# 360° VIDEO CLOUD STREAMING & HTMLVIDEOELEMENT EXTENSIONS

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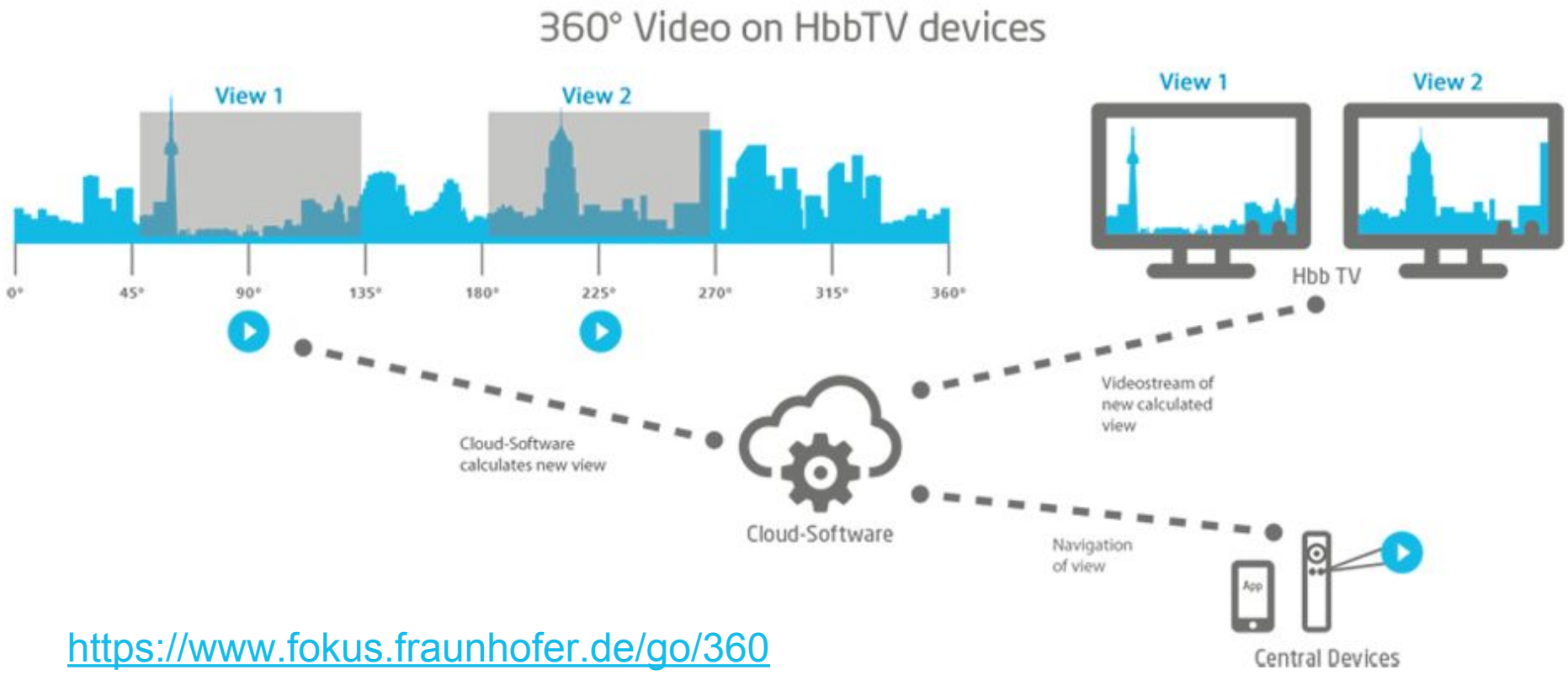
making cities smart

# 360° video cloud streaming




https://www.fokus.fraunhofer.de/go/360

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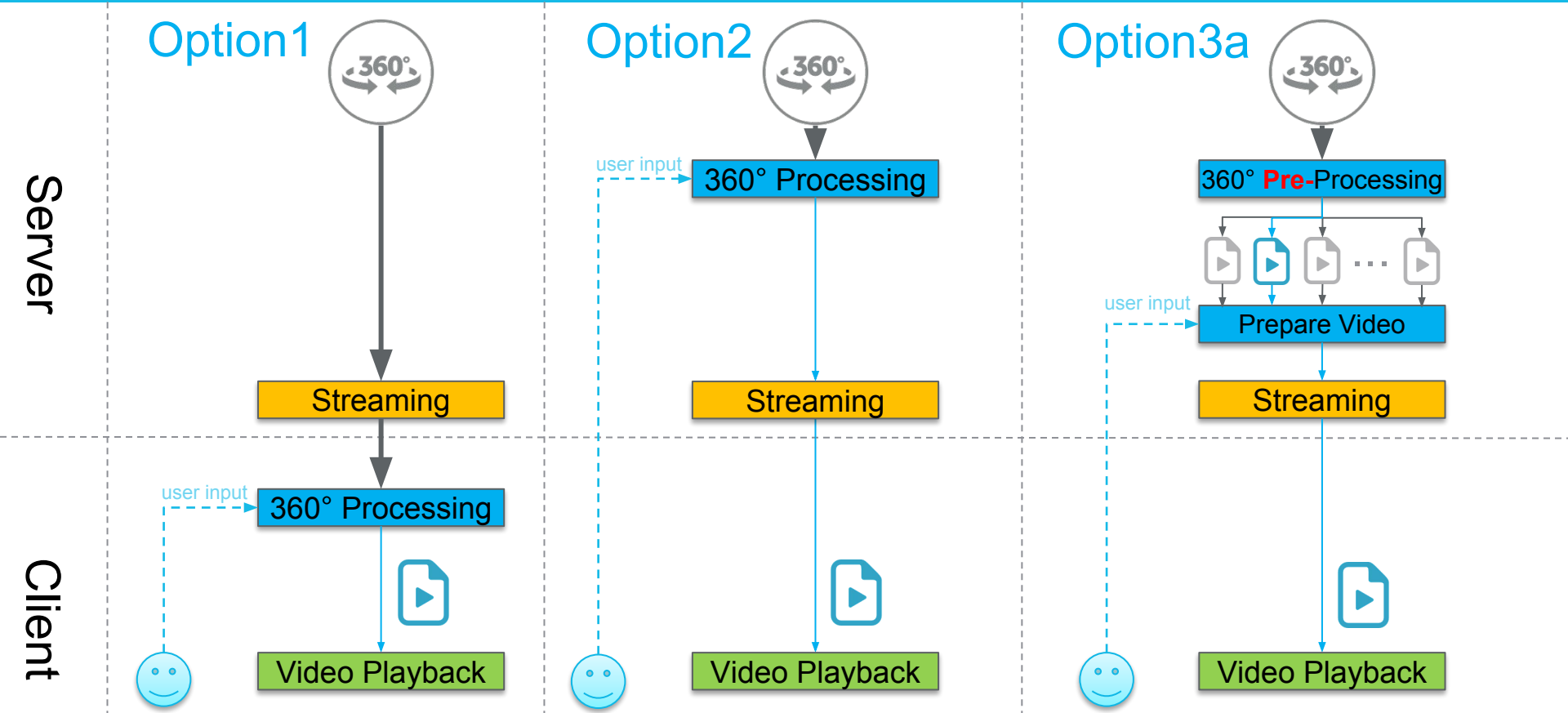
# 360° STREAMING AND VIDEO PROCESSING OPTIONS

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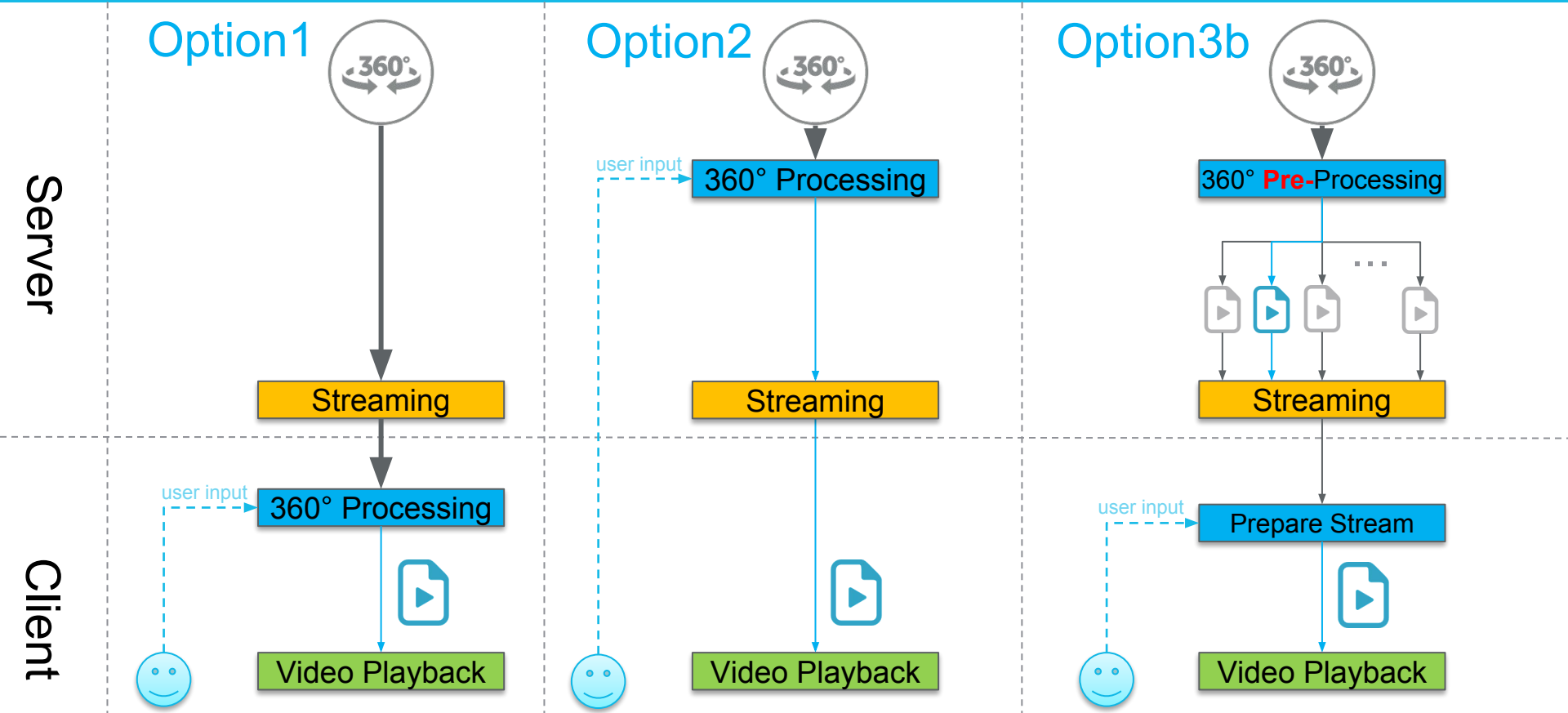


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# ADVANTAGES AND DISADVANTAGES

| | 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 | - Motion Sensors<br>- Touch/Mouse | - TV RC<br>- Keyboard<br>- (Touch/Mouse) | - TV RC<br>- Keyboard<br>- (Touch/Mouse) | - TV RC<br>- Keyboard<br>- Touch/Mouse |

# Notes for previous slide

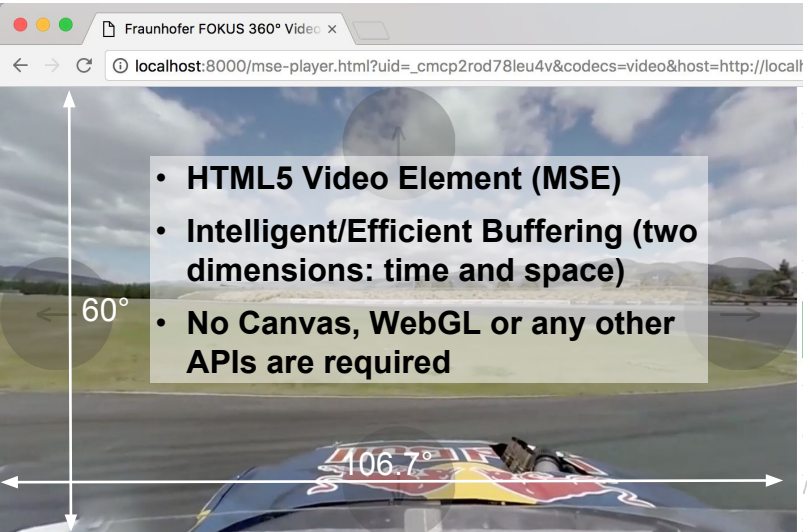
1) The original 360° video will be pre-processed and FOVs are stored in separate files. There will be an overlap between the FOVs this is why there is a need for more storage but on the other side no video processing is needed.
2) since only one FOV is streamed to the client, no additional bandwidth is needed comparing to traditional video streaming. But it is still possible to pre-cache neighboring FOVs e.g. in lower quality to enable fast switch between FOVs in this case additional bandwidth is needed
3) Motion to Photon delay depends on network latency and protocol used to stream a single FOV (and Buffering on the Player).
4) Motion to Photon Delay depends on the caching strategy of the player.
5) it is difficult to use CDN since a persistent connection between client and server is needed (there is a session for each client)

# DEMONSTRATION (Option 3b)

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

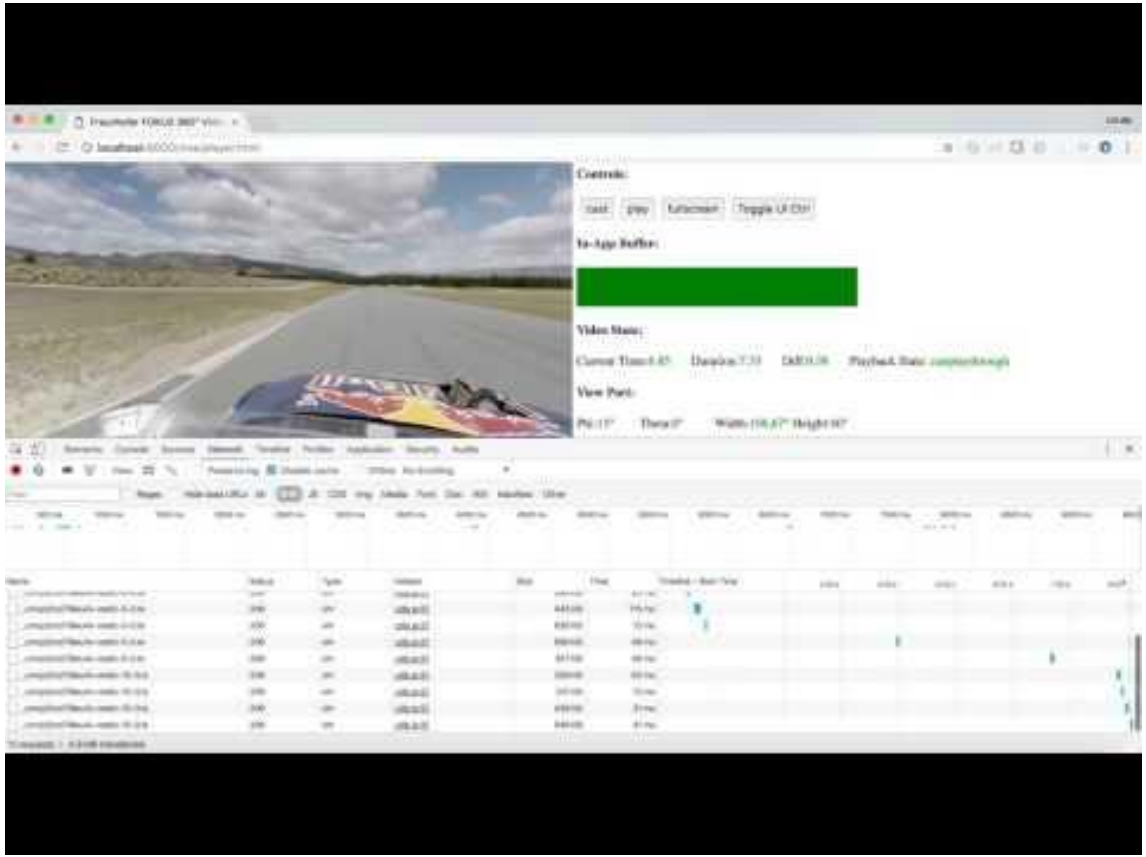
360° Pre-Processing

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




Prepare Stream (Caching)

# Demo video

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# HTMLVIDEOELEMENT EXTENSIONS

- Two types of players:
  - Native 360° Video Player
  - Using MSE → do we need extensions for the MSE API?
- Native 360° Video Player:
  - The HTMLVideoElement plays 360° video natively. Set video.src={360_video_url} (or use <source element>)
  - The HTMLVideoElement needs to get all the metadata in order to render the view correctly.
  - New functions to set and get the FOV are needed
  - New events on start, during and after changing the FOV are needed
  - (Maybe also functions and events for Zoom in/out.)
  - Example:
    - video.setFOV(phi, theta, width, height)
    - video.onfovstart,  video.onfovend, ...

# HTMLVIDEOELEMENT EXTENSIONS

- MSE 360° Player
  - Allows to implement different player algorithms similar for DASH on top of MSE
  - Available viewports can be described in a 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?