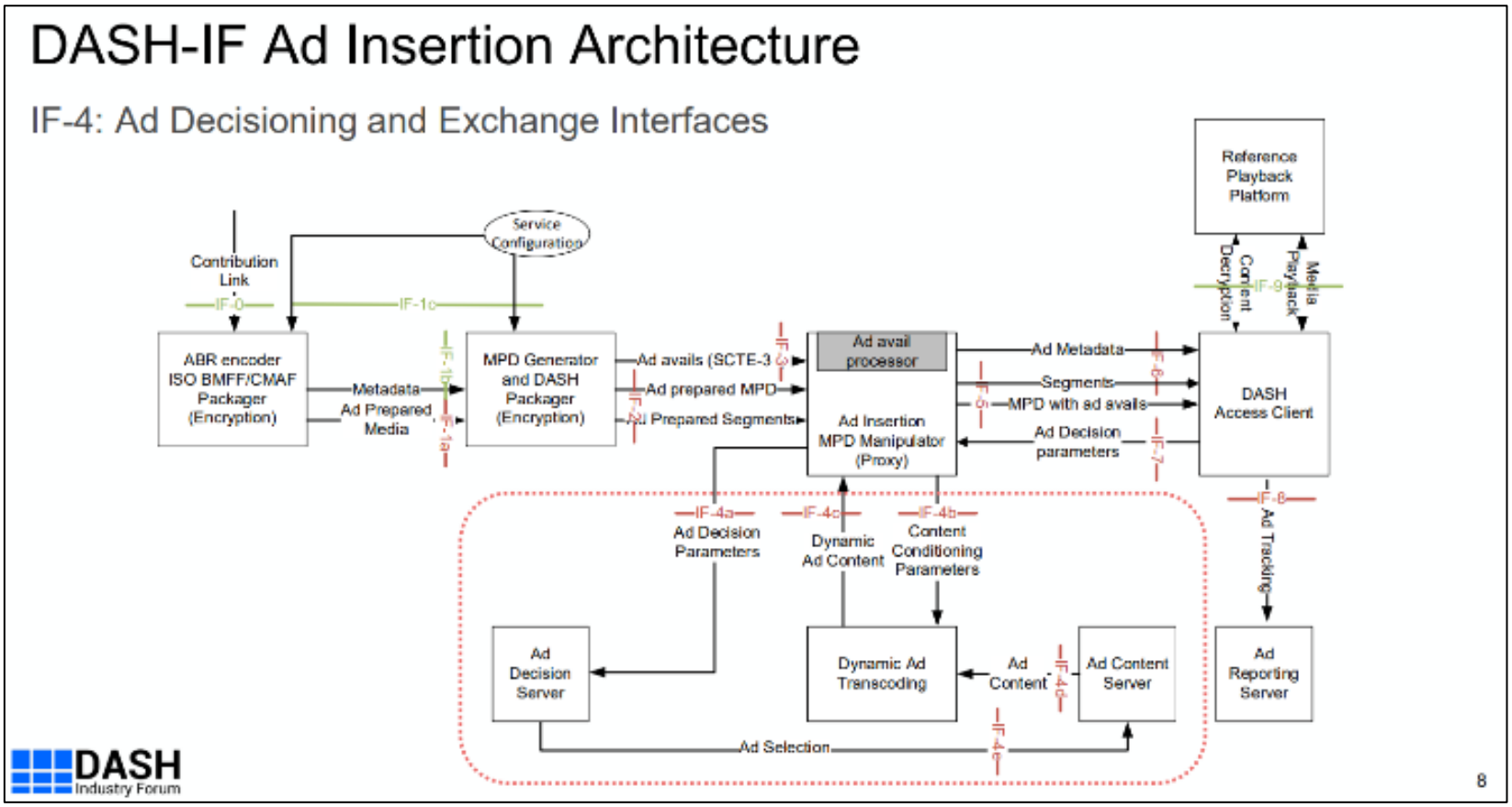


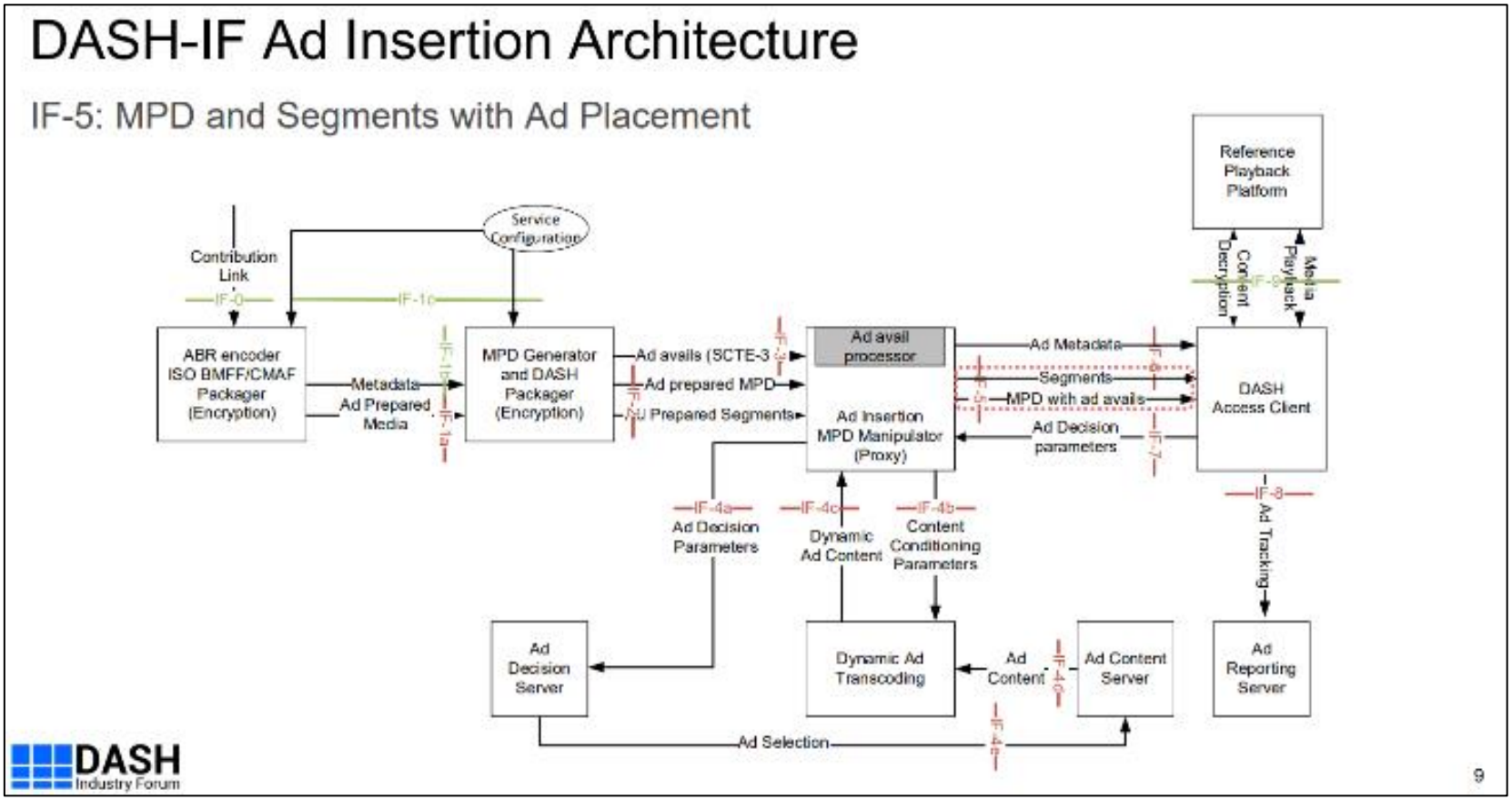
Figure 1 DASH-IF Ad Insertion Architecture

The DASH Standard explains Figure 1 further by stating that the "Ad Insertion MPD Manipulator uses the inputs IF-2 and IF-3 to generate a DASH presentation that is a mixture of content and advertisements." Thus, the Ad Insertion MPD Manipulator orders data blocks of the digital media content into a content stream for the user.

U.S. Patent No. 10,986,403	Hulu
	4.3 Overview on Interfaces and Functions The Ad Insertion architectures start with the ingest of an input stream over IF-0 which is processed by an ABR Encoder and output as well-formed CMAF content over the IF-1 interface. A DASH Packager / MPD Generator uses IF-1 input to generate a conformant DASH content presentation that is sent over IF-2 and additional opportunity metadata that is sent (IF-3). ***DASH-IF*** **13** **DASH-IF IOP-5 V5.0.0 (2021-11)** An Ad Insertion MPD Manipulator uses the inputs of IF-2 and IF-3 to generate a DASH presentation that is a mixture of content and advertisements. In the SSAI architecture, the manipulator uses IF-4 to ask an Ad Decisioning / Content Server to provide advertisement placements for the content stream, possibly utilizing client sourced parameters from IF-7, before generating the final DASH MPD for IF-5 which contains metadata about the inserted ads via IF-6. In the SGAI architecture, the manipulator does not immediately use IF-4, instead it embeds opportunity information from IF-3 into the DASH MPD IF-5 output so that the DASH Client may later use IF-7 to retrieve the proper ad placements by sending this opportunity information along with client source parameters to the manipulator. The DASH Client utilizes the reference media pipeline provided by IF-9 to perform seamless playout of the mixed content and ad presentation obtained via IF-5. Ad measurement and tracking is enabled in the client by IF-8 utilizing the ad metadata embedded as part of IF-6. In Table 1 the interfaces defined are detailed with clause references and some example instantiations. Each interface clause will provide an informative overview of said interface and where aspects of the interface fall within the scope of this document, normative requirements will be provided. DASH Standard at § 4.3.

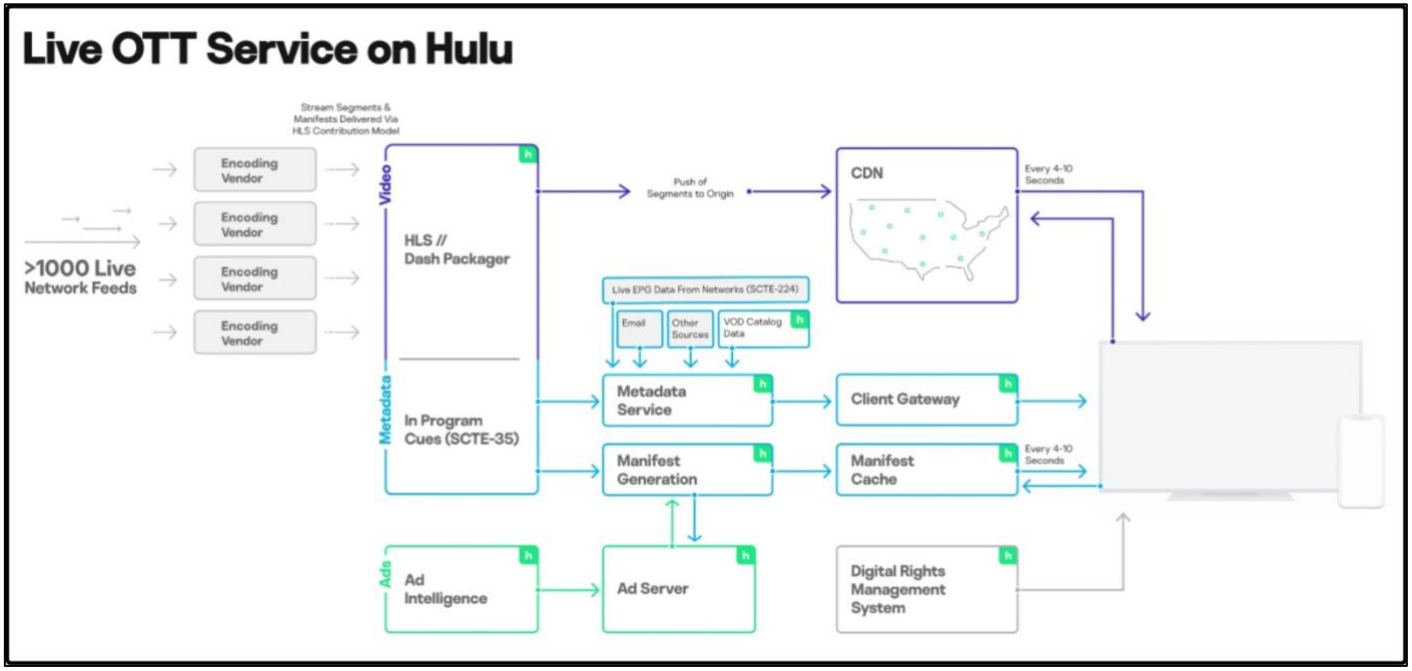
U.S. Patent No. 10,986,403	Hulu
	Zachary Cava, Video Platform Architect at Hulu, gave a presentation at the March 31, 2020 DVB World Webinar entitled, "Ad Insertion in Live Content." Cava Presentation at the 28:10 mark to the 43:20 mark. In that presentation, as part of his explanation of IF-4 in the DASH Standard, Mr. Cava stated, "The prepared content [from the DASH Packager] is then consumed by an Ad Insertion MPD Manipulator, or an Ad Proxy, and that is the mechanism that communicates with an ad decisioning exchange service that will take parameters for decisioning and internally perform decisioning."  Cava Presentation at 33:33 to 33:56 mark. Mr. Cava further explained, in the context of IF-5, "From there we'll go ahead and provide well-formed ad insertion content that

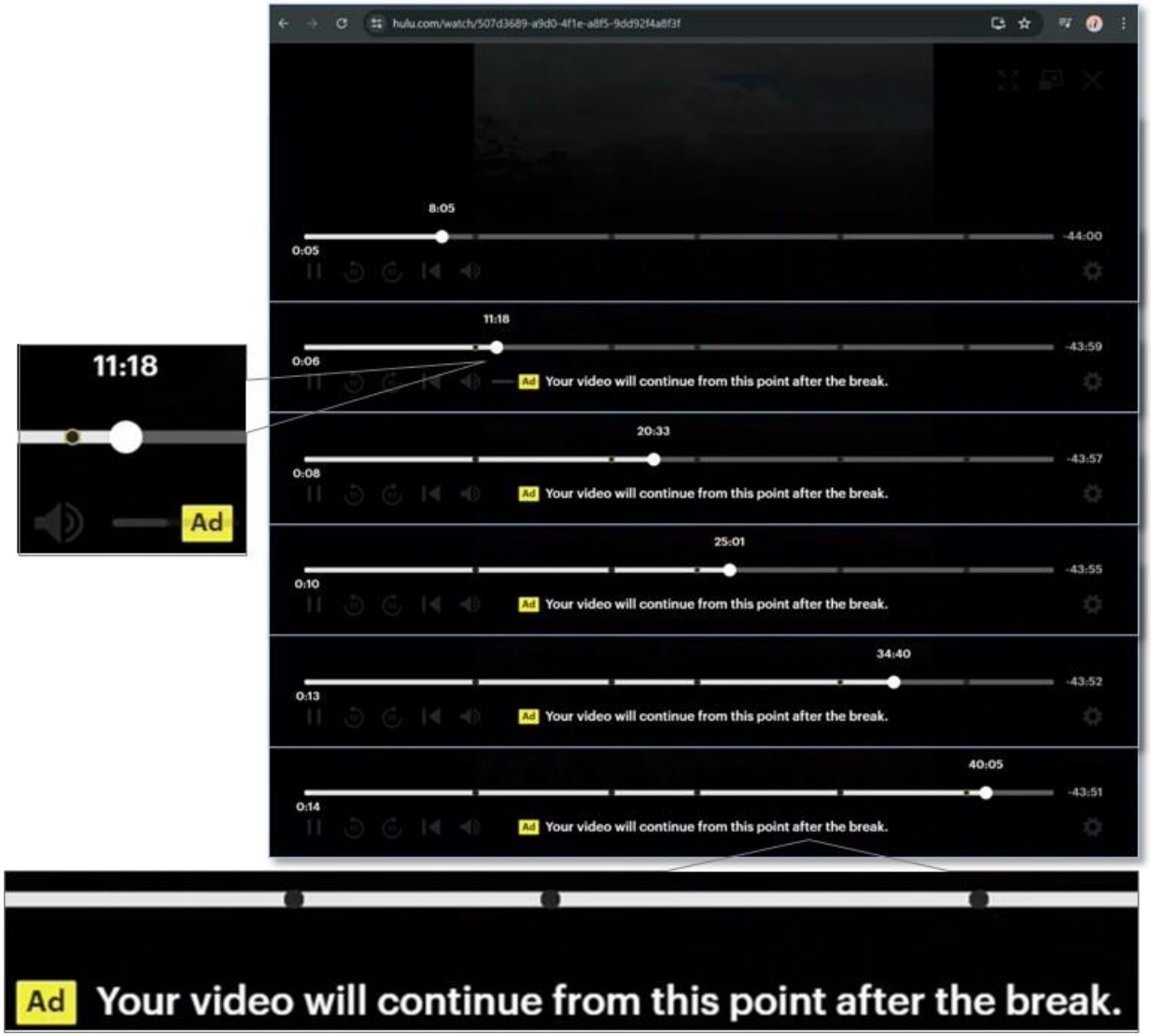
U.S. Patent No. 10,986,403	Hulu
	the MPD Manipulator can go ahead and combine with the original content to produce a[n] interleaved stream of content and advertisements. And this stream is communicated again with a DASH down to the clients."

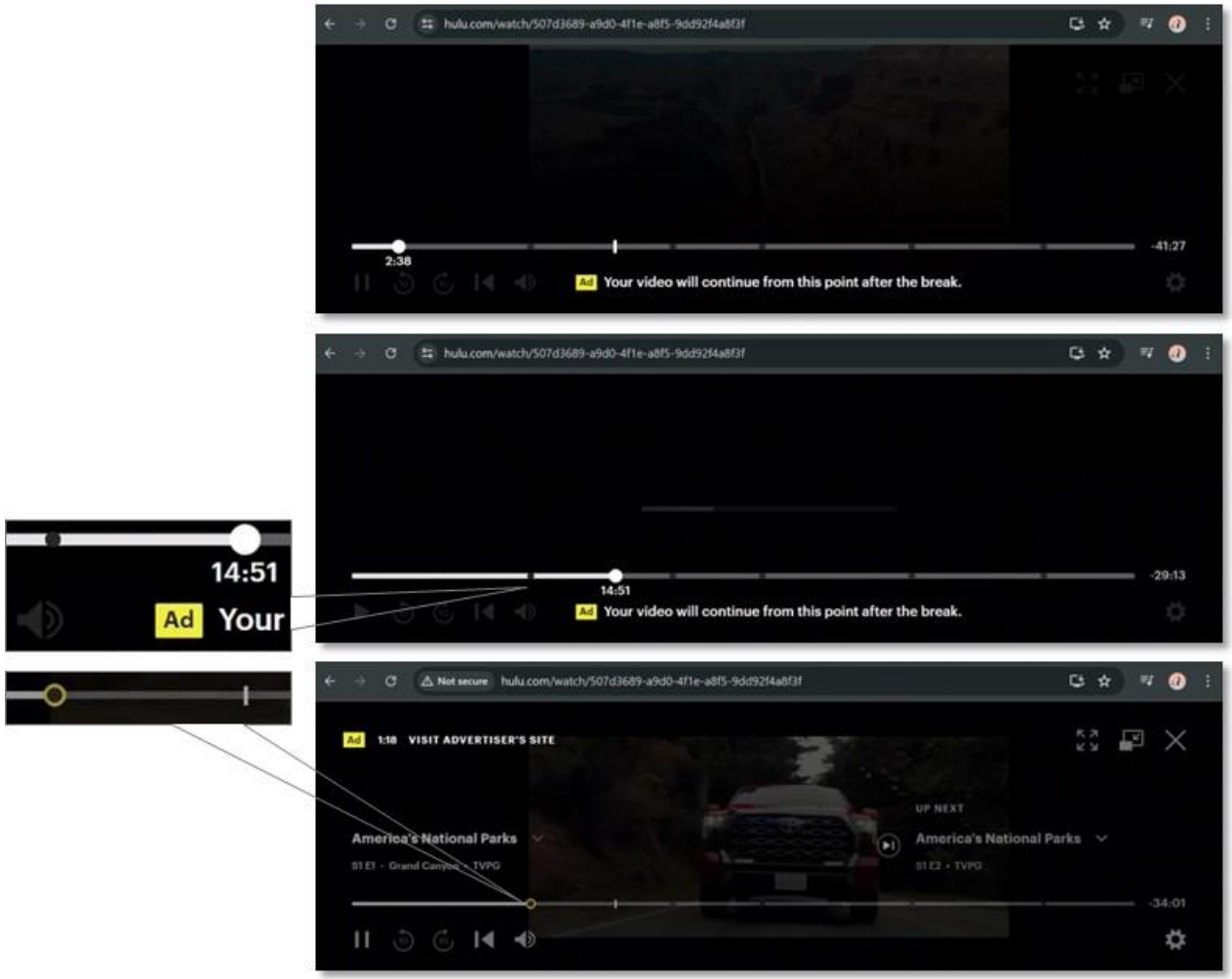


Cava Presentation at 34:00 to 34:25 mark.

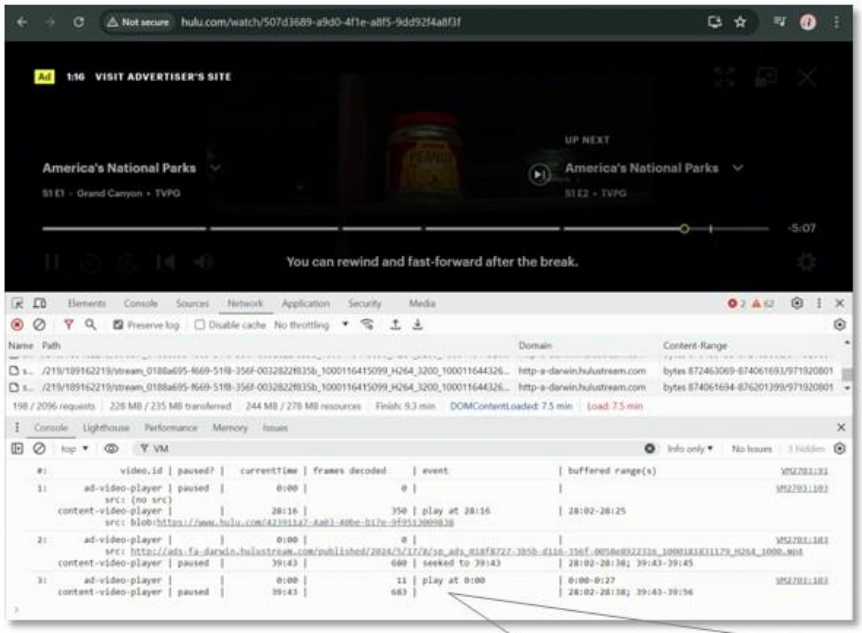
Thus, Mr. Cava demonstrates that the Ad Insertion MPD Manipulator is an intersplicer for controlling one or more insertion points of the digital advertising content into the digital media content thereby sequencing the digital media content and the digital advertising content and is in communication with the advertisement rotator.

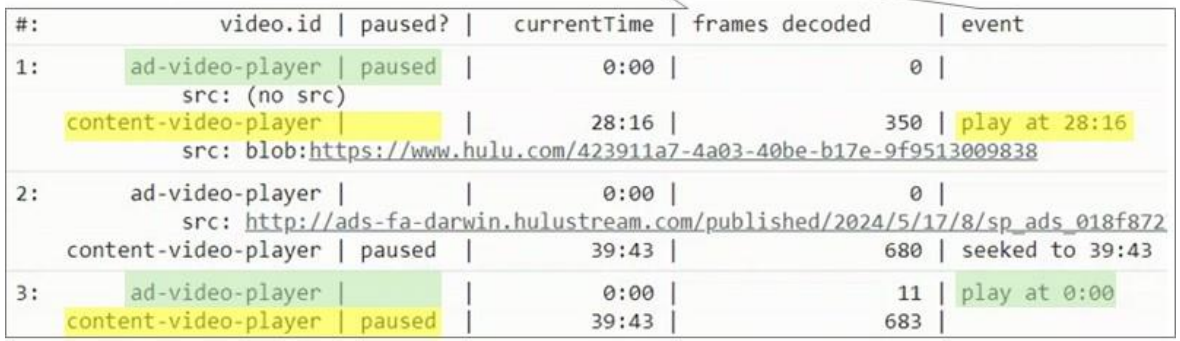
U.S. Patent No. 10,986,403	Hulu
	Likewise, the Hulu Tech Blog confirms that the Accused Instrumentalities include an intersplicer for controlling one or more insertion points of the digital advertising content into the digital media content thereby sequencing the digital media content and the digital advertising content. For example, the "Manifest Generation" in the figure below is an intersplicer that controls the insertion points of digital advertising content.  Hulu Tech Blog For example, Hulu presents content with predetermined ad insertion points. Those ad insertion points may be shown on the timeline bar, as in the example shown below.

U.S. Patent No. 10,986,403	Hulu
	 Screenshot of Hulu user interface on web browser, hulu.com.

U.S. Patent No. 10,986,403	Hulu
	The Hulu client presents content, and presents advertisements, by displaying different video files, and sequences video from content files and advertisement files. For example, if a user plays content up to an ad insertion point, or skips past an ad insertion point, Hulu may pause the main content and play one or more advertisements instead.  Screenshot of Hulu user interface on web browser, hulu.com.

U.S. Patent No. 10,986,403	Hulu
	In the example below from a web browser, Hulu uses what it calls "ad-video-player" to present advertising content, and "content-video-player" to present content. When the "ad-video-player" is playing, the "content-video-player" is paused, and vice versa. Both players can be paused at the same time. In this example, the "content-video-player" played content starting from 28 minutes and 16 seconds into the content, then paused as the "ad-video-player" loaded an advertisement file and began playing at the start (0:00) of that advertisement file.





#:	video.id	paused?	currentTime	frames decoded	event
1:	ad-video-player	paused	0:00	0	
	src: (no src)				
	content-video-player		28:16	350	play at 28:16
	src: blob:https://www.hulu.com/423911a7-4a03-40be-b17e-9f9513009838				
2:	ad-video-player		0:00	0	
	src: http://ads-fa-darwin.hulustream.com/published/2024/5/17/8/sp_ads_018f872				
	content-video-player	paused	39:43	680	seeked to 39:43
3:	ad-video-player		0:00	11	play at 0:00
	content-video-player	paused	39:43	683	

Screenshot of Hulu user interface on web browser, hulu.com, with debugger tool showing network traffic and console running

U.S. Patent No. 10,986,403	Hulu
	JavaScript reporting out video-related events. An analysis of proprietary backend systems and/or source code may be necessary to fully and accurately describe the functionality of the Accused Instrumentalities with respect to this limitation and, accordingly, Plaintiff reserves the right to supplement these infringement contentions once such information is made available to Plaintiff.
[1d.2] the sequencing comprising ordering one or more data blocks of the digital media content and one or more data blocks of the digital advertising content into a content stream playable as audio or visual content perceivable by the user,	The Accused Instrumentalities sequence the digital media content and one or more data blocks of the digital advertising content into a content stream playable as audio or visual content perceivable by the user. The MPD generated by the Ad Insertion MPD Manipulator is a manifest that sets forth the sequence in which the digital media content is played. **ad insertion MPD manipulator** – functional entity that proxies a DASH MPD and may change it to insert the ad creative in the streaming presentation. It may also embed other ad related metadata, or remove ad related metadata in the MPD DASH Standard at § 3.1. The DASH Standard sets out different architectures by which Hulu's Accused Instrumentalities can sequence one or more blocks of digital media content and one or more blocks of digital advertising content into a content stream playable as audio or visual content perceivable by the user:

U.S. Patent No. 10,986,403	Hulu

5.6.2.2 Decisioning Modes

The *decisioning mode* of an Ad Decisioning Server dictates how the server chooses to fulfil ad requests made by a caller. The Ad Insertion MPD Manipulator must specify the decisioning mode for the Ad Decisioning Server to use via IF-4a based on the implemented ad insertion architecture. There are two general modes of ad decisioning that the SSAI and SGAI architectures respectively enable: *stream level decisioning* and *pod level decisioning*.

With *stream level decisioning*, all advertisement opportunities are decided prior to DASH client receiving the stream. A SSAI architecture accomplishes this by having the Ad Insertion MPD Manipulator send the IF-3 supplied opportunity metadata to the Ad Decision server via IF-4a. The result of the ad decision request will contain advertisements for the entirety of the stream which the Ad Insertion MPD Manipulator transforms into an IF-5 manifest a mixture of content and advertisements.

After a DASH client receives a stream produced from an SSAI architecture, the stream will remain fixed for the duration of the playback session, e.g. the same advertisements will play again should the user choose to rewind the stream.

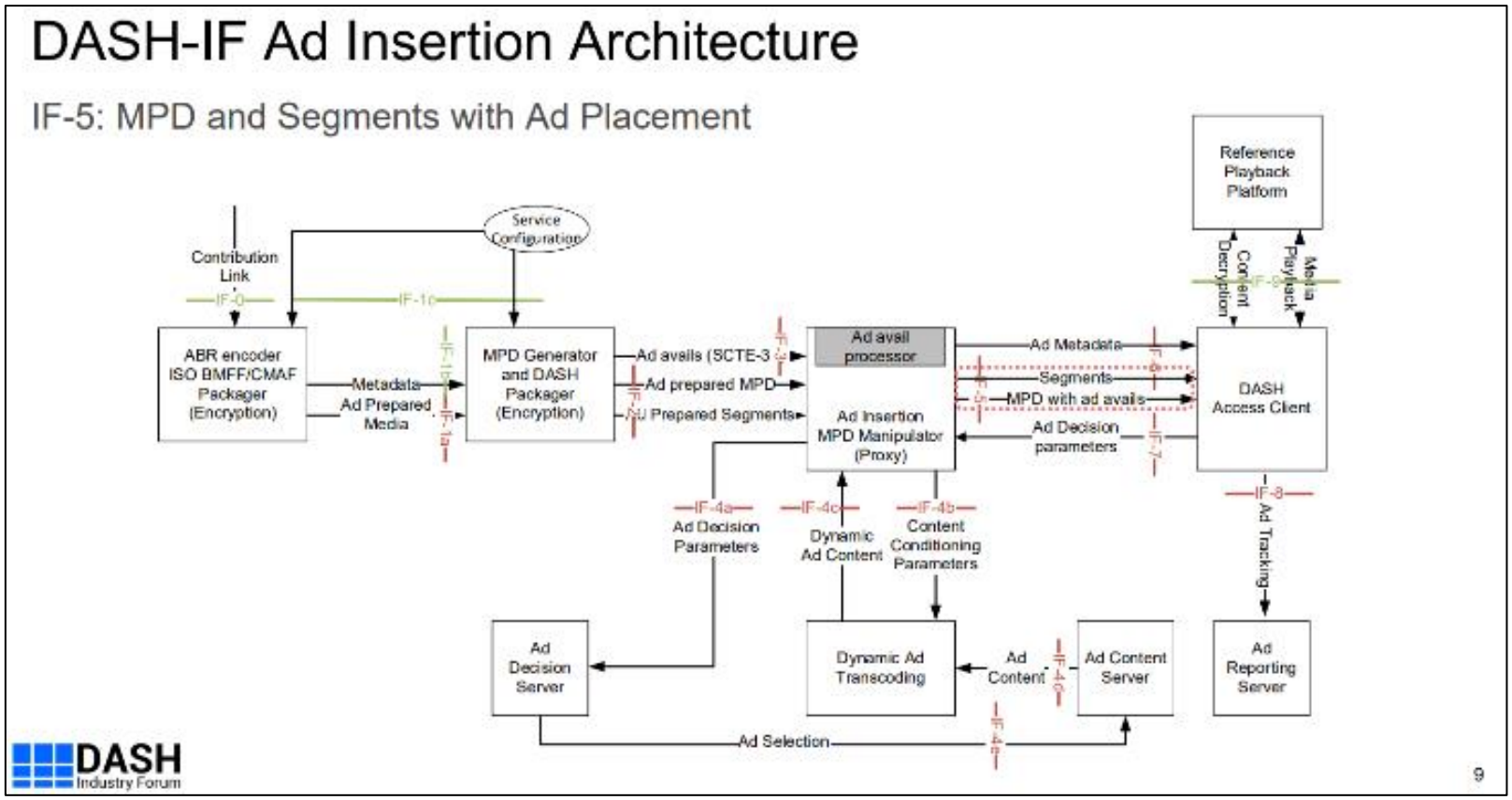
With *pod level decisioning*, advertisement opportunities are decided just as the DASH client reaches the opportunity within the stream. A SGAI architecture accomplishes by having the Ad Insertion MPD Manipulator use the IF-3 supplied opportunity metadata to generate an IF-5 manifest with a mixture of content and remote entities that represent opportunities. As the client reaches remote entities during playout, the client utilizes IF-7 to return the opportunity metadata to the Ad Insertion MPD Manipulator which then sends the data to the Ad Decision server via IF-4a. The result of the ad decision request will contain advertisements for this single opportunity which the Ad Insertion MPD Manipulator transforms into an IF-7 response for the client to consume.

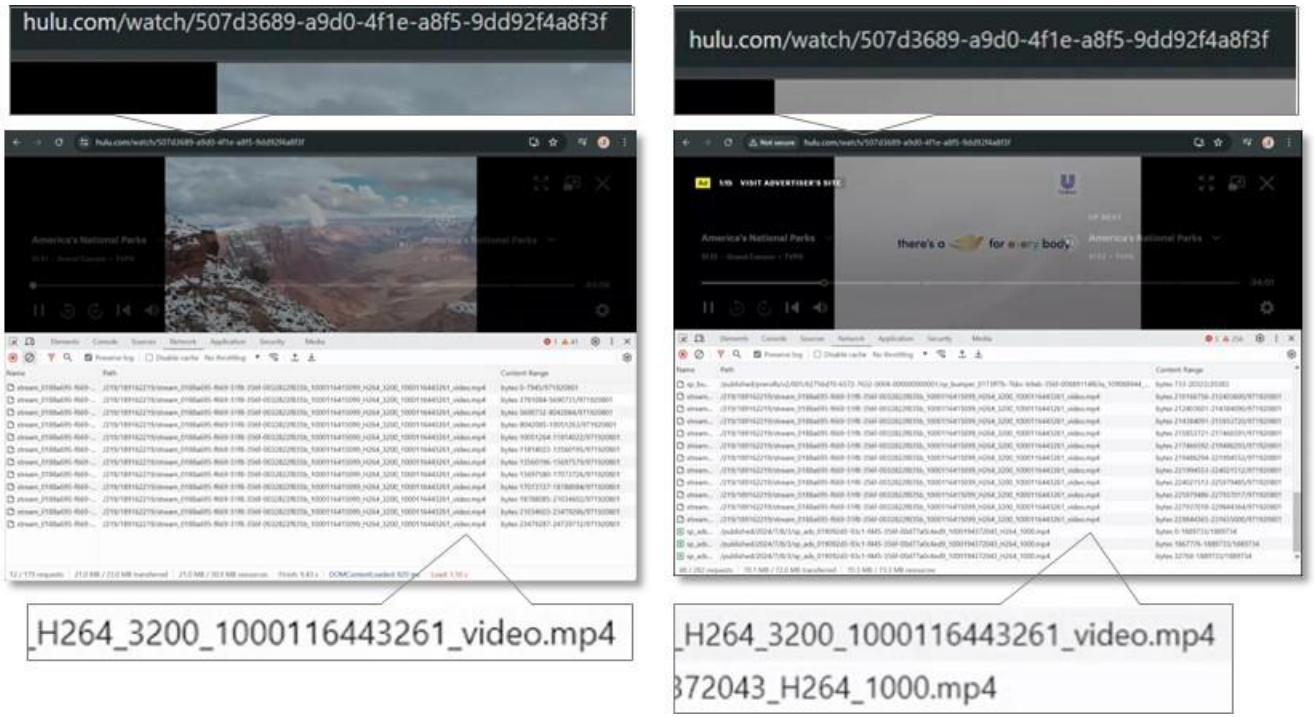
After a DASH client receives a stream produced from an SGAI architecture, the stream can continue to change for the duration of the playback session, e.g. the advertisements can be re-decisioned should the user choose to rewind the stream.

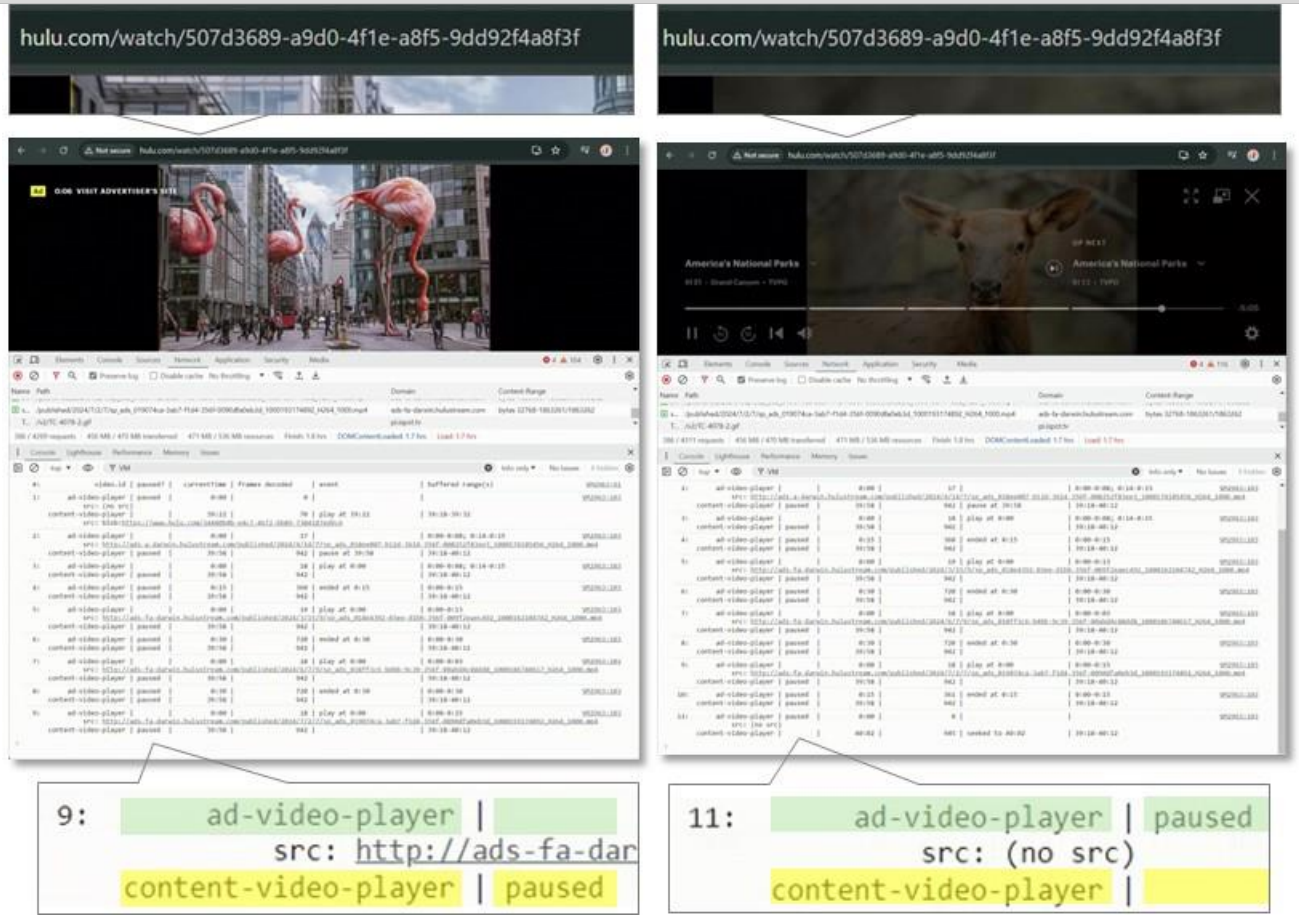
DASH Standard at § 5.6.2.2.

Zachary Cava, Video Platform Architect at Hulu, gave a presentation at the March 31, 2020 DVB World Webinar entitled, "Ad Insertion in Live Content." Cava Presentation at the 28:10 mark to the 43:20 mark.

In that presentation, as part of his explanation of IF-5 in the DASH Standard, Mr. Cava stated that the Ad Decision Server (and

U.S. Patent No. 10,986,403	Hulu
	related structures) advertisement rotator, "provide well-formed ad insertion content that the MPD Manipulator can go ahead and combine with the original content to produce a[n] interleaved stream of content and advertisements. And this stream is communicated again with a DASH down to the clients."  Cava Presentation at 34:00 to 34:25 mark. Thus, the sequencing performed by the Ad Insertion MPD Manipulator comprises interleaving one or more data blocks of the digital media content and one or more data blocks of the digital advertising content into a content stream playable as audio or visual content perceivable by the user.

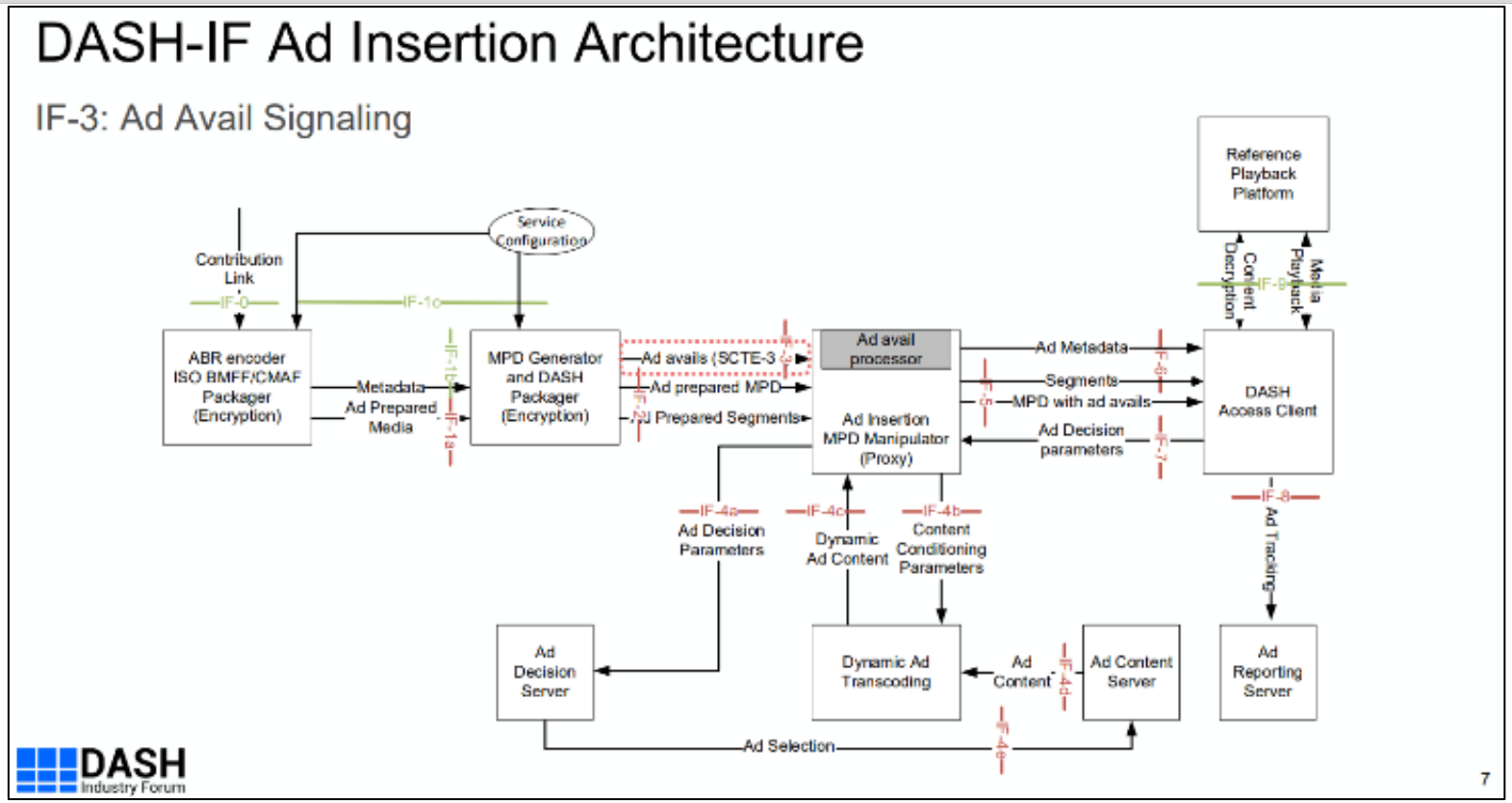
U.S. Patent No. 10,986,403	Hulu
	For example, the Hulu client presents the .mp4 content and ad files that it receives and presents them as a single video presentation to the user, at the same URL. The "ad-video-player" and the "content-video-player" pause or play as needed to present ads and content.  Screenshot of Hulu user interface on web browser, hulu.com, with debugger tool showing network traffic.

U.S. Patent No. 10,986,403	Hulu
	 Screenshot of Hulu user interface on web browser, hulu.com, with debugger tool showing network traffic and console running JavaScript reporting out video-related events. An analysis of proprietary backend systems and/or source code may be necessary to fully and accurately describe the functionality of the Accused Instrumentalities with respect to this limitation and, accordingly, Plaintiff reserves the right to supplement these infringement contentions once such information is made available to Plaintiff.

U.S. Patent No. 10,986,403	Hulu
[1d.3] the content stream comprising one or more initially sequenced insertion points at which the digital advertising content is scheduled to be presented relative to the digital media content during play;	The content stream sequenced by the Accused Instrumentalities comprises one or more initially sequenced insertion points at which the digital advertising content is scheduled to be presented relative to the digital media content during play. For example, both the Hulu Tech Block and Figure 1 of the DASH Standard indicate that SCTE-35 signaling is used to identify insertion points in the media for ads. "Opportunity metadata is made up of the original descriptive metadata of the input media related to signaling of ad opportunities and the content segmentation information generated by the DASH Packager." DASH Standard at § 5.5.1. "For the purposes of this document, we will assume the carriage of opportunity metadata via SCTE-35 signaling in DASH MPD Events." DASH Standard at § 5.5.1. **5.5 IF-3: Ad Avail Signalling** **5.5.1 Introduction** *Opportunity metadata* is made up of the original descriptive metadata of the input media related to signalling of ad opportunities and the content segmentation information generated by the DASH Packager. Carriage of opportunity metadata in the presentation output by the DASH Packager / MPD Generator is done via IF-3. The following normative statements on opportunity metadata carriage are made: • Opportunity metadata shall be carried through DASH MPD Events. The requirement of MPD Events over other carriage mechanisms is made such that the downstream Ad Insertion MPD Manipulator can perform insertions without accessing the content segments. NOTE: This does not exclude the option that equivalent metadata is present inband, but it is not expected that the MPD Proxy make use of such inband information.

U.S. Patent No. 10,986,403	Hulu
	While the carriage method is considered normative, the format of the metadata is workflow dependent. Examples of known schemes are provided in the subsequent sub-clauses of this interface. For the purposes of this document, we will assume the carriage of opportunity metadata via SCTE-35 signalling in DASH MPD Events. Other methods and formats may be used, but a service provider should understand the downstream system effects if the packager does not follow this assumption. Any opportunity metadata used in the context of this specification MUST provide: • the presentation time (in media time) of the splice point that corresponds to the start of an opportunity. • either: - the guaranteed accurate duration of the opportunity, or - an expected duration of the opportunity, if known, and - the identifier of a later metadata event that will signal the accurate end of the opportunity As an example, clause 5.5.2 provides an overview how SCTE-35 can be used to fulfil the requirements of a DASH-IF external opportunity signalling. DASH Standard at § 5.5.1. Thus, SCTE-35 and/or other signaling is used to arrange the advertising blocks within the content stream at initially defined insertion positions relative to the media sections. Zachary Cava, Video Platform Architect at Hulu, gave a presentation at the March 31, 2020 DVB World Webinar entitled, "Ad Insertion in Live Content." Cava Presentation at the 28:10 mark to the 43:20 mark. In that presentation, as part of his explanation of IF-3 in the DASH Standard, Mr. Cava stated, "the other piece [of inputs from the DASH Packager] is the ad avail information which provides details around how long an opportunity exists, and where the opportunity exists, in the stream."

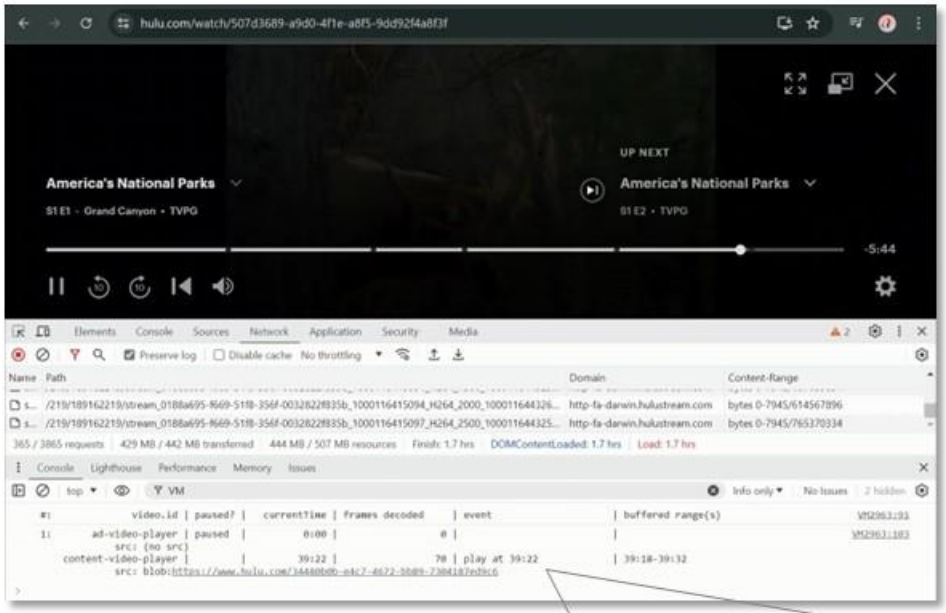
U.S. Patent No. 10,986,403	Hulu



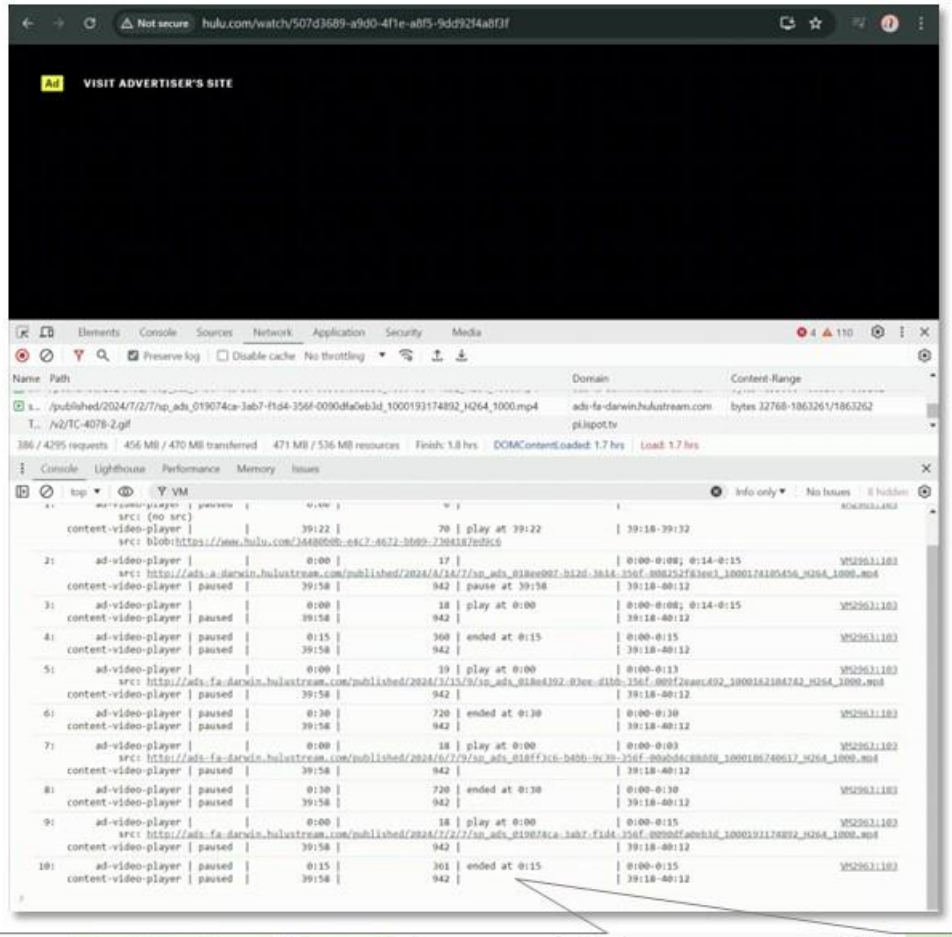
Cava Presentation at 33;20 to 33:33 mark.

As a result, the SCTE-35 data transmitted from the DASH Packager to the Ad Insertion MPD Manipulator intersplicer identifies initially sequenced insertion points in the content stream where digital advertising content is scheduled to be presented relative to the digital media content during play.

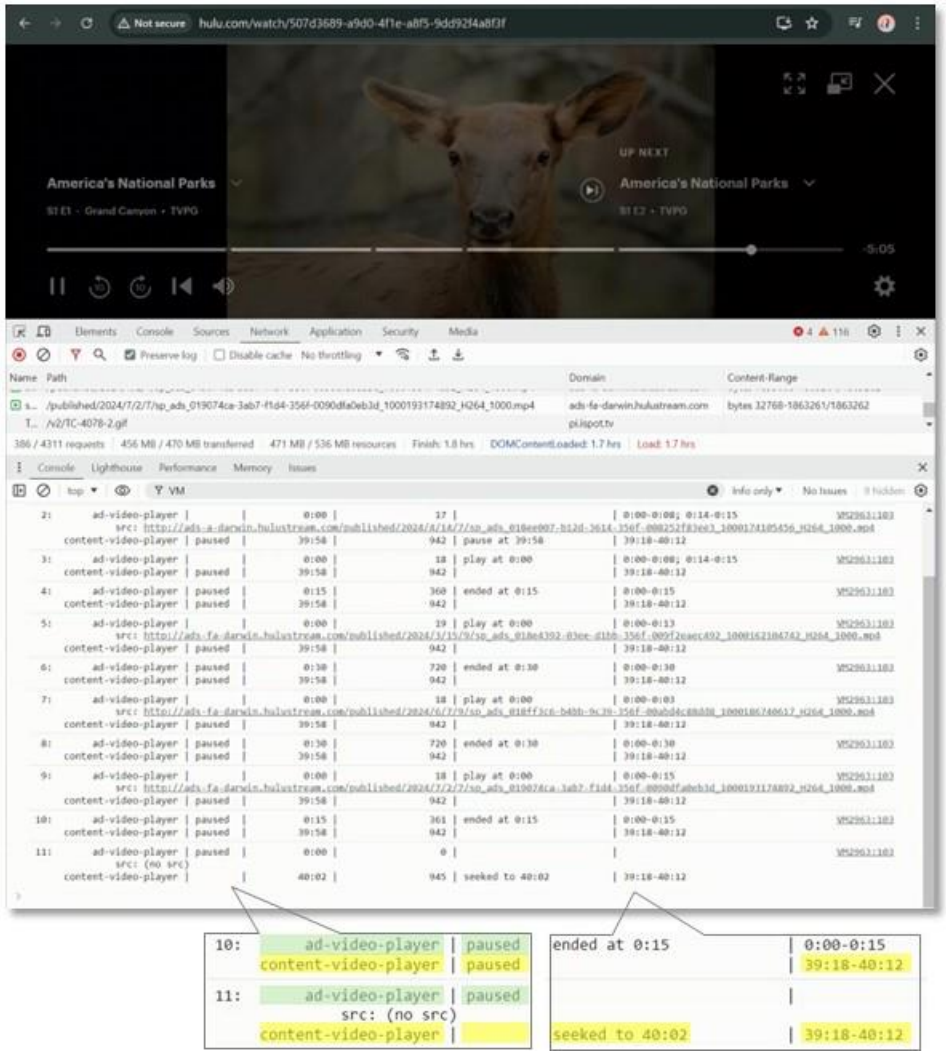
In the example below, Hulu has predetermined advertisement insertion points. As the Hulu client reaches those insertion points, it plays advertisements. Specifically, the Hulu "content-video-player" pauses and the Hulu "ad-video-player" plays advertisements, then the "ad-video-player" pauses and the "content-video-player" resumes playing content. In the example below, at event # 1, the "content-video-player" plays content starting at the 39:22 mark.

U.S. Patent No. 10,986,403	Hulu
	 Screenshot of Hulu user interface on web browser, hulu.com, with debugger tool showing network traffic and console running JavaScript reporting out video-related events. In the example below, at event # 2, the "content-video-player" pauses at 39:58, and at event #s 3-9 the "ad-video-player" plays multiple advertisements while the "content-video-player" remains paused.

U.S. Patent No. 10,986,403	Hulu
	  Screenshot of Hulu user interface on web browser, hulu.com, with debugger tool showing network traffic and console running JavaScript reporting out video-related events. In the example below, at event #10, the last advertisement for the advertisement break has ended, and both “ad-video-player” and “content-video-player” are paused.

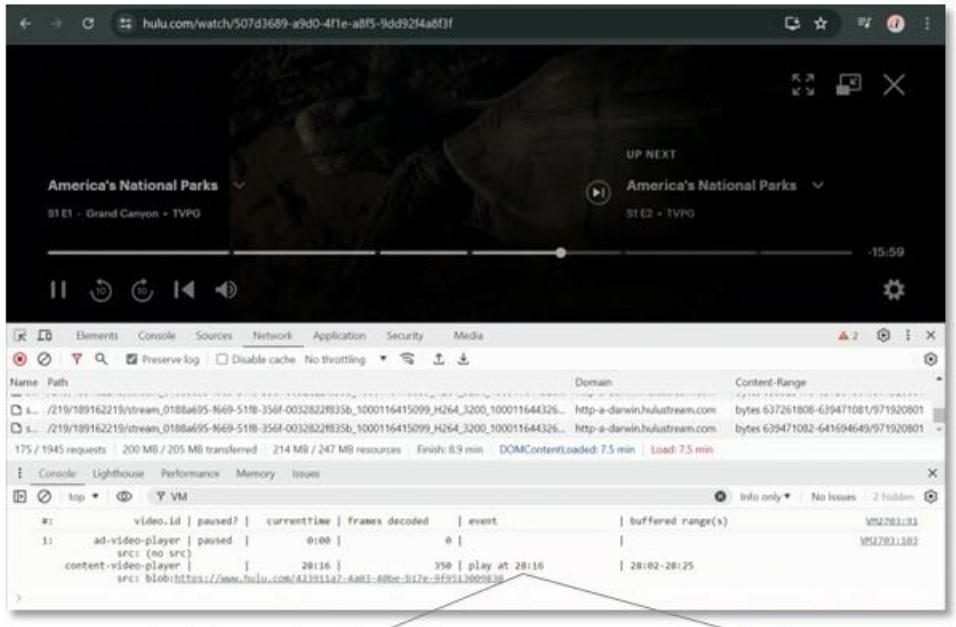
U.S. Patent No. 10,986,403	Hulu
	 Screenshot of Hulu user interface on web browser, hulu.com, with debugger tool showing network traffic and console running JavaScript reporting out video-related events. In the example below, at event # 11, the “ad-video-player” remains paused, and “content-video-player” resumes playing content after the ad break. More specifically, the “content-video-player” jumps forward by less than 1 minute (“seeked to 40:02”) and then

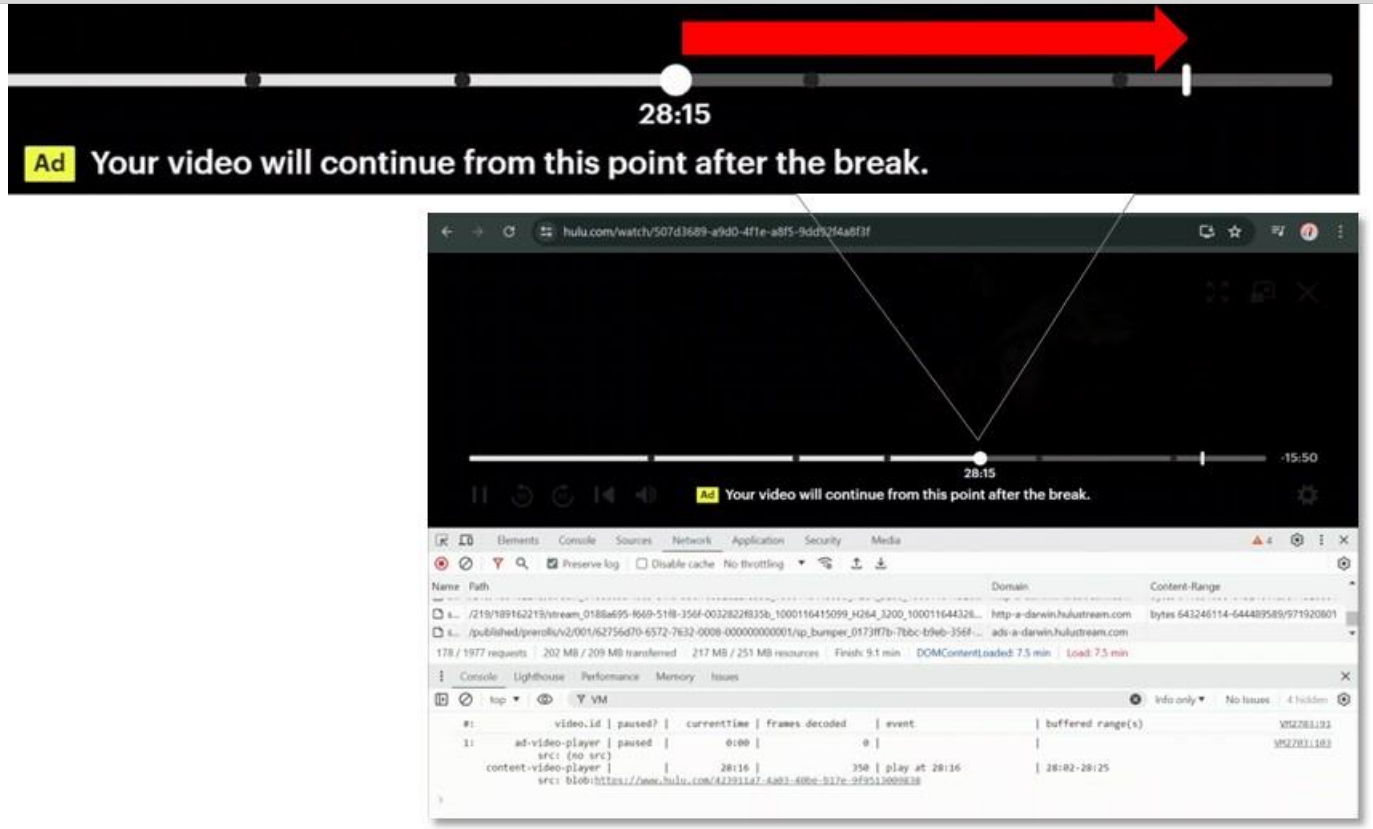
U.S. Patent No. 10,986,403	Hulu
	plays content. The "content-video-player" then has the video content from 39:18 to 40:12 buffered, that is, a continuous range of video content from before and after the ad break (recall that the "content-video-player" started playing at 39:22 at event #1 shown above.

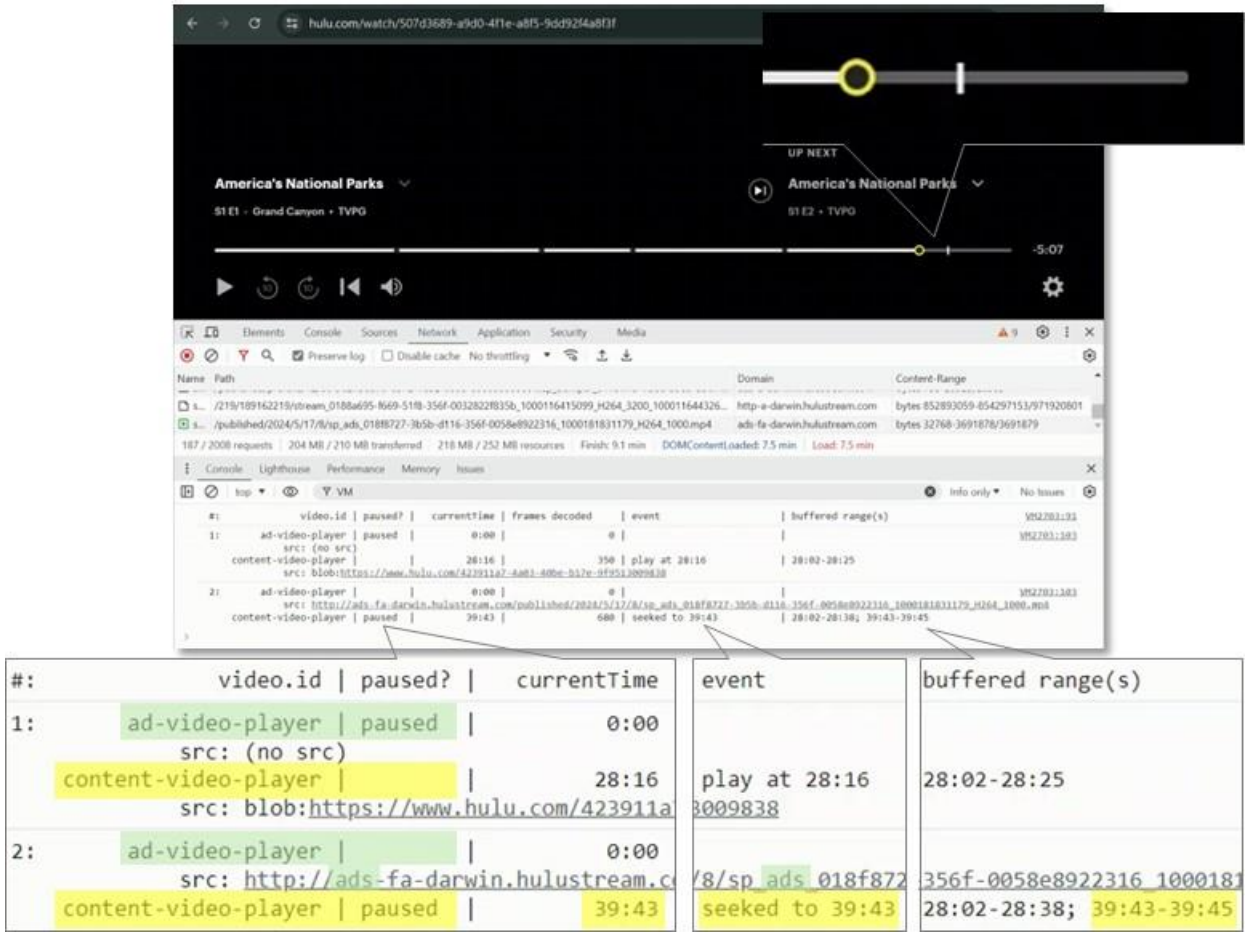


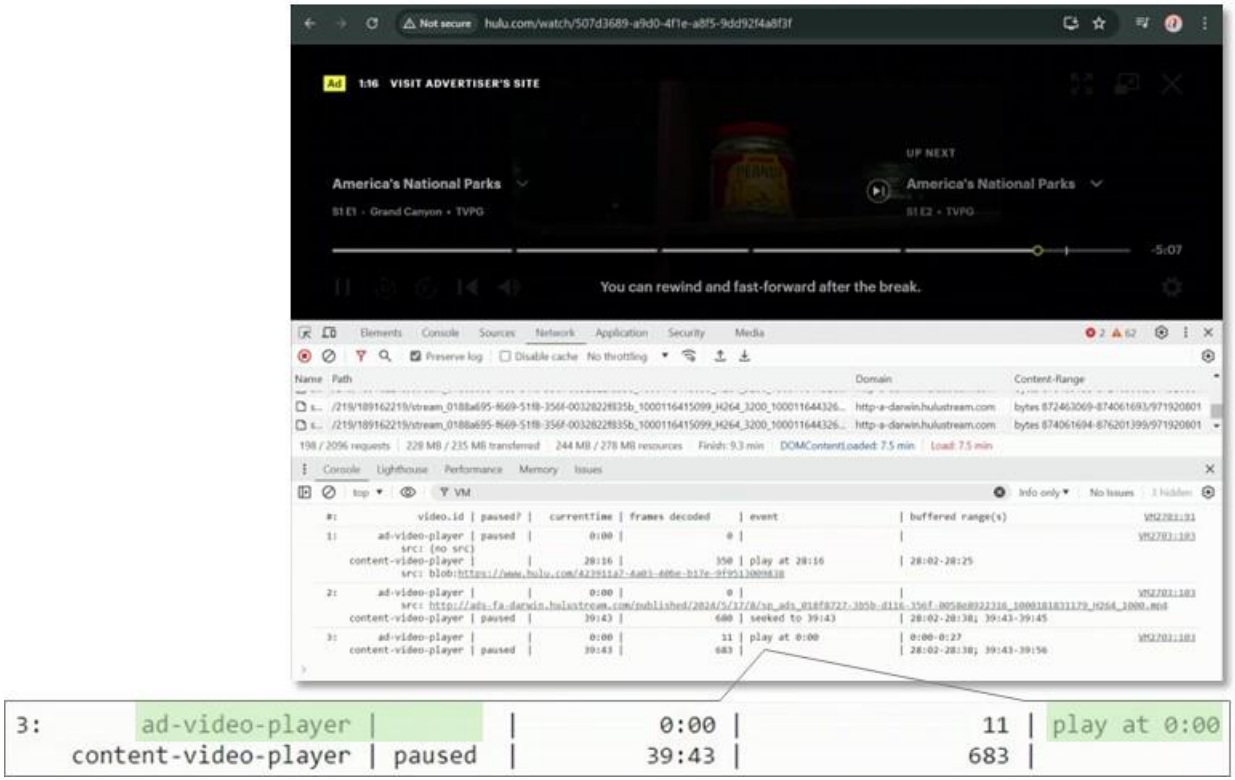
U.S. Patent No. 10,986,403	Hulu
	Screenshot of Hulu user interface on web browser, hulu.com, with debugger tool showing network traffic and console running JavaScript reporting out video-related events. An analysis of proprietary backend systems and/or source code may be necessary to fully and accurately describe the functionality of the Accused Instrumentalities with respect to this limitation and, accordingly, Plaintiff reserves the right to supplement these infringement contentions once such information is made available to Plaintiff.

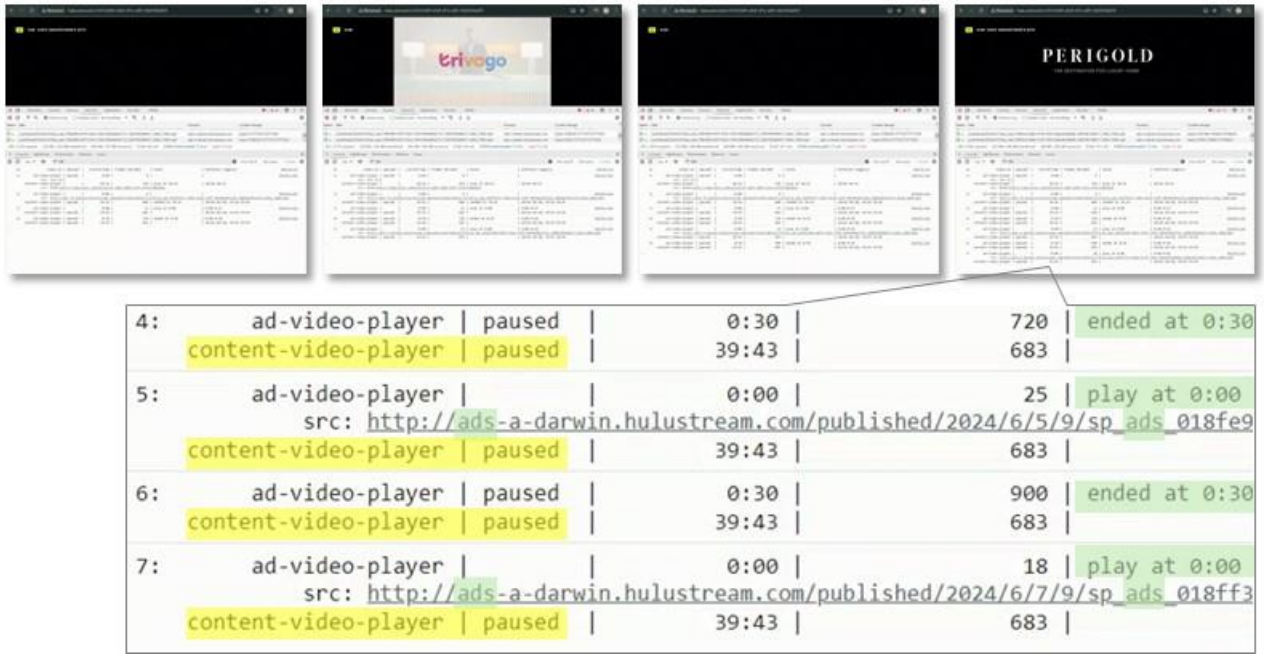
U.S. Patent No. 10,986,403	Hulu
[1d.4] in response to user input updating a current play position in the content stream to a new play position in the content stream, the one or more processors using one or more adaptive preference rules to adaptively modify a presentation position of the digital advertising content from at least one of the one or more initially sequenced insertion points to one or more alternatively sequenced insertion points in the digital media content,	The Accused Instrumentalities' processors use one or more adaptive preference rules to adaptively modify a presentation position of the digital advertising content from at least one of the one or more initially sequenced insertion points to one or more alternatively sequenced insertion points in the digital media content in response to user input updating a current play position. For example, when Hulu controls digital media presentations, it performs the step of adaptively re-sequencing the content stream into a modified content stream to reflect user input. For example, in response to a user jumping back in a live stream and subsequently jumping forward past an ad location in the time bar or attempting to jump forward past an ad location in a VOD stream, Hulu will adaptively re-sequence the content stream to force the user to watch an ad, as required by the ad-presentation rules, even if the play position is in a media section of the time bar in the user interface. The resequencing step is performed by the Hulu system, e.g., by Hulu's Ad Insertion MPD Manipulator and/or the Hulu client. Hulu's adaptive re-sequencing includes updating a current play position to a new play position in the digital media content detected at the digital media player system. When the user attempts to play media content after jumping forward past an ad, the new play position in the media content is reflected in the time bar. The updating step is performed by the Hulu system, e.g., by Hulu's Ad Insertion MPD Manipulator (and its Ad avail processor) and/or the Hulu client (and its processors). In the example below, at event #1, the Hulu client plays content starting at 28:16.

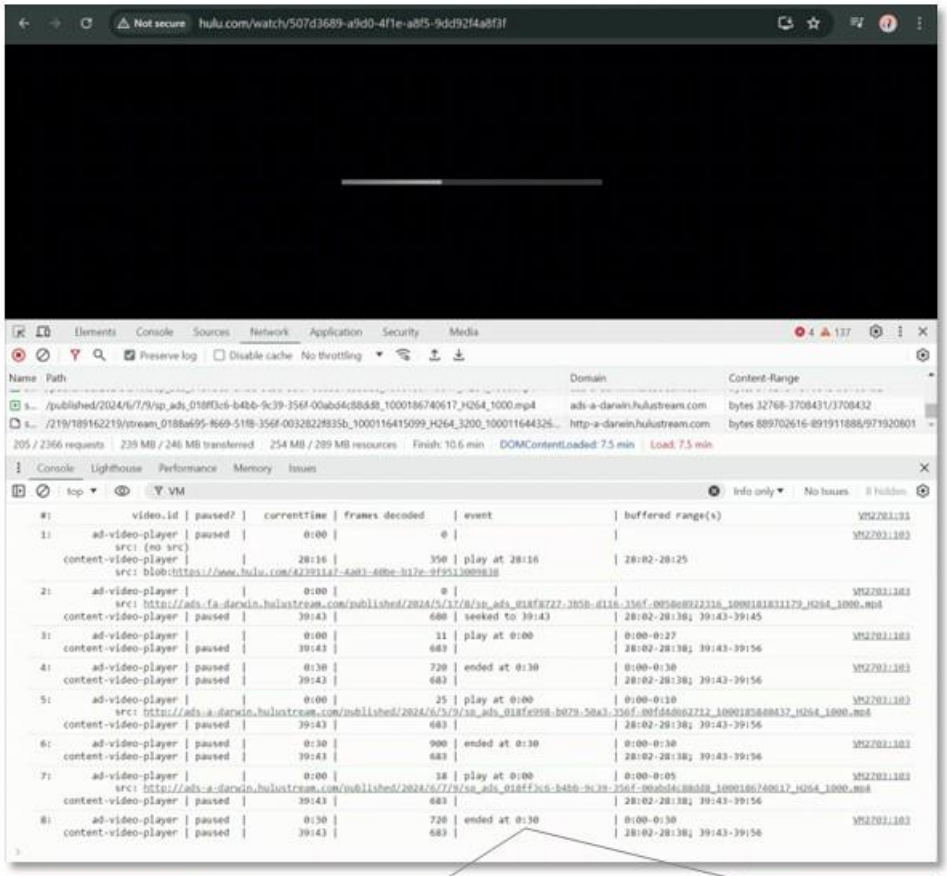
U.S. Patent No. 10,986,403	Hulu
	 Screenshot of Hulu user interface on web browser, hulu.com, with debugger tool showing network traffic and console running JavaScript reporting out video-related events. In the example below, the user moves the slide bar to jump forward, past two of the original ad insertion points.

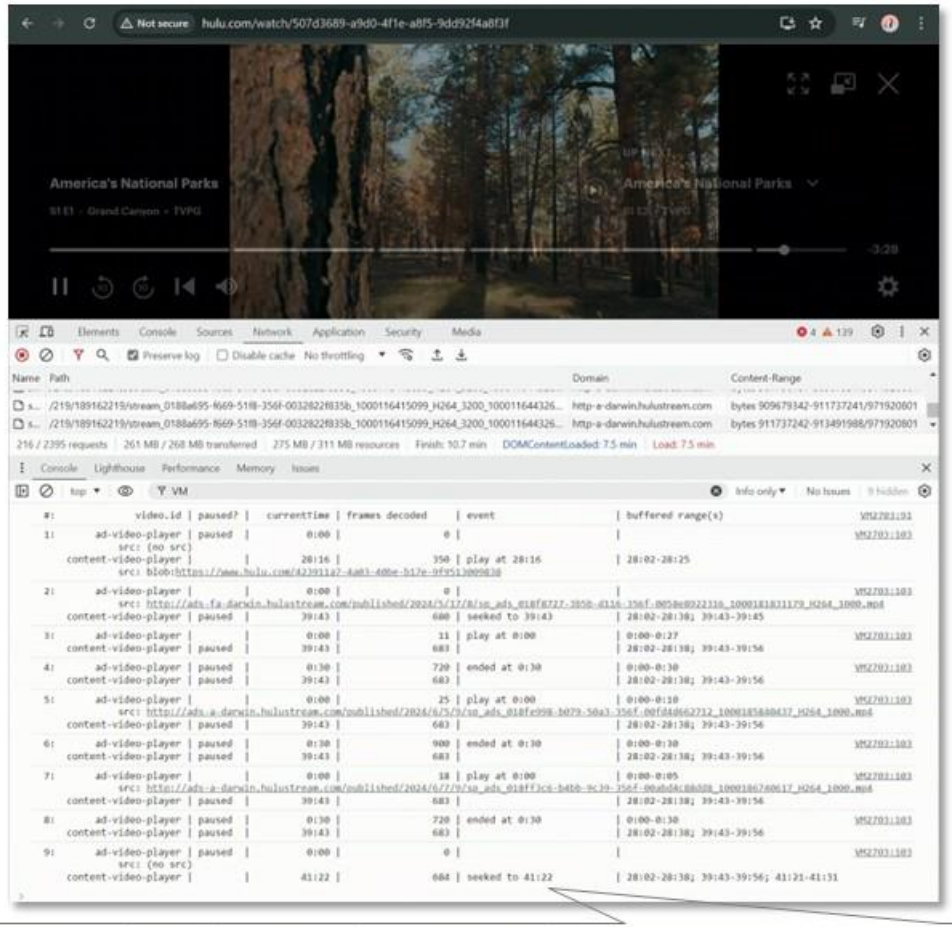
U.S. Patent No. 10,986,403	Hulu
	 Screenshot of Hulu user interface on web browser, hulu.com, with debugger tool showing network traffic and console running JavaScript reporting out video-related events. In the example below, at event # 2, the "ad-video-player" is no longer paused, and has a source ("src") that is an advertisement video file; "content-video-player" has paused, and has jumped ahead ("seeked") to 39:43. In response to the user input updating a current play position in the content stream to a new play position in the content stream that attempts to jump one or more ad insertion points, the processors adaptively modify a presentation position of the advertising content from the initially sequenced insertion point (before the red arrow) to the alternatively sequenced insertion points (after the red arrow). Here, the adaptive preference rules employed by Hulu will force the immediate presentation of the ad when the user selects a play position in the content.

U.S. Patent No. 10,986,403	Hulu
	 Screenshot of Hulu user interface on web browser, hulu.com, with debugger tool showing network traffic and console running JavaScript reporting out video-related events. In the example below, at event #3, the "ad-video-player" starts playing an advertisement at the start of that advertisement (0:00), while the "content-video-player" remains paused.

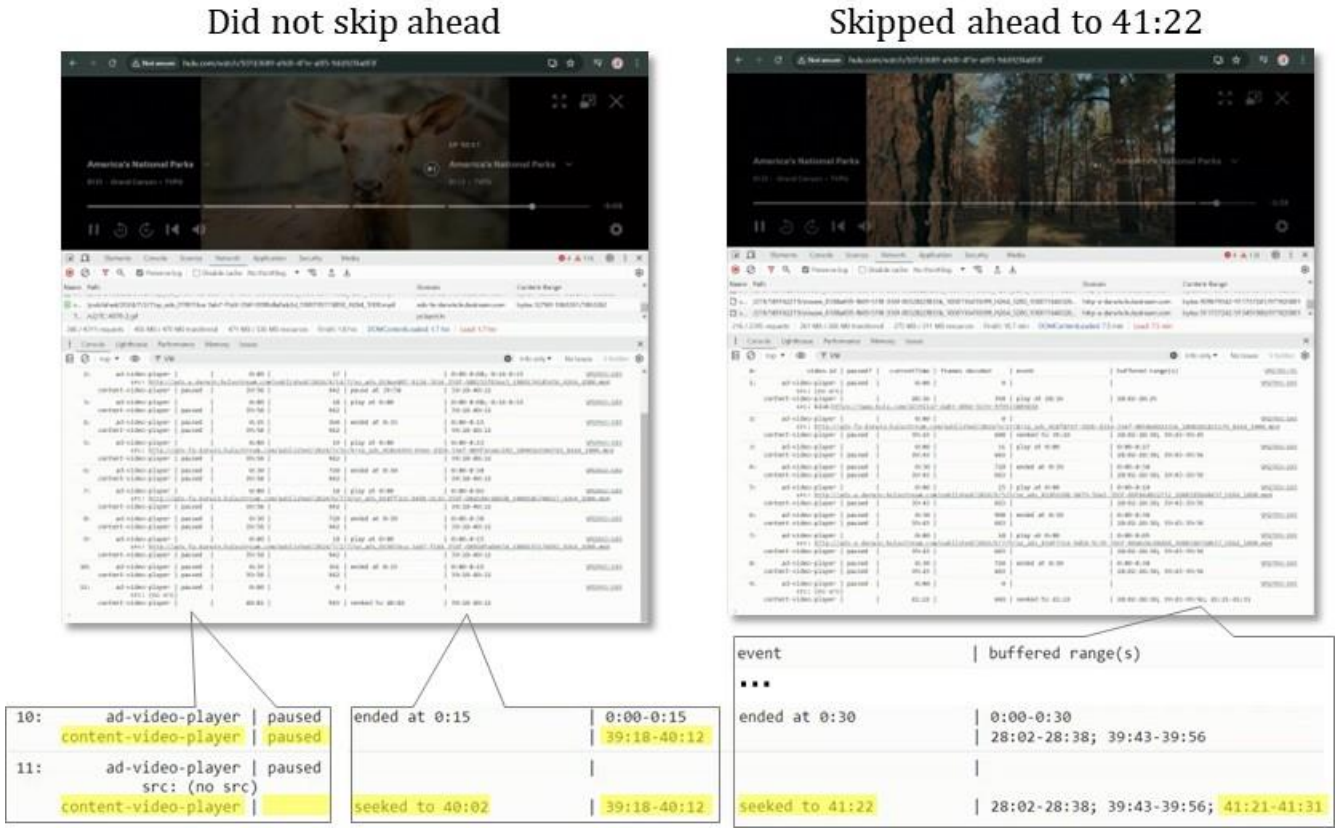
U.S. Patent No. 10,986,403	Hulu
	 Screenshot of Hulu user interface on web browser, hulu.com, with debugger tool showing network traffic and console running JavaScript reporting out video-related events. In the example below, at events #4 through #7, the "content-video-player" remains paused while the "ad-video-player" plays video advertisements from each advertisement's start to end.

U.S. Patent No. 10,986,403	Hulu
	 Screenshot of Hulu user interface on web browser, hulu.com, with debugger tool showing network traffic and console running JavaScript reporting out video-related events. In the example below, at event # 8, the last advertisement for the current ad break has ended, and both “ad-video-player” and “content-video-player” are paused.

U.S. Patent No. 10,986,403	Hulu
	 Screenshot of Hulu user interface on web browser, hulu.com, with debugger tool showing network traffic and console running JavaScript reporting out video-related events. In the example below, at event #9, the “ad video-player” remains paused as “content-video-player” jumps (“seeked”) to 41:22, ahead of where the player was paused (at 39:43 at event #8) in order to resume playing content at the user’s desired new play position.

U.S. Patent No. 10,986,403	Hulu
	 Screenshot of Hulu user interface on web browser, hulu.com, with debugger tool showing network traffic and console running JavaScript reporting out video-related events.

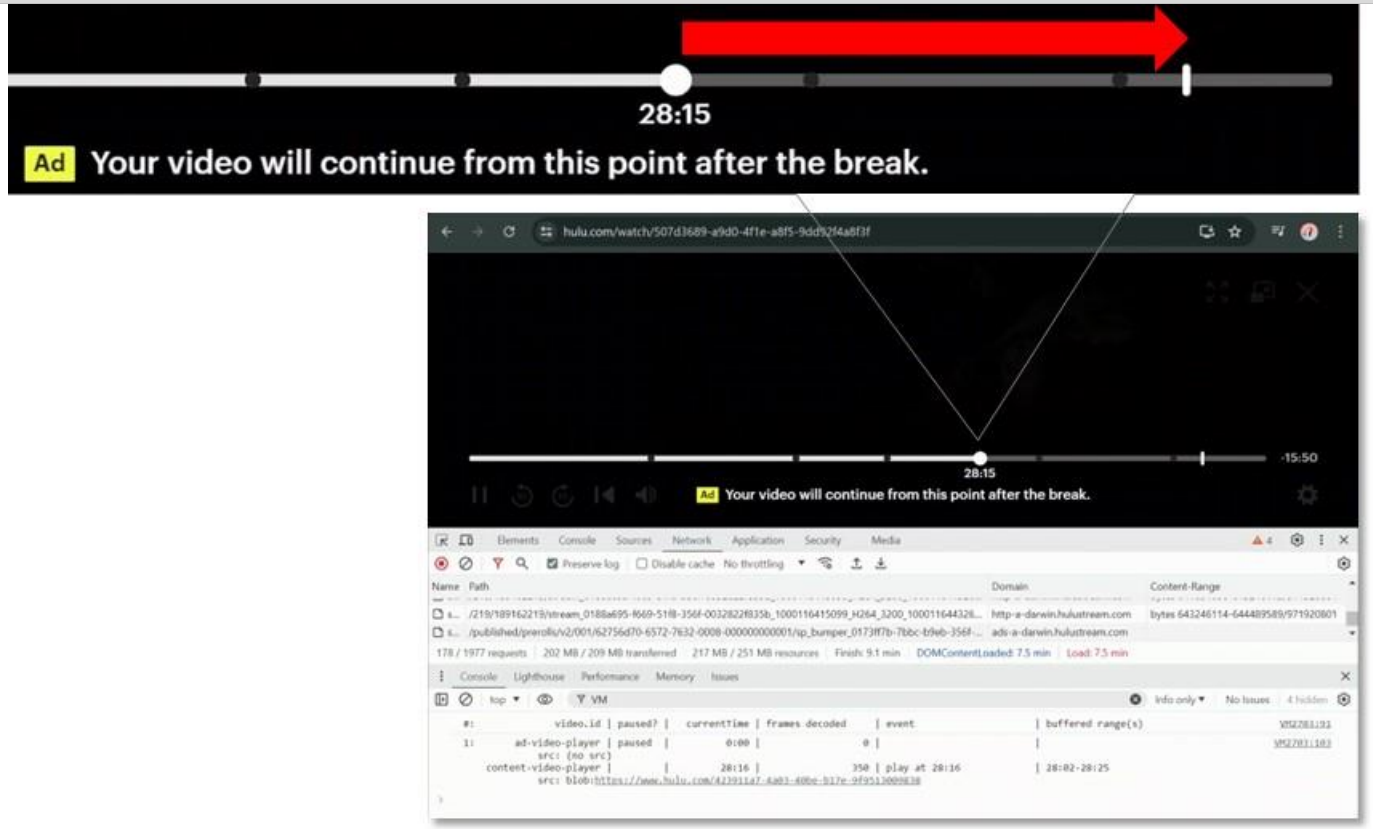
U.S. Patent No. 10,986,403	Hulu
	In contrast to the example shown in [1d.3], when the user skips ahead past the ad break, the "content-video-player" has disjointed time ranges of content buffered. When the user does not skip ahead, the player has a continuous range of content buffered, from before and after the ad break. The Hulu client played content up to the ad insertion point, then played ad files while the content was paused, then resumed playing content. In contrast, when the user skips ahead, the "content-video-player" pauses and the Hulu client switches to displaying an advertisement video file. The "content-video-player" then plays content at the user's desired starting position. The "content-video-player" buffers, but does not play, a small amount (13 seconds from 39:43-39:56 in the example below) of content from the original ad insertion point, then buffers content as needed for playing content starting from the user-selected new play position.

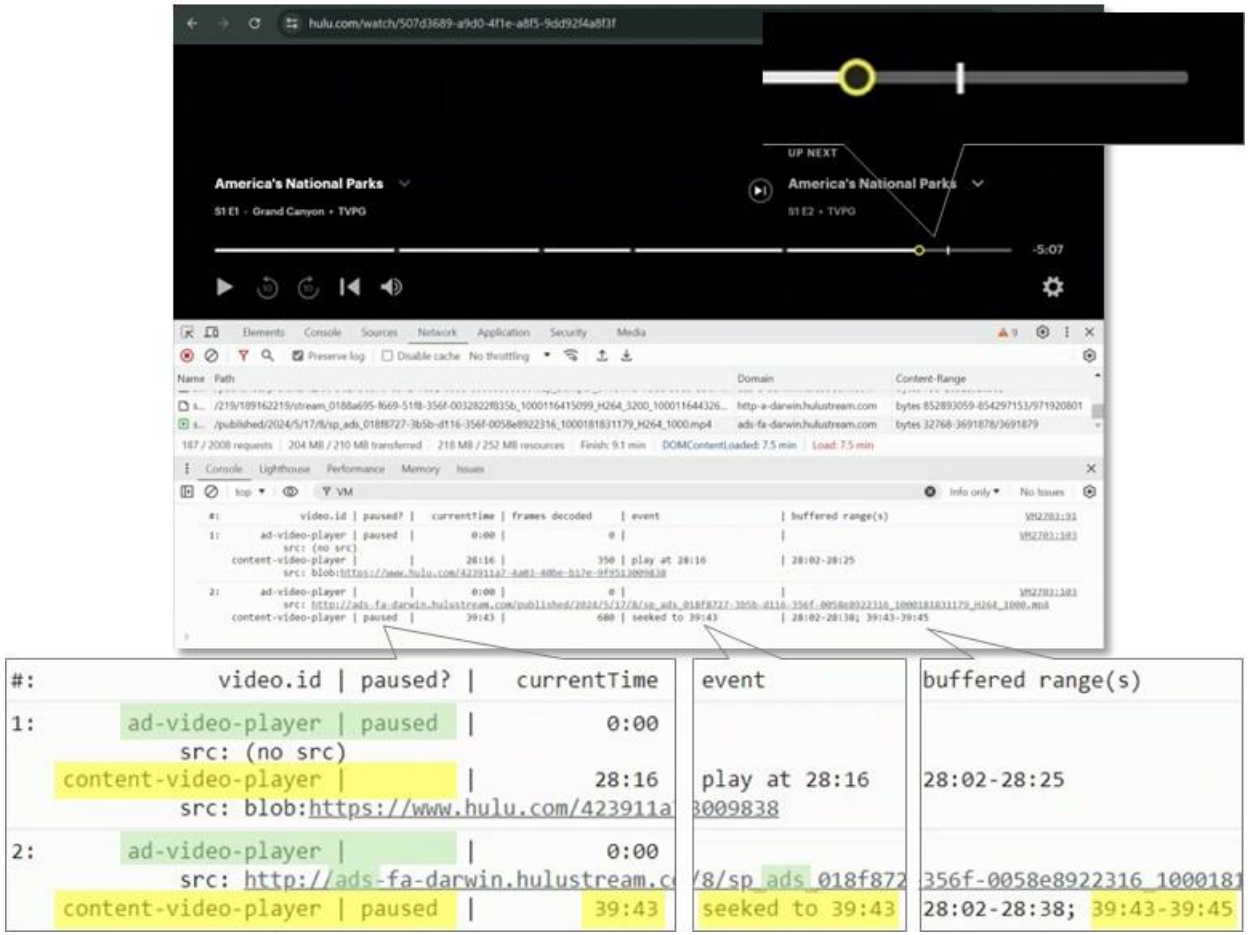


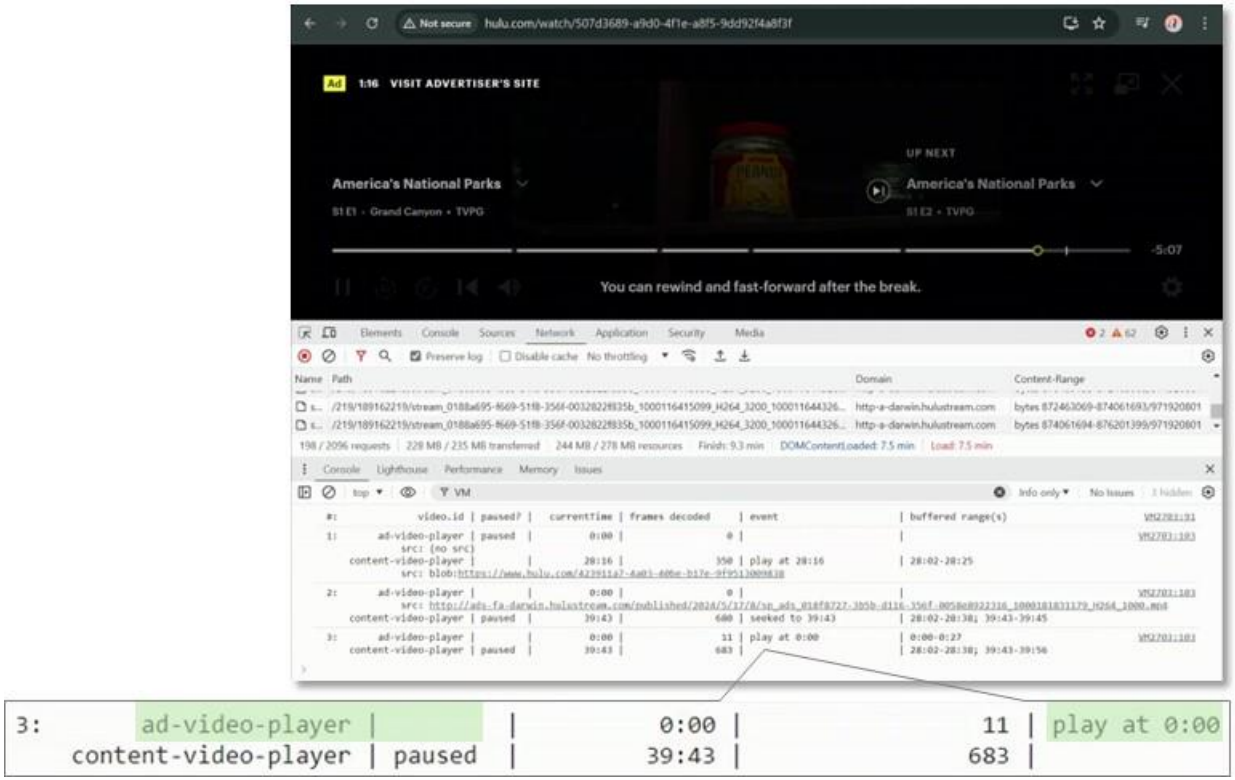
Screenshot of Hulu user interface on web browser, hulu.com, with debugger tool showing network traffic and console running JavaScript reporting out video-related events.

U.S. Patent No. 10,986,403	Hulu
	An analysis of proprietary backend systems and/or source code may be necessary to fully and accurately describe the functionality of the Accused Instrumentalities with respect to this limitation and, accordingly, Plaintiff reserves the right to supplement these infringement contentions once such information is made available to Plaintiff.
[1d.5] at least one of the one or more alternatively sequenced insertion points being different than the one or more initially sequenced insertion points relative to the digital media content within the content stream;	At least one of the one or more alternatively sequenced insertion points of the Accused Instrumentalities is different from the one or more initially sequenced insertion points relative to the digital media content within the content stream. The initially sequenced insertion points result in advertisement files being played after a pre-designated time in the content's timeline, but the alternatively sequenced insertion points result in advertisement files being played at a different time in the content's timeline. For example, in the example shown in [1d.3], when the user does not jump ahead and the player uses the initially sequenced insertion points, the "content-video-player" plays content right up until the ad insertion point (39:58 in the example below), then pauses while "ad-video-player" plays advertisements, then resumes. In contrast, when the user skips ahead, the alternatively sequenced insertion points are different relative to the digital media content because, for example, the "content-video-player" plays content only until the user selects a new play position (shortly after the timeline shows 28:15 in the example below), and does not play content in the time range before the initially sequenced insertion point, then pauses while the "ad-video-player" plays advertisements, then plays content from the users' desired starting point. In the example below, at event # 2, the "content-video-player" pauses at 39:58, and at event #s 3-9 the "ad-video-player" plays multiple ads while the "content-video-player" remains paused.

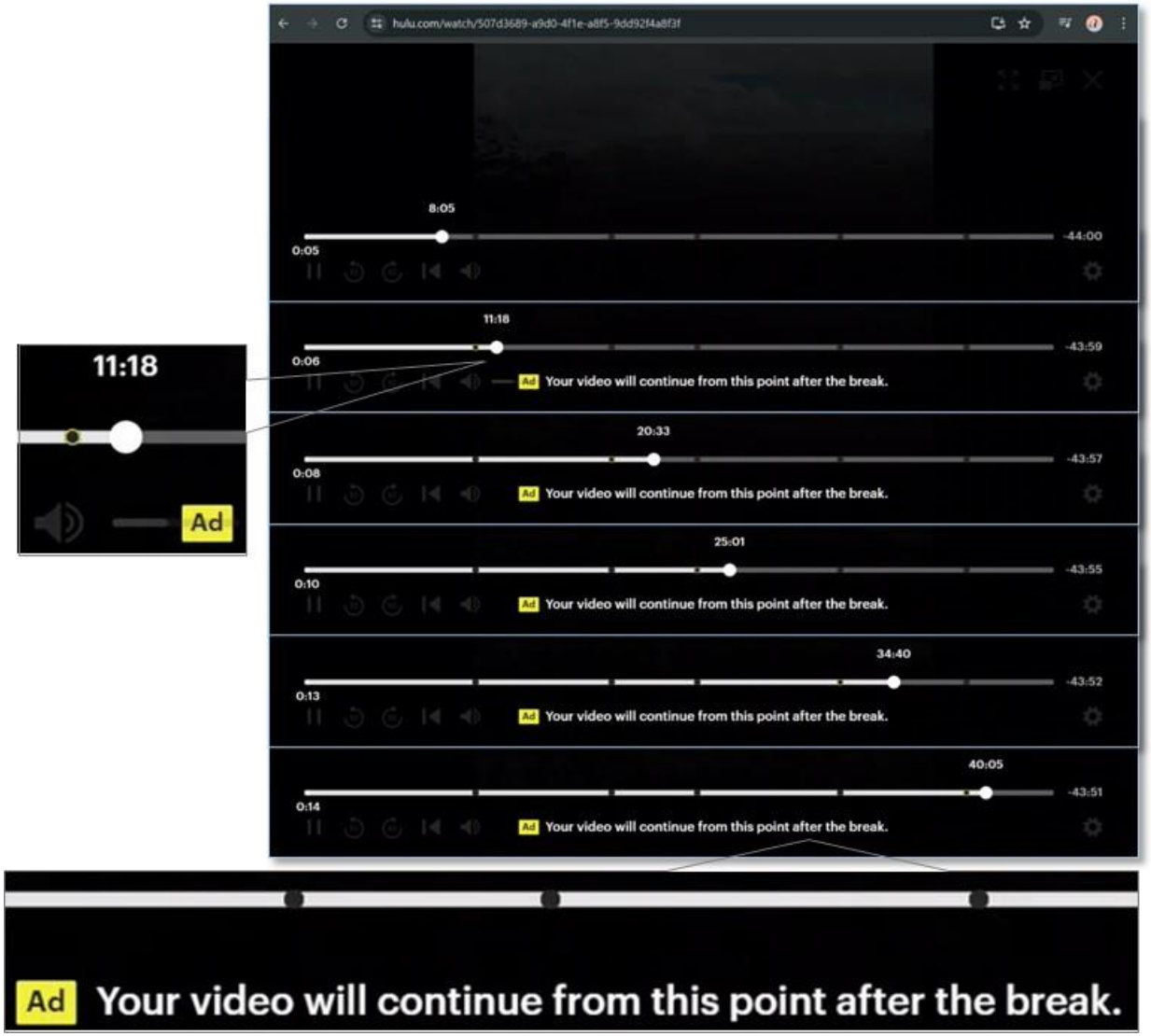
U.S. Patent No. 10,986,403	Hulu
	   Screenshot of Hulu user interface on web browser, hulu.com, with debugger tool showing network traffic and console running JavaScript reporting out video-related events. In contrast, when the user skips ahead, the "content-video-player" does not play content up to the original ad insertion point at 39:58. Instead, at this example, the "content-video-player" plays content up until shortly after 28:15, then pauses.

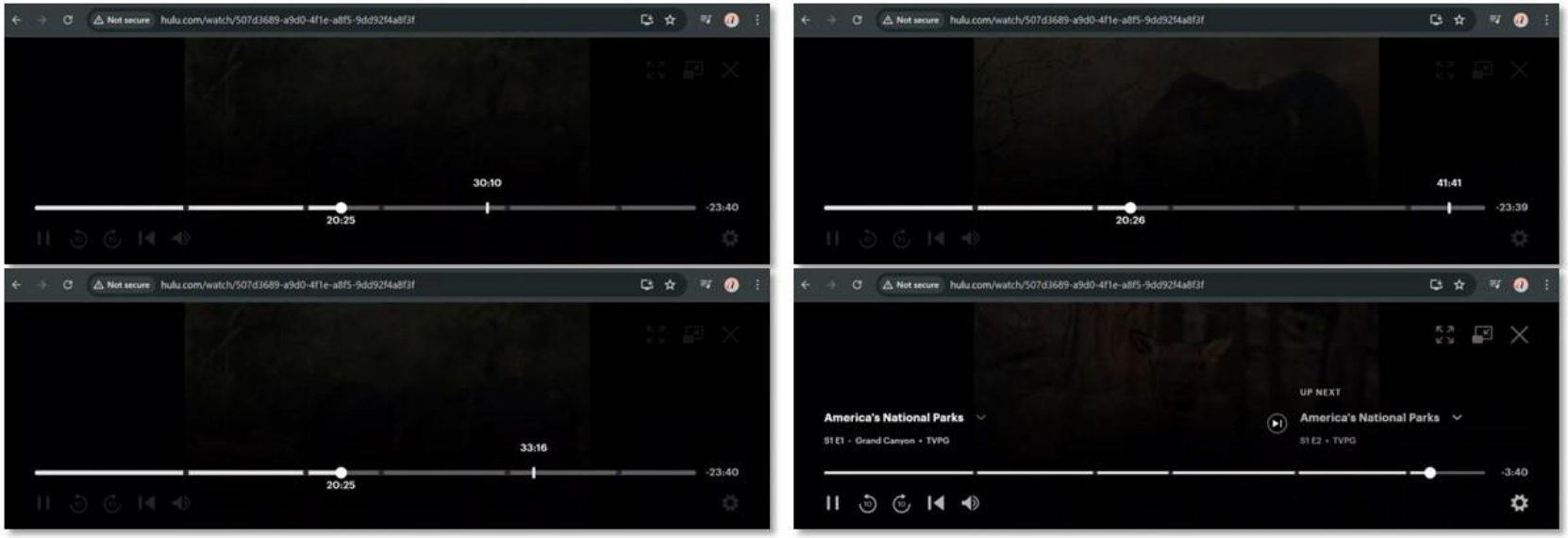
U.S. Patent No. 10,986,403	Hulu
	 Screenshot of Hulu user interface on web browser, hulu.com, with debugger tool showing network traffic and console running JavaScript reporting out video-related events. In the example below, at event # 2, the “ad-video-player” is no longer paused, and has a source (“src”) that is an advertisement video file; “content-video-player” has paused, and has jumped ahead (“seeked”) to 39:43, but does not play any content at 39:43.

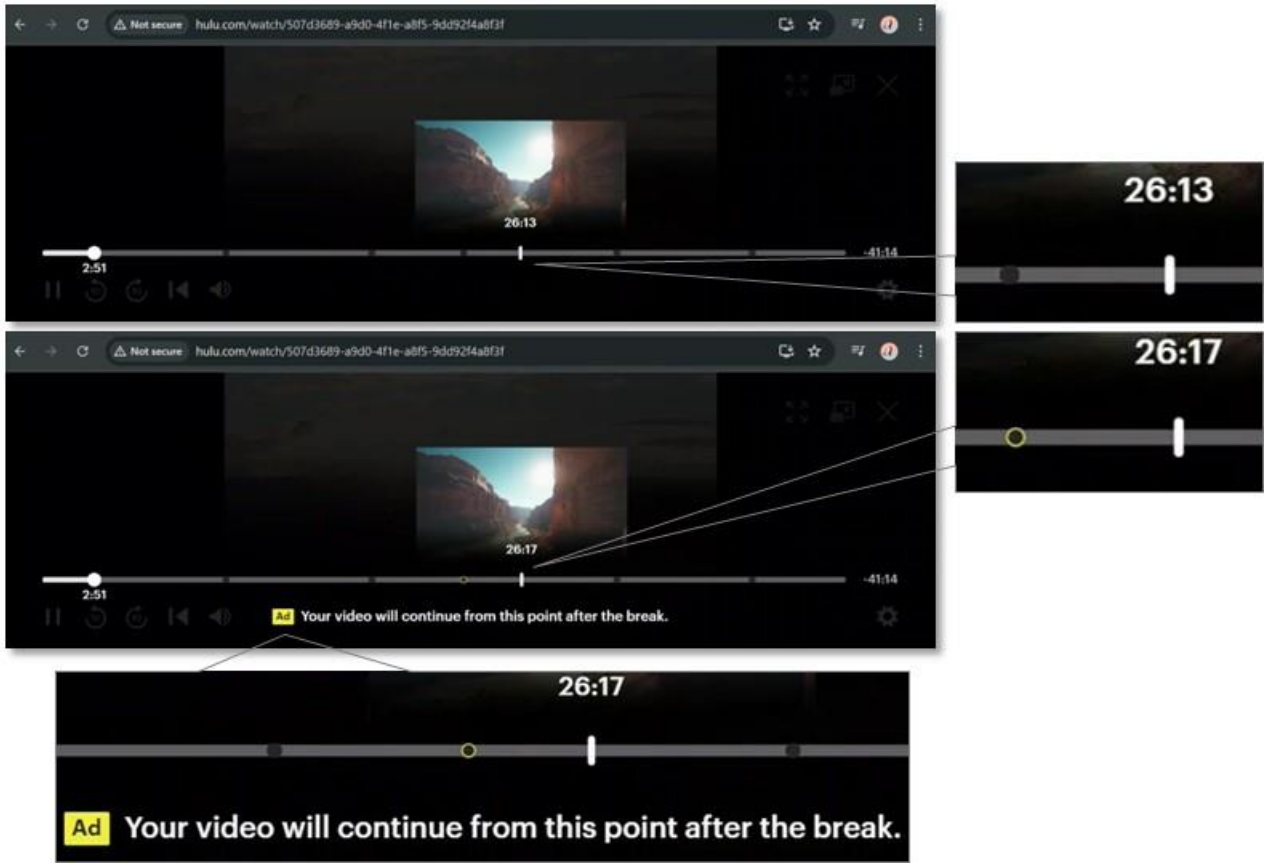
U.S. Patent No. 10,986,403	Hulu
	 Screenshot of Hulu user interface on web browser, hulu.com, with debugger tool showing network traffic and console running JavaScript reporting out video-related events. In the example below, at event #3, the "ad-video-player" starts playing an advertisement at 0:00, while the "content-video-player" remains paused.

U.S. Patent No. 10,986,403	Hulu
	 Screenshot of Hulu user interface on web browser, hulu.com, with debugger tool showing network traffic and console running JavaScript reporting out video-related events. An analysis of proprietary backend systems and/or source code may be necessary to fully and accurately describe the functionality of the Accused Instrumentalities with respect to this limitation and, accordingly, Plaintiff reserves the right to supplement these infringement contentions once such information is made available to Plaintiff.

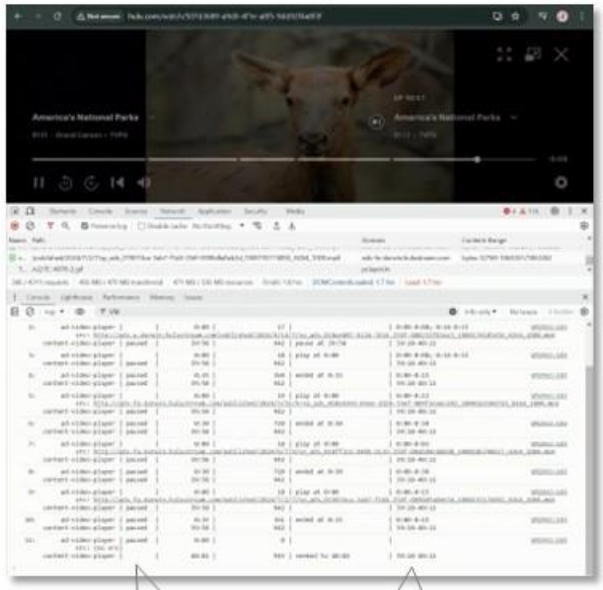
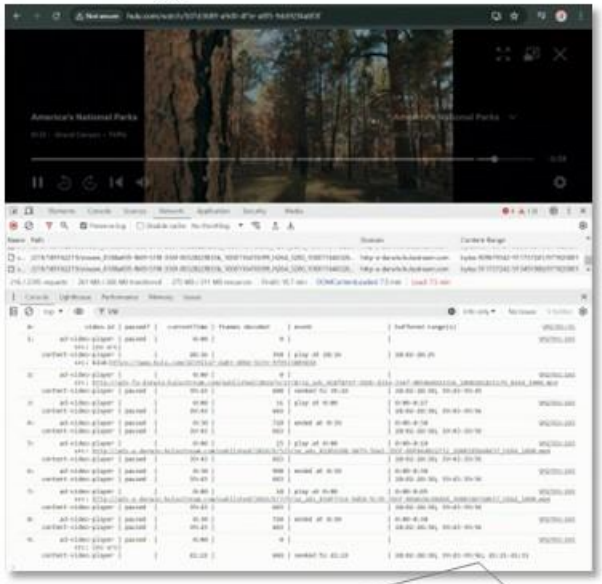
U.S. Patent No. 10,986,403	Hulu
[1d.6] the one or more alternatively sequenced insertion points being adaptively selectable by the intersplicer according to selection criteria defined by the one or more adaptive preference rules taking into account the new play position and at least one of a length of time associated with playing the digital media content and a number of digital media data blocks of the digital media content to be played,	The one or more alternatively sequenced insertion points of the Accused Instrumentalities are adaptively selectable by the intersplicer according to selection criteria defined by the one or more adaptive preference rules taking into account the new play position and at least one of a length of time associated with playing the digital media content and a number of digital media data blocks of the digital media content to be played. Hulu adaptively determines the alternate insertion position of the advertising block from the new playback position selected by the user. The determining step is performed by Hulu's system, e.g., by Hulu's Ad Insertion MPD Manipulator and/or the Hulu client. The adaptive preference placement rules of the Accused Instrumentalities can be observed during playback of digital media content on the Hulu user interface. For example, one adaptive preference rule of the Accused Instrumentalities takes into account the new play position. For example, in the example shown in [1d.5], upon selection of a new play position that jumps over an initially sequenced insertion point, Hulu plays the ad immediately, at the new play position. As another example from the example shown in [1d.5], the initially sequenced insertion points result in advertisement files being played after a pre-designated time in the content's timeline (39:58 in the example shown in [1d.5], but the alternatively sequenced insertion points result in advertisement files being played at a different time in the content's timeline (for example, immediately after the new play position of 41:22, in the example shown in [1d.5]). In the example below, Hulu's adaptive placement preference rules select which of the original ad insertion points will be adjusted for an alternate insertion position based on the media that has been played (an example of "a length of time associated with playing the digital media content"), and a point in time the media is to be played (an example of "content to be played"). Specifically, the preference rules select the original ad insertion point that is both after the current content play position and closest to the end of the content.

U.S. Patent No. 10,986,403	Hulu
	 Screenshot of Hulu user interface on web browser, hulu.com. In the example below, for a limited time after a user has watched a block of ads, Hulu's adaptive placement preference rules allow

U.S. Patent No. 10,986,403	Hulu
	a user to jump past an initial ad insertion point without watching additional ads. In the example below, the user is able to jump to anywhere in the content without watching additional ads.  Screenshot of Hulu user interface on web browser, hulu.com. In the example below, the limited time for jumping anywhere in the content without watching additional ads expires. Specifically, it expires between the time the user selected 26:13 in the time bar and the user selected 26:17 in the time bar a moment later. The expiration is flagged by the circle for the ad break becoming yellow and a message appearing with a yellow rectangle highlighting the word “Ad”.

U.S. Patent No. 10,986,403	Hulu
	 Screenshot of Hulu user interface on web browser, hulu.com. One adaptive preference rule of the Accused Instrumentalities allows a user to jump an initially sequenced insertion point if the jump is made a few seconds after watching the advertisements from another insertion point. If the user moves the play position from before to after an initially sequenced insertion point, the Hulu user interface requires the user to watch advertisements at the new play position. However, if the user, immediately after the block of advertisements ends, jumps past the second initially sequenced insertion point, rather than requiring the user to watch another advertising block, which is usually what happens when a user jumps an insertion point, the Accused Instrumentalities allow the user to continue watching digital media content from the new play position.

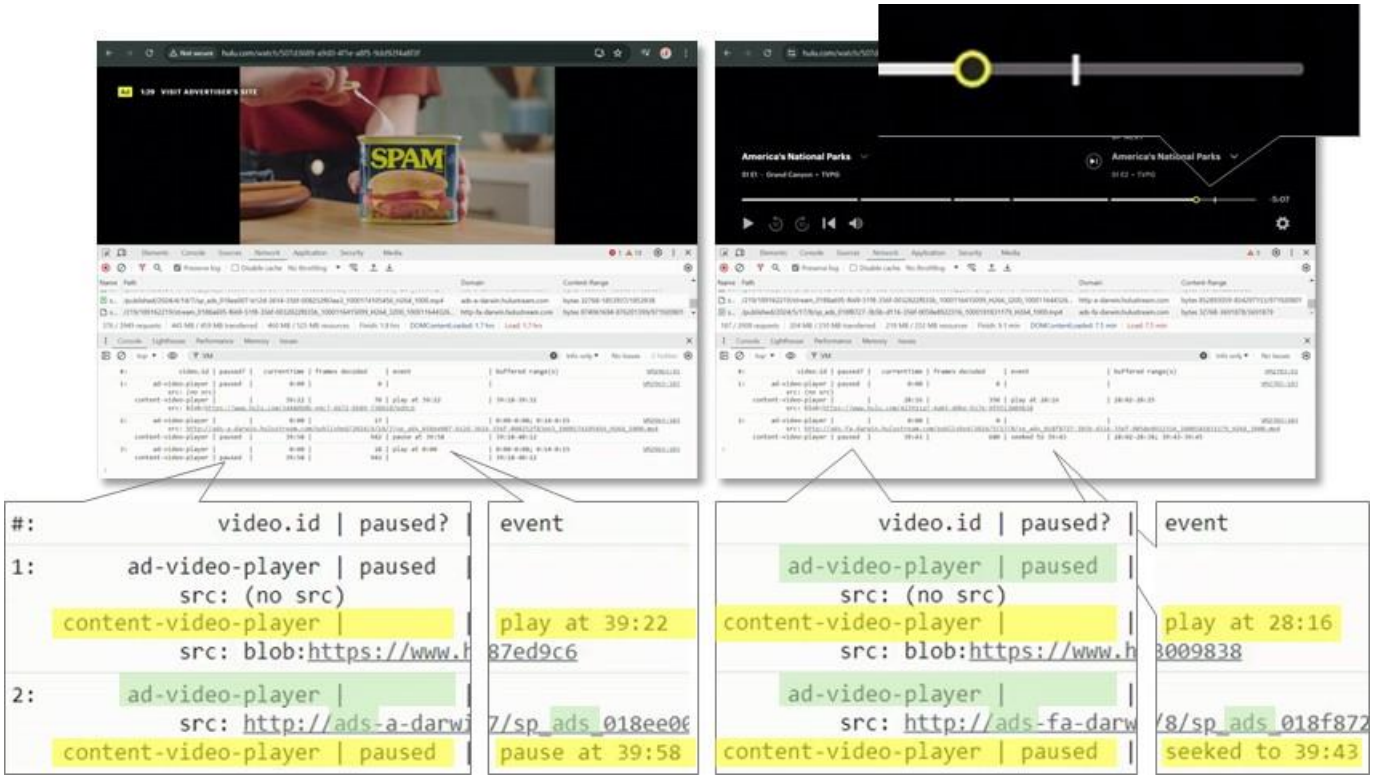
U.S. Patent No. 10,986,403	Hulu
	The intersplicer implemented an adaptive preference rule for the second jump that exempted the user from having to watch another set of ads. Under this adaptive preference rule, the intersplicer takes into account the new play position and the claimed "length of time associated with playing the digital media content," because a user can only be exempted from watching another advertising block if they make the second jump within a few seconds of finishing the advertising content. Similarly, the intersplicer takes into account the claimed "number of digital media data blocks of the digital media content to be played," because, for example, a user can only be exempted from watching another advertising block if they make the second jump within a few seconds of finishing the advertising content. As set forth above, when the Hulu intersplicer determines the alternate insertion position, it does so using one or more adaptive preference placement rules taking into account the new play position and at least one of a length of time associated with playing the digital media content, a number of digital media data blocks of the digital media content to be played, and a point in time the digital media content is to be played. An analysis of proprietary backend systems and/or source code may be necessary to fully and accurately describe the functionality of the Accused Instrumentalities with respect to this limitation and, accordingly, Plaintiff reserves the right to supplement these infringement contentions once such information is made available to Plaintiff.

U.S. Patent No. 10,986,403	Hulu
[1d.7] such that at least one of the alternatively sequenced insertion points is positioned at a play position in the digital media content that satisfies a condition selected from: the play position being a predetermined length of time after the new play position, the play position being a predetermined number of digital media data blocks after the new play position; and	At least one of the alternatively sequenced insertion points of the Accused Instrumentalities is positioned at a play position in the digital media content that satisfies a condition selected from the play position being a predetermined length of time after the new play position, the play position being a predetermined number of digital media data blocks after the new play position. For example, in the example shown in [1d.3], the initially sequenced insertion points result in advertisement files being played immediately after a pre-designated time in the content's timeline (39:58 in the example shown in [1d.3], but the alternatively sequenced insertion points result in advertisement files being played immediately after a different time in the content's timeline (for example, immediately after the new play position of 41:22 in the example shown in [1d.4]). *See, e.g.*, [1d.3, 1d.4, and 1d.5]. Did not skip ahead  10: ad-video-player | paused content-video-player | paused 11: ad-video-player | paused src: (no src) content-video-player | ended at 0:15 | 0:00-0:15 | 39:18-40:12 | seeked to 40:02 | 39:18-40:12 Skipped ahead to 41:22  event | buffered range(s) ... ended at 0:30 | 0:00-0:30 | 28:02-28:38; 39:43-39:56 | seeked to 41:22 | 28:02-28:38; 39:43-39:56; 41:21-41:31

U.S. Patent No. 10,986,403	Hulu
	Screenshot of Hulu user interface on web browser, hulu.com, with debugger tool showing network traffic and console running JavaScript reporting out video-related events. Thus, in the examples shown above, the alternate insertion position of the advertising block results in an ad play position that is a predetermined length of zero time after the new play position and zero digital media data blocks after the new play position. An analysis of proprietary backend systems and/or source code may be necessary to fully and accurately describe the functionality of the Accused Instrumentalities with respect to this limitation and, accordingly, Plaintiff reserves the right to supplement these infringement contentions once such information is made available to Plaintiff.
[1e] a user interface output for causing presentation of the content stream during a play period associated with one or more states of play such that a part of the digital advertising content is adaptively played at the one or more alternatively sequenced insertion points, instead of at the one or more initially sequenced insertion points; and	The Accused Instrumentalities include a user interface output for causing presentation of the content stream during a play period associated with one or more states of play such that a part of the digital advertising content is adaptively played at the one or more alternatively sequenced insertion points, instead of at the one or more initially sequenced insertion points. When Hulu controls digital media presentations it performs the step of causing presentation of the modified content stream at the digital media player system during a play period associated with one or more states of play. The modified content with the new advertising block position is played when the user attempts to start playback of content at the position indicated by the red arrow. In the example shown below, when the Hulu client plays the ad, the word “Ad” is displayed to the user, and the user is unable to navigate past the ad, reflecting a state of play during an ad. This “causing presentation” step is performed by Hulu’s system, e.g., by the Ad Insertion MPD Manipulator and/or the Hulu client.

U.S. Patent No. 10,986,403	Hulu
	 Screenshot of Hulu user interface on web browser, hulu.com. When Hulu controls digital media presentations it performs the step of causing adaptive presentation of a required part of the digital advertising content at the alternate insertion point, instead of the initially defined insertion position. Hulu plays the ad at the alternate insertion point corresponding to wherever the user has positioned the new playback position within the media section, instead of playing the ad at its initially defined insertion portion. For example, Hulu may force the user to watch the entire advertisement, thus the required part of the digital advertising content is the entire ad. The "causing adaptive presentation" step is performed by Hulu's system, e.g., by Hulu's Ad Insertion MPD Manipulator and/or the Hulu client. The Hulu user interface also demonstrates the Accused Instrumentalities cause presentation of the modified content stream at the digital media player system during a play period associated with one or more states of play such that the adaptive presentation of a required part of the digital advertising content is at the alternate insertion point, instead of the initially defined insertion position. As shown in the examples described in [1d.3, 1d.4, and 1d.5], the initially sequenced insertion points result in advertisement files being played after a pre-designated time in the content's timeline (39:58 in the example shown in [1d.3]), but the alternatively

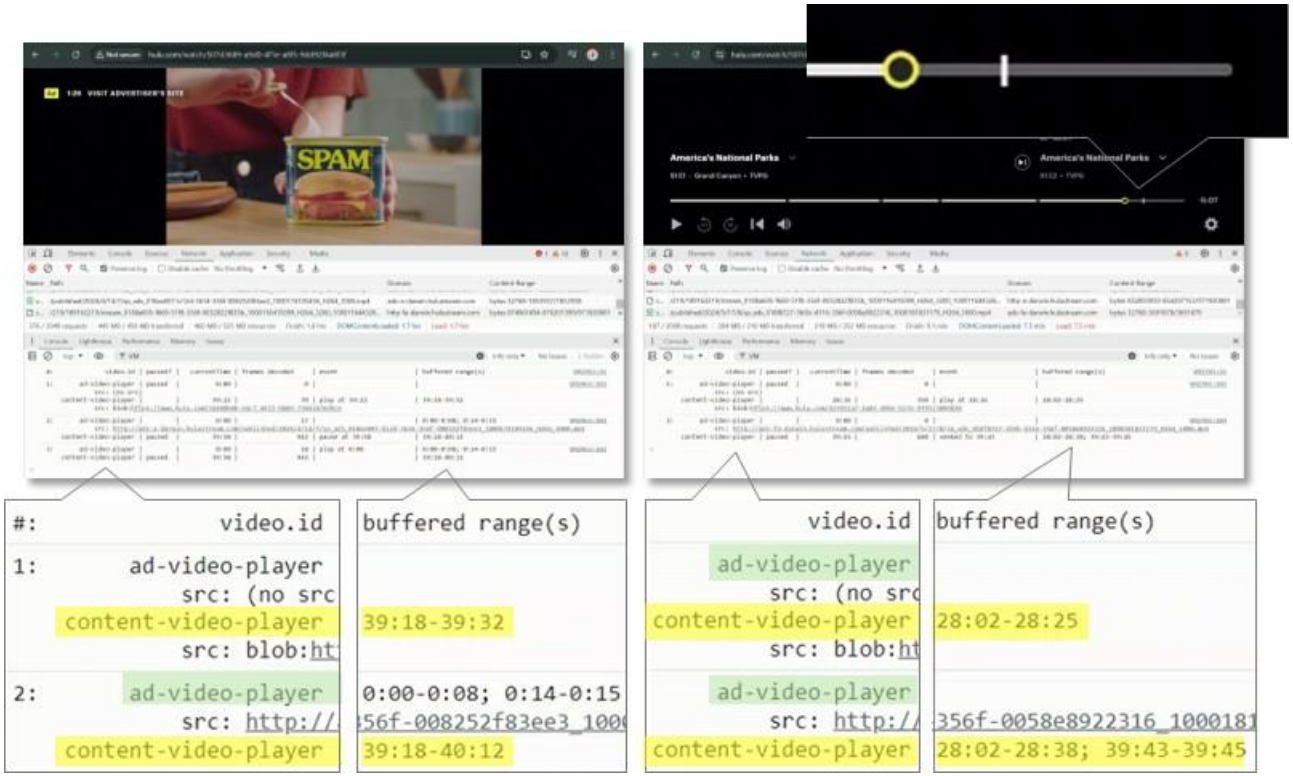
U.S. Patent No. 10,986,403	Hulu
	sequenced insertion points result in advertisement files being played at a different time in the content's timeline (for example, immediately after the new play position of 41:22 in the example shown in [1d.4]) In the example below, when Hulu uses the initially sequenced insertion point, Hulu plays content from 39:22 until pausing the content at 39:58, then plays ads. In contrast, when Hulu uses the alternatively sequenced insertion point, Hulu plays content from 28:16, then pauses, stops playing content before 29:00, and plays ads. The "content-video-player" skips ahead to 39:43 but does not play content at 39:43.



Screenshot of Hulu user interface on web browser, hulu.com, with debugger tool showing network traffic and console running JavaScript reporting out video-related events.

In the example shown above and below, when Hulu uses the initially sequenced insertion point, Hulu plays content from the 39-minute range, then plays ads, then resumes playing content through the 40-minute range. Accordingly, the buffered range of content for "content-video-player" covers the entire 39:18 - 40:12 timeframe in one continuous range. In contrast, when Hulu uses the alternatively sequenced insertion point, the buffered ranges of content for "content-video-player" are disjointed because the

U.S. Patent No. 10,986,403	Hulu
	"content-video-player" played content in the 28-minute range, but not the 29 to 39 minute range, before pausing to play ads.

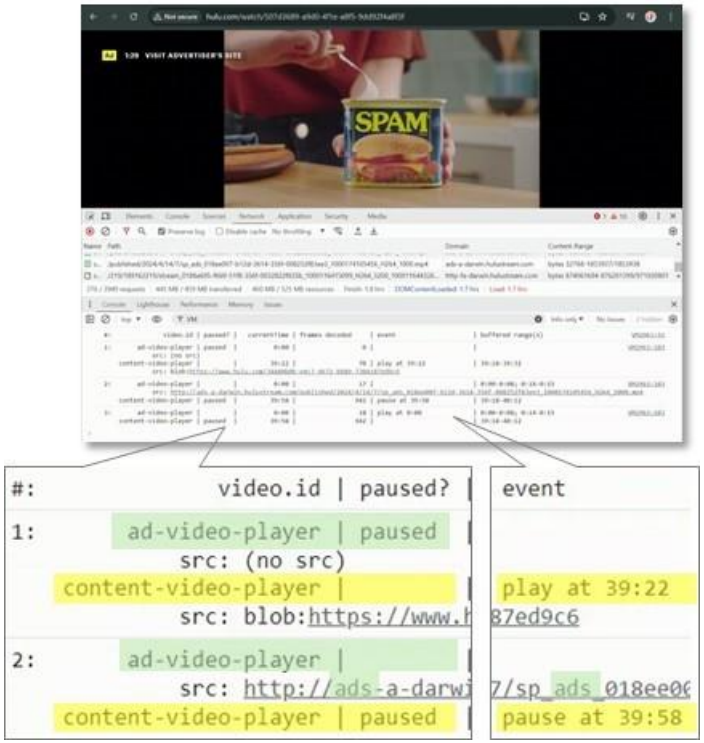


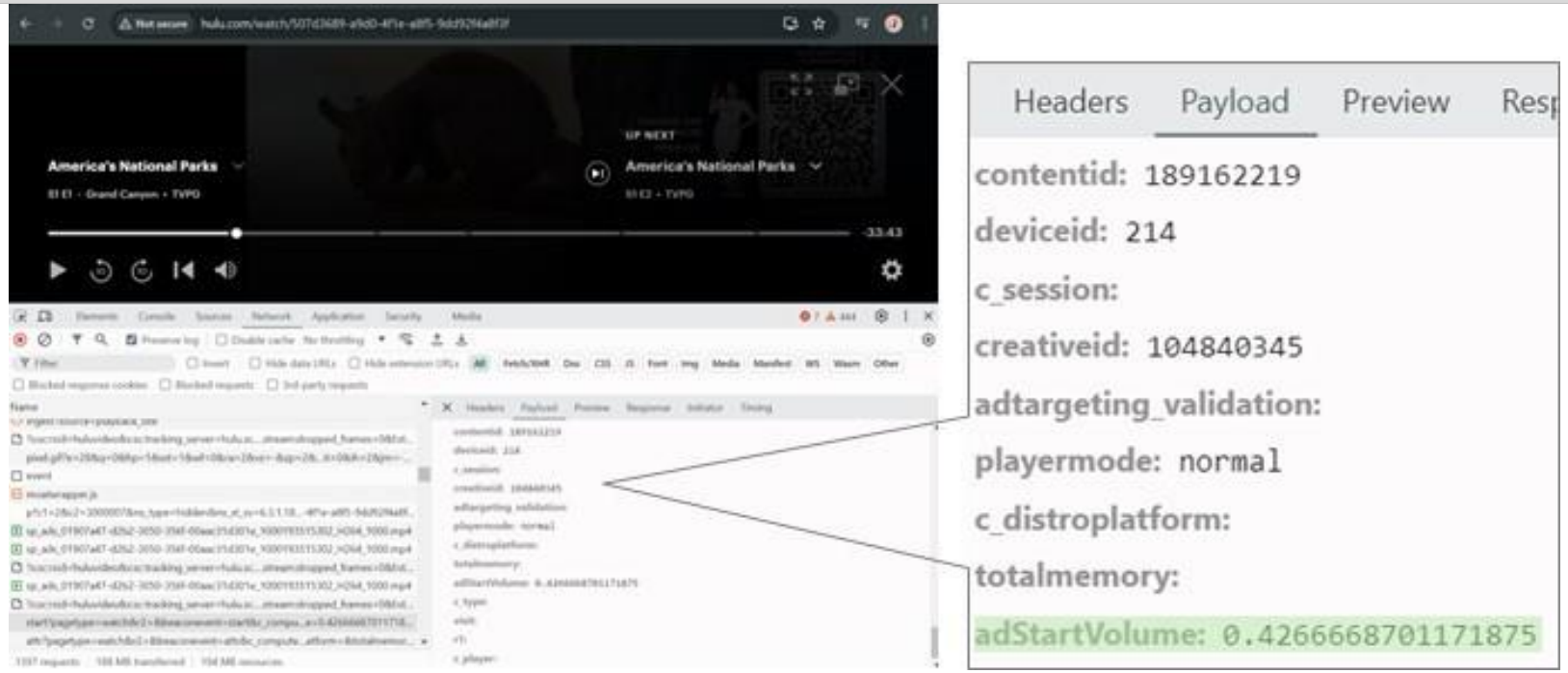
Screenshot of Hulu user interface on web browser, hulu.com, with debugger tool showing network traffic and console running JavaScript reporting out video-related events.

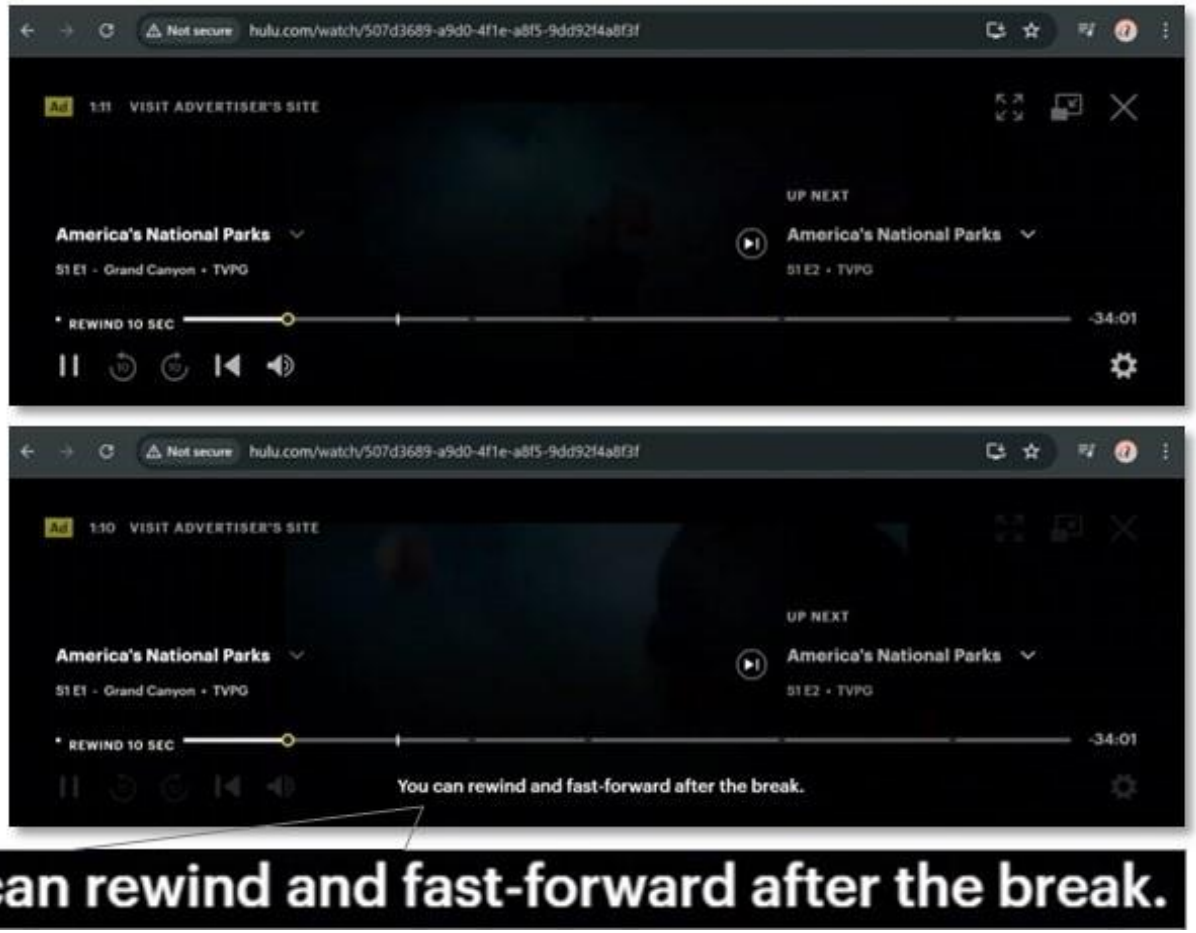
As a result, the Accused Instrumentalities cause the modified content stream to be played with one or more states of play and cause the adaptive presentation of a required part of the digital advertising content at the alternate insertion point, instead of the initially defined insertion position.

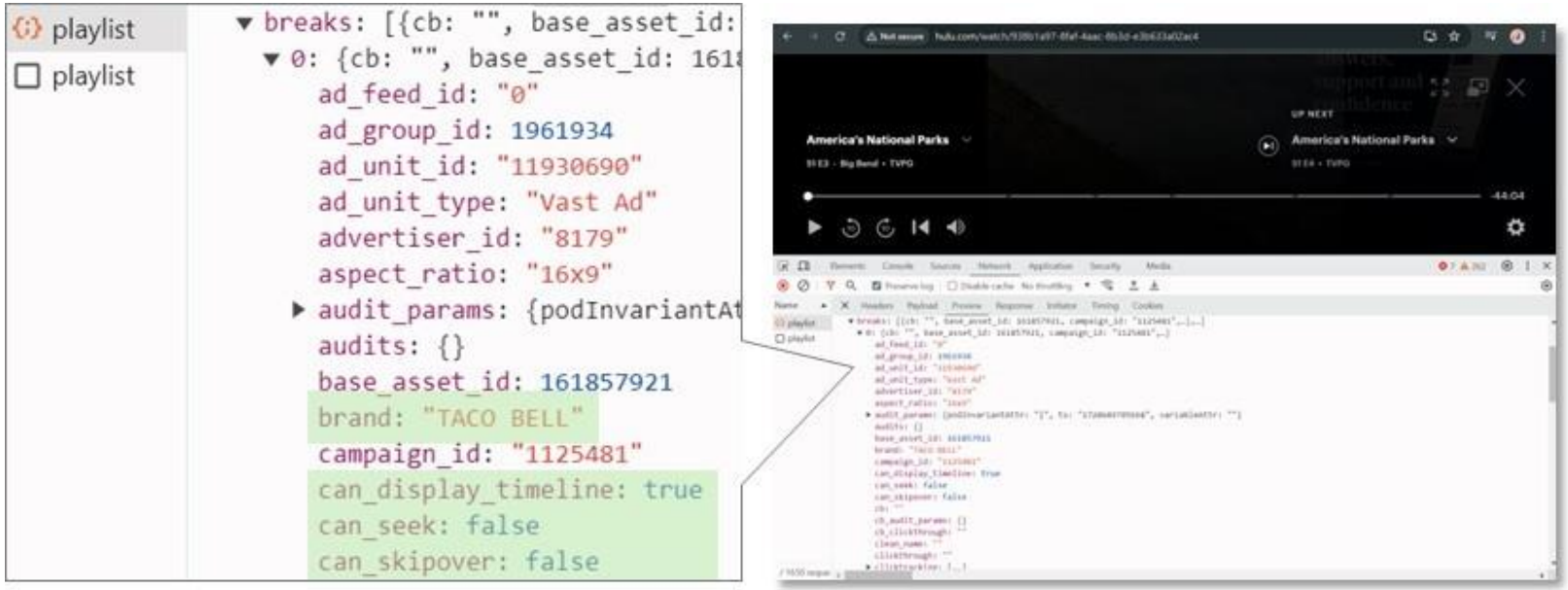
An analysis of proprietary backend systems and/or source code may be necessary to fully and accurately describe the functionality of the Accused Instrumentalities with respect to this limitation and, accordingly, Plaintiff reserves the right to supplement these infringement contentions once such information is made available to Plaintiff.

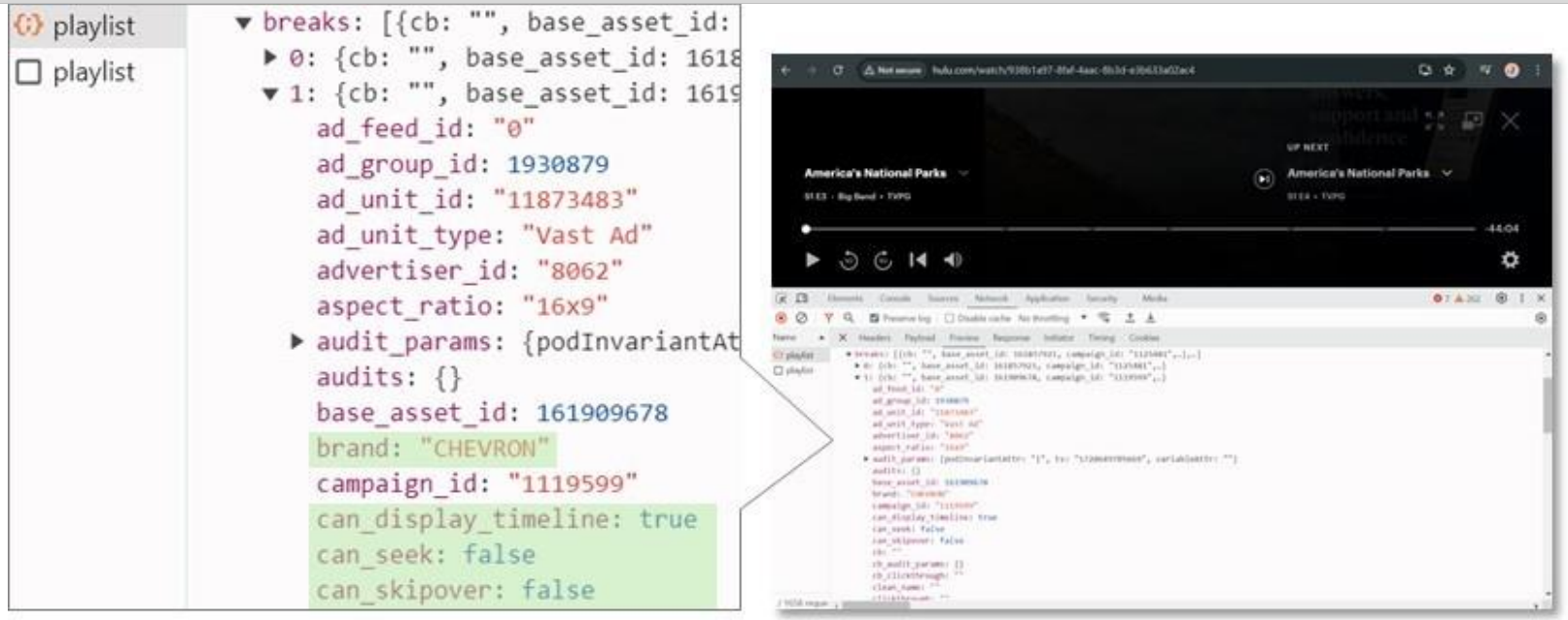
U.S. Patent No. 10,986,403	Hulu
[1f.1] at least a first memory for storing a setting to indicate a first state of play, the setting including a first value to indicate presentation of a required part of the digital advertising content is in progress during presentation of the content stream such that	The Accused Instrumentalities include at least a first memory for storing a setting to indicate a first state of play, the setting including a first value to indicate presentation of a required part of the digital advertising content is in progress during presentation of the content stream. When the Hulu client plays the ad, the user is unable to navigate past the ad, reflecting a state of play during an ad. Thus, Hulu necessarily keeps a setting in the memory of its digital media player system to indicate that advertising content is being played. This setting is also reflected by the word "Ad" displayed during advertisement. Hulu uses the setting in the digital media player system's memory to indicate the required part of the ad (i.e., the entire ad) is in progress when the ad is played as part of the modified digital content stream. This "keeping a setting" step is performed by Hulu's system, e.g., by Hulu's Ad Insertion MPD Manipulator and/or the Hulu client. The Hulu user interface also demonstrates the Accused Instrumentalities keep a setting, in at least a first memory of the digital media player system, to indicate a first state of play, the setting including a first value to indicate presentation of the required part of the digital advertising content is in progress during presentation of the modified content stream. Hulu tracks numerous indicators that an ad is being played. For example, Hulu uses the "ad-video-player" to play advertisements, as opposed to the "content-video-player" for playing content."

U.S. Patent No. 10,986,403	Hulu
	 Screenshot of Hulu user interface on web browser, hulu.com, with debugger tool showing network traffic and console running JavaScript reporting out video-related events. As an additional example, Hulu tracks whether users have viewed advertisements, and, if so, what volume the Hulu client was set to when the advertisement was played. That tracking information can be seen in the history of network traffic even after the ad has stopped playing.

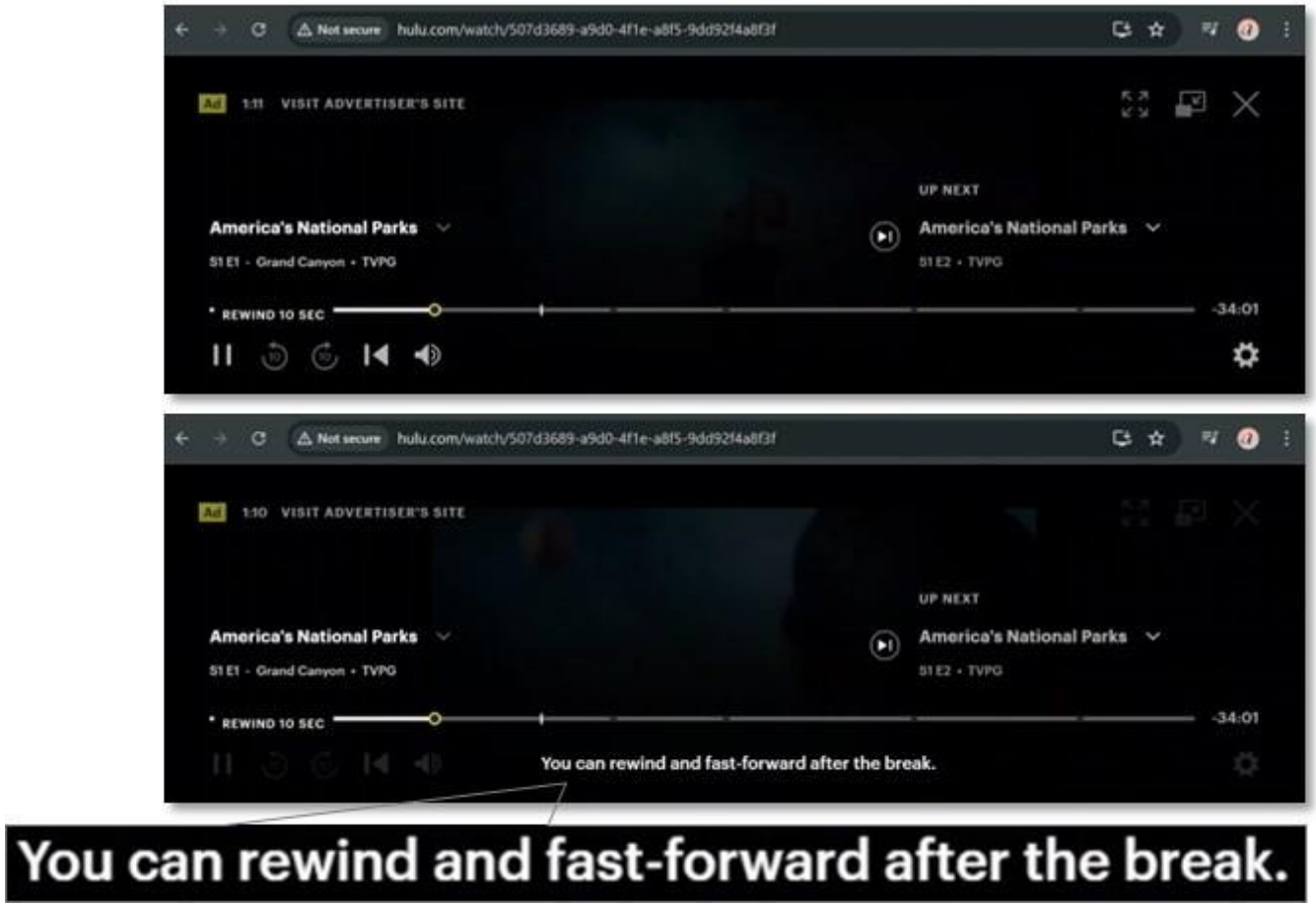
U.S. Patent No. 10,986,403	Hulu
	 Screenshot of Hulu user interface on web browser, hulu.com, with debugger tool showing network traffic. In the screenshot below, the user jumped past the first initially sequenced insertion point, and Hulu requires presentation of the digital advertising content by, among other things, disabling the ability to fast-forward or rewind through the ad.

U.S. Patent No. 10,986,403	Hulu
	 Screenshot of Hulu user interface on web browser, hulu.com. In order to disable navigation controls and require viewing of digital advertising content, the Accused Instrumentalities keep a setting in a digital memory that has a value that indicates this part of the digital advertising content is required viewing. For example, the Hulu client retrieves a “playlist” that includes information about the content to be played, advertisements to be played, and advertisement requirements such as whether the ad can be skipped.

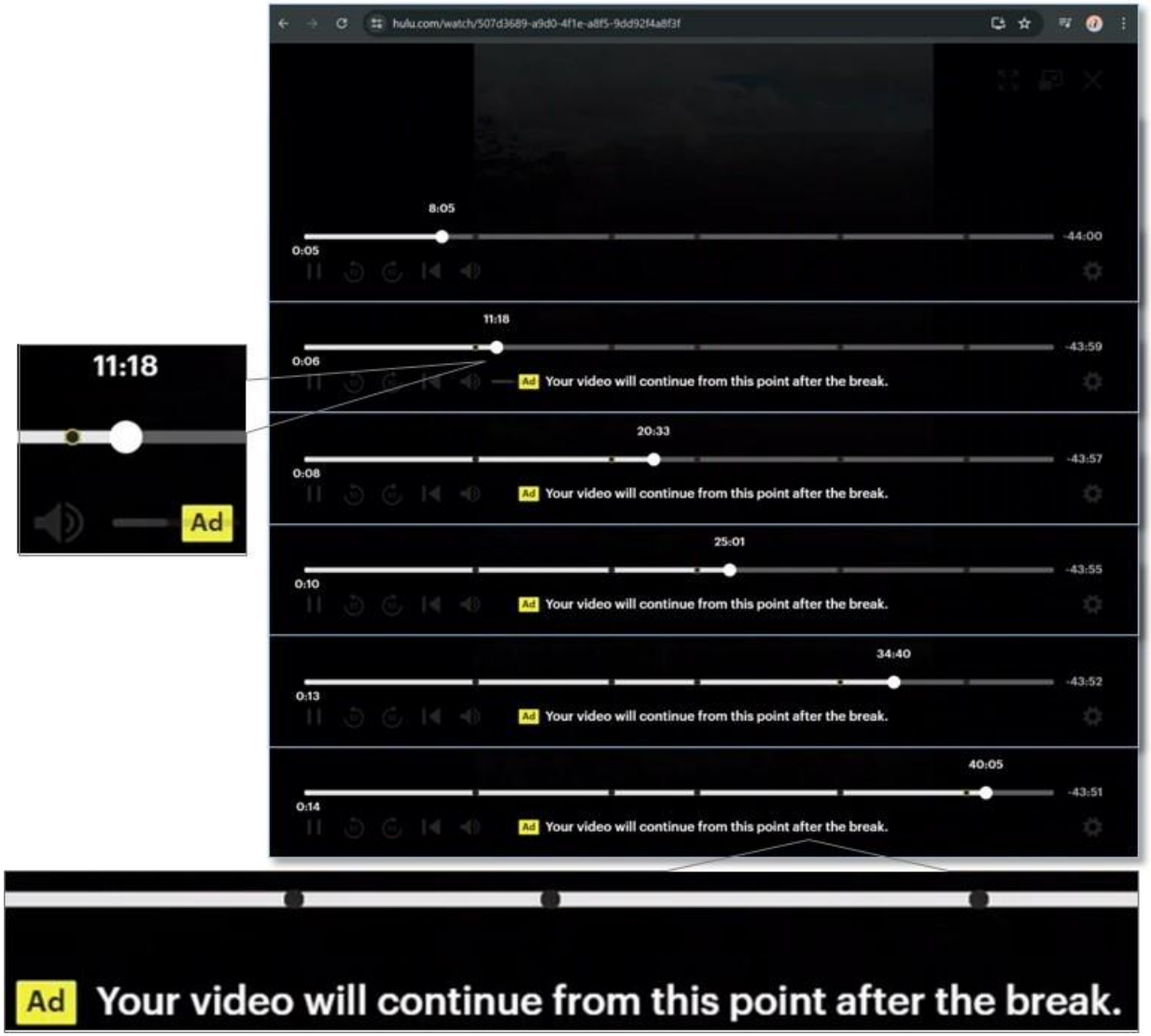
U.S. Patent No. 10,986,403	Hulu
	In the example below, the "playlist" includes a "breaks" section that includes information about advertisements, including advertisement requirements for each advertisement, e.g., "can_skipover" to indicate whether the ad can be skipped.  Screenshot of Hulu user interface on web browser, hulu.com, with debugger tool showing network traffic.

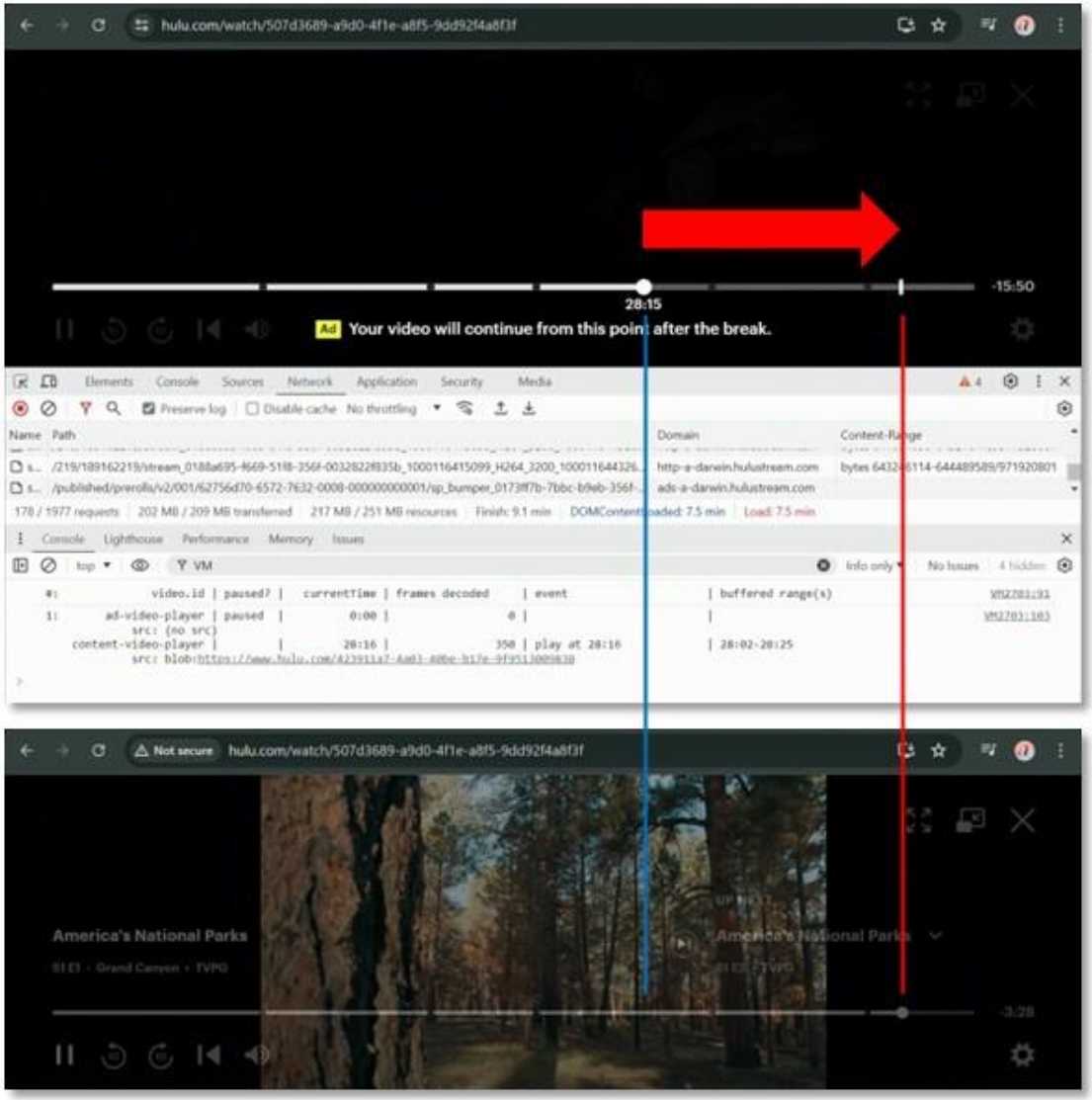
U.S. Patent No. 10,986,403	Hulu
	 Screenshot of Hulu user interface on web browser, hulu.com, with debugger tool An analysis of proprietary backend systems and/or source code may be necessary to fully and accurately describe the functionality of the Accused Instrumentalities with respect to this limitation and, accordingly, Plaintiff reserves the right to supplement these infringement contentions once such information is made available to Plaintiff.

U.S. Patent No. 10,986,403	Hulu
[1f.2] responsive to detecting the first value in the first memory, the user interface input is disabled to prevent commands comprising at least one of a user volume control or a user navigation control from altering a course of presentation of the content stream while presentation of the required part of the digital advertising content is in progress.	In the Accused Instrumentalities, detection of the first value in the first memory disables the user interface input to prevent commands comprising at least one of a user volume control or a user navigation control from altering a course of presentation of the content stream while presentation of the required part of the digital advertising content is in progress. When Hulu controls digital media presentations, it disables user interface commands for navigation control, particularly when the Hulu client plays an advertisement. This measure, enacted upon detecting a specific state of play in the system's memory, ensures that users cannot alter or skip the ad presentation. This disabling of navigation commands maintains ad playback and is executed by Hulu's system, such as the Ad Insertion MPD Manipulator and/or the Hulu client. The Hulu user interface also demonstrates the Accused Instrumentalities responsive to detecting the first value in the first memory, disable user interface commands comprising a user navigation control that enables the user to alter a course of presentation of the content stream. In the screenshot below, after the user jumped past the first initially sequenced insertion point, the Hulu user interface became disabled to prevent commands comprising user navigation control, preventing the user from altering the course of the presentation. For example, the 10-second fast-forward ( ) and 10-second rewind ( ) controls are disabled and appear light grey on the user interface, indicating they cannot be used. The user cannot jump to another position on the timeline and cannot fast-forward or rewind during presentation of the required part of the digital advertising content. In the example shown below, when the user clicks on the grayed-out fast-forward or rewind button, the Hulu client indicates that those buttons are disabled by presenting the message "You can rewind and fast-forward after the break."

U.S. Patent No. 10,986,403	Hulu
	 Screenshot of Hulu user interface on web browser, hulu.com. An analysis of proprietary backend systems and/or source code may be necessary to fully and accurately describe the functionality of the Accused Instrumentalities with respect to this limitation and, accordingly, Plaintiff reserves the right to supplement these infringement contentions once such information is made available to Plaintiff.

U.S. Patent No. 10,986,403	Hulu
[2] The digital media player device as in claim 1, wherein the user interface input comprises a graphical user interface that includes a time bar to allow the user to control the course of presentation of the digital media content received to a specific point in the presentation past at least one of the one or more initially sequenced insertion points.	In the Accused Instrumentalities, the user interface input comprises a graphical user interface that includes a time bar to allow the user to control the course of presentation of the digital media content received to a specific point in the presentation past at least one of the one or more initially sequenced insertion points. For example, the Hulu user interface includes a time bar at the bottom of the screen. The play position is denoted by a white ball that moves along the time bar, and the portion of the video content that has already been viewed is depicted by a white bar that trails the play position. The initially sequenced insertion points are shown as black gaps in the otherwise continuous gray time bar. In the screenshot below, the user allowed the cursor to hover over at a position that is after the play position and the first initially sequenced insertion point. In response, the Hulu user interface showed: (1) the time in the show where the play position will move to if the user clicks on the timeline at that position (e.g., 11:18 in the screenshot below); and (2) a message that Ad Your video will continue from this point after the break.

U.S. Patent No. 10,986,403	Hulu
	 Screenshot of Hulu user interface on web browser, hulu.com. As shown in the example discussed in [1d.4], when the user moved the play position to the point where the cursor was hovering by left clicking on the time bar, the Hulu user interface immediately transitioned to digital advertising content. When the

U.S. Patent No. 10,986,403	Hulu
	advertising block ended, the Hulu user interface returned to displaying digital media content from the position selected by the user.  Screenshot of Hulu user interface on web browser, hulu.com, with debugger tool showing network traffic and console running

U.S. Patent No. 10,986,403	Hulu
	JavaScript reporting out video-related events. As a result, the Accused Instrumentalities have a user interface input that include a graphical user interface with a time bar to allow the user to control the course of presentation of the digital media content received to a specific point in the presentation past at least one of the one or more initially sequenced insertion points. An analysis of proprietary backend systems and/or source code may be necessary to fully and accurately describe the functionality of the Accused Instrumentalities with respect to this limitation and, accordingly, Plaintiff reserves the right to supplement these infringement contentions once such information is made available to Plaintiff.
[4] The digital media player device as in claim 1, wherein the digital media content comprises at least one media file.	The Accused Instrumentalities are digital media player devices that receive digital media content that comprises at least one media file. Generally speaking, the fact that Hulu digital media player device displays viewable content through its user interface means that it must receive digital media content that comprises at least one media file. The ability to display digital media content means that the digital media player device must receive at least one media file. More specifically, the web traffic during playback of digital media content displays data blocks from the ate least one media file, demonstrating that the Hulu digital media player device receives at least one media file. As a result, the Accused Instrumentalities are digital media player devices that receive digital media content that comprises at least one media file. For example, Figure 1 of the DASH Standard indicates that the DASH Packager, among other things, passes "Ad Prepared Segments," which are media files, to the "Ad Insertion MPD Manipulator," which is part of the digital media player device.

U.S. Patent No. 10,986,403	Hulu

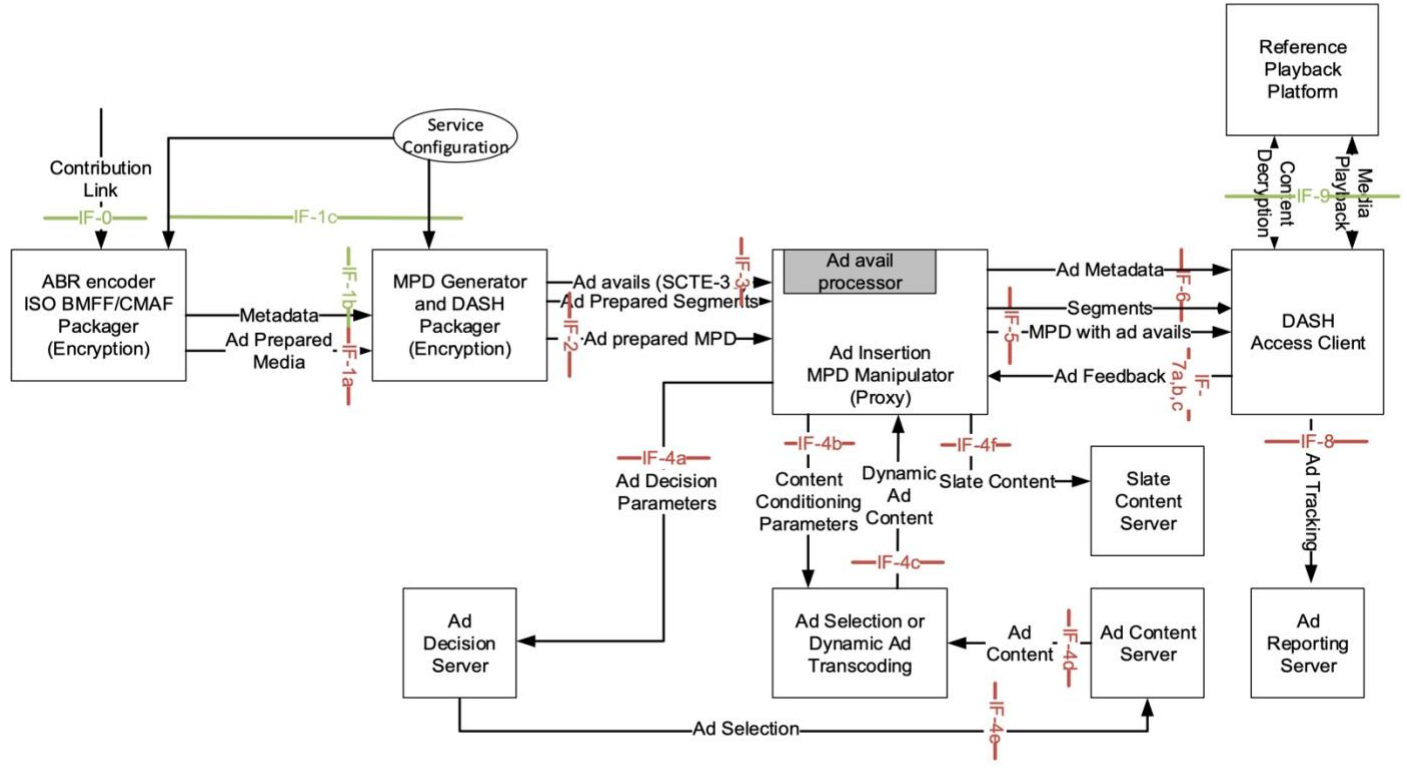


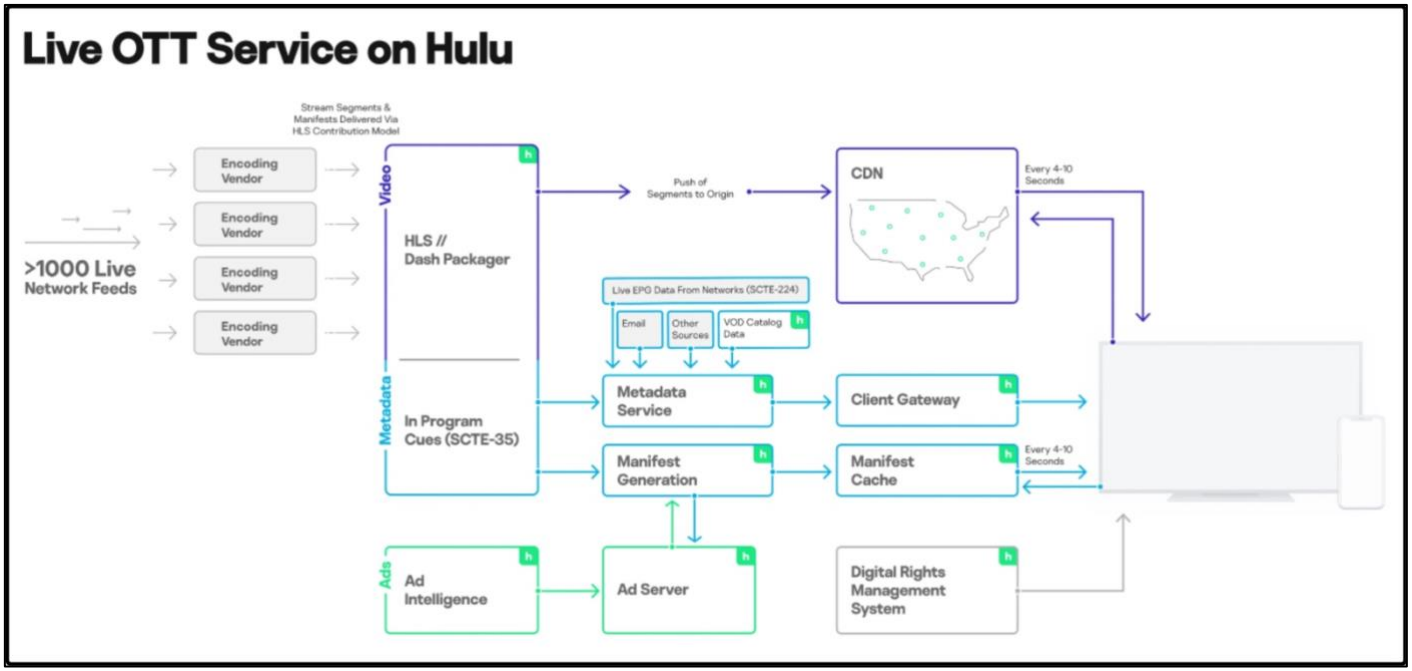
Figure 1 DASH-IF Ad Insertion Architecture

DASH Part 5 at Figure 1 DASH-IF Ad Insertion Architecture.

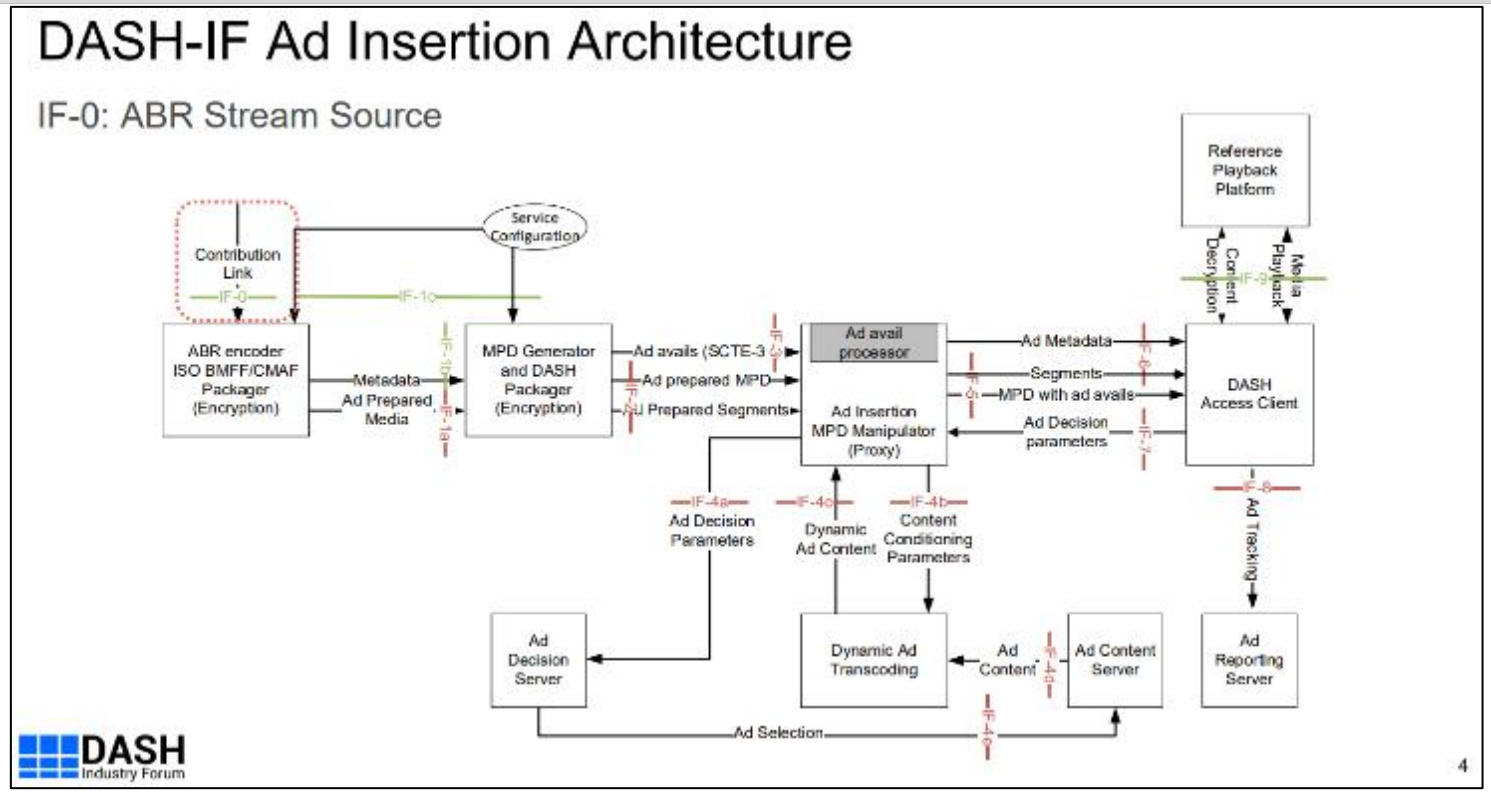
The DASH Standard defines the DASH Packager as:

> **DASH packager** – functional entity that processes conditioned content and produces media segments suitable for consumption by a DASH client. This entity is also known as fragmenter, encapsulater, or segmenter

DASH Part 5 at § 3.1.

U.S. Patent No. 10,986,403	Hulu
	Likewise, the Hulu Tech Blog entry "The Anatomy of a Live OTT Service" includes a figure that shows the "HLS // DASH Packager" sending "Video" to the client device.  Hulu Tech Blog Zachary Cava, Video Platform Architect at Hulu, gave a presentation at the March 31, 2020 DVB World Webinar entitled, "Ad Insertion in Live Content." Cava Presentation at the 28:10 mark to the 43:20 mark. In that presentation, as part of his explanation of IF-0 in the DASH Standard, Mr. Cava stated, "Starting from the very beginning of a Live Stream source, you have a Contribution Link, which is giving you your mezzanine video and audio, that's being fed into an ABR encoder, which is going to be producing well-formed CMAF content out to the DASH Packager."

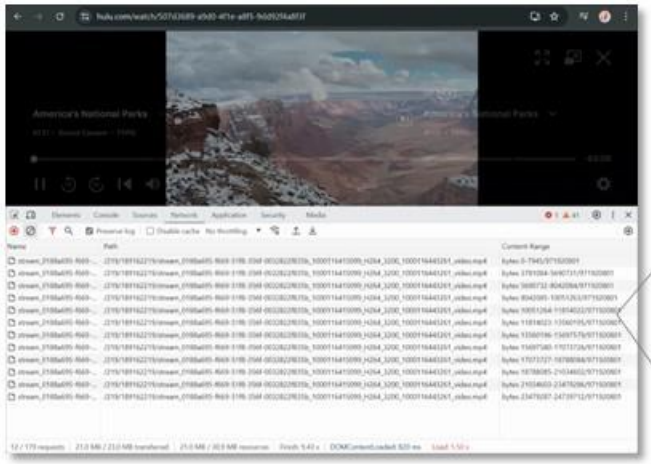
U.S. Patent No. 10,986,403	Hulu



Cava Presentation at 32:33 to 32:53 mark. Whatever media content the Contribution Link provides constitutes at least one media file that is ultimately passed along to the DASH Access Client.

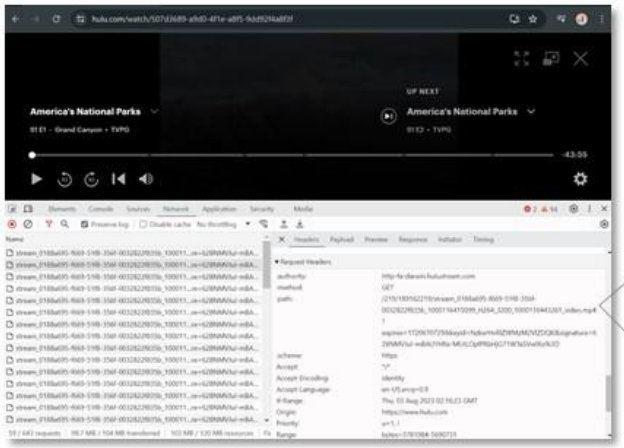
In the example below, the content displayed comes from a video.mp4 file, which the Hulu client fetches in segments by specifying byte ranges from the .mp4 file.

U.S. Patent No. 10,986,403	Hulu



	Content-Range
_H264_3200_1000116443261_video.mp4	bytes 0-7945/971920801
_H264_3200_1000116443261_video.mp4	bytes 3781084-5690731/971920801
_H264_3200_1000116443261_video.mp4	bytes 5690732-8042084/971920801
_H264_3200_1000116443261_video.mp4	bytes 8042085-10051263/971920801
_H264_3200_1000116443261_video.mp4	bytes 10051264-11814022/971920801
_H264_3200_1000116443261_video.mp4	bytes 11814023-13560195/971920801
_H264_3200_1000116443261_video.mp4	bytes 13560196-15697579/971920801
_H264_3200_1000116443261_video.mp4	bytes 15697580-17073726/971920801

Screenshot of Hulu user interface on web browser, hulu.com, with debugger tool showing network traffic.



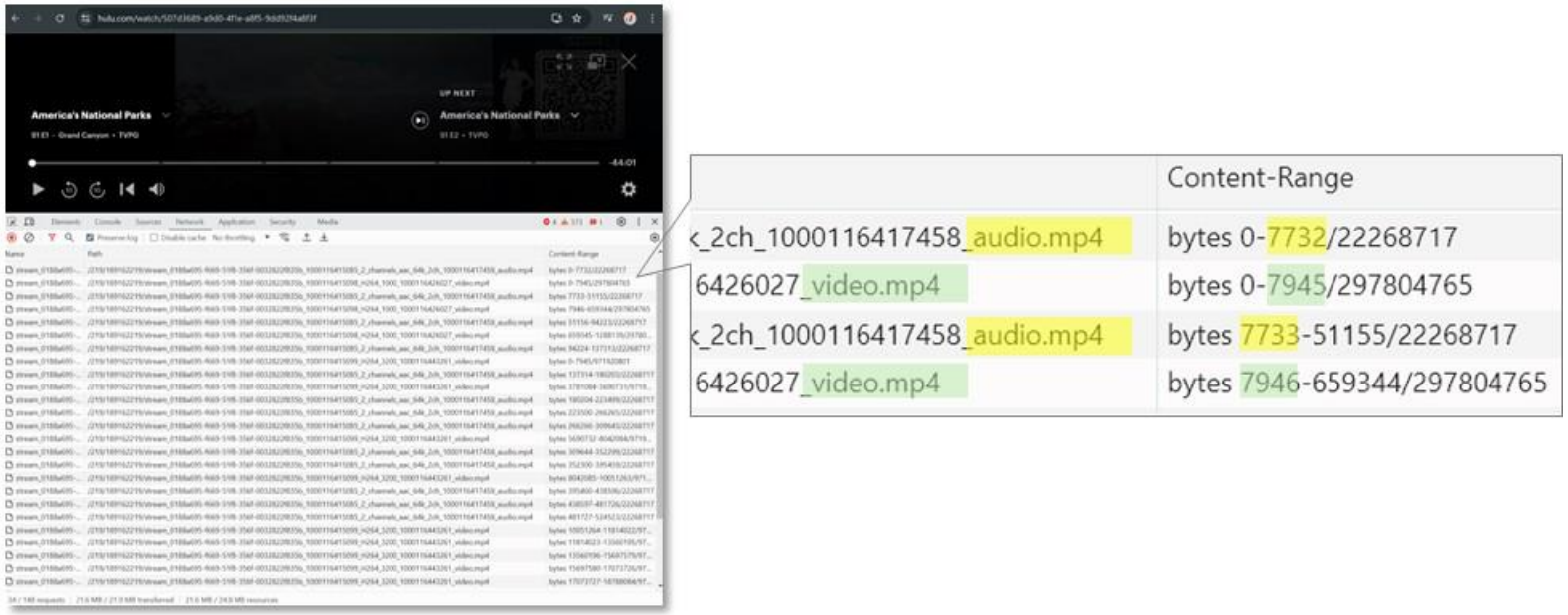
Headers Payload Preview Response Initiator Timing

▼ Request Headers

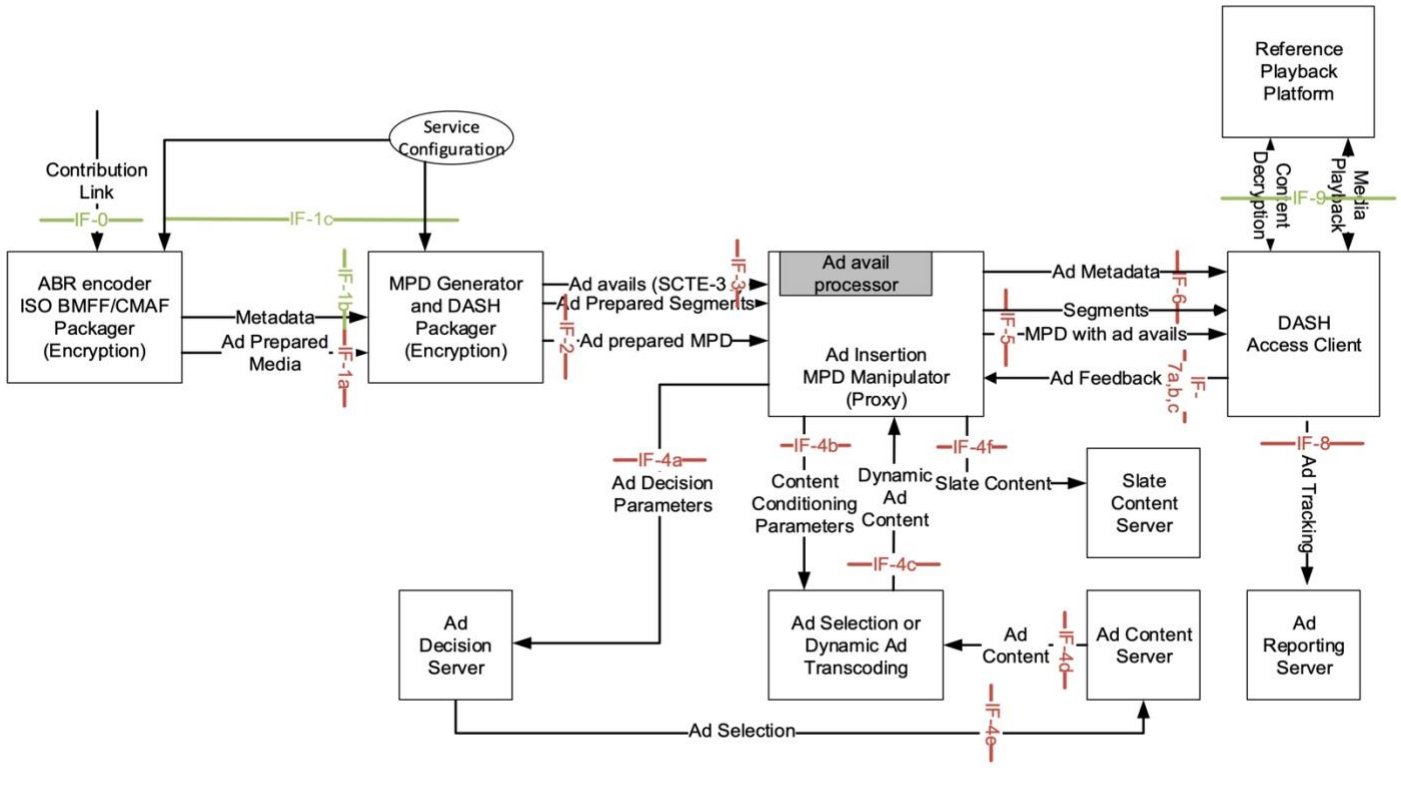
:authority:	http-fa-darwin.hulustream.com
:method:	GET
:path:	/219/189162219/stream_0188a695-f669-51f8-356f-0032822f835b_1000116415099_H264_3200_1000116443261_video.mp4
...	
Range:	bytes=3781084-5690731

Screenshot of Hulu user interface on web browser, hulu.com, with debugger tool showing network traffic.

The Hulu client also fetches segments from an audio .mp4 file that is associated with the video .mp4 file.

U.S. Patent No. 10,986,403	Hulu
	 Screenshot of Hulu user interface on web browser, hulu.com, with debugger tool showing network traffic. An analysis of proprietary backend systems and/or source code may be necessary to fully and accurately describe the functionality of the Accused Instrumentalities with respect to this limitation and, accordingly, Plaintiff reserves the right to supplement these infringement contentions once such information is made available to Plaintiff.
[5] The digital media player device as in claim 1, wherein the digital advertising content comprises at least one advertisement file.	The Accused Instrumentalities are digital media player devices that receive digital advertising content that comprises at least one advertisement file. Generally speaking, the fact that Hulu offers an ad-supported streaming service means that the Hulu digital media player device must receive digital advertising content that comprises at least one advertisement file. The ability to display digital advertising content means that the digital media player device must receive at least one advertisement file. More specifically, the web traffic during playback of digital advertising content includes data blocks from at least one advertisement file, demonstrating that the Hulu digital media player device receives at least one advertisement file. As a result, the Accused Instrumentalities are digital media player devices that receive digital advertising content that comprises at least one advertisement file. For example, Figure 1 of the DASH Standard indicates that the "Ad Content Server" passes "Ad Content," which are advertisement files, to "Ad Selection Dynamic Ad Transcoding," which then passes the advertisement files on to the "Ad Insertion MPD Manipulator," which is part of the digital media player device.

U.S. Patent No. 10,986,403	Hulu

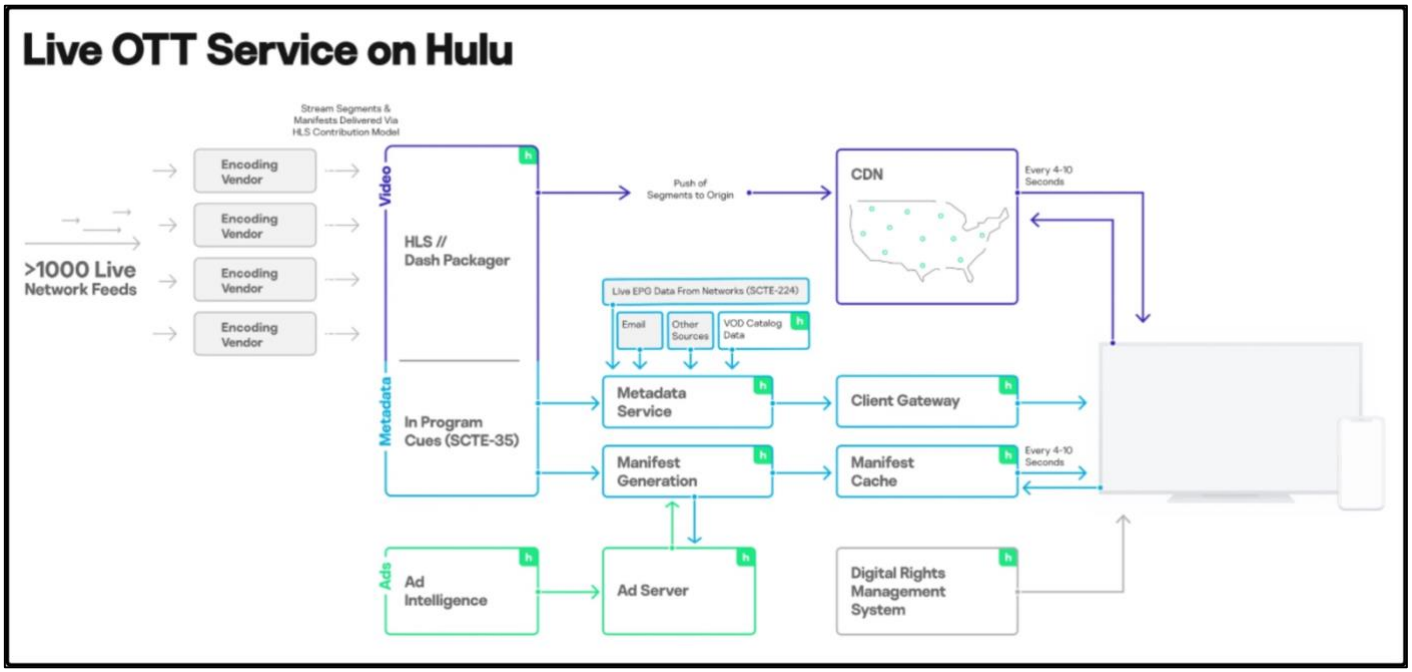


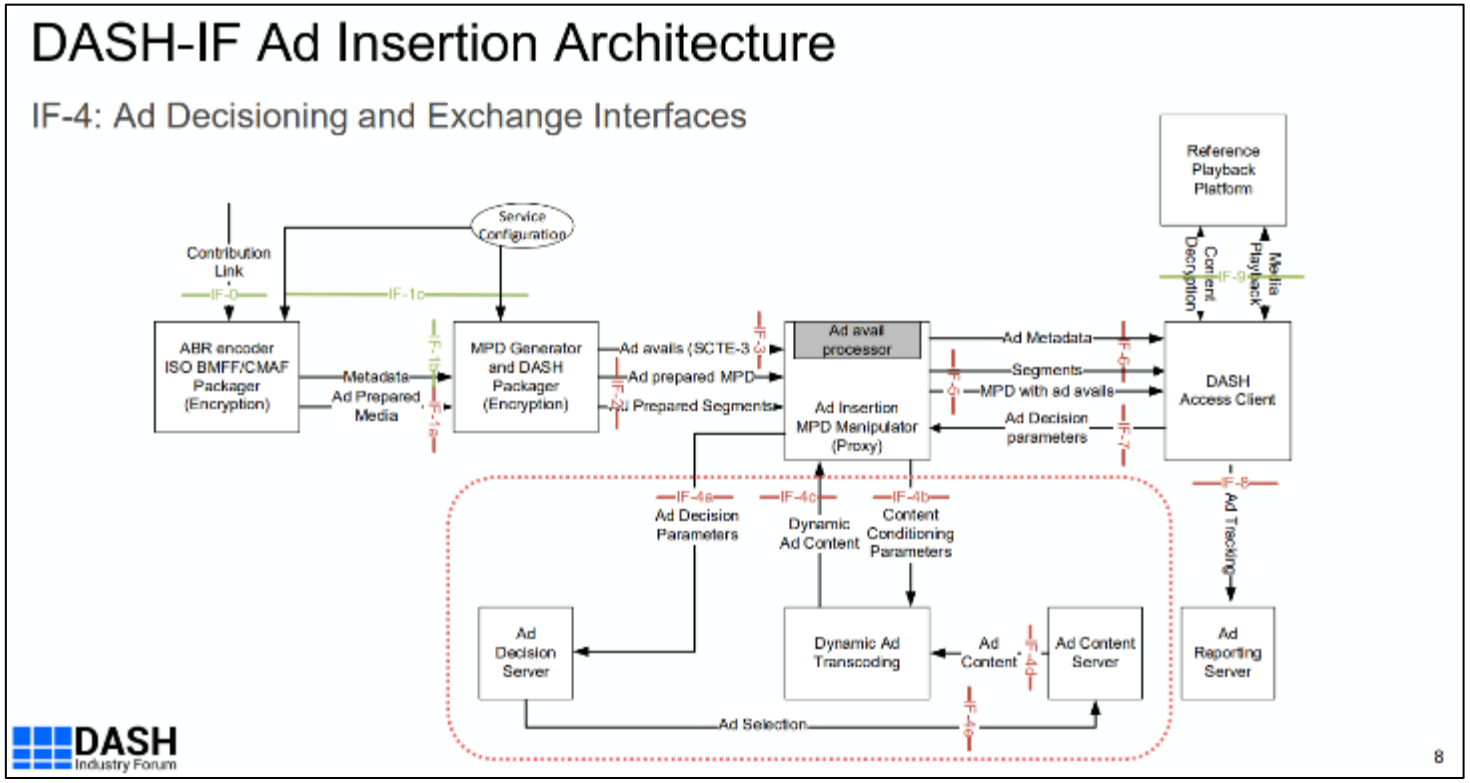
DASH Part 5 at Figure 1 DASH-IF Ad Insertion Architecture.

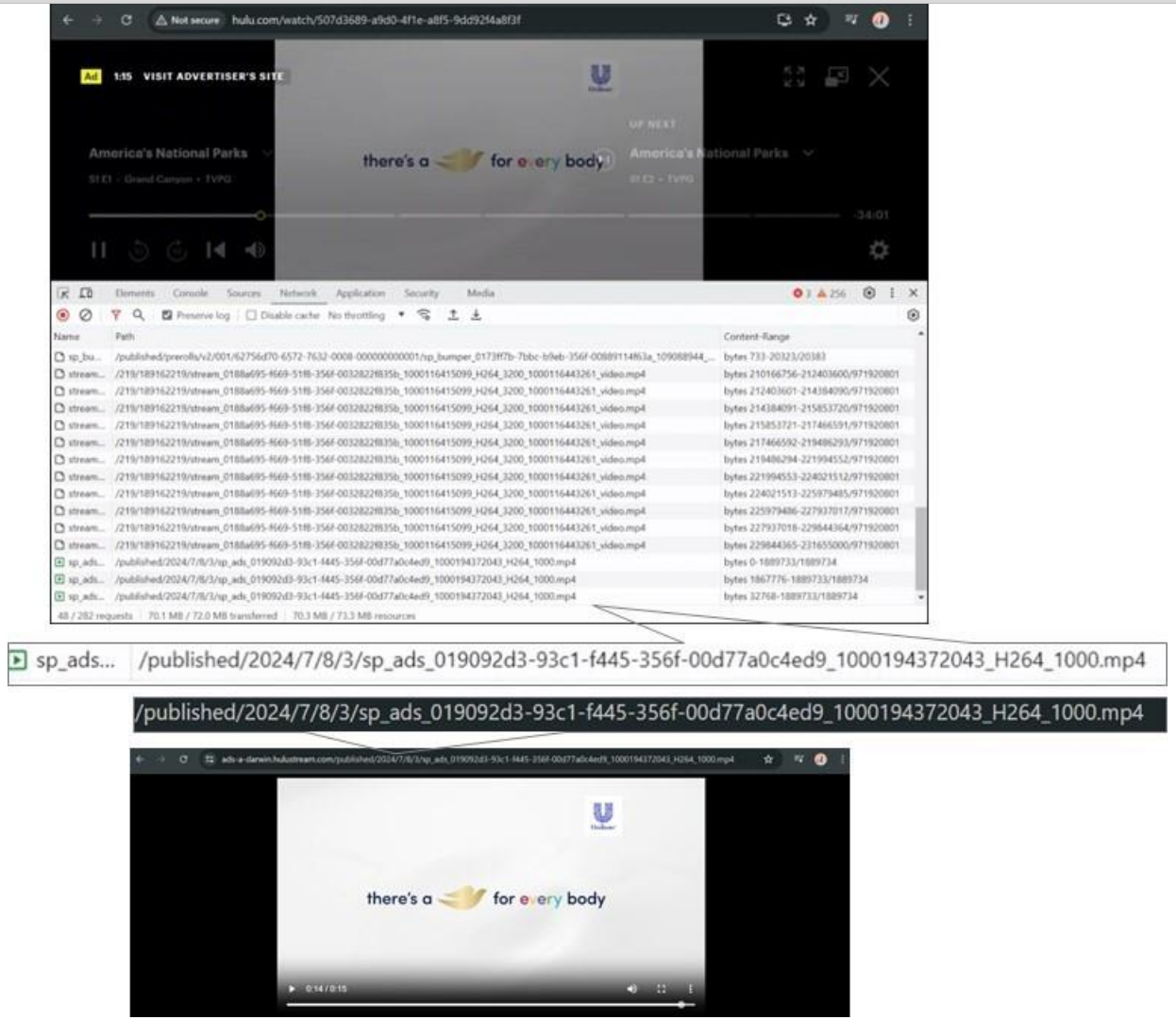
The DASH Standard defines the Ad Content Server as:

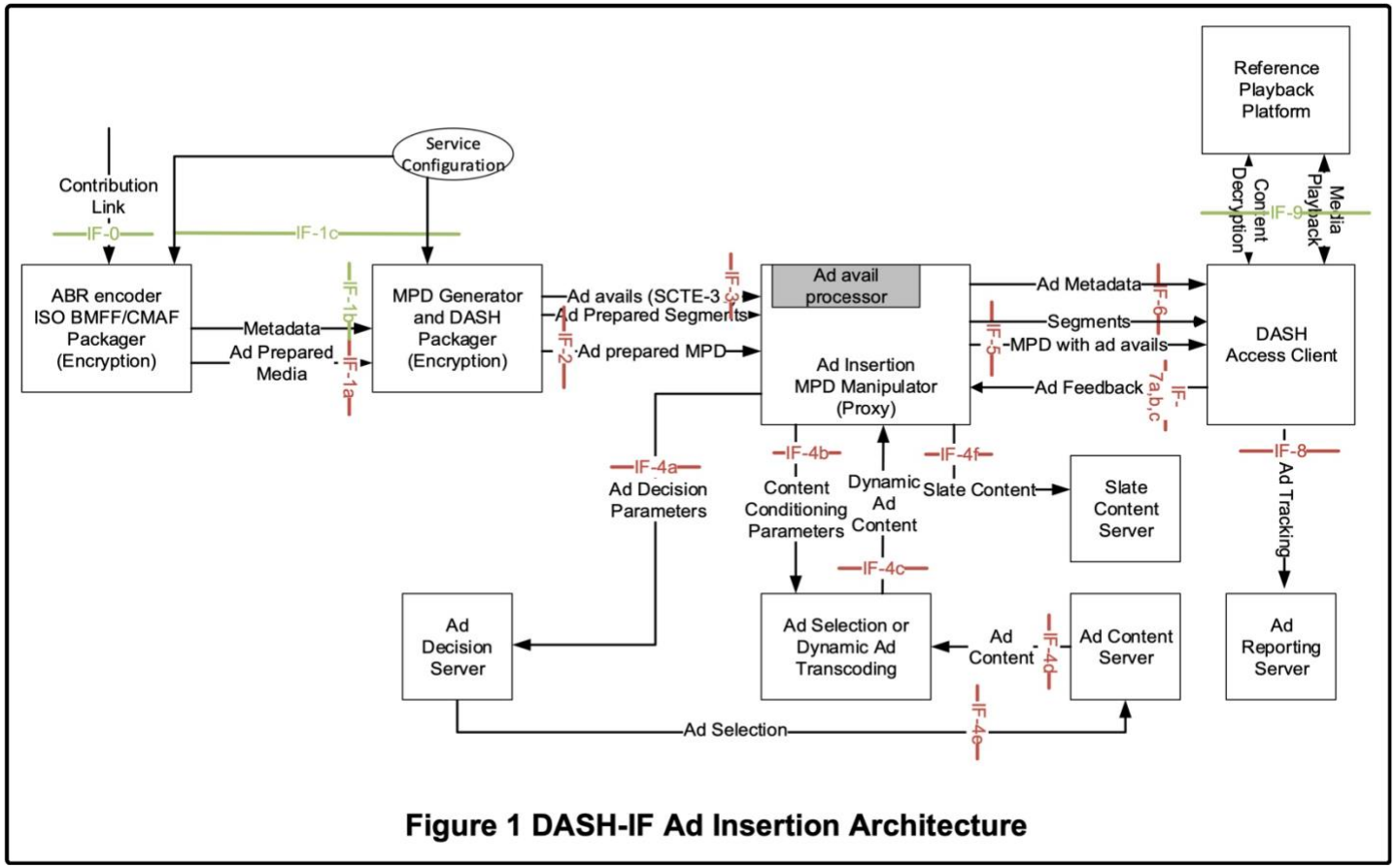
> **ad content server** – server storing the ad content and serving it on a per request basis

DASH Part 5 at § 3.1.

U.S. Patent No. 10,986,403	Hulu
	The DASH Standard goes on to explain that advertisement files are sent from the Ad Content Server to the digital media player device as requested, according to the timeline of the MPD. 4) The ad is served automatically to the client as the client will start requesting the Segments according to the information and timeline in the MPD from the Ad content server. While serving the ad, the MPD proxy DASH Part 5 at § 5.7.3. Likewise, the Hulu Tech Blog entry "The Anatomy of a Live OTT Service" includes a figure that shows the "Ad Server" sending "Ads" to the client device.  Hulu Tech Blog Zachary Cava, Video Platform Architect at Hulu, gave a presentation at the March 31, 2020 DVB World Webinar entitled, "Ad Insertion in Live Content." Cava Presentation at the 28:10 mark to the 43:20 mark.

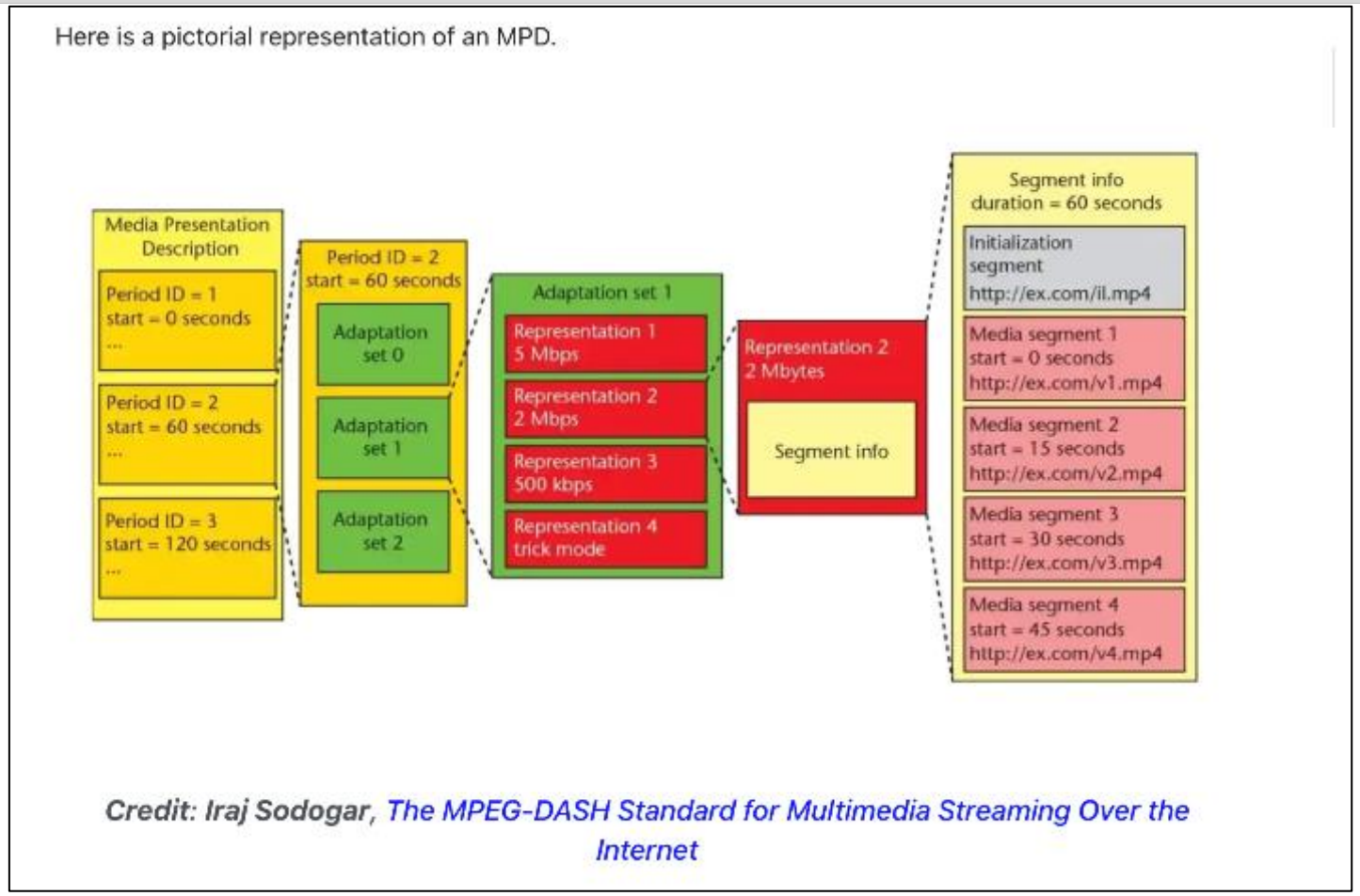
U.S. Patent No. 10,986,403	Hulu
	In that presentation, as part of his explanation of IF-4 in the DASH Standard, Mr. Cava stated, "The prepared content [from the DASH Packager] is then consumed by an Ad Insertion MPD Manipulator, or an Ad Proxy, and that is the mechanism that communicates with an ad decisioning exchange service that will take parameters for decisioning and internally perform decisioning."  Cava Presentation at 33:33 to 33:56 mark. The advertisements selected by the advertisement rotator are provided to the Ad Insertion MPD Manipulator intersplicer. Hulu plays advertisements that are from video .mp4 files. In this example, the Hulu client displays an advertisement that is an .mp4 file retrieved from a URL that is publicly accessible.

U.S. Patent No. 10,986,403	Hulu
	 Screenshot of Hulu user interface on web browser, hulu.com, with debugger tool showing network traffic. An analysis of proprietary backend systems and/or source code may be necessary to fully and accurately describe the functionality of the Accused Instrumentalities with respect to this limitation and, accordingly, Plaintiff reserves the right to supplement these

U.S. Patent No. 10,986,403	Hulu
	infringement contentions once such information is made available to Plaintiff.
[6] The digital media player device as in claim 5, wherein a sequence is generated by sub-dividing a media file into two or more segments, and wherein at least a part of the at least one of the advertising file is presented between two of the segments.	The Accused Instrumentalities generate a sequence by subdividing a media file into two or more segments, and at least a part of the at least one of the advertising file is presented between two of the segments. For example, Figure 1 of the DASH Standard shows the "DASH Packager" sends "Ad Prepared Segments" to the "Ad Insertion MPD Manipulator." To make these "Ad Prepared Segments," media file is sub-divided into two or more segments.  DASH Part 5 at Figure 1 DASH-IF Ad Insertion Architecture ("DASH diagram").

U.S. Patent No. 10,986,403	Hulu
	The DASH Standard goes on to explain that DASH Packager is the component that sub-divides the media file into two or more segments. **DASH packager** – functional entity that processes conditioned content and produces media segments suitable for consumption by a DASH client. This entity is also known as fragmenter, encapsulater, or segmenter Another example of the subdividing of the media file is shown in the diagram below, which is the DASH hierarchical model for the breaking down media and advertising content into segments. This structure, where media files are broken down into Periods, then Adaptation Sets, then Representations, and finally Segments, is a fundamental aspect of DASH.

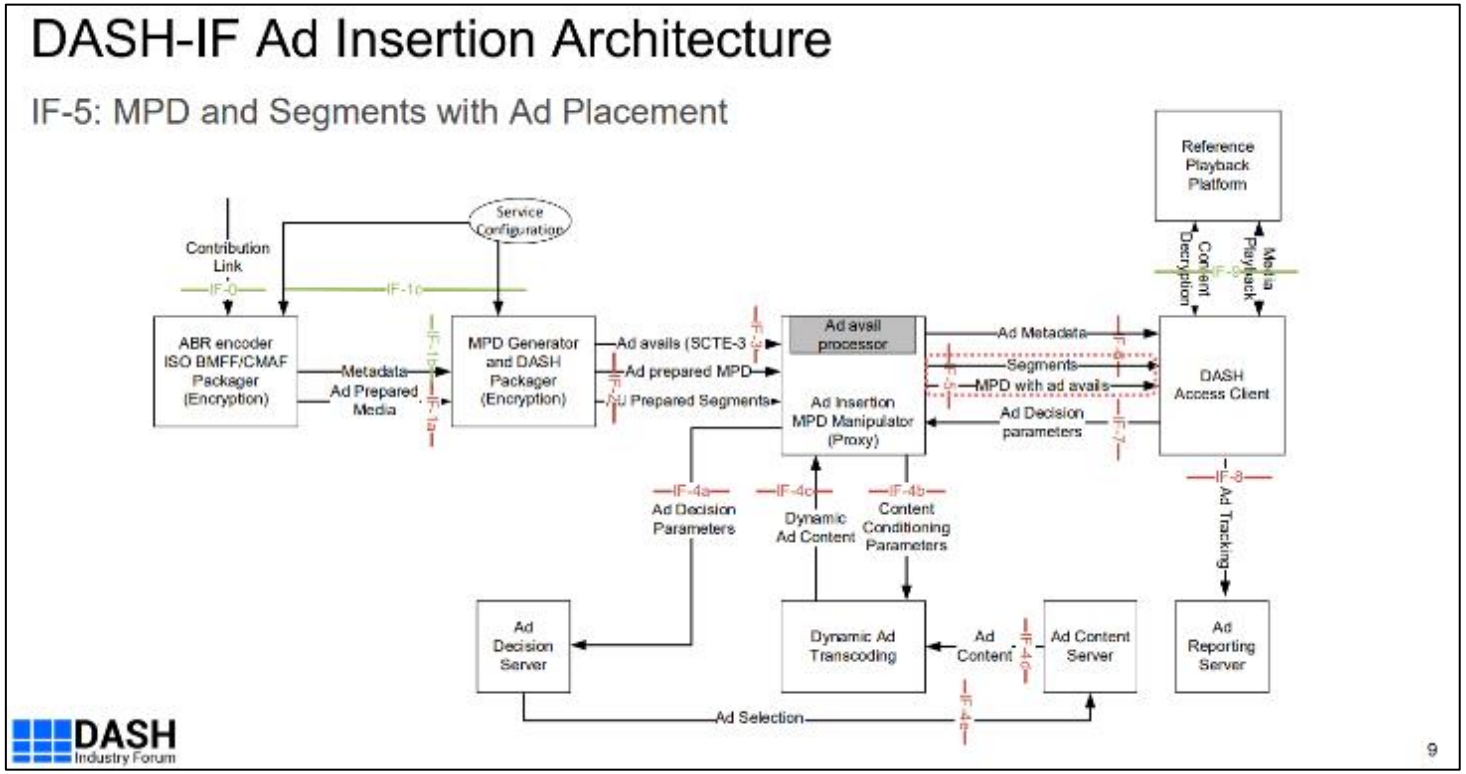
U.S. Patent No. 10,986,403	Hulu



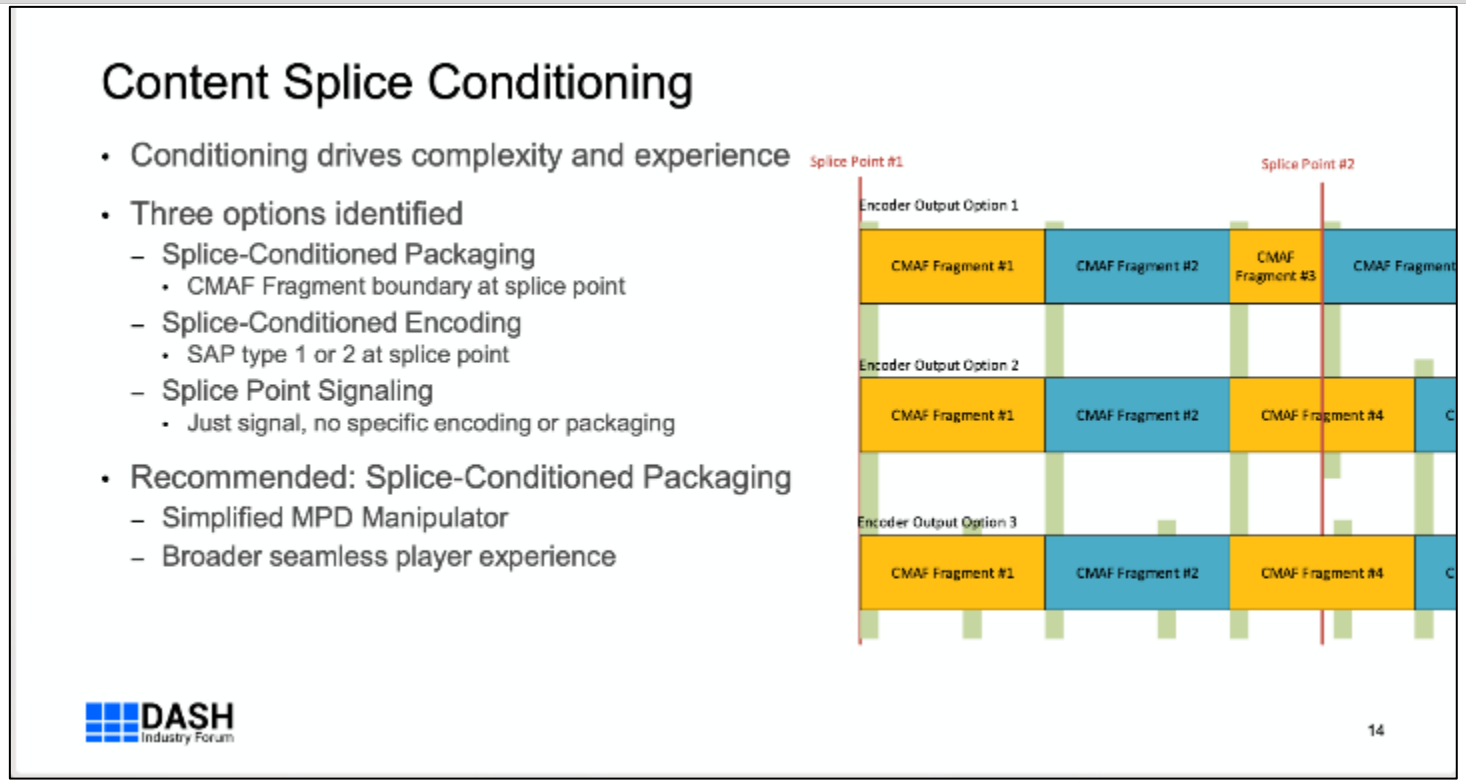
I. Sodagar, *The MPEG-DASH Standard for Multimedia Streaming Over the Internet*, IEEE MultiMedia, vol. 18, no. 4, pp. 62-67, (April 2011), http://www.eecs.harvard.edu/~michaelm/CS222/mpegdash.pdf at Figure 3 The MPD hierarchical data model.

In this same whitepaper as the figure above, Dr. Sodagar notes in his discussion of "Additional Features" of MPEG_DASH: "Ad Insertion: advertisements can be inserted as a period between periods or segment between segments in both on-demand and live cases." *Id.* at p. 5.

Zachary Cava, Video Platform Architect at Hulu, gave a presentation at the March 31, 2020 DVB World Webinar entitled, "Ad

U.S. Patent No. 10,986,403	Hulu
	Insertion in Live Content." Cava Presentation at the 28:10 mark to the 43:20 mark. In that presentation, as part of his explanation of IF-5 in the DASH Standard, Mr. Cava stated, "From there we'll go ahead and provide well-formed ad insertion content that the MPD Manipulator can go ahead and combine with the original content to produce a[n] interleaved stream of content and advertisements. And this stream is communicated again with a DASH down to the clients."  Cava Presentation at 34:00 to 34:25 mark. In that same presentation, Mr. Cava also discussed Splice Points, which are points during the video playback when the player device switches between media content and advertising content. Mr. Cava displayed the following graphic showing splice points, including splice points that are between fragments (or segments).

U.S. Patent No. 10,986,403	Hulu

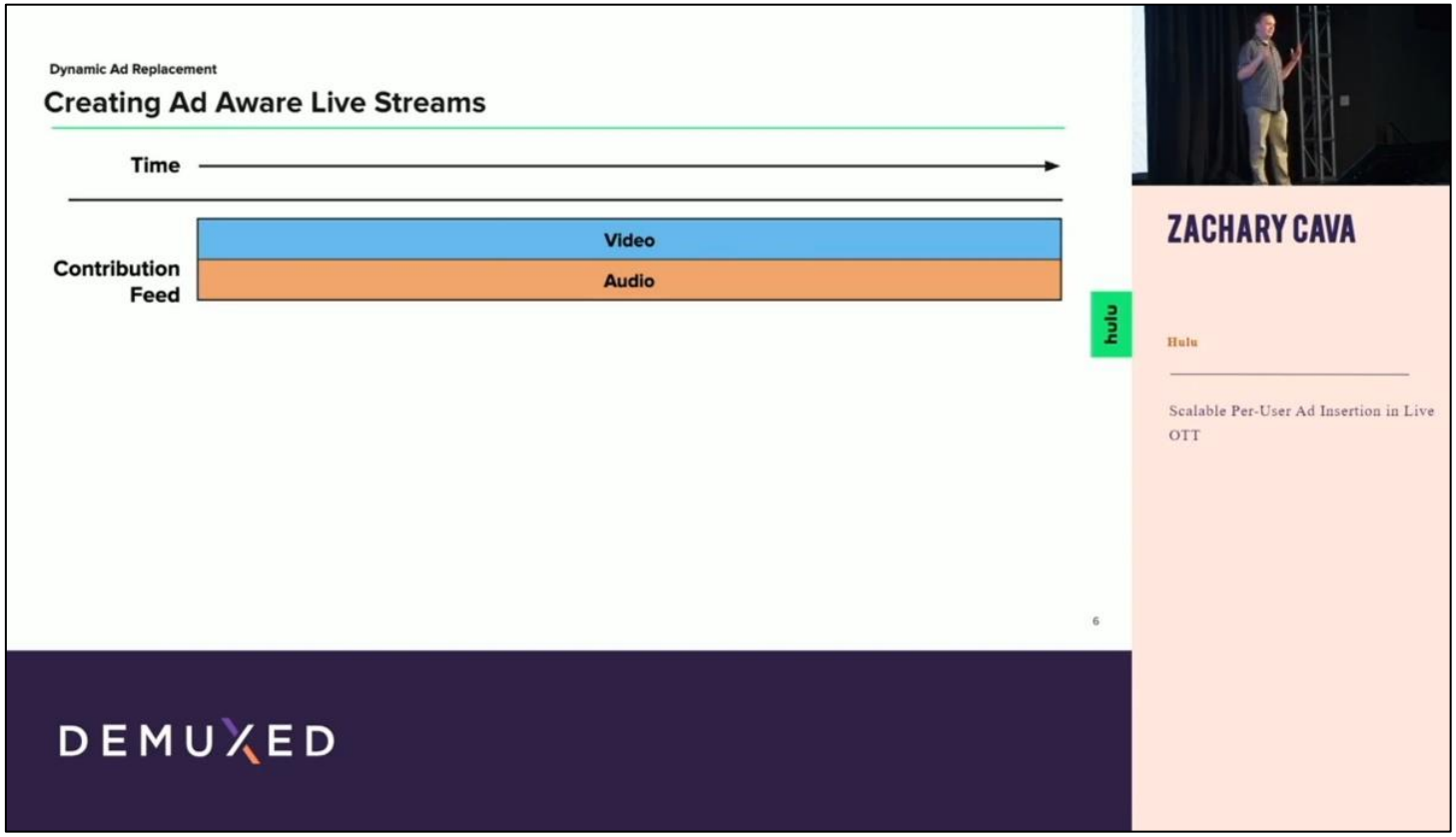


Cava Presentation at 36:10 to 38:33.

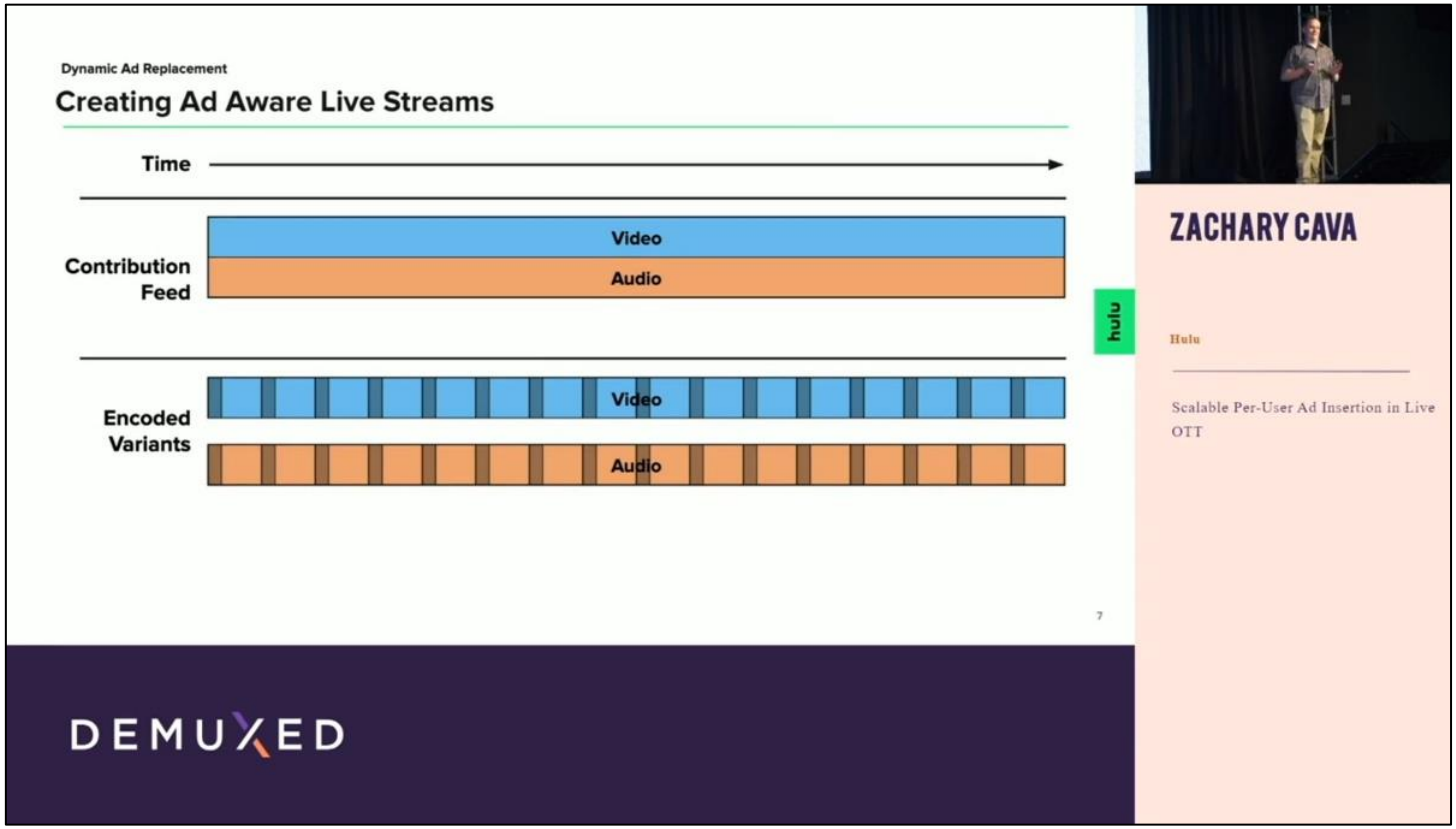
In a presentation given at the Demuxed 2019 Conference, Zachary Cava provided detail showing that the Hulu Accused Instrumentalities have an intersplicer that sub-divides a media file into two or more segments, and presents an advertising file between two of the segments. For example, in a section of his presentation entitled, "Dynamic Ad Replacement," Mr. Cava explained:

> I want to start with kind of detailing how you do dynamic ad insertion in a live stream and part of that is actually replacement. A live stream that you're getting from a broadcaster has ads in it. But you have the opportunity to replace those ads. And so, you are going to replace them.

Demuxed Presentation at the 2:12 to 2:29 mark. The content ultimately displayed on the DASH Access Client originally comes from a broadcaster in the form of a contribution feed. This contribution feed includes advertising content. The intersplicer of the

U.S. Patent No. 10,986,403	Hulu
	Hulu Accused Devices removes the advertisement content in the contribution feed (e.g., subtracts a media file) and replaces it with new advertisement content. Mr. Cava continued, "From your broadcaster you're going to get a contribution feed. It's going to be great quality, it's going to be the best thing in the world, but you can't send that to clients because you can't support that on the network."  Demuxed Presentation at 2:30 to 2:40 mark. Instead of sending the contribution feed to the clients, Hulu breaks it into smaller, manageable pieces. As Mr. Cava noted, "So, typical to the live streaming space, you're going to take that contribution feed, you're going to encode it, the encode is going to be to a fixed duration segment, and those segments are going to start with IDR frames."

U.S. Patent No. 10,986,403	Hulu



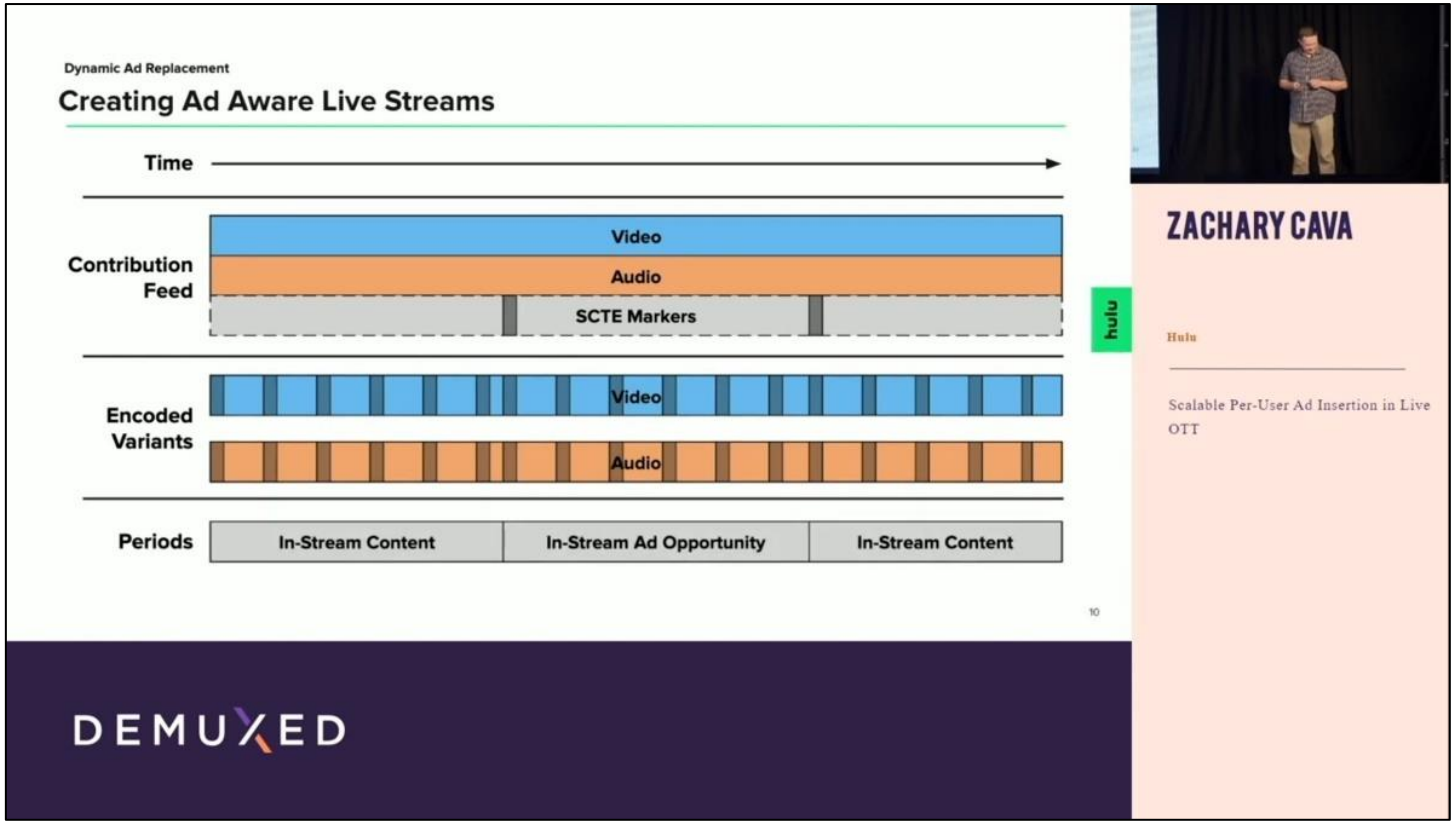
Demuxed Presentation at 2:41 to 2:50 mark.

In addition to encoding "fixed duration segments," the Hulu Accused Instrumentalities also encode for SCTE-35. According to Mr. Cava:

> Now when you want to do ad insertion, of course, you need to know where the ads are, and to support that we actually have a thing called SCTE-35. … SCTE-35 can identify a lot of things about this stream, but the thing we're going to look at the most today is the ad opportunity points. And so, the other thing we do is we use these ad opportunity points to continue conditioning the stream, so not just conditioning based on the segment's duration, but also conditioning based on where these markers are. And this is a very important property to enable seamless insertion. As long as you can transition out

U.S. Patent No. 10,986,403	Hulu

and in on a segment boundary it makes a much better experience on the client and makes it much easier to handle in your player implementations. And so, here we go through, and we've re-encoded it and you see how the segment durations have adjusted for that encode.

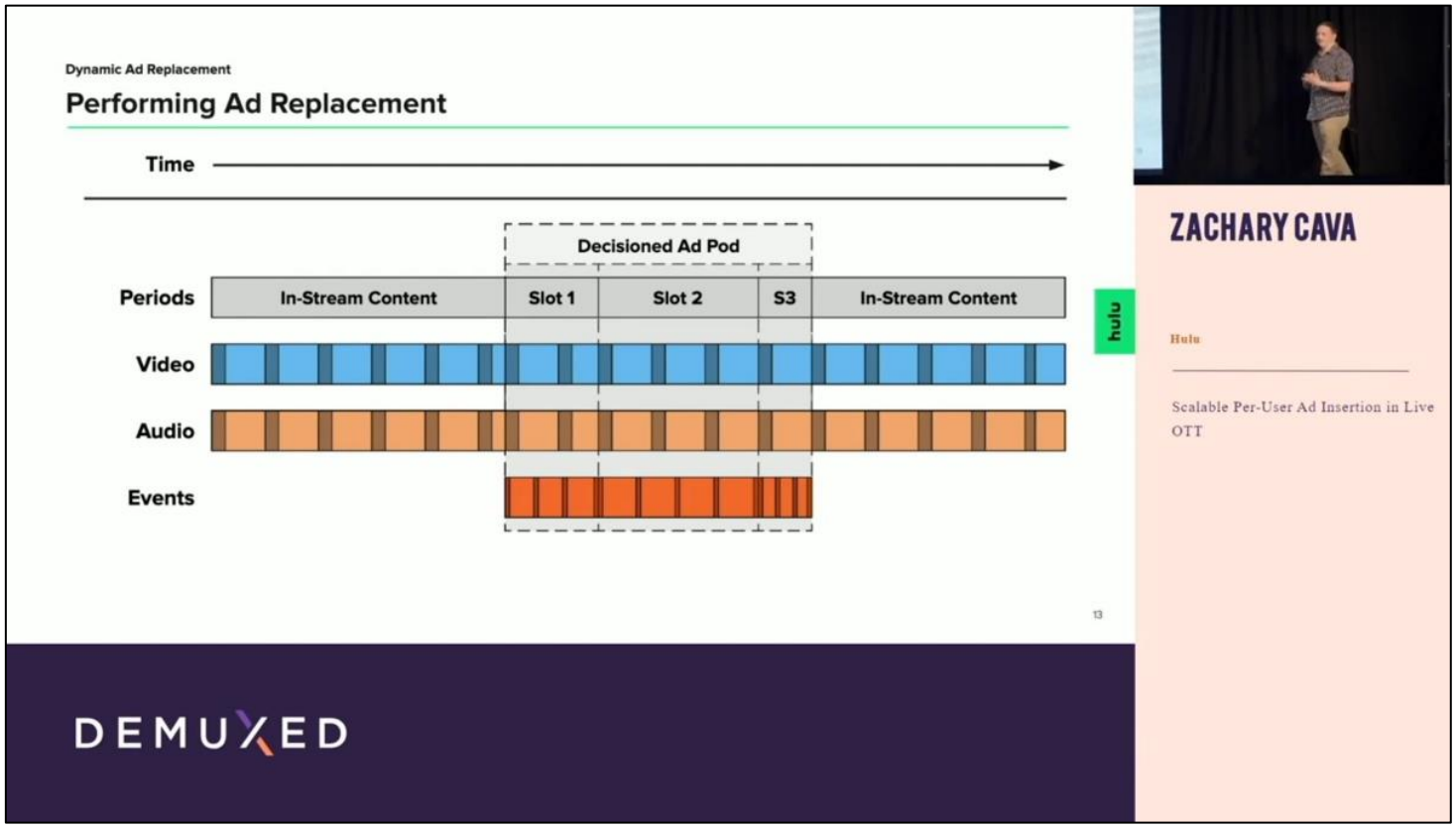


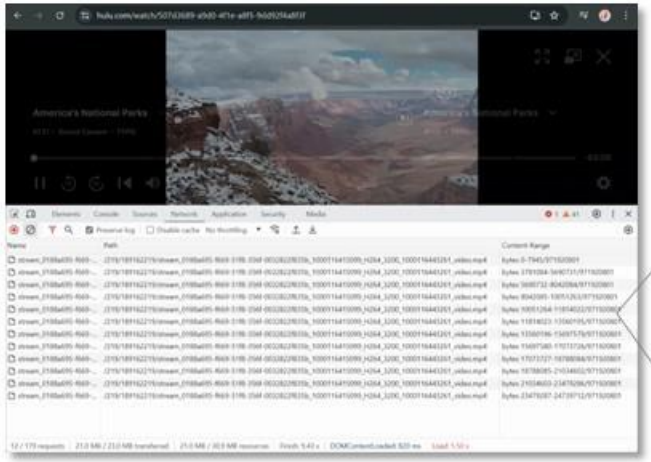
Demuxed Presentation at 2:54 to 3:52 mark.

Mr. Cava continued:

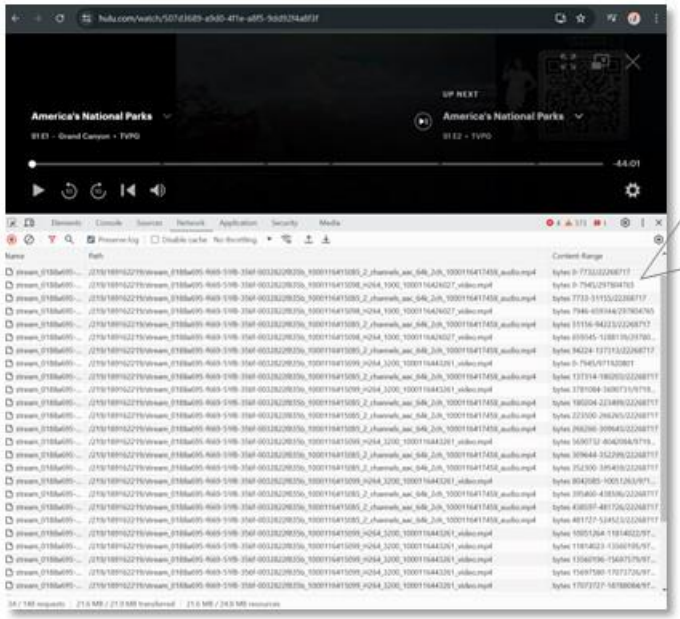
> You need to identify to the clients where these ad opportunities are, so that they can lock transfer controls, or do beaconing, or do a number of other things, and the common way to do this is to send the SCTE-35 down, but we found this was very cumbersome because the SCTE-35 had a lot of different implementations, and we didn't want to take that complexity to

U.S. Patent No. 10,986,403	Hulu
	the clients, so instead we actually abstracted this as DASH periods and what this did was we actually aligned our VOD and our Live format for describing ads. And so we didn't have to re-write any client logic, and it was great. And all the downstream systems were able to learn about the ads in a consistent way. But when you actually try to do ad replacement, this gives you a very unique property. You just have to take that period, throw it away, and bring in the ones you want to do for replacement. And because you've conditioned the stream in a very consistent and well-formed way, it becomes a very natural transition point. And so, typically an opportunity is going to be a bit longer than the typical ad slot, it's going to be 1 to 2 minutes, there's not too many 1 to 2 minute ad creatives in the world, so you get a pod of ads with different slots, of different durations, and you can drop those in. Alongside those ads you are going to have events and beacons that you need to send, and we send those down via events stream in the manifest. So everything is being described through the manifest. It is becoming the single source of truth.

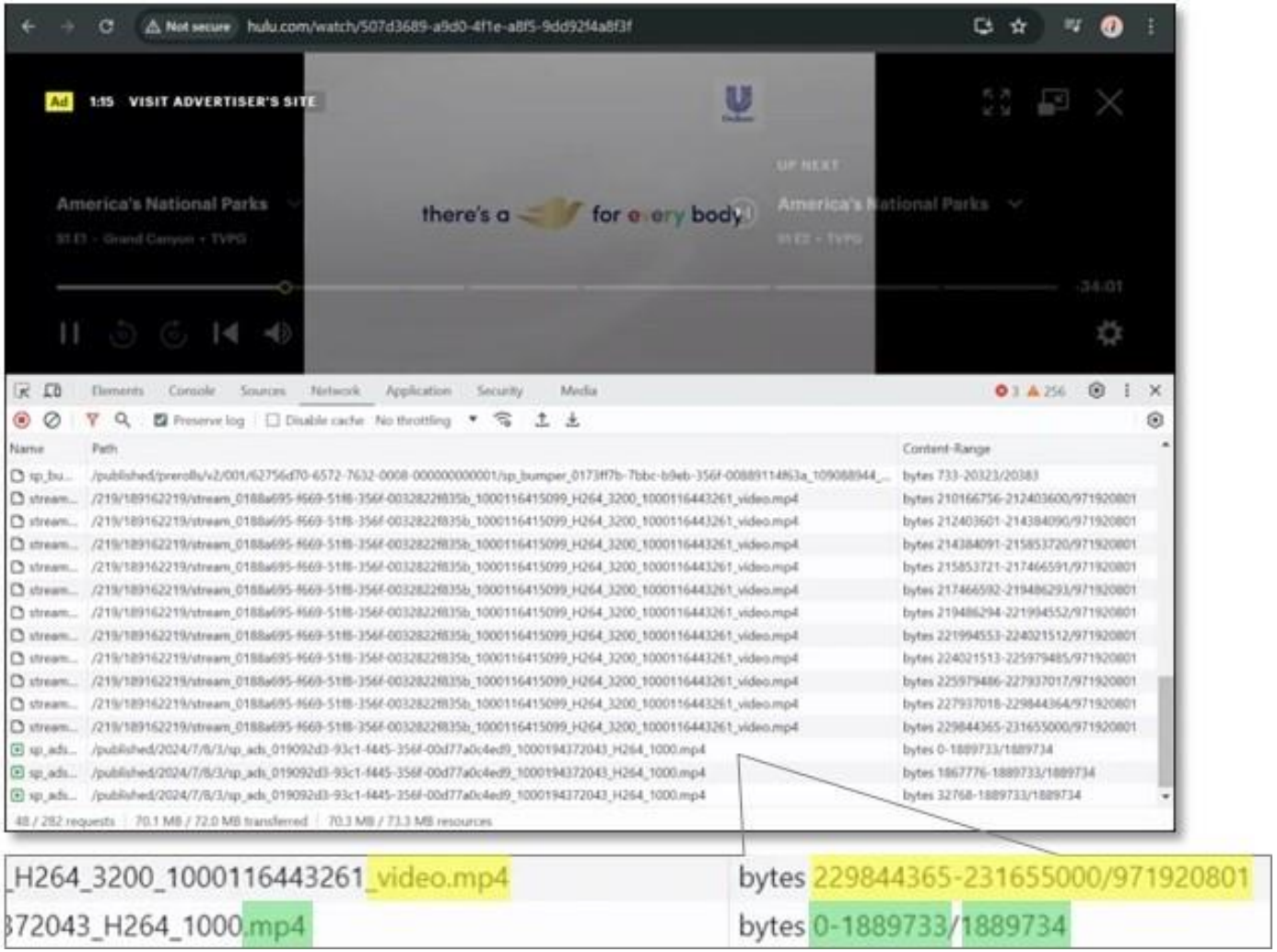


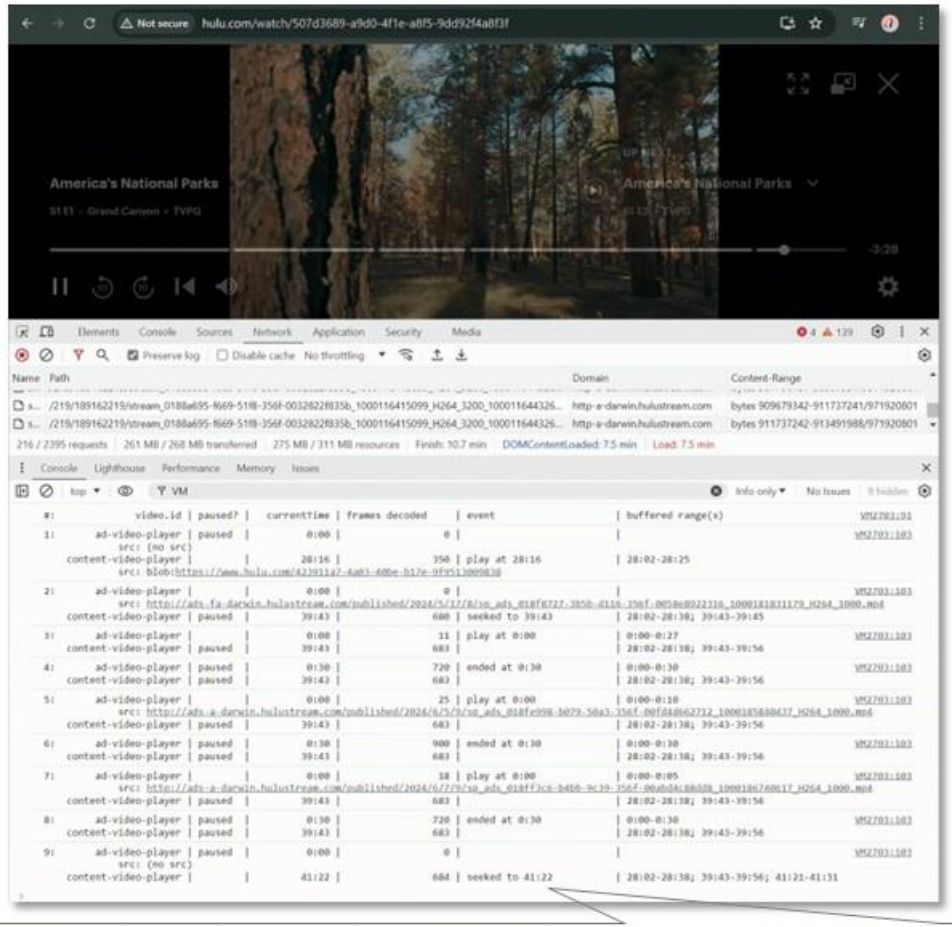
U.S. Patent No. 10,986,403	Hulu
	Demuxed Presentation at 3:58 to 4:44 mark. For example, advertisement insertion can be accomplished by sub-dividing a media file, removing a DASH period of content, and dropping in at least a part of one of the advertising file in the form of the Decisioned Ad Pod. Analysis of the web traffic displayed during playback of digital media content and digital advertising content also demonstrates that the Accused Instrumentalities generate a sequence by subdividing a media file into two or more segments, and at least a part of the at least one of the advertising file is presented between two of the segments. For example, the Hulu client on a browser requests and receives byte ranges of video.mp4 content files and presents video content using the video data it receives. In the example below, the Hulu client requests a byte range ending in 5690731, and separately requests a next byte range starting at the next byte, i.e., 5690732.  Screenshot of Hulu user interface on web browser, hulu.com, with debugger tool showing network traffic. The video .mp4 file has a corresponding audio .mp4 file as well.

	Content-Range
_H264_3200_1000116443261_video.mp4	bytes 0-7945/971920801
_H264_3200_1000116443261_video.mp4	bytes 3781084-5690731/971920801
_H264_3200_1000116443261_video.mp4	bytes 5690732-8042084/971920801
_H264_3200_1000116443261_video.mp4	bytes 8042085-10051263/971920801
_H264_3200_1000116443261_video.mp4	bytes 10051264-11814022/971920801
_H264_3200_1000116443261_video.mp4	bytes 11814023-13560195/971920801
_H264_3200_1000116443261_video.mp4	bytes 13560196-15697579/971920801
_H264_3200_1000116443261_video.mp4	bytes 15697580-17073726/971920801

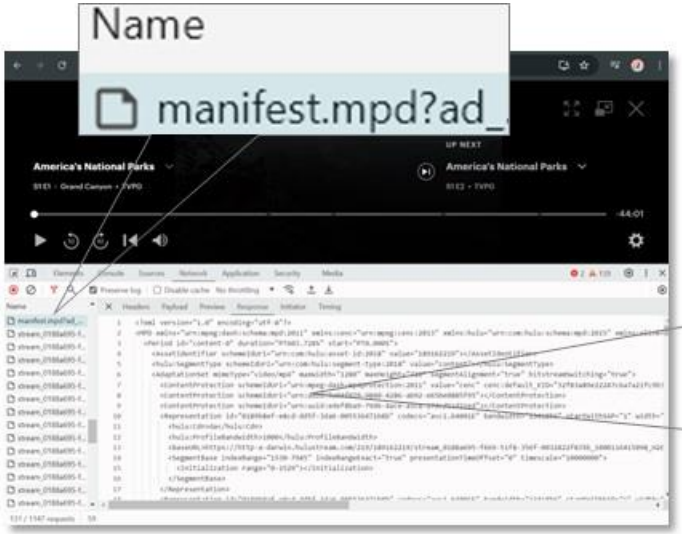
U.S. Patent No. 10,986,403	Hulu
	 Screenshot of Hulu user interface on web browser, hulu.com, with debugger tool showing network traffic. For example, the Hulu client on a browser requests and receives byte ranges of video.mp4 advertising files and presents video advertisements using the video data it receives. In the example below, after requesting a byte range from a content .mp4 video file, the Hulu client requests all bytes (0-1889733, for a total of 1889734 bytes) of an advertisement .mp4 video file

	Content-Range
x_2ch_1000116417458_audio.mp4	bytes 0-7732/22268717
6426027_video.mp4	bytes 0-7945/297804765
x_2ch_1000116417458_audio.mp4	bytes 7733-51155/22268717
6426027_video.mp4	bytes 7946-659344/297804765

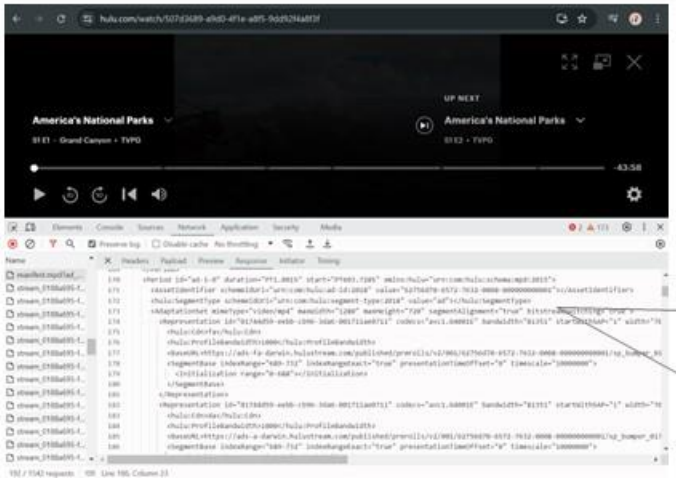
U.S. Patent No. 10,986,403	Hulu
	 Screenshot of Hulu user interface on web browser, hulu.com, with debugger tool showing network traffic. After Hulu plays the advertisement, Hulu resumes playing the content.

U.S. Patent No. 10,986,403	Hulu
	 Screenshot of Hulu user interface on web browser, hulu.com, with debugger tool showing network traffic and console running JavaScript reporting out video-related events.

U.S. Patent No. 10,986,403	Hulu
	As another example, the Hulu client retrieves a manifest that includes information about content to be played, and refers to "segments" with data such as "SegmentType" and "SegmentBase."



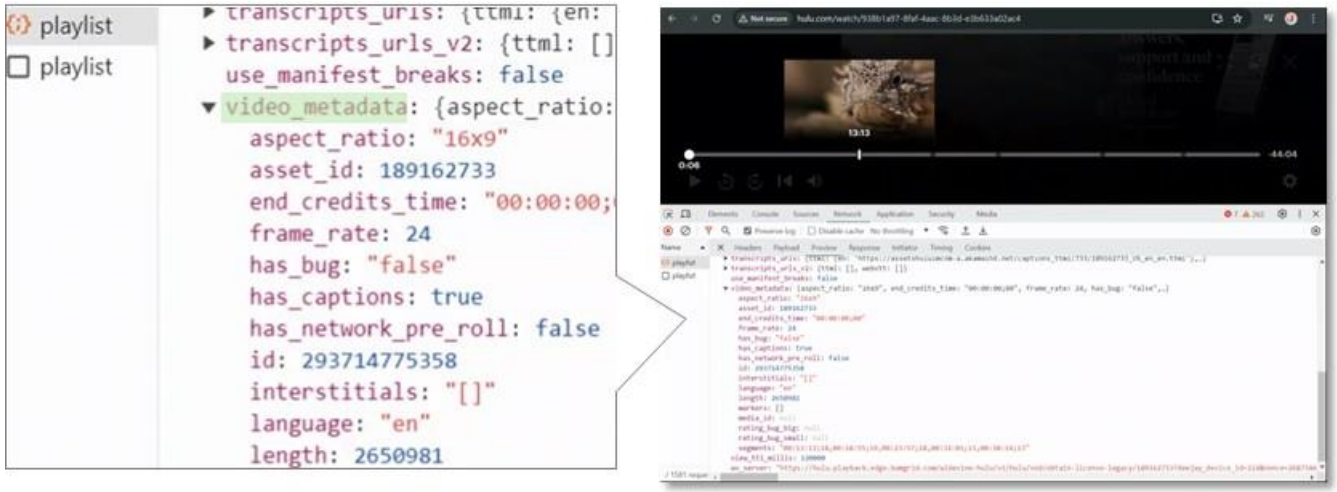

```
2   <MPD xmlns="urn:mpeg:dash:schema:mpd:2011" xmlns:cenc="urn:mpeg:cer
3     <Period id="content-0" duration="PT603.728S" start="PT0.000S">
4       <AssetIdentifier schemeIdUri="urn:com:hulu:asset-id:2018" value
5       <hulu:SegmentType schemeIdUri="urn:com:hulu:segment-type:2018"
6       <AdaptationSet mimeType="video/mp4" maxWidth="1280" maxHeight="
7         <ContentProtection schemeIdUri="urn:mpeg:dash:mp4protection:2
8         <ContentProtection schemeIdUri="urn:uuid:9a04f079-9840-4286-a
9         <ContentProtection schemeIdUri="urn:uuid:edef8ba9-79d6-4ace-a
10        <Representation id="0189b8ef-e8cd-dd5f-3da6-005536471b8b" co
11          <hulu:Cdn>da</hulu:Cdn>
12          <hulu:ProfileBandwidth>1000</hulu:ProfileBandwidth>
13          <BaseURL>https://http-a-darwin.hulustream.com/219/18916221
14          <SegmentBase indexRange="1530-7945" indexRangeExact="true"
```

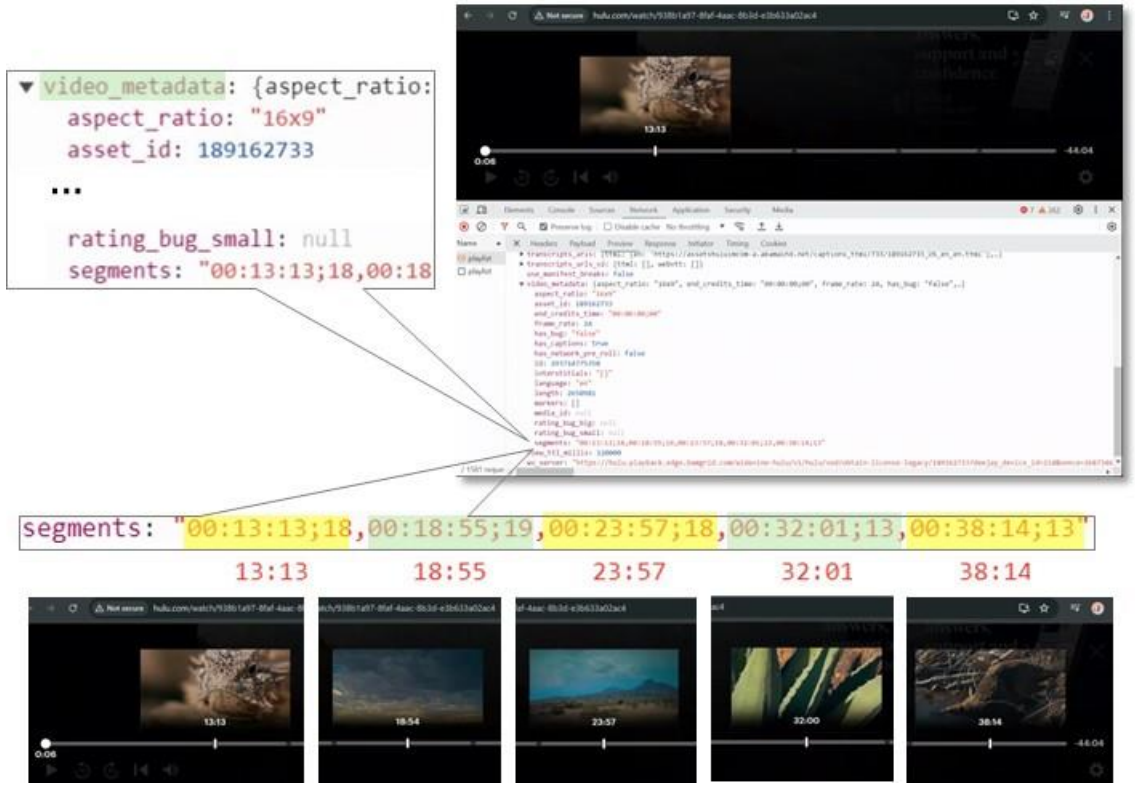


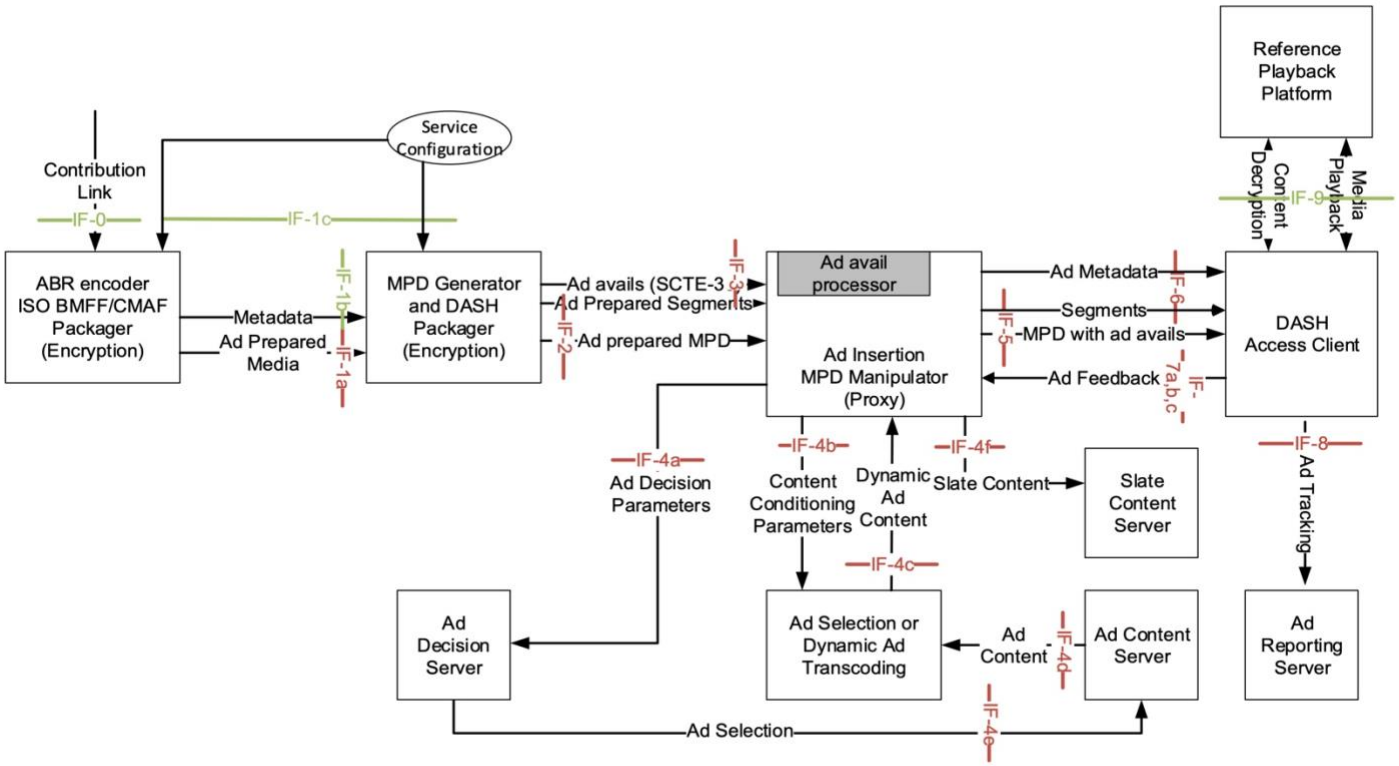

```
170   <Period id="ad-1-0" duration="PT1.001S" start="PT603.728S" xmlns
171     <AssetIdentifier schemeIdUri="urn:com:hulu:ad-id:2018" value="
172     <hulu:SegmentType schemeIdUri="urn:com:hulu:segment-type:2018"
173     <AdaptationSet mimeType="video/mp4" maxWidth="1280" maxHeight=
174       <Representation id="01744d59-eebb-cb96-3da6-001711ae0711" co
175         <hulu:Cdn>fa</hulu:Cdn>
176         <hulu:ProfileBandwidth>1000</hulu:ProfileBandwidth>
177         <BaseURL>https://ads-fa-darwin.hulustream.com/published/pr
178         <SegmentBase indexRange="689-732" indexRangeExact="true" p
```

Screenshot of Hulu user interface on web browser, hulu.com, with debugger tool showing network traffic.

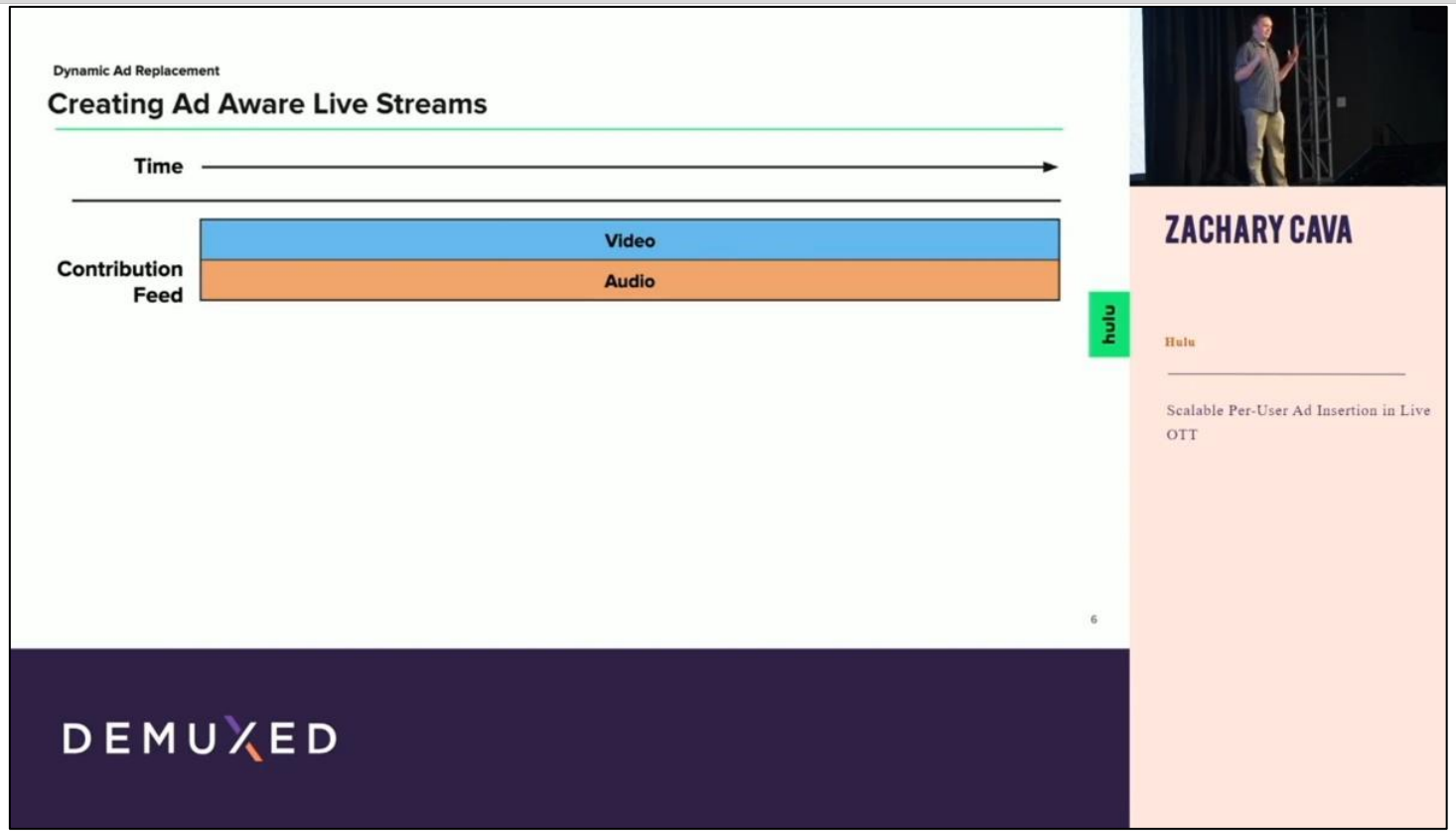
As another example, the Hulu client retrieves "playlist" data that includes "video_metadata" including "segments" information, which lists the time positions in the content timeline that are initially sequenced advertisement insertion points. That is, advertising

U.S. Patent No. 10,986,403	Hulu
	files are scheduled to be presented between segments of content, at the times listed in "segments."  Screenshot of Hulu user interface on web browser, hulu.com, with debugger tool showing network traffic.

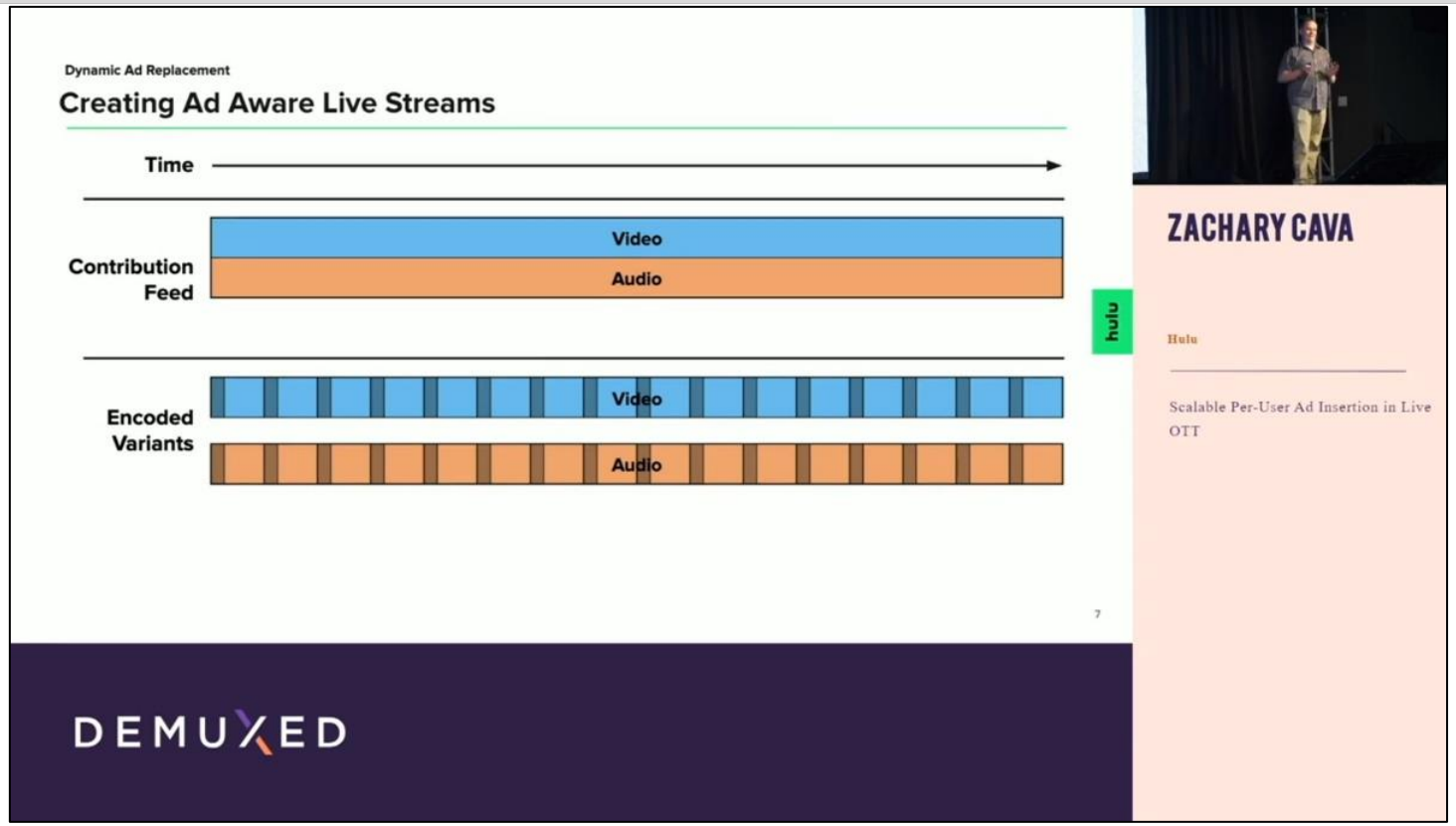
U.S. Patent No. 10,986,403	Hulu
	 Screenshot of Hulu user interface on web browser, hulu.com, with debugger tool showing network traffic. An analysis of proprietary backend systems and/or source code may be necessary to fully and accurately describe the functionality of the Accused Instrumentalities with respect to this limitation and, accordingly, Plaintiff reserves the right to supplement these infringement contentions once such information is made available to Plaintiff.

U.S. Patent No. 10,986,403	Hulu
[7] The digital media player device as in claim 4, wherein the user input results in a change of a sequence of two or more media files by at least one of subtracting an existing media file and re-arranging the sequence of two or more media files in a change of sequence by adding a new media file.	In the Accused Instrumentalities, the user input results in a change of a sequence of two or more media files by at least one of subtracting an existing media file and re-arranging the sequence of two or more media files in a change of sequence by adding a new media file. For example, as shown in Figure 1 of the DASH Standard, the MPD Generator of the Accused Instrumentalities generates and MPD that is passed to the intersplicer (e.g., the Ad Insertion MPD Manipulator). The MPD is a script that sets the order of segments for the presentation of piece of digital media content.  **Figure 1 DASH-IF Ad Insertion Architecture** DASH Part 5 at Figure 1 DASH-IF Ad Insertion Architecture ("DASH diagram").

U.S. Patent No. 10,986,403	Hulu
	In a presentation given at the Demuxed 2019 Conference, Zachary Cava provided detail showing that the Hulu Accused Instrumentalities have an intersplicer that changes the sequence of two or more media files by at least one of subtracting an existing media file and re-arranging the sequence of two or more media files in a change of sequence by adding a new media file. For example, in a section of his presentation entitled, "Dynamic Ad Replacement," Mr. Cava explained: > I want to start with kind of detailing how you do dynamic ad insertion in a live stream and part of that is actually replacement. A live stream that you're getting from a broadcaster has ads in it. But you have the opportunity to replace those ads. And so, you are going to replace them. Demuxed Presentation at the 2:12 to 2:29 mark. The content ultimately displayed on the DASH Access Client originally comes from a broadcaster in the form of a contribution feed. This contribution feed includes advertising content. The intersplicer of the Hulu Accused Devices removes the advertisement content in the contribution feed (e.g., subtracts a media file) and replaces it with new advertisement content (i.e., re-arranged the sequence of two or more media files in a change of sequence by adding new media). Mr. Cava continued, "From your broadcaster you're going to get a contribution feed. It's going to be great quality, it's going to be the best thing in the world, but you can't send that to clients because you can't support that on the network."

U.S. Patent No. 10,986,403	Hulu
	 Demuxed Presentation at 2:30 to 2:40 mark. Instead of sending the contribution feed to the clients, Hulu breaks it into smaller, manageable pieces. As Mr. Cava noted, "So, typical to the live streaming space, you're going to take that contribution feed, you're going to encode it, the encode is going to be to a fixed duration segment, and those segments are going to start with IDR frames."

U.S. Patent No. 10,986,403	Hulu

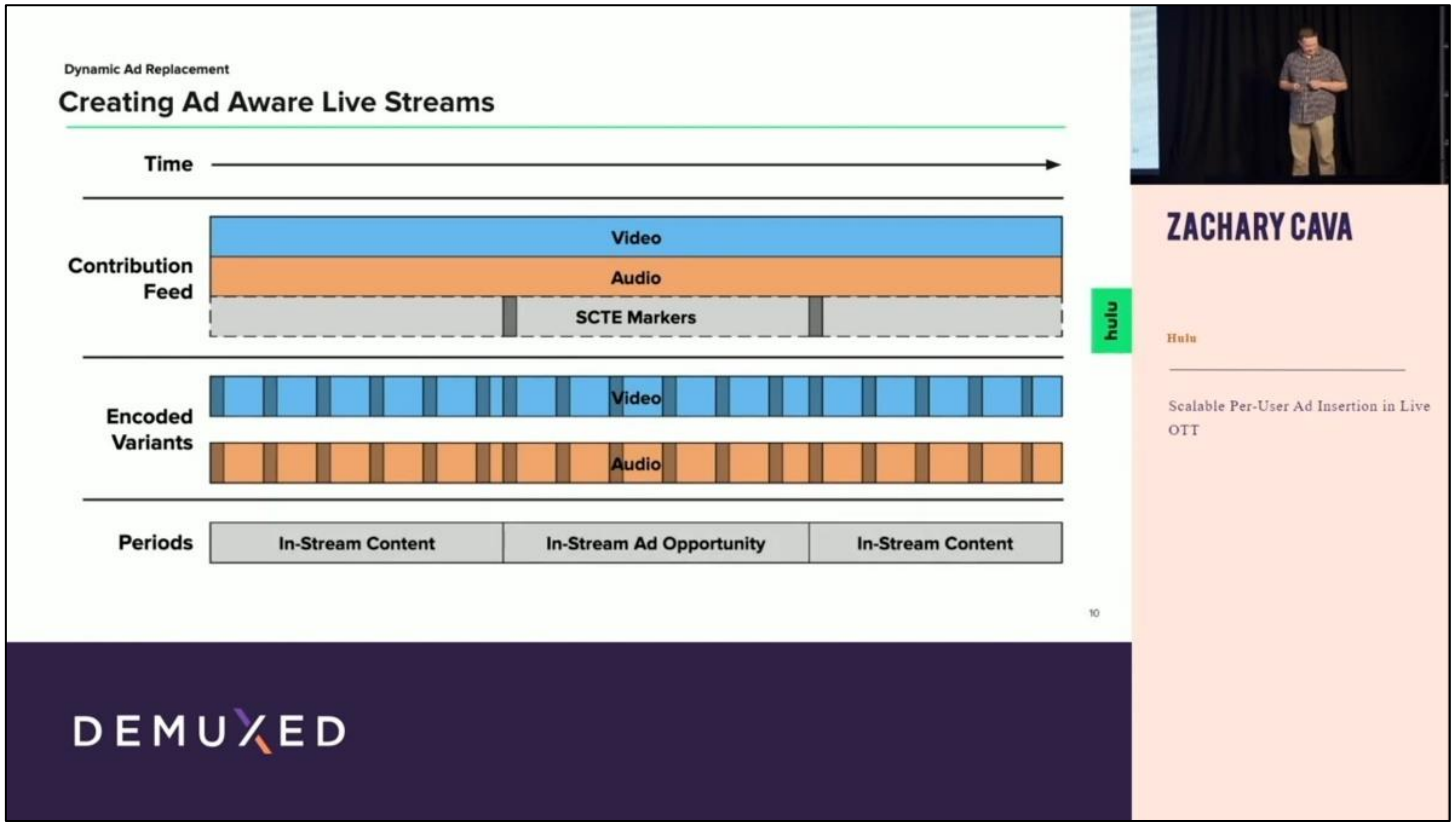


Demuxed Presentation at 2:41 to 2:50 mark.

In addition to encoding "fixed duration segments," the Hulu Accused Instrumentalities also encode for SCTE-35. According to Mr. Cava:

> Now when you want to do ad insertion, of course, you need to know where the ads are, and to support that we actually have a thing called SCTE-35. … SCTE-35 can identify a lot of things about this stream, but the thing we're going to look at the most today is the ad opportunity points. And so, the other thing we do is we use these ad opportunity points to continue conditioning the stream, so not just conditioning based on the segment's duration, but also conditioning based on where these markers are. And this is a very important property to enable seamless insertion. As long as you can transition out and in on a segment boundary it makes a much better experience on the client and makes it much easier to handle in your

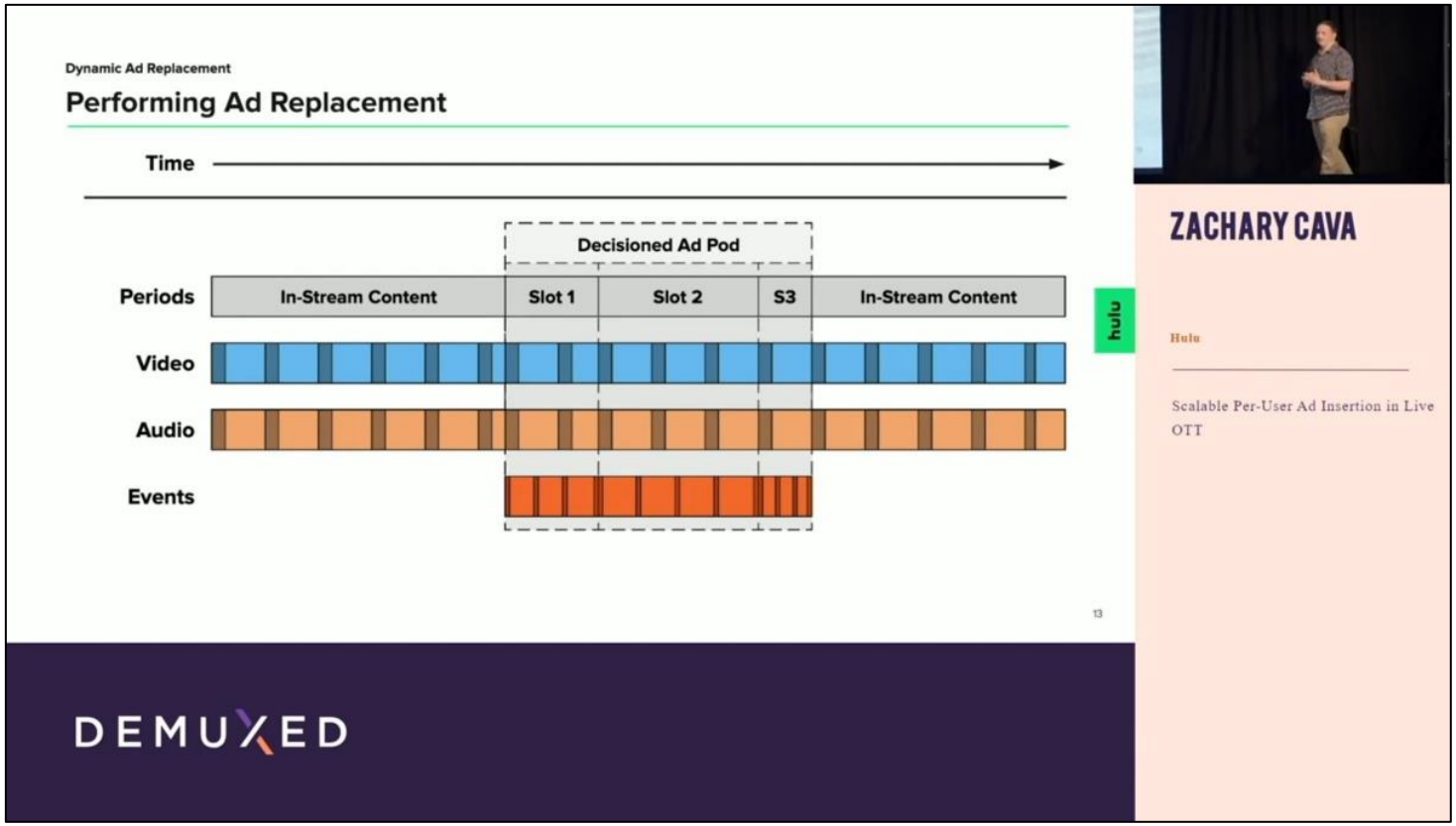
U.S. Patent No. 10,986,403	Hulu
	player implementations. And so, here we go through, and we've re-encoded it and you see how the segment durations have adjusted for that encode.

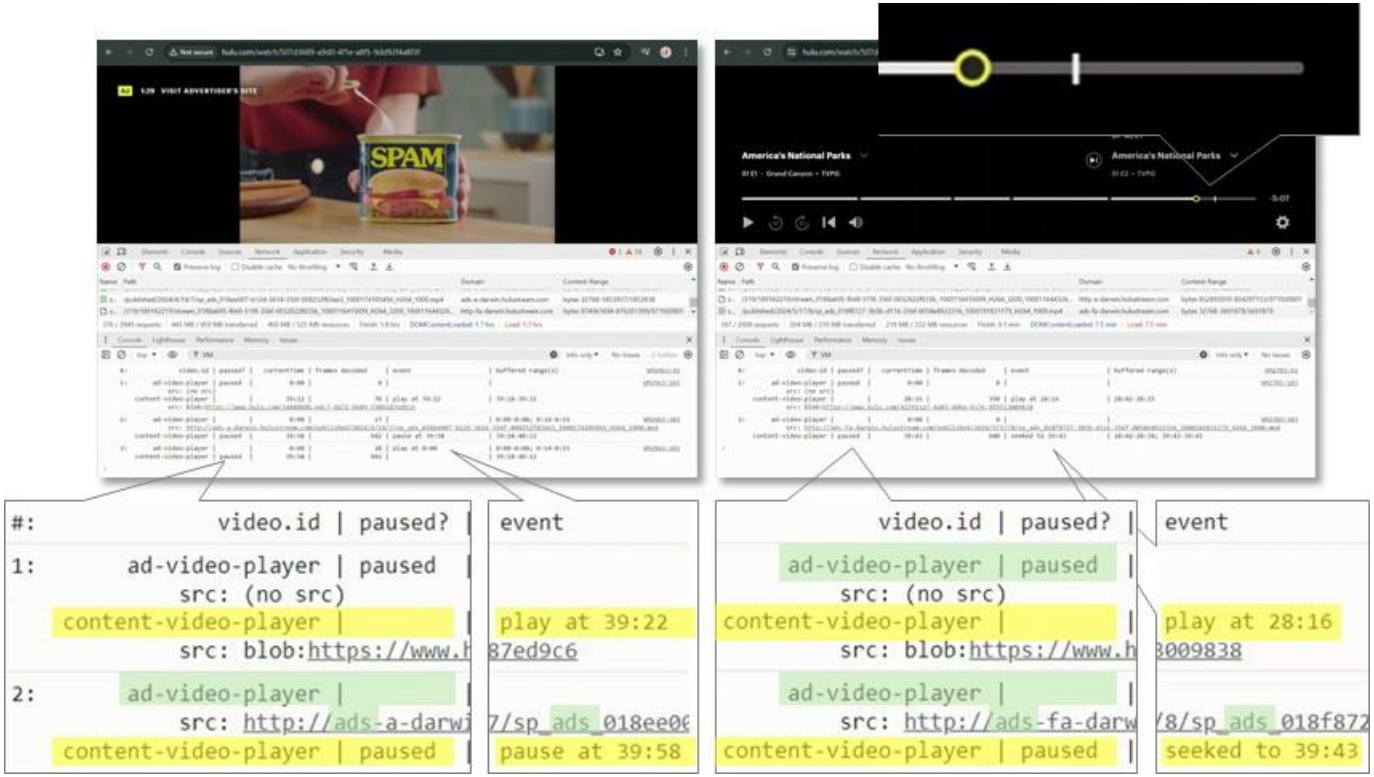


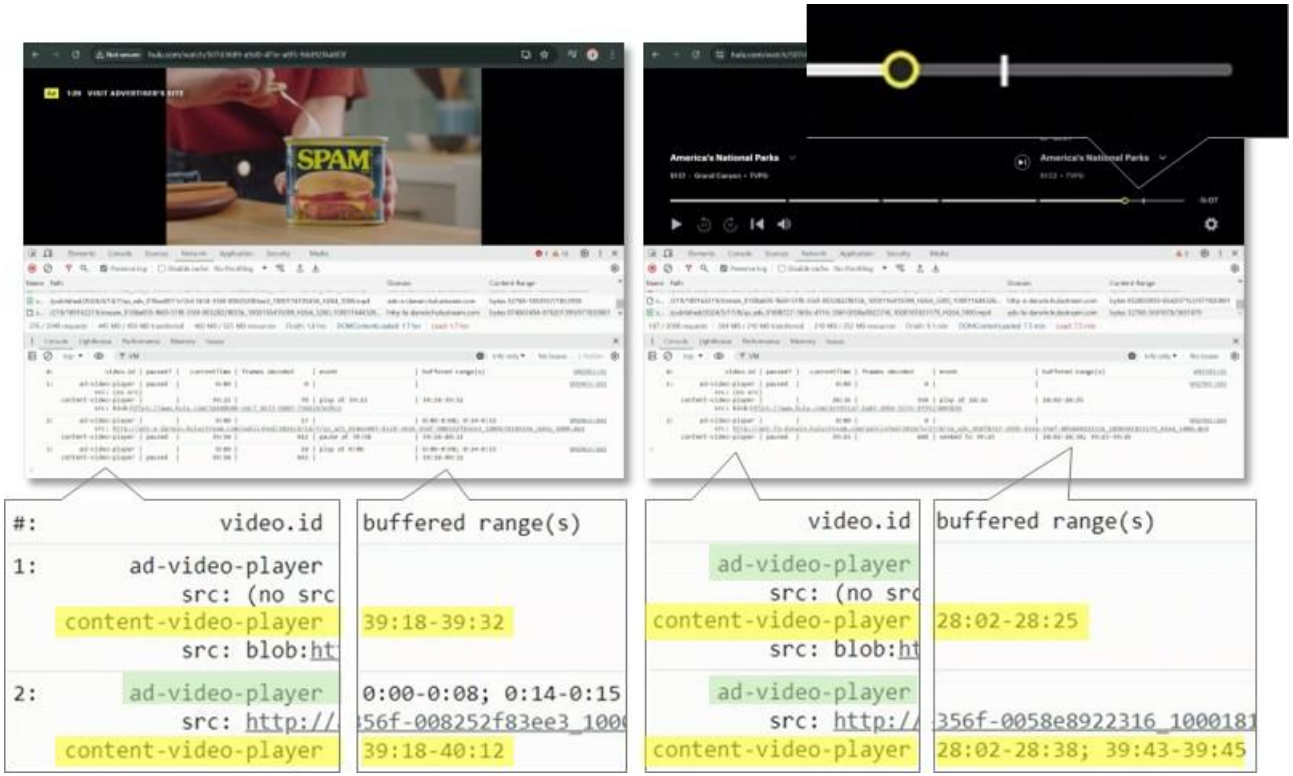
Demuxed Presentation at 2:54 to 3:52 mark.

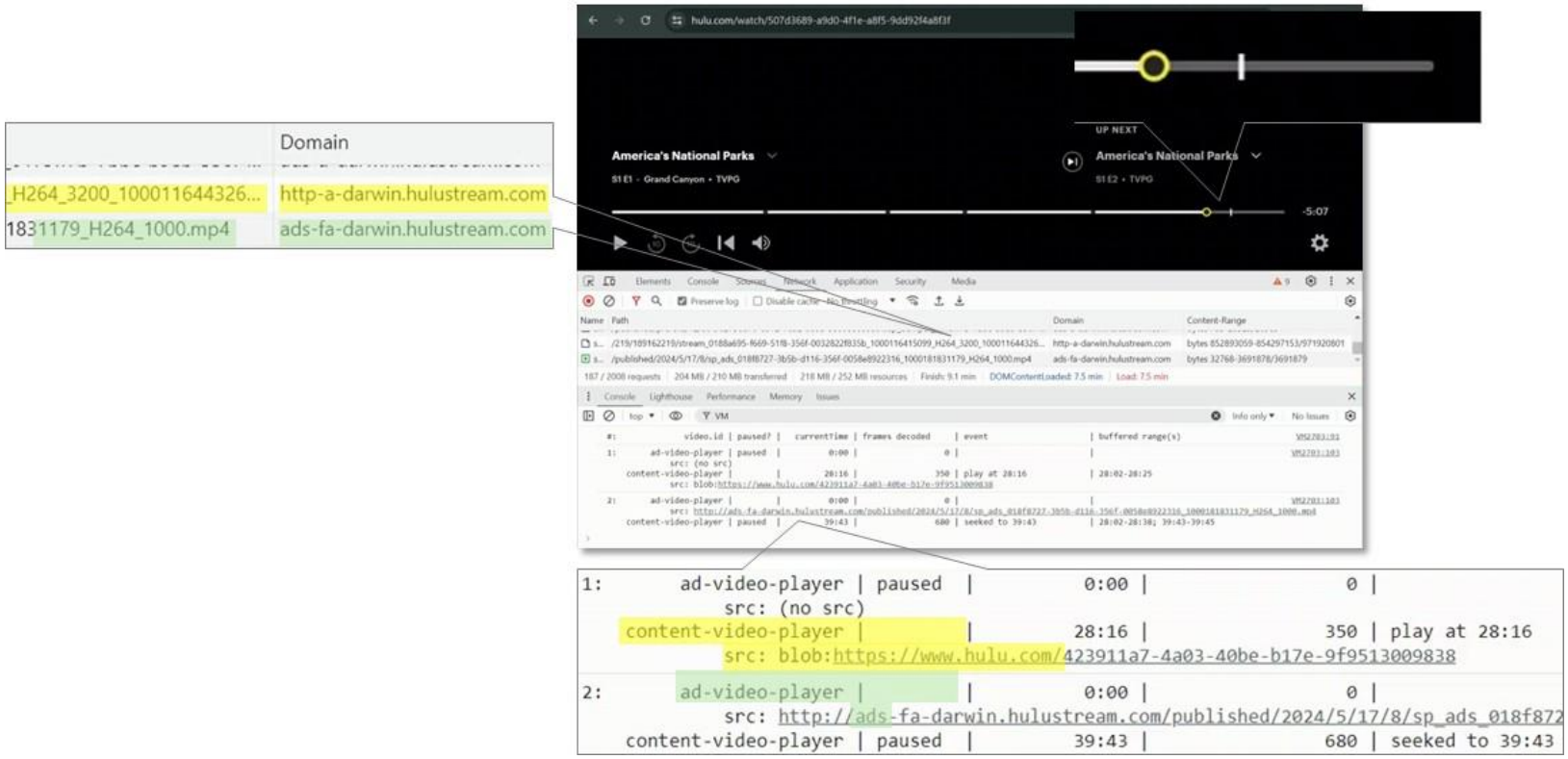
Mr. Cava continued:

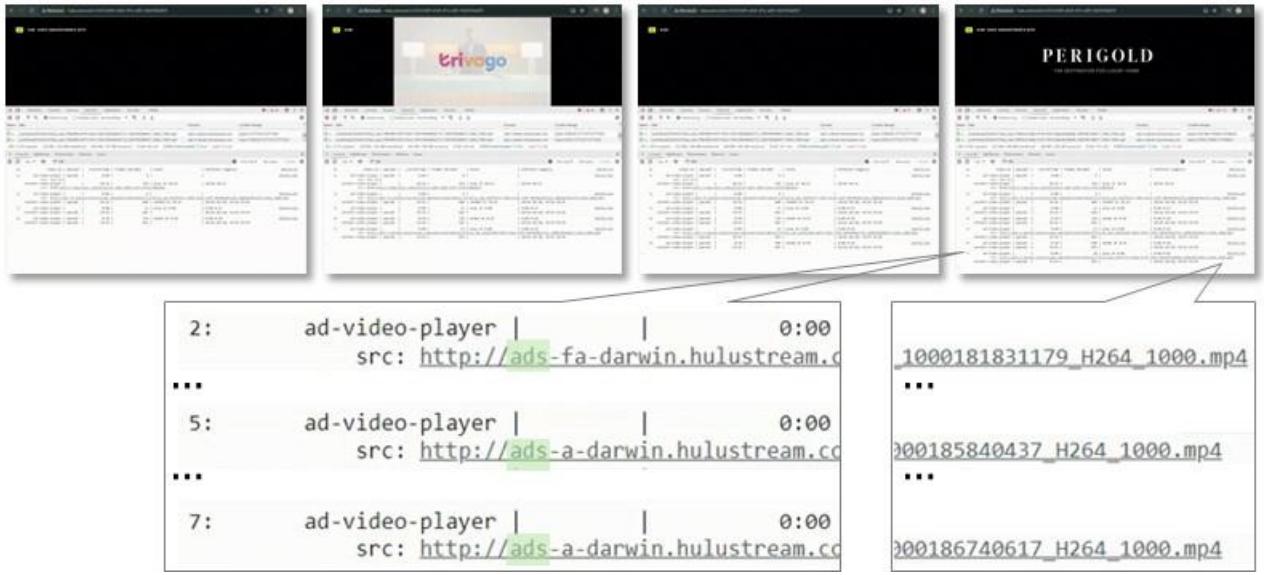
> You need to identify to the clients where these ad opportunities are, so that they can lock transfer controls, or do beaconing, or do a number of other things, and the common way to do this is to send the SCTE-35 down, but we found this was very cumbersome because the SCTE-35 had a lot of different implementations, and we didn't want to take that complexity to the clients, so instead we actually abstracted this as DASH periods and what this did was we actually aligned our VOD and

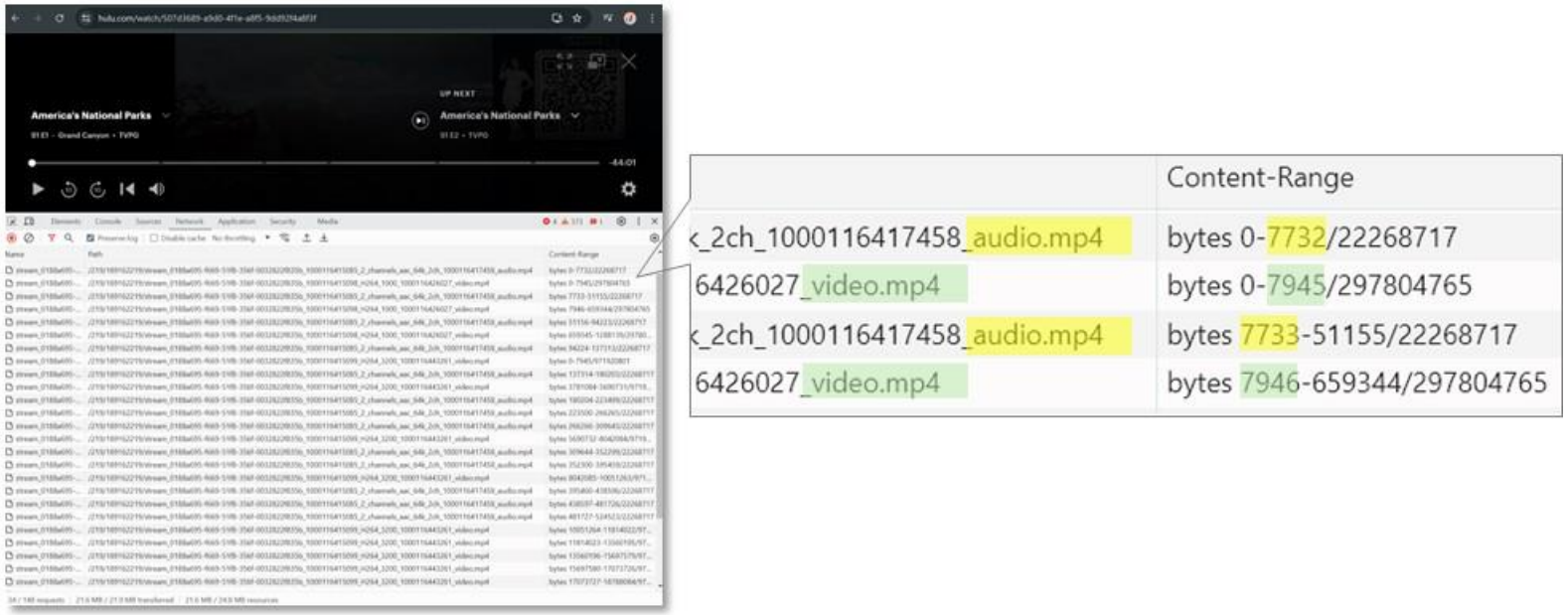
U.S. Patent No. 10,986,403	Hulu
	our Live format for describing ads. And so we didn't have to re-write any client logic, and it was great. And all the downstream systems were able to learn about the ads in a consistent way. But when you actually try to do ad replacement, this gives you a very unique property. You just have to take that period, throw it away, and bring in the ones you want to do for replacement. And because you've conditioned the stream in a very consistent and well-formed way, it becomes a very natural transition point. And so, typically an opportunity is going to be a bit longer than the typical ad slot, it's going to be 1 to 2 minutes, there's not too many 1 to 2 minute ad creatives in the world, so you get a pod of ads with different slots, of different durations, and you can drop those in. Alongside those ads you are going to have events and beacons that you need to send, and we send those down via events stream in the manifest. So everything is being described through the manifest. It is becoming the single source of truth.  Demuxed Presentation at 3:58 to 4:44 mark.

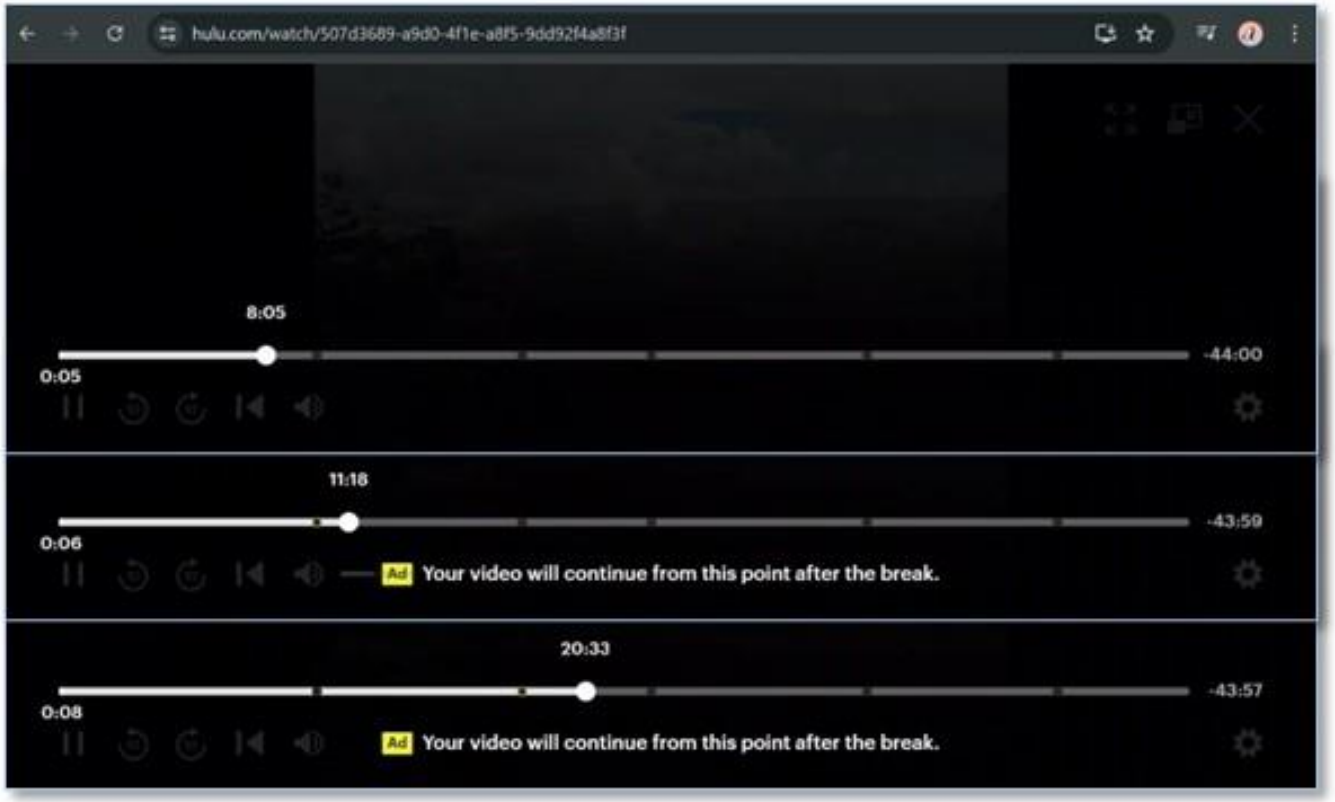
U.S. Patent No. 10,986,403	Hulu
	In other words, when the Hulu Accused Instrumentalities engage in dynamic ad insertion, for example, in response to a user input, they do so by subtracting existing media files shown by the "Decisioned Ad Pod" in the figure above, and re-arrange the sequence of two or more media files in a change of sequence by adding new media files in the form of selected advertisements. As shown in the examples discussed in [1d.3, 1d.4, and 1d.5], the initially sequenced insertion points result in advertisement files being played after a pre-designated time in the content's timeline (39:58 in the example shown in [1d.3]), but the alternatively sequenced insertion points result in advertisement files being played at a different time in the content's timeline (for example, immediately after the new play position of 41:22 in the example shown in [1d.4]) In the example below, when Hulu uses the initially sequenced insertion point, Hulu plays content from 39:22 until pausing the content at 39:58, then plays ads. In contrast, when Hulu uses the alternatively sequenced insertion point, Hulu plays content from 28:16, then pauses, stops playing content before 29:00, and plays ads. The "content-video-player" skips ahead to 39:43 but does not play content at 39:43. 

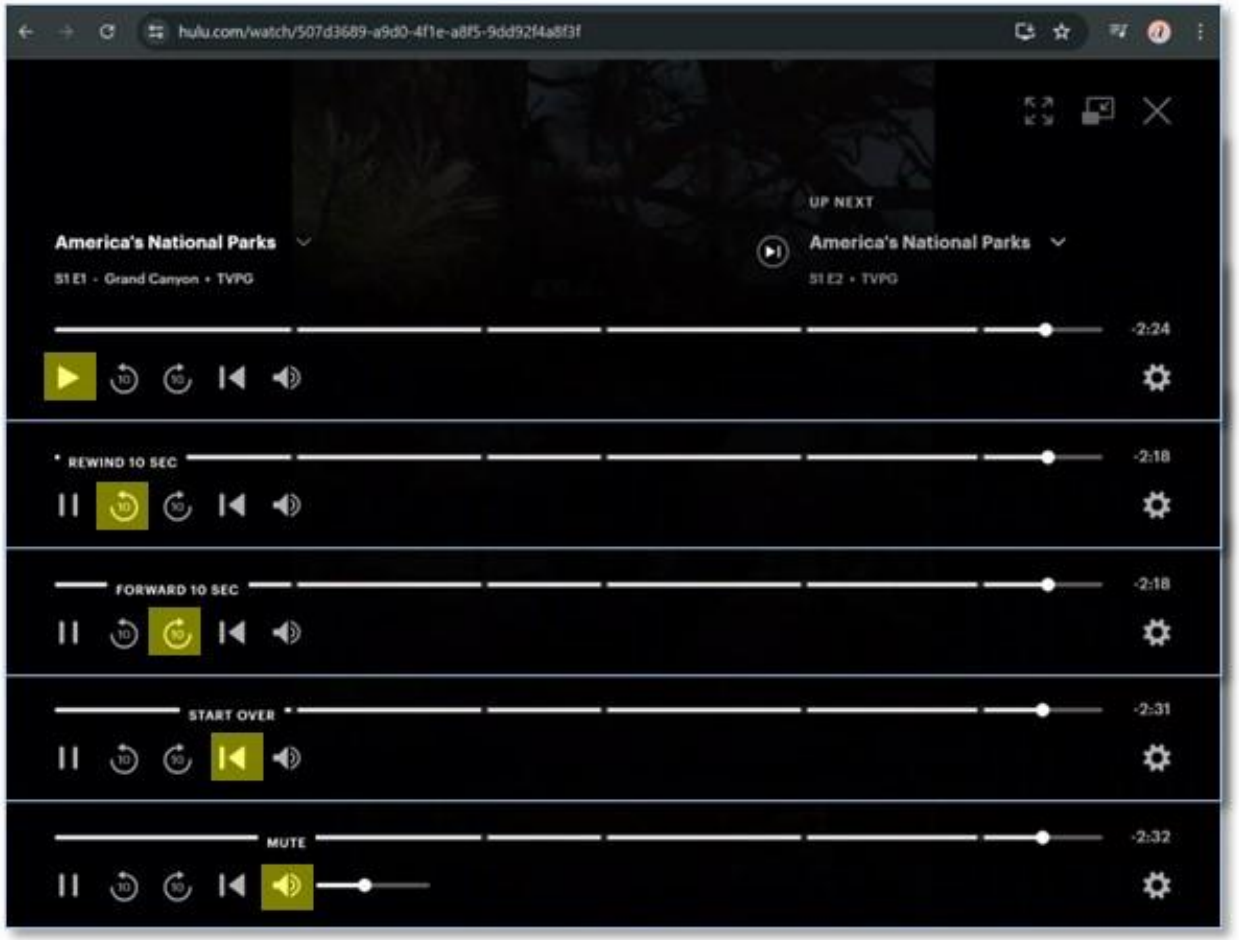
U.S. Patent No. 10,986,403	Hulu
	Screenshot of Hulu user interface on web browser, hulu.com, with debugger tool showing network traffic and console running JavaScript reporting out video-related events. In the example shown above and below, when Hulu uses the initially sequenced insertion point, Hulu plays content from the 39-minute range, then plays ads, then resumes playing content through the 40-minute range. Accordingly, the buffered range of content for "content-video-player" covers the entire 39:18 - 40:12 timeframe in one continuous range. In contrast, when Hulu uses the alternatively sequenced insertion point, the buffered ranges of content for "content-video-player" are disjointed because the "content-video-player" played content in the 28-minute range, but not the 29 to 39 minute range, before pausing to play ads.  Screenshot of Hulu user interface on web browser, hulu.com, with debugger tool showing network traffic and console running JavaScript reporting out video-related events. In this example, when Hulu used the alternatively sequenced insertion point to play content, then play advertisements, then resume

U.S. Patent No. 10,986,403	Hulu
	playing content, Hulu re-arranged the sequence of [1] the content media files (for example, the "_H264_3200" video .mp4 file and the corresponding audio .mp4 file(s) that "content-video-player" plays in this example) and [2] the advertisement media files (video, and possibly separate corresponding audio, files for multiple advertisements) that would have been played at the initially sequenced insertion point, in a change of sequence by adding new advertisement media files (including the three advertisement video files ending in "1179_H264_1000.mp4," "0437_H264_1000.mp4," and "0617_H264_1000.mp4" in this example).  Screenshot of Hulu user interface on web browser, hulu.com, with debugger tool showing network traffic and console running JavaScript reporting out video-related events.

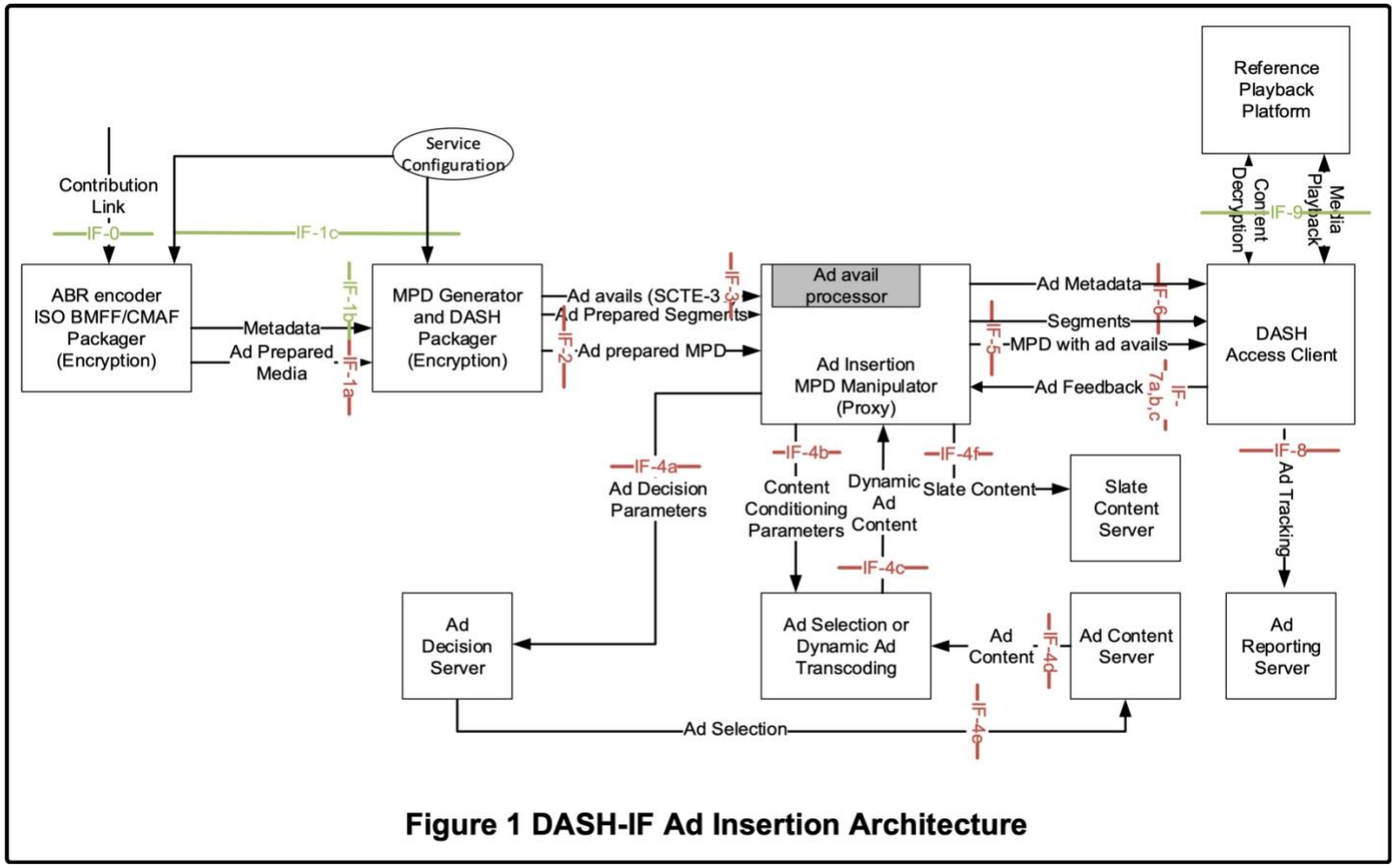
U.S. Patent No. 10,986,403	Hulu
	 Screenshot of Hulu user interface on web browser, hulu.com, with debugger tool showing network traffic and console running JavaScript reporting out video-related events. In the example shown below, the content .mp4 files include a video .mp4 file and a corresponding audio .mp4 file.

U.S. Patent No. 10,986,403	Hulu
	 Screenshot of Hulu user interface on web browser, hulu.com, with debugger tool showing network traffic. An analysis of proprietary backend systems and/or source code may be necessary to fully and accurately describe the functionality of the Accused Instrumentalities with respect to this limitation and, accordingly, Plaintiff reserves the right to supplement these infringement contentions once such information is made available to Plaintiff.
[8] The digital media player device as in claim 1, wherein the user input further comprises one or more navigational choices for the content stream.	The Accused Instrumentalities allow user input in the form of one or more navigational choices for the content stream. For example, one option a user has to change the play position for the content stream is to slide the play position (white ball on the time bar) forward or backward on the time bar.

U.S. Patent No. 10,986,403	Hulu
	 Screenshot of Hulu user interface on web browser, hulu.com. Additionally, the Hulu digital media player device provides a user with several tools, within the red boxes below, that provide navigational choices for the content stream. allows the user to move the play position forward in the content if it has been paused. Pressing this toggles between playing and pausing content. allows the user to move the play position backward 10 seconds from the current position. allows the user to move the play position forward 10 seconds from the current position. allows the user to move the play position back to the beginning of the content. allows the user to increase or decrease the volume or mute the audio.

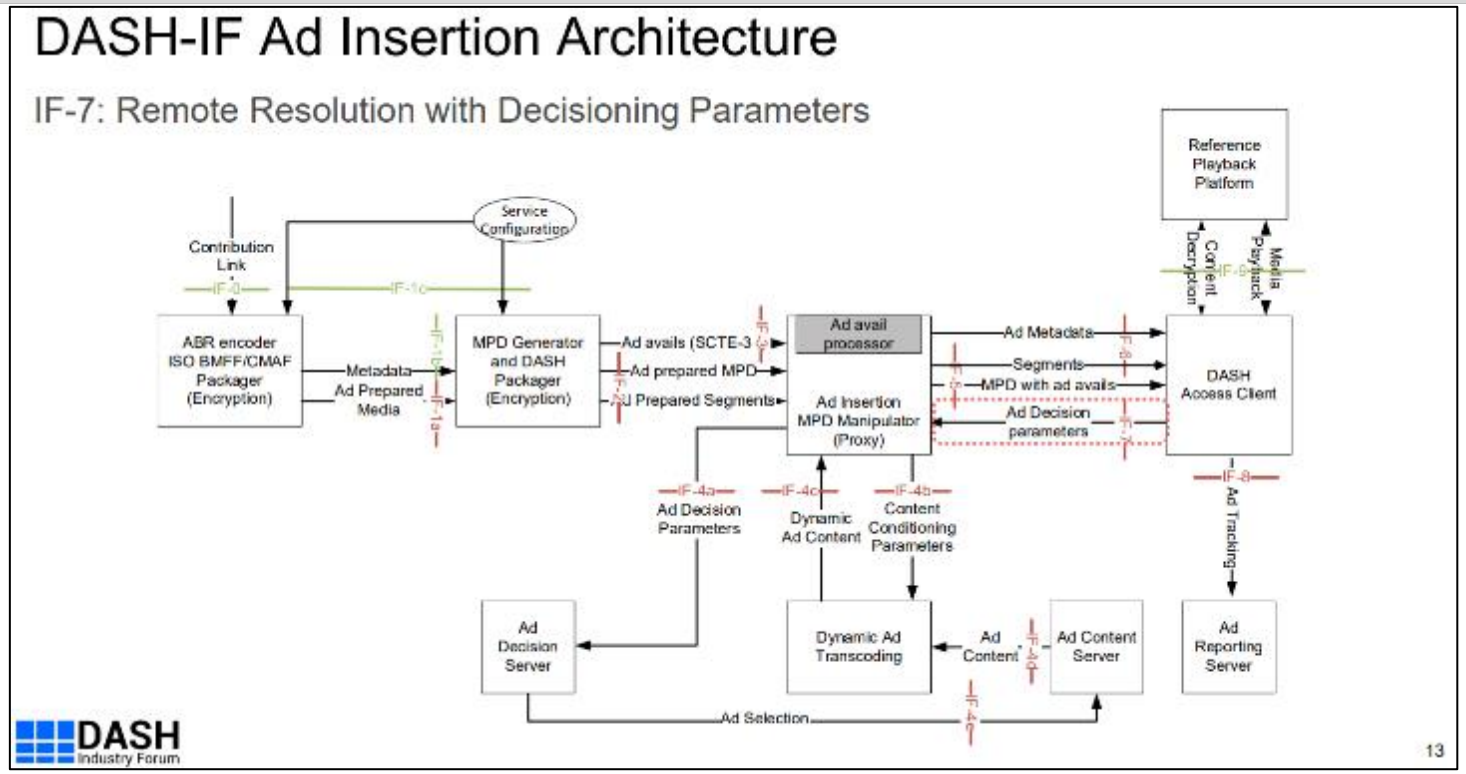
U.S. Patent No. 10,986,403	Hulu
	 Screenshot of Hulu user interface on web browser, hulu.com. An analysis of proprietary backend systems and/or source code may be necessary to fully and accurately describe the functionality of the Accused Instrumentalities with respect to this limitation and, accordingly, Plaintiff reserves the right to supplement these infringement contentions once such information is made available to Plaintiff.

U.S. Patent No. 10,986,403	Hulu
[9] The digital media player device as in claim 8, wherein the one or more navigational choices are selected from a group consisting of: play, stop, pause/continue, reverse, rewind, fast-forward, slow-motion, track advance, frame-by-frame advance, go direct to point or page in sequence, advance chapter, page turn, change track, change media selection, shuttle knob, and one or more sound controls.	The Accused Instrumentalities allow the user to input one or more navigational choices selected from a group consisting of: play, stop, pause/continue, reverse, rewind, fast-forward, slow-motion, track advance, frame-by-frame advance, go direct to point or page in sequence, advance chapter, page turn, change track, change media selection, shuttle knob, and one or more sound controls. *See, e.g.*, [8]. An analysis of proprietary backend systems and/or source code may be necessary to fully and accurately describe the functionality of the Accused Instrumentalities with respect to this limitation and, accordingly, Plaintiff reserves the right to supplement these infringement contentions once such information is made available to Plaintiff.

U.S. Patent No. 10,986,403	Hulu
[10] The digital media player device as in claim 1, further comprising: rotating, using an ad manager and an ad rotator, new advertising content into the content stream in response to the user input, the ad manager operative to receive ad files and select ad files for presentation from a database of ad files and the ad rotator configured to replace ad files with new ad files after the ad files have been presented.	The Accused Instrumentalities include an ad manager and ad rotator for rotating new advertising content into the content stream in response to the user input, the ad manager operative to receive ad files and select ad files for presentation from a database of ad files and the ad rotator configured to replace ad files with new ad files after the ad files have been presented. For example, in Figure 1 of the DASH Standard, the intersplicer (Ad Insertion MPD Manipulator) sends one or more requests for advertising content during the course of presentation of the digital media content, in the form of Ad Decision Parameters, to an ad manager (for example, the Ad Content Server and related structures), and an ad rotator (for example, the Ad Decision Server and related structures).  **Figure 1 DASH-IF Ad Insertion Architecture** DASH Part 5 at Figure 1 DASH-IF Ad Insertion Architecture ("DASH diagram").

U.S. Patent No. 10,986,403	Hulu
	For example, if a user is watching content through the Hulu user interface, and the play position is located before an initially sequenced insertion point, when the user moves the play position to after the insertion point (i.e., attempts to jump the advertisements at the insertion point) the client may send Ad Feedback to the Ad Insertion MPD Manipulator via IF-7. The DASH Standard explains that the Ad Insertion MPD Manipulator may then send Ad Decision Parameters to the Ad Decision Server (via IF-4) to help it decide which advertisements to display. **5.6.2 IF-4a: Ad Decision request parameters** **5.6.2.1 Decisioning Parameters** This document does not specify a specific format, but only discusses some principle approaches. Additional details on specific formats are for further study. A *decisioning parameter* is a piece of information about the content stream, consumption medium, or end user that is used by the Ad Decisioning Server as part of the advertisement qualification and selection process. The Ad Insertion MPD Manipulator collects and sends this information to the Ad Decisioning Server as part of IF-4a. DASH Part 5 at § 5.6.2. When the Ad Decision Server receives Ad Decision Parameters, it selects advertisements to display from a collection of available digital advertising content. **5.6 IF-4: Ad Decisioning and Exchange Interfaces** **5.6.1 Introduction** Information about ad content to insert into a presentation is retrieved from the Ad Decision and Ad Content server(s) via the IF-4 interfaces. The request from the Ad Insertion MPD Manipulator for ad content provides all the information needed to perform ad decisioning, including content metadata and opportunity descriptions. The response is then translated by the Ad Insertion MPD Manipulator into the DASH structures detailed in IF-5. DASH Part 5 at § 5.6.1, Introduction.

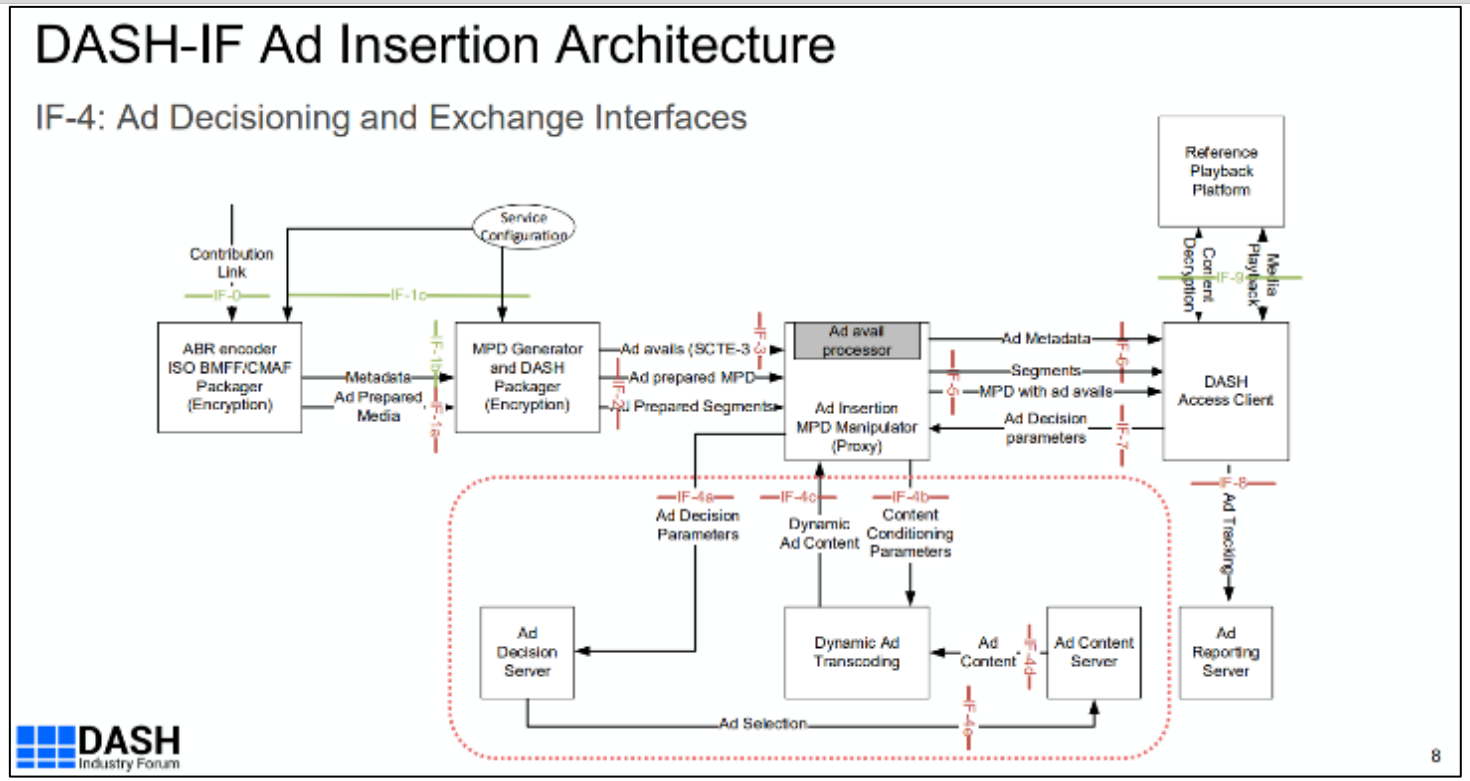
U.S. Patent No. 10,986,403	Hulu
	Once the Ad Decision Server identifies which advertisements, the Ad Content Server provides the actual ad content to the Ad Insertion MPD Manipulator. As noted in the above citation, the advertisements are "then translated by the Ad Insertion MPD Manipulator into the DASH structures" and sent to the client device for display. 5.6.4.1 Overview The response of the Ad Decision Server identifies the advertisements decisioned by the server and provides information associated with the advertisement such as general metadata, viewability requirements, media files, mezzanines, and tracking events. The actual ad content is provided by the Ad Content Server, preferably following the DASH-IF Ad Content format as defined in clause 5.6.7. Depending on the decisioning mode, the decision response may optionally contain the placement and ordering of advertisements as well. DASH Part 5 at § 5.6.4.1, Overview. In this way, the Accused Instrumentalities use an ad manager, and an ad rotator, to rotate new advertising content into the content stream in response to the user input such as attempting to jump over an initially sequenced insertion point. Zachary Cava, Video Platform Architect at Hulu, gave a presentation at the March 31, 2020 DVB World Webinar entitled, "Ad Insertion in Live Content." Cava Presentation at the 28:10 mark to the 43:20 mark. In that presentation, as part of his explanation of IF-7 in the DASH Standard, Mr. Cava stated, "IF-7 is actually part of what we consider the Server Guided Ad Insertion and this is where instead of the MPD Proxy replacing the ads before they reach the client, it's actually annotating the stream with enough information such that the client can come back to the proxy when it needs that ad replacement to occur and the ad proxy can provide it then with the appropriate information."

U.S. Patent No. 10,986,403	Hulu
	

Cava Presentation at 35:33 to 35:58 mark. Consequently, when the DASH Access Client needs an ad replacement, it requests this information by sending Ad Decision parameters to the Ad Insertion MPD Manipulator intersplicer.

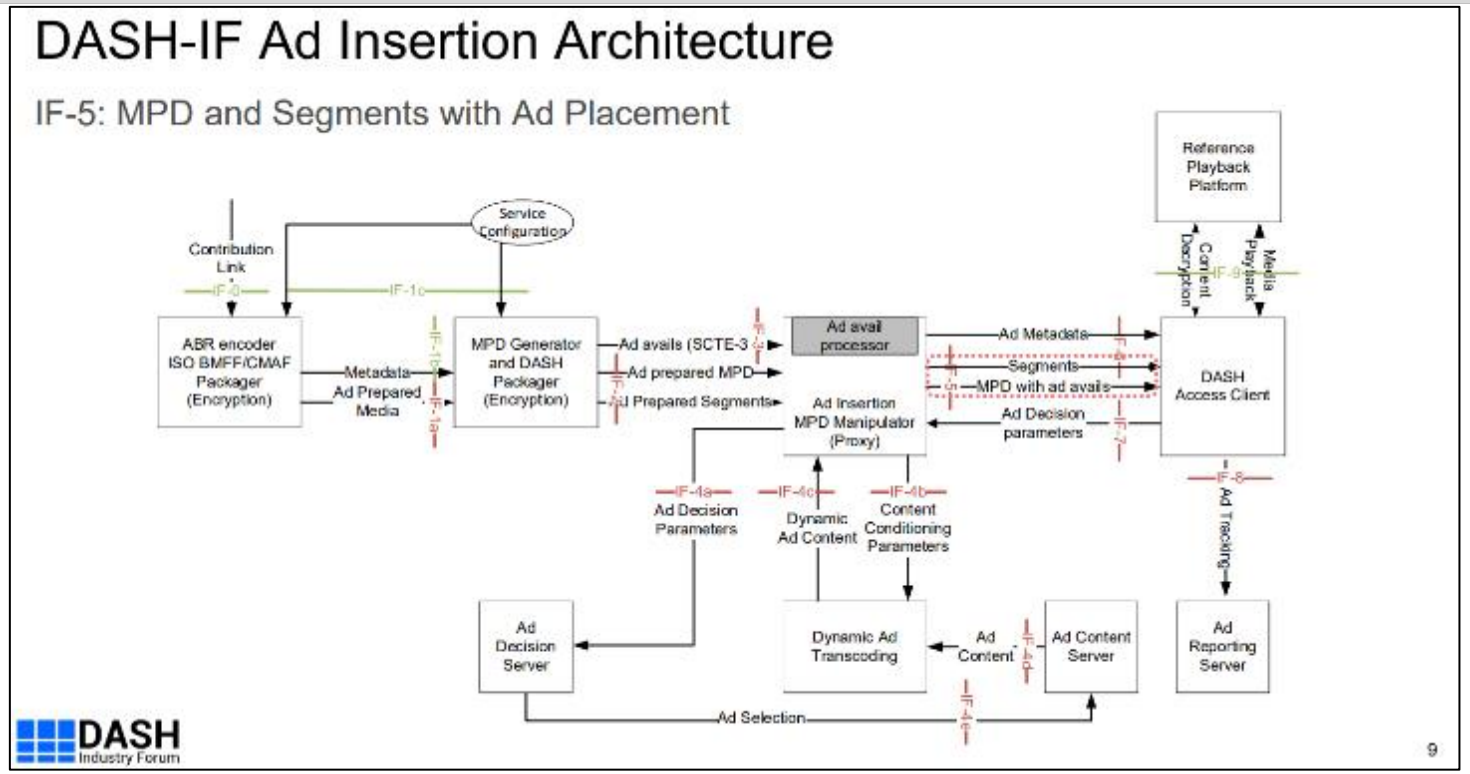
Mr. Cava also explained, in the context of IF-4, that the Ad Insertion MPD Manipulator "is the mechanism that communicates with an ad decisioning exchange service that will take parameters for decisioning and internally perform decisioning."

U.S. Patent No. 10,986,403	Hulu



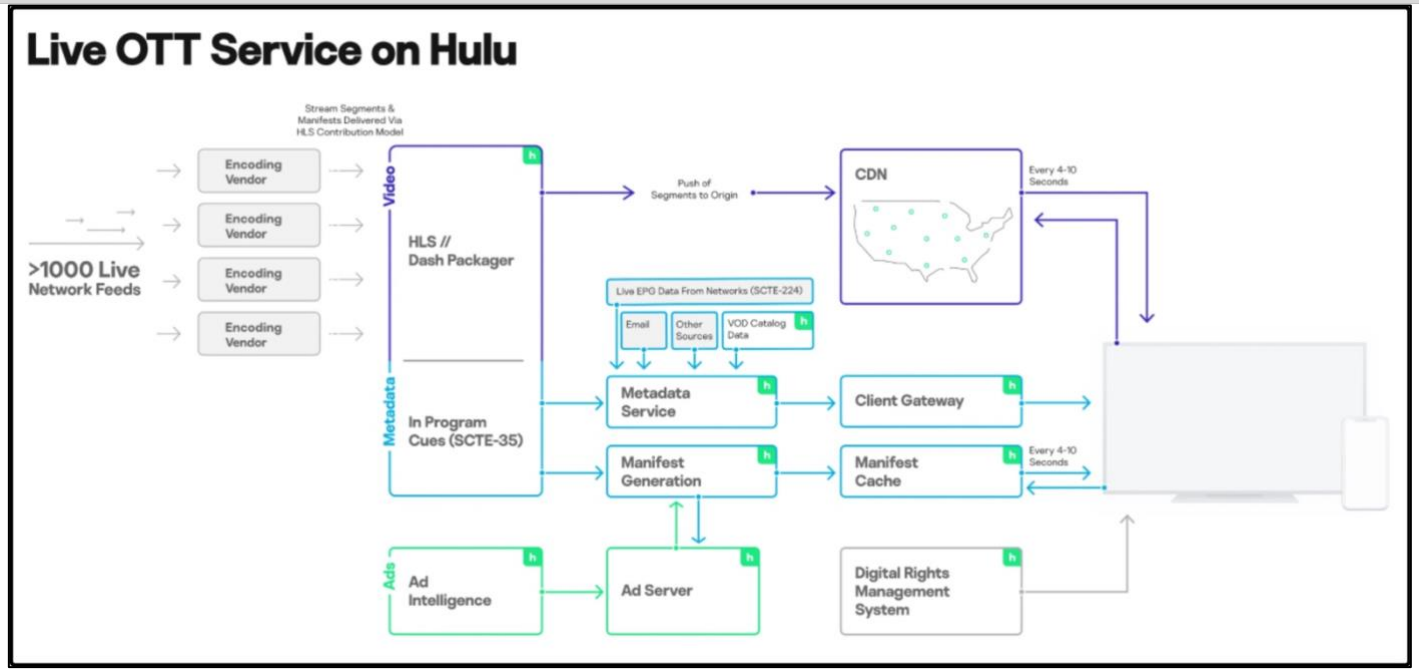
Cava Presentation at 33:33 to 33:55 mark. For example, the ad insertion architecture including the Ad Decision Server the Ad Content Server includes examples of an ad manager that receives ad files and select ad files for presentation from a database of ad files, and an ad rotator configured to replace ad files with new ad files.

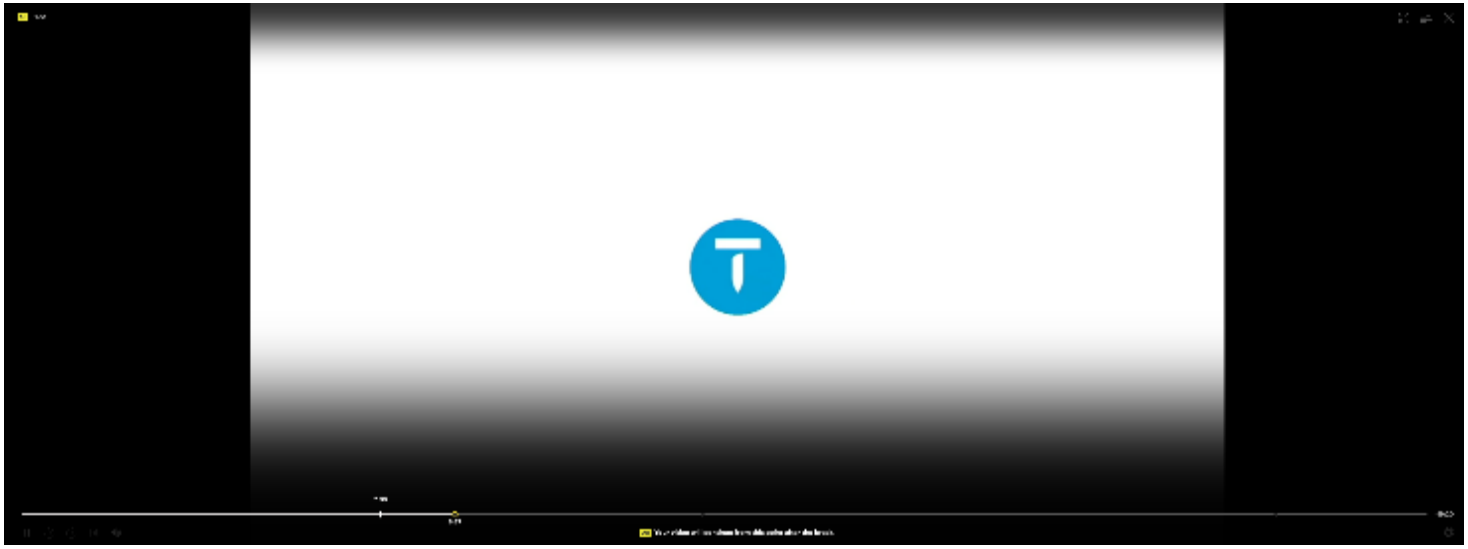
Finally, Mr. Cava indicated that, "From there we'll go ahead and provide well-formed ad insertion content that the MPD Manipulator can go ahead and combine with the original content to produce a[n] interleaved stream of content and advertisements. And this stream is communicated again with a DASH down to the clients."

U.S. Patent No. 10,986,403	Hulu
	

Cava Presentation at 34:00 to 34:25 mark. As a result, the Accused Instrumentalities rotate new advertising content into the content stream in response to Ad Decision parameters prompted by user input, using the Ad Decision Server ad manager operative to receive ad files and select ad files for presentation from a database of ad files and the Ad Content Server ad rotator configured to replace ad files with new ad files after the ad files have been determined.

Likewise, the Hulu Tech Blog confirms that the Accused Instrumentalities rotate advertisements by, for example, use of Ad Intelligence and an Ad Server.

U.S. Patent No. 10,986,403	Hulu
	 Hulu Tech Blog The Hulu user interface confirms that the Accused Instrumentalities rotate advertisements in response to user input. In the screenshot below, a user has paused playback in the Hulu user interface during an advertisement for a hotel chain.

U.S. Patent No. 10,986,403	Hulu
	   As shown in the screenshot below, if the user keeps the advertisement paused for several minutes and then resumes playing the digital advertising content, the Hulu digital media player's ad rotator automatically rotates to new advertising content, this time switching to an advertisement for Thumbtack. 

U.S. Patent No. 10,986,403	Hulu
	As a result, the Hulu Accused Instrumentality includes an advertisement rotator for managing one or more requests for advertising content to be presented during the course of presentation of the digital media content either visually or audibly. Furthermore, the Hulu Help Center, available to users through the Hulu user interface, indicates that the Accused Instrumentalities rotate advertisements based on user preferences. In the screenshot below, the Hulu Help Center indicates that an Ad Selector rotates advertisements shown to a user based on the user's input. hulu Help Center Home Help Topics Contact Us **How are ads personalized to me?** There are a number of factors that affect the ads that you are seeing. What you're watching, where you're located, and what you've streamed previously can all help us personalize your ads so they're relevant to you. Features like Ad Selector (which presents 2-3 different options so you can choose the ad that interests you most) also give viewers control over their experience. Other actions, such as interacting with the ad or pausing your video, can help create a more relevant and personalized experience. *Ads on Hulu*, Hulu Help Center, https://help.hulu.com/article/hulu-ads-on-hulu, (last visited July 1, 2024). Another example of the Accused Instrumentalities using an advertisement rotator for managing one or more requests for advertising content, is pod level decisioning, where the client sends requests for advertisement content to the Ad Insertion MPD Manipulator as the content streams. The Ad Insertion MPD sends these requests to the Ad Decision Server which then returns (via the Ad

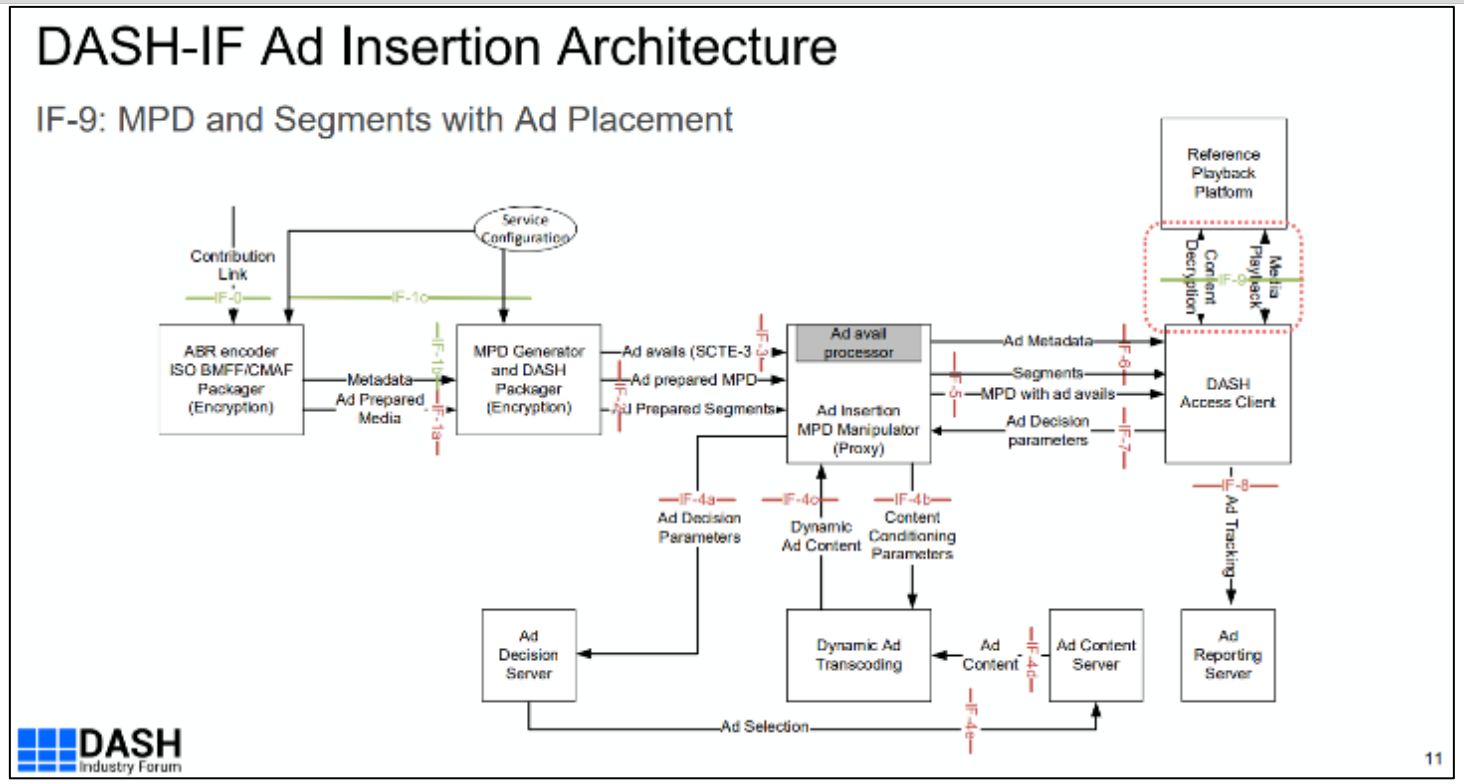
U.S. Patent No. 10,986,403	Hulu
	Content Server) the advertisements to be played. In this way, the Accused Instrumentalities rotate advertisements depending on user input. With *pod level decisioning*, advertisement opportunities are decided just as the DASH client reaches the opportunity within the stream. A SGAI architecture accomplishes by having the Ad Insertion MPD Manipulator use the IF-3 supplied opportunity metadata to generate an IF-5 manifest with a mixture of content and remote entities that represent opportunities. As the client reaches remote entities during playout, the client utilizes IF-7 to return the opportunity metadata to the Ad Insertion MPD Manipulator which then sends the data to the Ad Decision server via IF-4a. The result of the ad decision request will contain advertisements for this single opportunity which the Ad Insertion MPD Manipulator transforms into an IF-7 response for the client to consume. After a DASH client receives a stream produced from an SGAI architecture, the stream can continue to change for the duration of the playback session, e.g. the advertisements can be re-decisioned should the user choose to rewind the stream. DASH Part 5 at § 5.6.2.2. An analysis of proprietary backend systems and/or source code may be necessary to fully and accurately describe the functionality of the Accused Instrumentalities with respect to this limitation and, accordingly, Plaintiff reserves the right to supplement these infringement contentions once such information is made available to Plaintiff.

U.S. Patent No. 10,986,403	Hulu
[11] The digital media player device as in claim 1, wherein the adaptively modifying uses two or more of the adaptive preference rules for determining the one or more alternatively sequenced insertion points of at least a part of the digital advertising content.	The Accused Instrumentalities adaptively modify the presentation position of the digital advertising content using two or more of the adaptive preference rules for determining the one or more alternatively sequenced insertion points of at least a part of the digital advertising content. *See, e.g.*, [1d.6]. An analysis of proprietary backend systems and/or source code may be necessary to fully and accurately describe the functionality of the Accused Instrumentalities with respect to this limitation and, accordingly, Plaintiff reserves the right to supplement these infringement contentions once such information is made available to Plaintiff.

U.S. Patent No. 10,986,403	Hulu
[13] The device as in claim 1, the digital media player device further comprising a media file decryptor configured to receive and decrypt the digital media content during play, the media file decryptor configured to limit access to a non-volatile memory following the decryption of the digital media content.	The Accused Instrumentalities use a decryptor configured to receive and decrypt the digital media content during play, the media file decryptor configured to limit access to a non-volatile memory following the decryption of the digital media content. Hulu delivers encrypted content to supported media player devices. Specifically, Hulu uses AES 128-bit protocol or something comparable. *Confidential* **HULU CONTENT PROTECTION TECHNOLOGIES AND PROCESSES** **I. Core Content Protection Guiding Principles** Hulu employs robust, industry-accepted content security and protection technologies for streaming online video, governed by the following principles: 1. Secure video delivery 2. Secure video on clients 3. Protection against hacking 4. Maintenance of content integrity 5. Geofiltering 6. Network service protection 7. Ongoing maintenance Hulu at all times ensures a primary technical contact is available for questions and comments. The primary technical contact is currently: Richard Tom, richard@hulu.com, (310) 571-4802. **II. Secure Video Delivery** *A. General* 1. Video content is securely delivered from Hulu servers (or the servers of Hulu partners such as Content Delivery Networks) to clients, including via: a. cryptographic algorithms during transport for encryption, decryption, signatures, hashing, random number generation and key generation utilizing cryptographic protocols and algorithms b. use of AES 128-bit (or comparable) protocol c. encrypted transmission of critical security parameters ("CSPs") such as keys, tokens, passwords and other information critical to cryptographic strength d. expiring CSPs so they cannot be cached e. no exposed media on the server, i.e. streaming source URLs are not exposed to end users and expire shortly after being accessed 2. Video content and CSPs are never transmitted to unauthenticated clients 3. Streaming source URLs are short-lived and individualized *See Hulu Content Protection Technologies and Processes*, SCRIBD, https://www.scribd.com/document/487037368/Hulu-

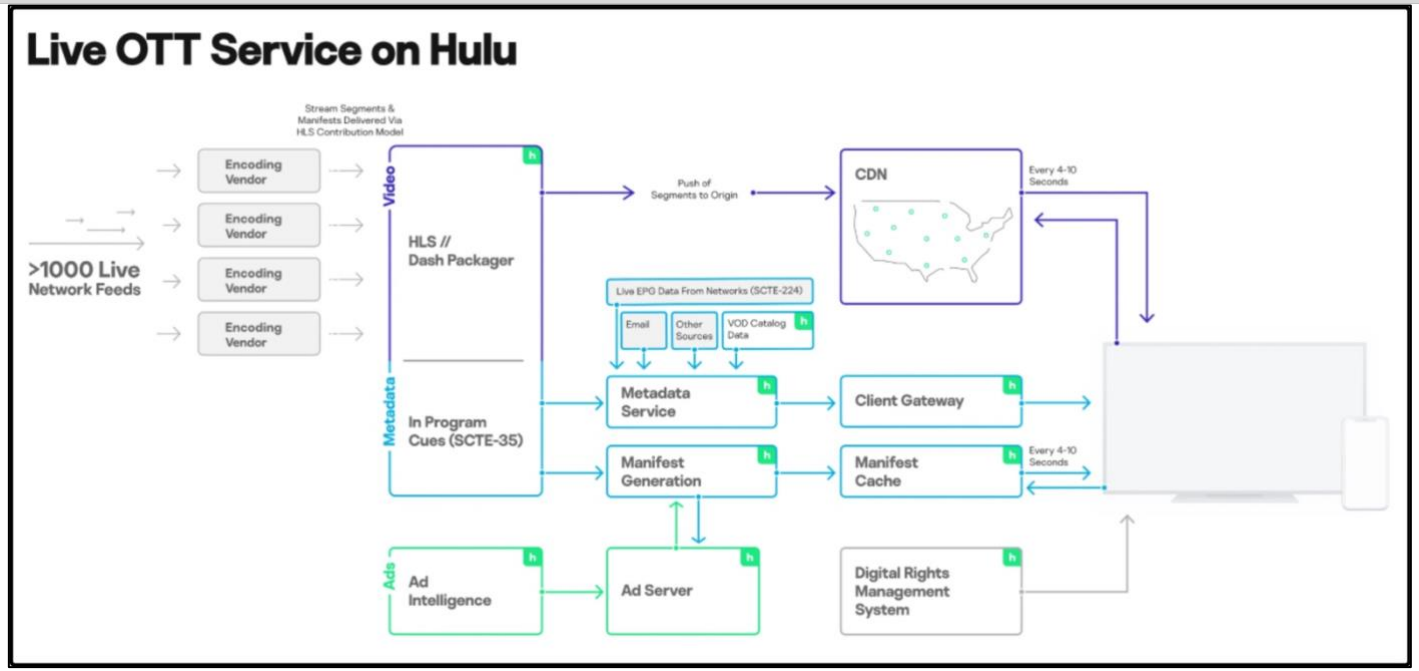
U.S. Patent No. 10,986,403	Hulu
	Content-Protection-Technologies-and-Processes (last visited July 1, 2024). **Hulu** Hulu is another popular streaming service that offers a huge library of movies and TV shows. It uses 128-bit AES encryption to protect your data, which is slightly less secure than Netflix's 256-bit SSL encryption. Hulu also has anti-malware protection to prevent malware from infecting your device while you stream. Hulu's privacy policy is also clear and comprehensive, outlining how the service collects, uses, and shares your data for various purposes. Mia Naumoska, *Binge in Private: What Are the Most Secure Streaming Services?*, INTERNXT BLOG (Mar. 16, 2023), https://blog.internxt.com/secure-streaming-services/ (last visited July 1, 2024). Zachary Cava, Video Platform Architect at Hulu, gave a presentation at the March 31, 2020 DVB World Webinar entitled, "Ad Insertion in Live Content." Cava Presentation at the 28:10 mark to the 43:20 mark. In that presentation, as part of his explanation of IF-9 in the DASH Standard, Mr. Cava stated, "DASH clients receive this content and go ahead and play it on a common reference playback platform, and here we've tried to align to our peer organizations in the industry of CTA WAVE which detail out the [] interrupt points. And so the expectation is the DASH client is being built on these interfaces and going through and playing out the interleaved content and ad stream."

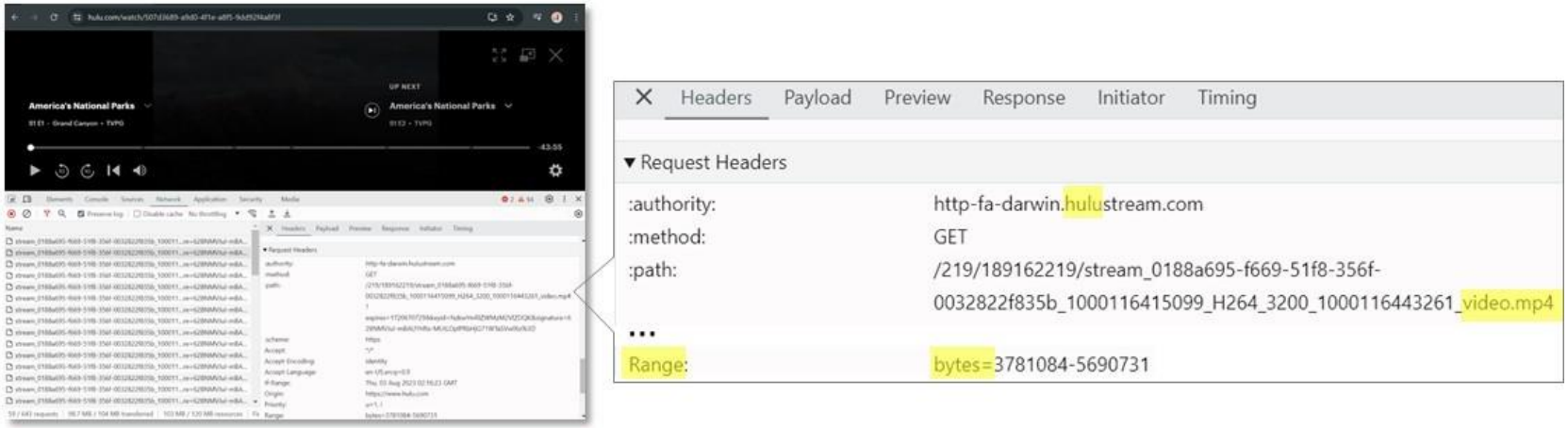
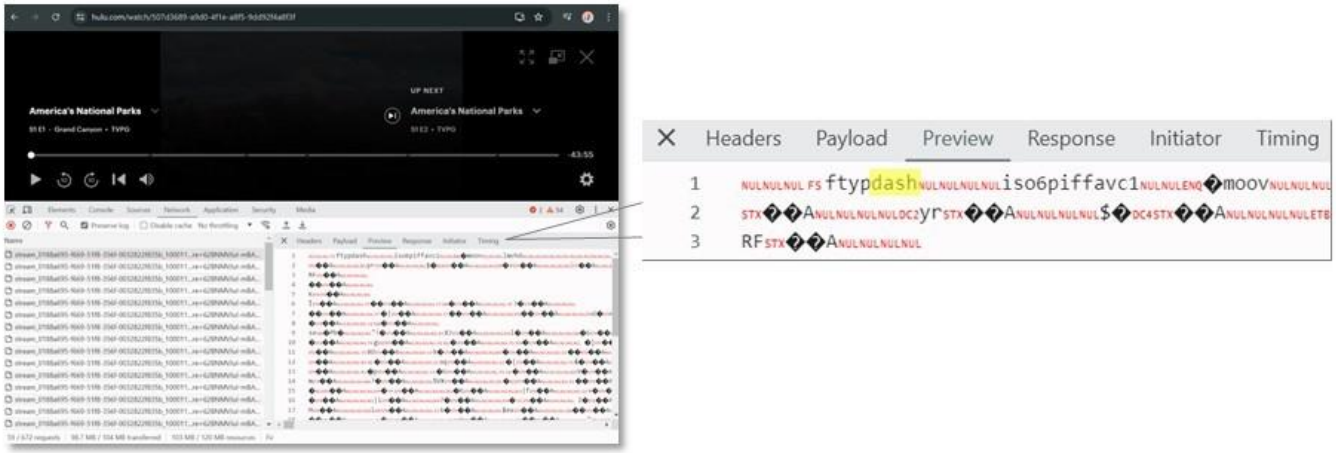
U.S. Patent No. 10,986,403	Hulu

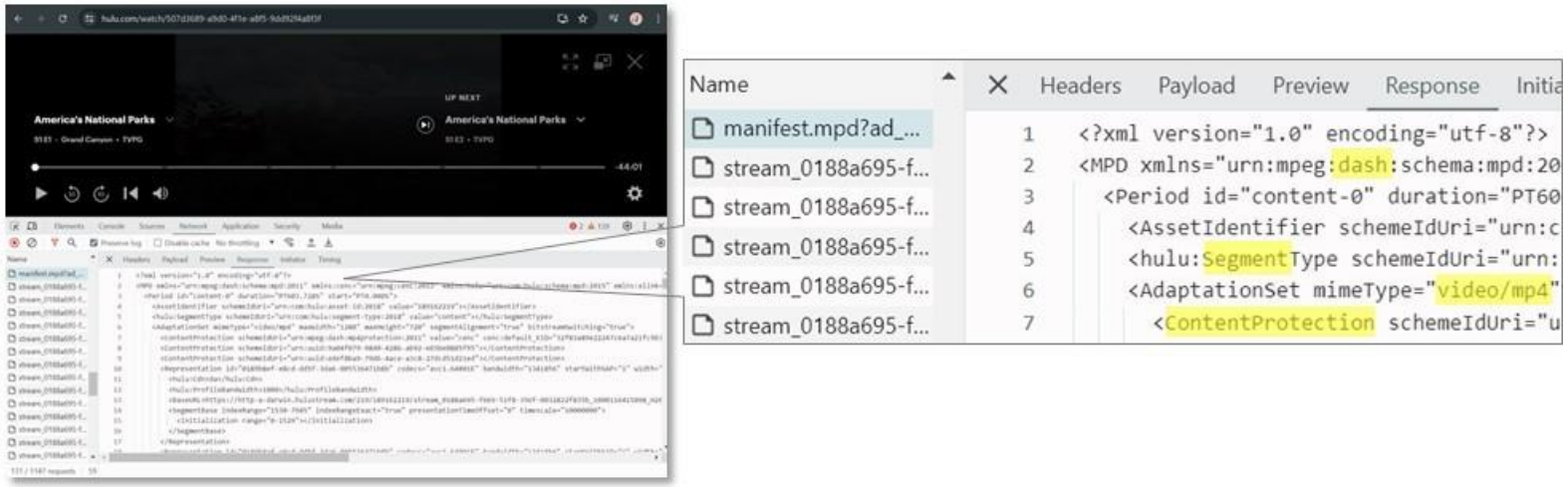


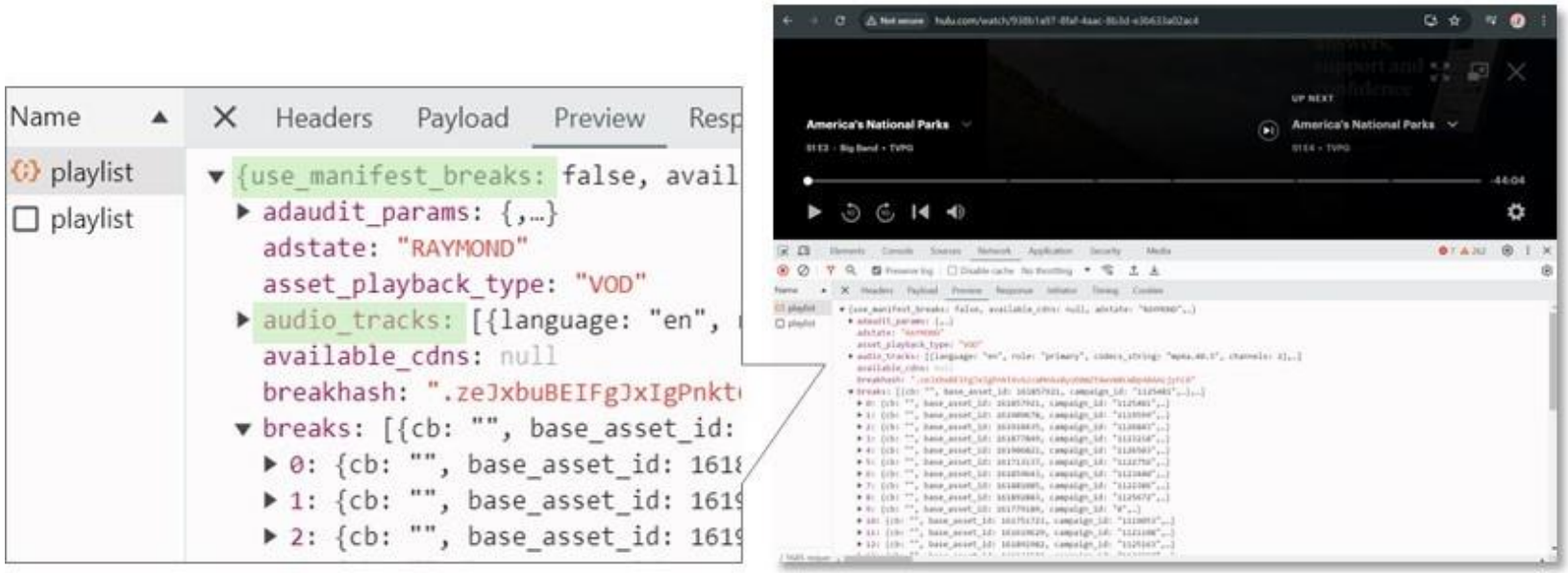
Cava Presentation at 34:25 to 34:31 mark. As can be seen in the figure above, IF-9 includes "Content Decryption" passing between the DASH Access Client and the "Reference Playback Platform."

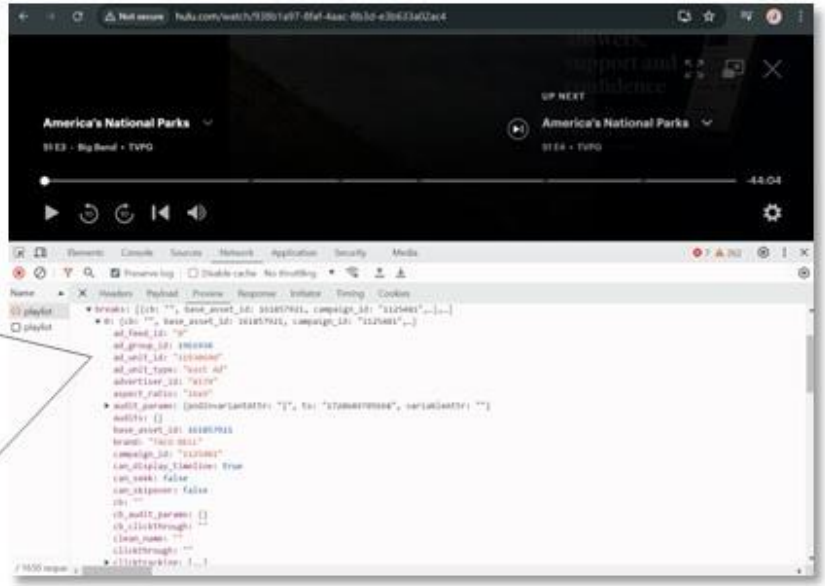
The Hulu Tech Blog entry "The Anatomy of a Live OTT Service," indicates that the Accused Instrumentalities use a Digital Rights Management System, which uses encryption to control access to the protected content.

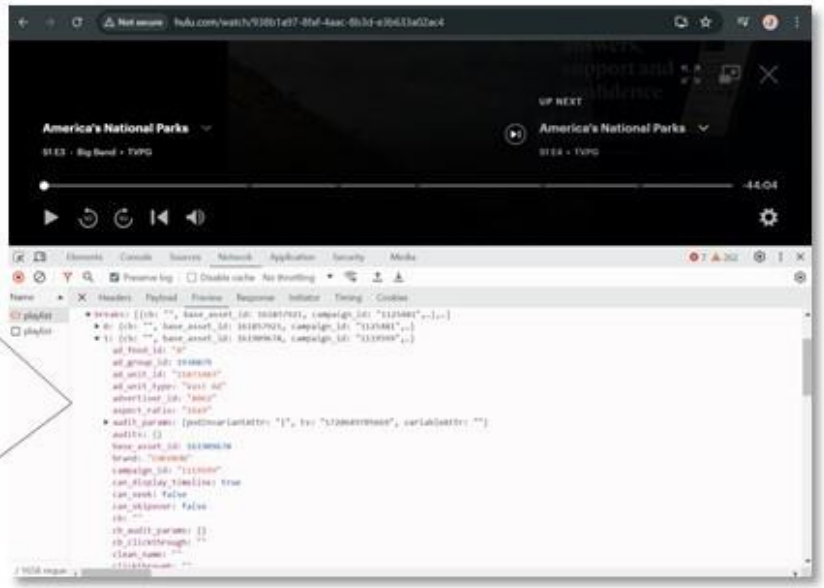
U.S. Patent No. 10,986,403	Hulu
	 Hulu Tech Blog In order for a digital media player device to display this content, it must have a decryptor configured to receive and decrypt the digital media content during play. Hulu presents content that is protected by encryption.

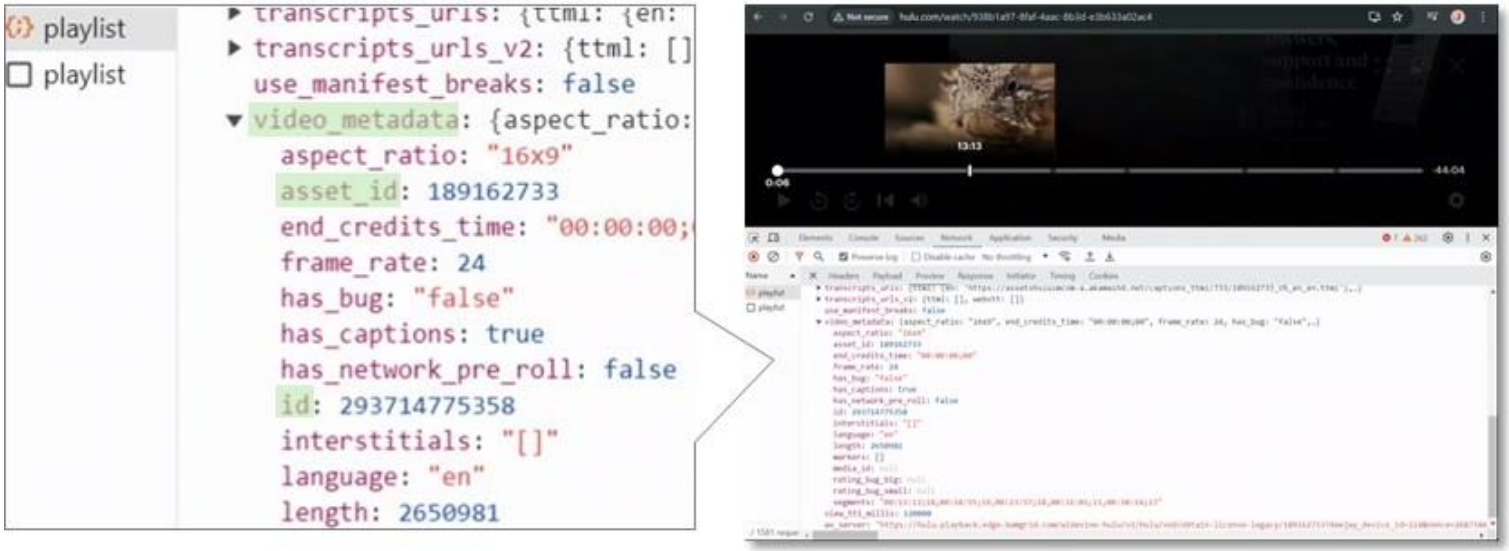
U.S. Patent No. 10,986,403	Hulu
	  Screenshot of Hulu user interface on web browser, hulu.com, with debugger tool showing network traffic. As another example, the manifest that the Hulu client receives regarding the content to be displayed notes that the content is protected, which includes protection by encryption.

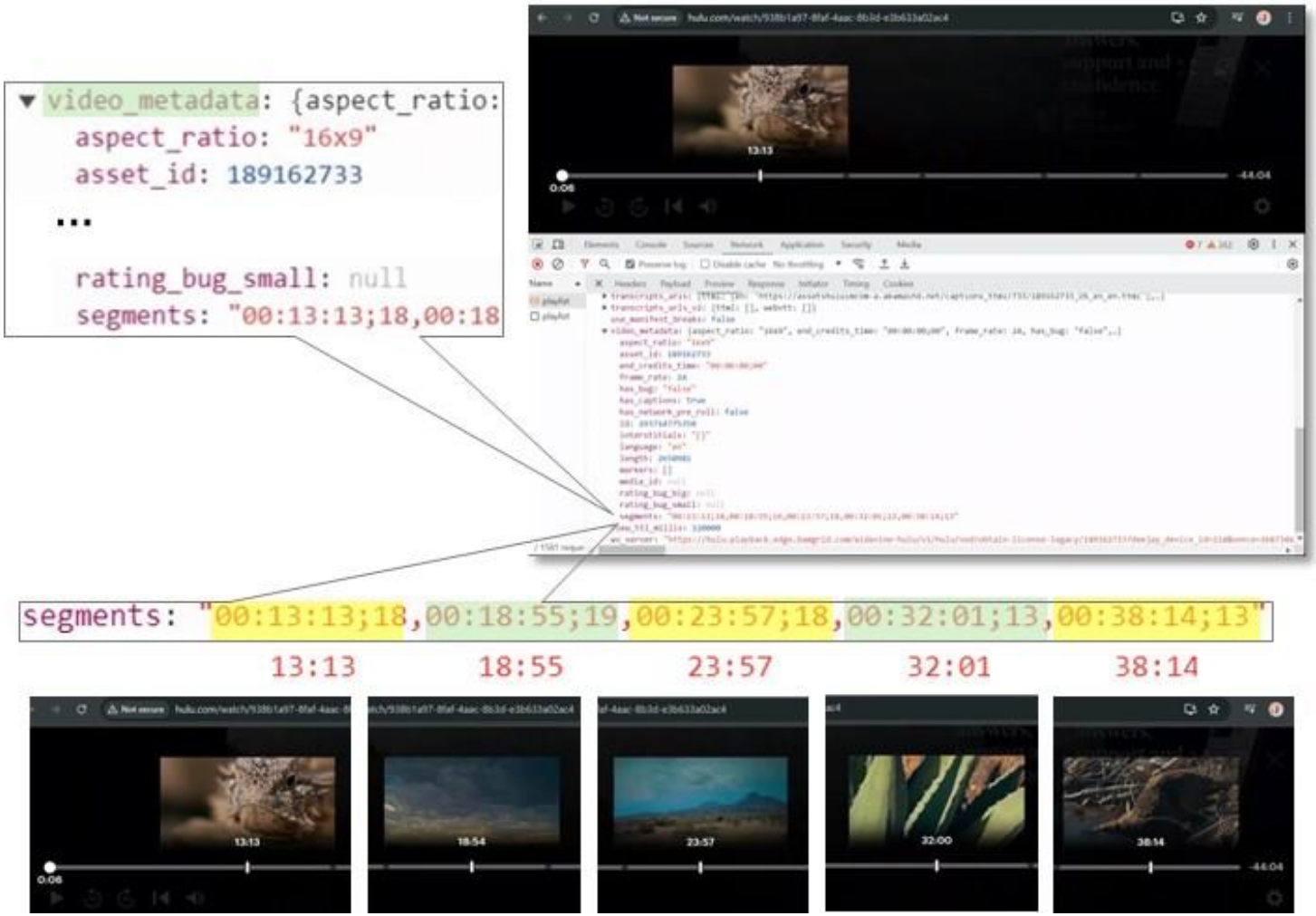
U.S. Patent No. 10,986,403	Hulu
	 Screenshot of Hulu user interface on web browser, hulu.com, with debugger tool showing network traffic. As set forth above, the media file decryptor of the Accused Instrumentalities is configured to limit access to a non-volatile memory following the decryption of the digital media content. An analysis of proprietary backend systems and/or source code may be necessary to fully and accurately describe the functionality of the Accused Instrumentalities with respect to this limitation and, accordingly, Plaintiff reserves the right to supplement these infringement contentions once such information is made available to Plaintiff.

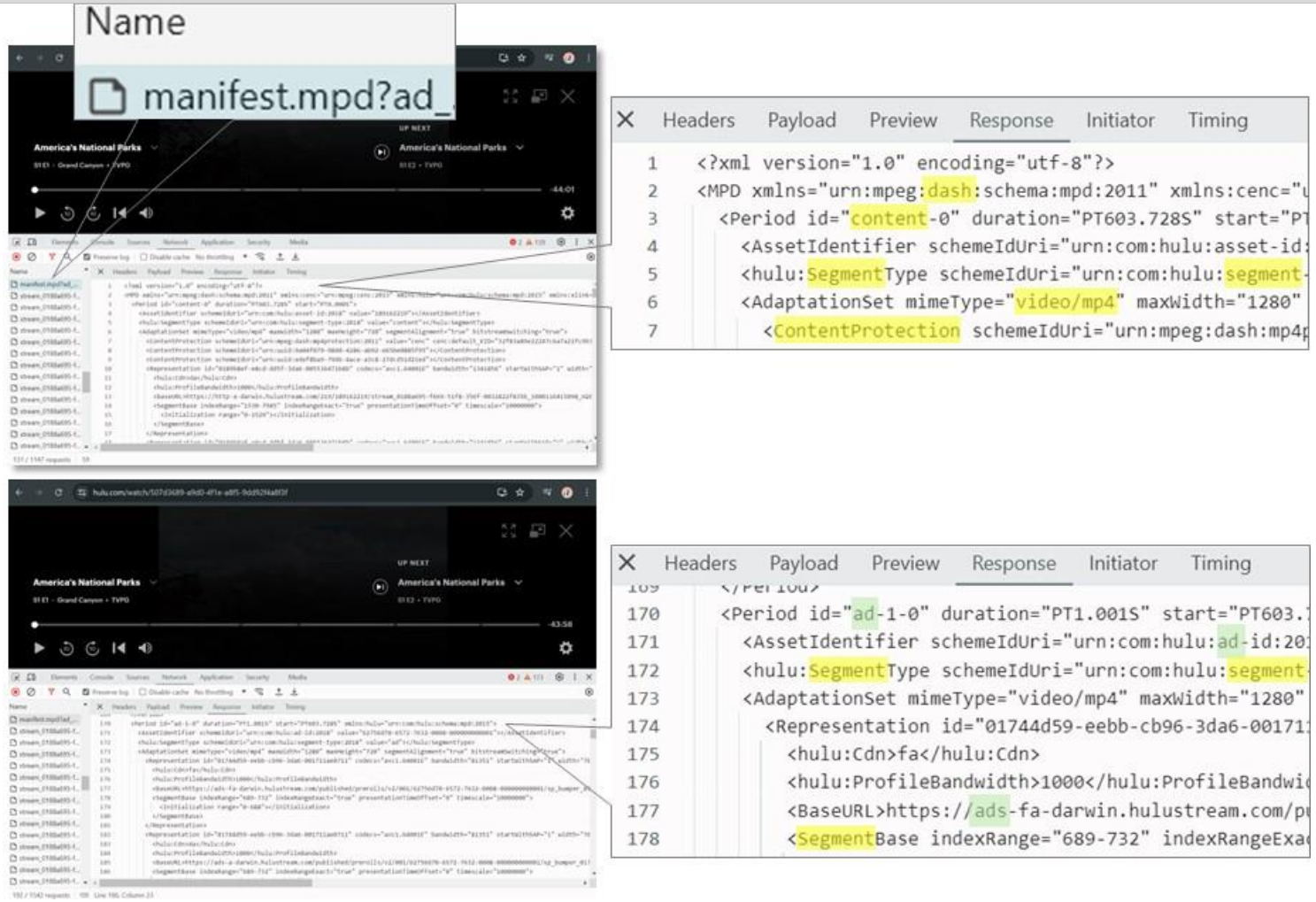
[14] The device as in claim 1, wherein the digital media player device is configured to read a data structure of the one or more data blocks of the digital media content, the data structure including a first field containing data identifying a media file associated with the digital media content, a second field containing data indicative of an ad requirement associated with the digital media content, and a third field containing data representing an ad file associated with the digital advertising content to be displayed with the media file.	The Accused Instrumentalities are configured to read a data structure of data blocks of the digital media content, including a first field containing data identifying a media file associated with the digital media content, a second field containing data indicative of an ad requirement associated with the digital media content, and a third field containing data representing an ad file associated with the digital advertising content to be displayed with the media file. For example, the Hulu client retrieves a "playlist" that includes information about the content to be played including data identifying a media file, advertisements to be played, and advertisement requirements such as whether the ad can be skipped. In the example below, the "playlist" includes video metadata including multiple items in "video_metadata" including the "asset_id" and "id" of the video, what audio tracks are available for the video file, whether to "use_manifest_breaks", the time for each initial advertisement insertion point, and a "breaks" section that includes information about advertisements, including advertisement requirements for each advertisement (e.g., whether the ad can be skipped).  Screenshot of Hulu user interface on web browser, hulu.com, with debugger tool showing network traffic.

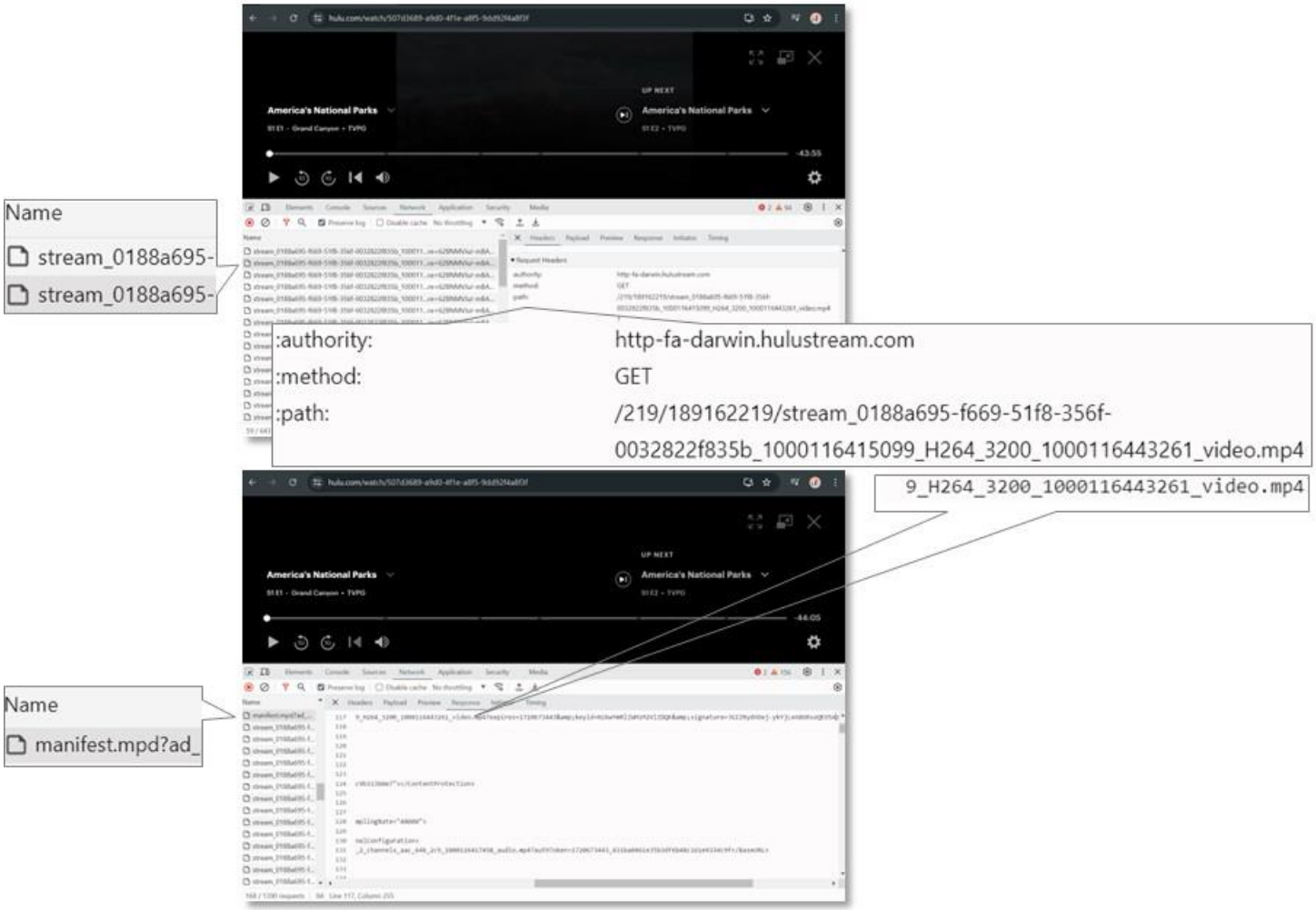
U.S. Patent No. 10,986,403	Hulu
	playlist playlist ▼ breaks: [{cb: "", base_asset_id: ▼ 0: {cb: "", base_asset_id: 161 ad_feed_id: "0" ad_group_id: 1961934 ad_unit_id: "11930690" ad_unit_type: "Vast Ad" advertiser_id: "8179" aspect_ratio: "16x9" ▶ audit_params: {podInvariantAt audits: {} base_asset_id: 161857921 brand: "TACO BELL" campaign_id: "1125481" can_display_timeline: true can_seek: false can_skipover: false  Screenshot of Hulu user interface on web browser, hulu.com, with debugger tool showing network traffic.

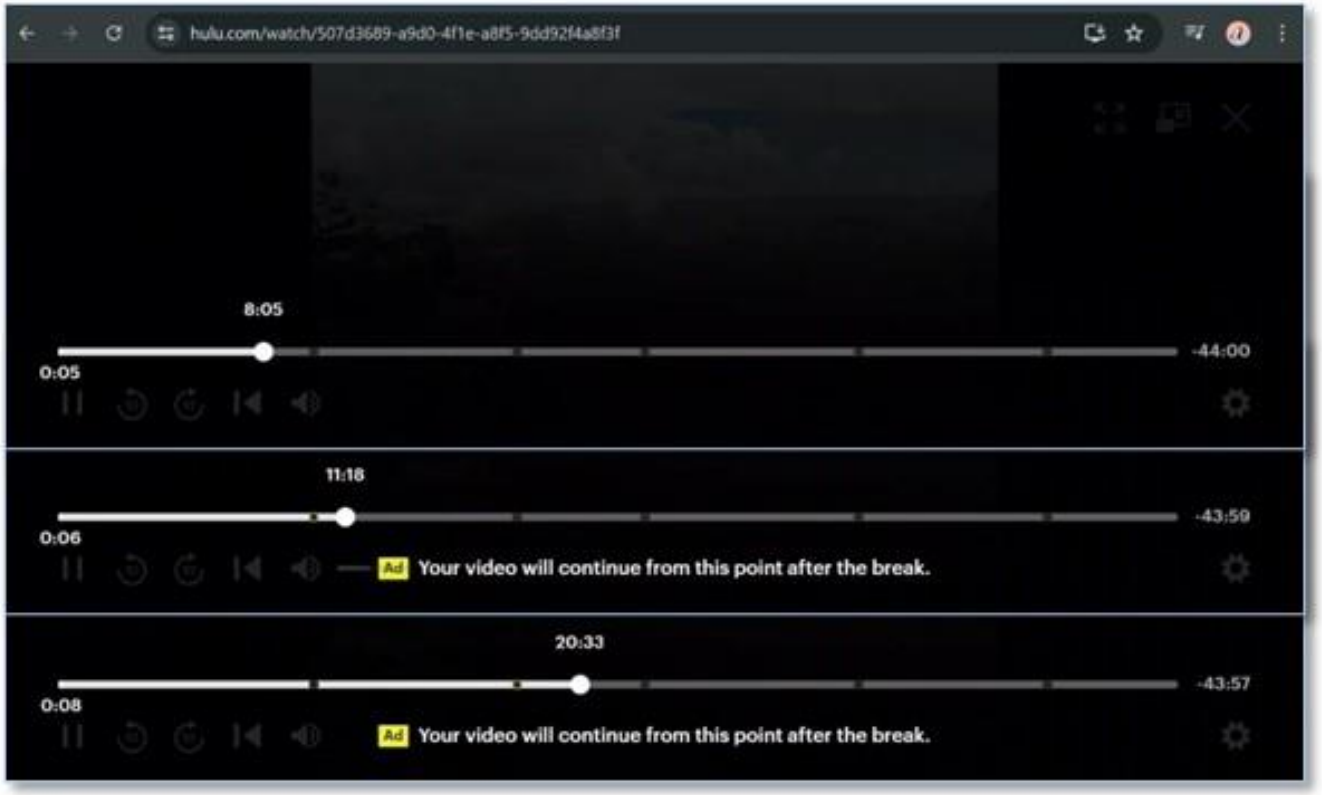
U.S. Patent No. 10,986,403	Hulu
	playlist playlist ▼ breaks: [{cb: "", base_asset_id: ▶ 0: {cb: "", base_asset_id: 1618 ▼ 1: {cb: "", base_asset_id: 1619 ad_feed_id: "0" ad_group_id: 1930879 ad_unit_id: "11873483" ad_unit_type: "Vast Ad" advertiser_id: "8062" aspect_ratio: "16x9" ▶ audit_params: {podInvariantAt audits: {} base_asset_id: 161909678 brand: "CHEVRON" campaign_id: "1119599" can_display_timeline: true can_seek: false can_skipover: false  Screenshot of Hulu user interface on web browser, hulu.com, with debugger tool showing network traffic.

U.S. Patent No. 10,986,403	Hulu
	 Screenshot of Hulu user interface on web browser, hulu.com, with debugger tool showing network traffic.

U.S. Patent No. 10,986,403	Hulu
	 Screenshot of Hulu user interface on web browser, hulu.com, with debugger tool showing network traffic. As another example, the Hulu client retrieves a manifest that includes information about content to be played, and information about advertisements including advertising requirements.

U.S. Patent No. 10,986,403	Hulu
	 Screenshot of Hulu user interface on web browser, hulu.com, with debugger tool showing network traffic. The manifest includes a URL for the content to be played, which the Hulu client uses to fetch the content.

U.S. Patent No. 10,986,403	Hulu
	 Screenshot of Hulu user interface on web browser, hulu.com, with debugger tool showing network traffic. An analysis of proprietary backend systems and/or source code may be necessary to fully and accurately describe the functionality of the Accused Instrumentalities with respect to this limitation and, accordingly, Plaintiff reserves the right to supplement these infringement contentions once such information is made available to Plaintiff.

U.S. Patent No. 10,986,403	Hulu
[15] The device as in claim 1, wherein the user interface input includes a time bar configured to control the intersplicer to alter a course of presentation of the content stream in response to the user dragging the time bar, the dragging of the time bar enabling at least one of fast-forward play, skipping forward, backward skipping to a fixed point, slow motion play, and frame advance play.	The user interface input of the Accused Instrumentalities includes a time bar configured to control the intersplicer to alter a course of presentation of the content stream in response to the user dragging the time bar, the dragging of the time bar enabling at least one of fast-forward play, skipping forward, backward skipping to a fixed point, slow motion play, and frame advance play. In the example below, the user drags the play position forward in the time bar to 8:05, 11:18, and 20:33 from the current play position (0:05, 0:06, or 0:08) to enable fast-forward play, and the Hulu client may alter a course of presentation by, for example, requiring a user to watch advertisements at the moment when the user drags the play position forward, instead of when the predetermined ad insertion point occurs on the timeline.  Screenshot of Hulu user interface on web browser, hulu.com. As a result, the Hulu digital media player user interface input includes a time bar configured to control the intersplicer to alter a

U.S. Patent No. 10,986,403	Hulu
	course of presentation of the content stream in response to the user dragging the time bar enabling at least fast-forward play. An analysis of proprietary backend systems and/or source code may be necessary to fully and accurately describe the functionality of the Accused Instrumentalities with respect to this limitation and, accordingly, Plaintiff reserves the right to supplement these infringement contentions once such information is made available to Plaintiff.
[17a] A computer-implemented system for controlling digital media presentations, the system comprising:	The Accused Instrumentalities are a computer-implemented system for controlling digital media presentations. *See, e.g.*, [1a]. An analysis of proprietary backend systems and/or source code may be necessary to fully and accurately describe the functionality of the Accused Instrumentalities with respect to this limitation and, accordingly, Plaintiff reserves the right to supplement these infringement contentions once such information is made available to Plaintiff.
[17b] one or more processors;	The Accused Instrumentalities include one or more processors. *See, e.g.*, [1b.1]. An analysis of proprietary backend systems and/or source code may be necessary to fully and accurately describe the functionality of the Accused Instrumentalities with respect to this limitation and, accordingly, Plaintiff reserves the right to supplement these infringement contentions once such information is made available to Plaintiff.
[17c] a user interface for allowing a user to control a course of presentation of digital media content;	The Accused Instrumentalities have a user interface for allowing a user to control a course of presentation of digital media content. *See, e.g.*, [1c]. An analysis of proprietary backend systems and/or source code may be necessary to fully and accurately describe the functionality of the Accused Instrumentalities with respect to this limitation and, accordingly, Plaintiff reserves the right to supplement these infringement contentions once such information is made available to Plaintiff.

U.S. Patent No. 10,986,403	Hulu
[17d.1] an intersplicer for controlling one or more insertion points of digital advertising content into the digital media content thereby sequencing the digital media content and digital advertising content,	The Accused Instrumentalities have an intersplicer for controlling one or more insertion points of the digital advertising content into the digital media content thereby sequencing the digital media content and the digital advertising content. *See, e.g.*, [1d.1]. An analysis of proprietary backend systems and/or source code may be necessary to fully and accurately describe the functionality of the Accused Instrumentalities with respect to this limitation and, accordingly, Plaintiff reserves the right to supplement these infringement contentions once such information is made available to Plaintiff.
[17d.2] the sequencing comprising ordering one or more data blocks of the digital media content and one or more data blocks of the digital advertising content into a content stream playable as audio or visual content perceivable by the user,	The Accused Instrumentalities sequence the digital media content and one or more data blocks of the digital advertising content into a content stream playable as audio or visual content perceivable by the user. *See, e.g.*, [1d.2]. An analysis of proprietary backend systems and/or source code may be necessary to fully and accurately describe the functionality of the Accused Instrumentalities with respect to this limitation and, accordingly, Plaintiff reserves the right to supplement these infringement contentions once such information is made available to Plaintiff.

U.S. Patent No. 10,986,403	Hulu
[17d.3] the content stream comprising one or more initially sequenced insertion points at which the digital advertising content is scheduled to be presented relative to the digital media content during play;	The content stream sequenced by the Accused Instrumentalities comprises one or more initially sequenced insertion points at which the digital advertising content is scheduled to be presented relative to the digital media content during play. *See, e.g.*, [1d.3]. An analysis of proprietary backend systems and/or source code may be necessary to fully and accurately describe the functionality of the Accused Instrumentalities with respect to this limitation and, accordingly, Plaintiff reserves the right to supplement these infringement contentions once such information is made available to Plaintiff.

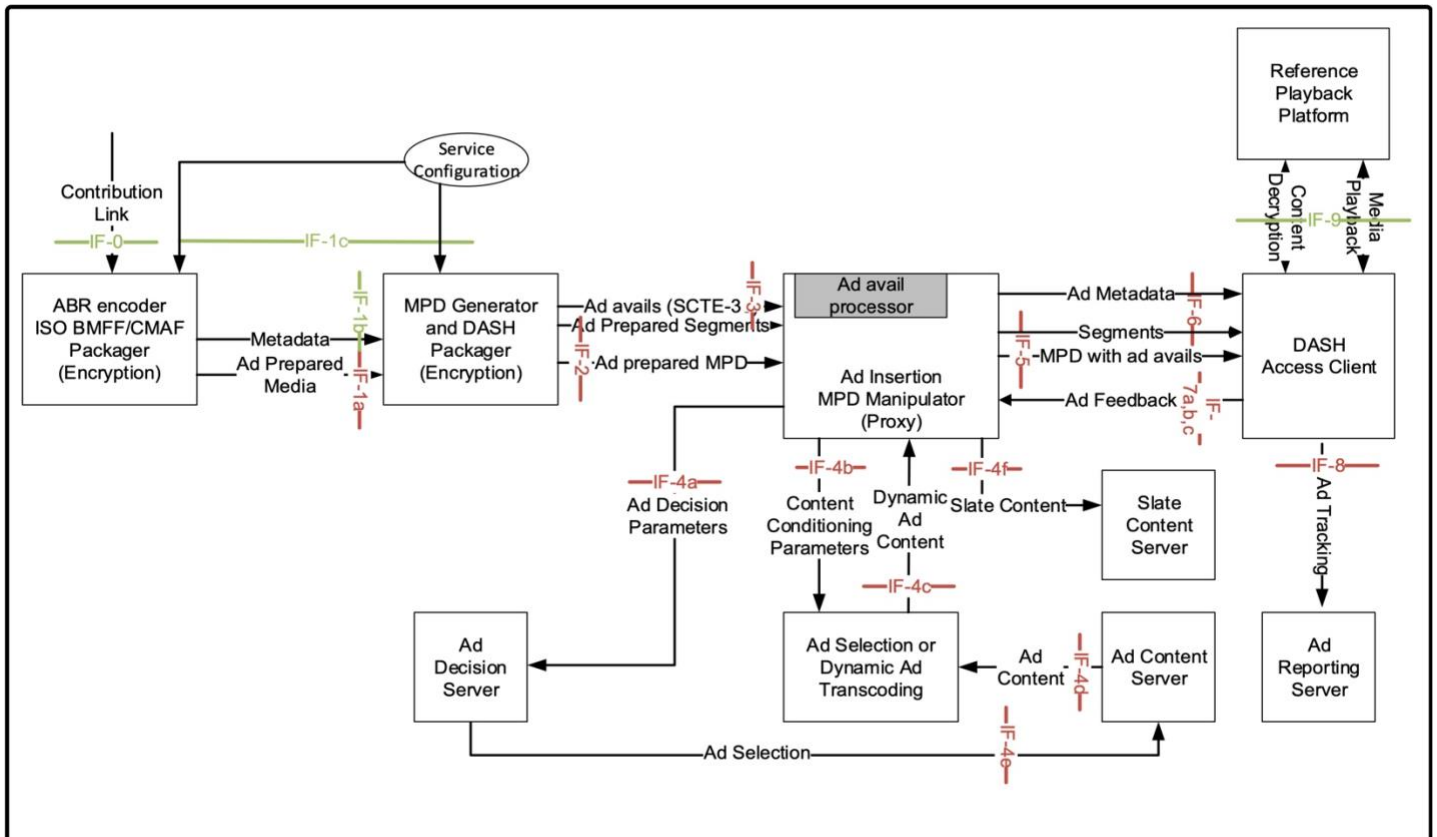
U.S. Patent No. 10,986,403	Hulu
[17d.4] in response to user input updating a current play position in the content stream to a new play position in the content stream, the one or more processors using one or more adaptive preference rules to adaptively modify, a presentation position of the digital advertising content from at least one of the one or more initially sequenced insertion points to one or more alternatively sequenced insertion points;	The Accused Instrumentalities' processors use one or more adaptive preference rules to adaptively modify a presentation position of the digital advertising content from at least one of the one or more initially sequenced insertion points to one or more alternatively sequenced insertion points in the digital media content in response to user input updating a current play position. *See, e.g.*, [1d.4]. An analysis of proprietary backend systems and/or source code may be necessary to fully and accurately describe the functionality of the Accused Instrumentalities with respect to this limitation and, accordingly, Plaintiff reserves the right to supplement these infringement contentions once such information is made available to Plaintiff.

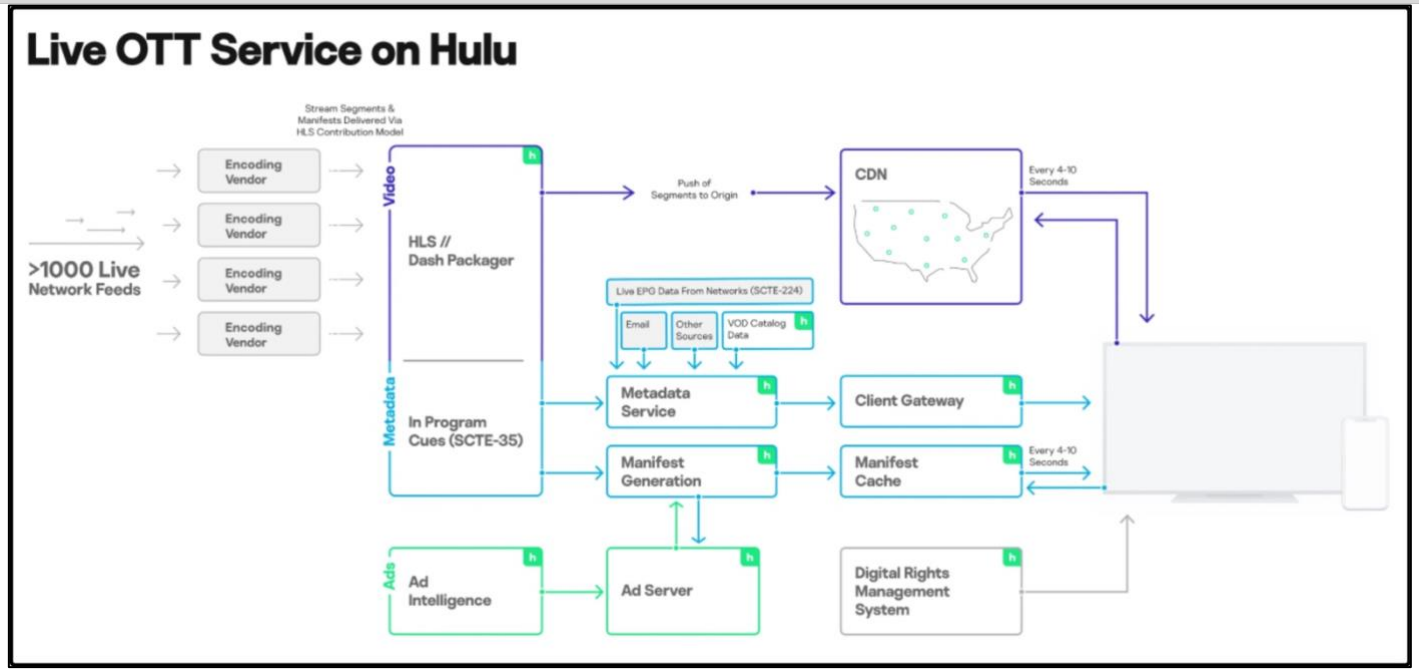
U.S. Patent No. 10,986,403	Hulu
[17d.5] The one or more alternatively sequenced insertion points being adaptively selectable by the intersplicer according to selection criteria defined by the one or more adaptive preference rules taking into account the new play position and at least one of a length of time associated with playing the digital media content, a number of digital media data blocks of the digital media content to be played, and a point in time the digital media content is to be played,	The one or more alternatively sequenced insertion points of the Accused Instrumentalities are adaptively selectable by the intersplicer according to selection criteria defined by the one or more adaptive preference rules taking into account the new play position and at least one of a length of time associated with playing the digital media content, a number of digital media data blocks of the digital media content to be played, and a point in time the digital media content is to be played. *See, e.g.*, [1d.6]. An analysis of proprietary backend systems and/or source code may be necessary to fully and accurately describe the functionality of the Accused Instrumentalities with respect to this limitation and, accordingly, Plaintiff reserves the right to supplement these infringement contentions once such information is made available to Plaintiff.

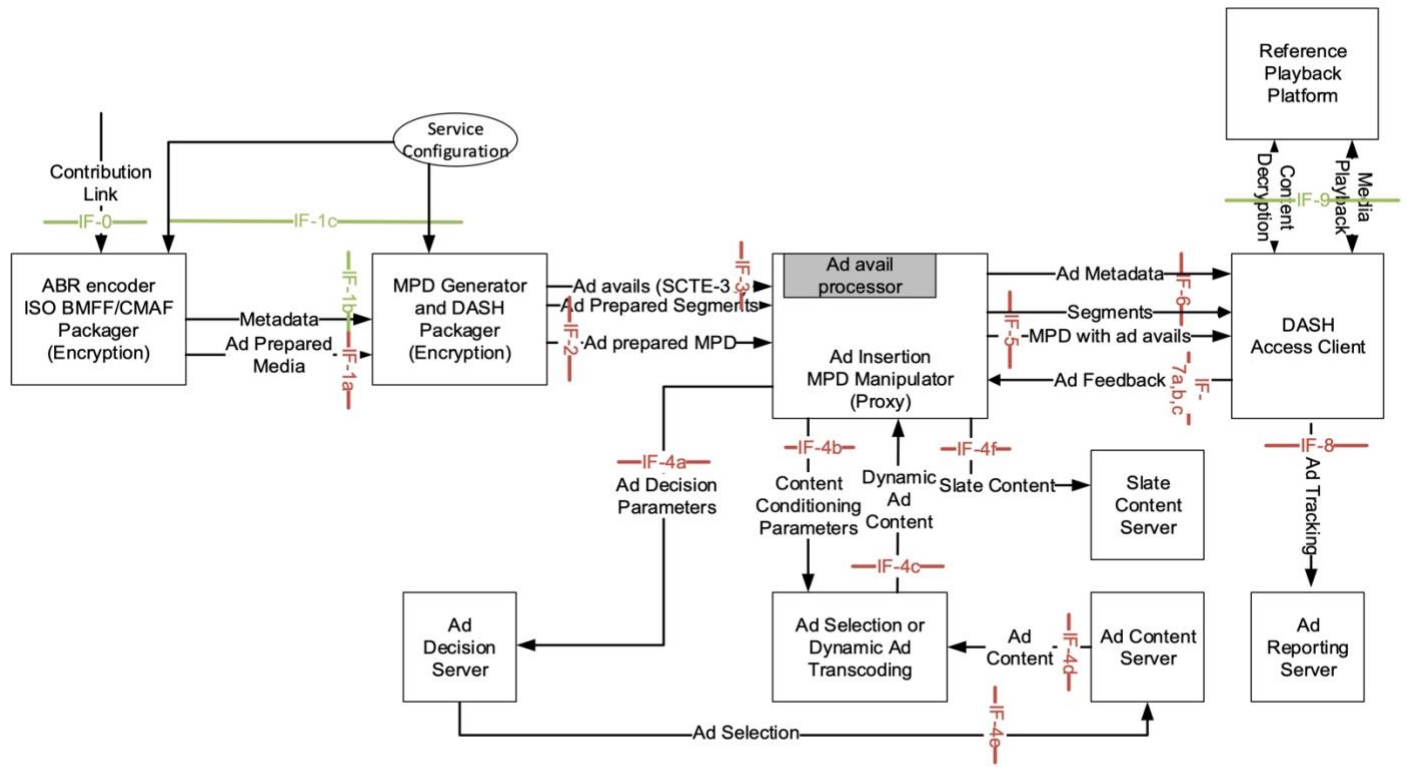
U.S. Patent No. 10,986,403	Hulu
[17d.6] such that at least one of the alternatively sequenced insertion points is positioned at a play position in the digital media content that satisfies a condition selected from: the play position being a predetermined length of time after the new play position, the play position being a predetermined number of digital media data blocks after the new play position, and the play position being at a predetermined time of the hour after the new play position;	At least one of the alternatively sequenced insertion points of the Accused Instrumentalities is positioned at a play position in the digital media content that satisfies a condition selected from the play position being a predetermined length of time after the new play position, the play position being a predetermined number of digital media data blocks after the new play position, and the play position being at a predetermined time of the hour after the new play position. *See, e.g.*, [1d.7]. An analysis of proprietary backend systems and/or source code may be necessary to fully and accurately describe the functionality of the Accused Instrumentalities with respect to this limitation and, accordingly, Plaintiff reserves the right to supplement these infringement contentions once such information is made available to Plaintiff.

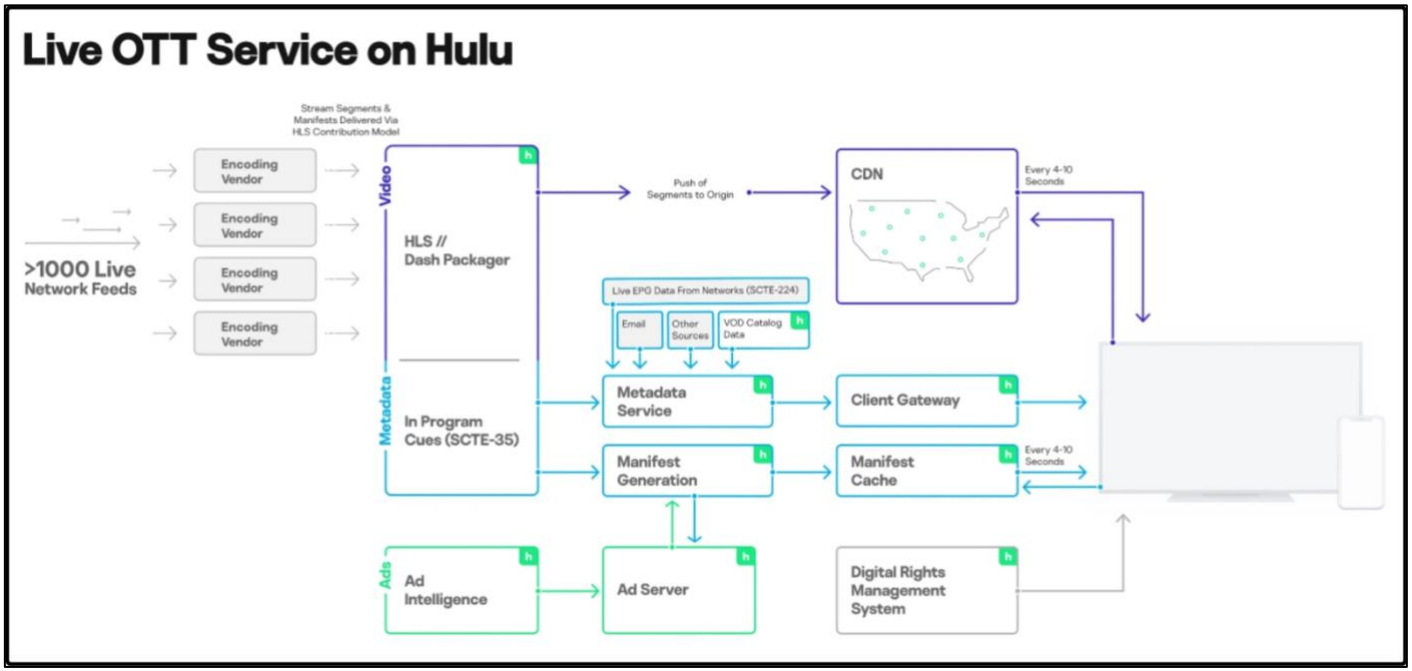
U.S. Patent No. 10,986,403	Hulu
[17e] a user interface output for causing presentation of the content stream during a play period associated with one or more states of play such that a part of the digital advertising content is adaptively played at the one or more alternatively sequenced insertion points, instead of the one or more initially sequenced insertion points; and	The Accused Instrumentalities include a user interface output for causing presentation of the content stream during a play period associated with one or more states of play such that a part of the digital advertising content is adaptively played at the one or more alternatively sequenced insertion points, instead of at the one or more initially sequenced insertion points. *See, e.g.*, [1e]. An analysis of proprietary backend systems and/or source code may be necessary to fully and accurately describe the functionality of the Accused Instrumentalities with respect to this limitation and, accordingly, Plaintiff reserves the right to supplement these infringement contentions once such information is made available to Plaintiff.

U.S. Patent No. 10,986,403	Hulu
[17f.1] at least a first memory for storing a setting to indicate a first state of play, the setting including a first value to indicate presentation of a required part of the digital advertising content is in progress during presentation of the content stream such that	The Accused Instrumentalities include at least a first memory for storing a setting to indicate a first state of play, the setting including a first value to indicate presentation of a required part of the digital advertising content is in progress during presentation of the content stream. *See, e.g.*, [1f.1]. An analysis of proprietary backend systems and/or source code may be necessary to fully and accurately describe the functionality of the Accused Instrumentalities with respect to this limitation and, accordingly, Plaintiff reserves the right to supplement these infringement contentions once such information is made available to Plaintiff.
[17f.2] responsive to detecting the first value in the first memory, the user interface is disabled to prevent commands comprising a user navigation control from altering a course of presentation of the content stream.	In the Accused Instrumentalities, detection of the first value in the first memory disables the user interface input to prevent commands comprising a user navigation control from altering a course of presentation of the content stream. *See, e.g.*, [1f.2]. An analysis of proprietary backend systems and/or source code may be necessary to fully and accurately describe the functionality of the Accused Instrumentalities with respect to this limitation and, accordingly, Plaintiff reserves the right to supplement these infringement contentions once such information is made available to Plaintiff.

U.S. Patent No. 10,986,403	Hulu
[18] The system as in claim 17, wherein the at least first memory is part of the computer-implemented system.	The Accused Instrumentalities include a first memory that is part of the computer-implemented system. For example, Hulu's servers and systems make, store, and transmit server-side and client-side software and data for providing ad-supported streaming service to Hulu's subscribers. These functions, interrelationships, and interfaces, as shown in Figure 1 of the DASH Standard, would necessitate the use of memory as part of the computer-implemented system.  **Figure 1 DASH-IF Ad Insertion Architecture** DASH Part 5 at Figure 1 DASH-IF Ad Insertion Architecture ("DASH diagram"). The Hulu Tech Blog further shows how Hulu's computer-implemented system must rely on at least one memory.

U.S. Patent No. 10,986,403	Hulu
	 Hulu Tech Blog Among other things, the "Manifest Cache" shown in the figure above is a machine-readable medium storing executable instructions to cause at least one programable processor to perform operations that implement Hulu's system for providing ad-supported streaming service. In order to provide an OTT streaming service for controlling digital media presentations, the Accused Instrumentalities must include numerous memories within the computer-implemented system for controlling digital media presentations. An analysis of proprietary backend systems and/or source code may be necessary to fully and accurately describe the functionality of the Accused Instrumentalities with respect to this limitation and, accordingly, Plaintiff reserves the right to supplement these infringement contentions once such information is made available to Plaintiff.

U.S. Patent No. 10,986,403	Hulu
[19] The system as in claim 17, wherein the at least first memory is part of at least one remote system.	The Accused Instrumentalities include a first memory that is part of at least one remote system. For example, Hulu's servers and systems make, store, and transmit server-side and client-side software and data for providing ad-supported streaming service to Hulu's subscribers. These functions, interrelationships, and interfaces, as shown in Figure 1 of the DASH Standard, would necessitate the use of memory as part of at least one remote system.  **Figure 1 DASH-IF Ad Insertion Architecture** DASH Part 5 at Figure 1 DASH-IF Ad Insertion Architecture ("DASH diagram"). The Hulu Tech Blog further shows how Hulu's computer-implemented system must interact with remote systems that have at least one memory.

U.S. Patent No. 10,986,403	Hulu
	 Hulu Tech Blog In order to provide an OTT streaming service for controlling digital media presentations, the Accused Instrumentalities must interact with numerous memories of systems remote to the computer-implemented system for controlling digital media presentations. An analysis of proprietary backend systems and/or source code may be necessary to fully and accurately describe the functionality of the Accused Instrumentalities with respect to this limitation and, accordingly, Plaintiff reserves the right to supplement these infringement contentions once such information is made available to Plaintiff.

U.S. Patent No. 10,986,403	Hulu
[21a] A computer-implemented method for controlling digital media presentations using an improved digital media player system, the method comprising:	The Accused Instrumentalities are a computer-implemented method for controlling digital media presentations using an improved digital media player system. *See, e.g.*, [1a]. An analysis of proprietary backend systems and/or source code may be necessary to fully and accurately describe the functionality of the Accused Instrumentalities with respect to this limitation and, accordingly, Plaintiff reserves the right to supplement these infringement contentions once such information is made available to Plaintiff.

U.S. Patent No. 10,986,403	Hulu
[21b] receiving, on a digital media player system, data comprising digital media content and digital advertising content, the digital media player system having a user interface and an intersplicer, the user interface configured to allow a user to control a course of presentation of the digital media content received, and the intersplicer configured to control one or more initially sequenced insertion points of the digital advertising content into the digital media content;	The Accused Instrumentalities receive, on a digital media player system, data comprising digital media content and digital advertising content, the digital media player system having a user interface and an intersplicer, the user interface configured to allow a user to control a course of presentation of the digital media content received, and the intersplicer configured to control one or more initially sequenced insertion points of the digital advertising content into the digital media content. See, e.g., [1b.2], [1c], and [1d.1]. An analysis of proprietary backend systems and/or source code may be necessary to fully and accurately describe the functionality of the Accused Instrumentalities with respect to this limitation and, accordingly, Plaintiff reserves the right to supplement these infringement contentions once such information is made available to Plaintiff.

[21c] sequencing the digital media content, using the intersplicer, the sequencing comprising ordering one or more data blocks of the digital media content into a content stream playable as audio or visual content perceivable by the user, the content stream comprising a media section that comprises at least some of the digital media content, the content stream further comprising an advertising block within which at least some of the digital advertising content is scheduled to be presented, the advertising block being arranged within the	The Accused Instrumentalities sequence sequencing the digital media content, using the intersplicer, the sequencing comprising ordering one or more data blocks of the digital media content into a content stream playable as audio or visual content perceivable by the user, the content stream comprising a media section that comprises at least some of the digital media content, the content stream further comprising an advertising block within which at least some of the digital advertising content is scheduled to be presented, the advertising block being arranged within the content stream at an initially defined insertion position relative to the media section during play. *See, e.g.*, [1d.2] An analysis of proprietary backend systems and/or source code may be necessary to fully and accurately describe the functionality of the Accused Instrumentalities with respect to this limitation and, accordingly, Plaintiff reserves the right to supplement these infringement contentions once such information is made available to Plaintiff.

U.S. Patent No. 10,986,403	Hulu
content stream at an initially defined insertion position relative to the media section during play;	

[21d.1] adaptively re-sequencing the content stream into a modified content stream to reflect a user input comprising updating a current play position to a new play position in the digital media content detected at the digital media player system, the modified content stream comprising an alternate insertion position of the advertising block relative to the media section, the adaptively re-sequencing comprising determining the alternate insertion position using one or more adaptive preference placement rules associated with	The Accused Instrumentalities adaptively re-sequence the content stream into a modified content stream to reflect a user input comprising updating a current play position to a new play position in the digital media content detected at the digital media player system, the modified content stream comprising an alternate insertion position of the advertising block relative to the media section, the adaptively re-sequencing comprising determining the alternate insertion position using one or more adaptive preference placement rules associated with the digital media content. *See, e.g.*, [1d.4] An analysis of proprietary backend systems and/or source code may be necessary to fully and accurately describe the functionality of the Accused Instrumentalities with respect to this limitation and, accordingly, Plaintiff reserves the right to supplement these infringement contentions once such information is made available to Plaintiff.

U.S. Patent No. 10,986,403	Hulu
the digital media content	
[21d.2] the alternate insertion position being adaptively selectable by the intersplicer according to selection criteria defined by the one or more adaptive preference placement rules taking into account the new play position and at least one of a length of time associated with playing the digital media content, a number of digital media data blocks of the digital media content to be played, and a point in time the digital media content is to be played,	The Accused Instrumentalities have an intersplicer that adaptively selects the alternate insertion position according to selection criteria defined by the one or more adaptive preference placement rules taking into account the new play position and at least one of a length of time associated with playing the digital media content, a number of digital media data blocks of the digital media content to be played, and a point in time the digital media content is to be played. *See, e.g.*, [1d.6]. An analysis of proprietary backend systems and/or source code may be necessary to fully and accurately describe the functionality of the Accused Instrumentalities with respect to this limitation and, accordingly, Plaintiff reserves the right to supplement these infringement contentions once such information is made available to Plaintiff.

U.S. Patent No. 10,986,403	Hulu
[21d.3] such that the alternate insertion position is positioned at a play position in the digital media content that satisfies a condition selected from: the play position being a predetermined length of time after the new play position, the play position being a predetermined number of digital media data blocks after the new play position, and the play position being at a predetermined time of the hour after the new play position;	The Accused Instrumentalities select the alternate insertion position such that it is positioned at a play position in the digital media content that satisfies a condition selected from: the play position being a predetermined length of time after the new play position, the play position being a predetermined number of digital media data blocks after the new play position, and the play position being at a predetermined time of the hour after the new play position. *See, e.g.*, [1d.7]. An analysis of proprietary backend systems and/or source code may be necessary to fully and accurately describe the functionality of the Accused Instrumentalities with respect to this limitation and, accordingly, Plaintiff reserves the right to supplement these infringement contentions once such information is made available to Plaintiff.
[21e] causing presentation of the modified content stream at	The Accused Instrumentalities cause presentation of the modified content stream at the digital media player system during a play period associated with one or more states of play. *See, e.g.*, [1e].

U.S. Patent No. 10,986,403	Hulu
the digital media player system during a play period associated with one or more states of play;	An analysis of proprietary backend systems and/or source code may be necessary to fully and accurately describe the functionality of the Accused Instrumentalities with respect to this limitation and, accordingly, Plaintiff reserves the right to supplement these infringement contentions once such information is made available to Plaintiff.
[21f] causing adaptive presentation of a required part of the digital advertising content at the alternate insertion position, instead of at the one or more initially sequenced insertion points;	The Accused Instrumentalities cause adaptive presentation of a required part of the digital advertising content at the alternate insertion position, instead of at the one or more initially sequenced insertion points. *See, e.g.*, [1e]. An analysis of proprietary backend systems and/or source code may be necessary to fully and accurately describe the functionality of the Accused Instrumentalities with respect to this limitation and, accordingly, Plaintiff reserves the right to supplement these infringement contentions once such information is made available to Plaintiff.

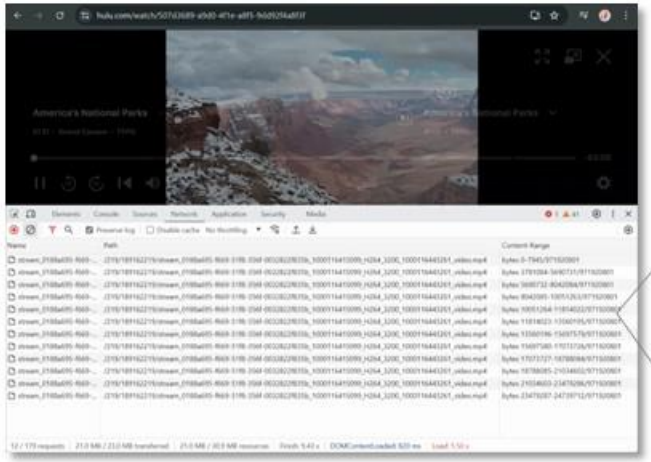
U.S. Patent No. 10,986,403	Hulu
[21g] keeping a setting, in at least a first memory of the digital media player system, to indicate a first state of play, the setting including a first value to indicate presentation of the required part of the digital advertising content is in progress during presentation of the modified content stream; and	The Accused Instrumentalities keep a setting, in at least a first memory of the digital media player system, to indicate a first state of play, the setting including a first value to indicate presentation of the required part of the digital advertising content is in progress during presentation of the modified content stream. *See, e.g.*, [1f.1]. An analysis of proprietary backend systems and/or source code may be necessary to fully and accurately describe the functionality of the Accused Instrumentalities with respect to this limitation and, accordingly, Plaintiff reserves the right to supplement these infringement contentions once such information is made available to Plaintiff.
[21h] responsive to detecting the first value in the first memory, disabling user interface commands comprising a user navigation control that enables the user to alter a course of presentation of the modified content stream.	The Accused Instrumentalities, when detecting the first value in the first memory, disable user interface commands comprising a user navigation control that enables the user to alter a course of presentation of the modified content stream. *See, e.g.*, [1f.2]. An analysis of proprietary backend systems and/or source code may be necessary to fully and accurately describe the functionality of the Accused Instrumentalities with respect to this limitation and, accordingly, Plaintiff reserves the right to supplement these infringement contentions once such information is made available to Plaintiff.

U.S. Patent No. 10,986,403	Hulu
[22a] A computer-implemented method for controlling digital media presentations using an improved digital media player system, the method comprising:	The Accused Instrumentalities perform a computer-implemented method for controlling digital media presentations using an improved digital media player system. *See, e.g.*, [1a]. An analysis of proprietary backend systems and/or source code may be necessary to fully and accurately describe the functionality of the Accused Instrumentalities with respect to this limitation and, accordingly, Plaintiff reserves the right to supplement these infringement contentions once such information is made available to Plaintiff.
[22b.1] transmitting, by at least one remote system to a digital media player system, data comprising digital media content and digital advertising content,	The Accused Instrumentalities transmit, by at least one remote system to a digital media player system, data comprising digital media content and digital advertising content. *See, e.g.*, [1b.2]. An analysis of proprietary backend systems and/or source code may be necessary to fully and accurately describe the functionality of the Accused Instrumentalities with respect to this limitation and, accordingly, Plaintiff reserves the right to supplement these infringement contentions once such information is made available to Plaintiff.
[22b.2] the digital media player system having a user interface and an intersplicer,	The Accused Instrumentalities include a digital media player system with a user interface and an intersplicer. *See, e.g.*, [1c] and [1d.1]. An analysis of proprietary backend systems and/or source code may be necessary to fully and accurately describe the functionality of the Accused Instrumentalities with respect to this limitation and, accordingly, Plaintiff reserves the right to supplement these infringement contentions once such information is made available to Plaintiff.

U.S. Patent No. 10,986,403	Hulu
[22b.3] the user interface configured to allow a user to control a course of presentation of the digital media content received, and	The Accused Instrumentalities include a user interface configured to allow a user to control a course of presentation of the digital media content received. *See, e.g.*, [1c]. An analysis of proprietary backend systems and/or source code may be necessary to fully and accurately describe the functionality of the Accused Instrumentalities with respect to this limitation and, accordingly, Plaintiff reserves the right to supplement these infringement contentions once such information is made available to Plaintiff.
[22b.4] the intersplicer for controlling one or more insertion points of the digital advertising content into the digital media content;	The Accused Instrumentalities include an intersplicer for controlling one or more insertion points of the digital advertising content into the digital media content. *See, e.g.*, [1d.1]. An analysis of proprietary backend systems and/or source code may be necessary to fully and accurately describe the functionality of the Accused Instrumentalities with respect to this limitation and, accordingly, Plaintiff reserves the right to supplement these infringement contentions once such information is made available to Plaintiff.
[22c.1] sequencing the digital media content, using the intersplicer,	The Accused Instrumentalities sequence the digital media content, using the intersplicer. *See, e.g.*, [1d.1]. An analysis of proprietary backend systems and/or source code may be necessary to fully and accurately describe the functionality of the Accused Instrumentalities with respect to this limitation and, accordingly, Plaintiff reserves the right to supplement these infringement contentions once such information is made available to Plaintiff.

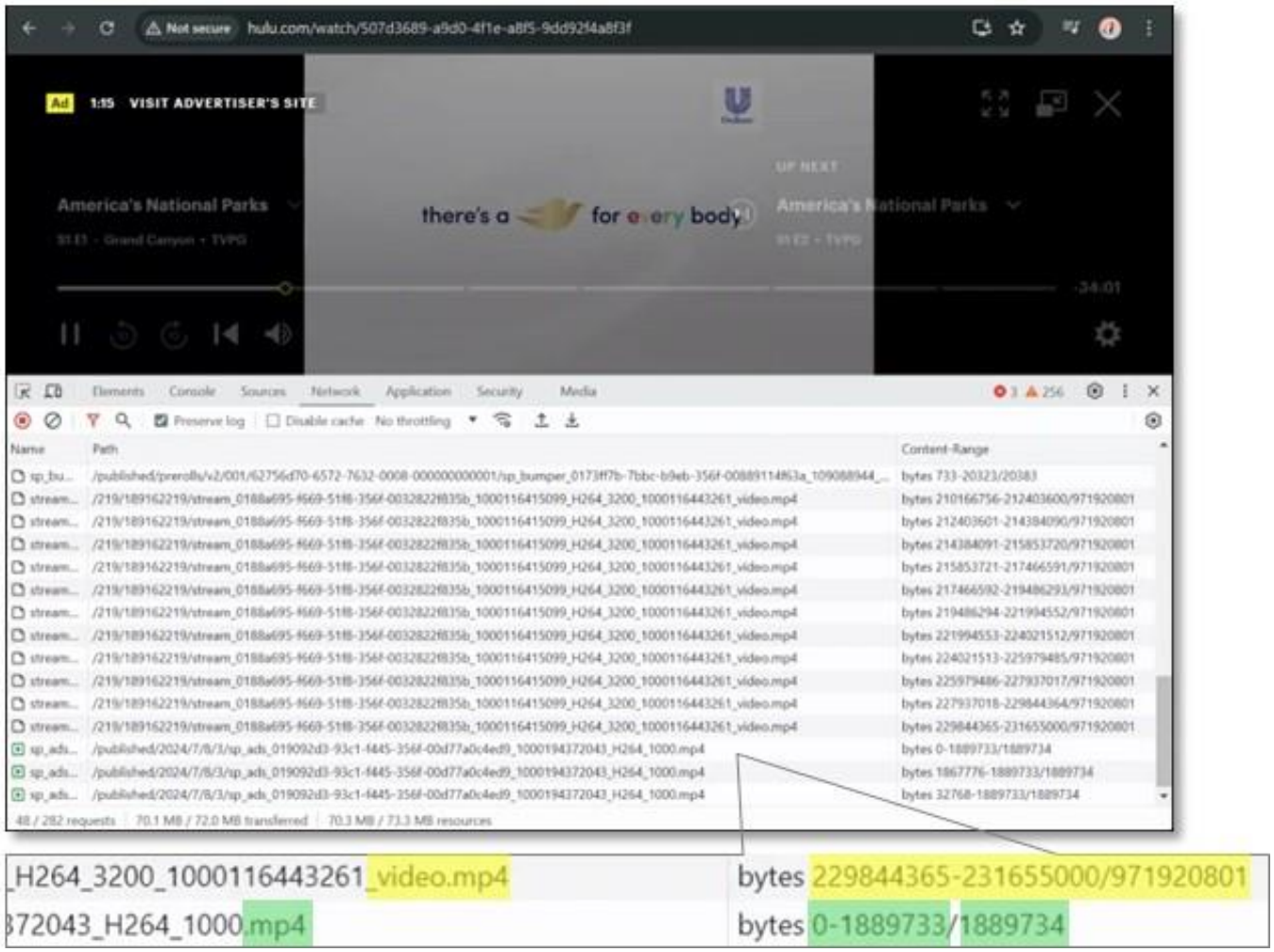
U.S. Patent No. 10,986,403	Hulu
[22c.2] the sequencing comprising ordering one or more data blocks of the digital media content into a content stream playable as audio or visual content perceivable by the user,	The Accused Instrumentalities order one or more data blocks of the digital media content into a content stream playable as audio or visual content perceivable by the user. *See, e.g.*, [1d.2]. An analysis of proprietary backend systems and/or source code may be necessary to fully and accurately describe the functionality of the Accused Instrumentalities with respect to this limitation and, accordingly, Plaintiff reserves the right to supplement these infringement contentions once such information is made available to Plaintiff.
[22c.3] the content stream comprising a media section that comprises at least some of the digital media content,	The Accused Instrumentalities provide a content stream comprising a media section that comprises at least some of the digital media content. *See, e.g.*, [1d.2]. For example, the Ad Insertion MPD Manipulator orders data blocks of the digital media content into a content stream for the user. For example, the Ad Insertion MPD Manipulator generates a DASH presentation that is a mixture of content and advertisements.

U.S. Patent No. 10,986,403	Hulu
	4.3 Overview on Interfaces and Functions The Ad Insertion architectures start with the ingest of an input stream over IF-0 which is processed by an ABR Encoder and output as well-formed CMAF content over the IF-1 interface. A DASH Packager / MPD Generator uses IF-1 input to generate a conformant DASH content presentation that is sent over IF-2 and additional opportunity metadata that is sent (IF-3). ***DASH-IF*** **13** **DASH-IF IOP-5 V5.0.0 (2021-11)** An Ad Insertion MPD Manipulator uses the inputs of IF-2 and IF-3 to generate a DASH presentation that is a mixture of content and advertisements. In the SSAI architecture, the manipulator uses IF-4 to ask an Ad Decisioning / Content Server to provide advertisement placements for the content stream, possibly utilizing client sourced parameters from IF-7, before generating the final DASH MPD for IF-5 which contains metadata about the inserted ads via IF-6. In the SGAI architecture, the manipulator does not immediately use IF-4, instead it embeds opportunity information from IF-3 into the DASH MPD IF-5 output so that the DASH Client may later use IF-7 to retrieve the proper ad placements by sending this opportunity information along with client source parameters to the manipulator. The DASH Client utilizes the reference media pipeline provided by IF-9 to perform seamless playout of the mixed content and ad presentation obtained via IF-5. Ad measurement and tracking is enabled in the client by IF-8 utilizing the ad metadata embedded as part of IF-6. In Table 1 the interfaces defined are detailed with clause references and some example instantiations. Each interface clause will provide an informative overview of said interface and where aspects of the interface fall within the scope of this document, normative requirements will be provided. DASH Standard at § 4.3. "The MPD proxy inserts the ad content into the MPD and makes it part of the media presentation timeline." DASH Standard at §

U.S. Patent No. 10,986,403	Hulu
	5.7.1. "The ad is served automatically to the client as the client will start requesting the Segments according to the information and timeline in the MPD from the Ad content server." DASH Standard at § 5.7.3. Thus, the Ad Insertion MPD Manipulator and/or the Hulu client orders the data blocks of the digital media content into a content stream playable to the user. For example, the Hulu client on a browser requests and receives byte ranges of video.mp4 content files and presents video content using the video data it receives. In the example below, the Hulu client requests a byte range ending in 5690731, and separately requests a next byte range starting at the next byte (i.e., 5690732) of the same content video.mp4 file.  Screenshot of Hulu user interface on web browser, hulu.com, with debugger tool showing network traffic. An analysis of proprietary backend systems and/or source code may be necessary to fully and accurately describe the functionality of the Accused Instrumentalities with respect to this limitation and, accordingly, Plaintiff reserves the right to supplement these infringement contentions once such information is made available to Plaintiff.

	Content-Range
_H264_3200_1000116443261_video.mp4	bytes 0-7945/971920801
_H264_3200_1000116443261_video.mp4	bytes 3781084-5690731/971920801
_H264_3200_1000116443261_video.mp4	bytes 5690732-8042084/971920801
_H264_3200_1000116443261_video.mp4	bytes 8042085-10051263/971920801
_H264_3200_1000116443261_video.mp4	bytes 10051264-11814022/971920801
_H264_3200_1000116443261_video.mp4	bytes 11814023-13560195/971920801
_H264_3200_1000116443261_video.mp4	bytes 13560196-15697579/971920801
_H264_3200_1000116443261_video.mp4	bytes 15697580-17073726/971920801

U.S. Patent No. 10,986,403	Hulu
[22c.4] the content stream further comprising an advertising block within which at least some of the digital advertising content is scheduled to be presented during play,	The Accused Instrumentalities provide a content stream including an advertising block within which at least some of the digital advertising content is scheduled to be presented during play. *See, e.g.*, [1d.2]. For example, because the "MPD proxy inserts the ad content into the MPD and makes it part of the media presentation timeline," the content stream includes an advertising block within which at least some of the digital advertising content is scheduled to be presented during play. • The MPD proxy inserts the ad content into the MPD and makes it part of the media presentation timeline. For details on the operation, refer to clause 0. The **MPD**`@minimumUpdatePeriod` is set such that clients return to the proxy at the end of the ad pod at the very latest. If the end point of the opportunity, $t_{splice\text{-}in}$, is unknown, **MPD**`@minimumUpdatePeriod` needs to be set such that the client checks back regularly. DASH Standard at § 5.7.1. In the example discussed in [1d.2], for the predetermined ad insertion points, the Hulu client on a browser requests and receives byte ranges of video.mp4 advertising files and presents video advertisements using the video data it receives. In the example below, after requesting many byte ranges from a content .mp4 video file (including bytes 229844365-231655000), the Hulu client requests all bytes (0-1889733, for a total of 1889734 bytes) of an advertisement .mp4 video file.

U.S. Patent No. 10,986,403	Hulu
	 Screenshot of Hulu user interface on web browser, hulu.com, with debugger tool showing network traffic and console running JavaScript reporting out video-related events. An analysis of proprietary backend systems and/or source code may be necessary to fully and accurately describe the functionality of the Accused Instrumentalities with respect to this limitation and, accordingly, Plaintiff reserves the right to supplement these infringement contentions once such information is made available to Plaintiff.

U.S. Patent No. 10,986,403	Hulu
[22c.5] the advertising block being arranged within the content stream at an initially defined insertion position relative to the media section;	The Accused Instrumentalities provide a content stream including an advertising block arranged within the content stream at an initially defined insertion position relative to the media section. *See, e.g.*, [1d.3]. An analysis of proprietary backend systems and/or source code may be necessary to fully and accurately describe the functionality of the Accused Instrumentalities with respect to this limitation and, accordingly, Plaintiff reserves the right to supplement these infringement contentions once such information is made available to Plaintiff.
[22d.1] adaptively re-sequencing the content stream into a modified content stream to reflect a user input comprising	The Accused Instrumentalities adaptively re-sequence the content stream into a modified content stream to reflect a user input. *See, e.g.*, [1d.4]. An analysis of proprietary backend systems and/or source code may be necessary to fully and accurately describe the functionality of the Accused Instrumentalities with respect to this limitation and, accordingly, Plaintiff reserves the right to supplement these infringement contentions once such information is made available to Plaintiff.
[22d.2] updating a current play position to a new play position in the digital media content detected at the digital media player system,	The Accused Instrumentalities update a current play position to a new play position in the digital media content detected at the digital media player system. *See, e.g.*, [1d.4]. An analysis of proprietary backend systems and/or source code may be necessary to fully and accurately describe the functionality of the Accused Instrumentalities with respect to this limitation and, accordingly, Plaintiff reserves the right to supplement these infringement contentions once such information is made available to Plaintiff.

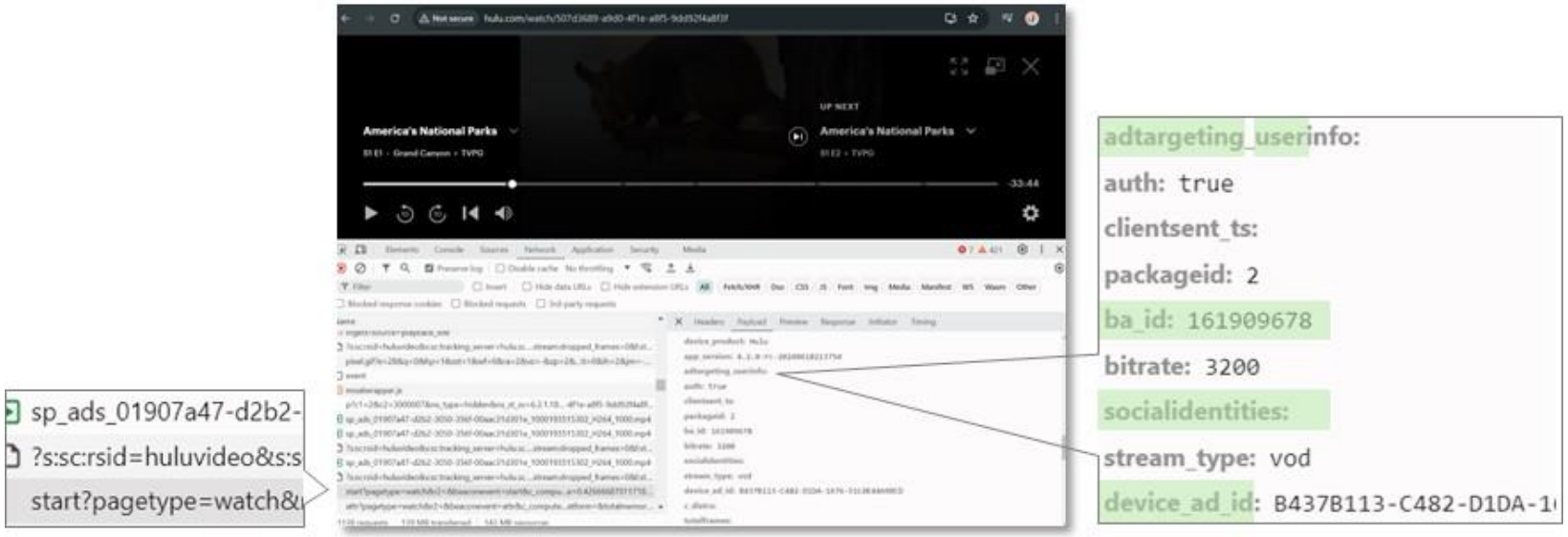
U.S. Patent No. 10,986,403	Hulu
[22d.3] the modified content stream comprising an alternate insertion position of the advertising block relative to the media section, the adaptively re-sequencing comprising	The Accused Instrumentalities provide a modified content stream comprising an alternate insertion position of the advertising block relative to the media section. *See, e.g.*, [1d.4]. An analysis of proprietary backend systems and/or source code may be necessary to fully and accurately describe the functionality of the Accused Instrumentalities with respect to this limitation and, accordingly, Plaintiff reserves the right to supplement these infringement contentions once such information is made available to Plaintiff.
[22d.4] determining the alternate insertion position using one or more adaptive preference placement rules associated with the digital media content during play;	The Accused Instrumentalities' step of adaptively re-sequencing comprises determining the alternate insertion position using one or more adaptive preference placement rules associated with the digital media content during play. *See, e.g.*, [1d.4]. An analysis of proprietary backend systems and/or source code may be necessary to fully and accurately describe the functionality of the Accused Instrumentalities with respect to this limitation and, accordingly, Plaintiff reserves the right to supplement these infringement contentions once such information is made available to Plaintiff.

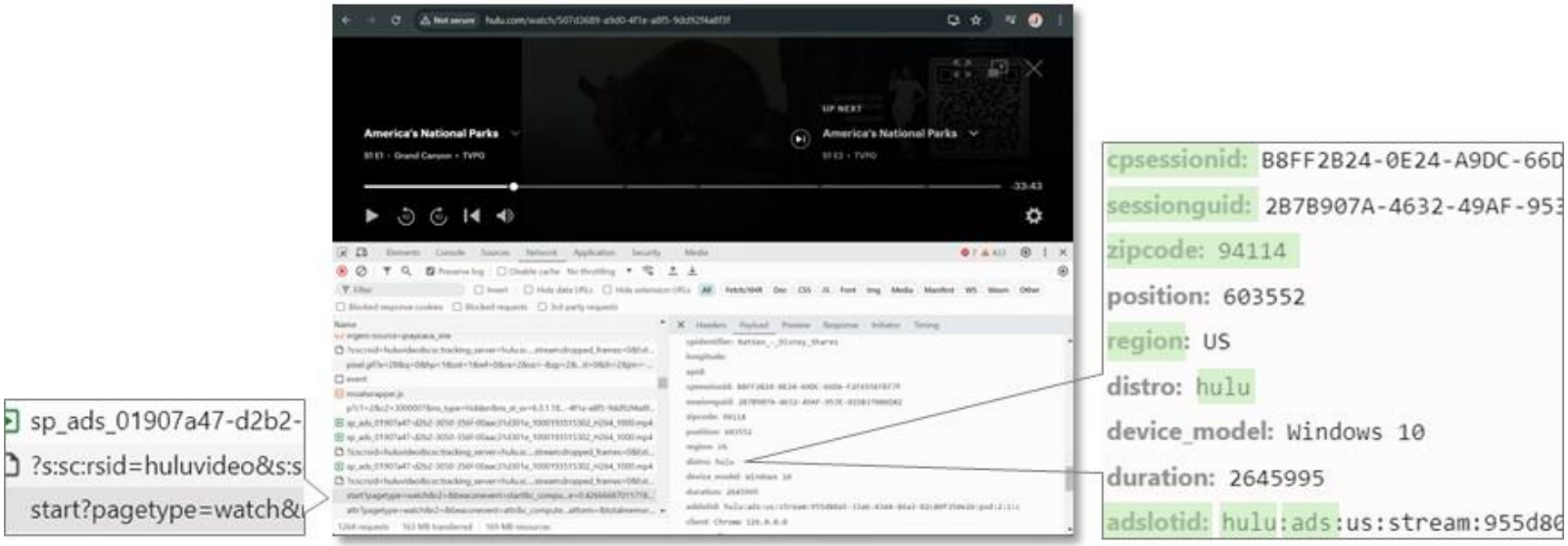
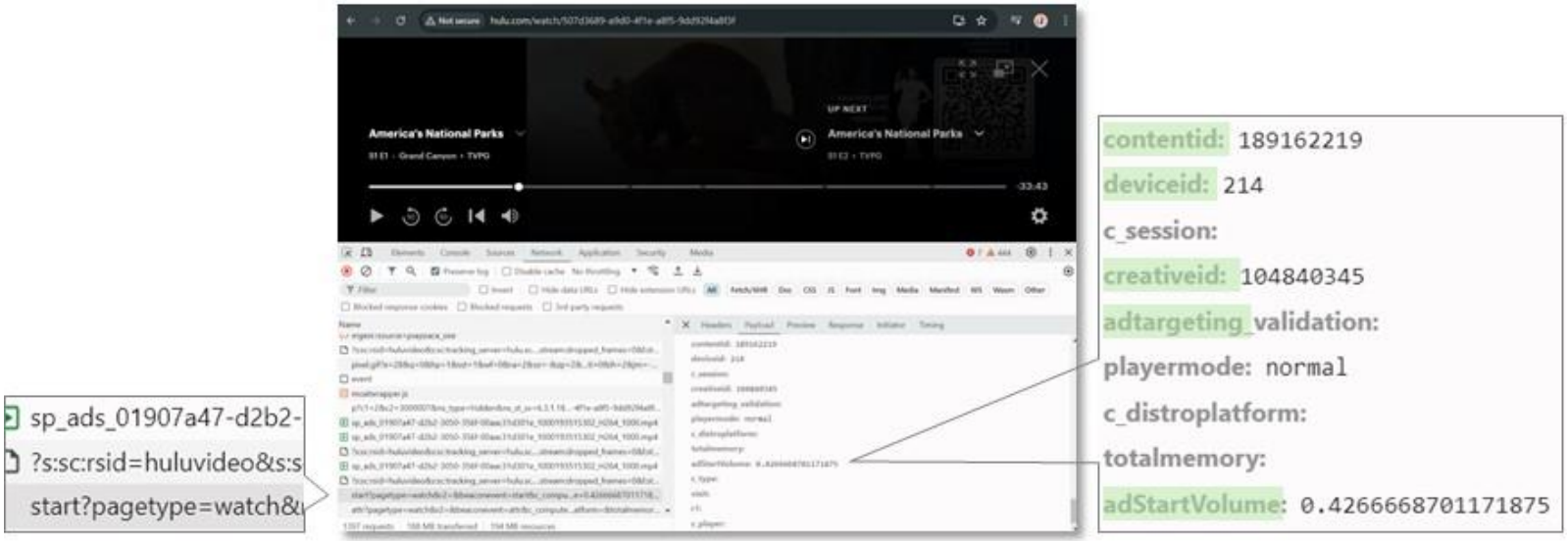
U.S. Patent No. 10,986,403	Hulu
[22e.1] the alternate insertion position being adaptively selectable by the intersplicer according to selection criteria defined by the one or more adaptive preference placement rules taking into account the new play position and at least one of a length of time associated with playing the digital media content, a number of digital media data blocks of the digital media content to be played, and a point in time the digital media content is to be played	The Accused Instrumentalities' alternate insertion position is adaptively selectable by the intersplicer according to selection criteria defined by the one or more adaptive preference placement rules taking into account the new play position and at least one of a length of time associated with playing the digital media content, a number of digital media data blocks of the digital media content to be played, and a point in time the digital media content is to be played. *See, e.g.*, [1d.6]. An analysis of proprietary backend systems and/or source code may be necessary to fully and accurately describe the functionality of the Accused Instrumentalities with respect to this limitation and, accordingly, Plaintiff reserves the right to supplement these infringement contentions once such information is made available to Plaintiff.

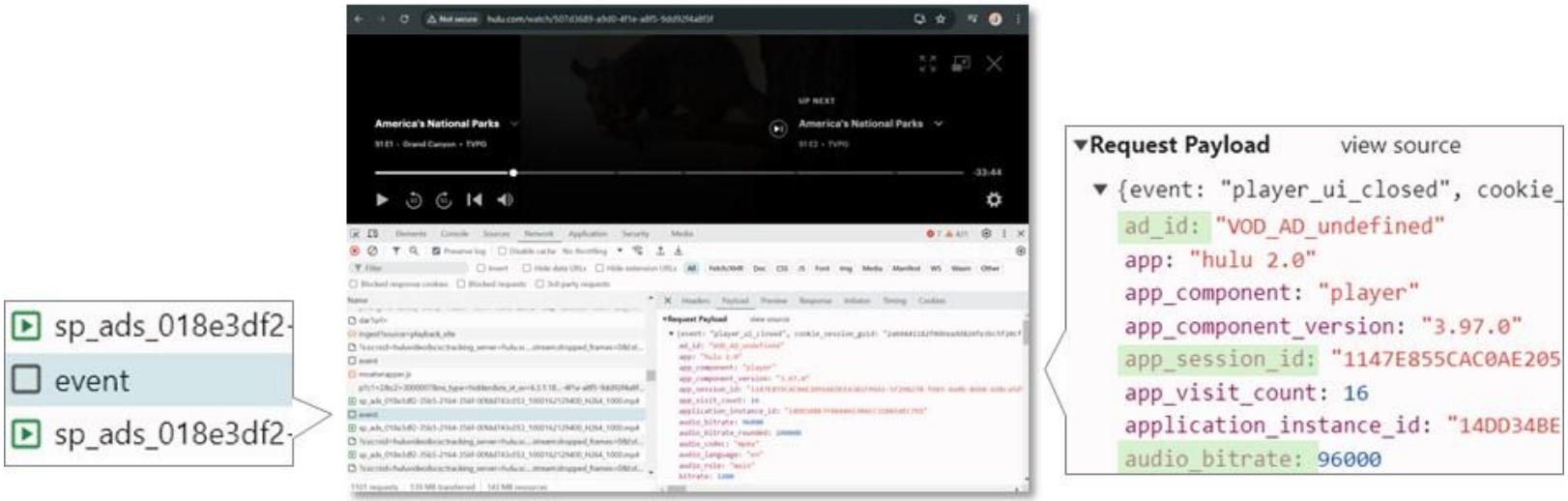
U.S. Patent No. 10,986,403	Hulu
[22e.2] such that the alternate insertion position is positioned at a play position in the digital media content that satisfies a condition selected from: the play position being a predetermined length of time after the new play position, the play position being a predetermined number of digital media data blocks after the new play position, and the play position being at a predetermined time of the hour after the new play position;	The alternate insertion position of the Accused Instrumentalities is positioned at a play position in the digital media content that satisfies a condition selected from: the play position being a predetermined length of time after the new play position, the play position being a predetermined number of digital media data blocks after the new play position, and the play position being at a predetermined time of the hour after the new play position. *See, e.g.*, [1d.7]. An analysis of proprietary backend systems and/or source code may be necessary to fully and accurately describe the functionality of the Accused Instrumentalities with respect to this limitation and, accordingly, Plaintiff reserves the right to supplement these infringement contentions once such information is made available to Plaintiff.

U.S. Patent No. 10,986,403	Hulu
[22f] causing presentation of the modified content stream at the digital media player system during a play period associated with one or more states of play;	The Accused Instrumentalities cause presentation of the modified content stream at the digital media player system during a play period associated with one or more states of play. *See, e.g.*, [1e]. An analysis of proprietary backend systems and/or source code may be necessary to fully and accurately describe the functionality of the Accused Instrumentalities with respect to this limitation and, accordingly, Plaintiff reserves the right to supplement these infringement contentions once such information is made available to Plaintiff.
[22g] causing adaptive presentation of a required part of the digital advertising content at the alternate insertion point, instead of the initially defined insertion position;	The Accused Instrumentalities cause adaptive presentation of a required part of the digital advertising content at the alternate insertion point, instead of the initially defined insertion position. *See, e.g.*, [1e]. An analysis of proprietary backend systems and/or source code may be necessary to fully and accurately describe the functionality of the Accused Instrumentalities with respect to this limitation and, accordingly, Plaintiff reserves the right to supplement these infringement contentions once such information is made available to Plaintiff.

U.S. Patent No. 10,986,403	Hulu
[22h] keeping a setting, in at least a first memory of the digital media player system, to indicate a first state of play, the setting including a first value to indicate presentation of the required part of the digital advertising content is in progress during presentation of the modified content stream; and	The Accused Instrumentalities keep a setting, in at least a first memory of the digital media player system, to indicate a first state of play, the setting including a first value to indicate presentation of the required part of the digital advertising content is in progress during presentation of the modified content stream. *See, e.g.*, [1f.1]. An analysis of proprietary backend systems and/or source code may be necessary to fully and accurately describe the functionality of the Accused Instrumentalities with respect to this limitation and, accordingly, Plaintiff reserves the right to supplement these infringement contentions once such information is made available to Plaintiff.
[22i] responsive to detecting the first value in the first memory, disabling user interface commands comprising a user navigation control that enables the user to alter a course of presentation of the content stream.	The Accused Instrumentalities, responsive to detecting the first value in the first memory, disable user interface commands comprising a user navigation control that enables the user to alter a course of presentation of the content stream. *See, e.g.*, [1f.2]. An analysis of proprietary backend systems and/or source code may be necessary to fully and accurately describe the functionality of the Accused Instrumentalities with respect to this limitation and, accordingly, Plaintiff reserves the right to supplement these infringement contentions once such information is made available to Plaintiff.

U.S. Patent No. 10,986,403	Hulu
23. The method as in claim 22, wherein presentation data comprising an indication of the digital advertising content that has been presented is stored in a second memory of the digital media player system.	The Accused Instrumentalities use presentation data comprising an indication of the digital advertising content that has been presented is stored in a second memory of the digital media player system. The Accused Instrumentalities track and store indications that advertisements have been presented, as well as data about such presentations. For example, the Accused Instrumentalities track which advertisements a users views, data about the user and the user's device, what the volume of the Hulu client was set to when the advertisement started, and whether the user clicked on the ad. In the example shown below, after a user watches an ad, Hulu network traffic includes "start?pagetype=watch" data that includes, for example, data relating to the user, the content the user was watching, the user's device, the advertisement the user watched, and the volume of the advertisement's audio at the start of the advertisement, including "adtargeting_userinfo," "device_ad_id," "zipcode," "adslotid," "contentid," "deviceid," "adtargeting_validation," and "adStartVolume."  Screenshot of Hulu user interface on web browser, hulu.com, with debugger tool showing network traffic.

U.S. Patent No. 10,986,403	Hulu
	 Screenshot of Hulu user interface on web browser, hulu.com, with debugger tool showing network traffic. 

U.S. Patent No. 10,986,403	Hulu
	Screenshot of Hulu user interface on web browser, hulu.com, with debugger tool showing network traffic. As another example, as shown below, after a user watches an ad, Hulu network traffic includes an “event” that includes an “ad_id,” “app_session_id,” and “audio-bitrate.”  Screenshot of Hulu user interface on web browser, hulu.com, with debugger tool showing network traffic. An analysis of proprietary backend systems and/or source code may be necessary to fully and accurately describe the functionality of the Accused Instrumentalities with respect to this limitation and, accordingly, Plaintiff reserves the right to supplement these infringement contentions once such information is made available to Plaintiff.