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**Title: Improved text on Overlays for ITT4RT Draft CR**

**Document for** Agreement

**Agenda item:** 11.5

**Introduction**

The document proposes improved text for overlay configuration in the draft CR.

**Changes to draft CR**

---------------------------Start of Change --------------------------------------

### X.6.4.3 Overlay Configuration

ITT4RT clients may support the following types of rendering for overlays, as defined in the OMAF specification [R1] clause 7.14.

* viewport-relative overlay, specifying that the overlay is displayed on a rectangular area at an indicated position relative to the top-left corner of the viewport;
* [sphere-relative projected omnidirectional overlay, specifying that the overlay is displayed on a sphere surface at an indicated position within or on the unit sphere;]
* sphere-relative 2D overlay, specifying that the overlay is displayed on a plane at an indicated position within the unit sphere.

An ITT4RT client supporting overlays may include in its SDP media description the attribute 3gpp\_overlay to define one or more parameters for configuring the rendering properties of an overlay. The attribute may also be used by an ITT4RT-Rx client to indicate capability in an SDP offer. The 3gpp\_overlay attribute has the following syntax:

a = 3gpp\_overlay: overlay\_id type [timeline\_change\_flag][sphere\_relative\_overlay\_config / viewport\_relative\_overlay\_config] [overlay\_info]

The 3gpp\_overlay attribute is included as part of the 360-degree video media description. More than one 3gpp\_overlay attribute may exist as part of the media description if more than one overlay is to be configured. The overlay\_id in 3gpp\_overlay is set to the mid of the media description of the overlay source for which the configuration is provided.

An ITT4RT client may include more than one 3gpp\_overlay attributes with the same non-zero overlay\_id (associated with an overlay source) in an SDP offer. The preferred overlay configuration is listed first. An ITT4RT client that receives an SDP offer with multiple 3gpp\_overlay attributes with the same non-zero overlay\_id shall reply with only one line for each acceptable overlay.

An ITT4RT-Tx client may include in the SDP offer one or more lines of the attribute 3gpp\_overlay with the overlay id 0 to offer multiple configurations to the ITT4RT-Rx client without attaching a specific overlay source to the configuration. The ITT4RT-Rx client then responds with the accepted lines, setting the overlay\_id to the appropriate mids of the overlay sources.

The *type* shall have the value ‘0’ for viewport-relative overlays and ‘1’ for sphere-relative overlays. Depending on the value of *type*, the 3gpp\_overlay attribute may further include the corresponding configuration information sphere\_relative\_overlay\_config (type = ‘1’) or the viewport\_relative\_overlay\_config (type = ‘0’).

A set of flags describing interactivity of the overlay may be included in the optional overlay\_info parameter defined in section X.6.4.3.1

Editor’s Note: Other overlay definitions in OMAF are not excluded from ITT4RT. Which overlay definition(s) from OMAF are adopted for overlays in ITT4RT is currently TBD. Optional user interactivity flags such as for definining moveability, resizing of the overlay may be added later to the 3gpp\_overlay parameter.

An ITT4RT-Rx client may indicate capability for overlays in an SDP offer using the 3gpp\_overlay attribute with the overlay\_id set to 0. An ITT4RT-Tx client that receives such an offer shall respond with one 3gpp\_overlay attribute for each overlay source such that the parameters match the capabilities of the ITT4RT-Rx client. The ITT4RT-Rx client indicating capability using the 3gpp\_overlay attribute may include the parameter timeline\_change\_flag, shall include the parameter type, and shall not include any other parameters in the 3gpp\_overlay attribute. In this case, the parameter type :

* shall have the value ‘0’ if only viewport-relative overlays are supported.
* shall have the value ‘1’ if only sphere-relative overlays are supported
* shall have the value ‘0,1’ if both sphere-relative and viewport relative overlays are supported.

An ITT4RT-Rx client indicating capability for overlays in an SDP offer with the 3gpp\_overlay attribute supporting sphere-relative overlays shall include the parameter timeline\_change\_flag to indicate capability as defined later in section X.6.4.3.1.

An ITT4RT client that receives an SDP offer including overlay sources without the 3gpp\_overlay attribute may decline the offer and send a renegotiation offer with the 3gpp\_overlay attribute.

Editor’s note: There should be a default configuration for overlay when explicit configuration is not provided to ensure that multiple receivers have similar experience.

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The SDP signaling semantics in Section 9.6 currently defined as a potential solution for predefined region signaling will have the following applicability:

* Allow adding real-time overlay on the top of a pre-defined region. Client devices may use the pre-defined regions as hints for personalized overlay operations. Compared to handling overlays for all audience on the server side, a client device may utilize its own computing power to generate overlays on pre-defined regions.
* Content to be overlaid on the predefined region may be encoded and transported separately with higher quality.

An MTSI sender supporting the ‘Overlay’ feature can allow adding real-time overlay on top of a 360 background and offer this capability in the SDP as part of the the initial offer-answer negotiation. Regions for overlays can be offered by including the "a=overlay" attribute under the relevant media line corresponding to the related 360-degree video and overlay images. The following parameters can be provided in the attribute for each overlay:

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X.6.4.3.1 Sphere-relative Overlay Configuration

An ITT4RT client supporting the 3gpp\_overlay attribute to configure a sphere-relative overlay shall set parameter type = ‘1’ and additionally include the parameter timeline\_change\_flag and sphere\_relative\_overlay\_config defined as follows:

**sphere\_relative\_overlay\_config** = Overlay\_azimuth "," Overlay\_elevation "," Overlay\_tilt "," Overlay\_azimuth\_range "," Overlay\_elevation\_range "," Overlay\_rot\_yaw "," Overlay\_rot\_pitch "," Overlay\_rot\_roll "," region\_depth\_minus1

* Overlay\_azimuth: Specifies the azimuth angle of the centre of the overlay region on the unit sphere in units of 2−16 degrees relative to the global coordinate axes.
* Overlay\_elevation: Specifies the elevation angle of the centre of the overlay region on the unit sphere in units of 2−16 degrees relative to the global coordinate axes.
* Overlay\_tilt: Specifies the tilt angle of the offered overlay region, in units of 2−16 degrees, relative to the global coordinate axes.
* Overlay\_azimuth\_range: Specifies the azimuth range of the region corresponding to the 2D plane on which the overlay is rendered through the centre point of the overlay region in units of 2−16 degrees.
* Overlay\_elevation\_range: Specifies the elevation range of the offered region corresponding to to the 2D plane on which the overlay is rendered through the centre point of the overlay region in units of 2−16 degrees.
* Overlay\_rot\_yaw, Overlay\_rot\_pitch, and Overlay\_rot\_roll specify the rotation of the 2D plane on which the overlay is rendered. Prior to rendering the 2D plane, it may be rotated as specified by overlay\_rot\_yaw, overlay\_rot\_pitch and overlay\_rot\_yaw and placed on a certain distance as specified by region\_depth\_minus1. The rotations are relative to the coordinate system as specified in clause 5.1 of ISO/IEC 23090-2 in which the origin of the coordinate system is in the centre of the overlay region, the X axis is towards the origin of the global coordinate axes, the Y axis is towards the point on the plane that corresponds to cAzimuth1 in Figure 7‑4 of ISO/IEC 23090-2, and the Z axis is towards the point on the plane that corresponds to cElevation2 in Figure 7‑4 of ISO/IEC 23090-2. overlay\_rot\_yaw expresses a rotation around the Z axis, overlay\_rot\_pitch rotates around the Y axis, and overlay\_rot\_roll rotates around the X axis. Rotations are extrinsic, i.e., around X, Y, and Z fixed reference axes. The angles increase clockwise when looking from the origin towards the positive end of an axis. The rotations are applied starting from overlay\_rot\_yaw, followed by overlay\_rot\_pitch, and ending with overlay\_rot\_roll.
* region\_depth\_minus1 - indicates the depth (z-value) of the region on which the overlay is to be rendered. The depth value is the norm of the normal vector of the overlay region. region\_depth\_minus1 + 1 specifies the depth value relative to a unit sphere in units of 2−16.
* timeline\_change\_flag equal to ‘1’ specifies that the overlay content playback shall pause if the overlay is not in the user's current viewport, and when the overlay is back in the user's viewport the overlay content playback shall resume with the global presentation timeline of the content. The content in the intermediate interval is skipped. timeline\_change\_flag equal to ‘0’ specifies that the overlay content playback shall pause if the overlay is not in the user's current viewport, and when the overlay is back in the user's viewport the overlay content playback resumes from the paused sample. This prevents loss of any content due to the overlay being away from the user's current viewport.
* [Name- specifies the name of the region for overlay.]

X.6.4.3.2 Viewport-relative Overlay Configuration

An ITT4RT client supporting the 3gpp\_overlay attribute to configure a viewport-relative overlay shall set parameter type = ‘0’ and additionally include the parameter viewport\_relative\_overlay\_config defined as follows:

**viewport\_relative\_overlay\_config** = Overlay\_rect\_left\_percent "," Overlay\_rect\_top\_percent "," Overlay\_rect\_width\_percent "," Overlay\_rect\_height\_percent "," Relative\_disparity\_flag "," (Disparity\_in\_percent / Disparity\_in\_pixels)

* Overlay\_rect\_left\_percent: Specifies the x-coordinate of the left corner of the rectangular region of the overlay to be rendered on the viewport in per cents relative to the width of the viewport. The values are indicated in units of 2-16 in the range of 0 (indicating 0%), inclusive, up to but excluding 65536 (that indicates 100%).
* Overlay\_rect\_top\_percent: Specifies the y-coordinate of the top corner of the rectangular region of the overlay to be rendered on the viewport in per cents relative to the height of the viewport. The values are indicated in units of 2-16 in the range of 0 (indicating 0%), inclusive, up to but excluding 65536 (that indicates 100%).
* Overlay\_rect\_width\_percent: Specifies the width of the rectangular region of the overlay to be rendered on the viewport in per cents relative to the width of the viewport. The values are indicated in units of 2-16 in the range of 0 (indicating 0%), inclusive, up to but excluding 65536 (that indicates 100%).
* Overlay\_rect\_height\_percent: Specifies the height of the rectangular region of the overlay to be rendered on the viewport in per cents relative to the height of the viewport. The values are indicated in units of 2-16 in the range of 0 (indicating 0%), inclusive, up to but excluding 65536 (that indicates 100%).

NOTE: The size of overlay region over the viewport changes according to the viewport resolution and aspect ratio. However, the aspect ratio of the overlaid media is not intended to be changed.

* Relative\_disparity\_flag indicates whether the disparity is provided as a percentage value of the width of the display window for one view (when the value is equal to 1) or as a number of pixels (when the value is equal to 0). This applies for the case when there is a monoscopic overlay.
* Disparity\_in\_percent: Specifies the disparity, in units of 2−16, as a fraction of the width of the display window for one view. The value may be negative, in which case the displacement direction is reversed. This value is used to displace the region to the left on the left eye view and to the right on the right eye view. This applies for the case when there is a monoscopic overlay and stereoscopic background visual media.
* Disparity\_in\_pixels indicates the disparity in pixels. The value may be negative, in which case the displacement direction is reversed. This value is used to displace the region to the left on the left eye view and to the right on the right eye view. This applies for the case when there is a monoscopic overlay and stereoscopic background visual media.

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* Name- specifies the name of the offered region for overlay.]

X.6.4.3.3 Overlay info parameter

The parameter overlay\_info is a bit field consisting of flags describing the type of overlay interactivity recommended:

- b0 = ‘0’: changing the position of the overlay is not recommended, overlay position is fixed  
b0 = ‘1’: changing the position of the overlay is allowed, ITT4RT-Rx client may change position

- b1 = ‘0’: switching the overlay on/off is not recommended  
b1 = ‘1’: switching the overlay on/off is allowed, ITT4RT-Rx client may switch overlay off

- b2 = ‘0’: rotating the overlay is not recommended   
b2 = ‘1’: rotating the overlay is allowed

- b3 = ‘0’: resizing the overlay is not recommended   
b3 = ‘1’: resizing the overlay is allowed

- b4 = ‘0’: changing the opacity of the overlay is not recommended  
b4 = ‘1’: changing the opacity of the overlay is allowed

---------------------------End of Change --------------------------------------

**Proposal**

The proposal is to move the agreed changes to the draft CR.

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