Augmented Reality & Video Service Emerging Technologies

Video Streaming & MPEG-DASH

Prof. Jong-Moon Chung

Video Streaming & MPEG-DASH

YouTube MPEG-DASH

YouTube MPEG-DASH

❖ YouTube MPEG-DASH

- Adaptive HTTP Streaming using
  8 video resolution file in the server

Resolution	Pixels (width x height)	
144p	256 x 144	
240p	426 x 240	x 1.6
360p	640 x 360	x 2.5
480p	854 x 480	x 3.3
720p	1280 x 720	x 5
1080p	1920 x 1080	x 7.5
1440p	2560 x 1440	x 10
2160p	3840 x 2160	x 15

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❖ YouTube MPEG-DASH

- Internet uses HTTP streaming
  over TCP most commonly for
  video streaming services
  (e.g., YouTube, Netflix, Hulu, etc.)

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❖ Types of HTTP Video Streaming

- Regular HTTP Streaming: Completely downloads the video to the client device
- Progressive Download: Progressive downloading of the video at a fixed quality
- Adaptive Streaming over HTTP: Combination of Adaptive Video Quality (bitrate) Control & Progressive Downloading

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❖ Progressive Downloading Advantages

- Mobile device may not be able to store the entire video due to limited memory space
- Savings in both Personal Data Usages and Internet Bandwidth
  - Many users to not watch the entire video (many watch less than 20% of the entire video)

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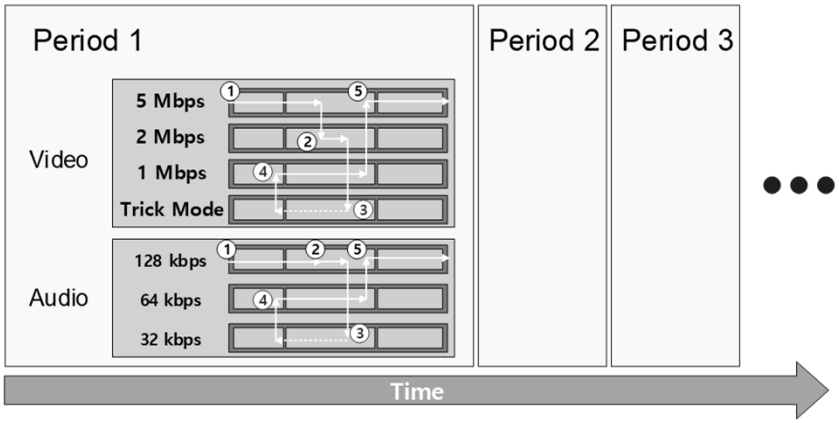
❖ Progressive Downloading Advantages



Example of DASH operations
Numbered circles represent the action points controlled by the Client device

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❖ MPEG-DASH specifications ISO/IEC 23009-1

- MPEG-DASH standard only defines MPD and the segment formats
  - MPD: Media Presentation Description
- MPD delivery, format of media-encoding that include the video segments, adaptive downloading, video playing control are determined by the application on the Client device

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❖ **MPEG-DASH specifications ISO/IEC 23009-1**

- HTTP Server
  - MPD (Media Presentation Description)
  - Video and Audio data segments

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❖ **Playing on the DASH Client**

1. DASH client requests for MPD from the Server
2. MPD is delivered to the Client using HTTP, email, thumb drive, broadcast, etc.
3. Client parses the MPD

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❖ Playing on the DASH Client

4. Client's MPEG-DASH application reads info
   - Program timing, media-content availability, media types, resolutions, minimum and maximum bandwidths, available multimedia resolution types, etc.
5. Client selects the appropriate encoded alternative and starts streaming the content by fetching the segments using HTTP GET requests

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❖ Playing on the DASH Client

6. Appropriate buffering is used to compensate for network throughput variations
7. Client continues to fetch subsequent segments and also monitors the network bandwidth fluctuations
8. Client adapts to the available bandwidth by fetching segments with lower or higher bitrates to maintain an adequate buffer

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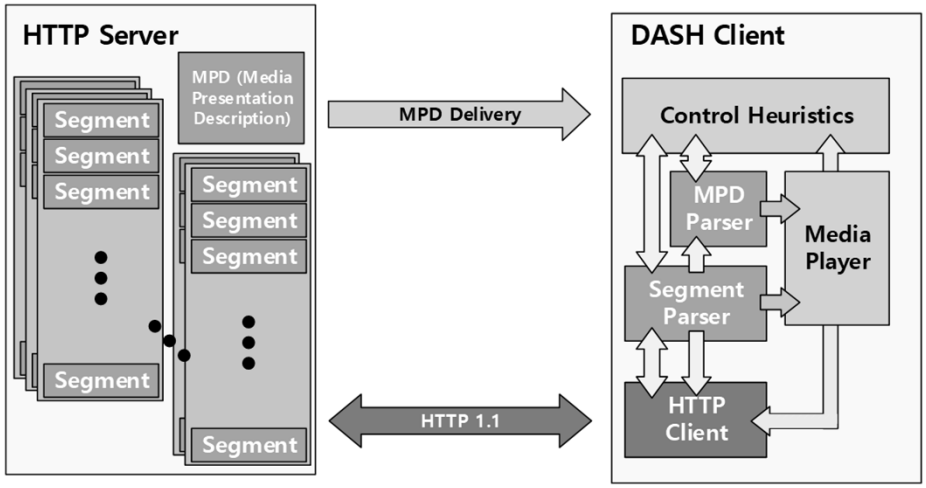
❖ Playing on the DASH Client



MPEG-DASH system blocks and functionalities

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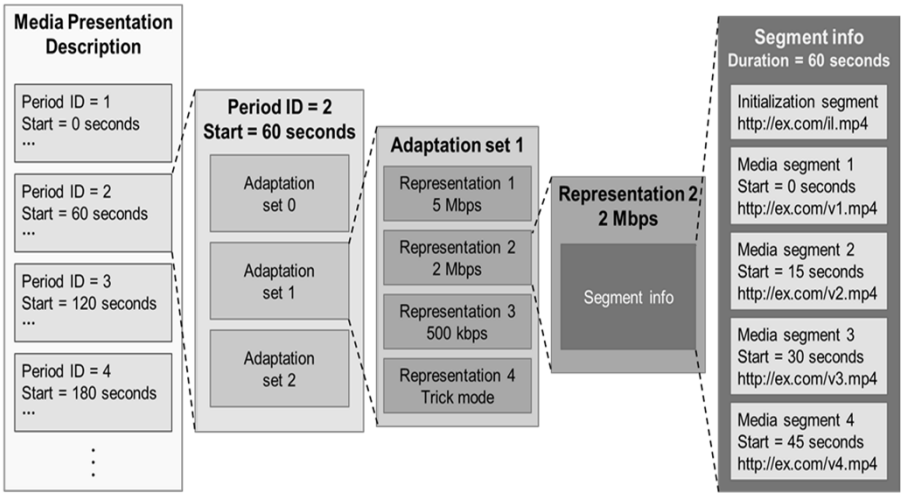
❖ Playing on the DASH Client



MDP (Multimedia Presentation Description) hierarchical data model

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❖ MPD Decoding & Playing Method

1. MPD contains multiple Periods

2. Period contains multiple Adaptation sets
   - Period is a program time interval which includes information on starting time and duration

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❖ MPD Decoding & Playing Method

3. Adaptation set contains multiple Representations
   A. Representations have different bitrate encodings of video or audio of the same multimedia content
      - bitrate is based on resolution, number of channels, etc.
   B. Representation for **Trick Mode** can be included

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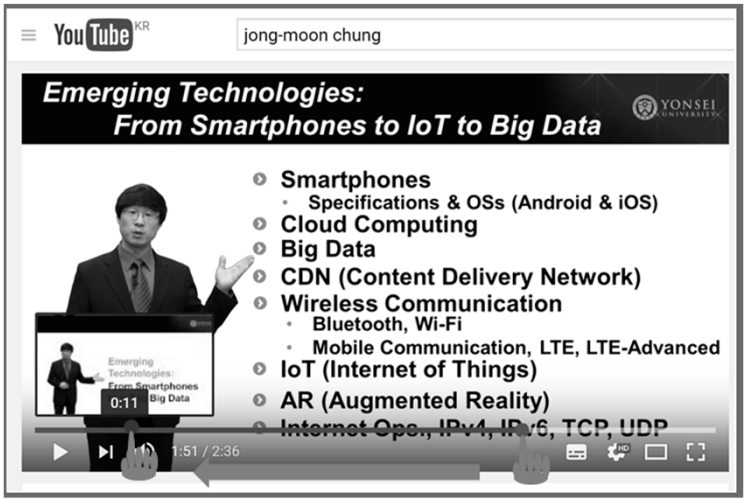
❖ Trick Mode example



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❖ MPD Decoding & Playing Method

4. Representations consists of multiple media Segments information
   A. Segments are chunks of the media stream in a time order sequence
   B. Each segment has a URI (Uniform Resource Identifier)
   C. URI is used as the Server's address location from where the multimedia content can be downloaded from
   D. Download uses HTTP GET (may include byte ranges)

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❖ MPD Decoding & Playing Method

5. Segment information includes its initialization segment and information of multiple media segments

MPEG-DASH Features

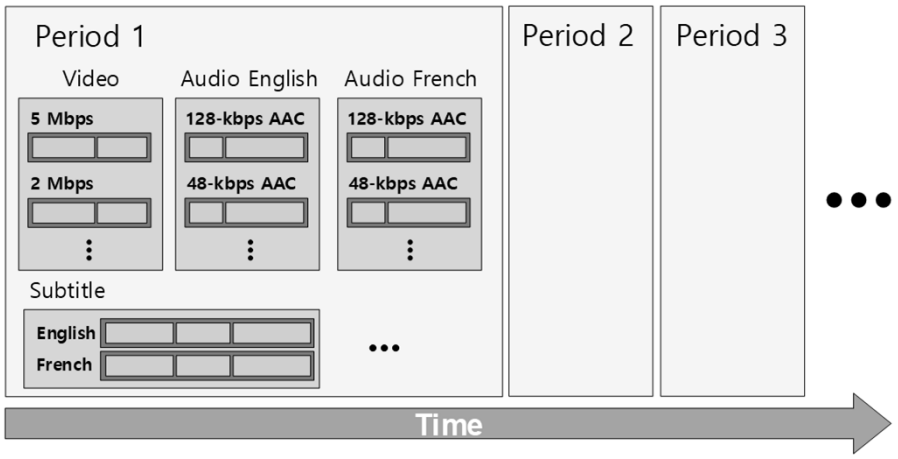
❖ MPEG-DASH Features

- MPEG-DASH specification has many features which include
  1. Switching and selectable streams
  2. Ad insertion
  3. Compact manifest
  4. Fragmented manifest
  5. Segments with variable durations

MPEG-DASH Features

❖ MPEG-DASH Features

1. Switching and selectable streams



MPEG-DASH Features

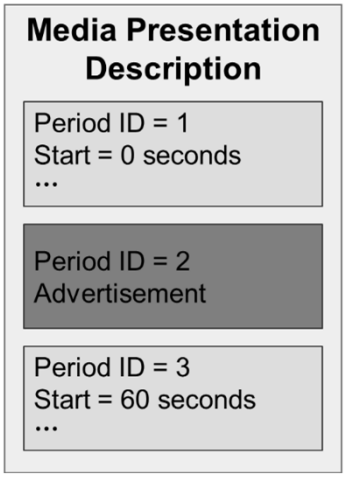
❖ MPEG-DASH Features

1. Switching and selectable streams
   - MPD provides adequate information to the client for selecting and switching between streams
     - Selecting one audio stream from different languages
     - Selecting video between different camera angles
     - Selecting the subtitles from provided languages
     - Dynamically switching between different bitrates of the same video camera

MPEG-DASH Features

❖ MPEG-DASH Features

2. Ad insertion
   - Advertisements can be inserted as a period between periods or segment between segments in both on-demand and live cases



MPEG-DASH Features

❖ MPEG-DASH Features

3. Compact manifest
   - Segments' address URLs can be signaled using a template scheme
   - Results in a compact MPD
4. Fragmented manifest
   - MPD can be divided into multiple parts or some of its elements can be externally referenced
   - Enables downloading MPD in multiple steps

MPEG-DASH Features

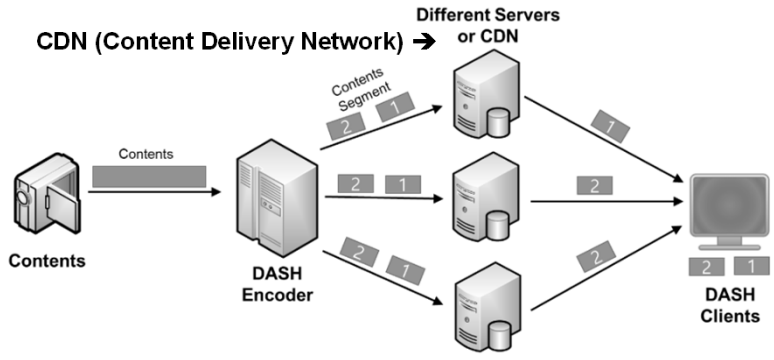
❖ MPEG-DASH Features

5. Segments with variable durations
   - Duration of segments can be varied
   - Duration information in Live Streaming
     - Duration of the Next segment can be provided in advance along with the delivery of the Current segment

MPEG-DASH Features

❖ MPEG-DASH Features

6. Multiple Base URLs
   - Same content can be available at multiple URLs
   - Client can stream from any URL



MPEG-DASH Features

❖ MPEG-DASH Features

7. Clock-drift control for live sessions
   - UTC time can be included with each segment
   - UTC time enables the client to control its clock drift
     - UTC: Coordinated Universal Time

MPEG-DASH Features

❖ MPEG-DASH Features

8. SVC (Scalable Video Coding) and MVC (Multiview Video Coding) support
   - MPD provides adequate information regarding the decoding dependencies between representations
   - This info can be used for streaming any (e.g., SVC, MVC) multilayer coded streams

MPEG-DASH Features

❖ MPEG-DASH Features

9. A flexible set of descriptors
   - Descriptors describe the content rating, components' roles, accessibility features, camera views, frame packing, audio channels' configuration
10. Subsetting adaptation sets into groups
   - Grouping occurs according to the content author's guidance

MPEG-DASH Features

❖ MPEG-DASH Features

11. Quality metrics for reporting the session experience
   - MPEG-DASH standards has a set of quality metrics
   - Metrics are used by the client to measure and report back to a server
12. Most of these features are provided in flexible and extensible ways
   - Enables MPEG-DASH to be used in flexible ways in various future apps

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Reference

References

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