**3GPP TSG-S4 Ad hoc post Meeting #113-e *S4aI21xxxx***

**Online, , 22nd April–6th May 2021** S4aI211167

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| *CR-Form-v12.0* | | | | | | | | |
| **PSEUDO CHANGE REQUEST** | | | | | | | | |
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|  |  | **CR** |  | **rev** |  | **Current version:** |  |  |
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| *For* [***HE******LP***](http://www.3gpp.org/3G_Specs/CRs.htm#_blank)*on using this form: comprehensive instructions can be found at* [*http://www.3gpp.org/Change-Requests*](http://www.3gpp.org/Change-Requests)*.* | | | | | | | | |
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| ***Proposed change affects:*** | UICC apps |  | ME |  | Radio Access Network |  | Core Network |  |

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| ***Title:*** |  | | | | | | | | | |
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| ***Work item code:*** |  | | | | |  | ***Date:*** | | |  |
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| ***Category:*** |  |  | | | | | ***Release:*** | | |  |
|  | *Use one of the following categories:* ***F*** *(correction)* ***A*** *(mirror corresponding to a change in an earlier release)* ***B*** *(addition of feature),* ***C*** *(functional modification of feature)* ***D*** *(editorial modification)*  Detailed explanations of the above categories can be found in 3GPP [TR 21.900](http://www.3gpp.org/ftp/Specs/html-info/21900.htm). | | | | | | | |  | |
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| ***Reason for change:*** | | Completion of Technical Report. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Summary of change:*** | | * A table summarising the provisioning style of edge compute resources and the 5G Media Streaming features used by each Use Case. * A basic analysis of each Use Case in the context of edge-enabled 5G Media Streaming. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Consequences if not approved:*** | | Failure to properly analyse the contributed Use Cases. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Clauses affected:*** | | 7.2.2 | | | | | | | | |
|  | |  | | | | | | | | |
|  | | **Y** | **N** |  | | | |  | | |
| ***Other specs*** | |  |  | Other core specifications | | | |  | | |
| ***affected:*** | |  |  | Test specifications | | | |  | | |
| ***(show related CRs)*** | |  |  | O&M Specifications | | | |  | | |
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| ***Other comments:*** | |  | | | | | | | | |
|  | |  | | | | | | | | |
| ***This CR's revision history:*** | |  | | | | | | | | |

FIRST CHANGE

# 2 References

[X] 3GPP TR 26.998: "Support of 5G glass-type Augmented Reality / Mixed Reality (AR/MR) devices", Release 17.

[Y] 3GPP TR 26.804: "Study on 5G media streaming extensions", Release 17.

NEXT CHANGE

## 5.4 Analysis of Use Cases

### 5.4.1 Summary

Table 5.4‑1 below summarises the key facets of the Use Cases presented in the preceding subclauses as they relate to edge-enabled 5G Media Streaming.

- The clauses in the present document where the Use Case description can be found, where the Use Case is analysed and where a call flow for the Use Case can be found are provided in the second, third and fourth columns of the table respectively.

- The party responsible for provisioning the Edge Application Server (EAS) is characterised in the fifth column of the table as either the **5GMS-Aware Application** (“Application”), following the generic call flow in clause 6.3.2, or the **5GMS Application Provider** (“Application Provider”), following the generic call flow in clause 6.3.3.

- The set of 5G Media Streaming features potentially relevant to the Use Case is indicated in the last six columns.

NOTE: A particular realisation of a Use Case may not necessarily exploit all indicated features.

Table 5.4‑1: Summary analysis of Use Cases

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Use Case | Description clause | Analysis clause | Call flow clause | EAS provisioning party | Relevant 5GMS features | | | | | |
| Content preparation | Content hosting | Consumtpion reporting | Metrics reporting | Dynamic policy | Network assistance |
| Use Cases requiring only downlink media streaming | | | | | | | | | | |
| Caching downlink streaming content | 5.2.1 | 5.4.2.1 |  | Application Provider | N | Y | | Y | Y | Y |
| Split rendering | 5.2.2 | 5.4.2.2 | B.1 | Application | N? | Y? | | Y | Y | Y? |
| Generalized split and cloud rendering and processing | 5.2.5 | 5.4.2.3 |  | ? |
| Cloud/split rendering of immersive live events | 5.3.2 | 5.4.2.4 |  | ? |
| Pandemic stadium | 5.3.3 | 5.4.2.5 |  | ? |
| Media services in the edge | 5.2.7 | 5.4.2.6 |  | ? | ? | ? | | ? | ? | ? |
| Use Cases requiring only uplink media streaming | | | | | | | | | | |
|  |  |  |  |  |  |  | |  |  |  |
| Use Cases requiring both uplink and downlink media streaming | | | | | | | | | | |
| User-generated live streaming | 5.2.3 | 5.4.4.1 |  | ? | Y | Y | | Y | Y | Y |
| Augmented video streaming | 5.2.4 | 5.4.4.2 |  | ? | Y | Y | | Y | Y | Y |
| Photo-realistic AR rendering in network | 5.2.6 | 5.4.4.3 |  | ? |
| Partial delivery of 3D content (point cloud, mesh) for AR/MR device | 5.2.8 | 5.4.4.4 |  | ? |
| Multi-camera uplink stream processing | 5.3.1 | 5.4.4.5 |  | ? |  |  | |  |  |  |

The detailed analysis of the Use Cases in the following subclauses considers whether and how each Use Case could potentially be realised using a combination of 5G Media Streaming supported by edge processing.

### 5.4.2 Use Cases requiring only downlink media streaming

#### 5.4.2.1 Caching downlink streaming content

Edge caching of downlink media streaming is a close match for the existing content hosting feature already specified in TS 26.512 [7]. As in the case of centralised content hosting, clients may make use of dynamic policies and network assistance to request a network Quality of Service to sustain the desired end user Quality of Experience. Both consumption reporting and metrics reporting remain in scope.

The main additional requirement is to specify that the 5GMS AS can be instantiated in the Edge DN at the point of provisioning. Traffic steering is expected to take advantage of whichever of the DNS-based solutions studied by SA2 (see clause 4.3.2) is finally standardised.

Mapping this required feature set to the SA6 edge architecture summarised in clause 4.2, the edge cache is realised as an instance of the EAS type “5GMSd AS” offering the generic EAS feature “5GMS content hosting”. When the content hosting feature is provisioned at M1d, the 5GMS AF needs to discover/instantiate an EAS of this type offering this feature and ensure it is both correctly configured (via M3d) and correctly registered in the EES database (via EDGE‑3). In addition, the 5GMS AF/EES needs to continusouly monitor the load on the EAS instances it is managing (via EDGE‑3) and expand or contract the resources assigned to downlink media streaming according to the level of client demand experienced at M4d.

#### 5.4.2.2 Split rendering

The split rendering use case covers scenarios where heavy graphics rendering is performed at the edge with low latency. The end device receives a pre-rendered representation of the viewport and may run some pose correction (e.g. Asynchronous Time Warp) to adjust the view to the current user’s viewport.

The real-time graphics rendering aspects of this Use Case are provided by an XR Server running as an EAS instance at the network edge. These application-specific aspects lie outside the scope of 5G Media Streaming.

1. Whether 5GMS uplink streaming is used to supply pose data from the UE to the XR Server is for study in TR 26.998 [X].

2. The XR Server application is likely to be too complex to be described in a generic Content Preparation Template, so the content preparation feature is not required in this Use Case.

3. The rendered results are bespoke for an individual UE, based on individual pose data, and so a unique 5GMS content hosting configuration would be required for each consumer in order for the 5GMSd AS to distribute the rendered results via M4.

NOTE: If the required distribution media format is application-specific, it may not be possible to use the 5GMS content hosting feature at all.

4. Usage reporting is closely tied to the content hosting feature, so is only relevant if the latter is also used.

5. Metrics reporting remains relevant.

6. Dynamic policies may be useful in assuring the network Quality of Experience needed to support the desired end user Quality of Experience.

Mapping this required feature set to the SA6 edge architecture summarised in clause 4.2, the XR Server could be realised as an instance of the EAS type “5GMSd AS” offering the generic “XR Split Rendering” EAS feature, potentially distinguished by some additional application-specific EAS feature name.

If 5GMS downlink media streaming is used to stream the rendered media to a 5GMS Client in the UE, each such client of the XR Server needs its own content hosting configuration to be provisioned in the 5GMSd AS. Since it is not possible for the 5GMS Application Provider to provision each individual content hosting configuration, this responsibility may fall to the 5GMSd AF at M3d.

#### 5.4.2.3 Generalized split and cloud rendering and processing

From the perspective of the study, this is similar to the Use Case on Split Rendering analysed in the preceding clause.

#### 5.4.2.4 Cloud/split rendering of immersive live events

From the perspective of the study, this is similar to the Use Cases on Split Rendering analysed in the preceding clauses.

#### 5.4.2.5 Pandemic stadium

From the perspective of the study, this is similar to the Use Cases on Split Rendering analysed in the preceding clauses.

#### 5.4.2.6 Media services in the edge

Not enough detail is provided in this Use Case to enable detailed analysis of potential requirements.

### 5.4.3 Use Cases requiring only uplink media streaming

No Use Cases requiring only uplink media streaming are documented in the study.

### 5.4.4 Use Cases requiring both uplink and downlink media streaming

#### 5.4.4.1 User-generated live streaming

NOTE: Detailed analysis of this Use Case is the subject of a study in TS 26.804 [Y].

The content preparation requirements for re-encoding user-generated content seem a good candidate for realisation as an additional 5G Media Streaming feature in a generic 5GMS AS edge instance. This transcoding feature will need to be supported by a suitable transcoding configuration to specify the desired content preparation manipulations, such as:

|  |  |  |  |
| --- | --- | --- | --- |
| Content preparation step | | Content preparation activities | Characterisation |
| 1. | Pre-processing of uplinked media | Video upscaling  Light correction in video  Image stablisation of video | Generic |
| 2. | Content augmentation | Audio dubbing  Captioning | Application-specific |
| 3. | Distribution configuration for downlink media streaming | Specification of media packaging format(s)  Specification of bit rate encoding ladder | Generic |

Many of the content preparation tasks listed above are generic and could therefore be provisioned in a standard content transcoding configuration. However, some of the tasks (e.g. content augmentation in step 2 above) seem more application-specific and more difficult to configure in this way. It is not clear how to use a generic Content Preparation Template to configure such application-specific tasks for execution by a standardised 5GMS AS transcoding feature in TS 26.512 [7]. It may be necessary to regard such application-specific content preparation tasks as outside the scope of 3GPP standardisation.

#### 5.4.4.2 Augmented video streaming

The content preparation requirements in this Use Case envisage the use of Artificial Intelligence to process uplink video prior to downlink media streaming. Because this Use Case involves downlink media streaming to a single user based on unique video capture from the UE, a separate 5GMSd AS content hosting configuration needs to be provisioned for each end user in a similar manner to that described in clause 5.4.2.2 above for the Split rendering Use Case.

#### 5.4.4.3 Photo-realistic AR rendering in network

This is similar to the “Augmented video streaming” Use Case analysed in the preceding clause.

#### 5.4.4.4 Partial delivery of 3D content (point cloud, mesh) for AR/MR device

This Use Case is similar to the augmented reality Use Cases described in the preceding clauses.

The element of uplink streaming essential to augmented/mixed reality is missing from the Use Case description, so no further analysis is possible.

#### 5.4.4.5 Multi-camera uplink stream processing

The main requirement in this Use Case is to stitch together video feeds from multiple live camera sources. The realisation is therefore an EAS instance of type “5GMSu AS” that provides a “VR 360” stitching feature. This could potentially be standardised as a generic content processing feature, or it could be implemented as an application-specific EAS that also makes use of M4u uplink media streaming.

The Use Case lacks a description of the downlink media streaming envisaged for distributing the result of the video stitctching, so no further analysis is possible.

END OF CHANGES