



HIGH QUALITY 360° VIDEO RENDERING AND STREAMING

NEM SUMMIT 2016 - MEDIA AND ICT FOR THE CREATIVE INDUSTRIES I - PORTO

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HIGH QUALITY 360° VIDEO RENDERING AND STREAMING

- Challenges:
 - Efficient streaming of high quality 360° video content using existing content delivery networks (CDNs) and without the need for additional bandwidth comparing to traditional video streaming.
 - Playback of 360° content even on devices with limited processing resources and programmatic capabilities like TVs.
 - Scalable Solution with reduced processing load

360° Video on TV ???

MITTWOCH, 4. MAI 2016 10.20 UHR



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NAVIGIEREN



AUSWÄHLEN

■ BEENDEN

■ HILFE/IMPRESSUM

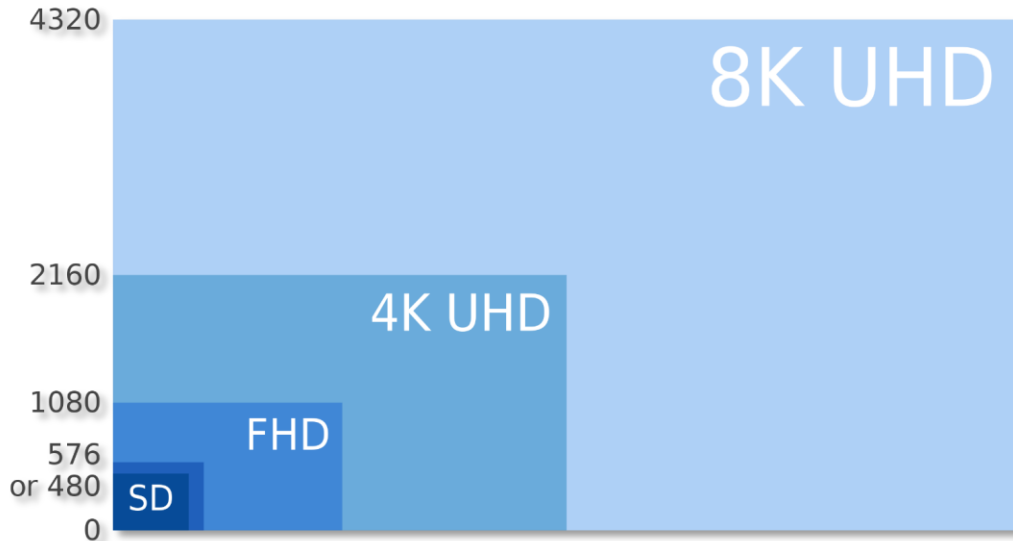


360°



Die rote Taste ●

WHY VIDEO IS BIG, AND WILL CONTINUE TO GROW



By Libron - Own work, CC0, <https://commons.wikimedia.org/w/index.php?curid=25976260>

4K has arrived / HD is commodity
→ 6-25 Mbit/s per single receiver

two 4K livestreams congest a 50Mbit/s
VDSL connection

Olympics 2020 will be filmed and
broadcast in 8K (in Japan)

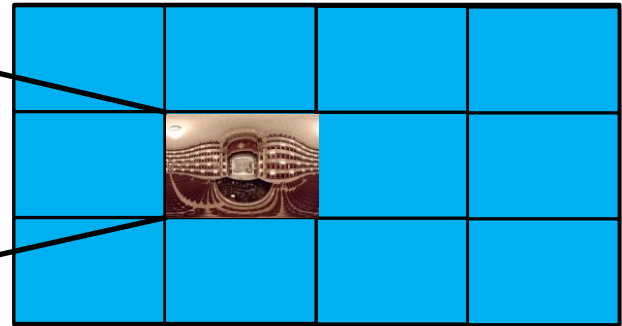
YouTube/FB recently started to
support mobile live video streaming

VR/360 adds an order of magnitude
→ **10-16x !!!**

4K RESOLUTION FOV?



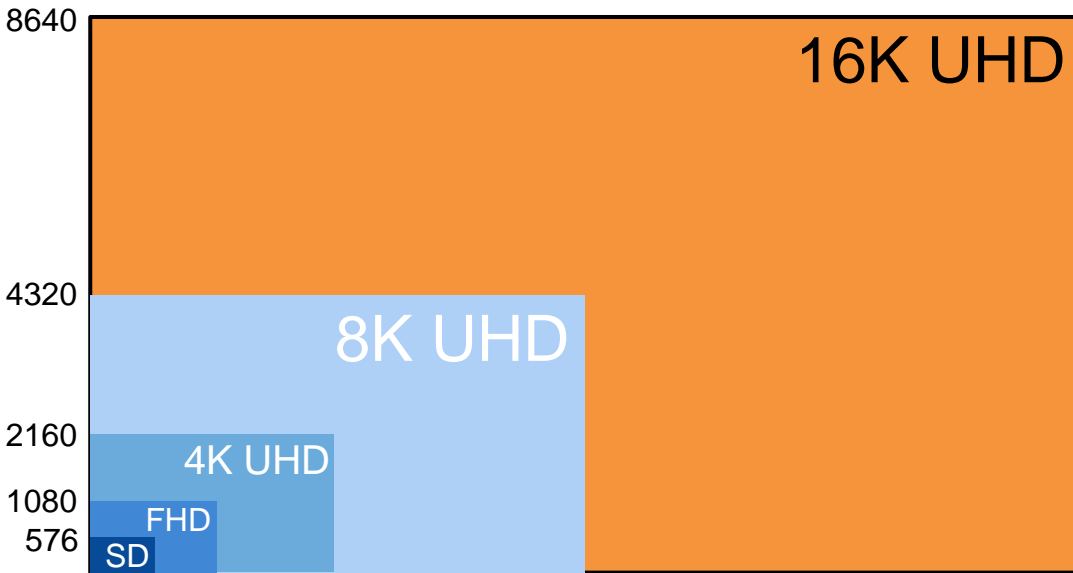
4K - 20 Mbit/s Stream



16K - ~300 Mbit/s Stream

Size ratio FOV \leftrightarrow Full 360° Video 1:12

4K FOV → 16K SOURCE



To get 4K FOV, 12K Video or higher is required

4k video bandwidth = 16-20 Mbit/s

16k video bandwidth= 320 Mbit/s

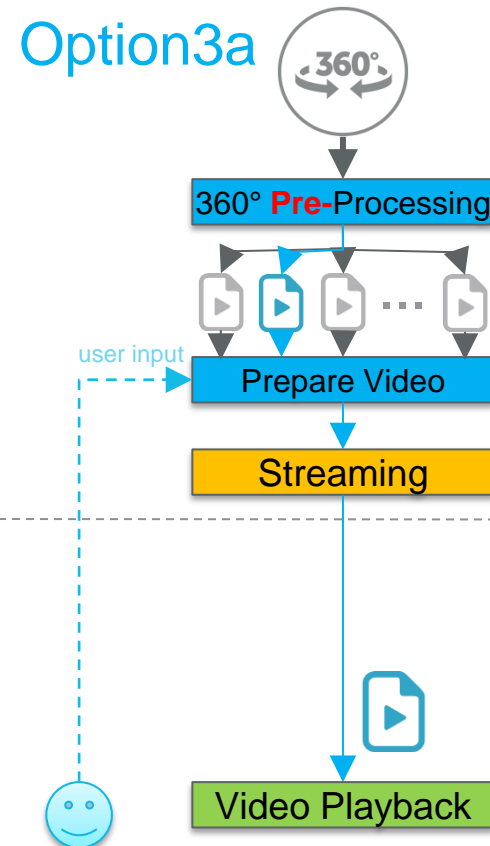
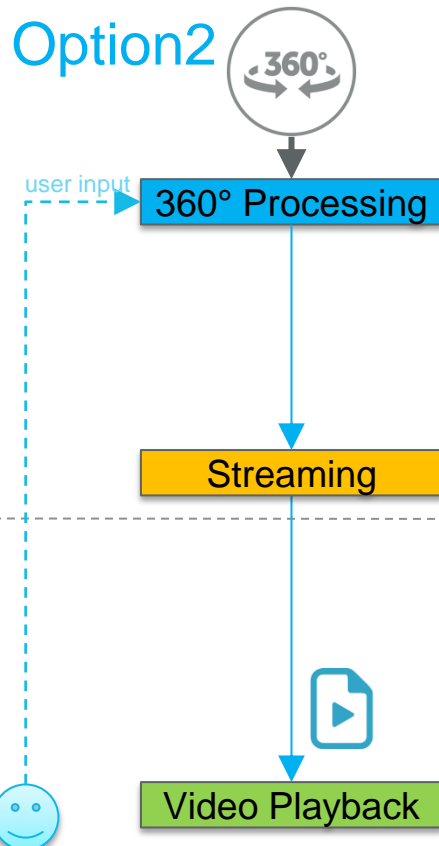
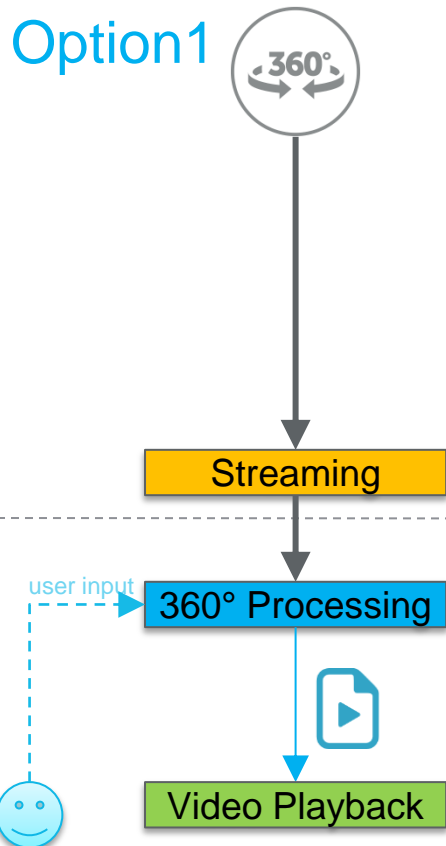
6k,10k and 12k are not industry standard.

2k(FHD),4k,8k are standard resolution.

360° STREAMING AND VIDEO PROCESSING OPTIONS

Server

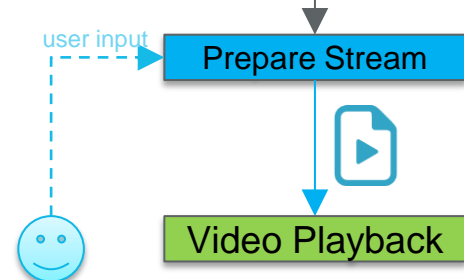
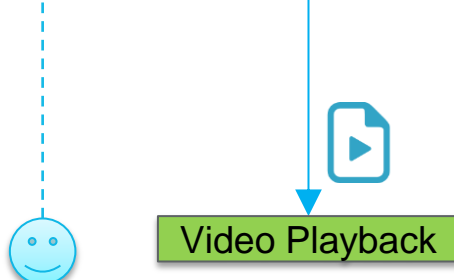
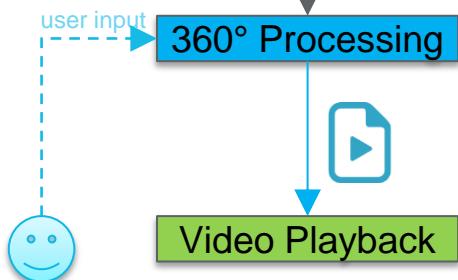
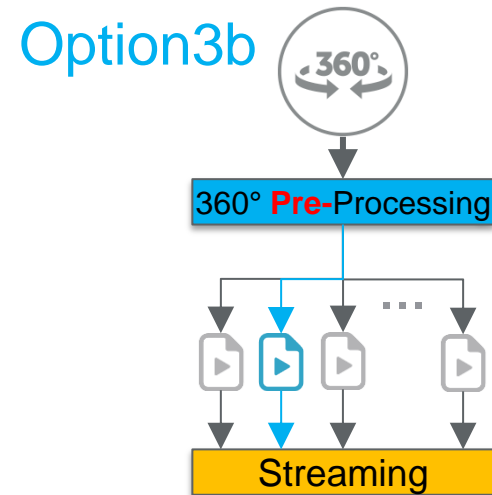
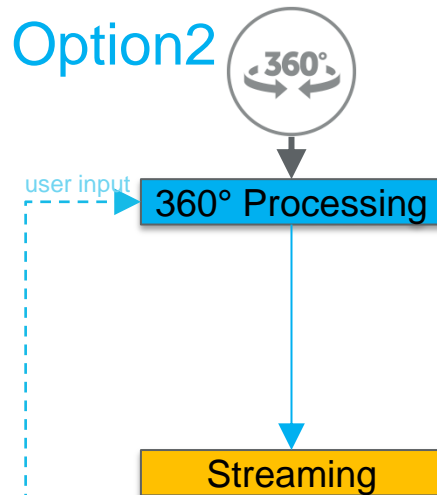
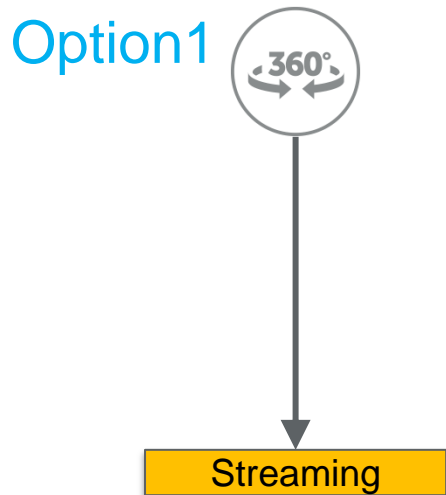
Client



360° STREAMING AND VIDEO PROCESSING OPTIONS

Server

Client



ADVANTAGES AND DISADVANTAGES

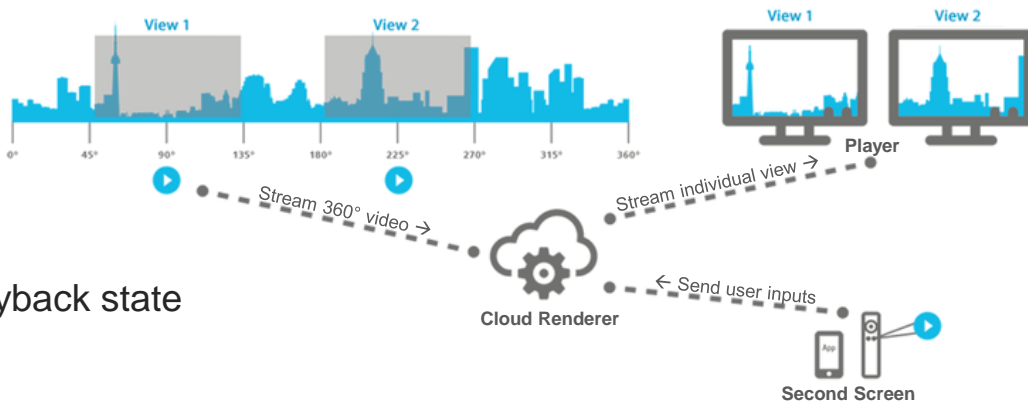
	Option1	Option2	Option3a	Option3b
Additional Storage	No	No	Yes	Yes
360° Video Processing on Client	Yes	No	No	No
360° Video Processing on Server	No	Yes	No ¹	No ¹
Bandwidth	High	Low	Low	Low ²
Motion-to-Photon Delay	Low	Medium ³	Medium ³	Medium ⁴
CDN usage	Yes	No ⁵	No ⁵	Yes
Example Target Devices	Head Mounted Displays	Low Capability Devices e.g. HbbTV	Low Capability Devices e.g. HbbTV	Medium Capability Devices e.g. Chromecast
Interaction Types	<ul style="list-style-type: none"> - Motion Sensors - Touch/Mouse 	<ul style="list-style-type: none"> - TV RC - Keyboard - (Touch/Mouse) 	<ul style="list-style-type: none"> - TV RC - Keyboard - (Touch/Mouse) 	<ul style="list-style-type: none"> - TV RC - Keyboard - Touch/Mouse

360° VIDEO CLOUD STREAMING SOLUTION

How it works

360° Video Cloud Renderer & Streamer:

- renders any kind of 360° content and streams only individual view to clients
- offers REST API to control view and playback state



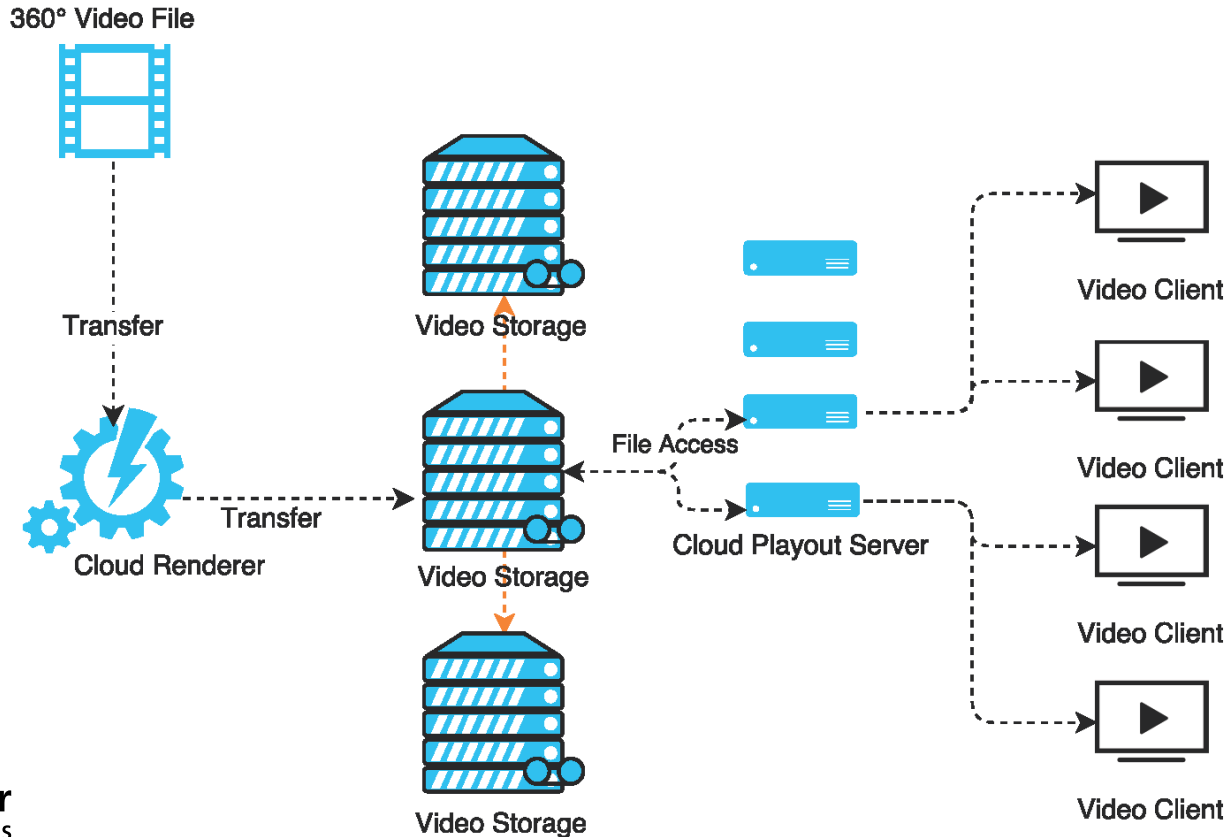
360° Video Player:

- enables mobile devices, Smart and Hybrid TVs to provide 360° experience through usual video playback from the cloud

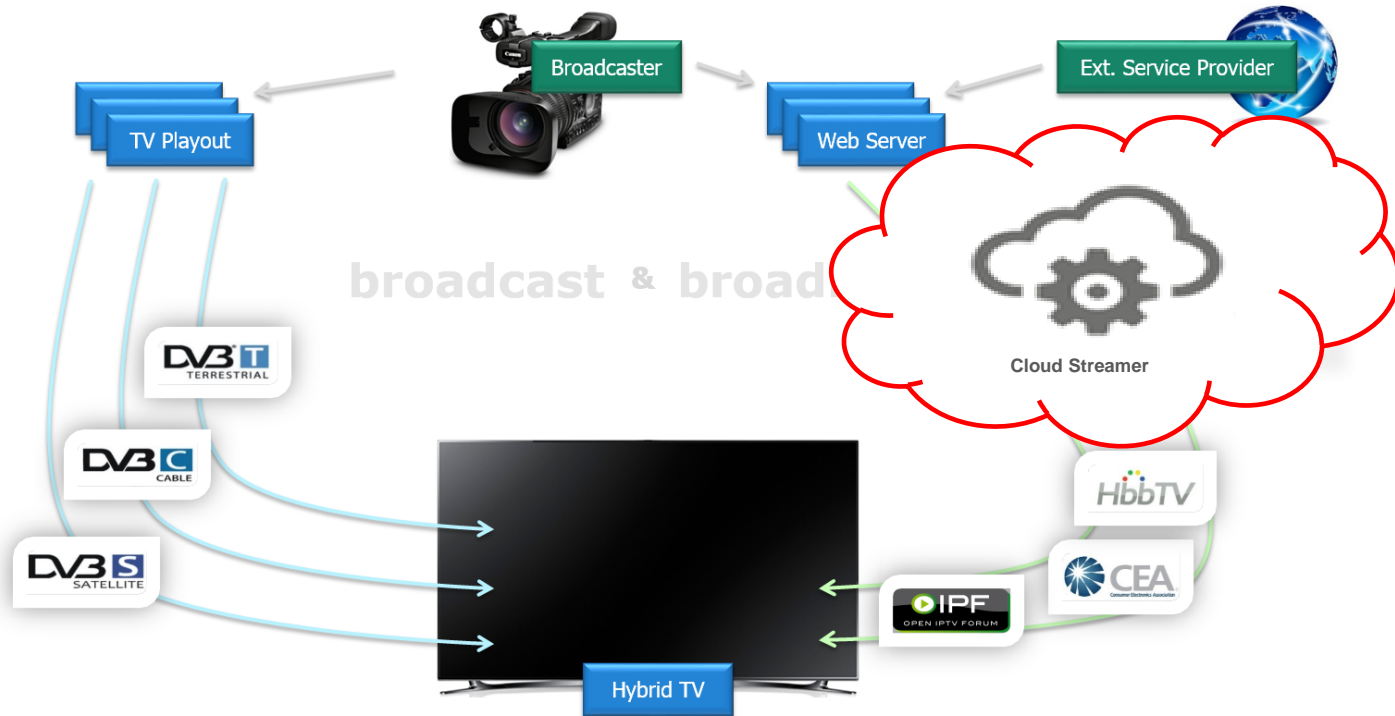
360° Second Screen App:

- acts as a smart remote control for the 360° video player
- provides smart interaction through touch, gestures, device orientation, etc.

ARCHITECTURE



HBBTV – HYBRID APP DELIVERY



Example (Option 3b)

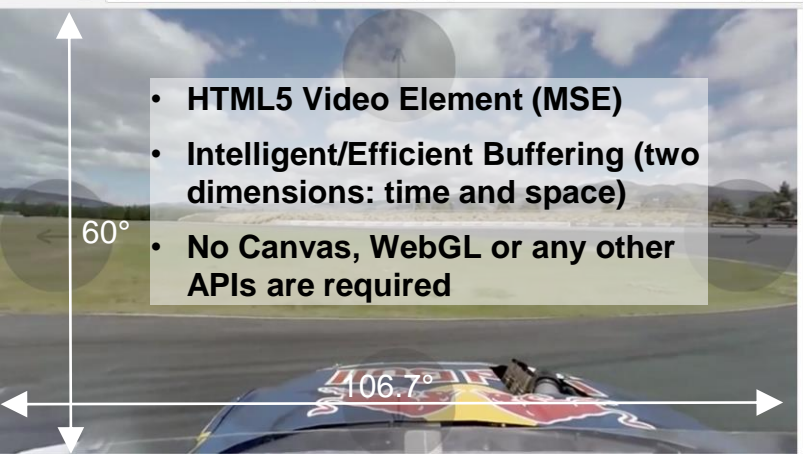


360°
Pre-Processing



4k origin 360° Video, 30fps, bitrate 40053 kb/s

HD view port, 30fps, bitrate 2435 kb/s, segment=333ms



- HTML5 Video Element (MSE)
- Intelligent/Efficient Buffering (two dimensions: time and space)
- No Canvas, WebGL or any other APIs are required

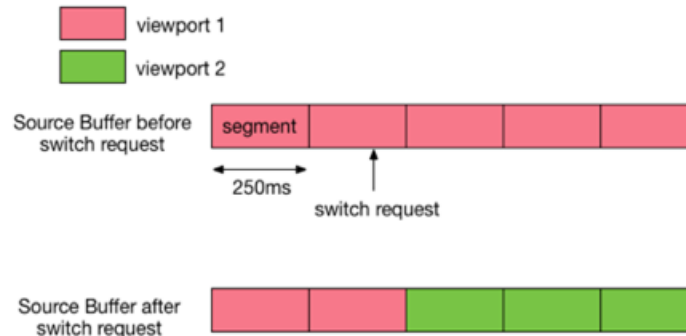


Prepare Stream
(Caching)

360° Player using W3C Media Source Extensions (MSE)

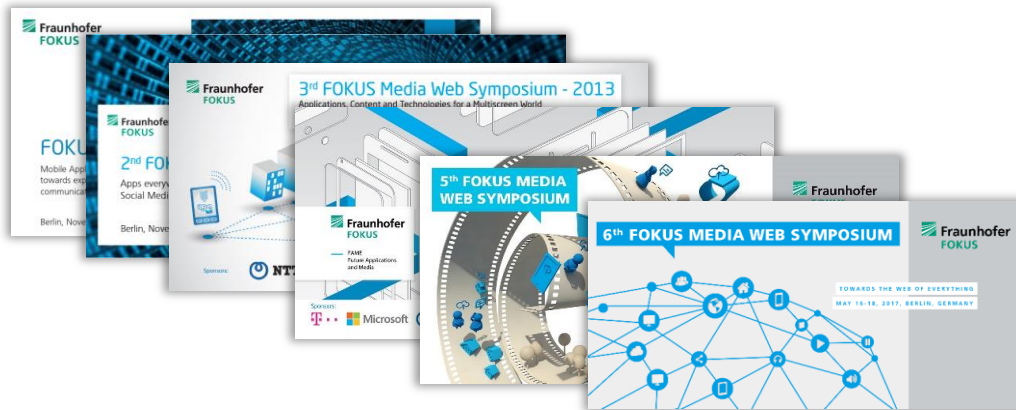
- MSE 360° Player
 - Allows to implement different player algorithms similar for DASH on top of MSE
 - Available viewports can be described in the manifest (e.g. DASH SRD fields)
 - At the start of the playback the currently selected viewport is buffered. When the user triggers a switch request for a different viewport, already buffered segments are removed/replaced by segments of the new viewport.
 - Challenge:

How to reduce delay by switching between two viewports?





May 16-18, 2017, Berlin



6th FOKUS Media Web Symposium: Towards the Web of Everything

The 6th FOKUS Media Web Symposium focuses on the convergence of the Media Web and the Internet of Things. Within the Conference, several Workshops and Tutorials offer the latest insights in internet delivered media such as 360°/VR Streaming, multiscreen interaction, media sync, SmartTV/HbbTV, protected adaptive streaming, related standardization and market developments.



More information at:

www.fokus.fraunhofer.de/go/360

Thank you for listening!

Questions?



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