



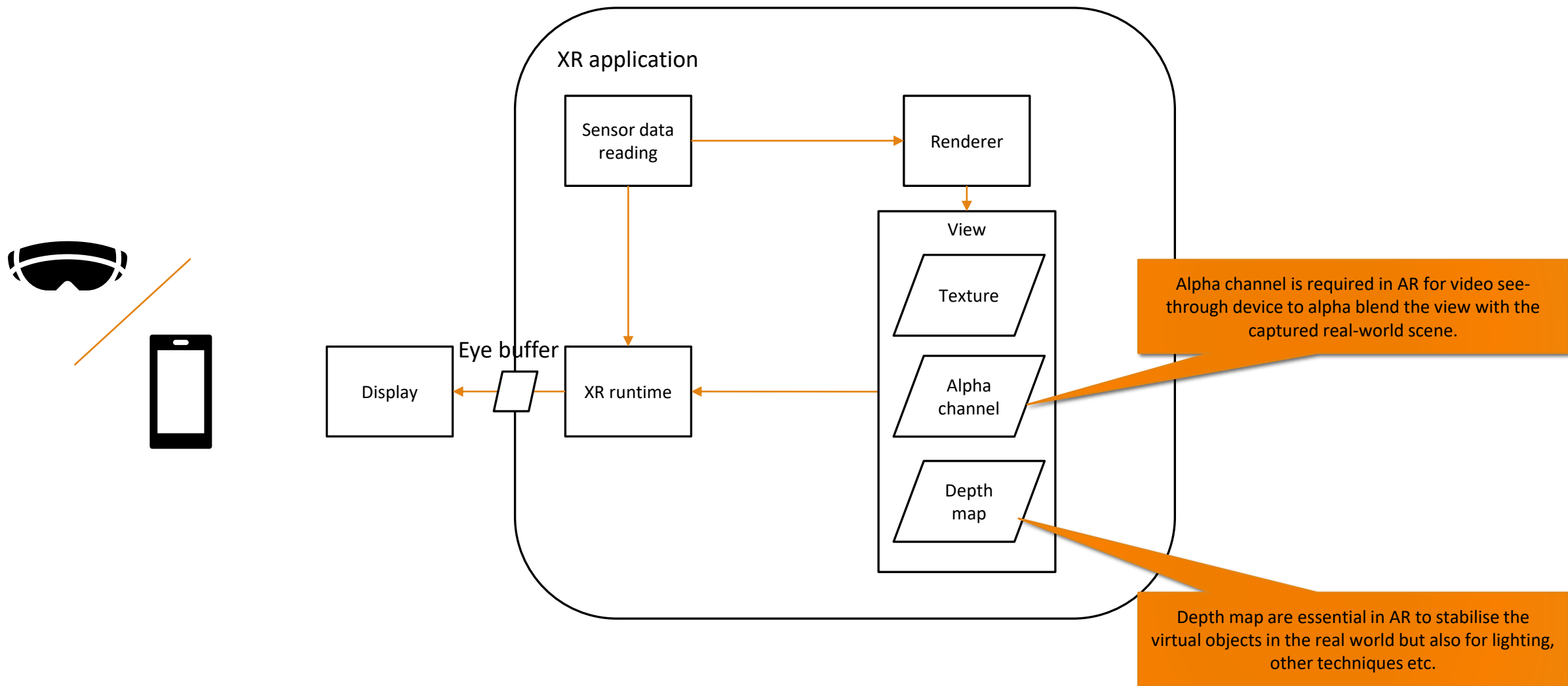
xiaomi

Carriage of depth and alpha maps as HEVC single-layer bitstreams

JVET-AG0144-v3

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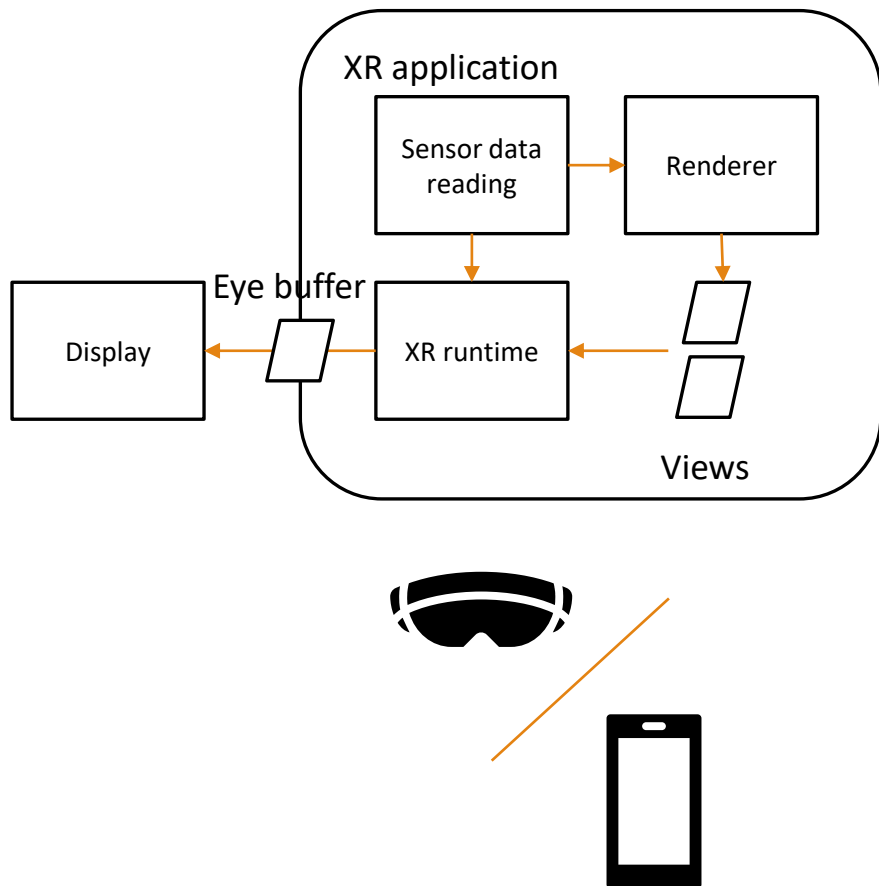
1. Background: XR rendering



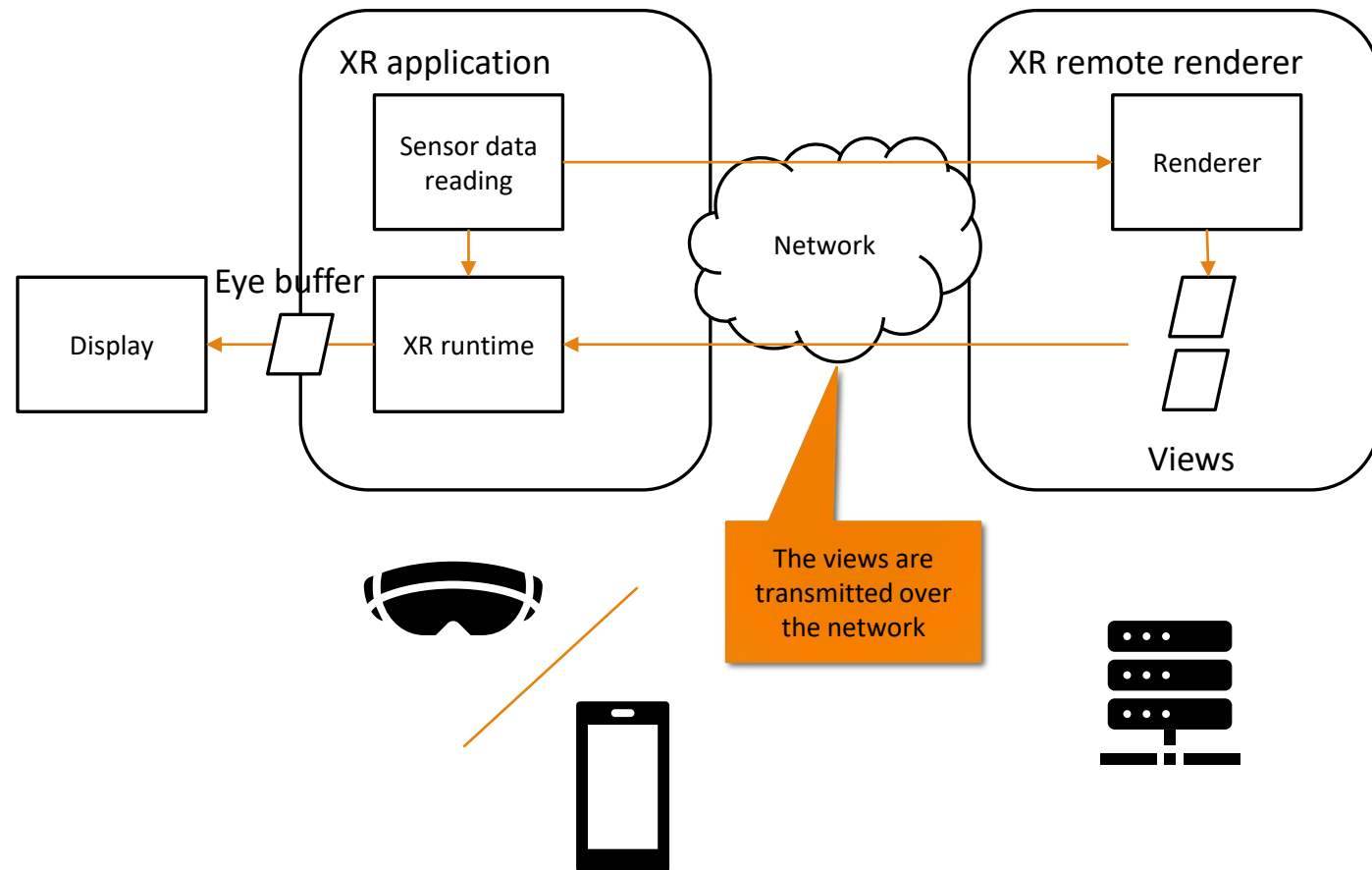
More information can be found in the OpenXR specification ([link](#))

1. Background: Split rendering concept

Local XR rendering



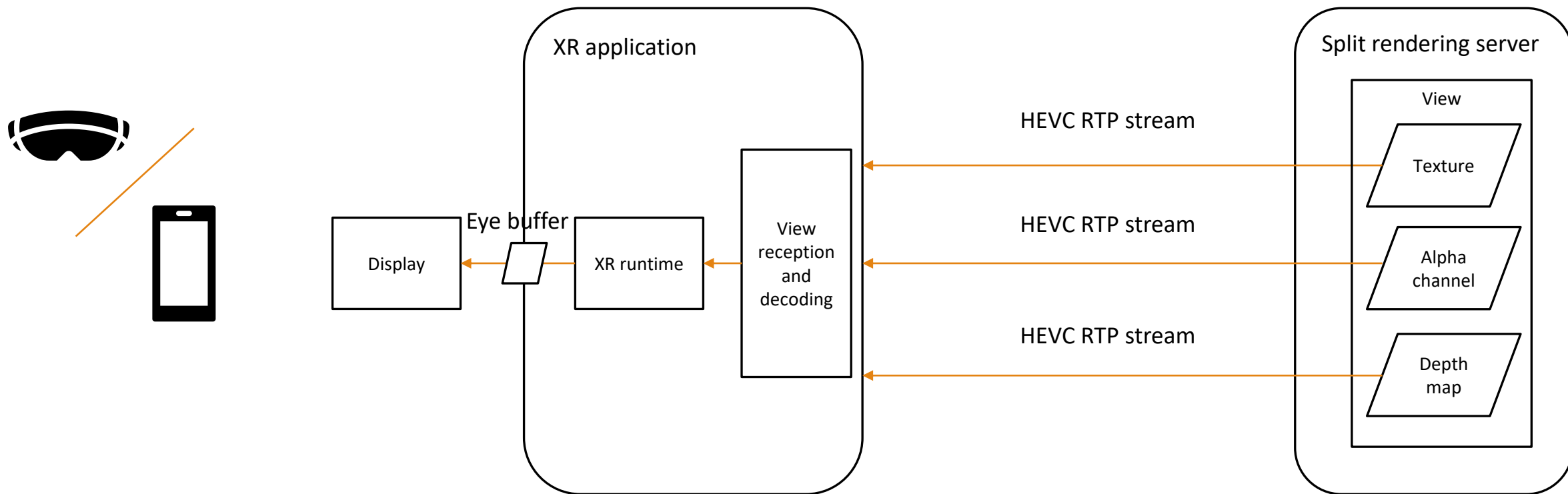
XR split rendering



1. Background: 3GPP HEVC split rendering



Overview of 3GPP SA4 split rendering service*



* See 3GPP SA4 TS 26.565 Split Rendering Media Service Enabler ([link](#)) for more details

2. Design goals

- **Enabling depth and alpha maps in HEVC single-layer bitstream by signalling:**
 - 1. Indication that the bitstream carries a depth map sequence or an alpha map sequence.**
 - 2. Indication on the mapping used between the depth/alpha map (mono-channel) and the luma and chroma components.**
 - 3. Information specifying how to interpret the sample values from the decoded pictures to reconstruct the depth/alpha maps.**

1. Information indicating that the bitstream carries a depth map sequence or an alpha map sequence.

Adding colour_primaries code points in CICP.
(based on JVET-AG0308)

Table E.3 — Colour primaries interpretation using colour_primaries syntax element

Value	Primaries			Informative remark
0	Reserved			For future use by ITU-T ISO/IEC
1	primary	x	y	Rec. ITU-R BT.709-6
	green	0.300	0.600	Rec. ITU-R BT.1361-0 conventional colour gamut system and extended colour gamut system (historical)
	blue	0.150	0.060	IEC 61966-2-1 sRGB or sYCC
	red	0.640	0.330	IEC 61966-2-4
	white D65	0.312 7	0.329 0	SMPTE RP 177 (1993) Annex B
...				
22	primary	x	y	EBU Tech. 3213-E (1975)
	green	0.295	0.605	
	blue	0.155	0.077	
	red	0.630	0.340	
	white D65	0.312 7	0.329 0	
23..127	Reserved			For future use by ITU-T ISO/IEC
128	Alpha map			This signal is an alpha map
129	Depth map			This signal is a depth picture

Note: See Word contribution in JVET-AG0144 for entire spec text

3. Possible solutions for design goal #2

2. Indication on the mapping used between the depth/alpha map (mono-channel) and the luma and chroma components.

Table E.5 — Matrix coefficients interpretation using the matrix_coeffs syntax element

Value	Matrix	Informative remark
...		
17	YCgCo-Ro	See Formulae (E-41) to (E-55)
18	1st colour component	A monochromatic representation with only the first colour component in the original representation present in the coded image. Typically used for Green only; however, may also be used for the Y tristimulus value (luminance), when the colour primaries are set to XYZ, or to indicate that the representation contains only the first component of an image not representing texture.
19	2nd colour component	A monochromatic representation with only the second colour component in the original representation present in the coded image. Typically used for Red only; however, may also be used for the X tristimulus value, when the colour primaries are set to XYZ, or to indicate that the representation contains only the second component of an image not representing texture.
20	3rd colour component	A monochromatic representation with only the third colour component in the original representation present in the coded image. Typically used for Blue only; however, may also be used for the Z tristimulus value, when the colour primaries are set to XYZ, or to indicate that the representation contains only the third component of an image not representing texture.
21	Luma only KR = 0.2126; KB = 0.0722	A monochromatic representation of the luma component of the Rec. ITU-R BT.709-6 representation. See Formula (E-28)
22	Luma only KR = 0.2627; KB = 0.0593	A monochromatic representation of the luma component of the Rec. ITU-R BT.2020-2 non-constant luminance representation. See Formula (E-28)
23	I only - ICTcP	A monochromatic representation of the I component of ICTcP representation. See Formula (E-75)
24..255	Reserved	For future use by ITU-T ISO/IEC

Adding matrix_coeffs code points for mono-channel (luma only) in CICP.
(based on JVET-AG0308)

Note: See Word contribution in JVET-AG0144 for entire spec text

3. Possible solutions for design goal #3

3. Information specifying how to interpret the sample values from the decoded pictures to reconstruct the depth/alpha maps.

Modifications of existing SEI messages to be used in the single layer context.

■ Example changes in the depth representation SEI message:

The syntax elements in the depth representation information SEI message specify various parameters for auxiliary pictures of type AUX_DEPTH or non-auxiliary pictures carrying depth maps. Those parameters are signalled for the purpose [...]

When present, the depth representation information SEI message shall be associated with either:

- one or more layers with AuxId value equal to AUX_DEPTH
- a layer with primary pictures carrying depth maps

See Word contribution for full text changes.

- Split rendering is critical for XR applications.
- 3GPP SA4 is developing a split rendering service specification.
- This service requires multiple RTP HEVC streams for texture sequence and depth and alpha map sequences.
- Solutions are proposed to enable HEVC single layer carriage of depth and alpha maps based on CICP code points and modifications of existing HEVC depth and alpha SEI messages.
- We recommend documenting the solution in the relevant draft specification documents.