**3GPP TSG SA WG4 #112e *S4-210306***

**E-meeting, 1st – 10th February 2021**

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| *CR-Form-v12.0* | | | | | | | | |
| **Pseudo CHANGE REQUEST** | | | | | | | | |
|  | | | | | | | | |
|  | **26.8xx** | **CR** | **<CR#>** | **rev** | **-** | **Current version:** | **0.0.0** |  |
|  | | | | | | | | |
| *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 | **X** | Radio Access Network |  | Core Network | **X** |

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|  | | | | | | | | | | |
| ***Title:*** | [FS\_5GMS-EXT] Key Topic Content Preparation | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Source to WG:*** | Qualcomm Incorporated, Tencent, BBC | | | | | | | | | |
| ***Source to TSG:*** | SA4 | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** | FS\_5GMS-EXT | | | | |  | ***Date:*** | | | 2021-01-25 |
|  |  | | | |  | |  | | |  |
| ***Category:*** | **B** |  | | | | | ***Release:*** | | | Rel-17 |
|  | *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). | | | | | | | | *Use one of the following releases: Rel-8 (Release 8) Rel-9 (Release 9) Rel-10 (Release 10) Rel-11 (Release 11) Rel-12 (Release 12)* *Rel-13 (Release 13) Rel-14 (Release 14) Rel-15 (Release 15) Rel-16 (Release 16)* | |
|  |  | | | | | | | | | |
| ***Reason for change:*** | | The study item description identifes the key topic “Content Preparation”. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Summary of change:*** | | Adds the structure and description for this key topic | | | | | | | | |
|  | |  | | | | | | | | |
| ***Consequences if not approved:*** | | Key topic not addressed | | | | | | | | |
|  | |  | | | | | | | | |
| ***Clauses affected:*** | |  | | | | | | | | |
|  | |  | | | | | | | | |
|  | | **Y** | **N** |  | | | |  | | |
| ***Other specs*** | |  | **X** | Other core specifications | | | | TS/TR ... CR ... | | |
| ***affected:*** | |  | **X** | Test specifications | | | | TS/TR ... CR ... | | |
| ***(show related CRs)*** | |  | **X** | O&M Specifications | | | | TS/TR ... CR ... | | |
|  | |  | | | | | | | | |
| ***Other comments:*** | |  | | | | | | | | |
| ***56*** | |  | | | | | | | | |
| ***This CR's revision history:*** | |  | | | | | | | | |

**===== CHANGE =====**

# 2 References

The following documents contain provisions which, through reference in this text, constitute provisions of the present document.

- References are either specific (identified by date of publication, edition number, version number, etc.) or non‑specific.

- For a specific reference, subsequent revisions do not apply.

- For a non-specific reference, the latest version applies. In the case of a reference to a 3GPP document (including a GSM document), a non-specific reference implicitly refers to the latest version of that document *in the same Release as the present document*.

[1] 3GPP TR 21.905: "Vocabulary for 3GPP Specifications".

[2] 3GPP TS 26.501: " 5G Media Streaming (5GMS); General description and architecture".

[3] 3GPP TS 26.511: "5G Media Streaming (5GMS); Profiles, codecs and formats".

[4] 3GPP TS 26.512: "5G Media Streaming (5GMS); Protocols".

[V] ISO/IEC 13818‑1: "Information technology — Generic coding of moving pictures and associated audio information: Systems".

[W] SCTE-35: "Digital Program Insertion Cueing Message for Cable".

[Z] ISO/IEC 23000-19:2018: "Information technology — Multimedia application format (MPEG-A) — Part 19: Common media application format (CMAF) for segmented media".

[ZZ] ISO/IEC 23009-1:2021: "Information technology — Dynamic adaptive streaming over HTTP (DASH) — Part 1: Media presentation description and segment formats".

[X] VSF TR-06-01, RIST Simple Profile, <https://www.videoservicesforum.org/download/technical_recommendations/VSF_TR-06-1_2018_10_17.pdf>

[Y] VSF TR-06-02, RIST Main Profile, <https://www.videoservicesforum.org/download/technical_recommendations/VSF_TR-06-2_2020_03_24.pdf>

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# 4 Introduction to 5G Media Streaming

## 4.1 Introduction

## 4.2 Collaboration Scenarios

## 4.3 Architectures

## 4.4 Summary of Stage-3 enablers

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# 5 Key Topics

## 5.1 Introduction

## 5.2 Content Preparation

### 5.2.1 Overview

[TS 26.501 includes the high-level concept of content preparation and/or modification within the 5G Media Streaming System. However, Content Preparation has not yet been defined in detail in TS 26.512. The extent of content preparation support (including. use- cases, functionalities and features, and resulting formats) needed in the existing 5G Media Streaming Architecture, and how these functions can be realized in with current 5GMS architecture are subject of this study.]

Content preparation may be applied in the following scenarios:

1. In uplink streaming: on an uplinked stream, providing the results to Application Provider.
2. In downlink streaming: on an input stream from an Application Provider, providing the result for distribution.
3. Between uplink and downlink streaming: on an uplink stream, providing the result for distribution.

Two aspects are of relevance for the discussion on Content Preparation:

* Content Ingest formats
* Content preparation instructions

On content ingest formats, a survey of existing format is needed to understand the available options. Examples include

1. MPEG-2 Transport Stream [V] with SCTE metadata [W].
2. CMAF content [Z] with timed metadata tracks.
3. CMAF content [Z] with a manifest such as the MPD [ZZ].
4. Reliable Internet Stream Transport (RIST) is an open source, open specification transport protocol designed for reliable transmission of video over lossy networks (including the internet) with low latency and high quality. It is currently under development under the Video Services Forum's "RIST Activity Group." To date, two open specifications have been produced:
   1. [TR-06-1 (RIST Simple Profile)](https://www.videoservicesforum.org/download/technical_recommendations/VSF_TR-06-1_2018_10_17.pdf) [X], first released in 2018, defines the basic ARQ (Automatic Repeat Query) technology used to recover lost packets. It has been updated in 2020 to include an optional "RTT Echo" message that streamlines the process of configuring packet buffers.
   2. [TR-06-2 (RIST Main Profile)](https://www.videoservicesforum.org/download/technical_recommendations/VSF_TR-06-2_2020_03_24.pdf) [Y], released in 2020, defines additional functions required for commercial applications, including stream encryption, sender/receiver authentication, in-band data tunneling, and bandwidth optimization.
5. Secure Reliable Transport (SRT) is an open source video transport protocol maintained by the SRT Alliance.

### 5.2.2 Gap Analysis of 26.512

TS 26.512 [4] defines a very limited set of features for content preparation:

1. The location for content preparation template provisioning.

2. CRUD Operation for content preparation template.

The current specification neither defines the content ingest formats nor the content preparation instructions.

### 5.2.3 Use-cases

#### 5.2.3.1 Basic CMAF/DASH/HLS multi-rate live streaming of user-generated content

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| --- |
| **Use Case Name**  Basic CMAF/DASH/HLS multi-rate live streaming of user-generated content |
| **Description**  Kim is subscribed to an Application for live streaming of captured videos from her everyday life. Based on the previous number and diversity of Kim’s usual audience (e.g. close friends), the Application/Application Provider has an “audience codecs-rates” profile which represents the typical number of streams based on Kim’s previous streaming sessions and provides the corresponding Content Preparation Template to the MNO as Kim starts the session live stream session.  While Kim is streaming a single stream through her device’s uplink, the MNO processes the received content based on the Content Preparation Template and provides multi-rate tracks for distribution.  If new users join Kim’s streaming session which cannot be supported with the current codecs-rates, the Application/Application Provider may update the Content Preparation Template in the session, and the MNO updates the content preparation process accordingly. |
| **Categorization**  **Delivery:** Live Streaming  **Device:** Any device connected to the cell network |
| **Preconditions**   1. On the device:    1. A 3GPP supported encoder is installed.    2. UE is 5GMS capable.    3. UE’s Application is installed which supports 5GMS. 2. On the network:    1. The AS may or may not have resources for running a requested content preparation with the update to the Content Preparation Template, and responds accordingly. |
| **Nominal Cost Analysis**  The cost of service increases linearly with the number of ingests.  The cost of service increases less than linearly with the number of download streaming clients because the encoding and caching requirement are common to a large number of viewers. |
| **Potential Standardization Status and Needs**  The Content Preparation Template is expected to define ingest format(s) as well as the following instructions for content preparation:  1. Input characteristics.  2, Outputs characteristics.  3. The media processes and/or functionalities applied.  Content preparation for CMAF streaming when the ingest format in CMAF and output is CMAF content with DASH and HLS manifests for live and on-demand services. In this case, the Content Preparation Template should include the following:   1. Ingest characteristics such as:    1. Video characteristics    2. Audio characteristics    3. Format of the subtitle track(s)    4. Metadata tracks and presence of media track events    5. Ingest protocols 2. Instructions such as    1. CMAF/DASH publishing profile    2. Configuration of Switching sets:       1. Ladder of bit rate/quality       2. The encoder configuration for each track       3. Nominal and maximum segment duration       4. Frequency and characteristics of random access and switching points       5. Initialization segment characteristics       6. Content protection scheme and encryption mode       7. Metadata and annotation such as roles, languages, ratings, and accessibility       8. Metadata tracks associated with the switching set or individual tracks       9. Media track events to be included in each track       10. Chunk encoding for low latency streaming    3. Period structure, splicing opportunities, and conditions    4. 5GMSd AS URL exposed at M4    5. Segments Addressing modes    6. Trick mode and thumbnail navigation tracks    7. Service description    8. Content splicing/ad opportunity signaling    9. Subtitle generation from the ingest audio track(s)    10. Multi-language support (when audio tracks for two or more language are ingested).    11. Manifest format, annotations, and metadata |

Editor’s Note: We should study existing stage-2 functionalities available in commercial services such AWS before diving into any specific stage-3 discussions. We will provide input on this even for this meeting, just a few hours late.

### 5.2.4 Collaboration Scenarios

### 5.2.4.1 Content preparation before downlink streaming

In this collaboration, the 5GMSd Application Provider requests content preparation for its stream before distribution. Figure XX shows such scenario.

UE

5GMSd

Client

5GMSd

Aware Application

5GMSd AS

External DN

5GMSd

Application Provider

M1d

M2d

Trusted DN

M4d

5GMSd AF

M5d

PCF

M8d

N5

Figure XX: Content preparation before downlink streaming

In this case:

1. The Application Provider defines the required content preparation and requests the 5GMSd AF to create the process using the Content Preparation Template (CPT) through M1d.

2. The 5GMSd AF discovers resources and responds to the Application Provider (M1d).

3. The media is streamed from Application Provider to 5GMSd AS.

4. The content is transformed by 5GMSd AS according to the Content Preparation Template and provided for distributions (M4d).

5. The Application Provider may update, retrieve or destroy the Content Preparation Template using M1d.

Editor’s Note: How does DistributionConfiguration relate to CPT? Does the CPT define the initial/generic formats (such as HLS and DASH) and DistributionConfiguration defines a subset of it for distribution?

Editor’s Note: Study collaboration scenarios between the 5G System and Application Provider for each of the key topics.

### 5.2.5 Deployment Architectures

Editor’s Note: Based on the 5GMS Architecture, develop one or more deployment architectures that address the key topics and the collaboration models.

### 5.2.6 Mapping to 5G Media Streaming and High-Level Call Flows

Editor’s Note: Map the key topics to basic functions and develop high-level call flows.

### 5.2.7 Potential open issues

Editor’s Note: Identify the issues that need to be solved.

### 5.2.8 Candidate Solutions

Editor’s Note: Provide candidate solutions (including call flows) for each of the identified issues.