**3GPP TSG- S4 Meeting #117e *S4-220250***

**Electronic Meeting, – 23rd February 2022**

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| *CR-Form-v12.2* | | | | | | | | |
| **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:*** | [FS\_5GMS\_EXT]: Conclusions | | | | | | | | | |
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| ***Source to WG:*** | Ericsson LM | | | | | | | | | |
| ***Source to TSG:*** | S4 | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** | FS\_5GMS\_EXT | | | | |  | ***Date:*** | | |  |
|  |  | | | |  | |  | | |  |
| ***Category:*** |  |  | | | | | ***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-16 (Release 16) Rel-17 (Release 17) Rel-18 (Release 18) Rel-19 (Release 19)* | |
|  |  | | | | | | | | | |
| ***Reason for change:*** | | The study on 5G Media Streaming Extensions (FS\_5GMS\_EXT) should be completed and the conclusion section was still missing. | | | | | | | | |
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| ***Summary of change:*** | | A new section containing the conclusion and conclusion summary is suggested. | | | | | | | | |
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| ***Consequences if not approved:*** | |  | | | | | | | | |
|  | |  | | | | | | | | |
| ***Clauses affected:*** | |  | | | | | | | | |
|  | |  | | | | | | | | |
|  | | **Y** | **N** |  | | | |  | | |
| ***Other specs*** | |  |  | Other core specifications | | | | TS/TR ... CR ... | | |
| ***affected:*** | |  |  | Test specifications | | | | TS/TR ... CR ... | | |
| ***(show related CRs)*** | |  |  | O&M Specifications | | | | TS/TR ... CR ... | | |
|  | |  | | | | | | | | |
| ***Other comments:*** | |  | | | | | | | | |
|  | |  | | | | | | | | |
| ***This CR's revision history:*** | |  | | | | | | | | |

\*\*\*\* First Change \*\*\*\*

# 6 Conclusions

## 6.1 List of Conclusions

Table 6.1-1 points to conclusions and next steps for each of the key issues studied in the present document.

Table 6.1-1: Index of Key Issues, Conclusions, and Next Steps

|  |  |
| --- | --- |
| Key Issue | Conclusions and Next Steps clause |
| Key Issue #1: Content Preparation | 5.2.9 |
| Key Issue #2: Traffic identification | 5.3.7 |
| Key Issue #3: Additional/new transport protocols | 5.4.7 |
| Key Issue #4: Uplink Media Streaming | 5.5.7 |
| Key Issue #5: Background Traffic | 5.6.7 |
| Key Issue #6: Content-Aware Streaming | - |
| Key Issue #7: Network Event usage | 5.8.5 |
| Key Issue #8: Per-application authorization | 5.9.7 |
| Key Issue #9: Support for encrypted and high-value content | - |
| Key Issue #10: TV-grade mass distribution of unicast Live Services | 5.11.7 |
| Key Issue #11: Network Slicing Extensions for 5G Media Streaming | 5.12.7 |

## 6.2 Content preparation

The study of this key issue demonstrates that the use of the Content Preparation Template is not explained adequately in TS 26.501 Release 16. Furthermore, TS 26.512 needs several extensions to make the use of the Content Preparation Template interoperable in the 5GMS architecture.

The following extensions are recommended:

- Inclusion of content preparation deployment scenarios and associated call flows in Stage 2.

- Extending the Content Preparation Templates Provisioning API and defining the 5GMS AF/AS requirements needed for the deployment scenarios identified in the study in Stage 3.

## 6.3 TrafficIdentification

The 5G System offers different solutions for traffic identification and traffic detection. Traffic identification is essential so that the 5G System can detect application flows to which, for instance, an appropriate Policy and Charging Rule (PCC) is applied.

It is recommended to study use-cases with IPsec and the usage of the security parameter index for traffic identification further in a subsequent study.

Existing stage 2 procedures already support the use of different traffic identification mechanisms.

The following extensions are recommended for stage 3:

- Extensions to the M5 API to support the configuration of ToS values for the identification of traffic associated with a Dynamic Policy.

- Describe the usage of usage of ToS/DSCP for traffic identification within an informative annex.

## 6.4 Additional/new transport protocols

The latest version of HTTP, HTTP/3, [5] can be used for at least some types of media immediately, but some existing 3GPP Stage 3 specifications are explicitly tied to specific versions of HTTP and need to be updated to allow HTTP/3 as a supported version, in order to allow deployment of this new protocol.

HTTP/3 is defined in the IETF and has been completed in the QUIC working group and approved for publication as an RFC but has not been published yet because of a normative dependency on other documents. The HTTP/3 document is stable (has not changed since February 2021)

When HTTP is used in 5GMS applications, it is often used with application-level protocols such as DASH or HLS that are defined (partially) outside of 3GPP. Some usages in 5GMS will depend on support for HTTP/3 in these application-level protocols.

The following actions are recommended:

- Update 5GMS stage 3 specifications to allow the use of HTTP/3 at relevant reference points in the 5GMS architecture, to allow early deployment and to identify any unforeseen open issues with using HTTP/3 in a 5G System.

- At this time, support for HTTP/3 in 5GMS specifications, can be allowed, but not required.

## 6.5 Uplink media streaming

The study of this key issue demonstrates that uplink streaming is severely underspecified in TS 26.501 and TS 26.512 in Release 16, and several gaps are identified.

The following extensions are recommended:

1. Inclusion of collaboration scenarios and associated call flows in Stage 2.

2. Specification of egest protocol(s), Content Publishing Configuration APIs and a corresponding Content Publishing Configuration resource, and the UE’s uplink streaming entry point in Stage 3.

## 6.6 Background traffic

Background Data Transfer (BDT) offers Mobile Network Operators (MNOs) and application service providers a tool to deliver content opportunistically at beneficial costs during low traffic time windows. The usage of BDT for media streaming services and potential enhancements to the 5GMS procedures and APIs have been studied and documented in the present document.

Existing stage 2 procedures already support the use of BDT. It is recommended to define the necessary parameter extensions to the M1, M5, and M6 reference points to provide access to BDT. Any normative work has to take into account the available BDT procedures developed by other 3GPP groups.

## 6.7 Content-aware streaming

No conclusion has yet been reached for this key issue. Initial considerations are provided in clause 5.7. It is recommended to study it further at an appropriate time.

## 6.8 Network Event usage

The 5GMS AF performs several critical support operations for media streaming sessions and collects information about the progress and status of media streaming sessions. This information can be of interest to the 5GMS Application Provider or to other Network Functions in the 5G Sytem.

The following extensions (Stage 2 and Stage 3) are recommended:

- Identify and define the media-related data to be exposed by the 5GMS AF towards the 5G System and other event consumer entities. Work with other 3GPP groups for carriage in existing AF events or the definition of new AF Events.

- Enhance the 5GMS AF data collection to support direct and indirect collection of UE data pertaining to media sessions.

- Devise mechanisms to control the access to the collected media session data.

- Define a generic architecture within which media-specific solutions for the configuration and subsequent operation of data collection and data reporting (via event exposure) by the AF can be specified.

## 6.9 Per-application-authorization

The 5G Media Streaming Architecture enables a 5GMS-Aware Application to access certain network features, in alignment with the 5GMS Application Provider. The Key Issue explores the usage of OAuth 2.0 for per-application authorization of different 5G System features, for example to prevent misuse. The Key Issue specifically addresses use-cases, when a UE hosts multiple 5GMS-Aware Applications from different 5GMS Application Providers.

It is recommended to specify the usage of OAuth 2.0 (according to the SA3 guidelines) within a normative work item.

## 6.10 Support for encrypted and high-value content

No conclusion has yet been reached for this key issue. Initial considerations are provided in clause 5.10. It is recommended to study it further at an appropriate time.

## 6.11 TV-grade mass distribution of unicast Live Services

Live TV services of different scale (professional, user-generated, session-based, etc.) are increasingly distributed over broadband and mobile networks, including 5G Networks. Live TV services are characterized by at least the following aspects: (1) scalability (in terms of concurrent users), (2) consistent quality, (3) high bandwidth requirements, (4) target latency constraints, and advanced TV Experiences.

To address these type services a consistent support in the 5G Media Streaming Architecture, the protocols and codecs is needed. It is identified that the combination of low-latency CMAF formats, chunked transfer from content provider to the device, as well as consistent signaling and support of service quality are key aspects to the work.

Based on the discussion and conclusions in clause 5.11.7, it is recommended to support and optimize the deployment of unicast live TV services in 5G Systems. For this purpose, the following follow-up aspects are recommended to be addressed:

1. Integrate into TS 26.501 (Stage 2)

a) At least one call flow into that documents provisioning, ingest, distribution, presentation and monitoring aspects of low-latency live streaming services using CMAF Chunks.

b) Updates to reference points to support provisioning, ingest, distribution, presentation and monitoring aspects of low-latency live services using CMAF Chunks.

c) Typical configurable service parameters and operation points in terms of bit rates, latencies, Audience Drift Gaps, etc.

2. Address updates to relevant stage-3 specifications (e.g., TS 26.511, TS 26.512, TS 26.247) to add consistent support of low-latency live streaming services, including:

a) Define capability mechanisms in order to identify the support of low-latency modes in 5GMS networks and clients

b) Provisioning to support operation points and policy templates for low-latency live streaming.

c) Create necessary extensions to support DASH and HLS chunked CMAF low-latency modes in an end-to-end workflow.

d) Provide necessary protocols to scalably support time synchronization across 5GMS Applications, AS and 5GMS Clients (at appropriate precision).

e) Extend QoE metrics schemes and metrics reporting functionality to address monitoring of Operation Point metrics for potential operational improvements.

f) Provide extensions to formats and manifests support advanced TV experiences.

g) Informative guidelines on using different Operation Points for low-latency live streaming.

3. Study even lower-latency streaming technologies based on the use cases and considerations of the DASH-IF webRTC streaming report [Z].

## 6.12 Network Slicing Extensions for 5G Media Streaming

As described in TS 28.530, network slicing is a paradigm where logical networks/partitions are created, with appropriate isolation, resources and optimized topology to serve a purpose or service category (e.g. use case/traffic category, or for MNO-internal reasons) or customers (logical system created "on demand"). Media services can be delivered to end users using such different network slices. As documented in clause 5.12 of the present document, aspects related to network slicing are not adequately addressed in TS 26.501 and 26.512. The following are the conclusions so far in the study:

1. The collaboration scenarios, deployment architectures, and potential open issues concerning network slicing extensions are to be studied further in Release 18.

2. The impact of network slicing is across multiple work items. Therefore, study for network slicing extensions is to be looked at from the perspective of multiple work items.

# 7 Recommendations

5G Media Streaming provides significant opportunities to integrate operator and third-party media streaming services into 5G Systems. The report provides at set of considered extensions to 5G Media Streaming as defined in TS 26.501, as well as the format and protocol specifications in TS 26.511 and TS 26.512, respectively. Advances in 5G System technologies, external enhancement and developments in other SDOs such as IETF, DASH-IF or MPEG, as well as initial experiences from deploymens have led to a set of conclusions in clause 6.

Based on the details in the report, the following next steps are proposed.

- Initiate stage 2 and stage 3 work on Network Event usage based on the conclusions in clause 6.8. Note that this is already addressed in TS 26.531 [X] and TS 26.532 [Y], respectively.

- Provide relevant extensions to the 5G Media Streaming architecture based on the conclusions in clause 6. Candidates for these extensions are:

- Content preparation deployment scenarios and associated call flows in Stage 2 according to clause 6.2

- Inclusion of collaboration scenarios and associated call flows in Stage 2 for uplink media streaming according to clause 6.5

- Inclusion and extensions of procedures and call flows for end-to-end low latency live streaming based on the conclusions in clause 6.11.

- Provide relevant extensions to 5G Media Streaming protocols and formats based on the conclusions in clause 6. Candidates for these extensions are:

- Stage-3 follow-up work from 5G Media Streamiong architecture extensions referred to above based on conclusions in clauses 6.2, 6.5, or 6.11.

- Extensions to 5GMS protocols to support for traffic identification based on the conclusions in clause 6.3

- Addition of HTTP/3 to the 5GMS Protocols as an optional alternative based on the conclusions in clause 6.4.

- Addition of HTTP/3 to the 5GMS Protocols as an optional alternative based on the conclusions in clause 6.5.

- Addition of necessary parameter extensions to the M1, M5, and M6 reference points to provide access to Background Data Traffic based on the conclusions in clause 6.6.

- Specification of the the usage of OAuth 2.0 (according to the SA3 guidelines) for 5GMS Protocols based on the conclusions in clause 6.9.

- Continue the study of additional extensions to 5G Media Streaming. Potential candidate topics based on this Technical report are:

- Content-Aware streaming based on the initial considerations in clause 5.7

- Study even lower-latency streaming technologies based on the use cases and considerations of the DASH-IF webRTC streaming report [Z].

- Distribution of encrypted and high-value content based on the considerations in clause 5.10.

- Network slicing extensions for 5G media streaming based on the conclusions in clause 6.12.

All work topics will benefit to be carried out in continuously checking relevance and support across 3GPP members. In addition, close coordination with other groups in 3GPP on 5G System and radio related matters, edge computing, applications, operational management and security as well in communication with experts in MPEG, DASH-IF, CTA WAVE on DASH, HLS and CMAF as well as with IETF on new protocols.

\*\*\*\* Last Change \*\*\*\*