# Overview of OMAF

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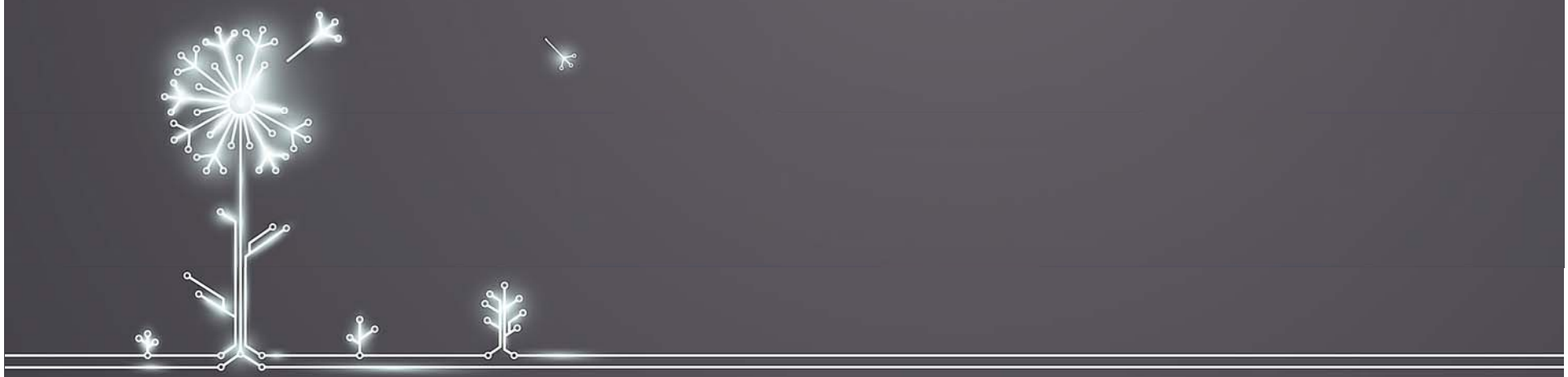
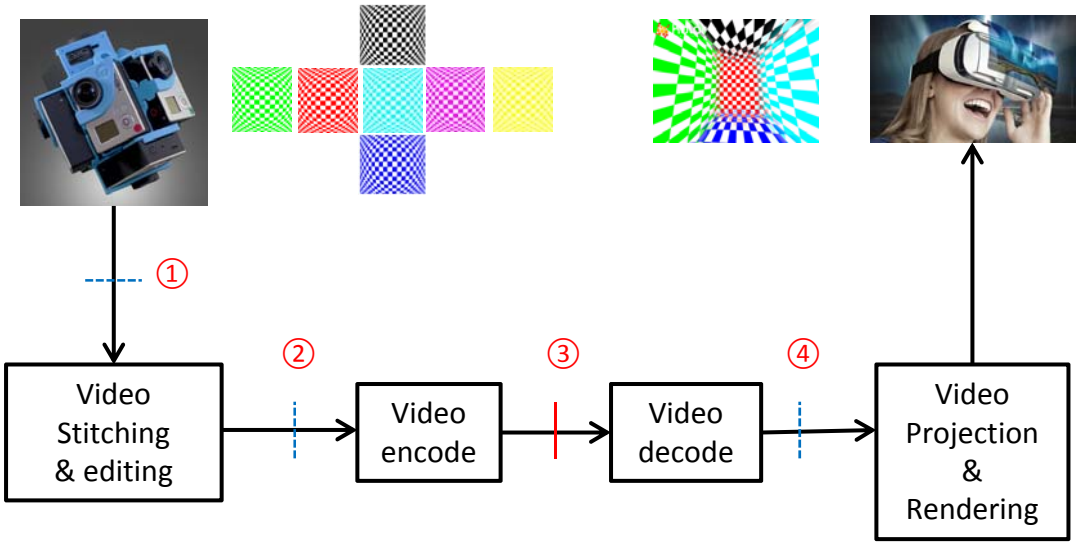
# I. Background



# VR Ecosystem and Interfaces



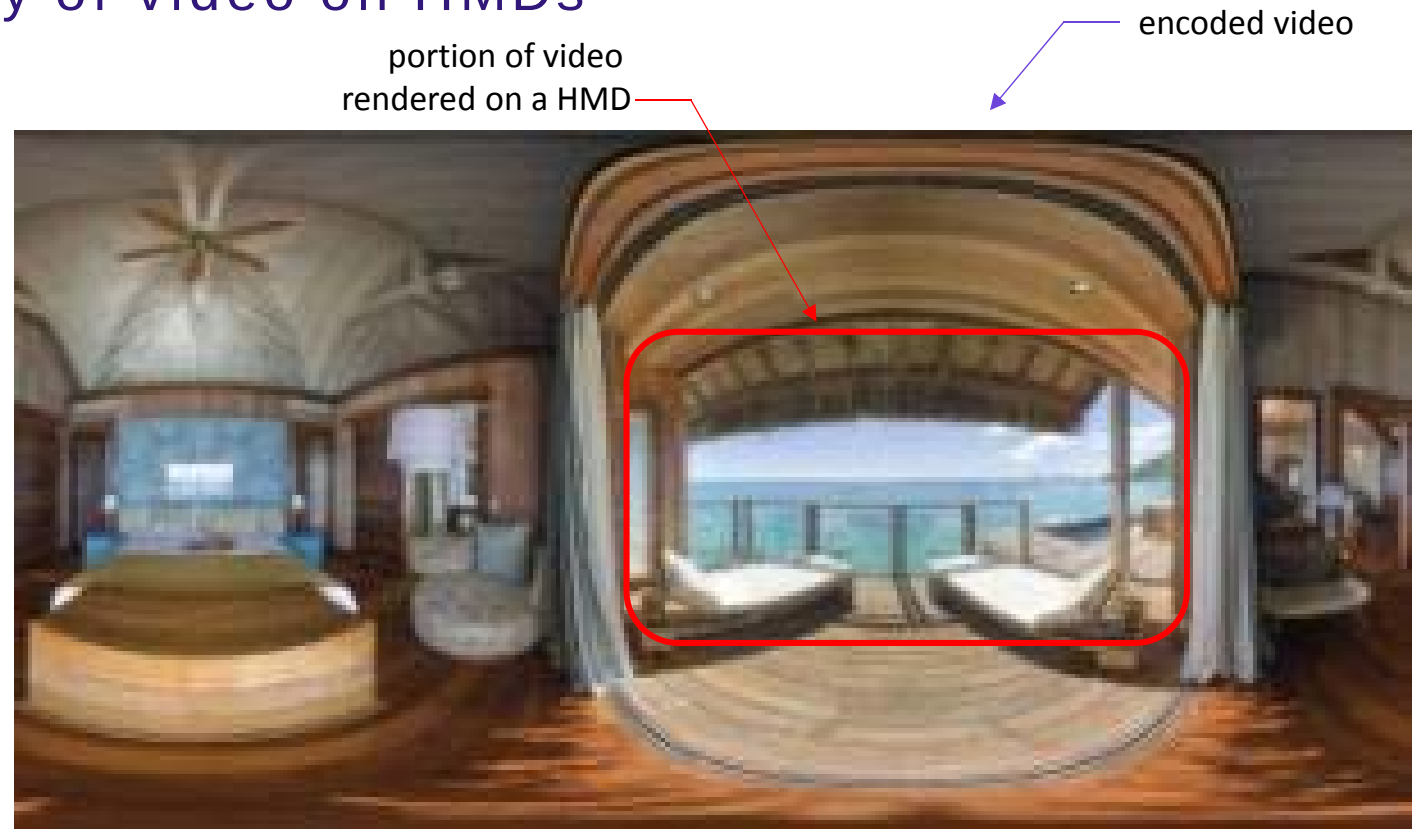



| | | |
|---|---|---|
| 1 | Multiple videos, Capture Metadata | |
| 2 | Single Video, Projection Metadata, Interactivity Data | |
| 3 | Storage & Delivery Format | OMAF |
| 4 | Single Video, Projection Metadata, Interactivity Data | |

# Challenges in VR Industries (I)



## Quality of video on HMDs



# Challenges in VR Industry (II)



## Interoperability of formats

- Projection formats
- Stereoscopic arrangement
- Coverage Range

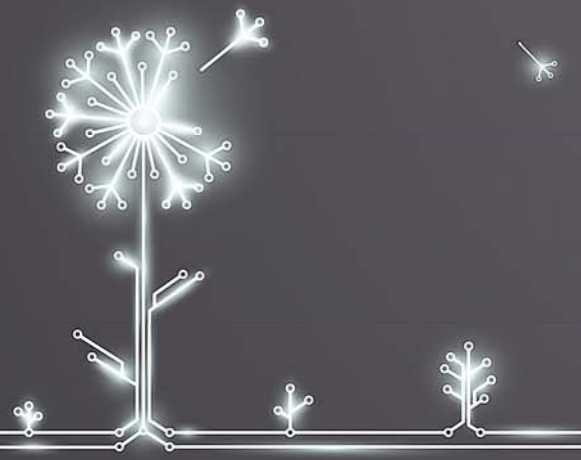
## Streaming Standards Support

- MMT
- DASH

| Video Type Combinations | Code |
|---|---|
| 2D video | "_2dp" |
| 3D top bottom video | "_3dpv" |
| 3D side by side video | "_3dph" |
| Monoscopic 180 | "180x180" |
| Monoscopic 180 16:9 | "180x101" |
| Monoscopic 360 | "_mono360" |
| Top bottom stereoscopic 360 | "3dv" or "_tb" |
| Left right stereoscopic 360 | "3dh" or "_lr" |
| Top bottom stereoscopic 3D 180 | "180x180_3dv" |
| Left right stereoscopic 3D 180 | "180x180_3dh" |
| LR stereo 3D 180 squished | "180x180_squished_3dh" |
| Top bottom stereoscopic 3D 180x160 | "180x160_3dv" |
| Two monoscopic 180 hemispheres | "180hemispheres" |
| TB 3D cylinder 2.25:1 | "cylinder_slice_2x25_3dv" |
| TB 3D cylinder 16:9 | "cylinder_slice_16x9_3dv" |
| TB 3D 360 no bottom | "sib3d" |
| 180 planetarium full dome | "_planetarium" or "_fulldome" |
| V360 camera | "_v360" |
| RTXP 360 cylindrical | "_rtxp" |
| Icosahedron | "_icosahedron" |
| Octahedron | "_octahedron" |

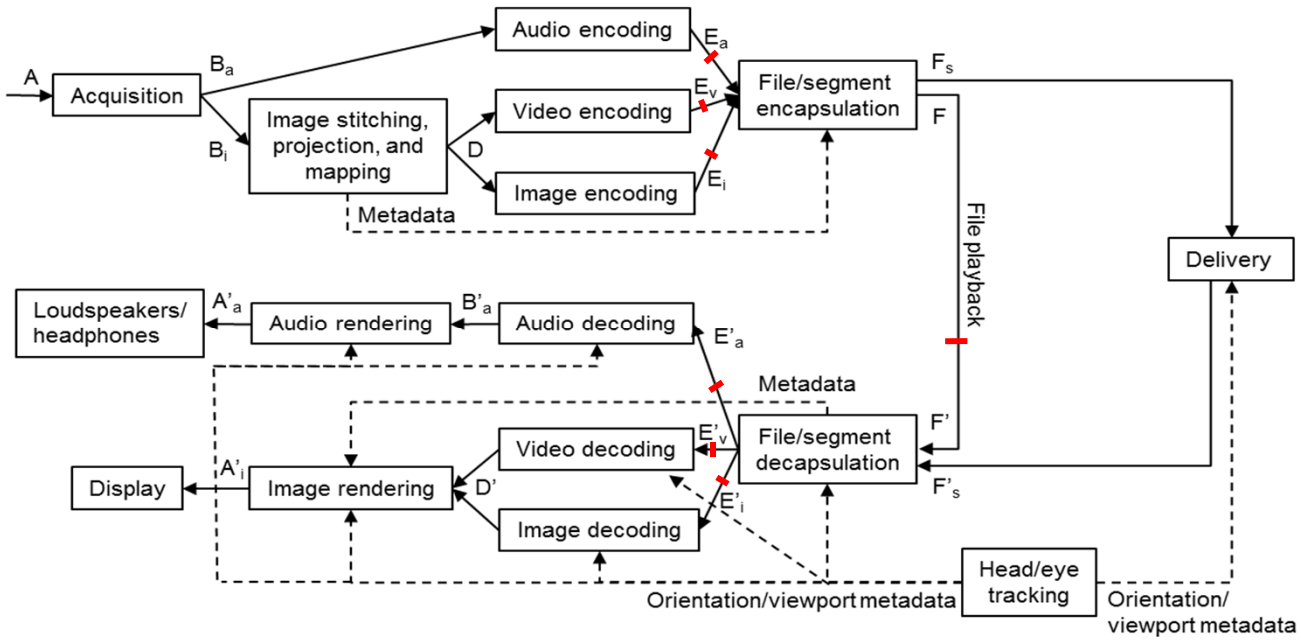
*https://samsungmilkvr.com/portal/content/faq#video-types*

# II. OMAF Solutions



# Architecture (Content Flow Process)

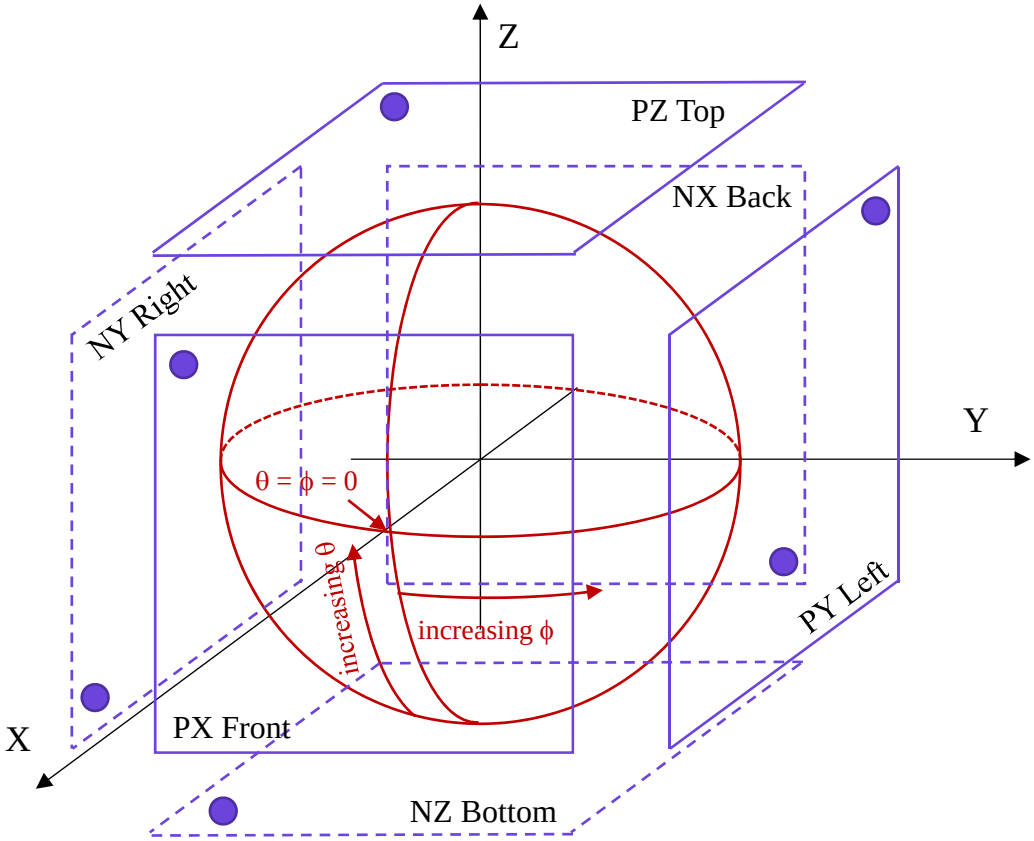


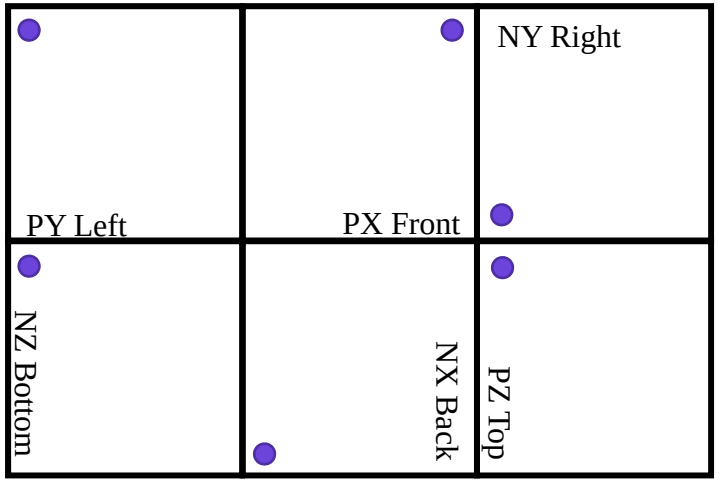



- Ea/E'a, Ev/E'v, Ei/E'i: audio bitstream, video bitstream, coded image(s)
- F/F': media file, including projection and region-wise packing metadata
- delivery related interfaces for DASH delivery & MMT delivery.

# Projection supports



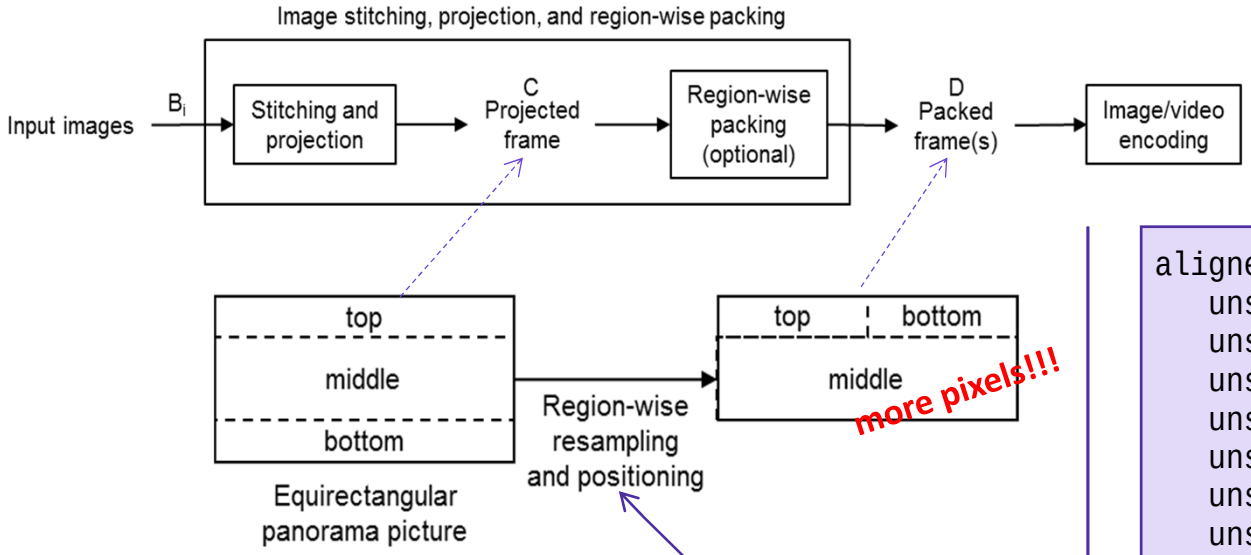


# Concepts & Definitions

## projected frame, packed frame and region-wise packing

- projected frame : frame that has a representation format specified by a 360 video projection format
- packed frame : frame that results from *region-wise packing* of a *projected frame*



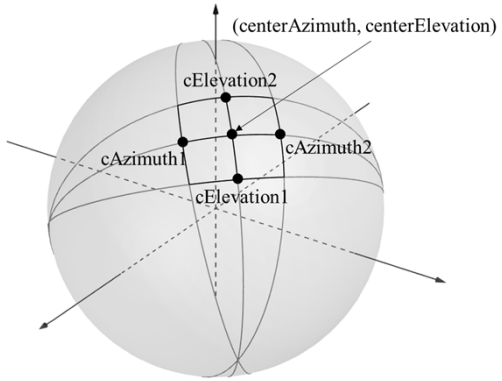

```
aligned(8) class RectRegionPacking(i) {
   unsigned int(32) proj_reg_width[i];
   unsigned int(32) proj_reg_height[i];
   unsigned int(32) proj_reg_top[i];
   unsigned int(32) proj_reg_left[i];
   unsigned int(8)  transform_type[i];
   unsigned int(32) packed_reg_width[i];
   unsigned int(32) packed_reg_height[i];
   unsigned int(32) packed_reg_top[i];
   unsigned int(32) packed_reg_left[i];
}
```

# Syntax & Semantics



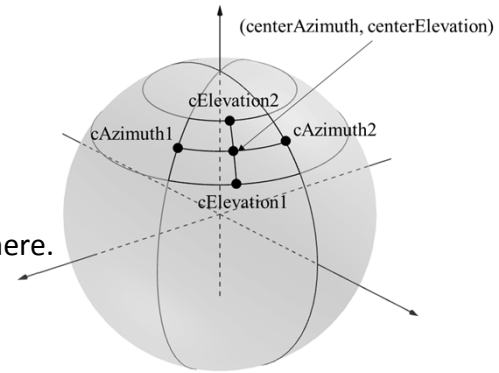
## Static Metadata

- Projected omnidirectional video box
  - the projection format
  - the orientation of the projection structure relative to the global coordinate system
  - the spherical coverage of the projected omnidirectional video
    (i.e., the area on the spherical surface that is represented by the projected frame).
- Fisheye omnidirectional video box




## Timed metadata

- Regions on Sphere
- Initial viewpoint
- Recommended viewport




## great circle, pitch circle and yaw circle

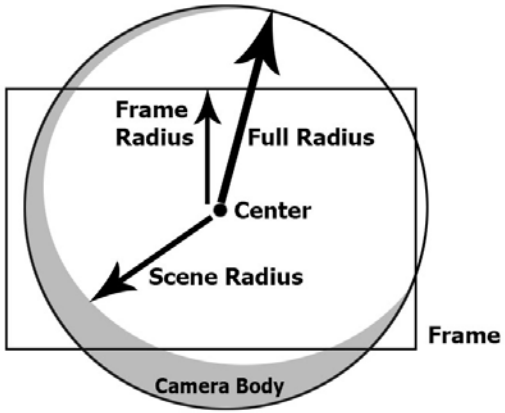
- **great circle**: intersection of the sphere and a plane that passes through the center point of the sphere.
- **azimuth circle**: circle on the sphere connecting all points with the same azimuth value
- **elevation circle**: circle on the sphere connecting all points with the same elevation value

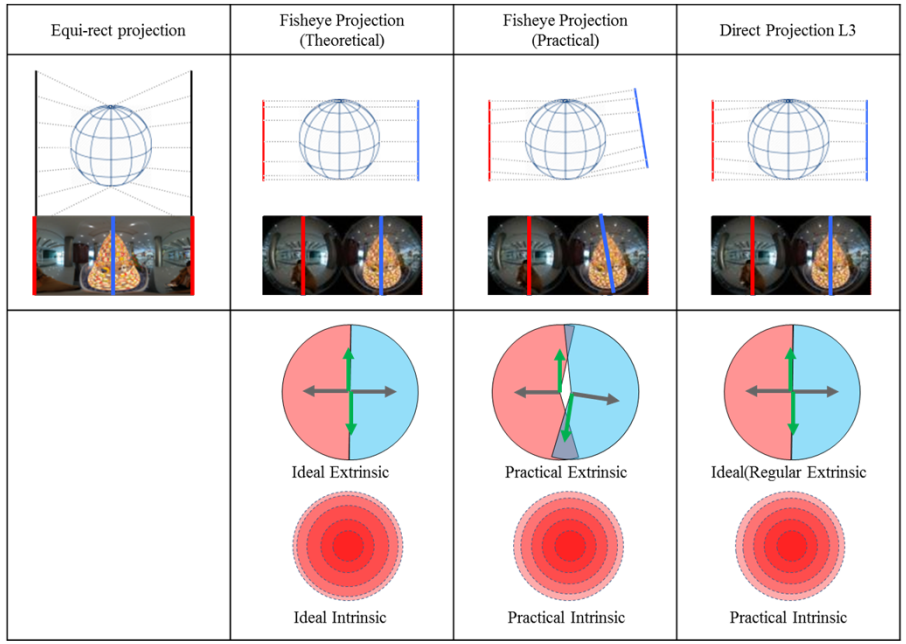
# Fisheye video

## No projection & region-wise packing process

## Parameters

- Lens distortion correction (LDC) parameters with local variation of FOV
- Lens shading compensation (LSC) parameters with RGB gains
- Displayed field of view information
- Camera extrinsic parameters



# Transport support (1/2)

## DASH MPD descriptors

- Extension method
  - new XML elements are defined in a separate namespace "urn:mpeg:mpegI:omaf:2017“ to avoid comma separated values

- Descriptors
  - projection format (PF) descriptor (at most one)
  - region-wise packing (RWPK) descriptor (at most one)
  - content coverage (CC) descriptor (at most one)
  - spherical region-wise quality ranking (SRQR) descriptor (at most one)
  - 2D region-wise quality ranking (2DQR) descriptor (at most one)
  - fisheye omnidirectional video (FOMV) descriptor (at most one)

# Transport Support (2/2)



## MMT signalling

- Descriptors
  - VRInformation Asset descriptor
  - Stereo video Asset descriptor

- Signaling messages
  - VRViewDependentSupportQuery
  - VRViewDependentSupportResponse
  - VRViewportChangeFeedback
  - VRViewDependentAssetInformation
  - VRROIGuide
  - VR3DAudioAssetInformation

# Profiles

## Media Profiles

- HEVC viewport-independent baseline profile
- HEVC viewport-dependent baseline profile
- AVC viewport-dependent profile
- OMAF 3D audio baseline profile (MPEG-H 3D Audio)
- OMAF 2D audio legacy profile (AAC)
- HEVC 360 image profile
- JPEG image profile
- IMSC1 timed text profile
- WebVTT timed text profile

## Presentation Profiles

- OMAF viewport-independent baseline presentation profile, which supports
  - HEVC viewport-independent baseline profile
  - OMAF 3D audio baseline profile
- OMAF viewport-dependent baseline presentation profile, which supports
  - HEVC viewport-dependent baseline profile
  - OMAF 3D audio baseline profile

# Signaling of conformance



## Brands

- OMAF media profiles, OMAF presentation profiles defined by OMAF

## Track Type Box

- the same syntax as the payload of FileTypeBox
- track-level media profile

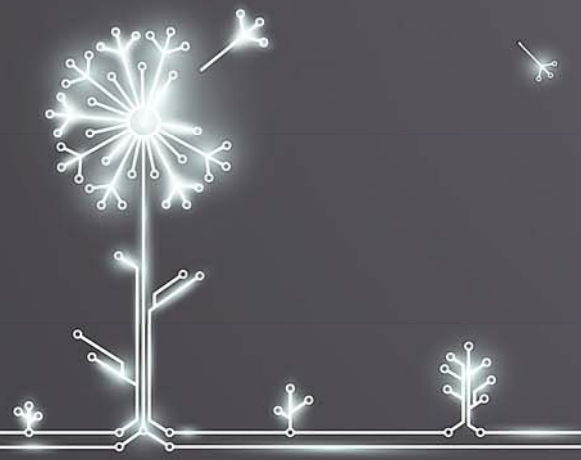
## Compatible Scheme Type Box

- zero or more

## ‘codecs’ parameter

- a plus character ('+') followed by the scheme_type four-character code
- the value of the codecs parameter is appended by a dot ('.') character.
- e.g., codecs="resv.podv+erpv.hvc1"

# II. Next Steps



# Potential Items

3DoF+ (parallax)

Interactivities

- chaning viewport
- multi-user interaction
- earcon

# OMAF Developers' Day



- Date: January 24th (Wednesday), 2018
- Time: 10:00 – 17:00
- Venue: Gwangju Kimdaejung Convention Center
  30 Sangmunuriro, Seo-gu, Gwangju, 61958 South Korea
- Presenters: FhG IIS, HHI, Samsung, SJTU, SK Telecom
- Logistics: https://mpeg.chiariglione.org/meetings/121
- Contact: Youngkwon Lim

# Thank You