**3GPP TSG- Meeting #**

**, , - revision of S4-241472**

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| *CR-Form-v12.3* |
| **CHANGE REQUEST** |
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|  |  | **CR** |  | **rev** |  | **Current version:** |  |  |
|  |
| *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:***  |  |
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| ***Source to WG:*** |  |
| ***Source to TSG:*** |  |
|  |  |
| ***Work item code:*** |  |  | ***Date:*** |  |
|  |  |  |  |  |
| ***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 canbe 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-17 (Release 17)Rel-18 (Release 18)Rel-19 (Release 19) Rel-20 (Release 20)* |
|  |  |
| ***Reason for change:*** | One of the open issues identified in the Rel-18 feasibility study 5GMS\_Pro\_Ph2 is the need for a specification that addresses interoperability considerations around content delivery protocol features and general technologies for segmented media streaming and the IP/PDU 5G System Layer. This points to the further study media plane issues to support additional functionalities, but also identifies what needs to be ported from legacy TS 26.512 to a generalised media plane technical specification. The relation to media session handling (as specified in TS 26.510) is identified in TR 26.804, but enhancements to media session handling are not the primary focus of this study. |
|  |  |
| ***Summary of change:*** | Adds discussion and conclusions on a Media Delivery specification |
|  |  |
| ***Consequences if not approved:*** | Study item objectives are not complete |
|  |  |
| ***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:*** | 1, 2, 3, 4, 5.15 (new), 6.15 (new) |
|  |  |
| ***This CR's revision history:*** |  |

## ===== CHANGE =====

# 1 Scope

This Technical Report identifies and evaluates a set of potential improvements and extensions, referred to as key topics. The initial set of key topics were:

- Content Preparation

- Traffic Identification

- Additional / New transport protocols

- Uplink media streaming

- Background traffic

- Content Aware Streaming

- Network Event usage

- Per-application-authorization

- Support for encrypted and high-value content

- Scalable distribution of unicast Live Services

- Network Slicing Extensions for 5G Media Streaming

- 3GPP Service Handler and URLs

- 5GMS Application Server configuration and management.

In an extension, a second set of key topics were collected as follows:

- Media Delivery Specification.

- Common Client Metadata.

- Common Server-and Network-Assisted Streaming.

- Multi-CDN and Multi-Access Media Delivery.

- Multi-Access with ATSSS.

- Modem Usage Optimized Media Streaming.

- DASH/HLS Interoperability.

- Further harmonization of RTC and Streaming for Advanced Media Delivery.

- Improved QoS support.For each of the above key topics, the following objectives are identified:

1. Document the above key topics in more detail, in particular how they relate to the 5GMS Architecture and protocols.

2. Study collaboration scenarios between the 5G System and Application Provider for each of the key topics.

3. Based on the 5GMS Architecture, develop one or more deployment architectures that address the key topics and the collaboration models.

4. Map the key topics to basic functions and develop high-level call flows.

5. Identify the issues that need to be solved.

6. Provide candidate solutions (including call flows) for each of the identified issues.

7. Coordinate work with other 3GPP groups e.g. SA2, SA3, SA5, and others as needed.

8. Coordinate work with external organizations such as DASH-IF, CTA WAVE, ISO/IEC JTC29 WG3 (MPEG Systems), or IETF, as needed.

9. Identify gaps and recommend potential normative work for stage-2 call flows and possibly stage-3.

## ===== 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*.

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## ===== CHANGE =====

## 3.3 Abbreviations

For the purposes of the present document, the abbreviations given in 3GPP TR 21.905 [1] and the following apply. An abbreviation defined in the present document takes precedence over the definition of the same abbreviation, if any, in 3GPP TR 21.905 [1].

AAAA Authentication, Authorization, Accounting, and Auditing

ABR Adaptive Bitrate

ACK ACKnowledgment

ACM Association for Computing Machinery

ALPN Application-Layer Protocol Negotiation

AMF Access and Mobility Management Function

ANBR Access Network Bitrate Recommendation

ANTS Advanced Network Technologies Symposium

API Application Programming Interface

AQM Active Queue Management

ARPA Advanced Research Projects Agency

ARQ Automatic Repeat reQuest

ASP Application Service Provider

ATSSS Access Traffic Steering, Switching, and Splitting

AUS AUthentication Server

AVC Advanced Video Coding

AWS Amazon Web Services

BBC British Broadcasting Corporation

BBR Bottleneck Bandwidth and Round-trip propagation time

BDT Background Data Transfer

BMFF Base Media File Format

BMSC Broadcast/Multicast Service Center

CAE Content-Aware Encoding

CBR Constant Bitrate

CCF Call Control Function

CDF Cumulative Distribution Function

CDN Content Delivery Network

CDP Content Delivery Protocol

CERN European Organization for Nuclear Research

CIRR Carrier-Independent Routing Registry

CMAF Common Media Application Format

CMAS Commercial Mobile Alert System

CMCD Common Media Client Data

CMMF Coded Multisource Media Format

CMSD Content Media Server Data

CNAME Canonical Name

CPI Content Protection Information

CPIX Content Protection Information Exchange

CPT Content Preparation Template

CRUD Create, Read, Update, Delete

CTA Consumer Technology Association

CWR Congestion Window Reduced

DANE DASH-Aware Network Element

DASH Dynamic Adaptive Streaming over HTTP

DCSM Data Collection and Storage Management

DGRAM Datagram

DNS Domain Name System

DRM Digital Rights Management

DSCP Differentiated Services Code Point

DTT Digital Terrestrial Television

DVB Digital Video Broadcasting

DVR Digital Video Recorder

EAS Edge Application Server

ECE Explicit Congestion Notification

ECN Explicit Congestion Notification

ECP Enhanced Content Protection

ECT Explicit Congestion Notification-Capable Transport

EDGE Enhanced Data rates for GSM Evolution

EDL Enhanced Data Link

EEC Edge-Enabled Client

EEL End-to-End Latency

EES Edge Enabler Server

EFDT Enhanced File Delivery Table

EME Encrypted Media Extensions

ENP Enhanced Network Performance

EPS Evolved Packet System

EPT Enhanced Packet Transport

EVEX EVent EXposure

EXT Extension

FALSE False

FAR Forward Action Rule

FDIS Final Draft International Standard

FDT File Delivery Table

FEC Forward Error Correction

FHD Full High Definition

FLUS Framework for Live Uplink Streaming

FLUTE File Delivery over Unidirectional Transport

FOR For

FORMAT Format

FQDN Fully Qualified Domain Name

GBR Guaranteed Bit Rate

GRO Generic Receive Offload

GSO Geostationary Orbit

GTP GPRS Tunneling Protocol

GUID Globally Unique Identifier

HDR High Dynamic Range

HEVC High Efficiency Video Coding

HLS HTTP Live Streaming

HPACK Header Compression for HTTP/2

HTTP Hypertext Transfer Protocol

HTTPS Hypertext Transfer Protocol Secure

IANA Internet Assigned Numbers Authority

ICCE International Conference on Consumer Electronics

IEC International Electrotechnical Commission

IEEE Institute of Electrical and Electronics Engineers

IETF Internet Engineering Task Force

IMS IP Multimedia Subsystem

INFOCOM International Conference on Computer Communications

IOP Interoperability Points

IPC Inter-Process Communication

IPTV Internet Protocol Television

ISO International Organization for Standardization

JSON JavaScript Object Notation

JTC Joint Technical Committee

KID Key Identifier

KPI Key Performance Indicator

LPT Low-Power Transceiver

LSD Low-Speed Data

LTE Long-Term Evolution

MABR Multicast Adaptive Bitrate

MANO Management and Orchestration

MAR Multi-Access Rule

MAX Maximum

MBMS Multimedia Broadcast Multicast Service

MBS Multicast Broadcast Service

MBSF Multicast Broadcast Service Function

MBSTF Multicast Broadcast Service Transport Function

MHV Mile-High Video

MIME Multipurpose Internet Mail Extensions

MNO Mobile Network Operator

MOQ Media over QUIC

MPD Media Presentation Description

MPEG Moving Picture Experts Group

MPQUIC Multipath QUIC

MPTCP Multipath TCP

MQTT Message Queuing Telemetry Transport

MSE Media Source Extensions

MSH Media Session Handler

MTSI Multimedia Telephony Service for IMS

NAT Network Address Translation

NBMP Network-Based Media Processing

NEF Network Exposure Function

NFV Network Functions Virtualization

NRF Network Repository Function

NRM Network Resource Model

NSACF Network Slice Admission Control Function

NSCALE Network Slice Capability Exposure

NSSAI Network Slice Selection Assistance Information

NWDAF Network Data Analytics Function

OAM Operations, Administration, and Maintenance

OMA Open Mobile Alliance

OTI Object Transmission Information

OTT Over-The-Top

PAS Publicly Available Specification

PCC Policy and Charging Control

PCF Policy Control Function

PDF Portable Document Format

PDR Packet Detection Rule

PDU Protocol Data Unit

PFCP Packet Forwarding Control Protocol

PFD Packet Flow Description

PFDF Packet Flow Description Function

PFS Packet Flow Set

PHB Per-Hop Behavior

PING Packet Internet Groper

PLMN Public Land Mobile Network

PSA Public Service Announcement

PSDB Packet Set Delay Budget

PSER Packet Set Error Rate

PSIHI Packet Set Integrated Information

PSNR Peak Signal-to-Noise Ratio

PSS Packet-Switched Streaming

QER Quality of Experience Rule

QFI QoS Flow Identifier

QLOG QUIC Logging

QPACK QUIC Header Compression

QRT QUIC RTP Tunneling

QUIC Quick UDP Internet Connections

RAN Radio Access Network

RAPTORQ RaptorQ Forward Error Correction

RCVBUF Receive Buffer

RFC Request for Comments

RIST Reliable Internet Stream Transport

RLC Radio Link Control

ROM Receive-Only Mode

RSFEC Reed-Solomon Forward Error Correction

RTC Real-Time Communication

RTCP Real-Time Control Protocol

RTMP Real-Time Messaging Protocol

RTP Real-Time Protocol

RTT Round-Trip Time

SAND Server and Network Assisted DASH

SAP Service Access Point

SBI Service-Based Interface

SCONEPRO Secure Communication of Network Properties

SCTE Society of Cable Telecommunications Engineers

SDAP Service Data Adaptation Protocol

SDF Service Data Flow

SEAL Service Enabler Architecture Layer

SEI Supplemental Enhancement Information

SIB System Information Block

SIM Subscriber Identity Module

SLA Service Level Agreement

SMF Session Management Function

SMS Short Message Service

SMTP Simple Mail Transfer Protocol

SRT Secure Reliable Transport

SRV Service

SSD Seek Start-up Delay

SST Slice Selection Type

STS Secure Token Service

SVC Scalable Video Coding

SVTA Streaming Video Technology Alliance

SYN Synchronize

TBD To Be Determined

TCP Transmission Control Protocol

TEE Trusted Execution Environment

TEID Tunnel Endpoint Identifier

TLS Transport Layer Security

TMGI Temporary Mobile Group Identity

TOI Transmission Object Identifier

TSG Technical Specification Group

TSI Transport Stream Identifier

TYP Type

TZM Time Zone Management

UDP User Datagram Protocol

UDR Unified Data Repository

UHD Ultra-High Definition

UMTS Universal Mobile Telecommunications System

UPF User Plane Function

URI Uniform Resource Identifier

URL Uniform Resource Locator

URN Uniform Resource Name

URR Usage Reporting Rule

USIM Universal Subscriber Identity Module

UTC Coordinated Universal Time

UUID Universally Unique Identifier

VBR Variable Bitrate

VSF Video Services Forum

WAVE Web Application Video Environment

WDD Workflow Description Document

XML Extensible Markup Language

XXX To Be Determined

ZSM Zero-touch network and Service Management

## ===== CHANGE =====

# 4 5G Media Streaming

The 5G Media Streaming architecture is defined in TS 26.501 [15].

Protocols and APIs are specified in TS 26.512 [16], with reference to the generalized Media Session Handling to TS 26.510 [108].

Profiles, codecs and formats are provided in TS 26.511 [96].

## ===== CHANGE =====

## 5.15 Media Delivery Specification

### 5.15.1 Description

The primary focus of the update to TS 26.512 [16] is addressing the of segmented media objects in the media plane, i.e. at reference points M2, M3, M4, M7, M11 and M12 of the Media Delivery architecture as shown in Figure 5.15.1-1.



Figure 5.15.1-1 Media Delivery Architecture as defined in TS 26.501 [15] with emphasis for protocol specification (M2, M3, M4, M7, M11 and M12) to be developed.

The specification is expected to address interoperability considerations around content delivery protocol features and general technologies for segmented media streaming and the IP/PDU 5G System Layer. It was discussed whether a new specification is needed or updates to TS 26.512 [16] are sufficient.

M12 is not in scope for this Technical Report and the expected new specification, the focus is on Media AS from/to UE.

Key aspects of such a specification should include common protocols on M2 and M4, as well as common APIs and reference points on M3, M7 and M11. In addition, consistent extensions to such protocols need to be reviewed, for example custom HTTP headers, query parameters, etc.

### 5.15.2 Considered Text in Specification

The following outline is considered for a new specification addressing the media plane.

1 Overview and Assumptions

1.1 General Assumptions and Protocol Stack for M2 and M4: IPv4 or IPv6 and HTTP according to RFC 9110

- HTTP/1.1, TLS (optional), TCP, IP – parallel requests, RFC 9112

- HTTP/2, TLS, TCP, IP – one TCP connection, RFC 9113

- HTTP/3, QUIC (+TLS), UDP, IP – one QUIC connection, RFC 9114

- HTTP Methods

- HTTP Headers

1.2 General Assumptions for M7 and M11

- Existence of a reference API in Media Access function

1.3 General Assumptions for M3

- Existence of a reference API in Media AS

1.4 Features

- What are features?

- Configurable UE and Media AS functionalities.

- Features may be mandatory or optional, but are typically optional

- Features are fully specified and normative

- How can the features be configured?

- What are the requirements for each feature?

- Overview of features and mapping to reference points

2 Media Delivery Features

- For each feature

- Overview

- Procedures (if not in stage-2, possibly referenced)

- Requirements for each function and reference point

- Configuration on AS through M3, Impact on M2 and M4, client APIs M7 and M11.

- Implementation Guidelines

### 5.15.3 Conclusions

Based on the discussion in this clause, it is recommended to

- update TS 26.512 for addressing extensions to media segment-based delivery

- adopt a documentation following the structure in clause 5.15.2.

## ===== CHANGE =====

## 6.15 Media Delivery Specification

The primary focus of the update to TS 26.512 [16] is addressing the of segmented media objects in the media plane, i.e. at reference points M2, M3, M4, M7, M11 and M12 of the Media Delivery architecture as shown in Figure 5.15.1-1.

Based on the discussion in clause 5.15 and the conclusion in 5.15.3, it is recommended to

- update TS 26.512 for addressing extensions to media segment-based delivery

- adopt a documentation following the structure in clause 5.15.2.