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5G;
Study on media handling aspects of conversational services in 5G systems (3GPP TR 26.919 version 17.0.0 Release 17)

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650 Route des Lucioles
F-06921 Sophia Antipolis Cedex - FRANCE

Tel.: +33 4 92 94 42 00 Fax: +33 4 93 65 47 16

Siret N° 348 623 562 00017 - APE 7112B
Association à but non lucratif enregistrée à la
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Introduction

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The present document studies media handling aspects of 5G conversational services, focusing on Multimedia Telephony Service over IMS (MTSI) in TS 26.114 [4] and IMS-based Telepresence Service in TS 26.223 [5]. Various technical aspects including speech codecs, video codecs, media rate adaptation, virtual reality (VR) support and new radio (NR) considerations are addressed, and related gap analysis and potential solutions are documented.

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1 Scope

The present document provides a study on the media handling aspects of conversational services in 5G, taking as baseline the Stage-1 requirements developed in TS 22.261 [2], as well as the Stage-2 architecture for 5G systems developed in TS 23.501 [3]. This includes the investigation of the following areas:

- Media handling aspects of the 5G system architecture in relation to 3GPP conversational services, e.g., Multimedia Telephony Service over IMS (MTSI) in TS 26.114 [4] and IMS-based Telepresence Service in TS 26.223 [5].
- Relevance and potential reuse of components in existing 3GPP conversational services (e.g., MTSI, IMS-based telepresence, etc.) in the context of 5G systems and related Stage-2 architecture, e.g., use of MTSI features for supporting voice and video calls, use of MTSI, MS-MTSI and IMS-telepresence features for supporting multi-party conferencing, and applicability of existing QoE monitoring and QoS handling mechanisms.
- Potential enhancements to existing 3GPP conversational services (e.g., MTSI, IMS-based telepresence, etc.) towards better fulfilling the Stage-1 requirements in TS 22.261, e.g., in terms of criteria such as latency and bandwidth efficiency, while also taking into consideration the Stage-2 architecture for 5G systems:
  - In case existing codecs are unable to address 5G application requirements, new media codec requirements for 3GPP conversational services may be developed.
- The need for, and potential use of, new QoS media handling mechanisms in 5G systems such as traffic classification and codec-aware network elements in the context of 3GPP conversational services.

The gap analysis of the above areas and associated recommendations and conclusions for the proposed improvements are documented in the present document.

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2 References

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

[2] 3GPP TS 22.261: "Service Requirements for Next Generation New Services and Markets; Stage 1".

[3] 3GPP TS 23.501: "System Architecture for the 5G System; Stage 2".

[4] 3GPP TS 26.114: "IP Multimedia Subsystem (IMS); Multimedia telephony; Media handling and interaction".

[5] 3GPP TS 26.223: "Telepresence using the IP Multimedia Subsystem (IMS); Media handling and interaction".

[6] 3GPP TR 23.799: "Study on Architecture for Next Generation System".

[7] 3GPP TS 23.228: "IP Multimedia Subsystem (IMS); Stage 2".

[8] 3GPP TS 23.503: "Policy and Charging Control Framework for the 5G System".

[9] 3GPP TR 26.918: "Virtual Reality (VR) media services over 3GPP".

[10] 3GPP TS 38.300: "NR; NR and NG-RAN Overall Description".

[11] 3GPP TS 38.331: "NR; Radio Resource Control (RRC); Protocol Specification".

[12] 3GPP TS 36.331: "Evolved Universal Terrestrial Radio Access (E-UTRA); Radio Resource Control (RRC) protocol specification".

[13] 3GPP TR 26.910: "Study on Media Handling Aspects of RAN Delay Budget Reporting in MTSI".

[14] 3GPP TR 26.959: "Study on enhanced Voice over LTE (VoLTE) performance".

[15] ISO/IEC 23008-2: "Information technology -- High efficiency coding and media delivery in heterogeneous environments -- Part 2: High efficiency video coding".

[16] ISO/IEC 23090-2: " Information technology -- Coded representation of immersive media -- Part 2: Omnidirectional media format".

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[20] 3GPP TS 38.306: "NR; User Equipment (UE) radio access capabilities".

[21] 3GPP TS 38.321: "NR; Medium Access Control (MAC) protocol specification".

[22] 3GPP TS 38.300: "NR; NR and NG-RAN Overall Description; Stage 2".

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[30] IETF Internet Draft draft-ietf-mmusic-msrp-usage-data-channel-12 (2019), "MSRP over Data Channels", https://tools.ietf.org/html/ draft-ietf-mmusic-msrp-usage-data-channel-12, WORK IN PROGRESS.

[31] 3GPP TS 24.371: "WebRTC access to the IMS; Stage 3; Protocol specification".

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3 Definitions and Abbreviations

3.1 Definitions

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

3.2 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].

5GC	5G Core
AF	Application Function
AMF	Access and Mobility Management Function
AN	Access Network
ANBR	Access Network Bitrate Recommendation
AS	Application Server
CMR	Codec Mode Request
CN	Core Network
CP	Control Plane
ECN	Explicit Congestion Notification
IBCF	Interconnection Border Control Function
KPI	Key Performance Indicator
MRFC	Media Resource Function Controller
MRFP	Media Resource Function Processor
MTSI	Multimedia Telephony Service over IMS
MS-MTSI	Multi-Stream MTSI
NEF	Network Exposure Function
NR	New Radio
NRF	Network Repository Function
OMAF	Omnidirectional MediA Format
PCF	Policy Control Function
QoE	Quality of Experience
SA	Standalone
SEI	Supplemental Enhancement Information
SMF	Session Management Function
SRVCC	Single Radio Voice Call Continuity
TMMBN	Temporary Maximum Media Stream Bit Rate Notification
TMMBR	Temporary Maximum Media Stream Bit Rate Request
TrGW	Transition Gateway
UDM	Unified Data Management
UDR	Unified Data Repository
UL	Up-link
UP	User Plane
UPF	User Plane Function
VoLTE	Voice over LTE
VoNR	Voice over NR

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4 5G System Overview

4.1 Introduction

This clause provides the background on 5G system requirements and architecture. Clause 4.2 describes the 5G Stage-1 Requirements. Clause 4.3 describes 5G Stage-2 architecture.

4.2 Stage-1 Requirements

TS 22.261 [2] developed by SA1 compiles service and operational requirements that define a 5G system. The 5G system is characterised, for example, by:

- Support for multiple access technologies
- Scalable and customizable network

- Advanced Key Performance Indicators (KPIs) (e.g., availability, latency, reliability, user experienced data rates, area traffic capacity)
- Flexibility and programmability (e.g., network slicing, diverse mobility management, Network Function Virtualization)
- Resource efficiency (both user plane and control plane)
- Seamless mobility in densely populated and heterogeneous environment
- Extreme long range coverage in low density areas
- Markets requiring minimal service levels with minimal user experience requirements around performance metrics such as bitrate, latency and coverage
- Support for real time and non-real time multimedia services and applications with advanced Quality of Experience (QoE), including services such as telepresence, virtual presence and telemedicine support

Many of the considered 5G system-related use cases and associated requirements in TS 22.261 relate to multimedia delivery, processing and storage.

4.3 Stage-2 System Architecture

In order to address the Stage-2 architectural aspects of 5G systems, SA2 has completed normative work "5G System - Phase 1", defined to support data connectivity and services enabling deployments to use techniques such as e.g. Network Function Virtualization and Software Defined Networking. For this purpose, the specification TS 23.501 [3] was developed, based on the conclusions of the Rel-14 study item FS_NextGen and related TR 23.799 [6].

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TS 23.501 covers the 5G System architecture that is defined to support data connectivity and services enabling deployments to use techniques such as Network Function Virtualization and Software Defined Networking. The 5G System architecture leverages service-based interactions between Control Plane (CP) Network Functions where identified. Some key principles and concept are to:

- Separate the User Plane (UP) functions from the Control Plane (CP) functions, allowing independent scalability, evolution and flexible deployments, e.g. at a centralized location or distributed (remote) locations.

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- Modularize the function design, e.g. to enable flexible and efficient network slicing.
- Wherever applicable, define procedures (i.e. the set of interactions between network functions) as services, so that their re-use is possible.
- Enable each Network Function to interact with other NF directly if required. The architecture does not preclude the use of an intermediate function to help route Control Plane messages (e.g. like a DRA).
- Minimize dependencies between the Access Network (AN) and the Core Network (CN). The architecture is defined with a converged core network with a common AN - CN interface which integrates different 3GPP and non-3GPP access types.
- Support a unified authentication framework.
- Support "stateless" NFs, where the "compute" resource is decoupled from the "storage" resource.
- Support capability exposure.
- Support concurrent access to local and centralized services. To support low latency services and access to local data networks, UP functions can be deployed close to the Access Network.
- Support roaming with both Home routed traffic as well as Local breakout traffic in the visited PLMN.

The 5G architecture is defined as service-based and the interaction between network functions is represented in two ways.

- A service-based representation, where network functions (e.g. AMF) within the Control Plane enables other authorized network functions to access their services. This representation also includes point-to-point reference points where necessary.

- A reference point representation, which shows the interaction between the NF services in the network functions described by point-to-point reference point (e.g. N11) between any two network functions (e.g. AMF and SMF).

Figure 4.3.1 depicts the non-roaming reference architecture. Service-based interfaces are used within the Control Plane.

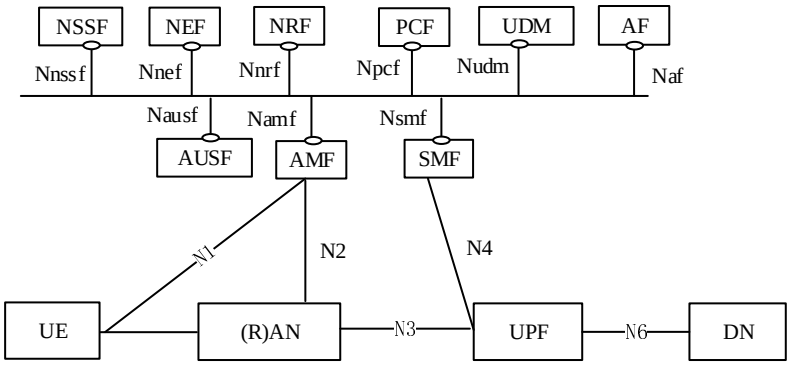

Figure 4.3.1: 5G System architecture

Figure 4.3.2 depicts the 5G System architecture in the non-roaming case, using the reference point representation showing how various network functions interact with each other.

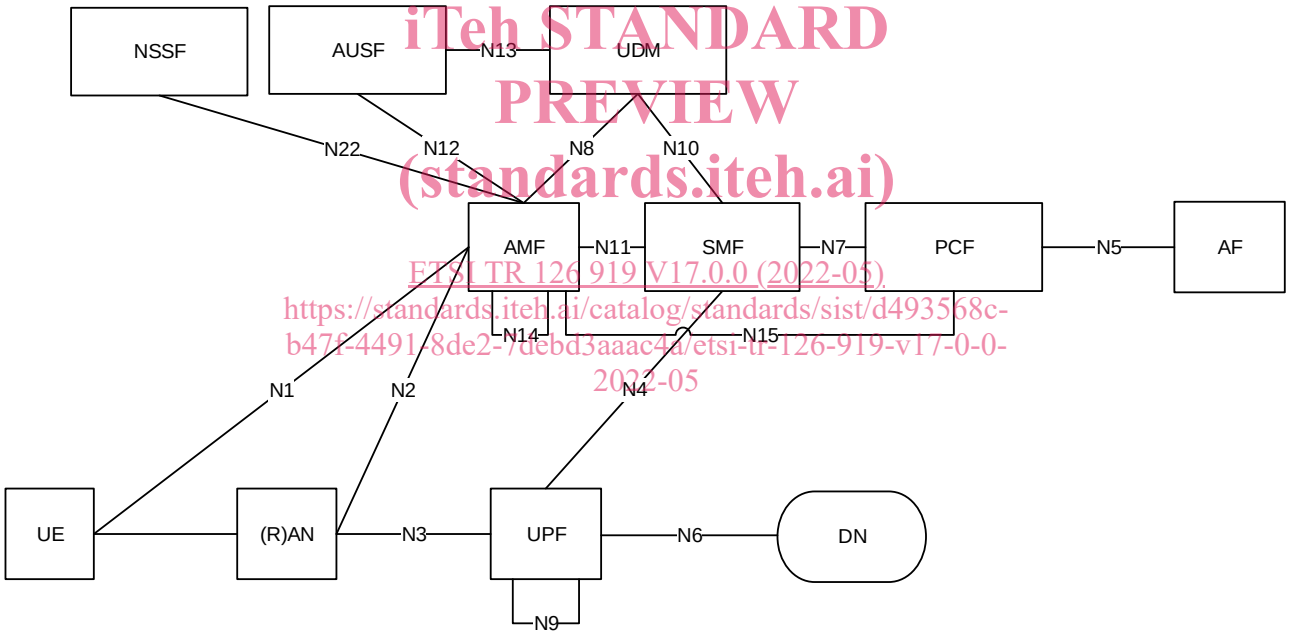

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Figure 4.3.2: Non-Roaming 5G System Architecture in reference point representation

The 5G System architecture consists of the following network functions (NF):

- Application Function (AF) interacts with the 3GPP Core Network in order to provide services, for example to support the following functionalities: Application influence on traffic routing, accessing Network Exposure Function, interacting with the Policy framework for policy control.

- Access and Mobility Management function (AMF) includes the following functionalities: Mobility management, connection management, lawful intercept, transparent proxy, access authentication and authorization.

- Session Management Function (SMF) includes the following functionalities: Session establishment, modification and release, selection and control of UP function, UE IP address allocation and management, traffic steering configuration at UPF, control part of policy enforcement and QoS, charging data collection.