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Contents

Foreword

This Technical Specification has been produced by the 3rd Generation Partnership Project (3GPP).

The contents of the present document are subject to continuing work within the TSG and may change following formal TSG approval. Should the TSG modify the contents of the present document, it will be re-released by the TSG with an identifying change of release date and an increase in version number as follows:

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y the second digit is incremented for all changes of substance, i.e. technical enhancements, corrections, updates, etc.

z the third digit is incremented when editorial only changes have been incorporated in the document.

In the present document, modal verbs have the following meanings:

shall indicates a mandatory requirement to do something

shall not indicates an interdiction (prohibition) to do something

The constructions "shall" and "shall not" are confined to the context of normative provisions, and do not appear in Technical Reports.

The constructions "must" and "must not" are not used as substitutes for "shall" and "shall not". Their use is avoided insofar as possible, and they are not used in a normative context except in a direct citation from an external, referenced, non-3GPP document, or so as to maintain continuity of style when extending or modifying the provisions of such a referenced document.

should indicates a recommendation to do something

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may indicates permission to do something

need not indicates permission not to do something

The construction "may not" is ambiguous and is not used in normative elements. The unambiguous constructions "might not" or "shall not" are used instead, depending upon the meaning intended.

can indicates that something is possible

cannot indicates that something is impossible

The constructions "can" and "cannot" are not substitutes for "may" and "need not".

will indicates that something is certain or expected to happen as a result of action taken by an agency the behaviour of which is outside the scope of the present document

will not indicates that something is certain or expected not to happen as a result of action taken by an agency the behaviour of which is outside the scope of the present document

might indicates a likelihood that something will happen as a result of action taken by some agency the behaviour of which is outside the scope of the present document

might not indicates a likelihood that something will not happen as a result of action taken by some agency the behaviour of which is outside the scope of the present document

In addition:

is (or any other verb in the indicative mood) indicates a statement of fact

is not (or any other negative verb in the indicative mood) indicates a statement of fact

The constructions "is" and "is not" do not indicate requirements.

Introduction

The use of 5GS to support MC services (i.e., MCPTT defined in 3GPP TS 23.379 [6], MCVideo defined in 3GPP TS 23.281 [4], MCData defined in 3GPP TS 23.282 [5]) including common application plane and signalling plane entities is specified in the present document.

Each MC service supports several types of communications amongst the users (e.g. group communication, peer to peer communication). There are several general functions and entities (e.g. configuration, identity) which are used by the MC services. The general functional architecture to support MC services utilizes aspects of the IMS architecture specified in 3GPP TS 23.228 [2].

An MC service UE in the 5GS context obtains access to a MC service via 3GPP access (i.e., E-UTRA, 5G NR), wireless non-3GPP access (e.g. WLAN or Satellite) and/or wireline access using the 5GS architecture defined in 3GPP TS 23.501 [7]. Certain MC service functions such as dispatch and administrative functions can be supported using MC service UEs with 3GPP access and non-3GPP wireless/wireline access. External applications usage of MC services can be enabled via 3GPP access and/or non-3GPP access.

NOTE: Dispatch consoles and devices used by MC service administrators are considered as MC service UEs to support MC services.

1 Scope

The present document specifies the use of the 5G System (5GS) considering common functional architecture, procedures and information flows needed to support mission critical services encompassing the common services core architecture.

The corresponding service requirements applied in 3GPP TS 23.280 [3], 3GPP TS 22.179 [11], 3GPP TS 22.280 [12], 3GPP TS 22.281 [13] and 3GPP TS 22.282 [14] also apply here.

The corresponding MC service specific procedures and information flows are defined in TS 23.379 [6], TS 23.281[4], and TS 23.282 [5].

The present document is applicable primarily to mission critical services using 3GPP access (5G NR and/or E-UTRA) and non-3GPP access (WLAN, Satellite and/or wireline) based on the 5GC architecture defined in 3GPP TS 23.501 [7].

The common functional architecture to support mission critical services can be used for public safety applications and for general commercial applications e.g. utility companies and railways.

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 23.228: "IP Multimedia Subsystem (IMS); Stage 2".

[3] 3GPP TS 23.280: "Common functional architecture to support mission critical services; Stage 2".

[4] 3GPP TS 23.281: "Functional architecture and information flows to support Mission Critical Video (MCVideo); Stage 2".

[5] 3GPP TS 23.282: "Functional architecture and information flows to support Mission Critical Data (MCData); Stage 2".

[6] 3GPP TS 23.379: "Functional architecture and information flows to support Mission Critical Push To Talk (MCPTT); Stage 2".

[7] 3GPP TS 23.501: "System architecture for the 5G System (5GS)".

[8] 3GPP TS 23.002: "Network Architecture".

[9] 3GPP TS 23.503: "Policy and Charging Control Framework for the 5G System (5GS); Stage 2".

[10] 3GPP TS 23.502: "Procedures for the 5G System (5GS)".

[11] 3GPP TS 22.179: "Mission Critical Push to Talk (MCPTT); Stage 1".

[12] 3GPP TS 22.280: "Mission Critical Services Common Requirements (MCCoRe); Stage 1".

[13] 3GPP TS 22.281: "Mission Critical (MC) Video".

[14] 3GPP TS 22.282: "Mission Critical (MC) Data".

3 Definitions of terms, symbols and abbreviations

3.1 Terms

For the purposes of the present document, the terms 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].

For the purposes of the present document, the following terms given in 3GPP TS 23.280 [3] apply:

MC service
MC service user
MC service UE
MC system
MC user

3.2 Symbols

Void.

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].

Void.

4 MC service system resource requirements

4.1 Multiple Access

4.1.1 General

5GS provides simultaneous integration of different access types 3GPP and non-3GPP (wireline and wireless), defined in 3GPP TS 23.501 [7]. Accordingly, this enables the MC service UE to be used under both stationary and non-stationary conditions.

With the convergence of multiple access technologies in 5GS, service features can be assigned agnostically without taking the access type into account for the MC service user.

4.1.2 Requirements

With the use of 5GS, MC services shall be available via 3GPP access as well as via non-3GPP access. To enable access to the MC service system, the use of the various access types shall be authorized by the 5GC. The simultaneous use of different access types (Access Traffic Steering, Switching and Splitting) is defined in 3GPP TS 23.501 [7] and its characteristics are subject to respective operators policy.

4.2 Session connectivity

4.2.1 General

The access from 5GS to the MC service environment takes place via the Data Network (DN) in accordance with 3GPP TS 23.501 [7]. A Data Network Name (DNN) as part of the 5GS user profile allows access to the Data Network with up to 8 connectivity sessions (PDU sessions) each with up to 64 communication flows (QoS flows). Different data networks require different DNNs.

4.2.2 Requirements

For MC service UEs who only utilize 5GS, a single DNN may be used for:

- for the SIP-1 reference point;
- for the HTTP-1 reference point; and
- for the CSC-1 reference point.

The DNN shall be made available to the MC service UE either via UE (pre)configuration or via initial UE configuration on a per HPLMN and optionally also per VPLMN basis.

NOTE 1: The Data Network access can also be shared with the "IMS" access taking into account the communication flow limits.

The MC service UE may exploit secondary authentication/authorization by a DN-AAA server during the establishment of session connectivity as specified in 3GPP TS 23.501 [7] using the Extensible Authentication Protocol (EAP) to access the DN identified by the MC service DNN. If required, DN access credentials shall be made available to the MC service UE via initial MC service UE configuration on a per DNN basis.

The DN connection to the DNN defined within the present subclause can be of PDU session type "IPv4", "IPv6", "IPv4v6", Ethernet or Unstructured (see 3GPP TS 23.501 [7]). If a DN connection to an DNN defined within the present subclause is of type "IPv4v6" then the MC service client shall use configuration data to determine whether to use IPv4 or IPv6.

NOTE 2: In accordance to 3GPP TS 23.501 [7], the use of PDU session type Ethernet and Unstructured has limited support in the Session and Service Continuity context.

For MC service UEs who utilize EPS and 5GS 3GPP TS 23.280 [3] clause 5.2.7 applies.

4.3 QoS characteristics

4.3.1 General

In 5GS, quality of service is enforced at QoS flow level and corresponding packets are classified and marked with an identifier in accordance with 3GPP TS 23.501 [7]. Every QoS flow is characterized by a QoS profile provided by the 5GC. and can be used for all connectivity types (PDU sessions) in accordance with 3GPP TS 23.501 [7].

5G QoS characteristics, standardized or non-standardized, are indicated through the 5QI value in accordance with 3GPP TS 23.501 [7]. Standardized 5QI values have a one-to-one mapping to a standardized combination of 5G QoS characteristics and non-standardized 5QI values allows a dynamic assignment of QoS parameter values.

NOTE 1: The use of non-standardized 5QI values can be subject for harmonisation within the individual user area.

The QoS parameter Allocation Retentions Priority (ARP) determines the priority level, the pre-emption capability and the pre-emption vulnerability of each QoS flow. ARP priority level defines the relative importance of a resource request to allow in deciding whether a new QoS Flow may be accepted or needs to be rejected in the case of resource limitations in accordance with 3GPP TS 23.501 [7].

NOTE 2: The use of ARP is regulated by the individual MC service.

4.3.2 QoS requirements for general purposes

The selection, deployment, initiation, and termination of QoS signalling and resource allocation shall consider the QoS mechanisms described in 3GPP TS 23.501 [7], 3GPP TS 23.502 [10] and 3GPP TS 23.503 [9].

MC system as well as MC service UE may share one DNN using multiple QoS flows for the settlement of MC services, application plane and signalling plane.

For the transport of SIP-1 reference point signalling, the standardized 5QI value of 69 in accordance with 3GPP TS 23.501 [7] shall be used.

For the transport of HTTP-1 reference point signalling, the standardized 5QI value of 8 in accordance with 3GPP TS 23.501 [7] or better shall be used.

MC services shall use standardized 5QI values or may use non-standardized 5QI values in accordance with 3GPP TS 23.501.

When the MC system utilizes IMS services, at least one QoS flow shall be associated for IMS signalling. The generic mechanisms for interaction between QoS and session signalling applicable for the use of IMS in the 5GS context are defined in 3GPP TS 23.228 [2].

4.3.3 QoS requirements for Mission Critical Push to Talk

4.3.3.1 General

The requirements listed here apply for the use of 5GS and replace the corresponding requirements in 3GPP TS 23.379 [6].

4.3.3.2 5QI values for MCPTT

The MCPTT system may use the N5 reference point or Rx reference point for direct interaction with 5GS PCF to determine the required QoS flow parameters. Alternatively, the MCPTT system may use the N33 reference point for indirect interaction with 5GS NEF. A QoS flow for an MCPTT voice call and MCPTT-4 reference point signalling shall utilize 5QI value 65 in accordance with 3GPP TS 23.501 [7].

4.3.3.3 Use of priorities

The QoS flow for an MCPTT emergency call shall have highest priority level among MCPTT call types. The QoS flow for MCPTT imminent peril call shall have higher priority level than one for a MCPTT call.

Depending on operators' policy, the MCPTT system may be able to request modification of the priority (ARP) of an established QoS flow.

NOTE: Operators' policy takes into account regional/national requirements.

4.3.4 QoS requirements for Mission Critical Video

4.3.4.1 General

The requirements listed here apply for the use of 5GS and replace the corresponding requirements in 3GPP TS 23.281.

4.3.4.2 5QI values for MCVideo

The MCVideo system may use the N5 reference point or Rx reference point for direct interaction with 5GS PCF to determine the required QoS flow parameters. Alternatively, the MCVideo system may use the N33 reference point for indirect interaction with 5GS NEF. Video media and control of the video media (i.e. MCVideo-4 and MCVideo-7) may use independent QoS flows and utilizes 5QI values depending on the MCVideo mode of the MCVideo call/session, as per table 4.3.4.2-1.

Table 4.3.4.2-1: MCVideo mode associated 5QI values

MCVideo mode	5QI value utilized (in accordance with 3GPP TS 23.501 [7])
Urgent real-time mode	67
Non-urgent real-time mode	67
Non real-time mode	4

For transmission and reception control signalling, the 5QI value 69 is recommended in accordance with 3GPP TS 23.501 [7].

4.3.4.3 Use of priorities

The MCVideo audio media and video media may transmit over dedicated QoS flows, in which case the priority for each QoS flow is determined by the operator policy.

MCVideo services shall be able to use ARP pre-emption capability and the pre-emption vulnerability of each individual QoS flow according to operators' policy. Depending on operators' policy, the MCVideo system may be able to request modification of the priority (ARP) of an established QoS flow.

NOTE: Operator policy takes into account regional/national requirements.

4.3.5 QoS requirements for Mission Critical Data

4.3.5.1 General

The requirements listed here apply for the use of 5GS and replace the corresponding requirements in 3GPP TS 23.282.

4.3.5.2 5QI values for MCData

The MCData system may use the N5 reference point or Rx reference point for direct interaction with 5GS PCF to determine the required QoS flow parameters. Alternatively, the MCData system may use the N33 reference point for indirect interaction with 5GS NEF. A QoS flow for MCData media may utilize standardized 5QI value 70 or may utilize non-standardized 5QI values in accordance with 3GPP TS 23.501 [7].

4.3.5.3 Use of priorities

The QoS flows for MCData emergency communications shall have highest priority level among MCData communication types. The QoS flow for MCData imminent peril call shall have higher priority level than one for a MCData communication.

MCData services shall be able to use ARP pre-emption capability and the pre-emption vulnerability of each individual QoS flow according to operators' policy.

NOTE: Operators' policy takes into account regional/national requirements.

4.4 Network Slicing

4.4.1 General

Network slicing in accordance with 3GPP TS 23.501 [7] can be used for several purposes such as to separate MC service users, UEs as well as applications in accordance with the various QoS requirements independent from 3GPP or non-3GPP access.

The corresponding slice information identifies a network slice across the 5G core, access network and the UE. In accordance with 3GPP TS 23.501 [7] standardized and non-standardized slice selection information can be used.

4.4.2 Requirements

For the use of network slicing in the MC service context, the following minimum requirements in accordance with 3GPP TS 23.501 [7] shall be considered:

One network slice shall be assigned per PDU session and may benefit from a dedicated transmission resource allocation.

The Initial MC service UE configuration shall contain at least one network slice identity (S-NSSAI) on a per HPLMN and optionally also per VPLMN basis.

If Network Slice-Specific Authentication and Authorization is used, the Initial MC service UE configuration or UE (pre)configuration shall provide the corresponding credentials for the network slice identity (S-NSSAI).

At least one S-NSSAI in the Initial MC service UE configuration shall be marked as default S-NSSAI.

The use of network slices corresponding to non-standardized NSSAIs across PLMN boundaries requires harmonisation in order to guarantee their availability.

4.5 Use of public and non-public networks

4.5.1 General

MC services are service agnostic with respect to 5GS, i.e., the available service options are identical in both public networks (i.e. PLMN) and Non-Public Networks (NPNs). A Non-Public Network (NPN) can be deployed in organization defined premises and the 5G network services are provided to a defined set of users or organizations in accordance with 3GPP TS 23.501 [7].

4.5.2 Requirements

An MC service system shall be able to utilize connectivity from public 5GS networks and non-public 5GS networks in accordance with 3GPP TS 23.501 [7].

4.6 Migration

4.6.1 General

For the migration of an MC service user the general assumptions in 3GPP TS 23.280 [3] clause 5.2.9.1 are applied.

4.6.2 Public network utilization

Migrated MC service users should utilize the home PLMN of the partner MC system to access MC services in the partner MC system, however, utilizing the home PLMN of the primary MC system is not precluded.

NOTE 1: The above recommendation ensures the security policy of the partner MC system and is not compromised, the expected 5QIs are used on the 5GS to ensure that service-level delay requirements are consistently met (which are especially at risk when the home PLMN of the primary MC system and the home PLMN of the partner MC system are far apart from a geographical point of view).

NOTE 2: Whether the home PLMN of partner MC systems or the home PLMNN of the primary MC system is used to access MC services in partner MC systems is left to business agreements between MC service providers and is outside the scope of the present document.

NOTE 3: The MC service user's MCData message store will not be available when using the home PLMN of the partner MC system to access MC services in migration.

The MC service user profile enabled for migration shall be provisioned with configuration data that specifies which PLMNs supporting 5GS are to be selected when migrating to another MC system.

If the home PLMN of a partner MC system is different from the home PLMN of the primary MC system (i.e. migrating MC service users roam into the home PLMN of the partner MC system), then:

- 5GS-level roaming is required between the home PLMN of the primary MC system and home PLMN of the partner MC system;
- the home PLMN of the partner MC system needs to enable local break-out for the DNNs in accordance to subclause 4.2.2 that identify the DNs of the partner MC system; and
- the 5GS user profile of the home PLMN of the primary MC system used by the MC service users who are allowed to migrate to the partner MC system needs to be provisioned with, and local break-out enabled for, the DNNs proposed in subclause 4.2.2 that identify the DNs of the partner MC system.

If the home PLMN of the partner MC system and the home PLMN of the primary MC system are the same (i.e. migrating MC service users continue to use the home PLMN of their primary MC system), then:

- the 5GS user profile of the home PLMN of the primary MC system utilized by the MC service users who are allowed to migrate to the partner MC system needs to be provisioned with the DNNs specified in subclause 4.2.2 that identify the DNs of the partner MC system.

4.6.3 Non-Public network utilization

Editor's Note: The utilization of NPN is FFS.

5. MC system functional model

5.1 General

The functional model for the MC services architecture is defined as a series of planes to allow for the breakdown of the architectural description. Each plane is expected to operate in an independent manner, providing services to the connected planes as and when requested by the connected plane, and requesting services from other planes as required.

In this context, each plane manages on its own behalf:

a) Use of identities: Each plane is responsible for the privacy of that plane's own identities; and

b) Security for that plane: It does not preclude a plane requesting security services from another plane, but that is a decision made within the plane, as to whether to use offered security services or mechanisms within the plane itself.

NOTE: Terminology such as client and server are not meant to imply specific physical implementation of a functional entity.

5.2 Description of the planes

The following planes are identified:

a) application plane: The application plane provides all of the services (e.g. call control, floor control, video control, data control, conferencing of media, provision of tones an announcements) required by the user together with the necessary functions to support MC service. It uses the services of the signalling control plane to support those requirements.

b) signalling control plane: The signalling control plane provides the necessary signalling support to establish the association of users involved in an MC service, such as an MCPTT call or other type of MC services. The signalling control plane also offers access to and control of services across MC services. The signalling control plane uses the services of session connectivity.

The corresponding session connectivity supporting these planes are defined for the use of 5GS within 3GPP TS 23.501 [7]. The associated resource control to support these planes is defined within 3GPP TS 23.503 [9].

Editor's Note: The use of multicast session connectivity and associated procedures for the application plane is FFS.

5.3 Common functional model description

5.3.1 On-network functional model

Each MC service can be represented by an application plane functional model. The corresponding functional model across MC services may be similar but is described by the individual functional entities and reference points that belong to that MC service. Within the application plane for an MC service, a common set of functions as well as reference points is shared across MC services and is referred as the common services core.

Figure 5.3.1-1 shows the common functional model for the application plane for an MC system using 5GS.

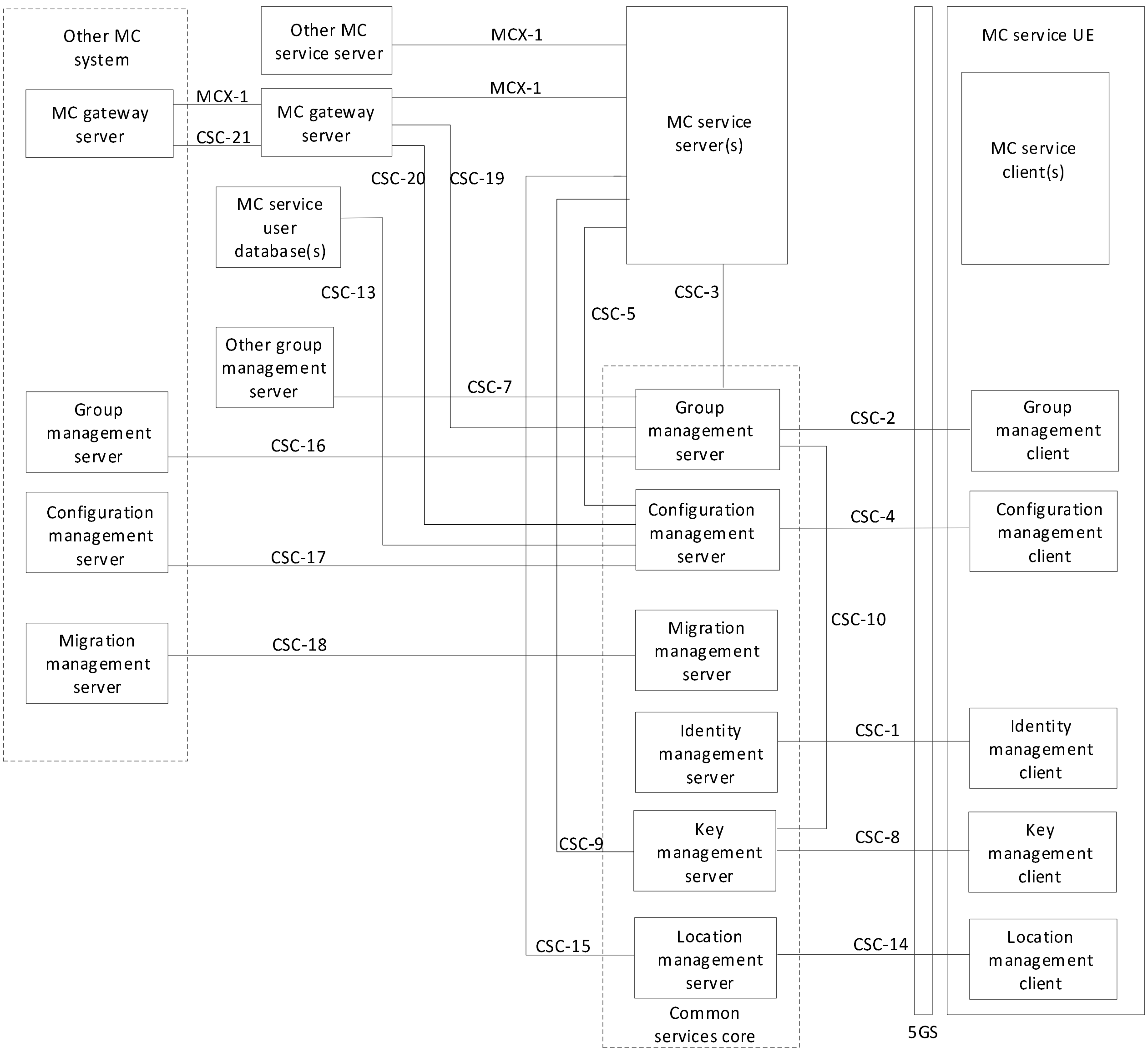

Figure 5.3.1-1: Common functional model for application plane for an MC system

The common services core functions and reference points shown in figure 5.3.1-1 are shared across each MC service.

Figure 5.3.1-2 shows the common functional model for the signalling control plane using 5GS.

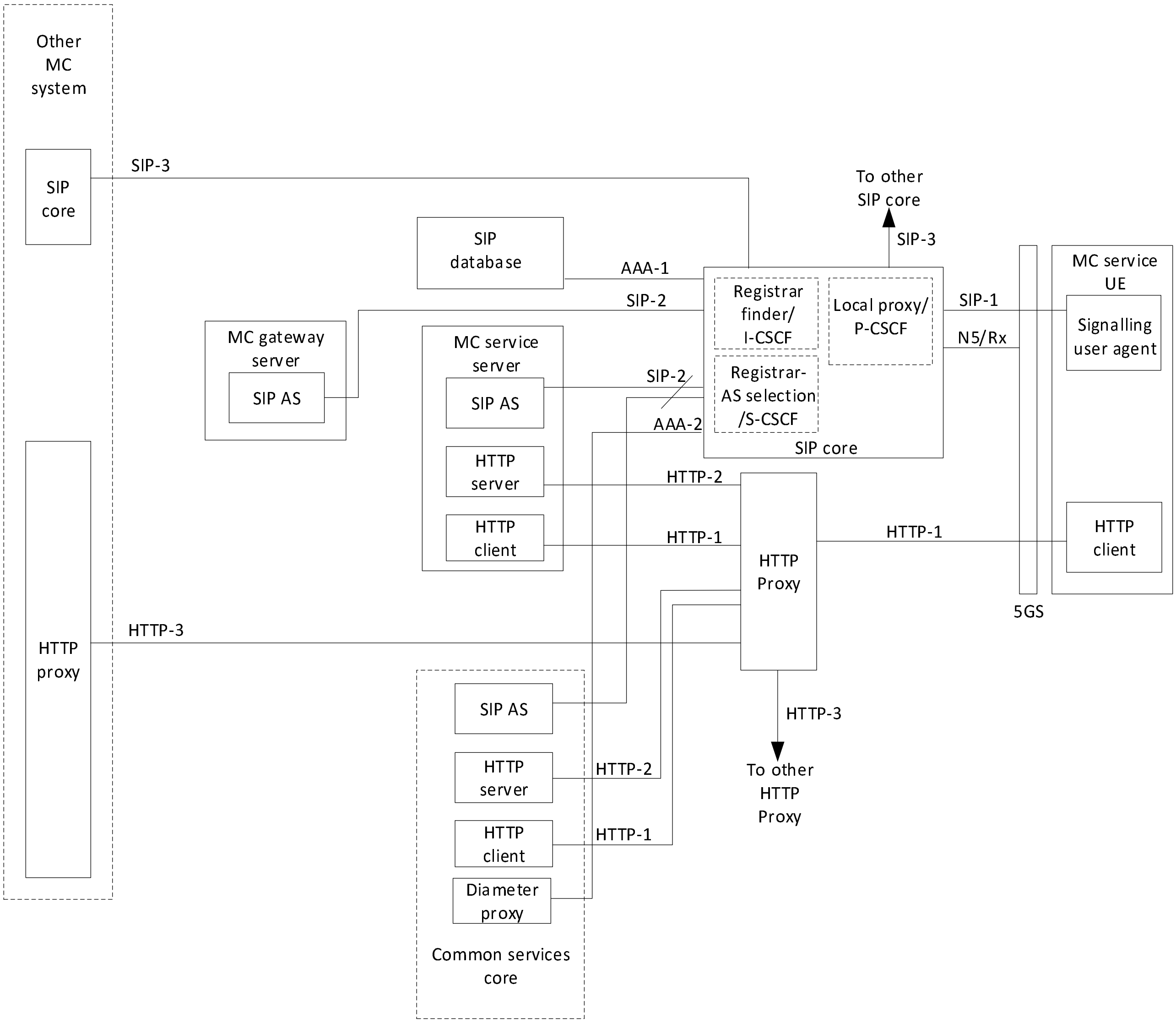

Figure 5.3.1-2: Common functional model for signalling control plane

In the model shown in figure 5.3.1-2, the SIP core may interact directly with 5GS via the N5 reference point or Rx reference point to control QoS on a per communication flow in accordance with 3GPP TS 23.501 [7].

NOTE 1: Indirect interaction between SIP core and 5GS Network Exposure Function using N33 reference point is not supported by 3GPP TS 23.002 [8].

Figure 5.3.1-3 shows the relationships between the reference points of the common application plane of an MC service server and the common signalling plane.

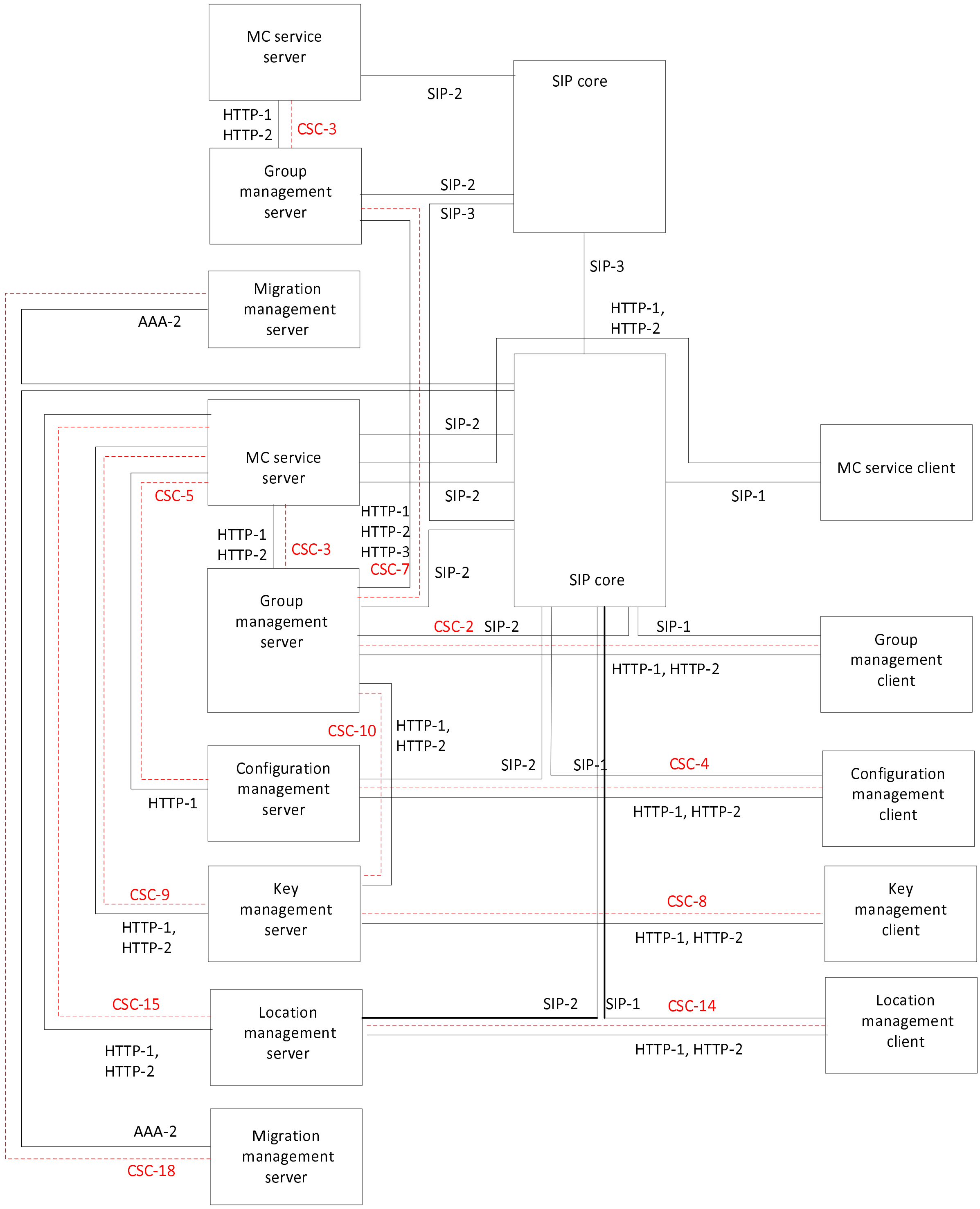

Figure 5.3.1-3: Relationships between reference points of the common MC service application plane and signalling control planes

NOTE 2: Application plane reference point CSC-7 makes use of SIP-2 reference point when the group management servers are connected by a single SIP core. Where they are joined by more than one SIP core, CSC-7 also makes use of the SIP-3 reference point.

NOTE 3: For simplicity, the HTTP proxy, which provides the interconnection between HTTP-1, HTTP-2 and HTTP-3 reference points, is not shown in figure 5.3.1-3.

NOTE 4: CSC-5, CSC-9, and CSC-15 make use of SIP-1 and SIP-2 reference points. For simplicity, this mapping relationship is not shown in figure 5.3.1-3.

5.3.2 Functional entities description

5.3.2.1 General

Each subclause is a description of a functional entity and does not imply a physical entity.

5.3.2.2 Application plane

The description of the application plane entities in 3GPP TS 23.280 [3] applies.

5.3.2.3 Signalling control plane

The description of the signalling control plane entities in 3GPP TS 23.280 [3] applies.

5.3.3 Reference points

5.3.3.1 General reference point principle

The protocols on any reference point that is exposed for MC service interoperability with other SIP core or other IMS entities in other systems shall be compatible with the protocols defined for the corresponding reference point defined in 3GPP TS 23.002 [8].

5.3.3.2 Application plane

5.3.3.2.1 General

The definition of the application plane reference points in 3GPP TS 23.280 [3] applies.

5.3.3.3 Signalling control plane

5.3.3.3.1 General

The reference points for the SIP and HTTP signalling are described in the following subclauses.

5.3.3.3.2 Reference point SIP-1(between the signalling user agent and the SIP core)

The SIP-1 reference point, which exists between the signalling user agent and the SIP core for establishing a session in support of MC service, shall use the Gm reference point as defined in 3GPP TS 23.002 [8] (with necessary enhancements to support MC service requirements and profiled to meet the minimum requirements for support of MC services). The SIP-1 reference point is used for:

- SIP registration;
- authentication and security to the service layer;
- event subscription and event notification;
- overload control;
- session management; and
- media negotiation.

Editor's Note: Necessary functions in the context of multicast operation are FFS.

5.3.3.3.3 Reference point SIP-2 (between the SIP core and the SIP AS)

The SIP-2 reference point, which exists between the SIP core and the SIP AS for establishing a session in support of MC service, shall use the ISC and Ma reference points as defined in 3GPP TS 23.002 [8]. The SIP-2 reference point is used for:

- notification to the MC service server(s) of SIP registration by the MC service UE;
- authentication and security to the service layer;
- event subscription and event notification;
- session management; and
- media negotiation.

Editor's Note: Necessary functions in the context of multicast operation are FFS.

5.3.3.3.4 Reference point SIP-3 (between the SIP core and SIP core)

The description of the SIP-3 reference point in 3GPP TS 23.280 [3] applies.

5.3.3.3.5 Reference point HTTP-1 (between the HTTP client and the HTTP proxy)

The description of the HTTP-1 reference point in 3GPP TS 23.280 [3] applies.

5.3.3.3.6 Reference point HTTP-2 (between the HTTP proxy and the HTTP server)

The description of the HTTP-2 reference point in 3GPP TS 23.280 [3] applies.

5.3.3.3.7 Reference point HTTP-3 (between the HTTP proxy and HTTP proxy)

The description of the HTTP-3 reference point in 3GPP TS 23.280 [3] applies.

5.3.3.3.8 Reference point AAA-1 (between the SIP database and the SIP core)

The description of the AA1-1 reference point in 3GPP TS 23.280 [3] applies.

5.3.3.3.9 Reference point AAA-2 (between the SIP core and Diameter proxy)

The description of the AA1-2 reference point in 3GPP TS 23.280 [3] applies.

5.3.3.3.10 Reference points N5 and Rx (between the SIP core and the 5GS)

The N5 reference point and Rx reference point, which exist between the SIP core and the 5GS, are used for resource management of MC service sessions, e.g. QoS control, as defined in 3GPP TS 23.501 [7], 3GPP TS 23.502 [10] and 3GPP TS 23.503 [9].

5.4 MCPTT functional model description

5.4.1 On-network functional model

Figure 5.4.1-1 shows the functional model for the application plane for an MCPTT system using the 5GS.

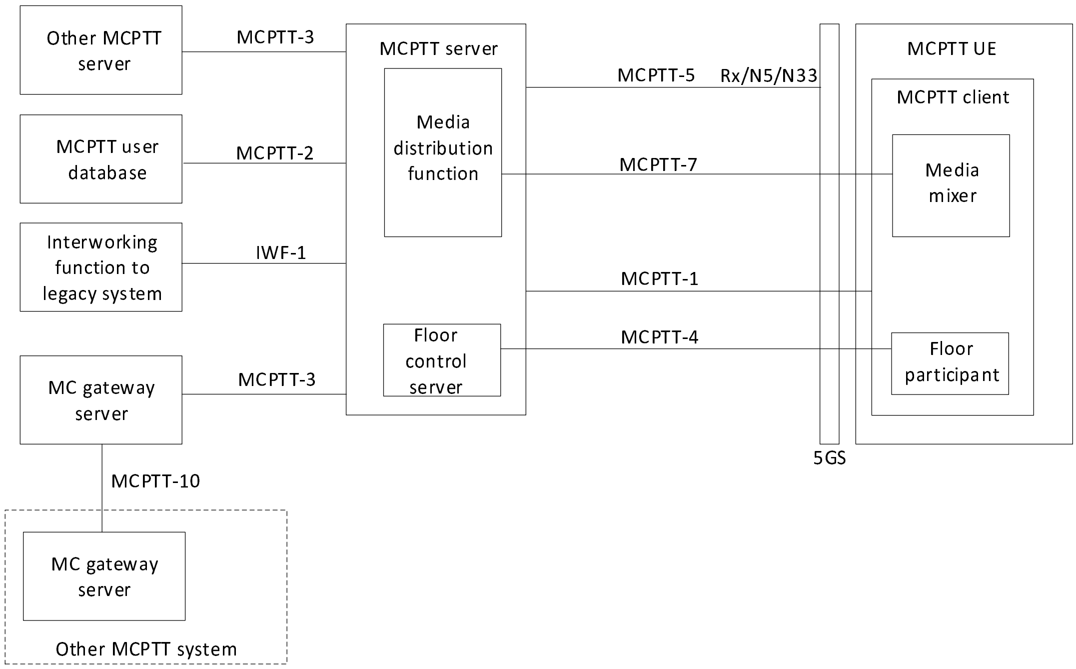

Figure 5.4.1-1: MCPTT functional model for application plane

In the functional model shown in figure 5.4.1-1, the following is considered:

- The description of the corresponding functional entities and reference points in 3GPP TS 23.379 [6] applies.
- The description of the MCPTT-4 and MCPTT-7 reference points in 3GPP TS 23.379 [6] applies considering that it utilizes the N6 reference point defined in 3GPP TS 23.501 [7].
- The description of the MCPTT-5 reference point in 3GPP TS 23.379 [6] applies considering that it exists between the MCPTT server and the 5GS. It is used for resource management of MCPTT sessions, e.g. QoS control, and utilizes the N5 reference point or the Rx reference point or the N33 reference point as defined in 3GPP TS 23.501 [7], 3GPP TS 23.502 [10] and 3GPP TS 23.503 [9].
- MCPTT-5, utilizing Rx reference point or N5 reference point, may be used when the MCPTT service provider directly interacts with operator's relevant 5GS network function for QoS control.
- MCPTT-5, utilizing N33 reference point, may be used when the MCPTT service provider is limited by the operational agreement, i.e., indirect interaction with operator's 5GS network functions for QoS control.

5.5 MCVideo functional model description

5.5.1 On-network functional model

Figure 5.5.1-1 shows the functional model for the application plane for an MCVideo system using the 5GS.

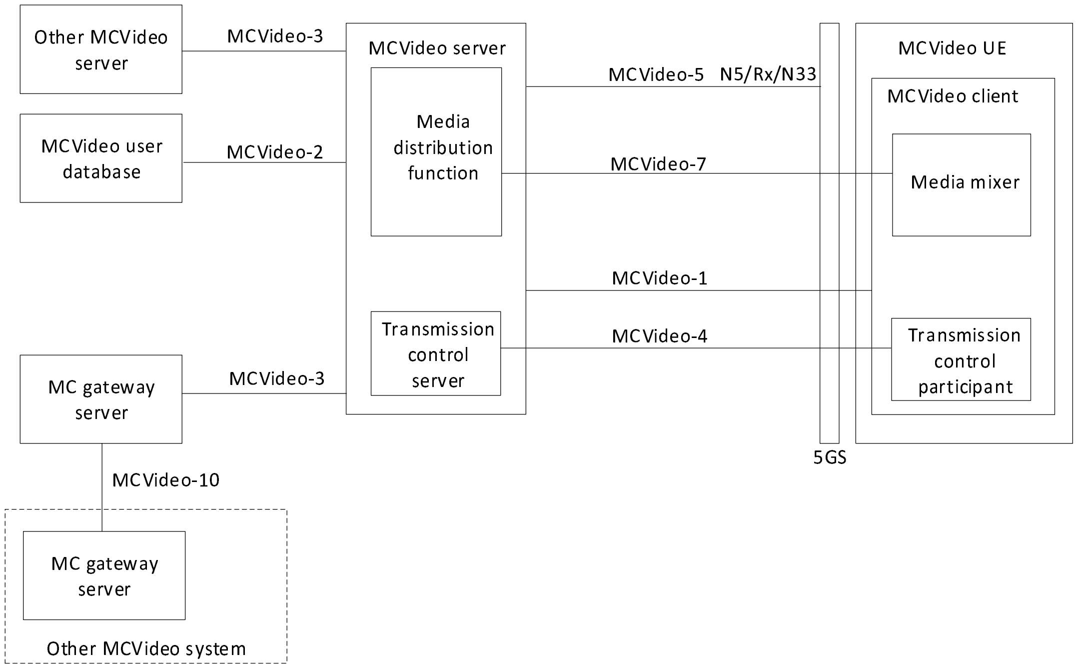

Figure 5.5.1-1: MCVideo functional model for application plane

In the functional model shown in figure 5.5.1-1, the following is considered:

- The description of the corresponding functional entities and reference points in 3GPP TS 23.281 [4] applies.
- The description of the MCVideo-4 and MCVideo-7 reference points in 3GPP TS 23.281 [4] applies considering that it utilizes the N6 reference point defined in 3GPP TS 23.501 [7].
- The description of the MCVideo-5 reference point in 3GPP TS 23.281 [4] applies considering that it exists between the MCVideo server and the 5GS. It is used for resource management of MCVideo sessions, e.g. QoS control, and utilizes the N5 reference point or the Rx reference point or the N33 reference point as defined in 3GPP TS 23.501 [7], 3GPP TS 23.502 [10] and 3GPP TS 23.503 [9].
- MCVideo-5, utilizing Rx reference point or N5 reference point, may be used when the MCVideo service provider directly interacts with operator's relevant 5GS network function for QoS control.
- MCVideo-5, utilizing N33 reference point, may be used when the MCVideo service provider is limited by the operational agreement, i.e., indirect interaction with operator's 5GS network functions for QoS control.

5.6 MCData functional model description

5.6.1 On-network functional model

Figure 5.6.1-1 shows the generic functional model for the application plane for an MCData system using the 5GS.

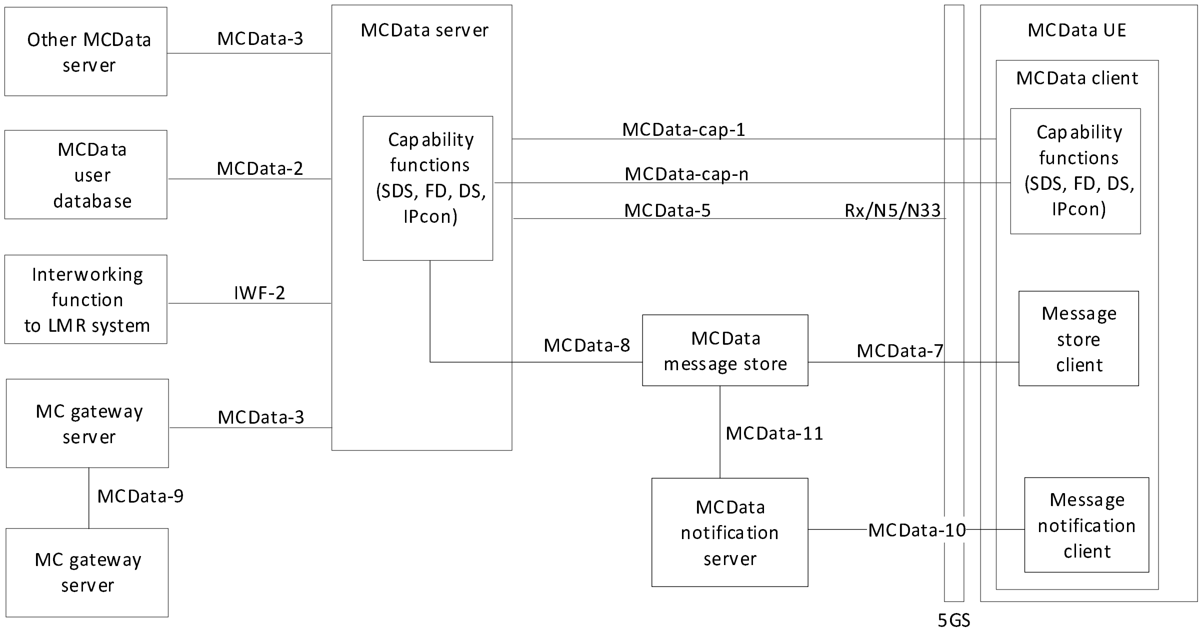

Figure 5.6.1-1: Generic MCData functional model for application plane

In the functional model shown in figure 5.6.1-1, the following is considered:

- The description of the corresponding functional entities and reference points in 3GPP TS 23.282 [5] applies.
- The description of the MCData-5 reference point in 3GPP TS 23.282 [6] applies considering that it exists between the MCData server and the 5GS. It is used for resource management of MCData sessions, e.g. QoS control, and utilizes the N5 reference point or the Rx reference point or the N33 reference point as defined in 3GPP TS 23.501 [7], 3GPP TS 23.502 [10] and 3GPP TS 23.503 [9].
- MCData-5, utilizing Rx reference point or N5 reference point, may be used when the MCData service provider directly interacts with operator's relevant 5GS network function for QoS control.
- MCData-5, utilizing N33 reference point, may be used when the MCData service provider is limited by the operational agreement, i.e., indirect interaction with operator's 5GS network functions for QoS control.
- The respective functional models supporting MCData capabilities (e.g., SDS, FD, DS, IPcon) over unicast transmissions along with the corresponding reference points (i.e., MCData-cap-1 to MCData-cap-n) described in 3GPP TS 23.282 [5] also apply when the 5G system is used.

6. Application of functional models and deployment scenarios

6.1 General

This clause describes the application of the functional models described in clause 5. It also describes deployment scenarios that highlight some of the possible variations in the way that the functional models can be applied in different situations.

6.2 On-network architectural model

6.2.1 On-network architectural model diagram

Figure 6.2.1-1 below is the on-network architectural model for the MC system solution, where the MC system provides one or more MC services via a single PLMN.

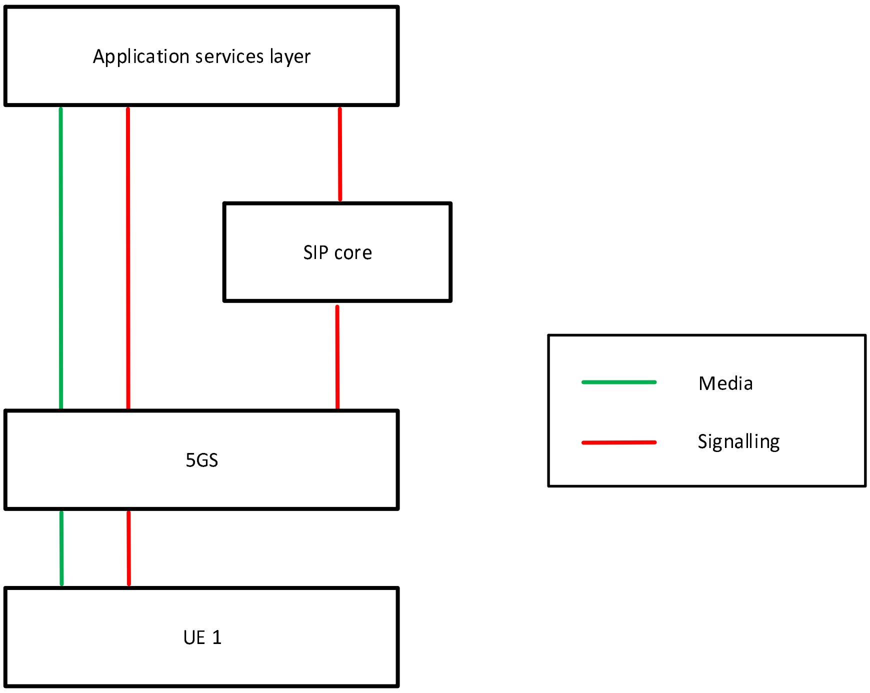

Figure 6.2.1-1: On-network architectural model

6.2.2 Application services layer

6.2.2.1 Overview

The application services layer includes application functions of one or more MC services and any required supporting functions grouped into common services core.

6.2.2.2 Common services core

Common services core is composed of the functional entities described in the common functional model in clause 5.3.

6.2.2.3 MC services

MC services are composed of the functional entities described in the corresponding MC service functional models in clause 5.

6.2.3 SIP core

The SIP core provides rendezvous (contact address binding and URI resolution) and service control (application service selection) functions, as described in clause 5.3.

6.2.4 5GS

The 5GS provides data connectivity and services with QoS control for the support of MC service sessions.

6.2.5 UE 1

UE 1 is an MC service UE in on-network mode supporting data connectivity and application(s) related to one or more MC services over the 5GS. It is composed of the corresponding MC service functional entities described in clause 5.

6.3 Deployment scenarios

6.3.1 Administration of MC service, SIP core and 5GS

6.3.1.1 General

This clause describes deployment scenarios in which different administration of MC service, SIP core and 5GS are described, together with the sensitivities of identities and other forms of signalling in those scenarios.

In each of these scenarios, the owner of the devices at each plane may be different from the organization that administers these devices. For example, the MC service provider may own some RAN components within the 5GS even when the 5GS is administered by the PLMN operator, and the MC service UE may be owned by an organization that is independent from PLMN and MC service providers.

6.3.1.2 Common administration of all planes

In this scenario, all planes (application services layer, SIP core and 5GS) are administered by the same party. This is illustrated in figure 6.3.1.2-1 below.

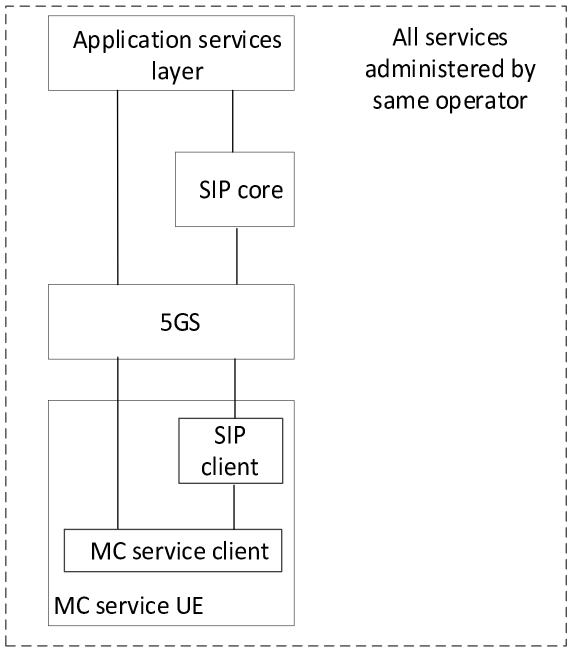

Figure 6.3.1.2-1: Common administration of all services by one operator

Although the identities in each plane are separate as described in 3GPP TS 23.280 [3], there is no particular sensitivity of identities and other information at the application plane, and these may be exposed to the SIP core and the 5GS.

All authorization and authentication mechanisms at each plane, i.e. the application services layer, SIP core and 5GS, shall be separate, but there may be no need for any restrictions in how these are stored and managed; for example the same entity could provide services to each of the application services layer, SIP core and 5GS.

6.3.1.3 MC service provider separate from SIP core and 5GS

In this scenario, as illustrated in figure 6.3.1.3-1, the MC service provider is separate and independent from the PLMN operator, and the MC service is administered independently of the 5GS and SIP core. The PLMN operator administers the 5GS and the SIP core.

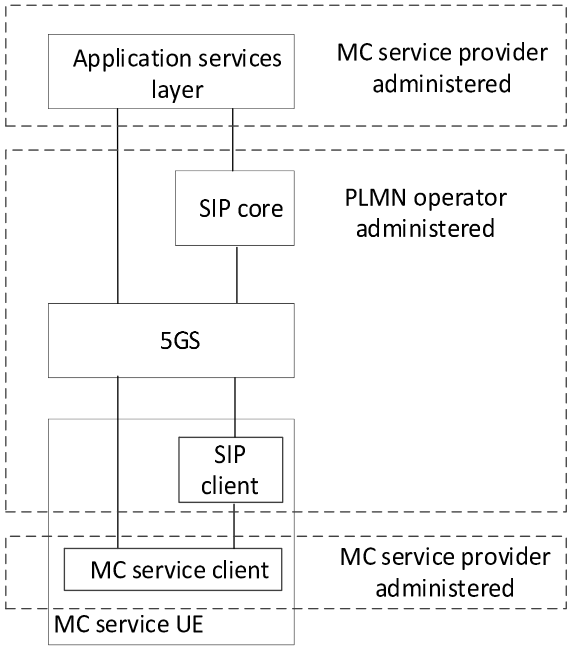

Figure 6.3.1.3-1: MC service provider administers MC service separately from SIP core and 5GS

The MC service provider may require that all application services layer identities and other sensitive information are hidden both from the SIP core and the 5GS.

When required by the MC service provider, all authentication and authorization mechanisms, including security roots, at the application services layer are hidden from and not available to the PLMN operator.

6.3.1.4 MC service provider administers SIP core, separate from 5GS

In this scenario, as illustrated in figure 6.3.1.4-1, the MC service provider administers the SIP core, and the MC services and SIP core are independent of the PLMN operator.

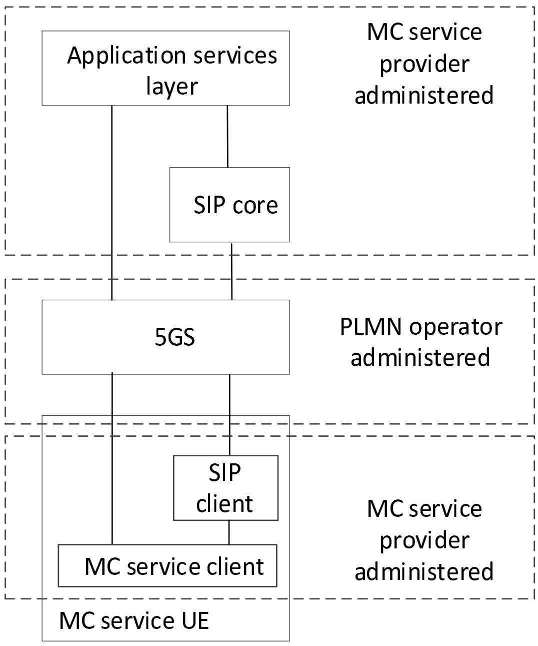

Figure 6.3.1.4-1: MC service provider provision of SIP core, separate domain from 5GS

The MC service provider may require that all identities and other sensitive information at the application services layer are hidden from the 5GS. The MC service provider need not hide the identities and signalling at the application services layer from the SIP core. However, the MC service provider may require that identities and other sensitive information between SIP core and SIP client in the MC service UE are also hidden from the 5GS.

All authentication and authorization mechanisms, including security roots, at both application services layer and at SIP signalling plane may need to be hidden from, and not available to, the PLMN operator.

6.3.1.5 SIP core partially administered by both PLMN operator and MC service provider

In this scenario, as illustrated in figure 6.3.1.5-1, the SIP core is partially administered by both parties, for example when the SIP core registrar is administered by the MC service provider, but the SIP core registrar finder and proxy is administered by the PLMN operator.

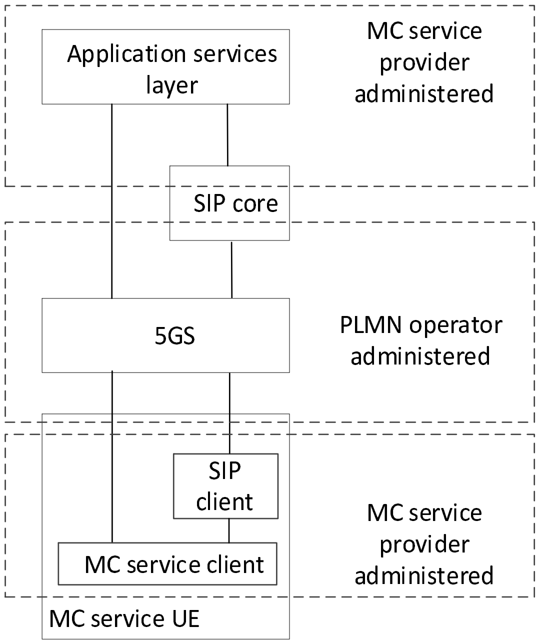

Figure 6.3.1.5-1: MC service provider partial provision of SIP core, separate domain from 5GS

The MC service provider may require that all identities and signalling at the application services layer are hidden from the 5GS, and may require identities and other sensitive information to be hidden from the PLMN operator administered part of the SIP core.

All authentication and authorization mechanisms, including security roots, at the application services layer may need to be hidden from, and not available to, the PLMN operator.

6.3.1.6 PLMN operator administers SIP core with SIP identities administered by MC service provider

In this scenario, the PLMN operator administers the SIP core. However, the identities used by the SIP core (IMPI and IMPU) for MC service UEs served by the MC service provider are provided from the SIP database of the MC service provider.

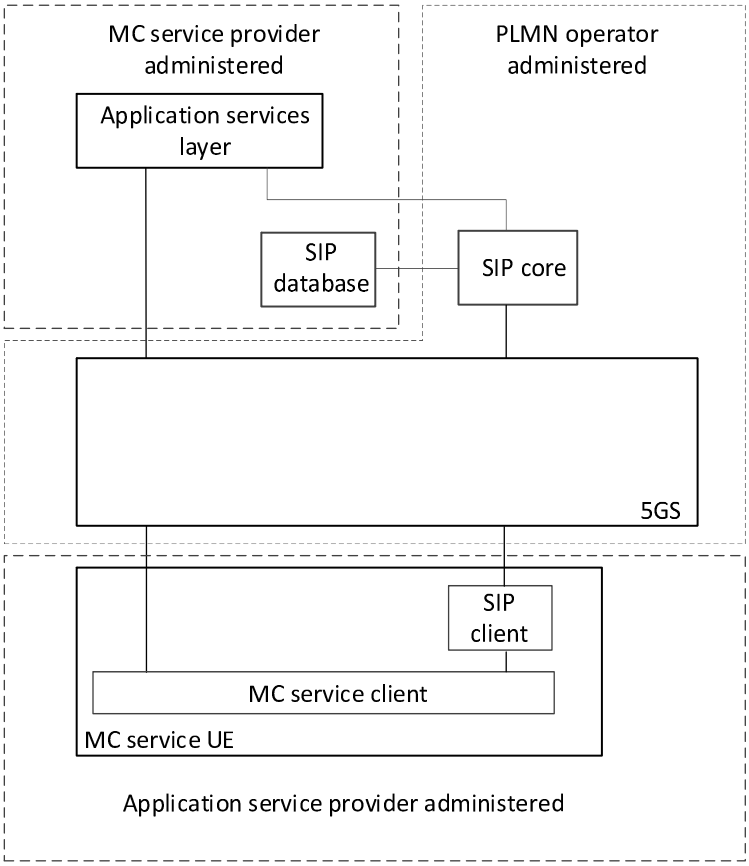

Figure 6.3.1.6-1: MC service provider provides identities to PLMN operator SIP core

The MC service provider may require that all identities and signalling at the application services layer are hidden from the SIP core and 5GS.

When required by the MC service provider, all authentication and authorization mechanisms, including security roots, at the application services layer may need to be hidden from, and not available to, the PLMN operator.

The security roots (authentication keys) required for access to the signalling control plane are not available to the PLMN operator as these are held in the MC service provider's SIP database. However, derived parameters e.g. authentication vectors are provided to the SIP core to allow signalling control plane authentication to take place.

6.3.2 Resource management of MC service sessions by SIP core and MC service server

6.3.2.1 General

This clause describes two different scenarios in which resource management of MC service sessions is performed via the Rx reference point, or N5 reference point, or N33 reference point as defined in 3GPP TS 23.501 [7], 3GPP TS 23.502 [10] and 3GPP TS 23.503 [9], by either the SIP core or the MC service server with the 5GS (PCF).

These may provide suitable models for each of the scenarios listed in clause 6.3.1. However, there is no direct correlation of any of the scenarios described in this clause to each of the scenarios described in clause 6.3.1.

6.3.2.2 Resource Management of MC service sessions by SIP core

In the scenario shown in figure 6.3.2.2-1, resource management of MC service sessions is performed by the SIP core.

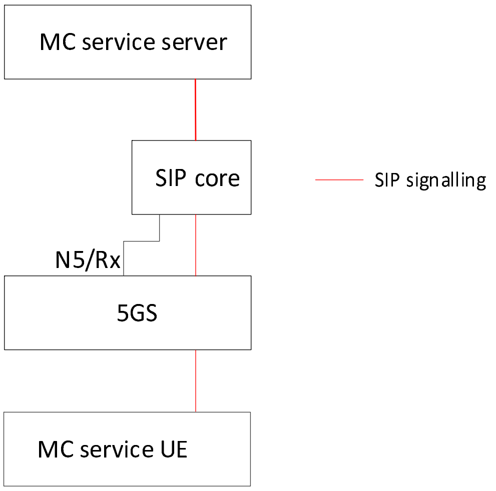

Figure 6.3.2.2-1: Resource management of MC service sessions by SIP core

6.3.2.3 Management of MC service sessions by MC service server

In the scenario shown in figure 6.3.2.3-1, resource management of MC service sessions is performed by the MC service server.

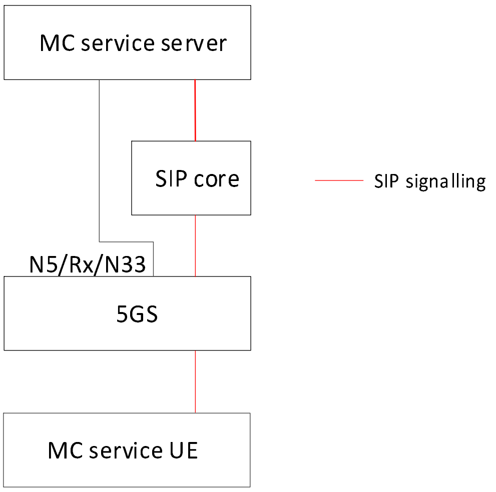

Figure 6.3.2.3-1: Resource management of MC service sessions by MC service server

6.4 Involved business relationships

6.4.1 General

For the relationship between the MC service provider, the MC service organization and the MC service user 3GPP TS 23.280 [3] clause 6 applies.

6.4.2 Public network and non-public network utilization

For the relationship between MC service provider and the utilization of public networks and/or non-public networks the following service arrangements apply:

- A home public network operator or a home non-public network operator can have service arrangements with multiple MC service providers.
- A MC service provider can have service arrangements with multiple home public network operators and/or home non-public network operators.

- As part of the service arrangement between the MC service provider and the home public network operator/home non-public network operator, the corresponding 5GS user profile can be provided which allows the MC service UEs to register to the home public network operator/home non-public network operator.
- The home PLMN operator can have PLMN roaming agreements with multiple visited PLMN operators and the visited PLMN operator can have PLMN roaming agreements with multiple home PLMN operators.

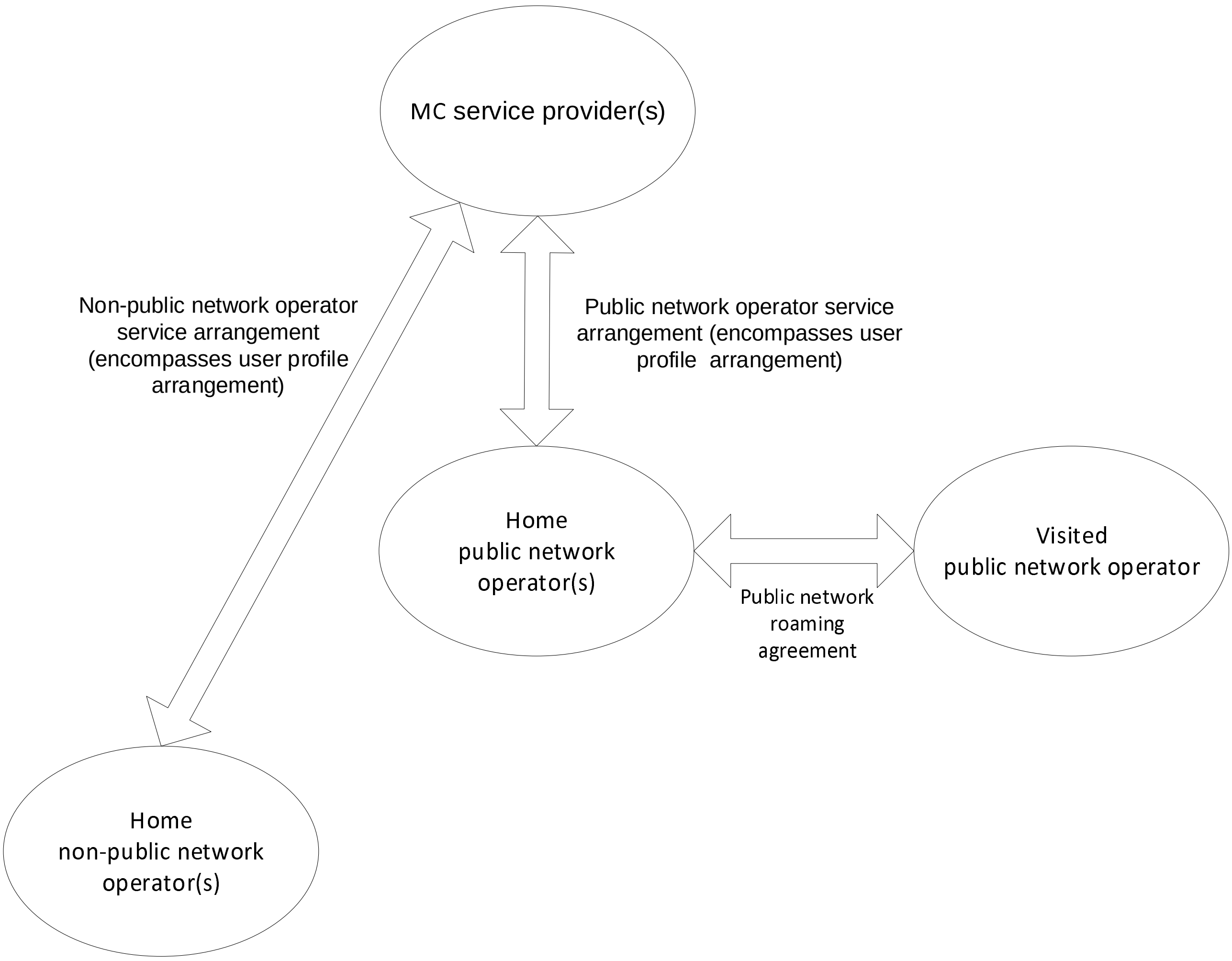

Figure 6.4.2-1: Business relationships for MC services

Editor's Note: The utilization of NPN is FFS.

7. MC procedures for 5GS

7.1 General

In this clause, only the procedures and information flows which are different from that over EPS are captured. The MC service specific procedures and information flows over 5GS remains the same as specified in TS 23.379 [6], TS 23.281[4], TS 23.282 [5] if not specially described in this clause.

7.2 MC service resource management (on-network)

7.2.1 General

These clauses specify the procedures for resource management for mission critical services. The procedures are utilized by the following MC services:

- MCPTT (as specified in 3GPP TS 23.379 [6]);
- MCVideo (as specified in 3GPP TS 23.281 [4]); and
- MCData (as specified in 3GPP TS 23.282 [5]).

Session management, QoS model and QoS policy control are defined in 3GPP TS 23.501 [7], 3GPP TS 23.502 [10] and 3GPP TS 23.503 [9].

7.2.2 Request for unicast resources at session establishment

The procedure defined in this clause specifies how communication resources are requested from 5GS at session establishment. If concurrent sessions are used the MC service server may utilize the capability of resource sharing specified in 3GPP TS 23.503 [9]. The exchange of the QoS characteristics of the required resources takes place exclusively by means of direct interaction between SIP core and PCF using N5 reference point or Rx reference point and encompass media type, bandwidth, priority, application identifier and resource sharing information.

Establishment, modification or release of communication resources are managed according to 3GPP TS 23.502 [10]. The procedure is generic to any type of session establishment that requires communication resources.

Procedures in figure 7.1.2-1 show the signalling procedures for the requesting resource at session establishment.

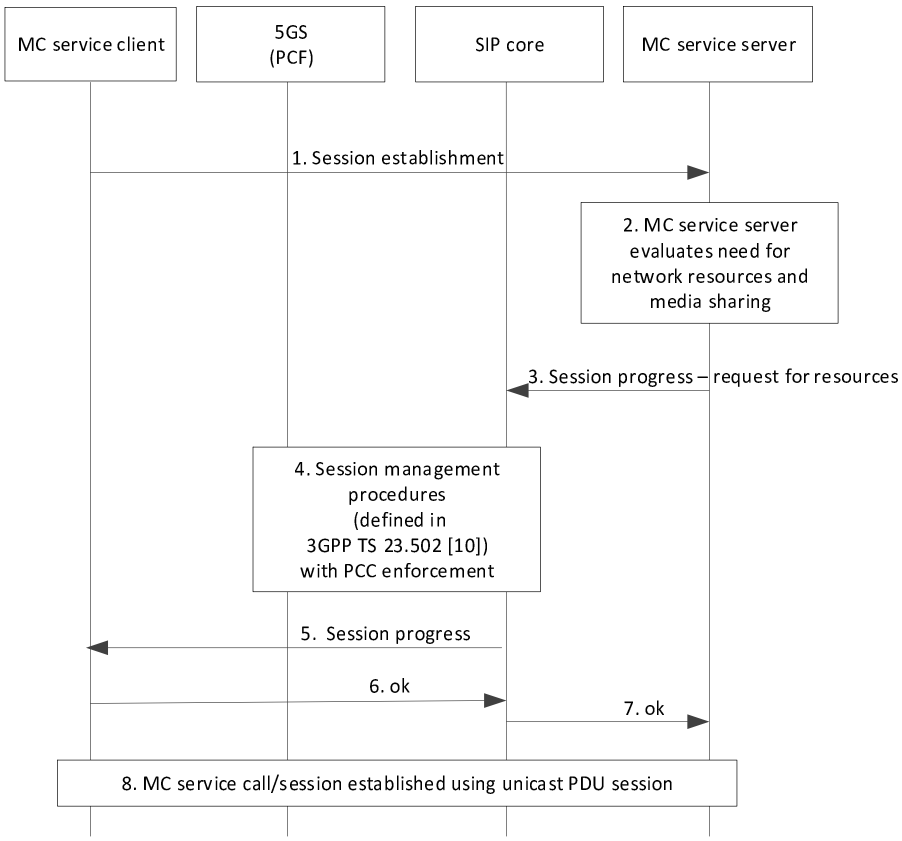

Figure 7.2.2-1: Resource request at session establishment

1. MC service client sends a call/session establishment request.

2. MC service server receives evaluates the need of communication resources and the use of media resource sharing.

3. MC service server sends a session progress request containing request for communication resources.

4. Session management procedures using PCF policy control enforcement (as defined in 3GPP TS 23.502 [10]) initiated from SIP core local inbound/outbound proxy using direct interaction between SIP core and PCF.

5. The SIP core local inbound/outbound proxy forwards the call control protocol request to the MC service client.

6. The MC service client acknowledges the session progress request with an OK message.

7. The SIP core local inbound/outbound proxy forwards the OK message to the MC service server.

8. The MC service call/session is established, and resources have been allocated.

7.2.3 Request for unicast resources at session establishment from MC service server

7.2.3.1 General

The procedure defined in this clause specifies how communication resources are requested from 5GS at session establishment from the MC service server. The required QoS characteristics for resources are sent directly to the PCF via the N5 reference point or Rx reference point from the MC service server. Alternatively, QoS characteristics for resources can be exchanged indirectly utilizing N33 reference point between MC service server and NEF. QoS characteristic information encompasses media type, bandwidth, priority, application identifier, resource sharing information and network slice information. If concurrent sessions are used, the MC service server may utilize the capability of resource sharing specified in 3GPP TS 23.503 [8].

For the request of communication resources by the MC service server via N5 reference point or Rx reference point, or N33 reference point, the MC service client provides to the MC service server the corresponding communication resource details (e.g. IP addresses and ports) of the MC service client and the corresponding media anchoring points.

This procedure is generic to any type of session establishment with the MC service server requesting network resources.

7.2.3.2 Procedure

Figure 7.2.3.2-1 describes the procedure for the request of resources at session establishment from the MC service server.

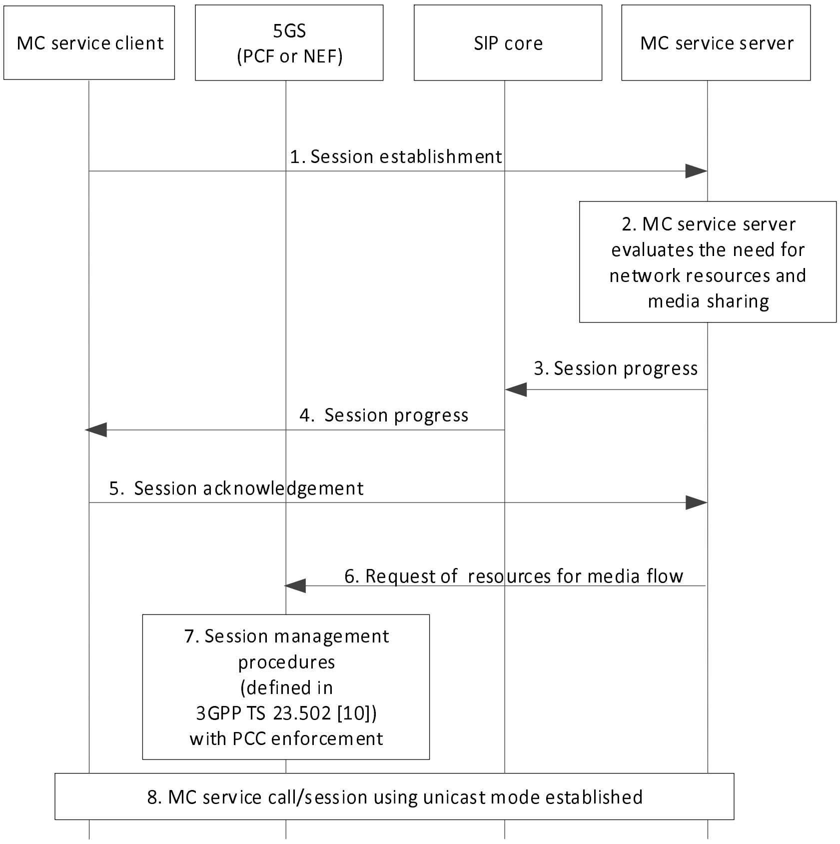

Figure 7.2.3.2-1: Resource request at session establishment from the MC service server

1. The MC service client sends a call/session establishment request. The request includes, apart from the SDP offer, access resource details, e.g. IP addresses and ports of the MC service client related to the media session.

2. The MC service server evaluates the need of communication resources and use of media resource sharing.

3. The MC service server sends a session progress request to the SIP core.

NOTE: The session progress request does not include a request for network communication resources to be performed by the SIP core.

4. The SIP core local inbound/outbound proxy forwards the session progress request to the MC service client.

5. The MC service client acknowledges the session establishment to the MC service server. This message contains the final negotiated media parameters, e.g. IP addresses and ports related to the media anchoring points received in the SDP answer from the SIP core.

6. To trigger resources allocation, the MC service server sends a request for communication resources to 5GS. For direct interaction, the resource allocation request is exchanged between MC service server and 5GS PCF using N5 reference point or Rx reference point. For indirect interaction, the resource allocation request is exchanged between MC service server and 5GS NEF using N33 reference point. The respective procedures are defined in 3GPP TS 23.502 [10]).

7. Session management procedures using PCF policy control enforcement (as defined in 3GPP TS 23.502 [10]) initiated from MC service server either directly via PCF or indirectly via NEF.

8. The MC service call/session is established, and resources have been allocated.

7.2.4 Request for modification of unicast resources

To modify an unicast media flow, the MC service server shall send a resource modification request containing the parameters to be modified, using the call control protocol via the SIP core to the UE. The exchange of the QoS characteristics of the concerned resources takes place exclusively by means of direct interaction between SIP core and PCF.

Possible scenarios when this procedure may be used are:

- Modify the allocation and retention priority for unicast resources;
- Release and resume resources in-between MC service calls when using the chat model; or
- Releasing resources for the media plane should give the option to allow the SIP session to either be torn down or continue.

Procedures in figure 7.2.4-1 are the signalling procedures for the modification of a unicast:

Pre-conditions:

- An MC service call or session is already in progress;

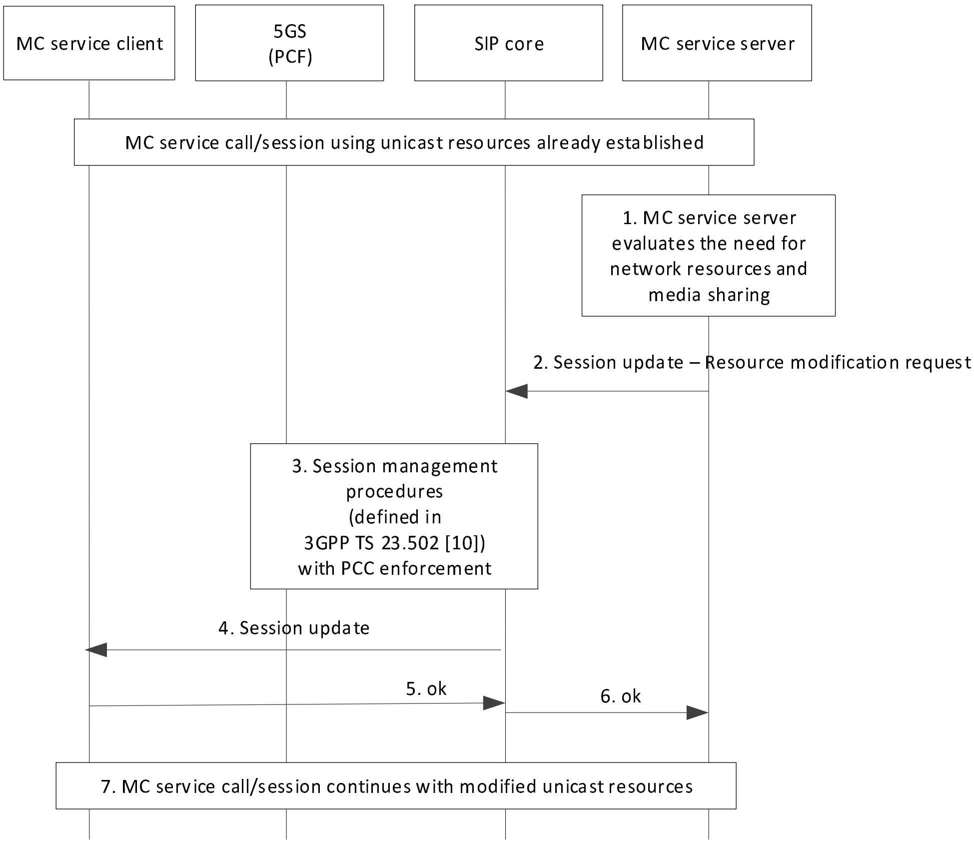

Figure 7.2.4-1: Media flow modification request

1. MC service server decides to modify the parameters of a unicast bearer (e.g. a request to upgrade the existing MC service call to an MC service emergency or imminent threat call).
2. MC service server sends a session update which includes a resource modification request containing the modified parameters of the unicast bearer.
3. Session management procedures using PCF policy control enforcement (as defined in 3GPP TS 23.502 [10]) initiated by the MC service server using direct interaction between SIP core and PCF.
4. The SIP core local inbound / outbound proxy forwards the session update request to the MC service client.
5. The MC service client acknowledges the call control protocol request with an OK message.
6. The SIP core local inbound / outbound proxy forwards the OK message to the MC service server.
7. The MC service call continues with the modified unicast resources.

NOTE: If multiple audio streams are sent to the UE, additional QoS flows could be required during an established session. Pre-allocation of additional QoS flows already at session establishment could be useful.

7.2.5 Request for media resources from MC service server

7.2.5.1 General

The procedure in this sub clause specifies how to request resources for floor control (or transmission control in MCVideo and MCData) and for the media plane can be handled independently. This procedure utilizes the N5 reference point or Rx reference point for direct interaction between MC service server and 5GS (PCF) and for direct interaction between SIP core and 5GS (PCF). Alternatively, resource requests for the media plane can be exchanged indirectly using N33 reference point between MC service server and NEF.

Resources for transmission control are requested at session establishment, in this case the IMS standard procedures using for direct interaction N5 reference point or Rx reference point as specified in 3GPP TS 23.228 [2] are used. The session description in this procedure shall encompass bandwidth information applicable for the transmission control traffic requirement. At group call setup the request for resources for the media plane is triggered. Either this request is sent directly from the MC service server to 5GS (PCF) or indirectly from the MC service server to 5GS (NEF).

The procedure is optional and is suitable when the procedures for pre-established sessions are used. It may also be used to setup and tear down the media plane used between consecutive group calls in one communication session using the chat call model.

7.2.5.2 Procedure

The figure 7.2.5.2-1 illustrates the procedure for resource allocation.

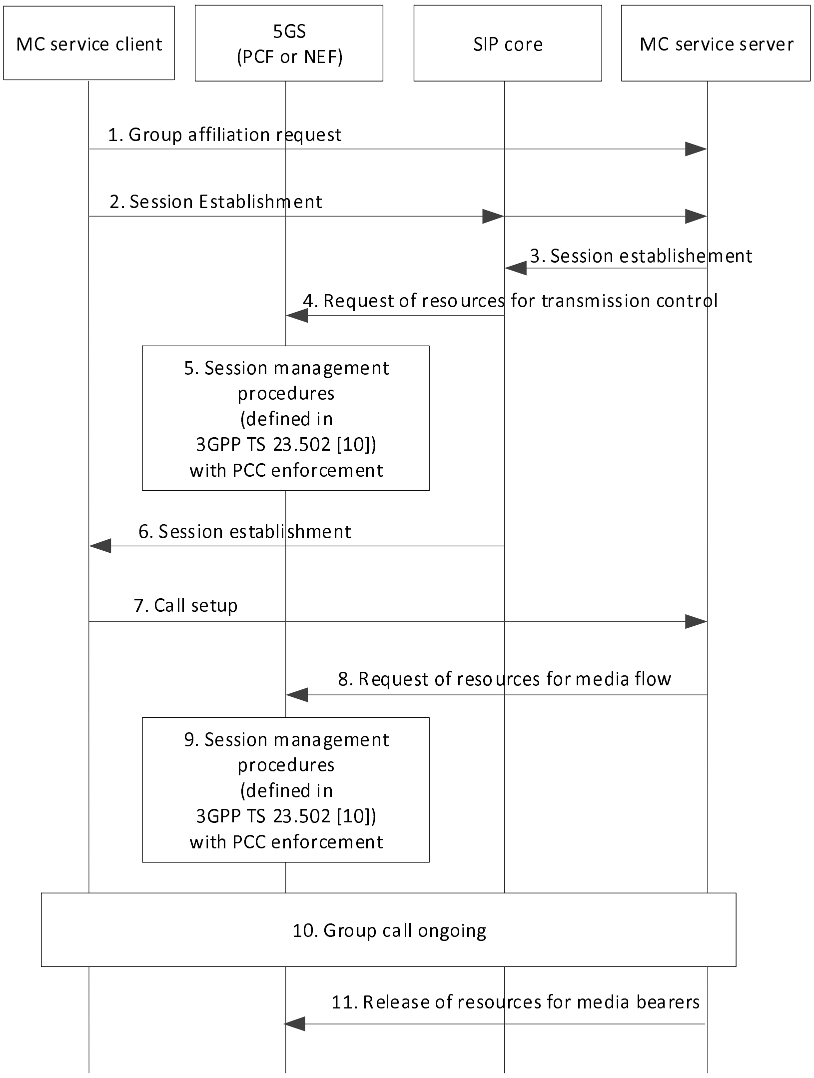

Figure 7.2.5.2-1: Request of resources for transmission control and media plane

1. The MC service client sends a request for group affiliation.
2. The MC service client sends a request to the MC service server for establishment of a communication session.
3. The MC service server answer the session establishment request and adjust the bandwidth information in the session description. The requested bandwidth shall be minimized to cover the bandwidth requirements for floor control signalling (or transmission control for MCVideo or MCData).
4. The SIP core request resources towards the 5GS according to the session establishment request.
5. Session management procedures using PCF policy control enforcement (as defined in 3GPP TS 23.502 [10]) initiated by the SIP Core.
6. The session establishment request is completed, and a response is sent towards the MC service client.
7. The MC service client sends a call setup message according to existing procedures.
8. The MC service server sends a request for resources for the media plane to 5GS, and the media plane is by that established. For direct interaction, the resource allocation request is exchanged between MC service server and 5GS PCF using N5 reference point or Rx reference point. For indirect interaction, the resource allocation request is exchanged between MC service server and 5GS NEF using N33 reference point. The respective procedures are defined in 3GPP TS 23.502 [10]). This request includes media description relevant for the media plane.

9. Session management procedures using PCF policy control enforcement (as defined in 3GPP TS 23.502 [10]) initiated by the MC service server either directly via PCF or indirectly via NEF.

10. Group call is ongoing on the group communication session.

11. The MC service serve sends a release of media resources to 5GS, and the media plane is by that terminated.

NOTE 1: The resources for transmission control are retained.

NOTE 2: Step 7-11 can be repeated several times within the life cycle of one communication session.

Annex A (normative): Configuration data for MC services using 5GS

A.1 General

This Annex provides information about the static data needed for configuration of MC services encompassing the following category:

- Initial MC service UE configuration data (see subclause A.2).

Each parameter that can be configured online shall only be configured through one online reference point. Each parameter that can be configured offline shall only be configured through one offline reference point. The most recent configuration data made available to the MC service UE shall always overwrite previous configuration data, irrespective of whether the configuration data was provided via the online or offline mechanism.

A.2 Initial MC service UE configuration data

The configuration data defined in 3GPP TS 23.280 [3] in Annex A.6 apply, with the following exceptions:

- DNN and the corresponding DN credentials instead of the PDN credentials shall be used;
- Network slice identification and corresponding network slice credentials may be provided per MC service.

Annex B (informative): Change history

Change history							
Date	**Meeting**	**TDoc**	**CR**	**Rev**	**Cat**	**Subject/Comment**	**New version**
2020-10	SA6#39-BIS-e					Initial version.	0.0.0
2020-10						Implemented the following pCRs approved in SA6#39-BIS-e: S6-201792, S6-201981.	0.1.0
2020-11	SA6#40-e					Implemented the following pCRs approved in SA6#40-e: S6-202308, S6-202309.	0.2.0
2021-01	SA6#41-e					Implemented the following pCRs approved in SA6#41-e: S6-210197, S6-210199, S6-210214,S6-210216, S6-210217, S6-210218, S6-210219, S6-210333	0.3.0
2021-03	SA6#42-e					Implemented the following pCRs approved in SA6#42-e: S6-210553, S6-210650, S6-210686	0.4.0
2021-03	SA#91-e	SP-210176				Presentation for information at SA#91-e	1.0.0
2021-04	SA6#42-BIS-e					Implemented the following pCRs approved in SA6#42-BIS-e: S6-210953, S6-210954	1.1.0
2021-05						Editorial corrections	1.1.1
2021-06	SA6#43-e					Implemented the following pCRs approved in SA6#43-e: S6-211405, S6-211407, S6-211408, S6-211409, S6-211410	1.2.0
2021-06	SA#92-e	SP-210473				Presentation for approval at SA#92-e	2.0.0
2021-06	SA#92-e	SP-210473				MCC Editorial update for publication after TSG SA approval (SA#92)	17.0.0
2021-12	SA#94-e	SP-211526	0013	1	F	Corrections on network slicing	17.1.0

History

Document history		
V17.1.0	May 2022	Publication