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MPEG-DASH Enhanced Multimedia Streaming

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Abstract— Multimedia streaming is still in its immaturity compared to its potential market because of its own manifest format, streaming protocols. There is no interoperability exists between devices and servers of various vendors. MPEG-DASH is one which provides interoperability between various servers and devices. Achieving such interoperability will increases the market growth, because there is no such common video streaming which supports all the formats and plays in all the devices like apple devices android devices etc. Video streaming through the web has been increasing due to MPEG-DASH Dynamic Adaptive Streaming over HTTP. Upcoming opportunities that arise with this technology and demonstration of live video using MPEG-DASH are discussed in this paper.

Keywords— MPEG-DASH, Interoperability, Manifest, RTP, Apple's HTTP Live Streaming, Microsoft's Smooth Streaming, Adobe's HTTP Dynamic streaming.

I. INTRODUCTION

In 1990 delivering the video content over the internet was challenge. The Internet Engineering Task Force's Real Time Transport Protocol (RTP) was designed to define packet formats for audio and video content along with stream session management, which allowed delivery of those packets with low overhead [5] . But RTP perform well in managed IP networks. But managed networks have been replaced by content delivery networks (CDN), so many of video content don't support RTP streaming. There are various draw backs of RTP streaming such as RTP packets are not allowed through firewalls. Due to tremendous growth in World Wide Web and increase in Internet net bandwidth the multimedia content is being delivered using HTTP. There are several advantages of using HTTP streaming. Audio and Video streaming has increased a lot because of HTTP.HTTP is firewall friendly because almost all firewalls are configured to support its outgoing connections [5]. HTTP server technology is a commodity and therefore supporting HTTP streaming for millions of users is cost effective. Second, with HTTP streaming the client manages the streaming without having to maintain a session state on the server, that's why HTTP streaming has become very popular. Apple's HTTP Live Streaming [1], Microsoft's Smooth Streaming [2] and Adobe's HTTP Dynamic streaming [3] all of them use HTTP streaming as their delivery method. But each of the streaming protocol has their own manifest and segment formats. So whenever the content received from the server the device must support the client protocol, for example HLS will be supported only by the apple devices, it can't be played in other android devices. There is no interoperability exists between devices and servers of various vendors. So MPEG-DASH is one which provides interoperability between various servers and client devices. MPEG-DASH technology was developed under MPEG. Work on DASH started in 2010; it became a Draft International Standard in January 2011 and an International Standard in November 2011[6] [7] [8] .The MPEG-DASH standard was published as ISO/IEC 23009-1:2012 in April, 2012. In July 2013, the second edition of MPEG-DASH has been approved incorporating first amendment and corrigenda including support for event messages and media presentation anchors [4].DASH is a technology related to Adobe Systems HTTP Dynamic Streaming, Apple Inc. HTTP Live Streaming(HLS) and Microsoft Smooth Streaming[9].DASH is based on Adaptive HTTP streaming (AHS) in 3GPP Release 9 and on HTTP Adaptive Streaming (HAS) in Open IPTV Forum Release 2 [10][11].As part of their collaboration with MPEG, 3GPP Release 10 has adopted DASH (with specific codec's and operating modes) for use over wireless networks [10].

II. RELATED WORK OF MPEG-DASH

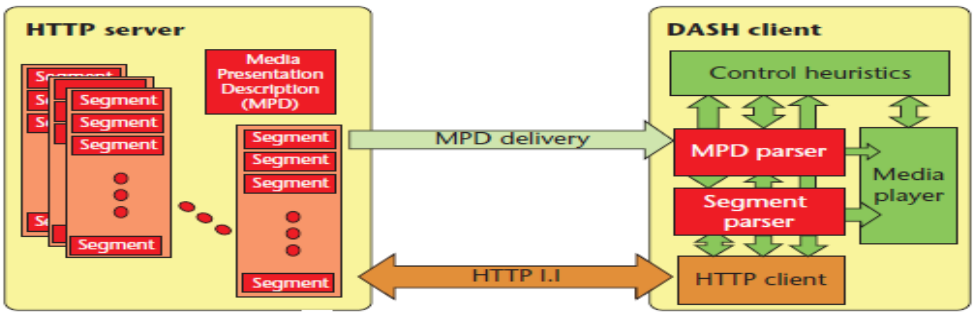

Fig1: Scope of MPEG-DASH

Figure 1 illustrates a simple streaming scenario between an HTTP server and a DASH client. In this figure, the multimedia content is captured and stored on an HTTP server and is delivered using HTTP. The content exists on the server in two parts: Media Presentation Description (MPD), which describes a manifest of the available content, its various alternatives, their URL addresses, and other characteristics; and segments, which contain the actual multimedia bit streams in the form of chunks, in single or multiple files. To play the content, the DASH client first obtains the MPD. The MPD can be delivered using HTTP, email, thumb drive, broadcast, or other transports. By parsing the MPD, the DASH client learns about the program timing, media content availability, media types, resolutions, minimum and maximum bandwidths, and the existence of various encoded alternatives of multimedia components, accessibility features and required digital rights management (DRM), media-component locations on the network, and other content characteristics. Using this information, the DASH client selects the appropriate encoded alternative and starts streaming the content by fetching the segments using HTTP GET requests. After appropriate buffering to allow for network throughput variations, the client continues fetching the subsequent segments and also monitors the network bandwidth fluctuations. Depending on its measurements, the client decides how to adapt to the available bandwidth by fetching segments of different alternatives (with lower or higher bitrates) to maintain an adequate buffer. The MPEG-DASH specification only defines the MPD and the segment formats. The delivery of the MPD and the media-encoding formats containing the segments, as well as the client behavior for fetching, adaptation heuristics, and playing content, are outside of MPEGDASH's scope.

Multimedia Presentation Description

Dynamic HTTP streaming requires various bitrate alternatives of the multimedia content to be available at the server. In addition, the multimedia content might consist of several media components (for example, audio, video, and text), each of which might have different characteristics. In MPEG-DASH, these characteristics are described by MPD, which is an XML document. Figure 2 demonstrates the MPD hierarchical data model. The MPD consists of one or multiple periods, where a period is a program interval along the temporal axis.

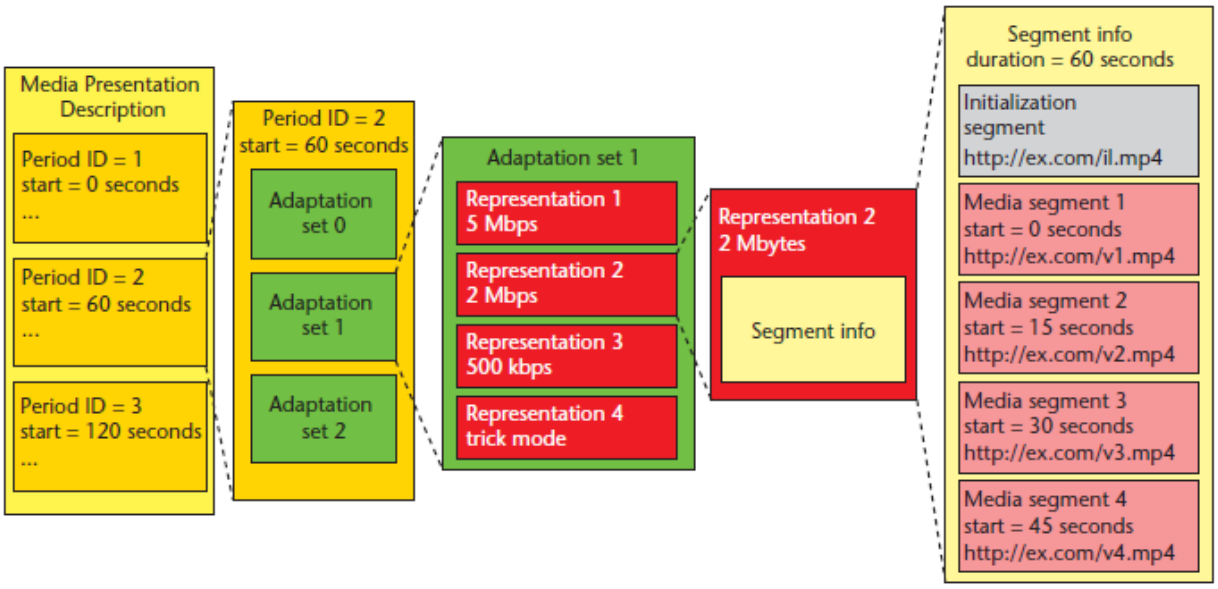

Fig 2: The Multimedia Presentation Description hierarchical data model.

Each period has a starting time and duration and consists of one or multiple adaptation sets. An adaptation set provides the information about one or multiple media components and its various encoded alternatives. For instance, an adaptation set might contain the different bitrates of the video component of the same multimedia content. Another adaptation set might contain the different bitrates of the audio component (for example, lower-quality stereo and higher quality surround sound) of the same multimedia content. Each adaptation set usually includes multiple representations. A representation is an encoded alternative of the same media component, varying from other representations by bitrate, resolution, number of channels, or other characteristics. Each representation consists of one or multiple segments. Segments are the media stream chunks in temporal sequence. Each segment has a URL that is, an addressable location on a server that can be downloaded using HTTP GET or HTTP GET with byte ranges. To use this data model, the DASH client first parses the MPD XML document. The client then selects the set of representations it will use based on descriptive elements in the MPD, the client's capabilities, and user's choices. The client then builds a timeline and starts playing the multimedia content by requesting appropriate media segments. Each representation's description includes information about its segments, which enables requests for each segment to be formulated in terms of the HTTP URL and byte range. For live presentations, the MPD also provides segment availability start time and end time, approximate media start time, and the fixed or variable duration of segments.

III. RESULTS

[To Parent Directory]

1/13/2014	2:46 PM	1665	manifest.mpd
1/13/2014	2:46 PM	704	Stream_0_1512000_init.m4i
1/13/2014	2:46 PM	1876869	Stream_0_1512000_Segment-1.m4v
1/13/2014	2:46 PM	698	Stream_1_864000_init.m4i
1/13/2014	2:46 PM	1060380	Stream_1_864000_Segment-1.m4v
1/13/2014	2:46 PM	702	Stream_2_432000_init.m4i
1/13/2014	2:46 PM	536662	Stream_2_432000_Segment-1.m4v
1/13/2014	2:46 PM	697	Stream_3_216000_init.m4i
1/13/2014	2:46 PM	269423	Stream_3_216000_Segment-1.m4v
1/13/2014	2:46 PM	621	Stream_4_192000_init.m4i
1/13/2014	2:46 PM	125353	Stream_4_192000_Segment-1.m4a

Fig 3: Output of manifest file & segment index files using Harmonic PML as encoder

manifest . mpd is the manifest file
Stream_0_1512000_Init.m4i is the index file
Stream_0_1512000_Segment-1.m4v is the segment with bit rate 1400kbps
Stream_1_864000_Init.m4i is the index file
Stream_1_864000_Segment-1.m4v is the segment with bit rate 800kbps
Stream_2_432000_Init.m4i is the index file
Stream_2_432000_Segment-1.m4v is the segment with bit rate 400kbps
Stream_3_216000_Init.m4i is the index file
Stream_3_216000_Segment-1.m4v is the segment with bit rate 200kbps
Stream_4_192000_Init.m4i is the index file
Stream_4_192000_Segment-1.m4a is the segment with bit rate 192kbps

[To Parent Directory]

1/13/2014	3:30 PM	<dir>	audio1
1/13/2014	3:29 PM	<dir>	audio2
1/13/2014	3:29 PM	2965	manifest.mpd
1/13/2014	3:29 PM	<dir>	video1
1/13/2014	3:29 PM	<dir>	video2
1/13/2014	3:29 PM	<dir>	video3

Fig 4: Output of Manifest file, Audio & Video files using Envivio Halo as encoder

Video 1 file with .m4s extension similarly for different Bitrates different video files will be there like video 2 & video 3.

1/6/2014	5:49 PM	52644	63844904640.m4s
1/6/2014	5:49 PM	53788	63845084640.m4s
1/6/2014	5:49 PM	54641	63845264640.m4s
1/6/2014	5:49 PM	46023	63845444640.m4s
1/6/2014	5:49 PM	52957	63845624640.m4s
1/6/2014	5:49 PM	46486	63845804640.m4s
1/6/2014	5:49 PM	46779	63845984640.m4s
1/6/2014	5:49 PM	73390	63846164640.m4s
1/6/2014	5:49 PM	41979	63846344640.m4s
1/6/2014	5:49 PM	50699	63846524640.m4s
1/6/2014	5:49 PM	52036	63846704640.m4s
1/6/2014	5:49 PM	53706	63846884640.m4s
1/7/2014	11:43 AM	685	Header.m4s

Audio 1 files with .m4s extension

1/6/2014	5:49 PM	16505	63844906490.m4s
1/6/2014	5:49 PM	16477	63845086213.m4s
1/6/2014	5:49 PM	16636	63845265935.m4s
1/6/2014	5:49 PM	16414	63845445658.m4s
1/6/2014	5:49 PM	16769	63845625380.m4s
1/6/2014	5:49 PM	16410	63845805103.m4s
1/6/2014	5:49 PM	16669	63845984825.m4s
1/6/2014	5:49 PM	16655	63846168727.m4s
1/6/2014	5:49 PM	16473	63846348450.m4s
1/6/2014	5:49 PM	16548	63846528172.m4s
1/6/2014	5:49 PM	16476	63846707895.m4s
1/6/2014	5:49 PM	16528	63846887617.m4s
1/7/2014	11:43 AM	612	Header.m4s

IV. CONCLUSION

This paper suggests the advantages and additional features that are supported by MPEG-DASH technology and as well as play back of live video. We illustrated the future work and as well as already possible situation. With the help of MPEG-DASH many challenges can be handled to progress user knowledge and to make novel business models. In the meanwhile, it appears that the industry is moving very fast to give solutions based on MPEG-DASH. It's believed that the next feature years will be a crucial time for the industry including content and service providers, platform providers, software vendors, CDN providers, and device manufacturers to adopt this standard and build an interoperable ecosystem for multimedia streaming over the Internet.

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