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TECHNICAL SPECIFICATION

Core Network and Interoperability Testing (INT); Network Interoperability Test Description for emergency services over 5G; (3GPP™ Release 16); Part 2: Test Descriptions

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Foreword

This Technical Specification (TS) has been produced by ETSI Technical Committee Core Network and Interoperability Testing (INT).

The present document is part 2 of a multi-part deliverable. Full details of the entire series can be found in part 1 [1].

Modal verbs terminology

In the present document "**shall**", "**shall not**", "**should**", "**should not**", "**may**", "**need not**", "**will**", "**will not**", "**can**" and "**cannot**" are to be interpreted as described in clause 3.2 of the ETSI Drafting Rules (Verbal forms for the expression of provisions).

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1 Scope

The present document provides the Test Descriptions (TDs) for network interoperability test description for emergency services over 5G in compliance with the relevant requirements and in accordance with the Test Purposes (TPs) presented in ETSI TS 103 796-1 [1].

2 References

2.1 Normative references

References are either specific (identified by date of publication and/or edition number or version number) or non-specific. For specific references, only the cited version applies. For non-specific references, the latest version of the referenced document (including any amendments) applies.

Referenced documents which are not found to be publicly available in the expected location might be found in the ETSI docbox.

NOTE: While any hyperlinks included in this clause were valid at the time of publication, ETSI cannot guarantee their long-term validity.

The following referenced documents are necessary for the application of the present document.

[1] ETSI TS 103 796-1: "Core Network and Interoperability Testing (INT); Network Interoperability Test Description for emergency services over 5G; (3GPP™ Release 16); Part 1: Test Purposes".

[2] ETSI TS 124 229: "Digital cellular telecommunications system (Phase 2+) (GSM); Universal Mobile Telecommunications System (UMTS); LTE; 5G; IP multimedia call control protocol based on Session Initiation Protocol (SIP) and Session Description Protocol (SDP); Stage 3 (3GPP TS 24.229 Release 16)".

[3] ETSI TS 129 228: "Digital cellular telecommunications system (Phase 2+) (GSM); Universal Mobile Telecommunications System (UMTS); LTE; 5G; IP Multimedia (IM) Subsystem Cx and Dx Interfaces; Signalling flows and message contents (3GPP TS 29.228 Release 16)".

[4] ETSI TS 129 229: "Digital cellular telecommunications system (Phase 2+) (GSM); Universal Mobile Telecommunications System (UMTS); LTE; Cx and Dx interfaces based on the Diameter protocol; Protocol details (3GPP TS 29.229 Release 16)".

[5] ETSI TS 129 214: "Universal Mobile Telecommunications System (UMTS); LTE; 5G; Policy and charging control over Rx reference point (3GPP TS 29.214 Release 16)".

[6] ETSI TS 129 514: "5G; 5G System; Policy Authorization Service; Stage 3 (3GPP TS 29.514 Release 16)".

[7] ETSI TS 124 501 (V16.14.0): "5G; Non-Access-Stratum (NAS) protocol for 5G System (5GS); Stage 3 (3GPP TS 24.501 version 16.14.0 Release 16)".

[8] ETSI TS 123 501: "5G; System architecture for the 5G System (5GS) (3GPP TS 23.501 Release 16)".

[9] ETSI TS 123 502: "5G; Procedures for the 5G System (5GS) (3GPP TS 23.502 Release 16)".

[10] IETF RFC 3261: "SIP: Session Initiation Protocol".

[11] ETSI TS 134 229-1: "Universal Mobile Telecommunications System (UMTS); LTE; Internet Protocol (IP) multimedia call control protocol based on Session Initiation Protocol (SIP) and Session Description Protocol (SDP); User Equipment (UE) conformance specification; Part 1: Protocol conformance specification (3GPP TS 34.229-1 Release 16)".

[12] ETSI TS 123 167: "Universal Mobile Telecommunications System (UMTS); LTE; IP Multimedia Subsystem (IMS) emergency sessions (3GPP TS 23.167)".

[13] ETSI TS 103 653-2: "Core Network and Interoperability Testing (INT); VoLTE/ViLTE interoperability test description over 4G/early 5G in physical/virtual environments; (3GPP™ Release 15); Part 2: Test Descriptions for VoLTE/ViLTE interoperability".

[14] IETF RFC 7090: "Public Safety Answering Point (PSAP) Callback".

[15] IETF RFC 5031: "A Uniform Resource Name (URN) for Emergency and Other Well-Known Services".

[16] IETF RFC 8147: "Next-Generation Pan-European eCall".

[17] ETSI TS 129 561(V16.5.0): " 5G; 5G System; Interworking between 5G Network and external Data Networks; Stage 3 (3GPP TS 29.561 version 16.5.0 Release 16)".

[18] ETSI TS 138 413 (V16.14.0): "5G; NG-RAN; NG Application Protocol (NGAP) (3GPP TS 38.413 version 16.14.0 Release 16)".

[19] ETSI TS 136 413 (V13.4.0): "LTE; Evolved Universal Terrestrial Radio Access Network (E-UTRAN); S1 Application Protocol (S1AP) (3GPP TS 36.413 version 13.4.0 Release 13)".

[20] ETSI TS 129 274 (V16.13.0): "Universal Mobile Telecommunications System (UMTS); LTE; 5G; 3GPP Evolved Packet System (EPS); Evolved General Packet Radio Service (GPRS) Tunnelling Protocol for Control plane (GTPv2-C); Stage 3 (3GPP TS 29.274 version 16.13.0 Release 16)".

[21] ETSI TS 103 920-2: "Core Network and Interoperability Testing (INT); 5G NGAP Conformance Testing for the N2 interface; (3GPP™ Release 16); Part 2: Test Suite Structure (TSS) and Test Purposes (TP)".

[22] ETSI TS 103 497-2: "Core Network and Interoperability Testing (INT); S1AP Conformance Testing for the S1-MME interface; (3GPP™ Release 13); Part 2: Test Suite Structure (TSS) and Test Purposes (TP)".

2.2 Informative references

References are either specific (identified by date of publication and/or edition number or version number) or non-specific. For specific references, only the cited version applies. For non-specific references, the latest version of the referenced document (including any amendments) applies.

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The following referenced documents may be useful in implementing an ETSI deliverable or add to the reader's understanding, but are not required for conformance to the present document.

[i.1] ETSI TR 184 008: "Telecommunications and Internet converged Services and Protocols for Advanced Networking (TISPAN); Infrastructure ENUM Options for a TISPAN IPX".

[i.2] IETF RFC 3761: "The E.164 to Uniform Resource Identifiers (URI); Dynamic Delegation Discovery System (DDDS) Application (ENUM)".

[i.3] ETSI TS 103 189 (V1.2.1): "Core Network and Interoperability Testing (INT);Assessment of end-to-end Quality for VoLTE and RCS".

[i.4] ISO/IEC 9646-1: "Information technology - Open Systems Interconnection - Conformance testing methodology and framework - Part 1: General concepts".

[i.5] ETSI TS 129 165: "Digital cellular telecommunications system (Phase 2+) (GSM); Universal Mobile Telecommunications System (UMTS); LTE; 5G; Inter-IMS Network to Network Interface (NNI) (3GPP TS 29.165 Release 16)".

[i.6] ETSI TS 123 228: "Digital cellular telecommunications system (Phase 2+) (GSM); Universal Mobile Telecommunications System (UMTS); LTE; IP Multimedia Subsystem (IMS); Stage 2 (3GPP TS 23.228 Release 16)".

[i.7] ETSI TS 103 795-2: "Core Network and Interoperability Testing (INT); Network Interoperability Test Description for emergency services over VoLTE (3GPP™ Release 15); Part 2: Test Descriptions".

3 Definition of terms, symbols and abbreviations

3.1 Terms

For the purposes of the present document, the following terms apply:

Abstract Test Method (ATM): Refer to ISO/IEC 9646-1 [i.4].

Abstract Test Suite (ATS): Refer to ISO/IEC 9646-1 [i.4].

Implementation Under Test (IUT): Refer to ISO/IEC 9646-1 [i.4].

Test Purpose (TP): Refer to ISO/IEC 9646-1 [i.4].

3.2 Symbols

Void.

3.3 Abbreviations

For the purposes of the present document, the abbreviations given in ETSI TS 124 229 [2], ETSI TS 129 165 [i.5], ETSI TS 129 228 [3], ETSI TS 129 229 [4] and the following apply:

3GPP	3rd Generation Partnership Project
5GC	5G Core
ACK	SIP 'ACK' message
AGW	Access GateWay
AS	(IMS) Application Server
ATS	Abstract Test Suite
CF	(Test) ConFiguration
ENUM	E.164 Number Mapping
EPC	Evolved Packet Core
E-UTRAN	Enhanced Universal Terrestrial Radio Access Network
IOP	InterOPerability
IPX	Internet Packet eXchange
IUT	Implementation Under Test
IVS	In Vehicle System
MSC	Message Sequence Chart
NAPTR	Naming Authority PoinTer Record
NAS	Non Access Stratum
NS	Name Server
PEI	Permanent Equipment Identifier
PO	Point of Observation
PO_UE	Point of Observation on UE
RAN	Radio Access Network
RCS	Rich Communication Services
REL	RELease
SIP UA	SIP User Agent
SUT	System Under Test
TD	Test Description
TP	Test Purpose
TSS	Test Suite Structure
UNI	User Network Interface

4 Test Environment

4.1 Introduction

The following architectural test configurations are referenced in the VoNR NNI interoperability emergency TDs in the present document. They are intended to give a general rather than a specific view of the required connections between IMS and 5GC network SUT(s) and associated UE(s), PSAP(s), AS(s), and DNS(s)/ENUM(s). Other configuration variants are currently not in the scope of the present document.

NOTE: Note that in the following figures observable Diameter interfaces are indicated as a solid green line, SIP interfaces are indicated as a solid blue line and user data interfaces are indicated as a solid yellow line. Non-observable interfaces are indicated as dashed lines.

4.2 Test configurations/architecture

4.2.1 Configuration CF_VoNR_INT_ES

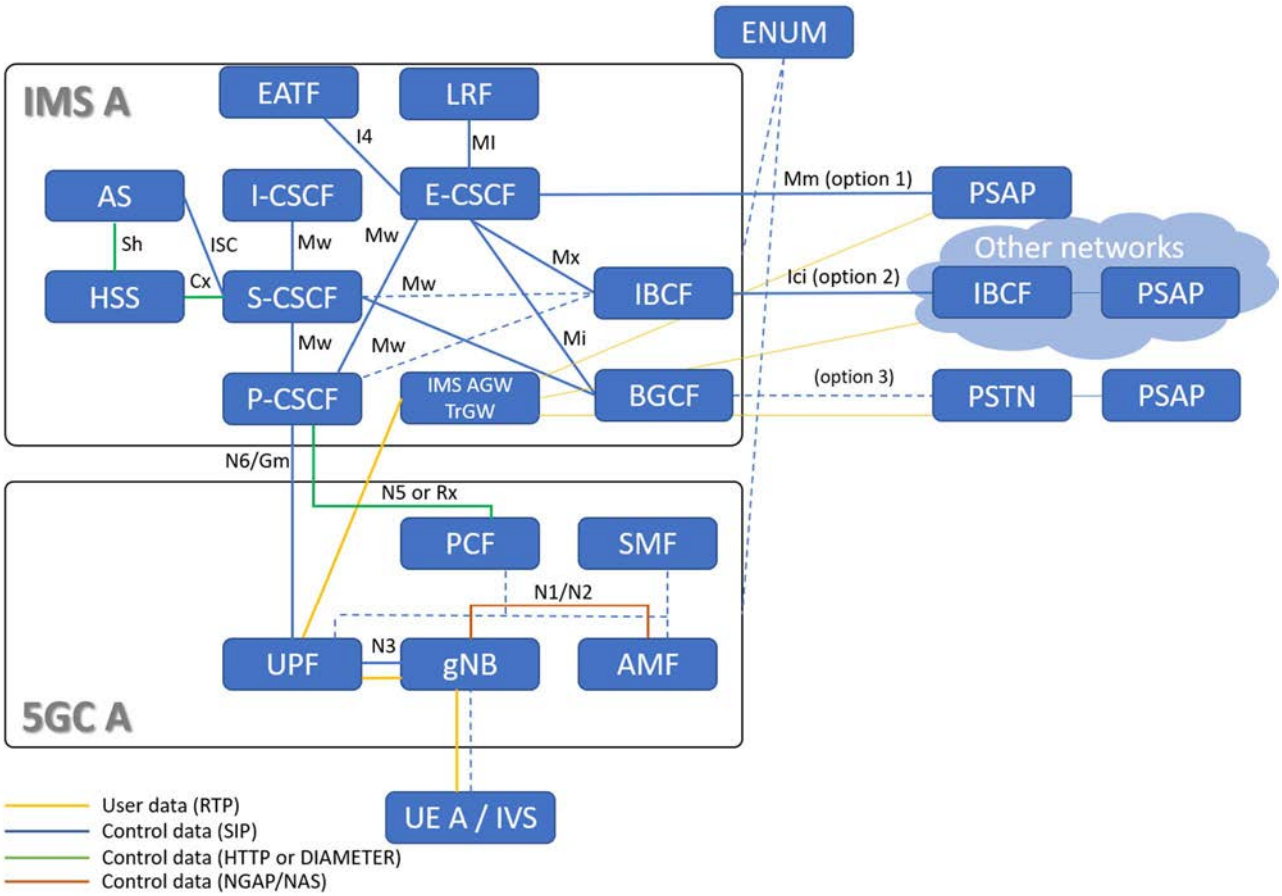


Figure 1: Configuration CF_VoNR_INT_ES

Configuration CF_VoNR_INT_ES is used for one Home Public Line Mobile Network (HPLMN) where users are 5G network registered and IMS registered to their home network. The suffix INT stands for home interoperability scenario and ES postfix stands for Emergency service. UE-A or IVS connects to home network represented by 5GC A and IMS A. E-CSCF may route emergency IMS session directly to PSAP (option 1). Another option is routing of emergency IMS session from E-CSCF towards IBCF to another IP multimedia network towards PSAP (option 2 in Figure 1) and to support legacy networks E-CSCF may route emergency IMS session to the BGCF via PSTN and towards PSAP (option 3 in Figure 1). 5G network registration, IMS registration, IMS deregistration and 5G network deregistration procedures of user are performed locally in their own home network. For Call establishment, call modification and call release procedures signalling are going in HPLMN network and therefore all related TDs are named as home interoperability tests.

NOTE 1: It is assumed that operator emergency requests are forwarded from P-CSCF to E-CSCF as described in ETSI TS 124 229 [2], clause 5.2.10.3 (item 1B).

NOTE 2: The P-CSCF may interact with PCF over the Rx interface or over the N5 interface as described in ETSI TS 123 228 [i.6], clause 4.6.1.

NOTE 3: Dashed interfaces of CF_VoNR_INT_ES will not be checked by the test descriptions in the present document.

4.2.2 Configuration CF_VoNR_RMI_ES

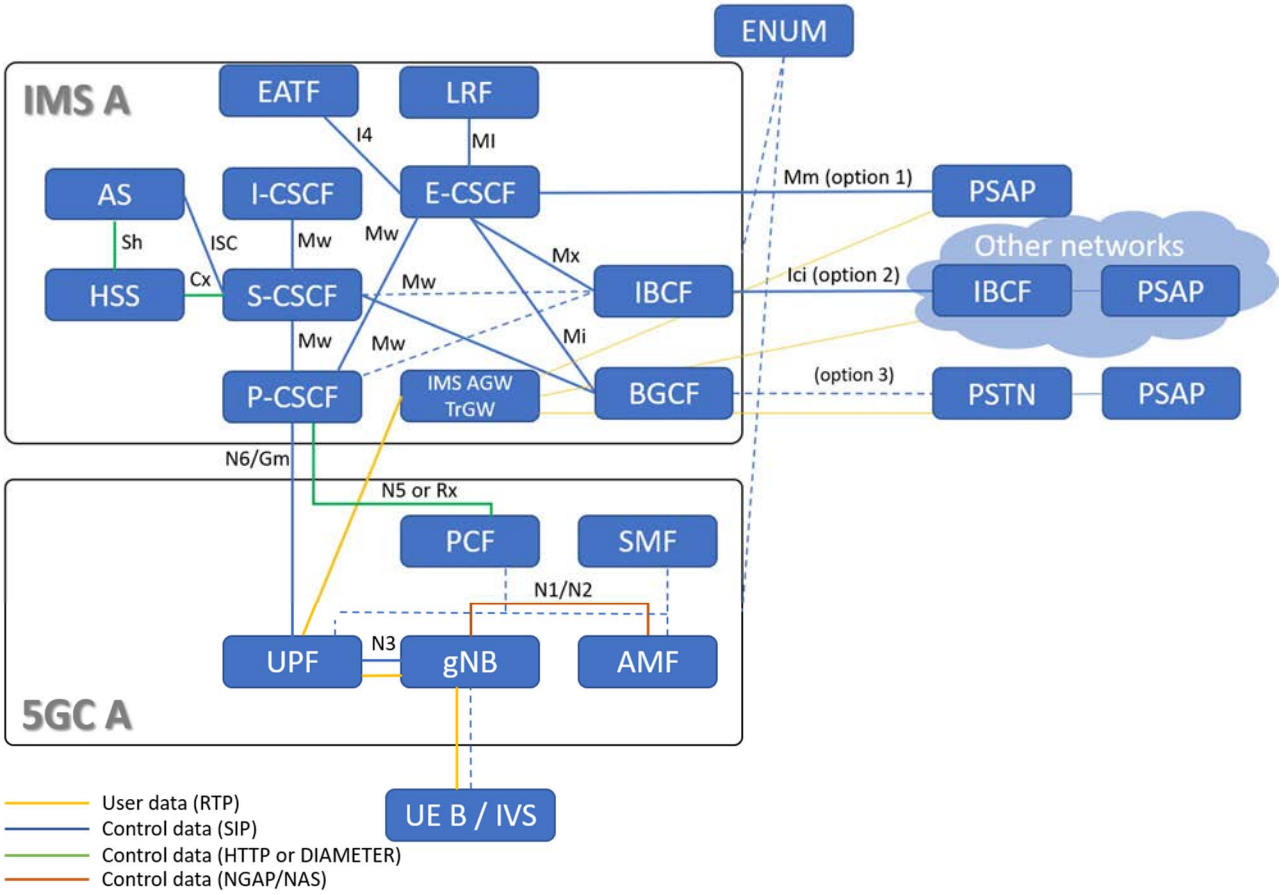


Figure 2: Configuration CF_VoNR_RMI_ES

Configuration CF_VoNR_RMI_ES describes roaming scenario. Within CF_VoNR_RMI_ES, UE-B connects to the visited network A registered to the 5GC A. 5G network registration and deregistration of UE-B is performed at the visited network A and provides the ability to subsequently register the visiting user UE-B or IVS at the home network. For call establishment, call modification and call release procedures signalling are going via VPLMN network and therefore all related TDs are named as roaming interoperability tests. Visited E-CSCF may route emergency IMS session directly to PSAP (option 1). Another option is routing of emergency IMS session from visited E-CSCF towards IBCF to another IP multimedia network towards PSAP (option 2) and to support legacy networks visited E-CSCF may route emergency IMS session to the BGCF via PSTN and towards PSAP (option 3).

NOTE 1: It is assumed that operator emergency requests are forwarded from P-CSCF to E-CSCF as described in ETSI TS 124 229 [2], clause 5.2.10.3 (item 1B).

NOTE 2: The P-CSCF may interact with PCF over the Rx interface or over the N5 interface as described in ETSI TS 123 228 [i.6], clause 4.6.1.

NOTE 3: Dashed interfaces of CF_VoNR_RMI_ES will not be checked by the test descriptions in the present document.

4.2.3 Configuration CF_VoNR_FB_INT_ES

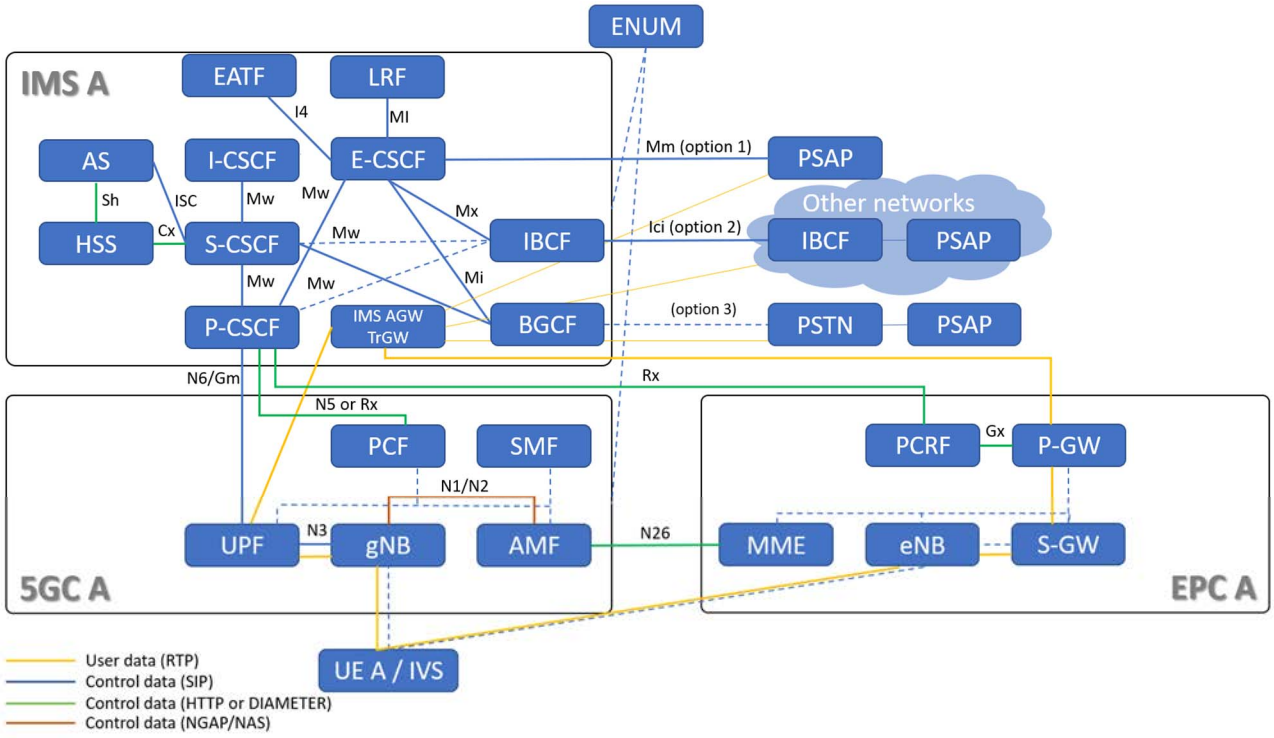


Figure 3: Configuration CF_VoNR_FB_INT_ES

Configuration CF_VoNR_FB_INT_ES is used for one Home Public Line Mobile Network (HPLMN) with 5G and 4G access where users are 5G network registered and IMS registered to their home network and the EPC fallback is possible to 4G. The suffix FB stands for fallback and INT stands for home interoperability scenario and ES postfix stands for Emergency service. UE-A or IVS connects to home network represented by 5GC A and IMS A. E-CSCF may route emergency IMS session directly to PSAP (option 1). Another option is routing of emergency IMS session from E-CSCF towards IBCF to another IP multimedia network towards PSAP (option 2) and to support legacy networks E-CSCF may route emergency IMS session to the BGCF via PSTN and towards PSAP (option 3). The EPC fallback from 5G to 4G can be executed while the emergency call is established. For fallback procedures signalling is going in HPLMN network and therefore all related TDs are named as home fallback interoperability tests.

NOTE 1: It is assumed that operator emergency requests are forwarded from P-CSCF to E-CSCF as described in ETSI TS 124 229 [2], clause 5.2.10.3 (item 1B).

NOTE 2: The P-CSCF may interact with PCF over the Rx interface or over the N5 interface as described in ETSI TS 123 228 [i.6], clause 4.6.1.

NOTE 3: Dashed interfaces of CF_VoNR_FB_INT_ES will not be checked by the test descriptions in the present document.

4.3 Test infrastructure

4.3.1 Introduction

The present clause covers the list of relevant emergency service components and interfaces used for testing interoperability between 5GC and IMS. EPC components and interfaces related to fall-back scenarios as well as IMS components and interfaces are described in ETSI TS 103 653-2 [13] under clause 4.3. For components that are not present here or in ETSI TS 103 653-2 [13], standard functionality is assumed.

4.3.2 VoNR component descriptions

4.3.2.1 User Endpoints

The test infrastructure shall contain User Endpoints (UEs) or In Vehicle System (IVS). These are represented by client devices or simulators, capable of performing the 5GC and IMS procedures.

The Test Descriptions are focusing only on the full message exchange details at the observation point at one client device. The peer UE in calls may be a full 5GC and IMS client, or only an IMS client, or even just a stand-alone SIP UA. However, for all those UE types the main requirement remains that all IP and SIP traffic shall be observable for test validation. To highlight this requirement, the Test Descriptions always make references to the PO_N6 interface ETSI TS 129 561 [17].

4.3.2.2 E-CSCF

The E-CSCF is a component of the IP Multimedia Subsystem (IMS) network responsible for managing emergency sessions. When an emergency session request is received from a P-CSCF or an S-CSCF, the E-CSCF performs several functions, including validating the user's credentials and location information, requesting additional information if necessary, and determining the proper routing information for the session. The E-CSCF may also use the Location Retrieval Function (LRF) to retrieve or validate location information, and it may route the emergency session to an appropriate destination such as a Public Safety Answering Point (PSAP), including anonymous sessions. Overall, the E-CSCF ensures that emergency sessions are routed and managed appropriately throughout the IMS network and may generate Call Detail Records (CDRs) for billing or other purposes.

4.3.2.3 LRF

The LRF is responsible for managing location information in IMS networks. It receives location information from different sources such as the Home Subscriber Server (HSS), User Equipment (UE), and other network elements. The LRF processes this information to determine the location of a user or a device within the network.

4.3.2.4 EATF

EATF is a component of IMS that enables the transfer of emergency calls from a non-IMS network to an IMS network.

When a user initiates an emergency call from a non-IMS network (such as a traditional circuit-switched network), the call is first routed to a gateway that connects the non-IMS network to the IMS network. The gateway then sends the call to the EATF, which determines the appropriate IMS emergency service to handle the call.

The EATF is responsible for identifying the user's location, which is essential for routing the call to the appropriate emergency service. It also ensures that emergency calls receive priority treatment in the IMS network, including resource allocation and admission control.

4.3.2.5 gNB (NG-RAN)

The gNB (Next Generation Node B) serves as the radio access network (RAN) node responsible for providing wireless connectivity between the User Equipment (UE) and the 5G Core (5GC). It manages the 5G New Radio (NR) interface (Uu) and performs both user plane and control plane functions for radio access.

The gNB is responsible for radio resource management, including scheduling, link adaptation, beamforming, and interference coordination. It handles radio bearer setup and release, manages uplink and downlink transmission and ensures efficient use of the radio spectrum. It supports advanced 5G NR features such as massive MIMO, dynamic spectrum sharing, and carrier aggregation to achieve high throughput and ultra-low latency.

4.3.2.6 AMF

The Access and Mobility Management Function (AMF) is the central control plane function in the 5G Core (5GC) architecture, responsible for handling signalling between the User Equipment (UE) and the core network. It manages registration, connection, reachability, mobility and access authentication for UEs across both 3GPP and non-3GPP access networks.

The AMF is responsible for UE registration and connection management, including tracking the UE's location in idle mode and initiating paging procedures when needed. It plays a critical role in mobility management, including intra- and inter-AMF handovers and access network mobility support. The AMF collaborates with the Network Slice Selection Function (NSSF) and Access and Mobility Policy Control Function (AM Policy Control Function) to ensure the UE is assigned to the correct SMF (Session Management Function) and network slice.

The Non-Access Stratum (NAS) signalling between the UE and the core network terminates at the AMF. It is responsible for NAS security, including ciphering and integrity protection, and manages security context establishment and updates. The AMF works with the Authentication Server Function (AUSF) and Unified Data Management (UDM) to perform UE authentication and authorization, including network access validation and roaming restriction enforcement.

The AMF handles temporary identifier allocation (such as 5G-GUTI) and supports lawful interception of signalling traffic

4.3.2.7 SMF

The Session Management Function (SMF) is a key control-plane entity in the 5G Core (5GC) responsible for managing session and IP address lifecycle for User Equipment (UE). It orchestrates and controls the establishment, modification, and release of Protocol Data Unit (PDU) sessions with enhanced flexibility and support for network slicing and service-based architecture.

The SMF is responsible for PDU session management, including session establishment, update, and release in coordination with the User Plane Function (UPF). It handles IP address allocation and management for UEs and is involved in selecting and configuring the appropriate UPF(s) based on session requirements, policy, and network topology. It also enforces session-level policies, Quality of Service (QoS) rules, and traffic steering decisions as received from the Policy Control Function (PCF).

4.3.2.8 UPF

The User Plane Function (UPF) is the primary data-plane entity in the 5G Core (5GC) architecture. It is responsible for forwarding user data packets between the Radio Access Network (RAN) and external data networks, acting as the anchor point for user sessions and enabling data path management based on control-plane instructions from the Session Management Function (SMF).

The UPF handles packet routing and forwarding, QoS enforcement, traffic usage reporting, and packet inspection, in accordance with policies provided by the SMF. It also supports traffic steering, allowing data flows to be directed toward appropriate service function chains or edge/cloud applications based on service type, location, or network slice.

4.3.2.9 PCF

The Policy Control Function (PCF) is the centralized policy engine in the 5G Core (5GC) architecture, responsible for managing and enforcing network policies related to QoS, access, mobility, and charging. It plays a critical role in providing unified and dynamic policy control to various network functions across both control and user planes.

4.3.3 VoNR Reference Points and Protocols

4.3.3.1 The Mw reference point between x-CSCF and x-CSCF (SIP)

The Mw interface is between an x-CSCF and another x-CSCF within the IMS core network (e.g. P-CSCF to E-CSCF). The protocols used on the Mw interface are SIP and SDP and are defined in ETSI TS 124 229 [2].

4.3.3.2 The Ml reference point between E-CSCF and LRF

Ml is a reference point between an E-CSCF and an LRF. See ETSI TS 123 167 [12].

4.3.3.3 The Mx reference point between E-CSCF and IBCF

Mx is a reference point between an E-CSCF and an IBCF. See ETSI TS 123 167 [12].

4.3.3.4 The I4 reference point between E-CSCF and EATF

I4 is a reference point between an E-CSCF and an EATF. See ETSI TS 123 167 [12].

4.3.3.5 The Mm reference point between E-CSCF and PSAP

Mm is a reference point between an E-CSCF and an PSAP. See ETSI TS 123 167 [12].

4.3.3.6 The Mi reference point between E-CSCF and BGCF

Mm is a reference point between an E-CSCF and an BGCF. See ETSI TS 123 167 [12].

4.3.3.7 The N1/N2 reference point between gNB and AMF

N1 is a reference point between a UE and an AMF.

N2 is a reference point between a gNB and an AMF. See ETSI TS 123 501 [8].

4.3.3.8 The N3 reference point between gNB and UPF

N3 is a reference point between a gNB and an UPF. See ETSI TS 123 501 [8].

4.3.3.9 The N5 reference point between AF and PCF

N5 is a reference point between a PCF and an AF (the P-CSCF in the case of VoNR). See ETSI TS 123 501 [8].

4.3.3.10 The N6 reference point between UPF and P-CSCF (IP)

4.3.3.10.1 General

The N6 reference point performs User plane generic IP interfacing, breaking out the user IP data from the 5GC plane towards the Application Functions (IMS, Internet, etc.). Towards the NG-RAN or non-3GPP access, this data is transported always as tunnelled and not merely routed on IP principles, such that the N6 correspondent node is provided with direct IP connectivity to the UE device. The SIP signalling as well as the IMS media are transported over this interface.

N6 is a reference point between a UPF and a Data Network (the P-CSCF for signalling and the IMS AGW for voice in the case of VoNR). See ETSI TS 129 561 [17] and ETSI TS 123 501 [8].

4.3.3.10.2 The Gm reference point (SIP)

The Gm interface is between the UE and the P-CSCF and enables connectivity between the UE and the IMS network for registration, authentication, encryption, and session control. The protocol used on the Gm interface is SIP/SDP and is defined within ETSI TS 124 229 [2].

The Gm reference point represents the 1st hop in SIP signalling between the UE and the IMS network represented by the P-CSCF. Its scope is to provide a secure SIP signalling channel, independent of the access network level security.

As such, with the exception of initial security negotiations, all signalling should be regarded as un-interceptable. However, for the interoperability purposes here in scope, intercepting this interface is critical for verifying the correct test scenario functionality, without requiring proprietary signalling tapping alternatives. Security measures as 3GPP-Ipsec or TLS will be disabled on the Gm interface during the interoperability testing. Nevertheless, security is still to be regarded as mandatory when testing IMS UNI interoperability.

4.3.3.11 The N26 reference point between AMF and MME

N26 is a reference point between an AMF and an MME. See ETSI TS 123 501 [8].

4.3.4 Applicable 3GPP Release Number

Considering that the purposes of these tests is to prove base IOP between two different systems from potentially different vendors, the functionality has been limited to common/typical procedures, while exhaustive conformance testing is out of the scope of the present document. The present document is aimed at Release 16 but (given its scope), Release 15 implementations should still be able to perform most of the tests without major difficulties.

4.4 Test pre-requisites

4.4.1 IP Version

Whether the 5GC system uses Ipv4 or Ipv6 to transport (i.e. tunnelling method) the User Plane data inside the 5GC is irrelevant to the outcome of the tests. Options for encapsulating either Ipv4 or Ipv6 packets into both Ipv4 and Ipv6 transported tunnels exist. There are no differences in the User Plane provided services by the 5GC platform relevant to the used IP transport version, such that this decision can be taken by the 5GC vendors as to maximize performance and optimize their platforms.

The UE registration to the 5GC is assumed to be a dual Ipv4 and Ipv6. It is assumed that for the test purposes, the IMS client software will be capable of SIP signalling and media transport over both protocol version. The choice will be a configuration parameter (e.g. P-CSCF provisioned address in ISIM, DHCP or DNS). The SDP media should use the same IP version protocol as discovered for SIP signalling.

The IMS-5GC IOP Test Suite will be executed once for IMS clients using Ipv4 and once for IMS clients using Ipv6.

4.4.2 Number Resolution

"ENUM (IETF RFC 3761 [i.2]) is a capability that transforms E.164 numbers into domain names and then uses the DNS (Domain Name System) to discover NAPTR records that specify the services available for a specific domain name" (ETSI TR 184 008 [i.1]).

The test infrastructure focuses on the use of Infrastructure ENUM to map a telephone number into a SIP URI that may identify a specific Point of Interconnection (PoI) to that communication provider's network that may enable the originating party to establish communication with the associated terminating party either directly or through an IPX.

The Infrastructure ENUM platform has a tiered structure and provides authoritative, service specific information to the querying party. A combination of Tier 0, Tier 1 and Tier 2 registries enables global discovery of ENUM data.

When returning the SIP URI of a PoI the ENUM solution acts a hosted T2 ENUM registry for the number range holder. When returning a NS record the ENUM solution acts as either a Tier 0 or Tier 1 registry.

4.4.3 QoS aspects

The present document describes only the functional signalling aspects of the interworking of IMS networks. ETSI TS 103 189 [i.3] defines a set of test descriptions that allow the evaluation of the Quality of Service (QoS) that is available on a connection established via the NNI interface between two UEs following the use cases and test descriptions described in the present document. Wherever QoS testing can be applied a link is given to the relevant clause of ETSI TS 103 189 [i.3].

4.5 Test description overview

The test descriptions are documented in clauses 5 and 6.

Clause 5 represents test descriptions in the single network (non-roaming) case and clauses 6 in the roaming case respectively. For each clause, the test descriptions are presented in the following groupings:

- Emergency 5G registration and Emergency IMS Registration;
- Emergency SIP Session/Emergency Bearer Operations:
  - Emergency SIP Session Establishment.
  - Emergency SIP Session Modification.
  - Emergency SIP Session Release.
  - Emergency SIP Session Abort/Reject.
- Emergency De-registration (with/without Emergency sessions).
- Emergency 5G Deregistration (with/without SIP sessions, with/without Emergency IMS registration).

The Test Descriptions present a definitive signalling and procedural flow through the test's execution. As a very high number of test variations may be generated, here only the most common scenarios are approached.

Each Test Description can be reconfigured to test various aspects (e.g. Ipv4 and Ipv6 IMS registrations). Yet these reconfigurations are to be regarded only as specific to the individual test executions as they should not affect the test descriptions.

4.6 TD naming convention

TDs are numbered, starting at 01, within each group.

Table 1: TD identifier naming convention scheme

Identifier: **<TD>_<type>_<group>_<network>_<scope>_<nn>**			
<td>	=	Test Description:	fixed to "TD"
<type>	=	Communication:	VoNR
<group>	=	Emergency:	EMC - Emergency Call
			NGC - NG eCall
			ECO - Emergency Call or NG eCall (common)
<network>	=	Network:	INT - Interoperability
			RMI - Roaming
<scope>	=	Group	5RG - 5G Registration
			REG - IMS Registration
			INI - Session establishment and modification
			REL - Session Release
			ABT - Session Abort
			REJ - Session Rejection
			DRG - IMS Deregistration
			5DR - 5G Deregistration
			FB - Fallback to 4G
<nn>	=	Sequential number	(01 to 99)

5 Test Descriptions (Interoperability at HPLMN)

5.0 General

The Interoperability Test Descriptions (TDs) defined in the following clauses are derived from the Emergency Test Purposes (TPs) specified in ETSI TS 103 796-1 [1] (ones containing ECO, EMC or NGC identifier are related to the emergency TPs) where each TD may realize one or more TPs.

Each TD contains three parts:

1) The TD itself in tabular format.
2) The call flow associated to the TD.
3) A textual description of the call flow.

5.1 5G Emergency Registration

5.1.1 UE Emergency Network Registration and Establishment of the Emergency PDU session with USIM

Interoperability Test Description		
Identifier:	TD_VoNR_ECO_INT_5RG_01	
Objective:	To perform UE emergency 5G registration to the network with USIM and establish an emergency PDU session.	
Summary:	On successful emergency 5G registration, the UE/IVS should discover the P-CSCF IP address. The 5GC will create the Emergency PDU session which will allow communication only between the UE and the P-CSCF and allowed forwarding towards E-CSCF.	
Configuration:	CF_VoNR_INT_ES	
SUT:	IMS A and 5GC A	
Interfaces:	N1/N2	
References:	N1/N2	ETSI TS 124 501 [7], clauses 5.5.1.2.2, 5.5.1.2.4, 8.2.6, 8.2.7, 5.4.5.2.3, 6.4.1.2, 8.2.10, 8.2.11, 8.3.1 and 8.3.2 ETSI TS 123 502 [9], clauses 4.2.2.2 and 4.3.2.2.1
		ETSI TS 124 229 [2], clauses 9.2.1 and U.2.2.6
Pre-test conditions:	• Network emergency registration provisioned in UE A, 5GC and UDM, PCF. • 5GC and UE A provisioned with selectable emergency PDU configurations for Ipv4, Ipv6 or Ipv4&Ipv6 PDU session types. • P-CSCF address provisioned in the PCF for the purpose of delivery to UE on emergency registration. • Emergency PDU session PCF policies set to allow UE A - P-CSCF communication. • Default 5GC Policy set to "Deny". • UE A contains USIM and is not registered to network and 5GC.	
Test Sequence:	**Step**	
	1	UE A starts emergency registration to home 5GC
	2	Verify that the message sequence is correct
	3	Verify that 5GC establishes Emergency PDU session for allowing UE A - P-CSCF communication, by starting at UE A an Emergency registration
	4	Verify that UE A registered successfully and received the following information: • suitable Ipv4 and/or Ipv6 address(es) • DNS configuration information P-CSCF IP address or FQDN
	5	Verify that arbitrary IP packets from UE A to arbitrary node, other than the P-CSCF, are filtered-out by 5GC and not visible on PO_N6
	6	Verify that arbitrary IP packets from another node (e.g. PSAP sent over PO_N6) to UE A, are filtered-out by 5GC and not visible on PO_UE A
Conformance criteria of test sequence step:	1, 2	N1N2 TP_N1N2_AMF_ECO_REG_01 (Events 2, 3)
	3	N1N2 TP_N1N2_AMF_ECO_PDUE_02 (Events 8, 9)

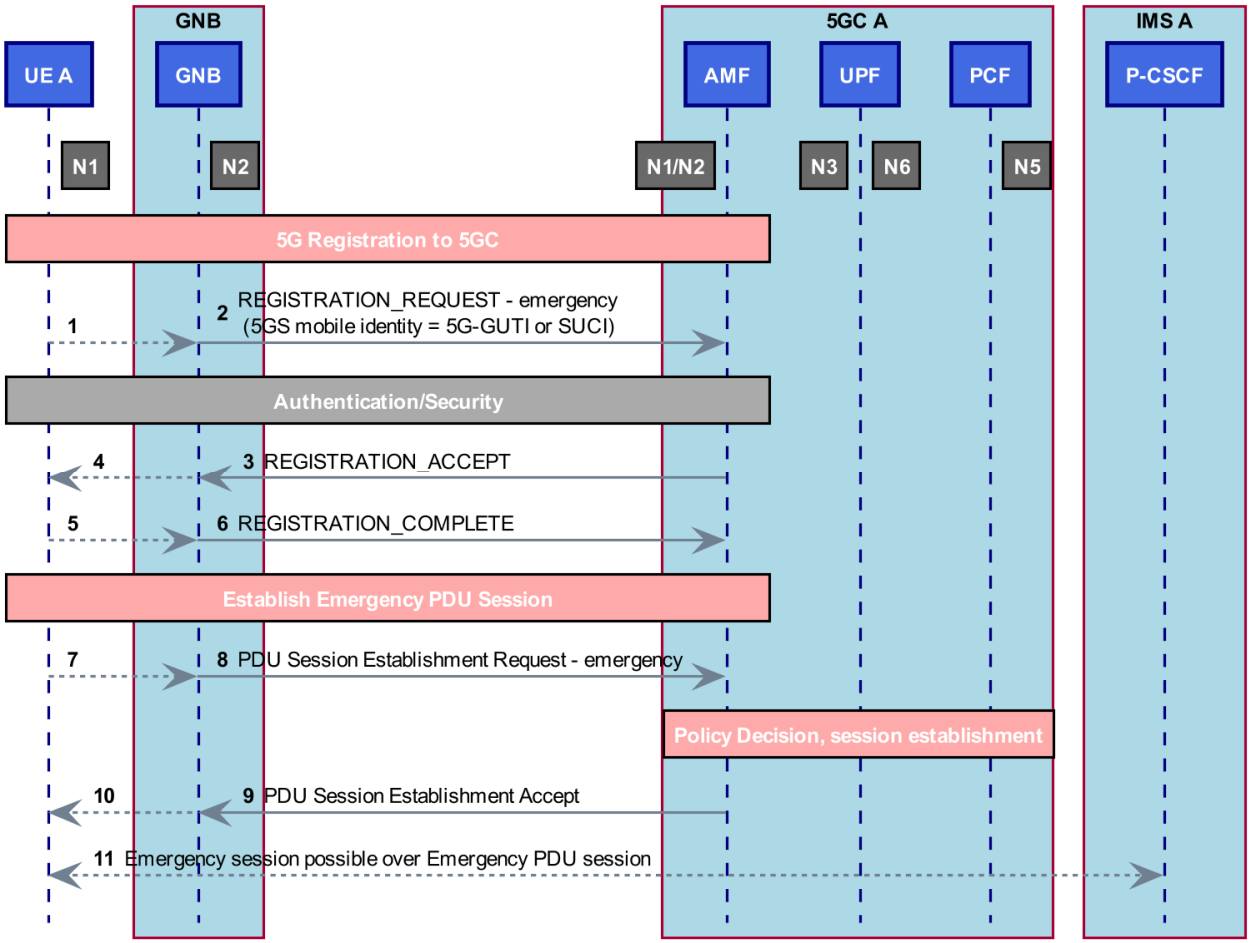


Figure 4: Emergency network registration with USIM

1) The UE-A requests IP-CAN emergency registration session with 5GC mobile identity set to 5G-GUTI or SUCI towards the home 5GC (AMF).

2) The GNB forwards a REGISTRATION_REQUEST message to the AMF.

3) The AMF responds with REGISTRATION_ACCEPT.

4) The GNB forwards message to the UE-A.

5) The UE-A responds with a REGISTRATION_COMPLETE.

6) The GNB forwards message to the AMF, confirming the emergency registration has been successfully set up.

7) User UE-A requests the PDU session establishment for DNN (emergency).

8) The GNB forwards message to the AMF.

9) AMF confirms the PDU session establishment for DNN (emergency).

10) The GNB forwards message to the UE-A.

11) The emergency PDU sessions should be successfully established.

5.1.2 UE Emergency Network Registration and Establishment of the Emergency PDU session without USIM

Interoperability Test Description		
Identifier:	TD_VoNR_ECO_INT_5RG_02	
Objective:	To perform UE emergency 5G registration to the network without USIM (related only to emergency call) and establish an emergency PDU session.	
Summary:	On successful emergency 5G registration, the UE/IVS should discover the P-CSCF IP address. The 5GC will create the Emergency PDU session which will allow communication only between the UE and the P-CSCF and allowed forwarding towards E-CSCF.	
Configuration:	CF_VoNR_INT_ES	
SUT:	IMS A and 5GC A	
Interfaces:	N1/N2	
References:	N1/N2	ETSI TS 124 501 [7], clauses 5.5.1.2.2, 5.5.1.2.4, 8.2.6, 8.2.7, 5.4.5.2.3, 6.4.1.2, 8.2.10, 8.2.11, 8.3.1 and 8.3.2 ETSI TS 123 502 [9], clauses 4.2.2.2 and 4.3.2.2.1
		ETSI TS 124 229 [2], clauses 9.2.1 and U.2.2.6
Pre-test conditions:	• Network emergency registration provisioned in UE A, 5GC and UDM, PCF. • 5GC and UE A provisioned with selectable emergency PDU configurations for Ipv4, Ipv6 or Ipv4&Ipv6 PDU session types. • P-CSCF address provisioned in the PCF for the purpose of delivery to UE on emergency registration. • Emergency PDU session PCF policies set to allow UE A - P-CSCF communication. • Default 5GC Policy set to "Deny". • UE A does not contain USIM and is not registered to network and 5GC. • If no USIM is present, the substate shall be NO-SUPI (only PEI).	
Test Sequence:	**Step**	
	1	UE A starts emergency registration to home 5GC
	2	Verify that the message sequence is correct
	3	Verify that 5GC establishes Emergency PDU session for allowing UE A - P-CSCF communication, by starting at UE A an Emergency registration
	4	Verify that UE A registered successfully and received the following information: • suitable Ipv4 and/or Ipv6 address(es) • DNS configuration information P-CSCF IP address or FQDN
	5	Verify that arbitrary IP packets from UE A to arbitrary node, other than the P-CSCF, are filtered-out by 5GC and not visible on PO_N6
	6	Verify that arbitrary IP packets from another node (e.g. PSAP sent over PO_N6) to UE A, are filtered-out by 5GC and not visible on PO_UE A
Conformance criteria of test sequence step:	1,2	N1N2 TP_N1N2_AMF_ECO_REG_02 (Events 2, 3)
	3	N1N2 TP_N1N2_AMF_ECO_PDUE_01 (Events 8, 9)

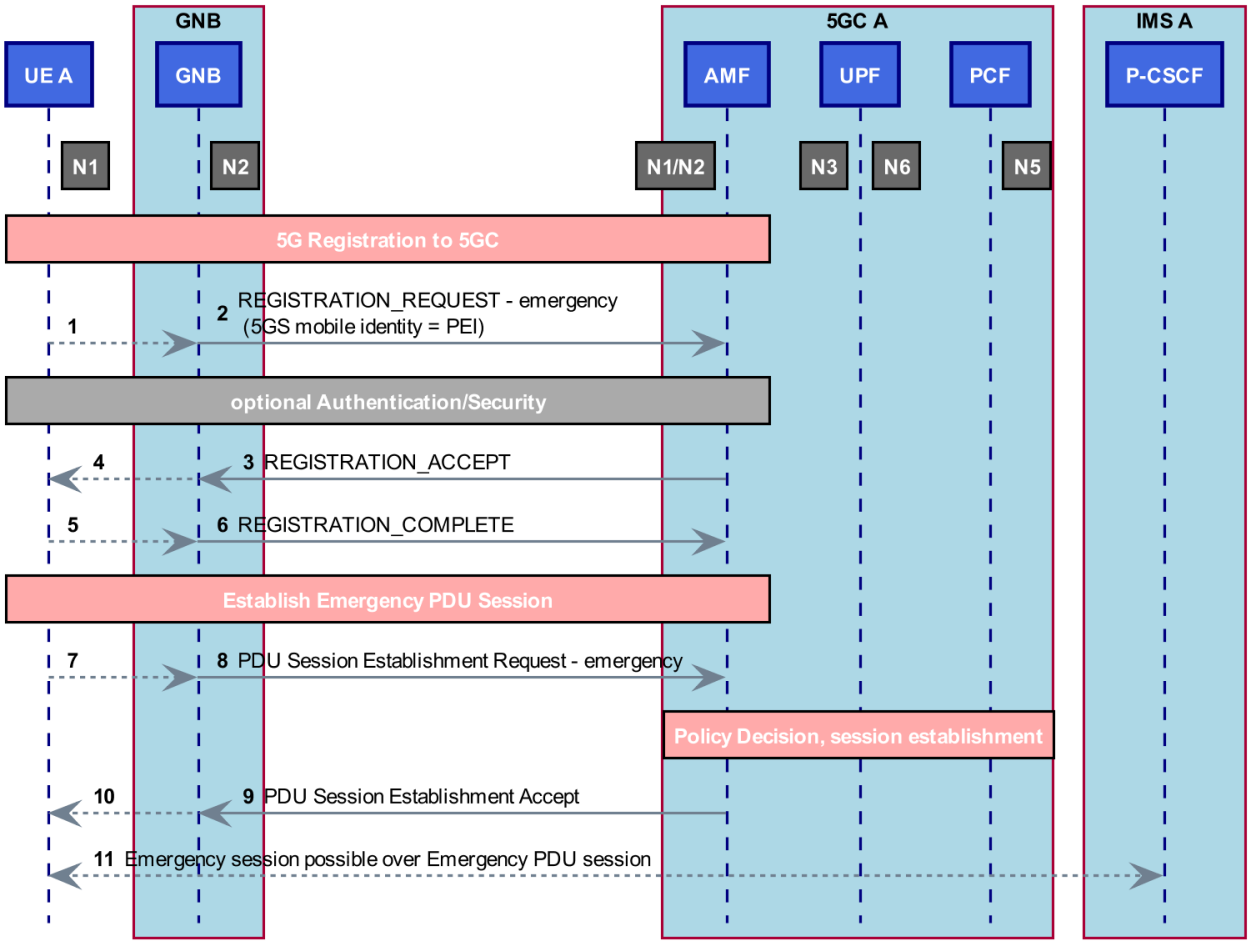


Figure 5: Emergency network registration without USIM

1) The UE-A which does not hold a valid 5G-GUTI or SUCI requests IP-CAN emergency registration session with 5GC mobile identity set to PEI towards the home 5GC (AMF).

2) The GNB sends/encapsulates a REGISTRATION_REQUEST message to the AMF.

3) The AMF responds with REGISTRATION_ACCEPT.

4) The GNB forwards message to the UE-A.

5) The UE-A responds with a REGISTRATION_COMPLETE.

6) The GNB forwards message to the AMF, confirming the emergency registration has been successfully set up.

7) User UE-A requests the PDU session establishment for DNN (emergency).

8) The GNB forwards message to the AMF.

9) AMF confirms the PDU session establishment for DNN (emergency).

10) The GNB forwards message to the UE-A.

11) The PDU sessions should be successfully established.

5.2 IMS Emergency Registration

5.2.1 IMS Emergency Registration - Successful

Interoperability Test Description		
Identifier:	TD_VoNR_ECO_INT_REG_01	
Objective:	To perform emergency IMS registration via the established emergency PDU session. Note that some UE-s perform emergency registration automatically on 5G emergency registration - in which case this test becomes merged with the previous ones.	
Summary:	During emergency IMS registration, the P-CSCF shall request the PCF to perform session binding onto the underlying emergency PDU session. The PCF should act on the request and modify the PDU session. Subsequent signalling should make use of the respective session's QoS and priority characteristics.	
Configuration:	CF_VoNR_INT_ES	
SUT:	IMS A and 5GC A	
Interfaces:	N6/Gm, Mw, Cx, N5 or Rx, N3	
References:	Gm, Mw	ETSI TS 124 229 [2], clauses 5.1.1 and 5.1.6.1 ETSI TS 134 229-1 [11], clauses C.20 and 19.1.1.3 (items 2 and 3)
	Cx	ETSI TS 129 228 [3], clauses 6.1.1, 6.1.2 and 6.3 and Annex G ETSI TS 129 229 [4], clause 6.1.1
	N5 or Rx	ETSI TS 129 514 [6], clause B.5 ETSI TS 129 214 [5], clause A.5
	N3	ETSI TS 123 501 [8], clause 5.6
	N6	ETSI TS 129 561 [17], clause 13.2
Pre-test conditions:	• UE A previously registered to 5GC and may be previously initially registered to IMS. An emergency PDU session has been established. An emergency session allowing UE A - P-CSCF- E-CSCF IP communication via GNB and UPF components. • HSS provisioned with UE A subscription. • UE A discovered the P-CSCF address.	
Test Sequence:	**Step**	
	1	UE A triggers Emergency IMS registration.
	2	Verify that the message sequence is correct.
	3	Verify that IMS included a Media Description for emergency signalling according to UE A.IP_Address, UE A.SIP_Port, P-CSCF.IP_Address, P-CSCF.SIP_Port.
	4	Verify that the PCF successfully provisioned QOS rules to the 5GC on the emergency PDU session.
	5	Verify that UE A can exchange subsequent signalling with IMS.
	6	Verify that UE A subsequent signalling is transported with appropriate PCC characteristics.
Conformance criteria of test sequence step:	2	Gm TP_GM_PCSCF_5G_ECO_REGISTER_01 (Events 2, 13) Gm TP_GM_PCSCF_5G_ECO_REGISTER_02 (Events 14, 23) Mw TP_MW_PCSCF_5G_ECO_REGISTER_01 (Events 5, 12) Mw TP_MW_PCSCF_5G_ECO_REGISTER_02 (Events 15, 22) Mw TP_MW_ICSCF_5G_ECO_REGISTER_01 (Events 8, 11) Mw TP_MW_ICSCF_5G_ECO_REGISTER_02 (Events 18, 21) Cx TP_CX_HSS_5G_ECO_UAA_01 (Events 6, 7) Cx TP_CX_HSS_5G_ECO_MAA_01 (Events 9, 10) Cx TP_CX_HSS_5G_ECO_UAA_02 (Events 16, 17) Cx TP_CX_HSS_5G_ECO_SAA_03 (Events 19, 20)
	3	Rx TP_RX_PCSCF_5G_ECO_AAR_01 (Event 3) or N5 TP_N5_PCSCF_5G_ECO_PCR_01 (Event 3) Rx TP_RX_PCRF_5G_ECO_AAA_01 (Event 4) or N5 TP_N5_PCF_5G_ECO_PCA_01 (Event 4)

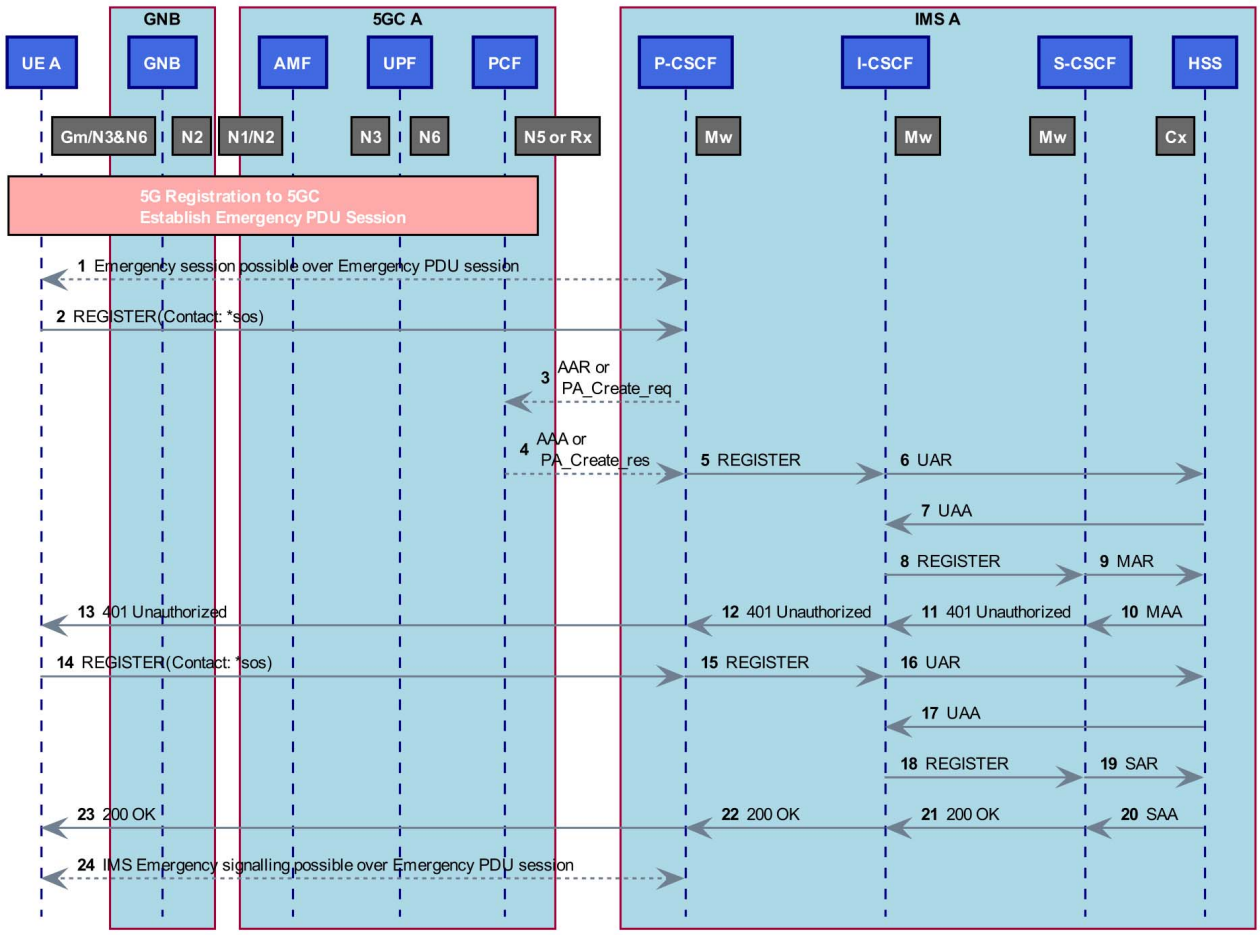


Figure 6: Emergency Registration (success)

1) 5G registration and emergency PDU session established successfully.
2) The UE-A requests IMS A Registration to P-CSCF over UPF.
3) P-CSCF optionally sent AAR or Npcf_PolicyAuthorization_Create request to PCF to provide 5GC-level identities (MSISDN, IMSI, IMEI).
4) PCF responds with AAA or Npcf_PolicyAuthorization_Create response.
5) P-CSCF forwards the REGISTER to I-CSCF.
6) I-CSCF sends UAR to HSS.
7) HSS responds with UAA.
8) I-CSCF forwards the REGISTER to S-CSCF.
9) S-CSCF sends MAR to HSS.
10) HSS responds with MAA.
11) IMS A rejects the REGISTER and issues a challenge.
12) I-CSCF forwards 401 response to P-CSCF.
13) P-CSCF forwards 401 response to UE-A over UPF.
14) The REGISTER is re-sent with an Authorization header to P-CSCF over UPF.
15) P-CSCF forwards the REGISTER to I-CSCF.

16) I-CSCF sends UAR to HSS.

17) HSS responds with UAA.

18) I-CSCF forwards the REGISTER to S-CSCF.

19) S-CSCF sends SAR to HSS.

20) HSS responds with SAA.

21) The IMS registration is successful.

22) I-CSCF forwards 200 response to P-CSCF.

23) P-CSCF forwards 200 response to UE-A over UPF.

24) IMS Emergency signalling possible over Emergency PDU session.

5.2.2 IMS Emergency Registration - Unsuccessful

Interoperability Test Description		
Identifier:	TD_VoNR_ECO_INT_REG_02	
Objective:	To attempt initial emergency IMS registration via the established emergency PDU session. In this case, the emergency IMS registration is not successful due to not accepted UE credentials. Emergency call can be established without emergency registration (see TD_VoNR_ECO_INT_INI_02).	
Summary:	On failed UE emergency Registration to IMS, IMS will be able to transport emergency signalling.	
Configuration:	CF_VoNR_INT_ES	
SUT:	IMS A and 5GC A	
Interfaces:	N6/Gm, Mw, Cx, N5 or Rx, N3	
References:	Gm, Mw	ETSI TS 124 229 [2], clauses 5.1.6.2, 5.2.10.5 ETSI TS 134 229-1 [11], clause 19.4.5
	Cx	ETSI TS 129 228 [3], clause 6.1.1.1
	N5 or Rx	ETSI TS 129 514 [6], clause B.5 ETSI TS 129 214 [5], clause A.5
	N3	ETSI TS 123 501 [8], clause 5.6
	N6	ETSI TS 129 561 [17], clause 13.2
Pre-test conditions:	• UE A previously registered to 5GC, but not registered to IMS. • 5GC established an emergency PDU session allowing UE A - P-CSCF IP communication. • HSS of IMS not provisioned with UE A's subscription. • UE A discovered the P-CSCF address.	
Test Sequence:	**Step**	
	1	UE A triggers Emergency IMS registration with not acceptable credentials.
	2	Verify that the Emergency IMS registration has been rejected.
	3	Verify that the PCF is not invoked.
Conformance criteria of test sequence step:	2	Gm TP_GM_PCSCF_5G_ECO_REGISTER_01 (Events 2, 13) Gm TP_GM_PCSCF_5G_ECO_REGISTER_03 (Events 14, 23) Mw TP_MW_PCSCF_5G_ECO_REGISTER_01 (Events 5, 12) Mw TP_MW_PCSCF_5G_ECO_REGISTER_03 (Events 15, 22) Mw TP_MW_ICSCF_5G_ECO_REGISTER_01 (Events 8, 11) Mw TP_MW_ICSCF_5G_ECO_REGISTER_03 (Events 18, 21) Cx TP_CX_HSS_5G_ECO_UAA_01 (Events 6, 7) Cx TP_CX_HSS_5G_ECO_MAA_01 (Events 9, 10) Cx TP_CX_HSS_5G_ECO_UAA_02 (Events 16, 17) Cx TP_CX_HSS_5G_ECO_SAA_03 (Events 19, 20)
	3	Rx TP_RX_PCSCF_5G_ECO_AAR_01 (Event 3) or N5 TP_N5_PCSCF_5G_ECO_PCR_01 (Event 3) Rx TP_RX_PCRF_5G_ECO_AAA_01 (Event 4) or N5 TP_N5_PCF_5G_ECO_PCA_01 (Event 4)

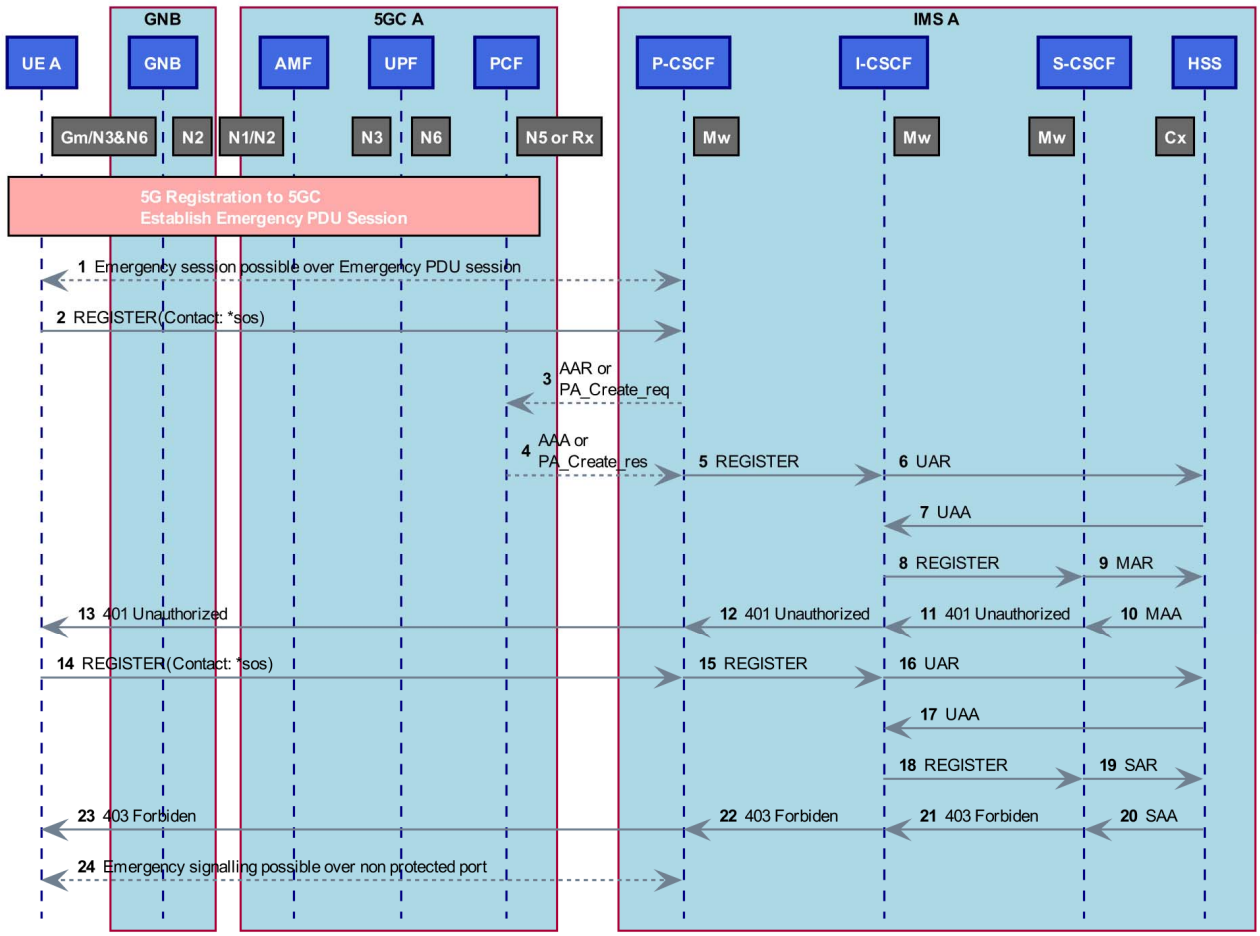


Figure 7: IMS Initial Registration (unsuccessful)

1) 5G registration and emergency PDU session established successfully.

2) The UE-A requests IMS A Registration to P-CSCF over UPF.

3) P-CSCF optionally sent AAR or Npcf_PolicyAuthorization_Create request to PCF to provide 5GC-level identities (MSISDN, IMSI, IMEI).

4) PCF responds with AAA or Npcf_PolicyAuthorization_Create response.

5) P-CSCF forwards the REGISTER to I-CSCF.

6) I-CSCF sends UAR to HSS.

7) HSS responds with UAA.

8) I-CSCF forwards the REGISTER to S-CSCF.

9) S-CSCF sends MAR to HSS.

10) HSS responds with MAA.

11) IMS A rejects the REGISTER and issues a challenge.

12) I-CSCF forwards 401 response to P-CSCF.

13) P-CSCF forwards 401 response to UE-A over UPF.

14) The REGISTER is re-sent with an Authorization header to P-CSCF over UPF.

15) P-CSCF forwards the REGISTER to I-CSCF.

16) I-CSCF sends UAR to HSS.

17) HSS responds with UAA.

18) I-CSCF forwards the REGISTER to S-CSCF.

19) S-CSCF sends SAR to HSS.

20) HSS responds with SAA.

21) The IMS registration is unsuccessful.

22) I-CSCF forwards 403 Forbidden response to P-CSCF.

23) P-CSCF forwards 403 Forbidden response to UE-A over UPF.

24) Emergency signalling possible over non-protected port.

5.3 Emergency Session and Emergency Bearer Operations (Interoperability)

5.3.0 Introduction

5.3.1 Emergency Session Establishment

5.3.1.1 General

The term "initiates an emergency call" or "initiates an NG eCall" used in the test descriptions describes the use of a service URN with a top-level service type "sos", which marks the user intends to establish an emergency call.

Some examples of the services with a top-level service type "sos" and the short descriptions provided in IETF RFC 5031 [15] and IETF RFC 8147 [16] can be found in Table 2.

Table 2: URN services

URN-Service	Short Description (see IETF RFC 5031 [15] and IETF RFC 8147 [16])
urn:service:sos	The generic 'sos' service reaches a Public Safety Answering Point (PSAP).
urn:service:sos.ambulance	This service identifier reaches an ambulance service that provides emergency medical assistance and transportation.
Urn:service:sos.fire	The 'fire' service identifier summons the fire service, also known as the fire brigade or fire department.
Urn:service:sos.gas	The 'gas' service allows the reporting of natural gas leaks or other natural gas emergencies.
Urn:service:sos.police	The 'police' service refers to the police department or other law enforcement authorities.
Urn:service:sos.ecall.automatic	The 'ecall' service indicating automatically triggered eCall.
urn:service:sos.ecall.manual	The 'ecall' service indicating manually triggered eCall.

5.3.1.2 UE calling PSAP with emergency registration

Interoperability Test Description		
Identifier:	TD_VoNR_ECO_INT_INI_01	
Objective:	To demonstrate the establishment of dedicated PDU sessions at the originating 5GC due to SIP emergency session establishment within an emergency registration. PSAP is located in the IM CN subsystem of IMS A.	
Summary:	An emergency call is setup between UE A and the PSAP located in the IM CN subsystem of IMS A. UE-A is registered to 5GC A, has performed the emergency registration to IMS A, and requests emergency session establishment using an emergency URN. The P-CSCF derives descriptions of the Service Data Flow from the SDP data, requests creation of adequate PDU sessions and QoS flows from PCF and 5GC and forwards the request to the E-CSCF. The E-CSCF retrieves the PSAP URI from local configuration and forwards the request to this PSAP. Media transport is possible only after the successful establishment of the session. Media negotiation happens during INVITE/200 OK (UE A sends SDP-offer, PSAP responds with SDP-answer).	
Configuration:	CF_VoNR_INT_ES option 1	
SUT:	IMS A, 5GC A and PSAP	
Interfaces:	N1/N2, N3, N6/Gm, Mw, N5 or Rx, Mm	
References:	Mm	ETSI TS 124 229 [2], clause 5.11.2 ETSI TS 123 167 [12]
	Gm, Mw	ETSI TS 124 229 [2], clauses 5.1.6.8.3, 5.1.6.11, 5.2.6.3.3, 5.2.10.3 and 5.11.2
	N1/N2	ETSI TS 124 501 [7], clauses 5.4.5.2.3, 6.3.2.3, 8.2.10, 8.2.11, 8.3.9 and 8.3.10
	N5 or Rx	N5 : ETSI TS 129 514 [6], clauses 4.2.2, B.1, B.2, B.5 and Annex C Rx : ETSI TS 129 214 [5], clauses 4.4.1, A.1, A.2, A.5 and Annex B
	N6	ETSI TS 129 561 [17], clause 13.2
	N3	ETSI TS 123 501 [8], clause 5.6
Pre-test conditions:	• UE A previously registered to 5GC A. • UE A previously registered to IMS A. • 5GC established an emergency PDU session allowing UE A - P-CSCF IP communication. • 5GC established a QoS Flow within a PDU Session for IMS signalling. • PSAP is registered in IMS A and ready to accept the session establishment. • UE A previously performed emergency registration.	
Test Sequence:	**Step**	
	1	Verify that media between UE A and PSAP is not delivered in any direction before call establishment.
	2	UE A initiates an emergency call to establish a communication session using an emergency service URN.
	3	Verify that the UE A inserts in the INVITE request, a From header field that includes the public user identity registered via emergency registration or the tel URI associated with the public user identity registered via emergency registration and a To header indicating one of the emergency URNs defined in Table 2.
	4	Verify that IMS A (P-CSCF, E-CSCF) routes the emergency call to the PSAP in the same IM CN subsystem of the own network.
	5	Verify that the IMS produced a Media Description for the session according to SDP-offer in SIP INVITE Request and SDP-answer in SIP 183.
	6	Verify that the P-CSCF in the IMS interacts with the Policy Control Function (PCF) in the 5GC (via the N5 interface) to request policy for the emergency call, providing the media description. The PCF evaluates the media description and invokes the Session Management Function (SMF) in the 5GC to establish a dedicated QoS Flow for the requested media.
	7	Verify that dedicated QoS Flows are established in the 5GC User Plane Function (UPF) and that media between UE A and PSAP is successfully routed over these dedicated QoS Flows with appropriate PCC characteristics enforced by the UPF based on policies from the PCF.

Interoperability Test Description			
Conformance criteria of test sequence step:	2	N6/Gm N6/Gm	TP_GM_PCSCF_5G_ECO_INVITE_02 (Events 1, 2) TP_GM_PCSCF_5G_NGC_INVITE_01 for eCall (Events 1, 2)
	3	N6/Gm	TP_GM_PCSCF_5G_ECO_REGISTER_02 (Pre-test)
	4	Mw Mm	TP_MW_PCSCF_5G_ECO_INVITE_02 (Event 7) TP_MM_ECSCF_5G_ECO_INVITE_01 (Event 8)
	6	Rx N5 Rx N5 Rx N5 Rx N5 N5 N1N2	TP_RX_PCSCF_5G_ECO_AAR_02 (AAR - Event 3) TP_N5_PCSCF_5G_ECO_PCR_02 (PA_Create_req - Event 3) TP_RX_PCRF_5G_ECO_AAA_02 (AAA - Events 4, 16) TP_N5_PCF_5G_ECO_PCA_02 (PA_Create_res - Event 4) TP_RX_PCSCF_5G_ECO_RAA_01 (RAR, RAA - Events 5, 6) TP_N5_PCSCF_5G_ECO_PNA_01 (PA_Notify_req - Events 5, 6) TP_RX_PCSCF_5G_ECO_AAR_04 (AAR - Event 11) TP_N5_PCSCF_5G_ECO_PUR_04 (PA_Update_req - Event 11) TP_N5_PCF_5G_ECO_PUA_01 (PA_Update_res - Event 16) TP_N1N2_AMF_ECO_PDUM_03 (Events 14, 15)
	7	Rtp	TP_RTP_ECO_03 (Event 30)

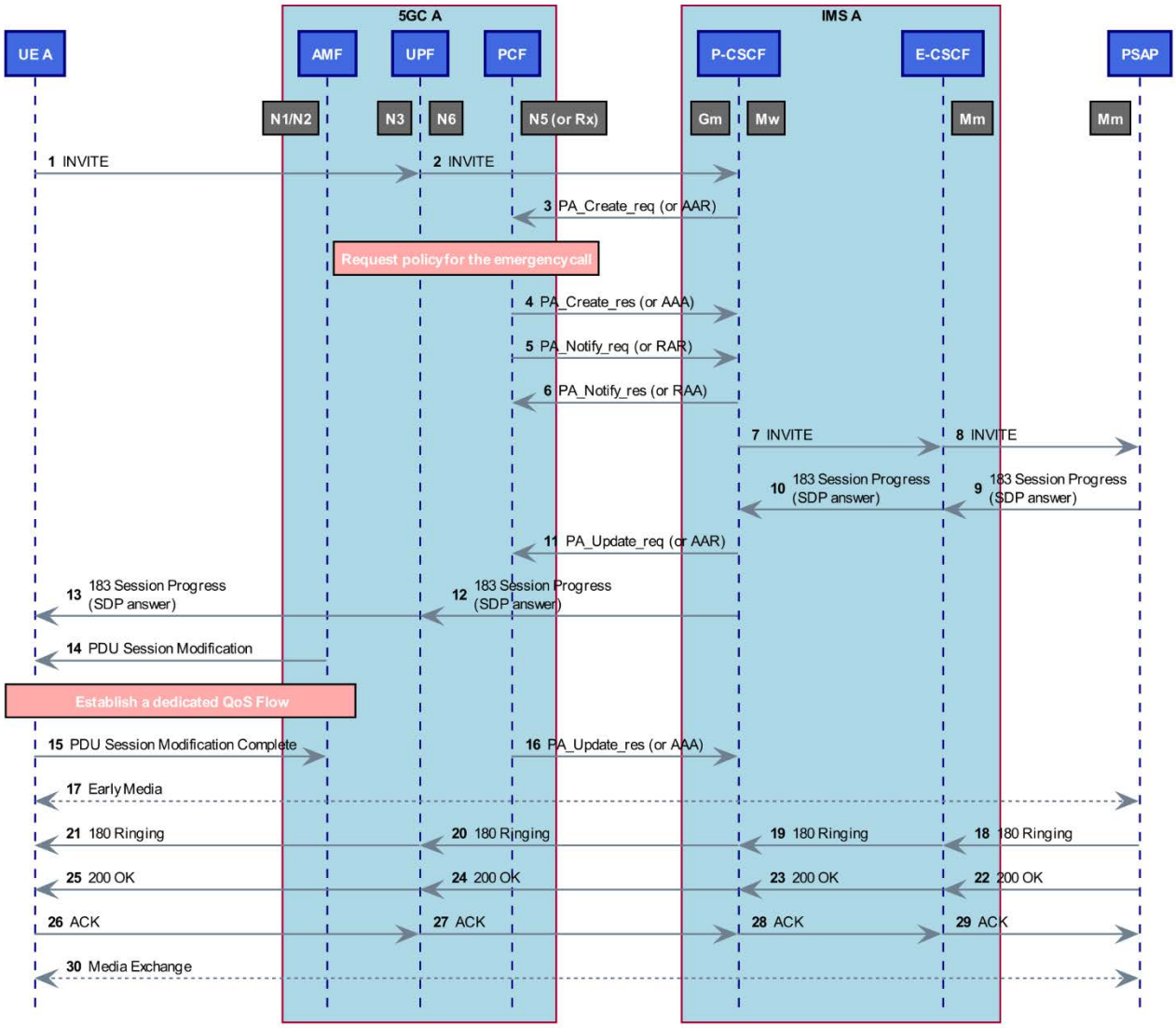


Figure 8: Emergency Session Establishment with emergency registration, PSAP in same IM CN subsystem

NOTE: The interaction in Figure 8 is the same for emergency registered and non-emergency registered UE.

1) UE A initiates the emergency session with an INVITE request to UPF. The From header field includes the public user identity (registered via emergency registration) or the tel URI associated with the public user identity (registered via emergency registration).
2) UPF forwards the INVITE to P-CSCF over N6.
3) The IMS A P-CSCF invokes the PCF with PA_Create_req over N5 or AAR over Rx.
4) PCF responds to IMS A P-CSCF with PA_Create_res over N5 or AAA over Rx.
5) PCF sends PA_Notify_req over N5 or RAR over Rx to P-CSCF.
6) P-CSCF responds with PA_Notify_res over N5 or RAA over Rx.
7) P-CSCF sends the INVITE to E-CSCF.
8) E-CSCF sends the INVITE to PSAP.
9) PSAP responds with the 183 response with SDP answer to E-CSCF.
10) E-CSCF sends the 183 response to P-CSCF.
11) The IMS A P-CSCF invokes the PCF with PA_Update_req over N5 or AAR over Rx.
12) P-CSCF forwards the SIP 183 (SDP) to UPF.
13) UPF forwards the SIP 183 (SDP) to UE A.
14) AMF sends PDU Session Modification Command to UE A.
15) UE A sends PDU Session Modification Complete to AMF.
16) PCF sends PA_Update_res over N5 or AAA over Rx to P-CSCF.
17) Early media may flow between the UE A and PSAP.
18) The PSAP responds with the 180 Ringing to E-CSCF.
19) E-CSCF forwards the 180 Ringing to P-CSCF.
20) P-CSCF forwards the SIP 180 Ringing to UPF.
21) UPF forwards the SIP 180 Ringing to UE A.
22) PSAP sends 200 OK to E-CSCF.
23) E-CSCF forwards the 200 OK to P-CSCF.
24) P-CSCF forwards the 200 OK towards UPF.
25) UPF forwards the 200 OK towards UE A.
26) UE A sends ACK to UPF.
27) UPF forwards ACK to P-CSCF.
28) P-CSCF sends ACK to E-CSCF.
29) E-CSCF forwards ACK to PSAP.
30) Media Exchange.

5.3.1.3 UE calling PSAP with non-emergency registration

Interoperability Test Description		
Identifier:	TD_VoNR_ECO_INT_INI_02	
Objective:	To demonstrate the establishment of dedicated PDU sessions at the originating 5GC due to SIP emergency session establishment within a non-emergency registration. PSAP is located in the IM CN subsystem of IMS A.	
Summary:	An emergency call is setup between UE A and the PSAP located in the IM CN subsystem of IMS A. UE-A is registered to 5GC A and registered to IMS A, has **NOT** performed the emergency registration to IMS A, and requests emergency session establishment using an emergency URN. The P-CSCF derives descriptions of the Service Data Flow from the SDP data, requests creation of adequate PDU sessions and QoS flows from PCF and 5GC and forwards the request to the E-CSCF. The E-CSCF retrieves the PSAP URI from local configuration and forwards the request to this PSAP. Media transport is possible only after the successful establishment of the session. Media negotiation happens during INVITE/200 OK (UE A sends SDP-offer, PSAP responds with SDP-answer).	
Configuration:	CF_VoNR_INT_ES option 1	
SUT:	IMS A, 5GC A and PSAP	
Interfaces:	N1/N2, N3, N6/Gm, Mw, N5 or Rx, Mm	
References:	Mm	ETSI TS 124 229 [2], clause 5.11.2 ETSI TS 123 167 [12]
	Gm, Mw	ETSI TS 124 229 [2], clauses 5.1.6.8.3, 5.1.6.11, 5.2.6.3.3, 5.2.10.3 and 5.11.2
	N1/N2	ETSI TS 124 501 [7], clauses 5.4.5.2.3, 6.3.2.3, 8.2.10, 8.2.11, 8.3.9 and 8.3.10
	N5 or Rx	N5 : ETSI TS 129 514 [6], clause B.5 Rx : ETSI TS 129 214 [5], clause A.5
	N3	ETSI TS 123 501 [8], clause 5.6
	N6	ETSI TS 129 561 [17], clause 13.2
Pre-test conditions:	• UE A previously registered to 5GC A. • UE A previously registered to IMS A. • 5GC established a non-emergency PDU session allowing UE A - P-CSCF IP communication. • 5GC established an IMS signalling bearer. • PSAP is registered in IMS A and ready to accept the session establishment. • UE A previously not performed emergency registration.	
Test Sequence:	**Step**	
	1	Verify that media between UE A and PSAP is not delivered in any direction before call establishment.
	2	UE A initiates an emergency call to establish a communication session using an emergency service URN (To header indicating one of the emergency URNs defined in Table 2).
	3	Verify that IMS A (P-CSCF, E-CSCF) routes the emergency call to the PSAP in the same IM CN subsystem of the own network.
	4	Verify that the IMS produced a Media Description for the session according to SDP-offer in SIP INVITE Request and SDP-answer in SIP 183.
	5	Verify that the P-CSCF in the IMS interacts with the Policy Control Function (PCF) in the 5GC (via the N5 interface) to request policy for the emergency call, providing the media description. The PCF evaluates the media description and invokes the Session Management Function (SMF) in the 5GC to establish a dedicated QoS Flow for the requested media.
	6	Verify that dedicated QoS Flows are established in the 5GC User Plane Function (UPF) and that media between UE A and PSAP is successfully routed over these dedicated QoS Flows with appropriate PCC characteristics enforced by the UPF based on policies from the PCF.

Interoperability Test Description			
Conformance criteria of test sequence step:	2	N6/Gm	TP_GM_PCSCF_5G_ECO_INVITE_03 (Events 1, 2)
	4	Mw	TP_MW_PCSCF_5G_ECO_INVITE_03 (Event 7)
		Mm	TP_MM_ECSCF_5G_ECO_INVITE_01 (Event 8)
	5	Rx	TP_RX_PCSCF_5G_ECO_AAR_02 (AAR - Event 3)
		N5	TP_N5_PCSCF_5G_ECO_PCR_02 (PA_Create_req - Event 3)
		Rx	TP_RX_PCRF_5G_ECO_AAA_02 (AAA - Events 4, 16)
		N5	TP_N5_PCF_5G_ECO_PCA_02 (PA_Create_res - Event 4)
		Rx	TP_RX_PCSCF_5G_ECO_RAA_01 (RAR, RAA - Events 5, 6)
		N5	TP_N5_PCSCF_5G_ECO_PNA_01 (PA_Notify_req - Events 5, 6)
		Rx	TP_RX_PCSCF_5G_ECO_AAR_04 (AAR - Event 11)
		N5	TP_N5_PCSCF_5G_ECO_PUR_04 (PA_Update_req - Event 11)
		N5	TP_N5_PCF_5G_ECO_PUA_01 (PA_Update_res - Event 16)
		N1N2	TP_N1N2_AMF_ECO_PDUM_03 (Events 14, 15)
	6	Rtp	TP_RTP_ECO_03 (Event 30)

The message sequence as depicted in Figure 8 applies without changes.

5.3.1.4 UE calling PSAP without any registration

Interoperability Test Description		
Identifier:	TD_VoNR_ECO_INT_INI_03	
Objective:	To demonstrate the establishment of dedicated PDU sessions at the originating 5GC due to SIP emergency session establishment without any registration. PSAP is located in the IM CN subsystem of IMS A.	
Summary:	An emergency call is setup between UE A and the PSAP located in the IM CN subsystem of IMS A. UE-A is registered to 5GC A but **NOT** registered to IMS A, has **NOT** performed the emergency registration to IMS A, and requests emergency session establishment using an emergency URN. The P-CSCF derives descriptions of the Service Data Flow from the SDP data, requests creation of adequate PDU sessions and QoS flows from PCF and 5GC, and forwards the request to the E-CSCF. The E-CSCF retrieves the PSAP URI from local configuration and forwards the request to this PSAP. Media transport is possible only after the successful establishment of the session. Media negotiation happens during INVITE/200 OK (UE A sends SDP-offer, PSAP responds with SDP-answer).	
Configuration:	CF_VoNR_INT_ES option 1	
SUT:	IMS A, 5GC A and PSAP	
Interfaces:	N1/N2, N3, N6/Gm, Mw, N5 or Rx, Mm	
References:	Mm	ETSI TS 124 229 [2], clause 5.11.2 ETSI TS 123 167 [12]
	Gm, Mw	ETSI TS 124 229 [2], clauses 5.1.6.8.2, 5.2.6.3.3, 5.2.10.2 and 5.11.2, ETSI TS 129 561 [17]
	N1/N2	ETSI TS 124 501 [7], clauses 5.4.5.2.3, 6.3.2.3, 8.2.10, 8.2.11, 8.3.9 and 8.3.10
	N5 or Rx	N5: ETSI TS 129 514 [6], clauses 4.2.2, B.1, B.2, B.5 and Annex C Rx: ETSI TS 129 214 [5], clauses 4.4.1, A.1, A.2, A.5 and Annex B
	N3	ETSI TS 123 501 [8], clause 5.6
	N6	ETSI TS 129 561 [17], clause 13.2
Pre-test conditions:	• UE A previously registered to 5GC A. • 5GC established a default PDU session allowing UE A - P-CSCF IP communication. • PSAP is registered or connected to the IMS A and ready to accept the session establishment. • UE A previously not registered to IMS A. • UE A has not performed emergency registration. • UE A discovered the P-CSCF address.	

Interoperability Test Description		
Test Sequence:	**Step**	
	1	Verify that media between UE A and PSAP is not delivered in any direction before call establishment.
	2	UE A initiates an emergency call to establish a communication session using an emergency service URN (To header indicating one of the emergency URNs defined in Table 2).
	3	Verify that the UE A sets the From header field of the INVITE request to "Anonymous" as specified in IETF RFC 3261 [10] and a To header indicating one of the emergency URNs defined in Table 2.
	4	Verify that IMS A (P-CSCF, E-CSCF) routes the emergency call to the PSAP in the same IM CN subsystem of the own network.
	5	Verify that the IMS produced a Media Description for the session according to SDP-offer in SIP INVITE Request and SDP-answer in SIP 183.
	6	Verify that the P-CSCF in the IMS interacts with the Policy Control Function (PCF) in the 5GC (via the N5 interface) to request policy for the emergency call, providing the media description. The PCF evaluates the media description and invokes the Session Management Function (SMF) in the 5GC to establish a dedicated QoS Flow for the requested media.
	7	Verify that dedicated QoS Flows are established in the 5GC User Plane Function (UPF) and that media between UE A and PSAP is successfully routed over these dedicated QoS Flows with appropriate PCC characteristics enforced by the UPF based on policies from the PCF.
Conformance criteria of test sequence step:	2/3	N6/Gm TP_GM_PCSCF_5G_ECO_INVITE_01 (Events 1, 2)
	4	Mw TP_MW_PCSCF_5G_ECO_INVITE_01 (Event 7) Mm TP_MM_ECSCF_5G_ECO_INVITE_01 (Event 8)
	6	Rx TP_RX_PCSCF_5G_ECO_AAR_02 (AAR - Event 3) N5 TP_N5_PCSCF_5G_ECO_PCR_02 (PA_Create_req - Event 3) Rx TP_RX_PCRF_5G_ECO_AAA_02 (AAA - Events 4, 16) N5 TP_N5_PCF_5G_ECO_PCA_02 (PA_Create_res - Event 4) Rx TP_RX_PCSCF_5G_ECO_RAA_01 (RAR, RAA - Events 5, 6) N5 TP_N5_PCSCF_5G_ECO_PNA_01 (PA_Notify_req - Events 5, 6) Rx TP_RX_PCSCF_5G_ECO_AAR_04 (AAR - Event 11) N5 TP_N5_PCSCF_5G_ECO_PUR_04 (PA_Update_req - Event 11) N5 TP_N5_PCF_5G_ECO_PUA_01 (PA_Update_res - Event 16) N1N2 TP_N1N2_AMF_ECO_PDUM_03 (Events 14, 15)
	7	Rtp TP_RTP_ECO_03 (Event 30)

The message sequence as depicted in Figure 8 applies with the following changes:

1) UE A initiates the emergency session with an INVITE request. The From header field of the INVITE request is set to "Anonymous" as specified in IETF RFC 3261 [10].

7) P-CSCF sends the INVITE to E-CSCF. The From header field of the INVITE request is set to "Anonymous".

5.3.1.5 UE calling PSAP in same network, LRF derived PSAP URI

Interoperability Test Description		
Identifier:	TD_VoNR_ECO_INT_INI_04	
Objective:	To demonstrate the establishment of dedicated PDU sessions at the originating 5GC due to SIP emergency session establishment within an emergency registration. PSAP is located in the IM CN subsystem of IMS A. The PSAP URI is delivered by the LRF.	
Summary:	An emergency call is setup between UE A and the PSAP located in the IM CN subsystem of IMS A. UE-A is registered to 5GC A and registered to IMS A, has performed the emergency registration to IMS A, and requests emergency session establishment using an emergency URN. The P-CSCF derives descriptions of the Service Data Flow from the SDP data, requests creation of adequate PDU sessions and QoS flows from PCF and 5GC, and forwards the request to the E-CSCF. The E-CSCF, where the network operator determines that an LRF is to be used, routes the emergency session establishment request to the LRF, derives the PSAP URI from the LRF response and forwards the request to this PSAP. Media transport is possible only after the successful establishment of the session. Media negotiation happens during INVITE/200 OK (UE A sends SDP-offer, PSAP responds with SDP-answer).	
Configuration:	CF_VoNR_INT_ES option 1	
SUT:	IMS A, 5GC A and PSAP	
Interfaces:	N1/N2, N6/Gm, Mw, N5 or Rx, Mm, Ml	
References:	Mm	ETSI TS 124 229 [2], clause 5.11.2 ETSI TS 123 167 [12]
	Gm, Mw	ETSI TS 124 229 [2], clauses 5.1.6.8.3, 5.1.6.11, 5.2.6.3.3, 5.2.10.3 and 5.11.2
	N1/N2	ETSI TS 124 501 [7], clauses 5.4.5.2.3, 6.3.2.3, 8.2.10, 8.2.11, 8.3.9 and 8.3.10
	N5 or Rx	N5 : ETSI TS 129 514 [6], clauses 4.2.2, B.1, B.2, B.5 and Annex C Rx: ETSI TS 129 214 [5], clauses 4.4.1, A.1, A.2, A.5 and Annex B
	Ml	ETSI TS 124 229 [2], clause 5.11.3
	N3	ETSI TS 123 501 [8], clause 5.6
	N6	ETSI TS 129 561 [17], clause 13.2
Pre-test conditions:	• UE A previously registered to 5GC A. • UE A previously registered to IMS A. • 5GC established an emergency PDU session allowing UE A - P-CSCF IP communication. • 5GC established an IMS signalling bearer. • PSAP is registered in IMS A and ready to accept the session establishment. • UE A previously performed emergency registration. • Network operator policy determines that an LRF is to be used.	
Test Sequence:	**Step**	
	1	Verify that media between UE A and PSAP is not delivered in any direction before call establishment.
	2	UE A initiates an emergency call to establish a communication session using an emergency service URN (To header indicating one of the emergency URNs defined in Table 2).
	3	Verify that the UE A inserts in the INVITE request, a From header field that includes the public user identity registered via emergency registration or the tel URI associated with the public user identity registered via emergency registration and a To header indicating one of the emergency URNs defined in Table 2.
	4	Verify that IMS A (P-CSCF, E-CSCF) routes the emergency call to the LRF to retrieve PSAP URI.
	5	Verify that IMS A (E-CSCF) routes the emergency call to the PSAP in the same IM CN subsystem of the own network with the PSAP URI received from the LRF.
	6	Verify that the IMS produced a Media Description for the session according to SDP-offer in SIP INVITE Request and SDP-answer in SIP 183.

Interoperability Test Description		
	7	Verify that the Application Function (AF) in the IMS interacts with the Policy Control Function (PCF) in the 5GC (via the N5 interface) to request policy for the emergency call, providing the media description. The PCF evaluates the media description and invokes the Session Management Function (SMF) in the 5GC to establish a dedicated QoS Flow for the requested media.
	8	Verify that dedicated QoS Flows are established in the 5GC User Plane Function (UPF) and that media between UE A and PSAP is successfully routed over these dedicated QoS Flows with appropriate PCC characteristics enforced by the UPF based on policies from the PCF.
Conformance criteria of test sequence step:	2	N6/Gm TP_GM_PCSCF_5G_ECO_INVITE_02 (Events 1, 2) N6/Gm TP_GM_PCSCF_5G_NGC_INVITE_01 for eCall (Events 1, 2)
	3	N6/Gm TP_GM_PCSCF_5G_ECO_REGISTER_02 (Pre-test)
	4	Mw TP_MW_PCSCF_5G_ECO_INVITE_02 (Event 7) Ml TP_ML_ECSCF_5G_ECO_INVITE_01 (Event 8)
	5	Ml/Mm TP_MM_ECSCF_5G_ECO_INVITE_02 (Events 8, 9)
	7	Rx TP_RX_PCSCF_5G_ECO_AAR_02 (AAR - Event 3) N5 TP_N5_PCSCF_5G_ECO_PCR_02 (PA_Create_res - Event 3) Rx TP_RX_PCRF_5G_ECO_AAA_02 (AAA - Events 4, 18) N5 TP_N5_PCF_5G_ECO_PCA_02 (PA_Create_res - Event 5) Rx TP_RX_PCSCF_5G_ECO_RAA_01 (RAR, RAA - Events 5, 6) N5 TP_N5_PCSCF_5G_ECO_PNA_01 (PA_Notify_req - Events 5, 6) Rx TP_RX_PCSCF_5G_ECO_AAR_04 (AAR - Event 13) N5 TP_N5_PCSCF_5G_ECO_PUR_04 (PA_Update_req - Event 13) N5 TP_N5_PCF_5G_ECO_PUA_01 (PA_Update_res - Event 18) N1N2 TP_N1N2_AMF_ECO_PDUM_03 (Events 16, 17)
	8	Rtp TP_RTP_ECO_03 (Event 32)

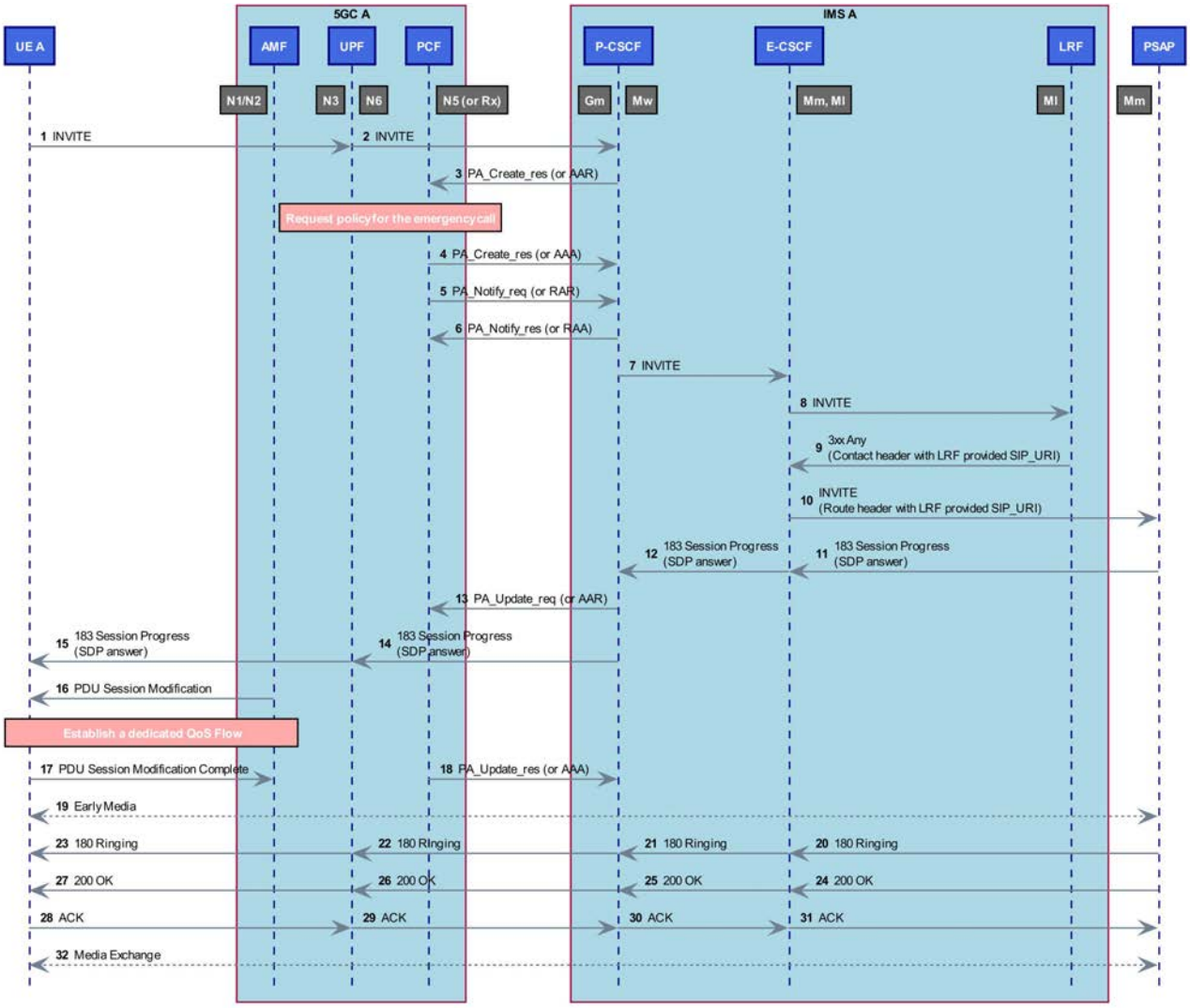


Figure 9: Emergency Session Establishment with LRF, PSAP in same IM CN subsystem

1) UE A initiates the emergency session with an INVITE request to UPF. The From header field includes the public user identity (registered via emergency registration) or the tel URI associated with the public user identity (registered via emergency registration).

2) UPF forwards the INVITE to P-CSCF over N6.

3) The IMS A P-CSCF invokes the PCF with PA_Create_req over N5 or AAR over Rx.

4) PCF responds to IMS A P-CSCF with PA_Create_res over N5 or AAA over Rx.

5) PCF sends PA_Notify_req over N5 or RAR over Rx to P-CSCF.

6) P-CSCF responds with PA_Notify_res over N5 or RAA over Rx.

7) P-CSCF sends the INVITE to E-CSCF.

8) E-CSCF sends the INVITE to PSAP.

9) LRF responds with 3xx and includes PSAP URI in the Contact header.

10) E-CSCF sends the INVITE to PSAP with LRF provided PSAP URI in Route header.

11) PSAP responds with the 183 response with SDP answer to E-CSCF.

12) E-CSCF sends the 183 response to P-CSCF.

13) The IMS A P-CSCF invokes the PCF with PA_Update_req over N5 or AAR over Rx.

14) P-CSCF forwards the SIP 183 (SDP) to UPF.

15) UPF forwards the SIP 183 (SDP) to UE A.

16) AMF sends PDU Session Modification Command to UE A.

17) UE A sends PDU Session Modification Complete to AMF.

18) PCF sends PA_Update_res over N5 or AAA over Rx to P-CSCF.

19) Early media may flow between the UE A and PSAP.

20) The PSAP responds with the 180 Ringing to E-CSCF.

21) E-CSCF forwards the 180 Ringing to P-CSCF.

22) P-CSCF forwards the SIP 180 Ringing to UPF.

23) UPF forwards the SIP 180 Ringing to UE A.

24) PSAP sends 200 OK to E-CSCF.

25) E-CSCF forwards the 200 OK to P-CSCF.

26) P-CSCF forwards the 200 OK towards UPF.

27) UPF forwards the 200 OK towards UE A.

28) UE A sends ACK to UPF.

29) UPF forwards ACK to P-CSCF.

30) P-CSCF sends ACK to E-CSCF.

31) E-CSCF sends ACK to PSAP.

32) Media Exchange.

5.3.1.6 UE calling PSAP in another network via IBCF

Interoperability Test Description	
Identifier:	TD_VoNR_ECO_INT_INI_05
Objective:	To demonstrate the establishment of dedicated PDU sessions at the originating 5GC due to SIP emergency session establishment within an emergency registration. PSAP is located in the IM CN subsystem of another network connected via IBCF.
Summary:	An emergency call is setup between UE A and the PSAP located in the IM CN subsystem of another network. UE-A is registered to 5GC A and registered to IMS A, has performed the emergency registration to IMS A, and requests emergency session establishment using an emergency URN. The P-CSCF derives descriptions of the Service Data Flow from the SDP data, requests creation of adequate PDU sessions and QoS flows from PCF and 5GC, and forwards the request to the E-CSCF. The E-CSCF retrieves the PSAP URI from local configuration and forwards the request to this PSAP in the other network via the IBCF. Media transport is possible only after the successful establishment of the session. Media negotiation happens during INVITE/200 OK (UE A sends SDP-offer, PSAP responds with SDP-answer).
Configuration:	CF_VoNR_INT_ES option 2
SUT:	IMS A, 5GC A and PSAP
Interfaces:	N1/N2, N3, N6/Gm, Mw, N5 or Rx, Mx

Interoperability Test Description		
References:	Mx	ETSI TS 124 229 [2], clause 5.11.2
	Gm, Mw	ETSI TS 124 229 [2], clauses 5.1.6.8.3, 5.1.6.11, 5.2.6.3.3, 5.2.10.3 and 5.11.2
	Rx N5	ETSI TS 129 214 [5], clauses 4.4.1, A.1, A.2, A.5 and Annex B ETSI TS 129 514 [6], clauses 4.2.2, B.1, B.2, B.5 and Annex C
	N1/N2	ETSI TS 124 501 [7], clauses 5.4.5.2.3, 6.3.2.3, 8.2.10, 8.2.11, 8.3.9 and 8.3.10
	N3	ETSI TS 123 501 [8], clause 5.6
	N6	ETSI TS 129 561 [17], clause 13.2
Pre-test conditions:	• UE A previously registered to 5GC A. • UE A previously registered to IMS A. • 5GC established an emergency PDU session allowing UE A - P-CSCF IP communication. • 5GC established an IMS signalling bearer. • PSAP is located outside of IMS A in another network. • UE A previously performed emergency registration.	
Test Sequence:	**Step**	
	1	Verify that media between UE A and PSAP is not delivered in any direction before call establishment.
	2	UE A initiates an emergency call to establish a communication session using an emergency service URN (To header indicating one of the emergency URNs defined in Table 2).
	3	Verify that the UE A inserts in the INVITE request, a From header field that includes the public user identity registered via emergency registration or the tel URI associated with the public user identity registered via emergency registration and a To header indicating one of the emergency URNs defined in Table 2.
	4	Verify that IMS A (P-CSCF, E-CSCF) routes the emergency call to the PSAP in another network via the IBCF.
	5	Verify that the IMS produced a Media Description for the session according to SDP-offer in SIP INVITE Request and SDP-answer in SIP 183. The PCF evaluates the media description and invokes the Session Management Function (SMF) in the 5GC to establish a dedicated QoS Flow for the requested media.
	6	Verify that the PCF in the originating 5GC evaluates the media description and invokes the Session Management Function (SMF) in the originating 5GC (via the N7 interface) to establish a dedicated QoS Flow for the requested media.
	7	Verify that media between UE A and PSAP is transported with appropriate PCC characteristics enforced by the UPF based on policies from the PCF.
Conformance criteria of test sequence step:	2	N6/Gm TP_GM_PCSCF_5G_ECO_INVITE_02 (Events 1, 2) N6/Gm TP_GM_PCSCF_5G_NGC_INVITE_01 for eCall (Event s1, 2)
	3	N6/Gm TP_GM_PCSCF_5G_ECO_REGISTER_02 (Pre-test)
	4	Mw TP_MW_PCSCF_5G_ECO_INVITE_02 (Event 7) Mx TP_MX_ECSCF_5G_ECO_INVITE_01 (Event 8)
	5/6	Rx TP_RX_PCSCF_5G_ECO_AAR_02 (AAR - Event 3) N5 TP_N5_PCSCF_5G_ECO_PCR_02 (PA_Create_res - Event 3) Rx TP_RX_PCRF_5G_ECO_AAA_02 (AAA - Events 4, 18) N5 TP_N5_PCF_5G_ECO_PCA_02 (PA_Create_res - Event 4) Rx TP_RX_PCSCF_5G_ECO_RAA_01 (RAR, RAA - Events 5, 6) N5 TP_N5_PCSCF_5G_ECO_PNA_01 (PA_Notify_req - Events 5, 6) Rx TP_RX_PCSCF_5G_ECO_AAR_04 (AAR - Event 13) N5 TP_N5_PCSCF_5G_ECO_PUR_04 (PA_Update_req - Event 13) N5 TP_N5_PCF_5G_ECO_PUA_01 (PA_Update_res - Event 18) N1N2 TP_N1N2_AMF_ECO_PDUM_03 (Events 16, 17)
	7	Rtp TP_RTP_ECO_03 (Event 32)

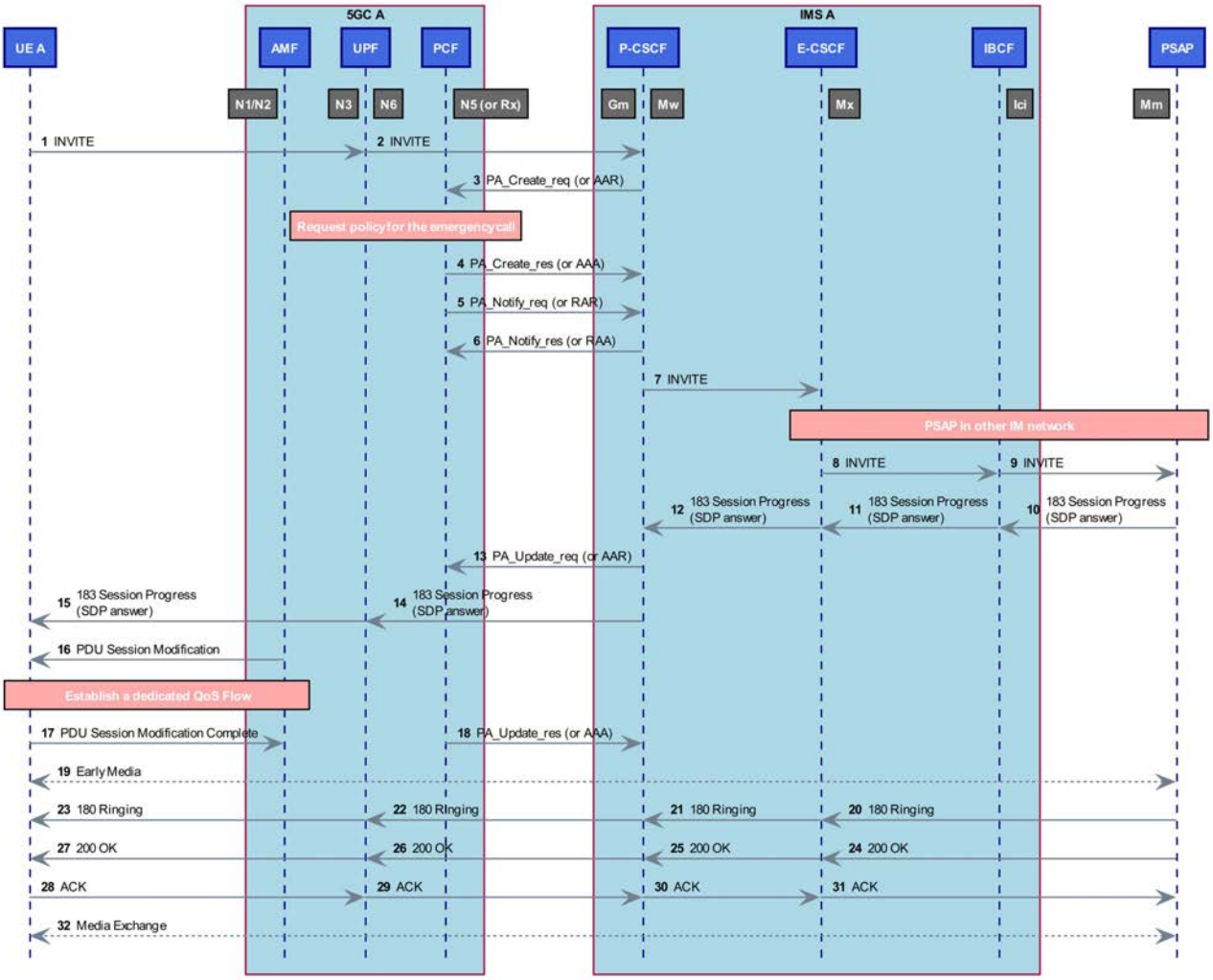


Figure 10: Emergency Session Establishment, PSAP in another IM CN subsystem

1) UE A initiates the emergency session with an INVITE request to UPF. The From header field includes the public user identity (registered via emergency registration) or the tel URI associated with the public user identity (registered via emergency registration).

2) UPF forwards the INVITE to P-CSCF over N6.

3) The IMS A P-CSCF invokes the PCF with PA_Create_req over N5 or AAR over Rx.

4) PCF responds to IMS A P-CSCF with PA_Create_res over N5 or AAA over Rx.

5) PCF sends PA_Notify_req over N5 or RAR over Rx to P-CSCF.

6) P-CSCF responds with PA_Notify_res over N5 or RAA over Rx.

7) P-CSCF sends the INVITE to E-CSCF.

8) E-CSCF sends the INVITE to IBCF.

9) IBCF forwards the INVITE to PSAP.

10) PSAP responds with the 183 response with SDP answer to IBCF.

11) IBCF forwards the 183 response to E-CSCF.

12) E-CSCF sends the 183 response to P-CSCF.

13) The IMS A P-CSCF invokes the PCF with PA_Update_req over N5 or AAR over Rx.

14) P-CSCF forwards the SIP 183 (SDP) to UPF.

15) UPF forwards the SIP 183 (SDP) to UE A.

16) AMF sends PDU Session Modification Command to UE A.

17) UE A sends PDU Session Modification Complete to AMF.

18) PCF sends PA_Update_res over N5 or AAA over Rx to P-CSCF.

19) Early media may flow between the UE A and PSAP.

20) The PSAP responds with the 180 Ringing to E-CSCF.

21) E-CSCF forwards the 180 Ringing to P-CSCF.

22) P-CSCF forwards the SIP 180 Ringing to UPF.

23) UPF forwards the SIP 180 Ringing to UE A.

24) PSAP sends 200 OK to E-CSCF.

25) E-CSCF forwards the 200 OK to P-CSCF.

26) P-CSCF forwards the 200 OK towards UPF.

27) UPF forwards the 200 OK towards UE A

28) UE A sends ACK to UPF.

29) UPF sends ACK to P-CSCF.

30) P-CSCF sends ACK to E-CSCF.

31) E-CSCF sends ACK to PSAP.

32) Media Exchange.

5.3.1.7 UE calling PSAP in another network via IBCF, LRF derived PSAP URI

Interoperability Test Description	
Identifier:	TD_VoNR_ECO_INT_INI_06
Objective:	To demonstrate the establishment of dedicated PDU sessions at the originating 5GC due to SIP emergency session establishment within an emergency registration. PSAP is located in the IM CN subsystem of another network connected via IBCF.
Summary:	An emergency call is setup between UE A and the PSAP located in the IM CN subsystem of another network. UE-A is registered to 5GC A and registered to IMS A, has performed the emergency registration to IMS A, and requests emergency session establishment using an emergency URN. The P-CSCF derives descriptions of the Service Data Flow from the SDP data, requests creation of adequate PDU sessions and QoS flows from PCF and 5GC, and forwards the request to the E-CSCF. The E-CSCF retrieves the PSAP URI from local configuration and forwards the request to this PSAP in the other network via the IBCF. Media transport is possible only after the successful establishment of the session. Media negotiation happens during INVITE/200 OK (UE A sends SDP-offer, PSAP responds with SDP-answer).
Configuration:	CF_VoNR_INT_ES option 2
SUT:	IMS A, 5GC A and PSAP
Interfaces:	N1/N2, N3, N6/Gm, Mw, N5 or Rx, Mx

Interoperability Test Description		
References:	Mx	ETSI TS 124 229 [2], clause 5.11.2
	Gm, Mw	ETSI TS 124 229 [2], clauses 5.1.6.8.3, 5.1.6.11, 5.2.6.3.3, 5.2.10.3 and 5.11.2
	Rx N5	ETSI TS 129 214 [5], clauses 4.4.1, A.1, A.2, A.5 and Annex B ETSI TS 129 514 [6], clauses 4.2.2, B.1, B.2, B.5 and Annex C
	Ml	ETSI TS 124 229 [2], clause 5.11.3
	N1/N2	ETSI TS 124 501 [7], clauses 5.4.5.2.3, 6.3.2.3, 8.2.10, 8.2.11, 8.3.9 and 8.3.10
	N3	ETSI TS 123 501 [8], clause 5.6
	N6	ETSI TS 129 561 [17], clause 13.2
Pre-test conditions:	• UE A previously registered to 5GC A. • UE A previously registered to IMS A. • 5GC established an emergency PDU session allowing UE A - P-CSCF IP communication. • 5GC established an IMS signalling bearer. • PSAP is located outside of IMS A in another network. • UE A previously performed emergency registration.	
Test Sequence:	**Step**	
	1	Verify that media between UE A and PSAP is not delivered in any direction before call establishment.
	2	UE A initiates an emergency call to establish a communication session using an emergency service URN (To header indicating one of the emergency URNs defined in Table 2).
	3	Verify that the UE A inserts in the INVITE request, a From header field that includes the public user identity registered via emergency registration or the tel URI associated with the public user identity registered via emergency registration and a To header indicating one of the emergency URNs defined in Table 2.
	4	Verify that IMS A (P-CSCF, E-CSCF) routes the emergency call to the LRF to retrieve PSAP URI.
	5	Verify that IMS A (E-CSCF) routes the emergency call to the PSAP in another network with the PSAP URI received from the LRF.
	6	Verify that the IMS produced a Media Description for the session according to SDP-offer in SIP INVITE Request and SDP-answer in SIP 183 and provides this information to the PCF. The PCF evaluates the media description and invokes the Session Management Function (SMF) in the 5GC to establish a dedicated QoS Flow for the requested media.
	7	Verify that the PCF evaluated the media description and instructed the SMF to establish dedicated QoS Flows, and that the SMF confirmed the establishment of these QoS Flows.
	8	Verify that media between UE A and PSAP is successfully routed over the dedicated QoS Flow with transported with appropriate PCC characteristics enforced by the UPF based on policies from the PCF.
Conformance criteria of test sequence step:	2	N6/Gm TP_GM_PCSCF_5G_ECO_INVITE_02 (Events 1, 2) N6/Gm TP_GM_PCSCF_5G_NGC_INVITE_01 for eCall (Events 1, 2)
	3	Gm TP_GM_PCSCF_5G_ECO_REGISTER_02 (Pre-test)
	4	Mw TP_MW_PCSCF_5G_ECO_INVITE_02 (Event 10) Ml TP_ML_ECSCF_5G_ECO_INVITE_01 (Event 11)
	5	Ml/Mx TP_MX_ECSCF_5G_ECO_INVITE_02 (Events 12, 13)
	6	Rx TP_RX_PCSCF_5G_ECO_AAR_02 (AAR - Event 3) N5 TP_N5_PCSCF_5G_ECO_PCR_02 (PA_Create_res - Event 3) Rx TP_RX_PCRF_5G_ECO_AAA_02 (AAA - Events 4, 20) N5 TP_N5_PCF_5G_ECO_PCA_02 (PA_Create_res - Event 4) Rx TP_RX_PCSCF_5G_ECO_RAA_01 (RAR, RAA - Events 5, 6) N5 TP_N5_PCSCF_5G_ECO_PNA_01 (PA_Notify_req- Events 5, 6) Rx TP_RX_PCSCF_5G_ECO_AAR_04 (AAR - Event 15) N5 TP_N5_PCSCF_5G_ECO_PUR_04 (PA_Update_req - Event 15) N5 TP_N5_PCF_5G_ECO_PUA_01 (PA_Update_res - Event 20) N1N2 TP_N1N2_AMF_ECO_PDUM_03 (Events 18, 19)
	8	Rtp TP_RTP_ECO_03 (Event 34)

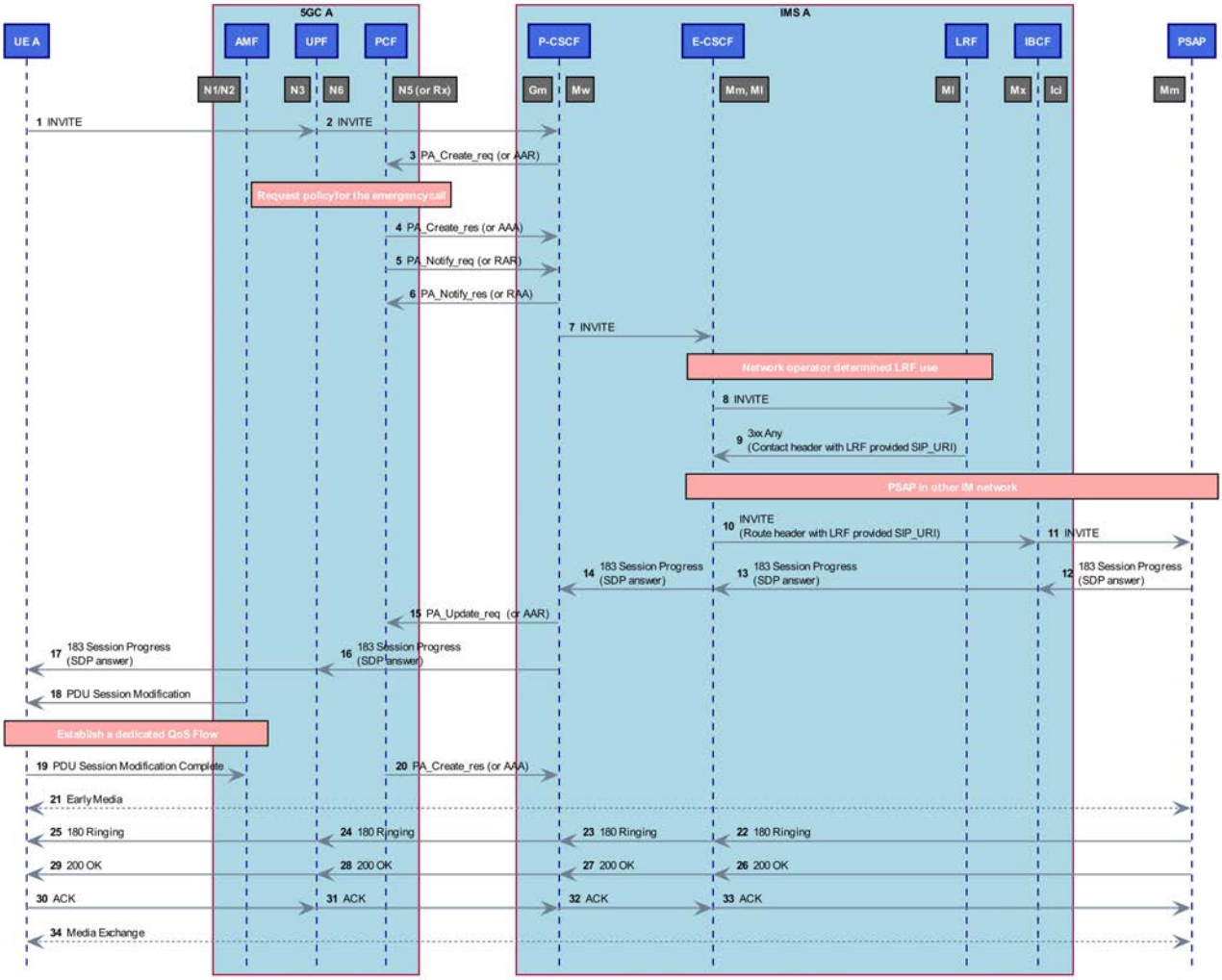


Figure 11: Emergency Session Establishment with LRF, PSAP in another IM CN subsystem

1) UE A initiates the emergency session with an INVITE request to UPF. The From header field includes the public user identity (registered via emergency registration) or the tel URI associated with the public user identity (registered via emergency registration).

2) UPF forwards the INVITE to P-CSCF over N6.

3) The IMS A P-CSCF invokes the PCF with PA_Create_req over N5 or AAR over Rx.

4) PCF responds to IMS A P-CSCF with PA_Create_res over N5 or AAA over Rx.

5) PCF sends PA_Notify_req over N5 or RAR over Rx to P-CSCF.

6) P-CSCF responds with PA_Notify_res over N5 or RAA over Rx.

7) P-CSCF sends the INVITE to E-CSCF.

8) E-CSCF sends the INVITE to LRF.

9) LRF sends 3xx Any including Contact header provided SIP_URI to E-CSCF.

10) E-CSCF sends the INVITE to IBCF using Contact header provided SIP_URI.

11) IBCF forwards the INVITE to PSAP.

12) PSAP responds with the 183 response with SDP answer to IBCF.

13) IBCF forwards the 183 response to E-CSCF.

14) E-CSCF sends the 183 response to P-CSCF.

15) The IMS A P-CSCF invokes the PCF with PA_Update_req over N5 or AAR over Rx.

16) P-CSCF forwards the SIP 183 (SDP) to UPF.

17) UPF forwards the SIP 183 (SDP) to UE A.

18) AMF sends PDU Session Modification Command to UE A.

19) UE A sends PDU Session Modification Complete to AMF.

20) PCF sends PA_Update_res over N5 or AAA over Rx to P-CSCF.

21) Early media may flow between the UE A and PSAP.

22) The PSAP responds with the 180 Ringing to E-CSCF.

23) E-CSCF forwards the 180 Ringing to P-CSCF.

24) P-CSCF forwards the SIP 180 Ringing to UPF.

25) UPF forwards the SIP 180 Ringing to UE A.

26) PSAP sends 200 OK to E-CSCF.

27) E-CSCF forwards the 200 OK to P-CSCF.

28) P-CSCF forwards the 200 OK towards UPF.

29) UPF forwards the 200 OK towards UE A.

30) UE A sends ACK to UPF.

31) UPF forwards ACK to P-CSCF.

32) P-CSCF sends ACK to E-CSCF.

33) E-CSCF sends ACK to PSAP.

34) Media Exchange.

5.3.1.8 UE calling PSAP in PSTN via BGCF

Interoperability Test Description	
Identifier:	TD_VoNR_ECO_INT_INI_07
Objective:	To demonstrate the establishment of dedicated PDU sessions at the originating 5GC due to SIP emergency session establishment within an emergency registration. PSAP is located in the PSTN connected via BGCF.
Summary:	An emergency call is setup between UE A and the PSAP located in the PSTN. UE-A is registered to 5GC A and registered to IMS A, has performed the emergency registration to IMS A, and requests emergency session establishment using an emergency URN. The P-CSCF derives descriptions of the Service Data Flow from the SDP data, requests creation of adequate PDU sessions and QoS flows from PCF and 5GC, and forwards the request to the E-CSCF. The E-CSCF retrieves the PSAP URI from local configuration and forwards the request to this PSAP in the PSTN via the BGCF. Media transport is possible only after the successful establishment of the session. Media negotiation happens during INVITE/200 OK (UE A sends SDP-offer, PSAP responds with SDP-answer).
Configuration:	CF_VoNR_INT_ES option 3
SUT:	IMS A, 5GC A and PSAP
Interfaces:	N1/N2, N3, N6/Gm, Mw, N5 or Rx, Mx

Interoperability Test Description		
References:	Gm, Mw	ETSI TS 124 229 [2], clauses 5.1.6.8.3, 5.1.6.11, 5.2.6.3.3, 5.2.10.3 and 5.11.2
	Rx N5	ETSI TS 129 214 [5], clauses 4.4.1, A.1, A.2, A.5 and Annex B ETSI TS 129 514 [6], clauses 4.2.2, B.1, B.2, B.5 and Annex C
	Mi	ETSI TS 124 229 [2], clause 5.11.2
	N1/N2	ETSI TS 124 501 [7], clauses 5.4.5.2.3, 6.3.2.3, 8.2.10, 8.2.11, 8.3.9 and 8.3.10
	N3	ETSI TS 123 501 [8], clause 5.6
	N6	ETSI TS 129 561 [17], clause 13.2
Pre-test conditions:	• UE A previously registered to 5GC A. • UE A previously registered to IMS A. • 5GC established an emergency PDU session allowing UE A - P-CSCF IP communication. • 5GC established a QoS Flow within a PDU Session for IMS signalling. • PSAP is located outside of IMS A in the PSTN. • UE A previously performed emergency registration.	
Test Sequence:	**Step**	
	1	Verify that media between UE A and PSAP is not delivered in any direction before call establishment.
	2	UE A initiates an emergency call to establish a communication session using an emergency service URN (To header indicating one of the emergency URNs defined in Table 2).
	3	Verify that the UE A inserts in the INVITE request, a From header field that includes the public user identity registered via emergency registration or the tel URI associated with the public user identity registered via emergency registration and a To header indicating one of the emergency URNs defined in Table 2.
	4	Verify that IMS A (P-CSCF, E-CSCF) routes the emergency call to the PSAP in the PSTN via the BGCF.
	5	Verify that the IMS produced a Media Description for the session according to SDP-offer in SIP INVITE Request and SDP-answer in SIP 183 and provides this information to the PCF.
	6	Verify that the PCF evaluates the media description and invokes the Session Management Function (SMF) in the 5GC to establish a dedicated QoS Flow for the requested media. The PCF evaluated the media description and instructed the SMF to establish dedicated QoS Flows, and that the SMF confirmed the establishment of these QoS Flows.
	7	Verify that media between UE A and PSAP is successfully routed over the dedicated QoS Flow with appropriate PCC characteristics enforced by the UPF based on policies from the PCF.
Conformance criteria of test sequence step:	2	N6/Gm TP_GM_PCSCF_5G_ECO_INVITE_02 (Events 1, 2) N6/Gm TP_GM_PCSCF_5G_NGC_INVITE_01 for eCall (Events 1, 2)
	3	N6/Gm TP_GM_PCSCF_5G_ECO_REGISTER_02 (Pre-test)
	4	Mw TP_MW_PCSCF_5G_ECO_INVITE_02 (Event 7) Mi TP_MI_ECSCF_5G_ECO_INVITE_01 (Event 8)
	6	Rx TP_RX_PCSCF_5G_ECO_AAR_02 (AAR - Event 3) N5 TP_N5_PCSCF_5G_ECO_PCR_02 (PA_Create_res - Event 3) Rx TP_RX_PCRF_5G_ECO_AAA_02 (AAA - Events 4, 18) N5 TP_N5_PCF_5G_ECO_PCA_02 (PA_Create_res - Event 4) Rx TP_RX_PCSCF_5G_ECO_RAA_01 (RAR, RAA - Events 5, 6) N5 TP_N5_PCSCF_5G_ECO_PNA_01 (PA_Notify_req - Events 5, 6) Rx TP_RX_PCSCF_5G_ECO_AAR_04 (AAR - Event 13) N5 TP_N5_PCSCF_5G_ECO_PUR_04 (PA_Update_req - Event 13) N5 TP_N5_PCF_5G_ECO_PUA_01 (PA_Update_res - Event 18) N1N2 TP_N1N2_AMF_ECO_PDUM_03 (Events 16, 17)
	7	Rtp TP_RTP_ECO_03 (Event 32)

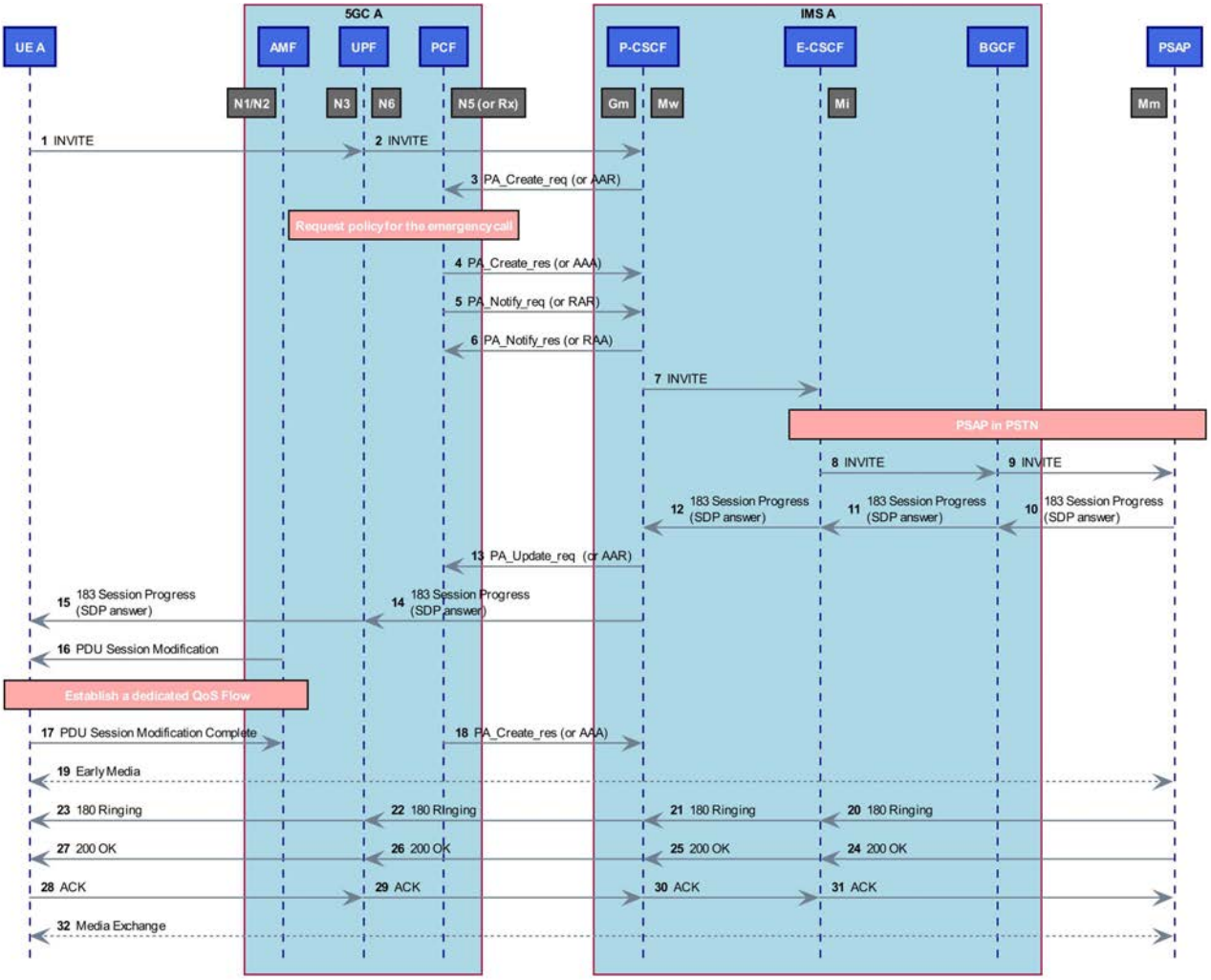


Figure 12: Emergency Session Establishment, PSAP in the PSTN

1) UE A initiates the emergency session with an INVITE request to UPF. The From header field includes the public user identity (registered via emergency registration) or the tel URI associated with the public user identity (registered via emergency registration).

2) UPF forwards the INVITE to P-CSCF over N6.

3) The IMS A P-CSCF invokes the PCF with PA_Create_req over N5 or AAR over Rx.

4) PCF responds to IMS A P-CSCF with PA_Create_res over N5 or AAA over Rx.

5) PCF sends PA_Notify_req over N5 or RAR over Rx to P-CSCF.

6) P-CSCF responds with PA_Notify_res over N5 or RAA over Rx.

7) P-CSCF sends the INVITE to E-CSCF.

8) E-CSCF sends the INVITE to BGCF.

9) BGCF sends the INVITE to PSAP.

10) PSAP responds with the 183 response with SDP answer to IBCF.

11) BGCF forwards the 183 response to E-CSCF.

12) E-CSCF sends the 183 response to P-CSCF.

13) The IMS A P-CSCF invokes the PCF with PA_Update_req over N5 or AAR over Rx.

14) P-CSCF forwards the SIP 183 (SDP) to UPF.

15) UPF forwards the SIP 183 (SDP) to UE A.

16) AMF sends PDU Session Modification Command to UE A.

17) UE A sends PDU Session Modification Complete to AMF.

18) PCF sends PA_Update_res over N5 or AAA over Rx to P-CSCF.

19) Early media may flow between the UE A and PSAP.

20) The PSAP responds with the 180 Ringing to E-CSCF.

21) E-CSCF forwards the 180 Ringing to P-CSCF.

22) P-CSCF forwards the SIP 180 Ringing to UPF.

23) UPF forwards the SIP 180 Ringing to UE A.

24) PSAP sends 200 OK to E-CSCF.

25) E-CSCF forwards the 200 OK to P-CSCF.

26) P-CSCF forwards the 200 OK towards UPF.

27) UPF forwards the 200 OK towards UE A.

28) UE A sends ACK to UPF.

29) UPF forwards ACK to P-CSCF.

30) P-CSCF sends ACK to E-CSCF.

31) E-CSCF sends ACK to PSAP.

32) Media Exchange.

5.3.1.9 UE calling PSAP in PSTN via BGCF, LRF derived PSAP URI

Interoperability Test Description	
Identifier:	TD_VoNR_ECO_INT_INI_08
Objective:	To demonstrate the establishment of dedicated PDU sessions at the originating 5GC due to SIP emergency session establishment within an emergency registration. PSAP is located in the PSTN connected via BGCF. The PSAP URI is delivered by the LRF.
Summary:	An emergency call is setup between UE A and the PSAP located in the PSTN. UE-A is registered to 5GC A and registered to IMS A, has performed the emergency registration to IMS A, and requests emergency session establishment using an emergency URN. The P-CSCF derives descriptions of the Service Data Flow from the SDP data, requests creation of adequate PDU sessions and QoS flows from PCF and 5GC, and forwards the request to the E-CSCF. The E-CSCF retrieves the PSAP URI from local configuration and forwards the request to this PSAP in the PSTN via the BGCF. Media transport is possible only after the successful establishment of the session. Media negotiation happens during INVITE/200 OK (UE A sends SDP-offer, PSAP responds with SDP-answer).
Configuration:	CF_VoNR_INT_ES option 3
SUT:	IMS A, 5GC A and PSAP
Interfaces:	N1/N2, N3, N6/Gm, Mw, N5 or Rx, Mx

Interoperability Test Description		
References:	Gm, Mw	ETSI TS 124 229 [2], clauses 5.1.6.8.3, 5.1.6.11, 5.2.6.3.3, 5.2.10.3 and 5.11.2
	N5 or Rx	ETSI TS 129 514 [6], clauses 4.2.2, B.1, B.2, B.5 and Annex C ETSI TS 129 214 [5], clauses 4.4.1, A.1, A.2, A.5 and Annex B
	Ml	ETSI TS 124 229 [2], clause 5.11.3
	Mi	ETSI TS 124 229 [2], clause 5.11.2
	N1/N2	ETSI TS 124 501 [7], clauses 5.4.5.2.3, 6.3.2.3, 8.2.10, 8.2.11, 8.3.9 and 8.3.10
	N3	ETSI TS 123 501 [8], clause 5.6
	N6	ETSI TS 129 561 [17], clause 13.2
Pre-test conditions:	• UE A previously registered to 5GC A. • UE A previously registered to IMS A. • 5GC established an emergency PDU session allowing UE A - P-CSCF IP communication. • 5GC established a QoS Flow within a PDU Session for IMS signalling. • PSAP is located outside of IMS A in the PSTN. • UE A previously performed emergency registration.	
Test Sequence:	**Step**	
	1	Verify that media between UE A and PSAP is not delivered in any direction before call establishment.
	2	UE A initiates an emergency call to establish a communication session using an emergency service URN (To header indicating one of the emergency URNs defined in Table 2).
	3	Verify that the UE A inserts in the INVITE request, a From header field that includes the public user identity registered via emergency registration or the tel URI associated with the public user identity registered via emergency registration and a To header indicating one of the emergency URNs defined in Table 2.
	4	Verify that IMS A (P-CSCF, E-CSCF) routes the emergency call to the LRF to retrieve PSAP URI.
	5	Verify that IMS A (E-CSCF) routes the emergency call to the PSAP in the PSTN with the PSAP URI received from the LRF.
	6	Verify that the IMS produced a Media Description for the session according to SDP-offer in SIP INVITE Request and SDP-answer in SIP 183 and provides this information to the PCF. The PCF evaluated the media description and instructed the SMF to establish dedicated QoS Flows, and that the SMF confirmed the establishment of these QoS Flows.
	7	Verify that media between UE A and PSAP is successfully routed over the dedicated QoS Flow with appropriate PCC characteristics enforced by the UPF based on policies from the PCF.
Conformance criteria of test sequence step:	2	N6/Gm TP_GM_PCSCF_5G_ECO_INVITE_02 (Events 1, 2) N6/Gm TP_GM_PCSCF_5G_NGC_INVITE_01 for eCall (Events 1, 2)
	3	N6/Gm TP_GM_PCSCF_5G_ECO_REGISTER_02 (Pre-test)
	4	Mw TP_MW_PCSCF_5G_ECO_INVITE_02 (Event 7) Ml TP_ML_ECSCF_5G_ECO_INVITE_01 (Event 8)
	5	Ml/Mi TP_MI_ECSCF_5G_ECO_INVITE_02 (Events 10, 11)
	6	Rx TP_RX_PCSCF_5G_ECO_AAR_02 (AAR - Event 3) N5 TP_N5_PCSCF_5G_ECO_PCR_02 (PA_Create_res - Event 3) Rx TP_RX_PCRF_5G_ECO_AAA_02 (AAA - Events 4, 20) N5 TP_N5_PCF_5G_ECO_PCA_02 (PA_Create_res - Event 4) Rx TP_RX_PCSCF_5G_ECO_RAA_01 (RAR, RAA - Events 5, 6) N5 TP_N5_PCSCF_5G_ECO_PNA_01 (PA_Notify_res - Events 5, 6) Rx TP_RX_PCSCF_5G_ECO_AAR_04 (AAR - Event 15) N5 TP_N5_PCSCF_5G_ECO_PUR_04 (PA_Update_req - Event 15) N5 TP_N5_PCF_5G_ECO_PUA_01 (PA_Update_res - Event 20) N1N2 TP_N1N2_AMF_ECO_PDUM_03 (Events 18, 19)
	7	Rtp TP_RTP_ECO_03 (Event 34)

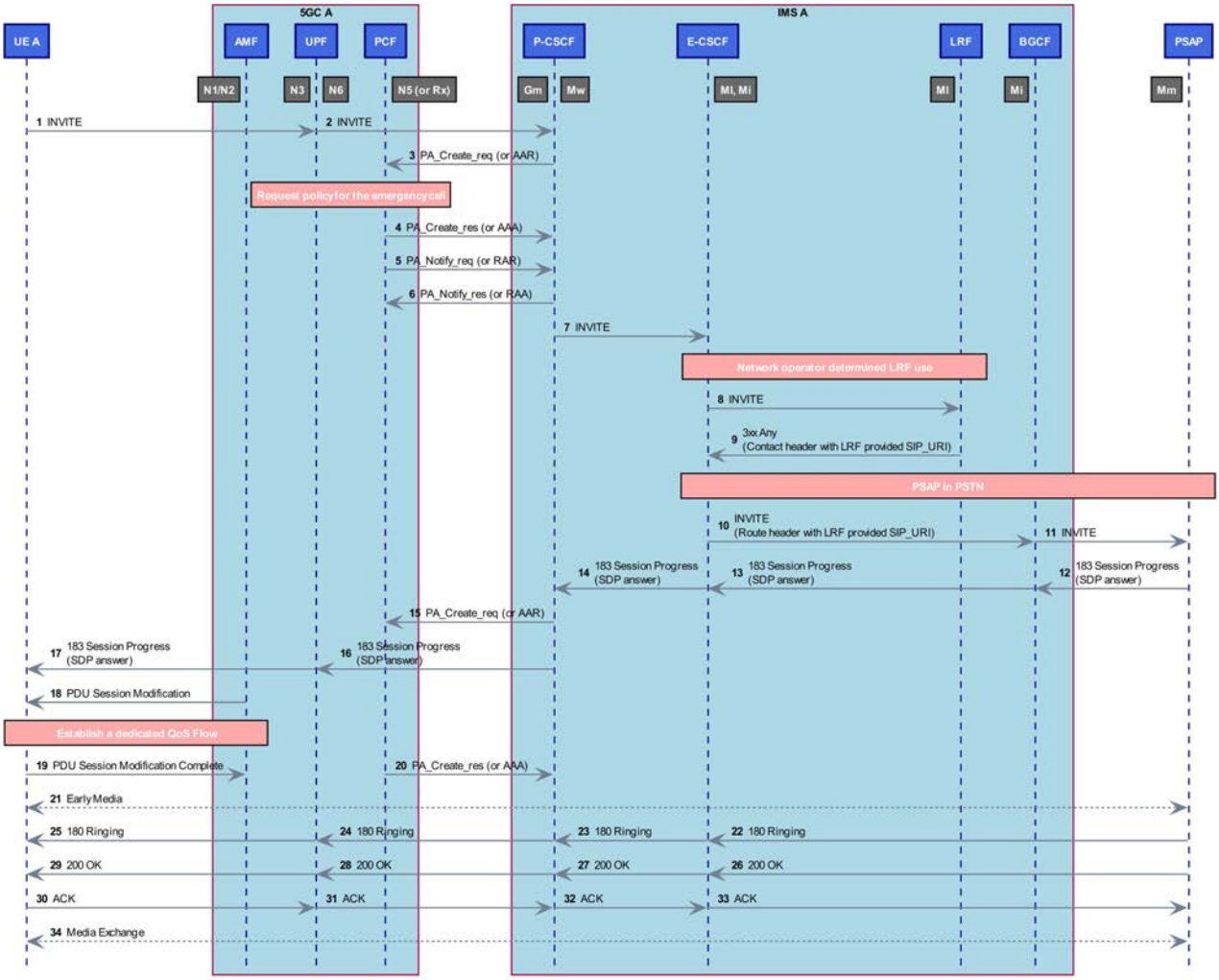


Figure 13: Emergency Session Establishment with LRF, PSAP in the PSTN

1) UE A initiates the emergency session with an INVITE request to UPF. The From header field includes the public user identity (registered via emergency registration) or the tel URI associated with the public user identity (registered via emergency registration).

2) UPF forwards the INVITE to P-CSCF over N6.

3) The IMS A P-CSCF invokes the PCF with PA_Create_req over N5 or AAR over Rx.

4) PCF responds to IMS A P-CSCF with PA_Create_res over N5 or AAA over Rx.

5) PCF sends PA_Notify_req over N5 or RAR over Rx to P-CSCF.

6) P-CSCF responds with PA_Notify_res over N5 or RAA over Rx.

7) P-CSCF sends the INVITE to E-CSCF.

8) E-CSCF sends the INVITE to LRF.

9) LRF responds with 3xx and includes PSAP URI in the Contact header.

10) E-CSCF sends the INVITE to BGCF with LRF provided PSAP URI in Route header.

11) BGCF forwards INVITE to PSAP.

12) PSAP responds with the 183 response with SDP answer to BGCF.

13) BGCF forwards the 183 response to E-CSCF.

14) E-CSCF sends the 183 response to P-CSCF.

15) The IMS A P-CSCF invokes the PCF with PA_Update_req over N5 or AAR over Rx.

16) P-CSCF forwards the SIP 183 (SDP) to UPF.

17) UPF forwards the SIP 183 (SDP) to UE A.

18) AMF sends PDU Session Modification Command to UE A.

19) UE A sends PDU Session Modification Complete to AMF.

20) PCF sends PA_Update_res over N5 or AAA over Rx to P-CSCF.

21) Early media may flow between the UE A and PSAP.

22) The PSAP responds with the 180 Ringing to E-CSCF.

23) E-CSCF forwards the 180 Ringing to P-CSCF.

24) P-CSCF forwards the SIP 180 Ringing to UPF.

25) UPF forwards the SIP 180 Ringing to UE A.

26) PSAP sends 200 OK to E-CSCF.

27) E-CSCF forwards the 200 OK to P-CSCF.

28) P-CSCF forwards the 200 OK towards UPF.

29) UPF forwards the 200 OK towards UE A.

30) UE A sends ACK to UPF.

31) UPF forwards ACK to P-CSCF.

32) P-CSCF sends ACK to E-CSCF.

33) E-CSCF sends ACK to PSAP.

34) Media Exchange.

5.3.1.10 UE calling PSAP over AS with non-emergency registration

Interoperability Test Description	
Identifier:	TD_VoNR_ECO_INT_INI_09
Objective:	To demonstrate the establishment of dedicated PDU sessions at the originating 5GC due to SIP emergency session establishment over AS with non-emergency registration. PSAP is located in the IM CN subsystem of IMS A.
Summary:	An emergency call is setup between UE A and the PSAP located in the IM CN subsystem of IMS A over AS. UE-A is registered to 5GC A and registered to IMS A, has **NOT** performed the emergency registration to IMS A, and requests emergency session by requesting the AS. The AS generates an emergency session establishment request. The S-CSCF derives descriptions of the Service Data Flow from the SDP data, requests creation of adequate PDU sessions and QoS flows from PCF and 5GC, and forwards the request to the E-CSCF. The E-CSCF retrieves the PSAP URI from local configuration and forwards the request to this PSAP. Media transport is possible only after the successful establishment of the session. Media negotiation happens during INVITE/200 OK.
Configuration:	CF_VoNR_INT_ES option 1
SUT:	IMS A
Interfaces:	ISC, Gm, Mw, Mm, Mx

Interoperability Test Description		
References:	Mm	ETSI TS 124 229 [2], clause 5.11.2 ETSI TS 123 167 [12]
	ISC	ETSI TS 124 229 [2], clauses 4.7.3 and 5.7.1.14 ETSI TS 123 167 [12], clause 6.2.8
	Gm, Mw	ETSI TS 124 229 [2], clauses 5.1.6.8.4, 5.2.6.3.3, 5.2.10.4 and 5.11.2
Pre-test conditions:	• UE A previously registered to 5GC A. • UE A previously registered to IMS A. • UE A has **not** performed emergency registration. • UE A is in the same network as the S-CSCF (UE A is not roaming). • AS is part of the trust domain of the network. • 5GC established an emergency PDU session allowing UE A - P-CSCF IP communication. • PSAP is registered or connected to the IMS A and ready to accept the session establishment.	
Test Sequence:	**Step**	
	1	The AS detect an emergency session establishment request from UE A.
	2	AS initiates an emergency session to establish a communication session using an emergency service URN with a top-level service type of "sos" and a Route header field with the topmost Route header field set to the URI associated with an E-CSCF
	3	Verify that the P-Asserted-Identity header field containing the identity of the UE A
	4	Verify that IMS A (E-CSCF) routes the emergency call to the PSAP in the same IM CN subsystem of the own network.
	5	Verify that the IMS produced a Media Description for the session according to SDP-offer in SIP INVITE Request and SDP-answer in SIP 183 to the PCRF.
	6	Verify that the PCF evaluates the media description and invokes the Session Management Function (SMF) in the 5GC to establish a dedicated QoS Flow for the requested media. The PCF evaluated the media description and instructed the SMF to establish dedicated QoS Flows, and that the SMF confirmed the establishment of these QoS Flows.
	7	Verify that dedicated QoS Flows are established in the 5GC User Plane Function (UPF) and that media between UE A and PSAP is successfully routed over these dedicated QoS Flows with appropriate PCC characteristics enforced by the UPF based on policies from the PCF.
Conformance criteria of test sequence step:	2	ISC TP_ISC_SCSCF_5G_EMC_INVITE_01 (Event 2)
	3	Mw TP_MW_PCSCF_5G_ECO_INVITE_02 (Event 3)
	4	Mm TP_MM_ECSCF_5G_ECO_INVITE_02 (Event 4)

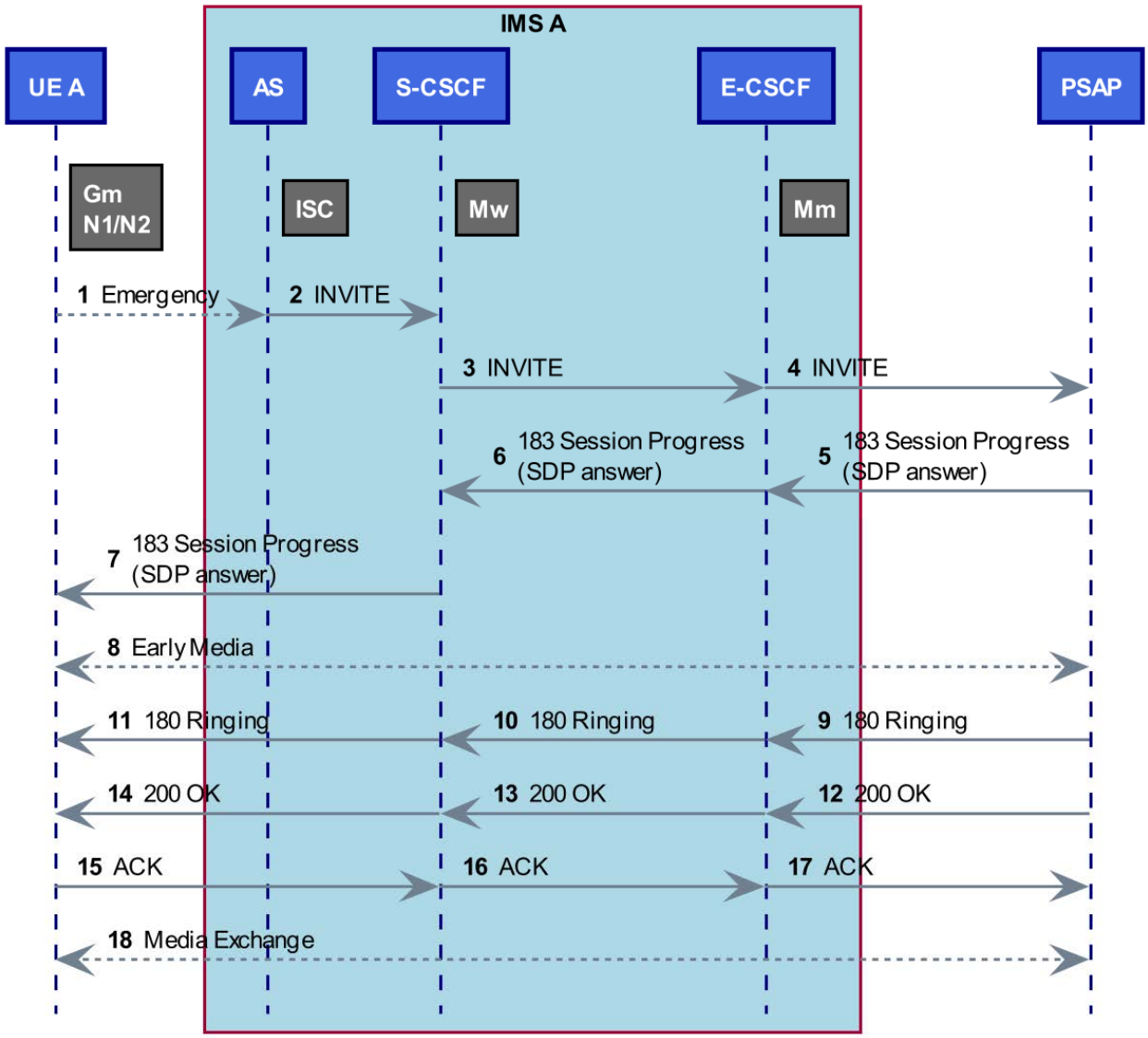


Figure 14: Emergency Session Establishment without emergency registration over AS

NOTE 1: How the interaction between UE A and AS proceeds in detail is beyond the scope of this test description and depends on the supported application.

NOTE 2: The message flow remains the same like the UE-A is attached to EPC (described in ETSI TS 103 795-2 [i.7]).

1) UE A initiates an emergency session establishment request (see note 1).

2) AS detect an emergency session establishment request and generates an INVITE request to S-CSCF include in the Request-URI an emergency service URN, i.e. a service URN with a top-level service type of "sos" as specified in IETF RFC 5031 [15] and a Route header field with the topmost Route header field set to the URI associated with an E-CSCF.

3) S-CSCF sends the INVITE to E-CSCF.

4) E-CSCF sends the INVITE to PSAP.

5) PSAP responds with the 183 response with SDP answer to E-CSCF.

6) E-CSCF sends the 183 response to S-CSCF.

7) S-CSCF sends the SIP 183 (SDP answer) to UE A via UPF.

8) Early media may flow between the UE A and PSAP.

9) The PSAP responds with the 180 Ringing to E-CSCF.

10) E-CSCF forwards the 180 to S-CSCF.

11) S-CSCF forwards the SIP 180 to UE A via UPF.

12) PSAP sends 200 OK to E-CSCF.

13) E-CSCF forwards the 200 OK to S-CSCF.

14) S-CSCF forwards the 200 OK towards UE A via UPF.

15) UE A sends ACK to AS via UPF.

16) AS sends ACK to E-CSCF.

17) S-CSCF sends ACK to E-CSCF.

18) Media Exchange.

5.3.1.11 Callback from PSAP

Interoperability Test Description		
Identifier:	TD_VoNR_ECO_INT_INI_10	
Objective:	To demonstrate that if an emergency call has been terminated, the attempt by the PSAP call taker to communicate back to the emergency caller shall be answered.	
Summary:	Verifying the functionality of the PSAP callback feature, ensuring that the callback is successfully initiated, routed and that media is correctly transmitted over the dedicated PDU sessions at the originating 5GC. The callback shall use the same media as the original emergency call.	
Configuration:	CF_VoNR_INT_ES (Option 1, Option 2 and Option 3)	
SUT:	IMS A, 5GC A and PSAP	
Interfaces:	N3, N6/Gm, Mw, N5 or Rx, Mm, Mx, Mi	
References:	Mm, Mx, Mi,	ETSI TS 123 167 [12], clause 5.2 ETSI TS 124 229 [2], clause 5.10.1 IETF RFC 7090 [14], clause 5.3
	Gm, Mw	ETSI TS 124 229 [2], clauses 5.2.7.2, 5.3.2.1, 5.3.2.1A, 5.4.4.1 and 5.4.4.2 ETSI TS 134 229-1 [11], clause C.11
	N5 or Rx	ETSI TS 129 514 [6], clauses 4.2.2, B.1, B.2, B.5 and Annex C ETSI TS 129 214 [5], clauses 4.4.1, A.1, A.2, A.5 and Annex B
	N3	ETSI TS 123 501 [8], clause 5.6
	N6	ETSI TS 129 561 [17], clause 13.2
Pre-test conditions:	• UE A previously registered to 5GC and shall be previously initially registered to IMS A and an emergency call has been established with dedicated PDU sessions at the originating 5GC allowing UE A - UPF - P-CSCF- E-CSCF IP communication. One of tests from clauses 5.3.1.2 to 5.3.1.10 need to be executed as precondition. • HSS provisioned with UE A subscription. • UE A discovered the P-CSCF address. • PSAP release the call. Release the call with test from 5.3.2.2 after emergency call establishment.	
Test Sequence:	**Step**	
	1	UE A initiates an emergency session.
	2	Verify that the emergency session between UE A and PSAP is successfully established.
	3	Verify that media between UE A and PSAP is successfully routed with appropriate PCC characteristics enforced by the UPF based on policies from the PCF.
	4	PSAP initiates a Call-Release (BYE) operation to UE A, ending the session.
	5	Verify that media between UE A and PSAP is not delivered in any direction.
	6	PSAP initiates a callback using UE A callback number, SIP identifier or IP address.
	7	Verify that the SIP Priority header field value "psap-callback" may be set, which allows blacklists to be bypass and ignore call-forwarding procedures and other similar features.

Interoperability Test Description		
	8	Verify that the IMS produces the same Media Description as the original emergency call.
	9	Verify that the PSAP callback is successfully routed to the UE A.
	10	Verify that media between UE A and PSAP is successfully routed with appropriate PCC characteristics enforced by the UPF based on policies from the PCF.
Conformance criteria of test sequence step:	6	Mm TP_MM_ECSCF_5G_ECO_INVITE_03 (Event 1) Mx TP_MX_ECSCF_5G_ECO_INVITE_03 (Event 3) Mi TP_MI_ECSCF_5G_ECO_INVITE_03 (Event 5) Mw TP_MW_PCSCF_5G_ECO_INVITE_05 (Event 6)
	10	Rtp TP_RTP_ECO_03 (Event 42)

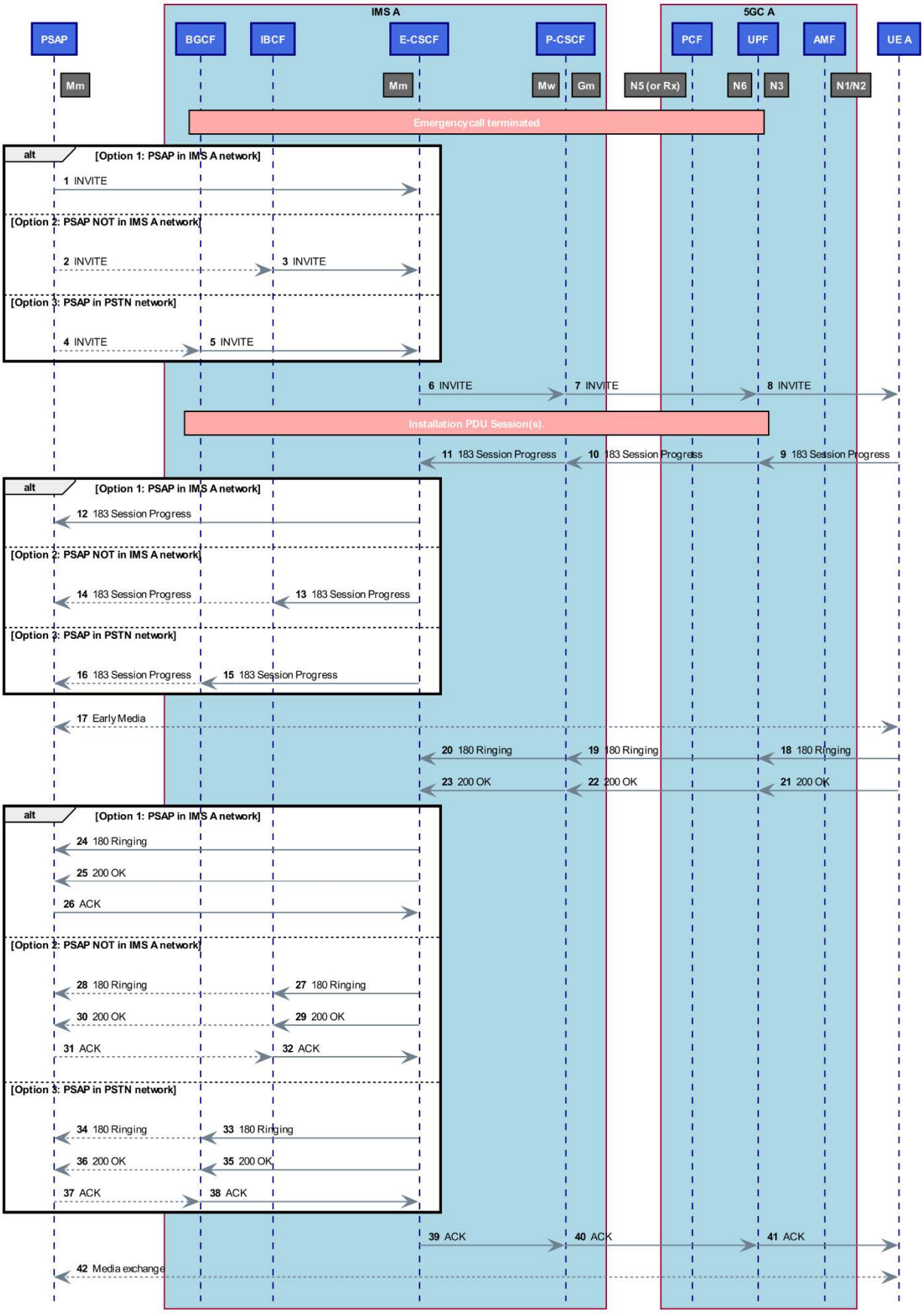


Figure 15: Callback from PSAP

NOTE: For reasons of readability, only the SIP messages are shown in the figure. The message exchange between PCF and P-CSCF remains the same as in Figure 8.

1) (Option 1) PSAP initiates a callback using UE A callback number, SIP identifier or IP address. PSAP sends the INVITE to E-CSCF.

2) (Option 2) PSAP initiates a callback using UE A callback number, SIP identifier or IP address. PSAP sends the INVITE towards IBCF.

3) (Option 2) IBCF forwards the INVITE to E-CSCF.

4) (Option 3) PSAP initiates a callback using UE A callback number, SIP identifier or IP address. PSAP sends the INVITE towards BGCF.

5) (Option 3) BGCF forwards the INVITE to E-CSCF.

6) E-CSCF forwards the INVITE to P-CSCF.

7) P-CSCF forwards the INVITE to UPF.

8) UPF forwards the INVITE to UE A.

9) UE A responds with the 183 response with SDP answer to UPF.

10) UPF forwards response with SDP to P-CSCF.

11) P-CSCF sends the 183 response to E-CSCF.

12) (Option 1) E-CSCF forwards the 183 Session Progress to PSAP.

13) (Option 2) E-CSCF forwards the 183 Session Progress to IBCF.

14) (Option 2) IBCF forwards the 183 Session Progress towards PSAP.

15) (Option 3) E-CSCF forwards the 183 Session Progress to BGCF.

16) (Option 3) BGCF forwards the 183 Session Progress towards PSAP over PSTN (may not be a SIP message).

17) Early media may flow between the UE A and PSAP.

18) The UE A responds with the 180 Ringing to UPF.

19) UPF forwards 180 Ringing to E-CSCF.

20) P-CSCF forwards the 180 to E-CSCF.

21) UE A sends 200 OK to UPF.

22) UPF forwards 200 OK to P-CSCF.

23) P-CSCF forwards the 200 OK to E-CSCF.

24) (Option 1) E-CSCF forwards the 180 Ringing to PSAP.

25) (Option 1) E-CSCF forwards the 200 OK to PSAP.

26) (Option 1) PSAP sends ACK to E-CSCF.

27) (Option 2) E-CSCF forwards the 180 Ringing to IBCF.

28) (Option 2) IBCF forwards 180 Ringing towards PSAP.

29) (Option 2) E-CSCF forwards the 200 OK to IBCF.

30) (Option 2) IBCF forwards 200 OK towards PSAP.

31) (Option 2) PSAP sends ACK to IBCF.

32) (Option 2) IBCF sends ACK to E-CSCF.

33) (Option 3) E-CSCF forwards 180 Ringing to BGCF.

34) (Option 3) BGCF forwards the 180 Ringing towards PSAP over PSTN (may not be a SIP message).

35) (Option 3) E-CSCF forwards the 200 OK to BGCF.

36) (Option 3) BGCF forwards 200 OK towards PSAP.

37) (Option 3) PSAP sends ACK to BGCF.

38) (Option 3) BGCF sends ACK to E-CSCF.

39) E-CSCF forwards the ACK P-CSCF.

40) P-CSCF forwards the ACK towards UPF.

41) UPF forwards the ACK towards UE A.

42) Media Exchange.

5.3.2 Emergency Session Release

5.3.2.0 General

These tests show the removal of the PDU sessions during the normal release procedures of an already established emergency session.

The test assumes that the UE A has been previously registered to 5GC and registered to IMS. An emergency call is assumed to have been successfully established.

The test procedure will follow the Call Release procedures, terminating any bearers and PDU sessions that have been previously created as part of the call.

These tests will verify that:

1) The P-CSCF will act on call release and trigger release of call bearers.

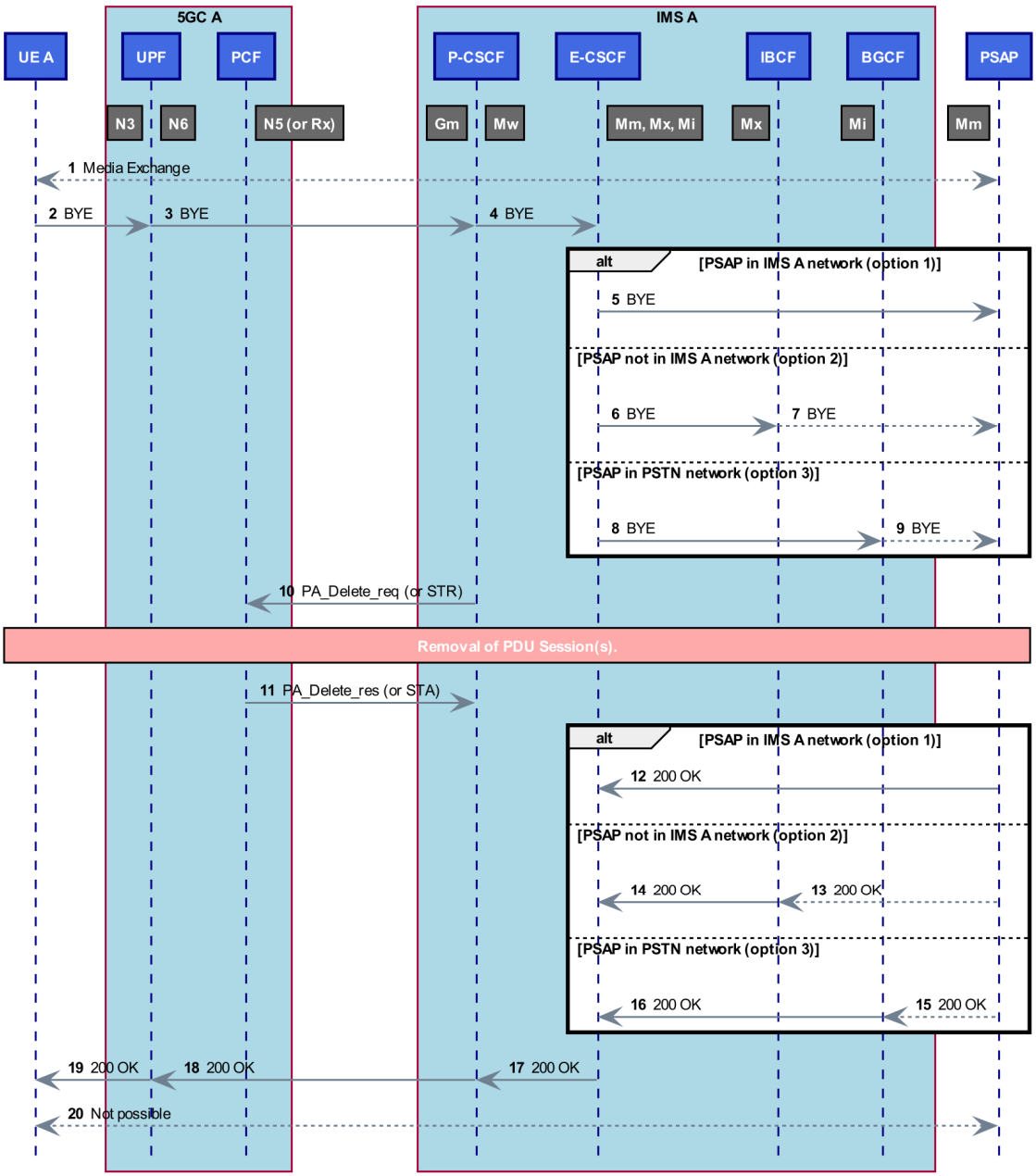
2) The PCF/5GC will remove the call's PDU sessions accordingly.

3) Media will not be transported after the session termination. Tests will continue transmitting media after the session release and verify that the default 5GC gating policy of "Deny" will stop all media.

5.3.2.1 UE Initiated Emergency Session Release

Interoperability Test Description		
Identifier:	TD_VoNR_EMC_INT_REL_01	
Objective:	To perform originating UE session release and the tear down of related PDU session	
Summary:	On call release, the P-CSCF A should trigger the removal of all relevant previously created PDU sessions. 5GC A removes the PDU sessions at the originating 5GC for media. Media transport is no longer possible, after the session release.	
Configuration:	CF_VoNR_INT_ES (Option 1, Option 2 and Option 3)	
SUT:	IMS A and 5GC A	
Interfaces:	N3, N6/Gm, Mw, N5 or Rx, Mm	
References:	Gm, Mw	ETSI TS 124 229 [2], clauses 5.1.5 (1st paragraph), 5.1.6.9, 5.2.7, 5.2.8.1.2, 5.4.5.2 and 6.2
	Mm, Mx, Mi	ETSI TS 123 167 [12], clause 5.2 ETSI TS 124 229 [2], clause 5.11.2
	N5 or Rx	N5: ETSI TS 129 514 [6], clauses 4.2.4.2, 5.3.4.3.2 and B.5 Rx : ETSI TS 129 214 [5], clauses 4.4.4, 4.4.5, A.8 and A.5
	N6	ETSI TS 129 561 [17], clause 13.2
Pre-test conditions:	• UE A previously registered to 5GC A. • 5GC A established a emergency PDU session allowing UE A to P-CSCF IP communication and PSAP to P-CSCF IP communication. • UE A previously established an emergency session with PSAP.	

Interoperability Test Description		
Test Sequence:	**Step**	
	1	Verify that media between UE A and PSAP is delivered in both directions and for all negotiated media stream types after the call establishment.
	2	UE A initiates a Call-Release (BYE) operation, ending the session.
	3	Verify that P-CSCF terminates the emergency session, triggering removal of all associated data flows.
	4	Verify that 5GC A removes all session related data flows.
	5	Verify that media between UE A and PSAP can no longer be exchanged.
Conformance criteria of test sequence step:	1	Rtp TP_RTP_ECO_03 (Event 1)
	2	N6/Gm TP_GM_PCSCF_5G_ECO_BYE_01 (Events 2, 3) Mw TP_MW_PCSCF_5G_ECO_BYE_01 (Event 4) Mm TP_MM_ECSCF_5G_ECO_BYE_01 (Event 5) Mx TP_MX_ECSCF_5G_ECO_BYE_01 (Events 6, 7) Mi TP_MI_ECSCF_5G_ECO_BYE_01 (Events 8, 9)
	3	Rx TP_RX _PCSCF_5G_ECO_STR_01 (Event 10) N5 TP_N5_PCSCF_5G_ECO_PDR_01 (Event 10) N6/Gm TP_GM_PCSCF_5G_ECO_200OK_BYE_01 (Events 18, 19) MwTP_MW_PCSCF_5G_EMC_200OK_BYE_01 (Event 17)
	4	Rx TP_RX_PCRF_5G_ECO_STA_02 (Event 11) N5 TP_N5_PCF_5G_ECO_PDA_02 (Event 11)
	5	Rtp TP_RTP_ECO_01 (Event 20)



NOTE: Emergency Session Release from UE side is not possible for eCall.

Figure 16: Emergency Session Tear-down - UE Initiated Emergency Session Release

1) Media can be exchanged between UE A and PSAP.
2) UE A initiates the emergency session release with a BYE to UPF.
3) UPF forwards BYE to P-CSCF.
4) P-CSCF forwards the BYE to E-CSCF.
5) (Option 1) E-CSCF forwards the BYE to PSAP.
6) (Option 2) E-CSCF forwards the BYE to IBCF.
7) (Option 2) IBCF forwards the BYE towards PSAP.
8) (Option 3) E-CSCF forwards the BYE to BGCF.
9) (Option 3) BGCF forwards the BYE towards PSAP over PSTN (may not be a SIP message).

10) P-CSCF sends PA_Delete_req over N5 or STR over Rx to PCF.

11) PCF responds with PA_Delete_res over N5 or STA over Rx to P-CSCF.

12) (Option 1) PSAP sends 200 OK (BYE) to E-CSCF.

13) (Option 2) PSAP sends 200 OK (BYE) towards IBCF.

14) (Option 2) IBCF sends 200 OK (BYE) to E-CSCF.

15) (Option 3) PSAP sends 200 OK (BYE) to BGCF over PSTN (may not be a SIP message).

16) (Option 3) BGCF sends 200 OK (BYE) to E-CSCF.

17) E-CSCF forwards the 200 OK (BYE) to P-CSCF.

18) P-CSCF forwards the 200 OK (BYE) to UPF.

19) UPF forwards the 200 OK (BYE) towards UE A.

20) No media can flow between PSAP and UE A.

5.3.2.2 PSAP Initiated Emergency Session Release

Interoperability Test Description		
Identifier:	TD_VoNR_ECO_INT_REL_02	
Objective:	To perform originating PSAP emergency session release and the tear down of related PDU session.	
Summary:	On call release initiated by PSAP, the P-CSCF A should trigger the removal of all relevant previously created PDU sessions. 5GC A removes the PDU sessions at the originating 5GC for media. Media transport is no longer possible, after the session release.	
Configuration:	CF_VoNR_INT_ES (Option 1, Option 2 and Option 3)	
SUT:	IMS A and 5GC A	
Interfaces:	N6/Gm, Mw, N5 or Rx, Mm, Mx, Mi	
References:	Gm, Mw	ETSI TS 124 229 [2], clauses 5.1.5, 5.2.7, 6.1 and 6.2
	Mm, Mx, Mi,	ETSI TS 123 167 [12], clause 5.2
	N5 or Rx	N5 : ETSI TS 129 514 [6], clause B.5 Rx : ETSI TS 129 214 [5], clause 4.4.4
	N6	ETSI TS 129 561 [17], clause 13.2
Pre-test conditions:	UE A previously registered to 5GC A. 5GC A established a emergency PDU session allowing UE A to P-CSCF IP communication and PSAP to P-CSCF IP communication. UE A previously established an emergency session with PSAP.	
Test Sequence:	Step	
	1	Verify that media between UE A and PSAP is delivered in both directions and for all negotiated media stream types after the call establishment.
	2	PSAP initiates a Call-Release (BYE) operation, ending the session.
	3	Verify that P-CSCF terminates the N5 (or Rx) session, triggering removal of all emergency session related PDU sessions.
	4	Verify that 5GC A removes all emergency session related PDU sessions.
	5	Verify that media between UE A and PSAP can no longer be exchanged.

Interoperability Test Description			
Conformance criteria of test sequence step:	1	Rtp	TP_RTP_ECO_03 (Event 1)
	2	Mm Mx Mi	TP_MM_ECSCF_5G_ECO_BYE_02 (Events 2, 7) TP_MX_ECSCF_5G_ECO_BYE_02 (Events 4, 7) TP_MI_ECSCF_5G_ECO_BYE_02 (Events 6, 7)
	3	Gm Mw Rx N5	TP_GM_PCSCF_5G_ECO_200OK_BYE_02 (Event 13) TP_MW_PCSCF_5G_EMC_200OK_BYE_02 (Event 14) TP_RX_PCSCF_5G_ECO_STR_01 (Event 10) TP_N5_PCSCF_5G_ECO_PDR_01 (Event 10)
	4	N5 Rx	TP_N5_PCF_5G_ECO_PDA_02 (Event 11) TP_RX_PCRF_5G_ECO_STA_02 (Event 11)
	5	Rtp	TP_RTP_ECO_01 (Events 20)

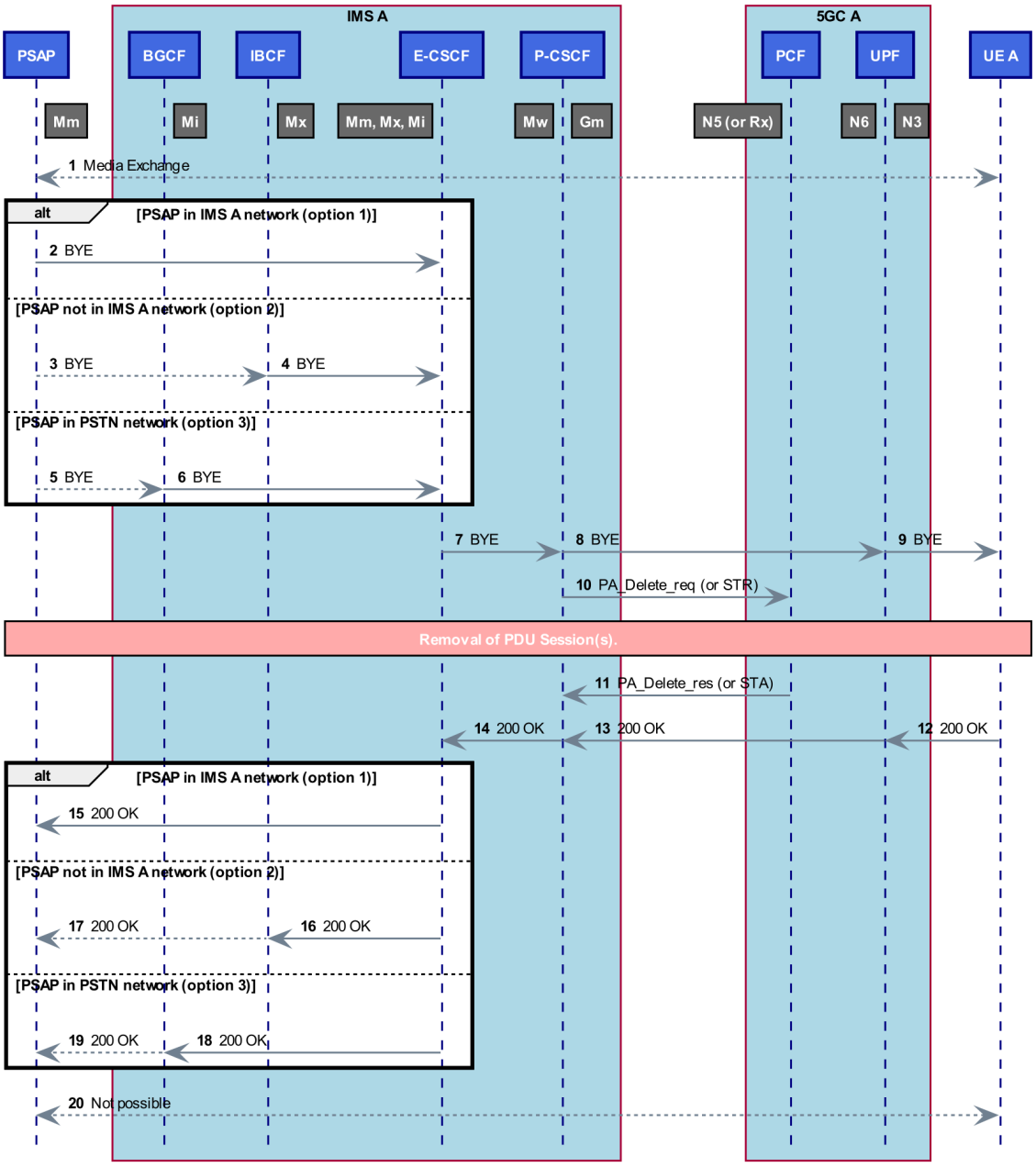


Figure 17: Emergency Session Tear-down - PSAP Initiated Emergency Session Release

1) Media can be exchanged between UE A and PSAP.

2) (Option 1) PSAP initiates the emergency session release with sending BYE to E-CSCF.

3) (Option 2) PSAP initiates the emergency session release with sending BYE to IBCF.

4) (Option 2) IBCF forwards the BYE towards E-CSCF.

5) (Option 3) PSAP initiates the session release with sending BYE to BGCF over PSTN (may not be a SIP message).

6) (Option 3) BGCF forwards the E-CSCF.

7) E-CSCF forwards the BYE to P-CSCF.

8) P-CSCF forwards the BYE to UPF.

9) UPF forwards the BYE to UE A.

10) P-CSCF sends PA_Delete_req over N5 or STR over Rx to PCF.

11) PCF responds with PA_Delete_res over N5 or STA over Rx to P-CSCF.

12) UE A sends 200 OK (BYE) to UPF.

13) UPF forwards 200 OK (BYE) to P-CSCF.

14) P-CSCF forwards 200 OK (BYE) to E-CSCF.

15) (Option 1) E-CSCF forwards 200 OK (BYE) to.

16) (Option 2) E-CSCF forwards 200 OK (BYE) to IBCF.

17) (Option 2) IBCF forwards the 200 OK (BYE) towards PSAP.

18) (Option 3) E-CSCF forwards 200 OK (BYE) to BGCF.

19) (Option 3) BGCF forwards the 200 OK (BYE) towards PSAP over PSTN (may not be a SIP message).

20) No media can flow between PSAP and UE A.

5.3.3 Emergency Session Abort/Reject

5.3.3.0 General

These test cases cover unsuccessful emergency session setup. Either the emergency call is aborted in the UE side or rejected on the PSAP side. The test assumes that the UE A has been previously registered to 5GC and registered to IMS.

For emergency session abort, it is assumed that a call is established to the ringing phase prior to the originating UE initiating session release. Early media is possible in the backward direction prior to session abort.

For emergency session reject, the INVITE is delivered to the P-CSCF but is rejected (e.g. PSAP is busy). In both cases, dedicated media bearers are established prior to being turn down after session abort/reject.

5.3.3.1 Emergency Session Abort

Interoperability Test Description			
Identifier:	TD_VoNR_EMC_INT_ABT_01		
Objective:	To perform SIP session abort (originating side) and the related interactions with PCF A and 5GC A.		
Summary:	On session abort, the P-CSCF A should trigger the removal of all relevant previously created early media sessions. 5GC A removes the sessions for early media. Media transport is no longer possible, after the session abort.		
Configuration:	CF_VoNR_INT_ES (Option 1, Option 2 and Option 3)		
SUT:	IMS A and 5GC A		
Interfaces:	N6/Gm, Mw, N5 or Rx, Mm/Mx/Mi		
References:	Gm, Mw	ETSI TS 124 229 [2], clauses 5.1.5, 5.2.7, 6.1 and 6.2	
	Mm Mx Mi	ETSI TS 123 167 [12], clause 5.2 ETSI TS 124 229 [2], clause 5.11.2	
	N5 or Rx	N5: ETSI TS 129 514 [6], clauses 4.2.4.2, 5.3.4.3.2 and B.5 Rx: ETSI TS 129 214 [5], clauses 4.4.4, 4.4.5, A.8 and A.5	
	N6	ETSI TS 129 561 [17], clause 13.2	
Pre-test conditions:	UE A previously registered to 5GC A. 5GC A established an emergency Bearer allowing UE A to P-CSCF IP communication. UE A & PSAP previously registered to IMS A and IMS A signalling bearers provisioned.		
Test Sequence:	Step		
	1	Verify that media between UE A and PSAP is not delivered in any direction.	
	2	UE A initiates an emergency session establishment operation.	
	3	PSAP answers with SIP 183 Session Progress INVITE Response and starts sending early media.	
	4	Verify that early media session is established between PSAP and UE A.	
	5	UE A cancels the session establishment.	
	6	Verify that P-CSCF A terminates the N5 (or Rx) session, triggering removal of all early media sessions.	
	7	Verify that 5GC A removes all early media related sessions.	
	8	Verify that media between UE A and PSAP can not be exchanged and is filtered out by 5GC A.	
Conformance criteria of test sequence step:	5	Gm Mw Mm Mx Mi	TP_GM_PCSCF_5G_EMC_CANCEL_01 (Events 1, 2) TP_MW_PCSCF_5G_EMC_CANCEL_01 (Event 5) TP_MM_ECSCF_5G_EMC_CANCEL_01 (Events 6, 7) TP_MX_ECSCF_5G_EMC_CANCEL_01 (Events 8, 11) TP_MI_ECSCF_5G_EMC_CANCEL_01 (Events 12, 15)
	6/7	Rx N5 Rx N5 Gm Mw Mm Mx Mi Gm Mw	TP_RX_PCSCF_5G_ECO_STR_03 (Event 3) TP_N5_PCSCF_5G_ECO_PDR_03 (Event 3) TP_RX_PCRF_5G_ECO_STA_02 (Event 4) TP_N5_PCF_5G_ECO_PDA_02 (Event 4) TP_GM_PCSCF_5G_EMC_200OK_CANCEL_01 (Events 17, 18) TP_MW_PCSCF_5G_EMC_200OK_CANCEL_01 (Event 16) TP_MM_ECSCF_5G_EMC_487INVITE_01 (Event 19) TP_MX_ECSCF_5G_EMC_487INVITE_01 (Event 21) TP_MI_ECSCF_5G_EMC_487INVITE_01 (Event 23) TP_GM_PCSCF_5G_EMC_487INVITE_01 (Events 25, 26) TP_MW_PCSCF_5G_EMC_487INVITE_01 (Event 24)
	8	Rtp	TP_RTP_ECO_01 (Event 35)

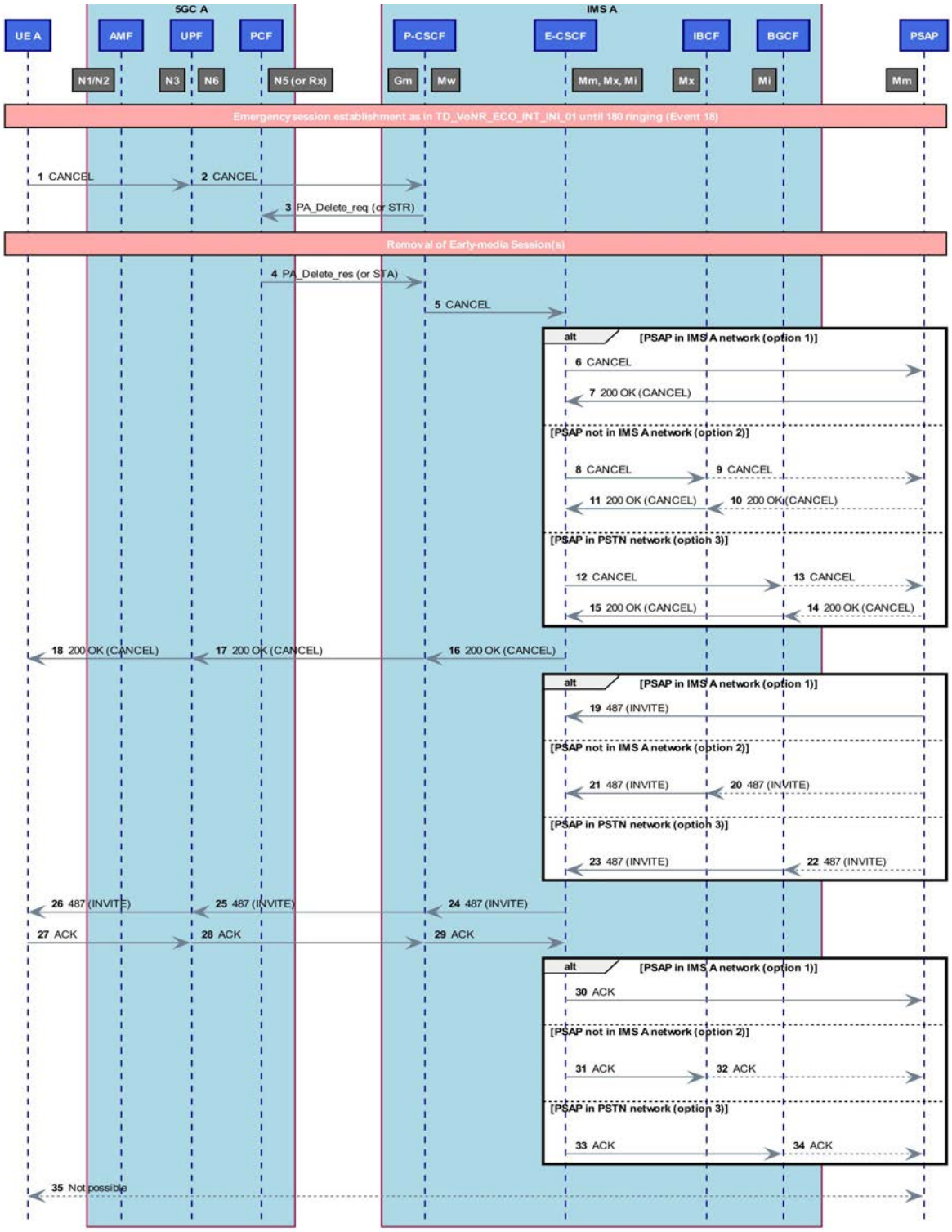


Figure 18: Emergency Session Abort

1) The UE A responds 180 Ringing with CANCEL to UPF.
2) The UPF forwards 180 Ringing with CANCEL to P-CSCF.
3) P-CSCF sends PA_Delete_req over N5 or STR over Rx to PCF.
4) PCF responds with PA_Delete_res over N5 or STA over Rx to P-CSCF.
5) P-CSCF sends CANCEL to E-CSCF.
6) (Option 1) E-CSCF sends CANCEL to PSAP.

7) (Option 1) PSAP sends 200 OK (CANCEL) to E-CSCF.

8) (Option 2) E-CSCF sends CANCEL to IBCF.

9) (Option 2) IBCF forwards the CANCLE towards PSAP.

10) (Option 2) PSAP sends 200 OK (CANCEL) to IBCF.

11) (Option 2) IBCF sends 200 OK (CANCEL) to E-CSCF.

12) (Option 3) E-CSCF sends CANCEL to BGCF.

13) (Option 3) BGCF forwards CANCLE towards PSAP over PSTN (may not be a SIP message).

14) (Option 3) PSAP sends 200 OK (CANCEL) to BGCF over PSTN.

15) (Option 3) BGCF forwards 200 OK (CANCEL) to E-CSCF.

16) E-CSCF sends 200 OK (CANCEL) to P-CSCF.

17) P-CSCF forwards 200 OK (CANCEL) to UPF.

18) UPF forwards 200 OK (CANCEL) to UE A.

19) (Option 1) PSAP sends 487 (INVITE) to E-CSCF.

20) (Option 2) PSAP sends 487 (INVITE)) to IBCF.

21) (Option 2) IBCF sends 487 (INVITE) to E-CSCF.

22) (Option 3) PSAP sends 487 (INVITE) to BGCF over PSTN (may not be a SIP message).

23) (Option 3) BGCF forwards 487 (INVITE) to E-CSCF.

24) E-CSCF sends 487 (INVITE) to P-CSCF.

25) P-CSCF forwards 487 (INVITE) to UPF.

26) UPF forwards 487 (INVITE) to UE A.

27) UE A sends ACK to UPF.

28) UPF forwards ACK to IMS A P-CSCF.

29) P-CSCF sends ACK to E-CSCF.

30) (Option 1) E-CSCF forwards ACK to PSAP.

31) (Option 2) E-CSCF forwards ACK to IBCF.

32) (Option 2) IBCF forwards the ACK towards PSAP.

33) (Option 3) E-CSCF forwards ACK to BGCF.

34) (Option 3) BGCF forwards the ACK towards PSAP over PSTN (may not be a SIP message).

35) No media can flow between the UE A and PSAP.

5.3.3.2 Emergency Session Reject from PSAP

Interoperability Test Description			
Identifier:	TD_VoNR_ECO_INT_REJ_01		
Objective:	To demonstrate interaction between UE A and PSAP when an emergency session is rejected.		
Summary:	On session reject, the P-CSCF A should trigger the removal of all relevant previously created early media sessions. 5GC A removes the sessions for early media. Media transport is no longer possible, after the rejected session.		
Configuration:	CF_VoNR_INT_ES (Option 1, Option 2 and Option 3)		
SUT:	IMS A and 5GC A		
Interfaces:	N6/Gm, Mw, N5 or Rx, Mm/Mx/Mi		
References:	Gm, Mw	ETSI TS 124 229 [2], clauses 5.1.5, 5.2.7, 6.1 and 6.2	
	Mm Mx Mi	ETSI TS 123 167 [12], clause 5.2	
	N5 or Rx	N5: ETSI TS 129 514 [6], clauses 4.2.4.2, 5.3.4.3.2 and B.5 Rx: ETSI TS 129 214 [5], clauses 4.4.4, 4.4.5, A.8 and A.5	
	N6	ETSI TS 129 561 [17], clause 13.2	
Pre-test conditions:	UE A previously registered to 5GC A. 5GC A established an emergency session allowing UE A to P-CSCF IP communication. UE A & PSAP previously registered to IMS A. PSAP not available (turn off)		
Test Sequence:	Step		
	1	UE A initiates an emergency session establishment operation.	
	2	PSAP rejects session establishment with 480 "Temporary Unavailable".	
	3	Verify that P-CSCF reject the request by returning a 380 (Alternative Service) response.	
	4	Verify that P-CSCF A terminates the session, triggering removal of all early media sessions.	
	5	Verify that 5GC A removes all early media sessions.	
Conformance criteria of test sequence step:	1	Gm	TP_GM_PCSCF_5G_ECO_INVITE_01 (Events 2, 3)
		Gm	TP_GM_PCSCF_5G_ECO_INVITE_02 (Events 2, 3)
		Gm	TP_GM_PCSCF_5G_ECO_INVITE_03 (Events 2, 3)
		Gm	TP_GM_PCSCF_5G_NGC_INVITE_01 (Events 2, 3)
		Gm	TP_GM_PCSCF_5G_ECO_INVITE_05 (Events 2, 3)
	2	Mm	TP_MM_ECSCF_5G_ECO_480INVITE_01 (Events 10, 19)
		Mx	TP_MX_ECSCF_5G_ECO_480INVITE_01 (Events 14, 19)
		Mi	TP_MI_ECSCF_5G_ECO_480INVITE_01 (Events 18, 19)
	3	Mw	TP_MW_PCSCF_5G_ECO_480INVITE_01 (Events 19, 22)
	4/5	Rx	TP_RX_PCSCF_5G_ECO_STR_05 (Event 20)
		N5	TP_N5_PCSCF_5G_ECO_PDR_05 (Event 20)
		Rx	TP_RX_PCRF_5G_ECO_STA_02 (Event 21)
		N5	TP_N5_PCF_5G_ECO_PDA_02 (Event 21)
		Rtp	TP_RTP_ECO_01 (Event 32)

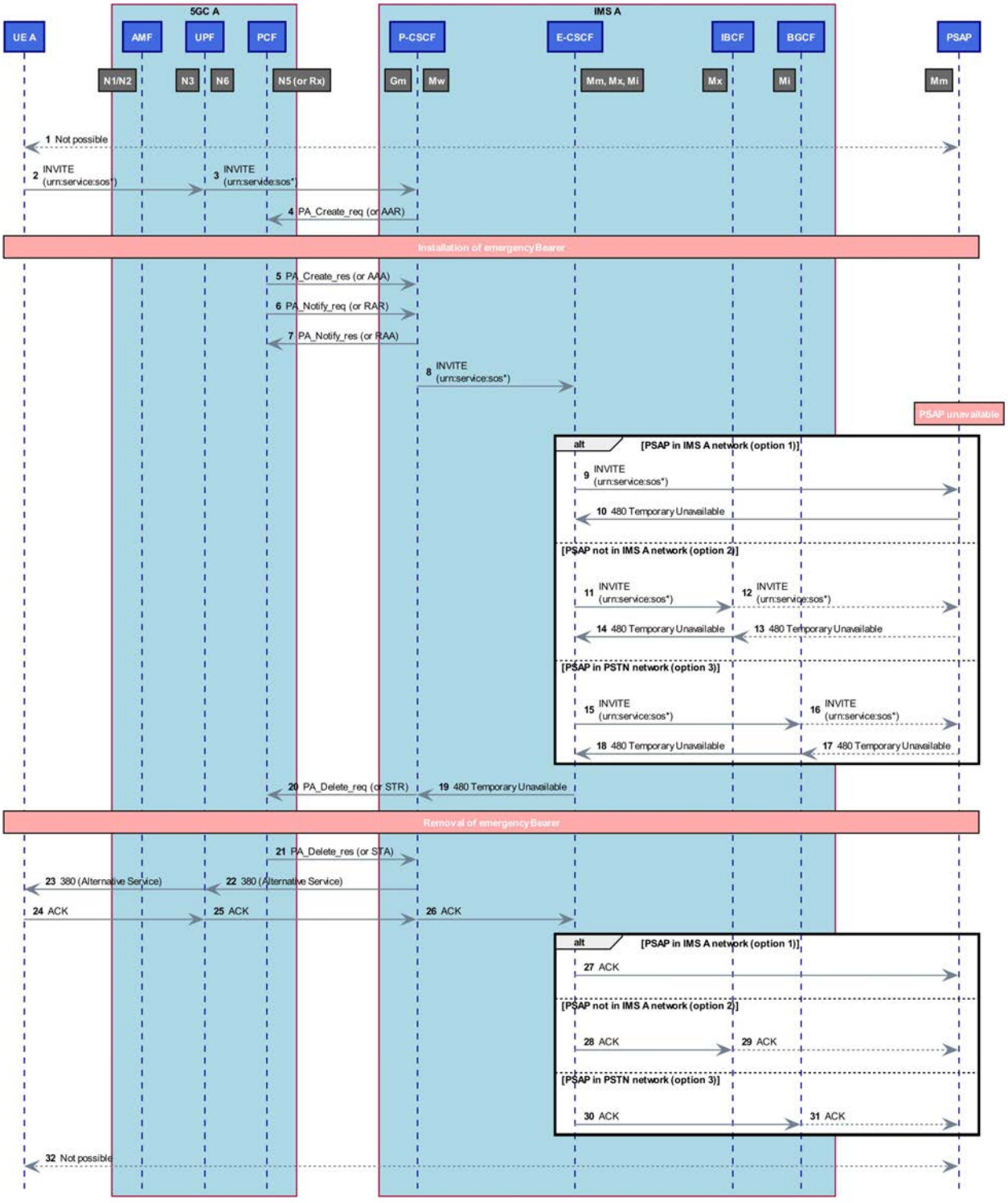


Figure 19: Emergency Session Reject - PSAP unavailable

1) No media can flow between the UE A and PSAP.
2) UE A initiates the SIP session with an INVITE containing the service URN "sos" to UPF.
3) UPF forwards INVITE containing the service URN "sos" to P-CSCF.
4) The IMS A P-CSCF invokes the PCF with PA_Create_req over N5 or AAR over Rx.
5) PCF responds to IMS A P-CSCF with PA_Create_res over N5 or AAA over Rx.
6) PCF sends PA_Notify_req over N5 or RAR over Rx to P-CSCF.

7) P-CSCF responds with PA_Notify_res over N5 or RAA over Rx.
8) P-CSCF sends the INVITE to E-CSCF.
9) (Option 1) E-CSCF forwards the INVITE to PSAP.
10) (Option 1) PSAP response with 480 Temporary Unavailable to E-CSCF.
11) (Option 2) E-CSCF forwards the INVITE to IBCF.
12) (Option 2) IBCF forwards the INVITE towards PSAP.
13) (Option 2) PSAP response with 480 Temporary Unavailable to IBCF.
14) (Option 2) IBCF forwards the response with 480 Temporary Unavailable to E-CSCF.
15) (Option 3) E-CSCF forwards the INVITE to BGCF.
16) (Option 3) BGCF forwards the INVITE towards PSAP over PSTN (may not be a SIP message).
17) (Option 3) PSAP response with 480 Temporary Unavailable to BGCF over PSTN (may not be a SIP message).
18) (Option 3) BGCF forwards the response with 480 Temporary Unavailable to E-CSCF.
19) E-CSCF sends the 480 Temporary Unavailable to P-CSCF.
20) P-CSCF sends PA_Delete_req over N5 or STR over Rx to PCF.
21) PCF responds with PA_Delete_res over N5 or STA over Rx to P-CSCF.
22) P-CSCF sends the 380 (Alternative Service) to UPF.
23) UPF forwards the 380 (Alternative Service) to UE A.
24) UE A sends ACK to UPF.
25) UPF forwards ACK to IMS A P-CSCF.
26) P-CSCF sends ACK to E-CSCF.
27) (Option 1) E-CSCF forwards ACK to PSAP.
28) (Option 2) E-CSCF forwards ACK to IBCF.
29) (Option 2) IBCF forwards the ACK towards PSAP.
30) (Option 3) E-CSCF forwards ACK to BGCF.
31) (Option 3) BGCF forwards the ACK towards PSAP over PSTN (may not be a SIP message).
32) No media can flow between the UE and PSAP.

5.3.3.3 Emergency Session Reject - IMS not able to handle emergency sessions

Interoperability Test Description		
Identifier:	TD_VoNR_ECO_INT_REJ_02	
Objective:	To demonstrate interaction between UE A and P-CSCF when an emergency session is rejected.	
Summary:	On session reject, the P-CSCF A should trigger the removal of all relevant previously created early media sessions. 5GC A removes the early media session. Media transport is no longer possible, after the rejected session.	
Configuration:	CF_VoNR_INT_ES	
SUT:	IMS A and 5GC A	
Interfaces:	N6/Gm	
References:	N6, Gm, Mw	N6: ETSI TS 129 561 [17], clause 13.2 Gm: ETSI TS 124 229 [2], clauses 5.2.10.4 and 5.2.10.5
Pre-test conditions:	UE A previously registered to 5GC A. UE A & PSAP previously registered to IMS A and IMS A signalling bearers provisioned. The IMS A is not capable or does not handle emergency sessions.	
Test Sequence:	Step	
	1	UE A initiates an emergency session establishment operation.
	2	Verify that P-CSCF reject the request by returning a 380 (Alternative Service) response.
Conformance criteria of test sequence step:	1	N6/Gm TP_GM_PCSCF_5G_ECO_INVITE_01 (Event 1)
	2	N6/Gm TP_MW_PCSCF_5G_ECO_380INVITE_01 (Event 3)

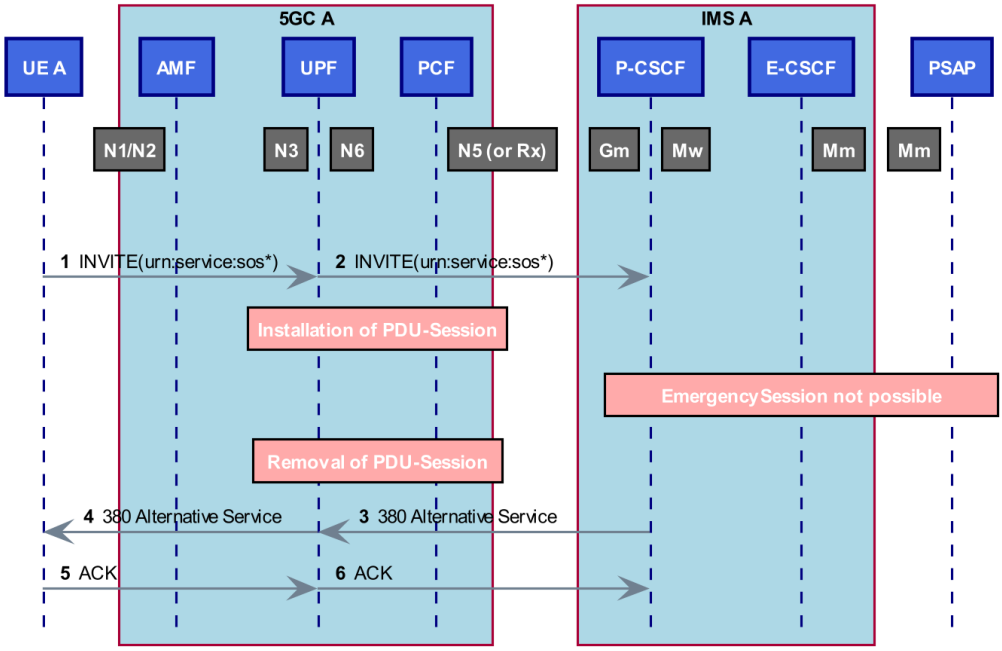


Figure 20: Emergency Session Reject - Network Rejection

1) UE A sends an emergency PDU session request containing the ServiceUrn:"urn:service:sos*" to UPF.

2) UPF forwards the emergency PDU session request containing the ServiceUrn:"urn:service:sos*" to P-CSCF.

3) P-CSCF sends 380 (Alternative Service) to UPF.

4) UPF sends 380 (Alternative Service) to UE-A.

5) UE A sends ACK to UPF.

6) UPF forwards ACK to P-CSCF.

5.3.3.4 Emergency Session Reject - due to wrong urn

Interoperability Test Description		
Identifier:	TD_VoNR_ECO_INT_REJ_03	
Objective:	To demonstrate interaction between UE A and P-CSCF when an emergency session is rejected due to wrong urn.	
Summary:	On session reject, the P-CSCF A should trigger the removal of all relevant previously created early media sessions. 5GC A removes the early media session. Media transport is no longer possible, after the rejected session.	
Configuration:	CF_VoNR_INT_ES	
SUT:	IMS A and 5GC A	
Interfaces:	N6/Gm	
References:	N6, Gm	N6: ETSI TS 129 561 [17], clause 13.2 Gm: ETSI TS 124 229 [2], clauses 5.2.10.4 and 5.2.10.5
Pre-test conditions:	UE A previously registered to 5GC A. UE A & PSAP previously registered to IMS A and IMS A signalling bearers provisioned.	
Test Sequence:	Step	
	1	UE A initiates an emergency session establishment operation with wrong urn
	2	Verify that P-CSCF reject the request by returning a 380 (Alternative Service) response due to wrong urn
Conformance criteria of test sequence step:	2	Gm TP_MW_PCSCF_5G_ECO_380INVITE_02 (Event 2)

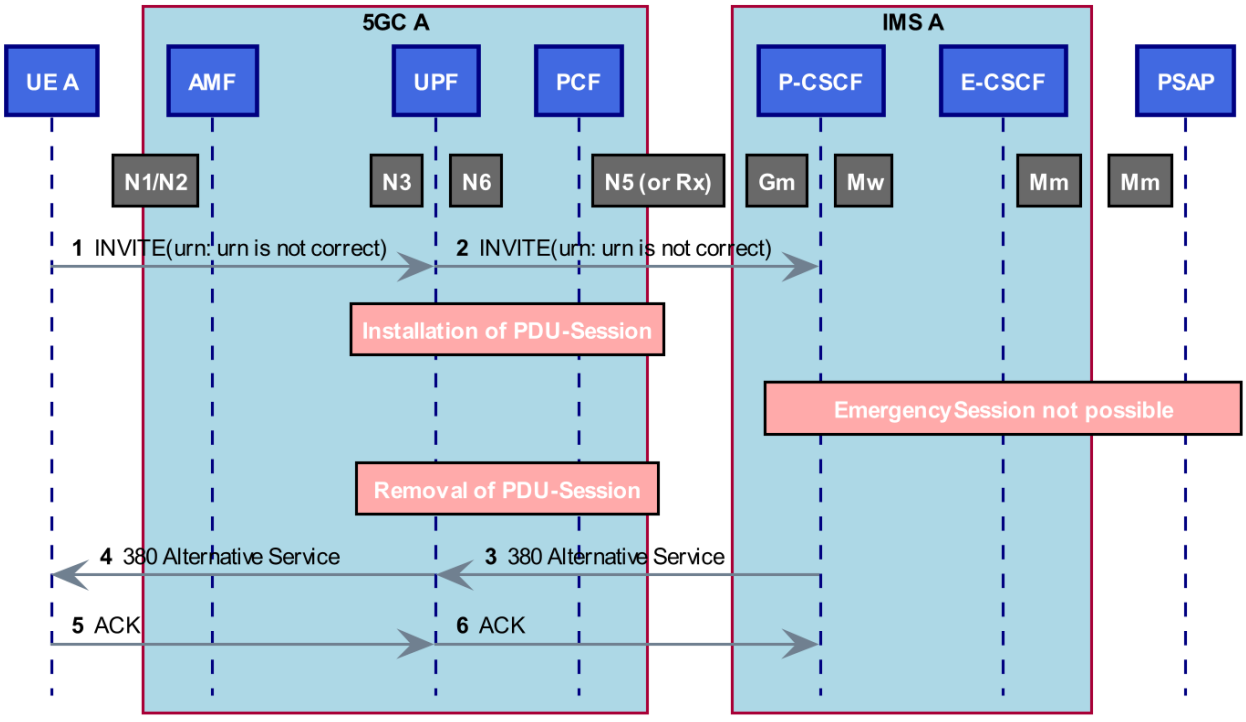


Figure 21: Emergency Session Reject - Wrong urn

1) UE A initiates the emergency session with an INVITE containing wrong service URN send to UPF.

2) UPF forwards the INVITE containing wrong service URN to P-CSCF.

3) P-CSCF sends 380 (Alternative Service) to UPF.

4) UPF forwards 380 (Alternative Service) to UE-A.

5) UE A sends ACK to UPF.

6) UPF forwards ACK to P-CSCF.

5.3.4 NG eCall tests

5.3.4.1 MSD sent during NG eCall establishment

Interoperability Test Description		
Identifier:	TD_VoNR_NGC_INT_INI_01	
Objective:	To demonstrate the establishment of IMS emergency call of the (automatically or manually) initiated eCall type of emergency service within an emergency registration. PSAP is located in the IM CN subsystem of IMS A.	
Summary:	An eCall type of emergency service is setup between UE A and the PSAP located in the IM CN subsystem of IMS A. UE-A is registered to 5GC A and registered to IMS A, has performed the emergency registration to IMS A, and requests emergency session establishment using an emergency URN. The P-CSCF derives descriptions of the Service Data Flow from the SDP data, requests creation of adequate PDU sessions from PCF and 5GC, and forwards the request to the E-CSCF. The E-CSCF retrieves the PSAP URI from local configuration and forwards the request to this PSAP. Media transport is possible only after the successful establishment of the session. Media negotiation happens during INVITE/200 OK (UE A sends SDP-offer, PSAP responds with SDP-answer).	
Configuration:	CF_VoNR_INT_ES option 1	
SUT:	IMS A, 5GC A and PSAP	
Interfaces:	N6/Gm, Mw, N3, N5 or Rx, Mm	
References:	Mm	ETSI TS 124 229 [2], clause 5.11.2 ETSI TS 123 167 [12]
	Gm, Mw	ETSI TS 124 229 [2], clauses 5.1.6.8.3, 5.1.6.11, 5.2.6.3.3, 5.2.10.3 and 5.11.2
	N5 or Rx	N5: ETSI TS 129 514 [6], clause B.5 Rx: ETSI TS 129 214 [5], clause A.5
	N6	ETSI TS 129 561 [17], clause 13.2
	N3	ETSI TS 123 501 [8], clause 5.6
Pre-test conditions:	• UE A previously registered to 5GC A. • UE A previously registered to IMS A. • 5GC established an emergency session allowing UE A - P-CSCF IP communication. • 5GC established an IMS signalling bearer. • PSAP is registered or connected to the IMS A and ready to accept the session establishment. • UE A previously performed emergency registration.	

Interoperability Test Description		
Test Sequence:	Step	
	1	Verify that media between UE A and PSAP is not delivered in any direction before call establishment.
	2	UE A initiates an eCall type of emergency call to establish a communication session using an emergency service URN.
	3	Verify that the UE A inserts in the INVITE request, a From header field that includes the public user identity registered via emergency registration or the tel URI associated with the public user identity registered via emergency registration and a To header indicating one of the NG eCall URNs defined in Table 2. Verify also that the UE A inserts a multipart/mixed body containing an "application/EmergencyCallData.eCall.MSD" MIME body part containing the MSD not exceeding 140 bytes and encoded in binary ASN.1 PER, a Content-Disposition header field with the handling parameter set to optional, an Accept header field indicating "application/EmergencyCallData.Control+xml"is acceptable, and a Recv-Info header field set to "EmergencyCallData.eCall.MSD".
	4	Verify that IMS A (P-CSCF, E-CSCF) routes the emergency call to the PSAP in the same IM CN subsystem of the own network.
	5	Verify that the IMS produced a Media Description for the session according to SDP-offer in SIP INVITE Request and SDP-answer in SIP 183 to the PCRF.
	6	Verify that the Application Function (AF) in the IMS interacts with the Policy Control Function (PCF) in the 5GC (via the N5 interface) to request policy for the emergency call, providing the media description. The PCF evaluates the media description and invokes the Session Management Function (SMF) in the 5GC to establish a dedicated QoS Flow for the requested media.
	7	Verify that dedicated QoS Flows are established in the 5GC User Plane Function (UPF) and that media between UE A and PSAP is successfully routed over these dedicated QoS Flows with appropriate PCC characteristics enforced by the UPF based on policies from the PCF.
Conformance criteria of test sequence step:	2	Gm TP_GM_PCSCF_5G_NGC_INVITE_01 (Event 1)
	3	Gm TP_GM_PCSCF_5G_ECO_REGISTER_02 (Pre-test)
	4	Mw TP_MW_PCSCF_5G_ECO_INVITE_02 (Events 6, 7) Mm TP_MM_ECSCF_5G_ECO_INVITE_01 (Events 6, 7)
	6	Rx TP_RX_PCSCF_5G_ECO_AAR_02 (AAR - Event 2) N5 TP_N5_PCSCF_5G_ECO_PCR_02 (PA_Create_res - Event 2) Rx TP_RX_PCRF_5G_ECO_AAA_02 (AAA - Events 3, 9) N5 TP_N5_PCF_5G_ECO_PCA_02 (PA_Create_res - Event 3) Rx TP_RX_PCSCF_5G_ECO_RAA_01 (RAR, RAA - Events 4, 5) N5 TP_N5_PCSCF_5G_ECO_PNA_01 (PA_Notify_res - Events 4, 5) Rx TP_RX_PCSCF_5G_ECO_AAR_04 (AAR - Event 8) N5 TP_N5_PCSCF_5G_ECO_PUR_04 (PA_Update_req - Event 8) N5 TP_N5_PCF_5G_ECO_PUA_01 (PA_Update_res - Event 9)
	7	Rtp TP_RTP_ECO_03 (Event 25)

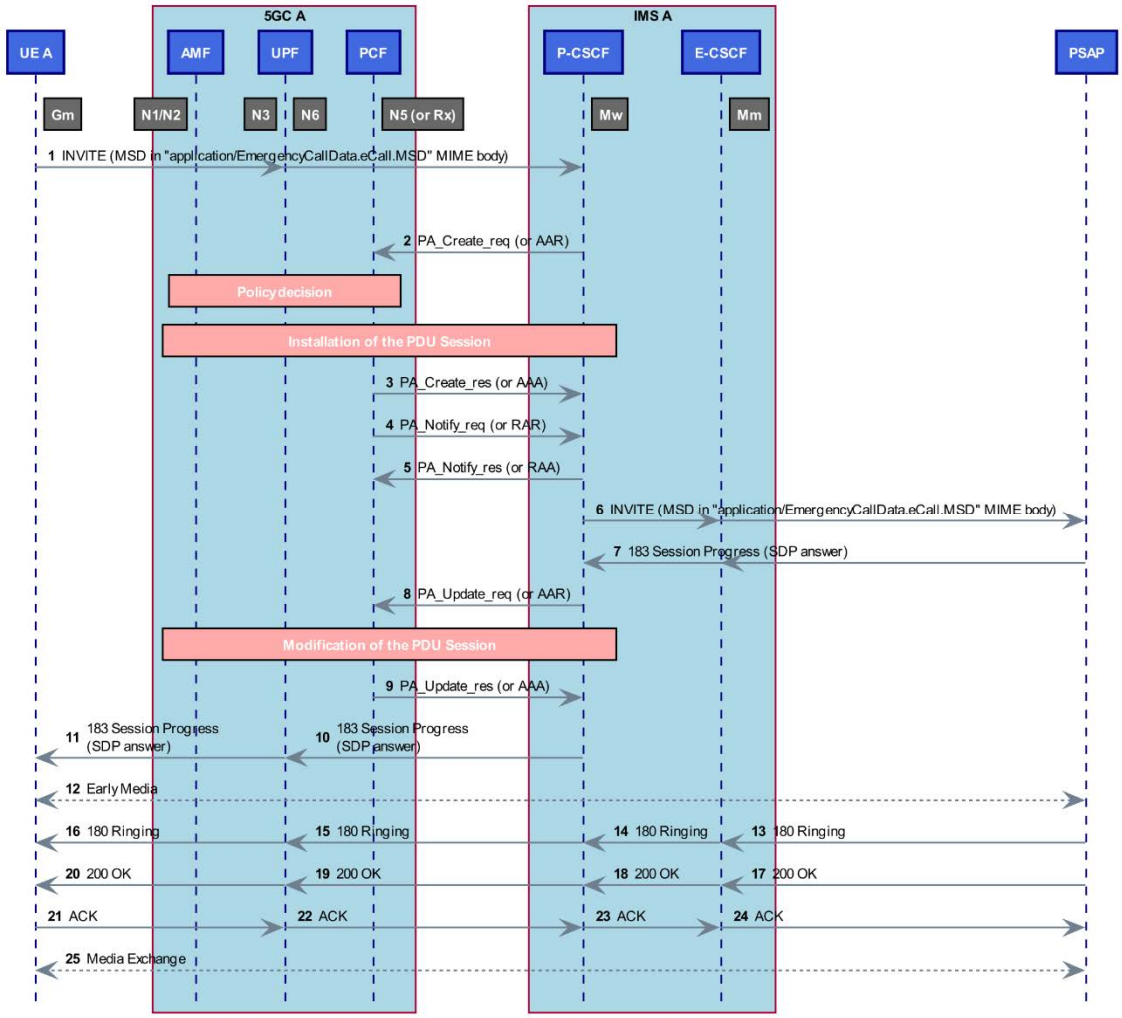


Figure 22: NG eCall establishment with emergency registration, PSAP in same IM CN subsystem

1) UE A initiates the emergency session with an INVITE request. The From header field includes the public user identity (registered via emergency registration) or the tel URI associated with the public user identity (registered via emergency registration). The multipart/mixed body contains an "application/EmergencyCallData.eCall.MSD" MIME body part containing the MSD not exceeding 140 bytes and encoded in binary ASN.1 PER.
The INVITE request is sent to UPF and then forwarded to P-CSCF.

2) The IMS A P-CSCF invokes the PCF with PA_Create_req over N5 or AAR over Rx.

3) PCF responds to IMS A P-CSCF with PA_Create_res over N5 or AAA over Rx.

4) PCF sends PA_Notify_req over N5 or RAR over Rx to P-CSCF.

5) P-CSCF responds with PA_Notify_res over N5 or RAA over Rx.

6) P-CSCF sends the INVITE including the MSD MIME body to E-CSCF and the E-CSCF forwards the INVITE to PSAP.

7) PSAP responds with the 183 response with SDP answer to UPF and UPF forwards the response to E-CSCF.

8) The IMS A P-CSCF invokes the PCF with PA_Update_req over N5 or AAR over Rx.

9) P-CSCF responds with PA_Update_res over N5 or RAA over Rx.

10) P-CSCF forwards the SIP 183 (SDP) to UPF.

11) UPF forwards the SIP 183 (SDP) to UE A.

12) Early media may flow between the UE A and PSAP.

13) The PSAP responds with the 180 Ringing to E-CSCF.

14) E-CSCF forwards the 180 to P-CSCF.

15) P-CSCF forwards the SIP 180 to UPF.

16) UPF forwards the SIP 180 to UE A.

17) PSAP sends 200 OK to E-CSCF.

18) E-CSCF forwards the 200 OK to P-CSCF.

19) P-CSCF forwards the 200 OK towards UPF.

20) UPF forwards the 200 OK towards UE A.

21) UE A sends ACK to UPF.

22) UPF forwards ACK to P-CSCF.

23) P-CSCF sends ACK to E-CSCF.

24) E-CSCF sends ACK to PSAP.

25) Media Exchange.

5.3.4.2 MSD update during NG eCall

Interoperability Test Description		
Identifier:	TD_VoNR_NGC_INT_INF_01	
Objective:	To demonstrate that if an IMS emergency call of the (automatically or manually) initiated eCall type of emergency service has been established, the attempt by the PSAP to request transfer of an updated MSD shall be answered.	
Summary:	Verifying the complete message stream related to the transfer of an updated MSD requested by the PSAP and answered by the UE having established the eCall session. The updated MSD is transferred in the "application/EmergencyCallData.eCall.MSD" MIME body of an INFO request message.	
Configuration:	CF_VoNR_INT_ES (Option 1, Option 2 and Option 3)	
SUT:	IMS A and 5GC A	
Interfaces:	N6/Gm, Mw, N3, Mm	
References:	Mm	ETSI TS 124 229 [2], clause 5.11.2 ETSI TS 123 167 [12]
	Gm, Mw	ETSI TS 124 229 [2], clauses 5.1.6.8.3, 5.1.6.11, 5.2.6.3.3, 5.2.10.3 and 5.11.2
	N6	ETSI TS 129 561 [17], clause 13.2
	N3	ETSI TS 123 501 [8], clause 5.6
Pre-test conditions:	• UE A previously established an emergency call of the (automatically or manually) initiated eCall type of emergency service as described in clause 5.3.4.1.	

Interoperability Test Description		
Test Sequence:	**Step**	
	1	PSAP initiates a request for the transfer of an updated MSD to UE A.
	2	Verify that the PSAP request for the transfer of an updated MSD is successfully routed to the UE A. (INFO request including Info-Package header field set to "EmergencyCallData.eCall.MSD", a multipart/mixed body including "application/EmergencyCallData.Control+xml" MIME body part containing a "request" element with an "action" attribute set to "send-data" and a "datatype" attribute set to "eCall.MSD", a Content-Disposition header field set to "By-Reference" associated with the MIME body part, and a Content-Disposition header field set to "Info-Package" associated with the multipart/mixed body).
	3	Verify that UE A answers the request for the transfer of an updated MSD (INFO request including Info-Package header field set to "EmergencyCallData.eCall.MSD", a Content-Disposition header field set to "Info-Package", a multipart/mixed body including an "application/EmergencyCallData.eCall.MSD" MIME body part containing the MSD not exceeding 140 bytes and encoded in binary ASN.1 and a Content-Disposition header field set to "By-Reference" associated with the "application/EmergencyCallData.eCall.MSD" MIME body part).
	4	Verify that the UE A answer to request for the transfer of an updated MSD which is successfully routed to the PSAP.
Conformance criteria of test sequence step:	2, 3	Mw TP_MW_PCSCF_5G_NGC_INFO_01 (Event 7) Gm TP_GM_PCSCF_5G_NGC_INFO_01 (Event 8)

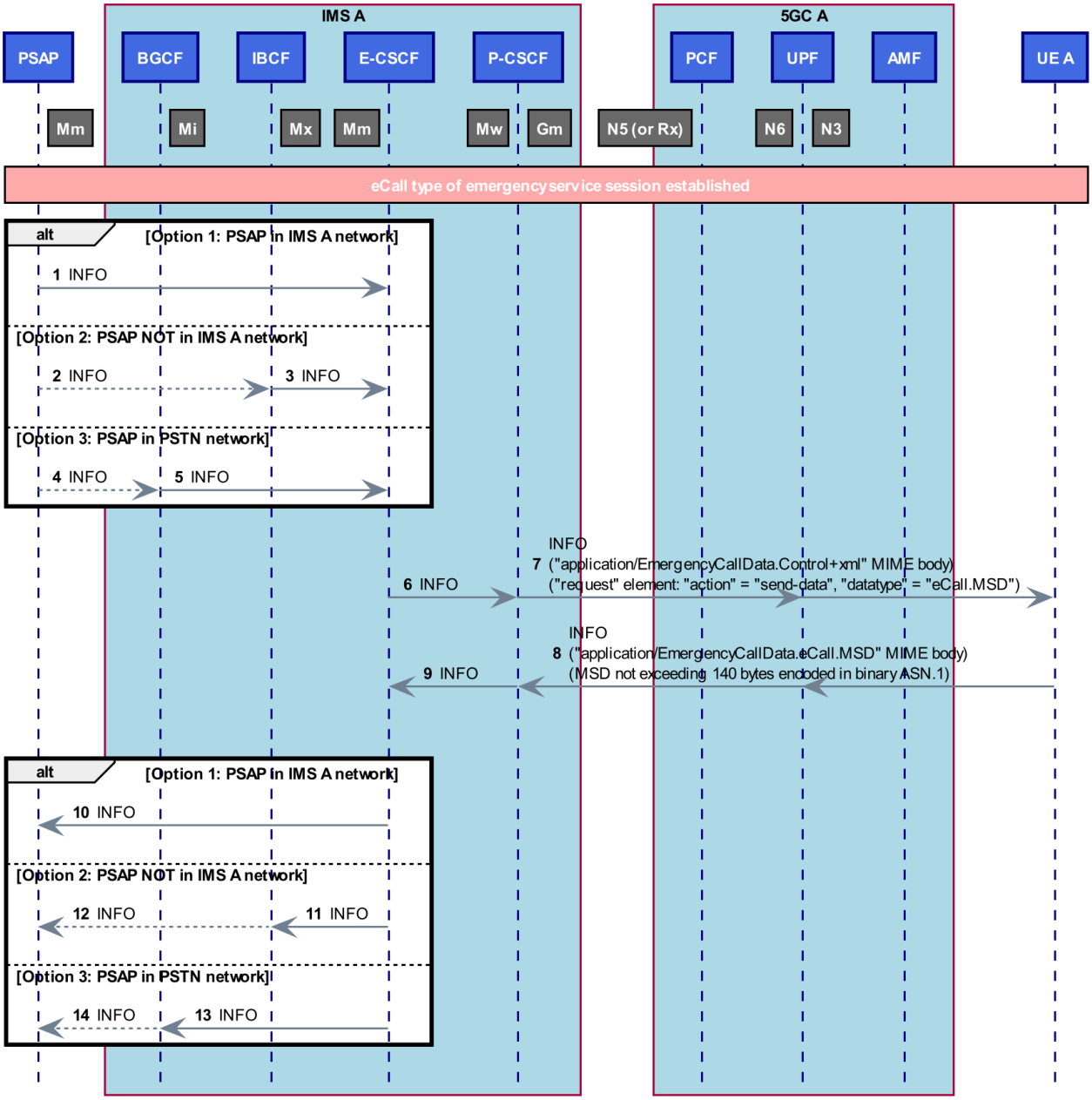


Figure 23: MSD update during NG eCall

1) (Option 1) PSAP initiates an MSD update request. PSAP sends the INFO to E-CSCF.
2) (Option 2) PSAP initiates an MSD update request. PSAP sends the INFO towards IBCF.
3) (Option 2) IBCF forwards the INFO to E-CSCF.
4) (Option 3) PSAP initiates an MSD update request. PSAP sends the INFO towards BGCF.
5) (Option 2) BGCF forwards the INFO to E-CSCF.
6) E-CSCF forwards the INFO to P-CSCF.
7) P-CSCF forwards the INFO to UPF and UPF to UE A.
8) UE A responds with an INFO with SDP answer to UPFD and UPF forwards INFO to P-CSCF.
9) P-CSCF forwards the INFO to E-CSCF.
10) (Option 1) E-CSCF forwards the INFO to PSAP.

11) (Option 2) E-CSCF forwards the INFO to IBCF.

12) (Option 2) IBCF forwards the INFO towards PSAP.

13) (Option 3) E-CSCF forwards the INFO to BGCF.

14) (Option 3) BGCF forwards the INFO towards PSAP over PSTN (may not be a SIP message).

5.4 IMS Emergency Deregistration

UE shall not perform user-initiated deregistration due to ETSI TS 124 229 [2], clause 5.1.6.6.

An emergency registration will not be deregistered by the network due to ETSI TS 124 229 [2], clause 5.1.6.7.

5.5 5G Emergency Deregistration

5.5.0 General

These tests cover interaction between the 5GC, PCF and IMS when 5G emergency network deregistration takes place. 5G Emergency deregistration may be triggered by the UE or network.

At the point of 5G network deregistration, a UE may or may not be registered to IMS and may or may not have active IMS sessions. All possibilities are covered. All affected PDU sessions for a given established session will be removed, and administrative termination of the SIP registration/sessions will be triggered as appropriate.

5.5.1 UE 5G Emergency Deregistration (with/without Emergency Registration)

Interoperability Test Description		
Identifier:	TD_VoNR_ECO_INT_5DR_01	
Objective:	To demonstrate UE initiated 5G emergency deregistration (IP-CAN session termination) for a UE that has not yet emergency registered to the IMS or for UE that has been emergency registered to the IMS. (emergency deregistration shall not be performed by the UE due to ETSI TS 124 229 [2], clause 5.1.6.6).	
Summary:	On complete network 5G emergency deregistration, the 5GC removes emergency PDU session.	
Configuration:	CF_VoNR_INT_ES	
SUT:	IMS A and 5GC A	
Interfaces:	N1/N2	
References:	N1/N2	ETSI TS 124 501 [7], clause 5.5.2.2.3 ETSI TS 123 502 [9], clauses 4.2.2.3 and 4.3.4.2
Pre-test conditions:	• UE A previously 5G emergency registered to 5GC	
Test Sequence:	**Step**	
	1	UE A starts complete network 5G emergency deregistration, whilst being or not being registered at IMS.
	2	Verify that 5GC removes the affected emergency PDU sessions.
Conformance criteria of test sequence step:	1	N1N2_TP_N1N2_AMF_ECO_DRG_01 (Events 2, 3) or N1N2_TP_N1N2_AMF_ECO_DRG_02 (Event 2)

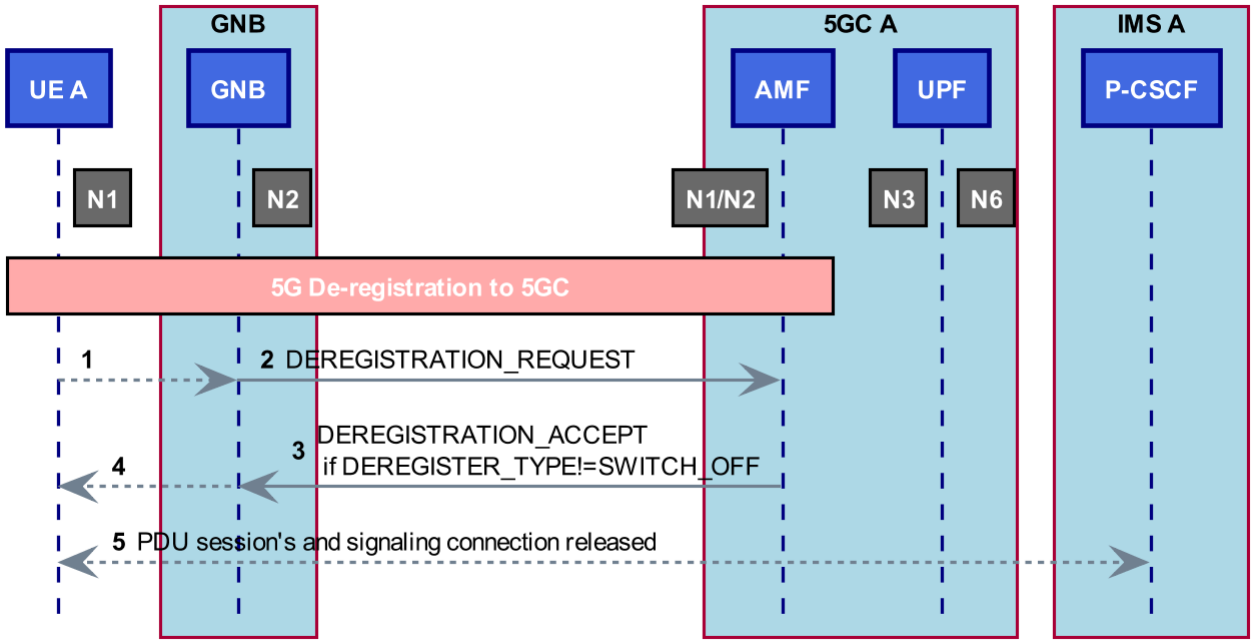


Figure 24: UE Emergency Initiated 5G Deregistration (with/without Emergency Registration)

1) User initiates emergency 5G deregistration on UE-A. The UE-A requests emergency IP-CAN session dis-establishment to the 5GC (AMF).

2) The GNB forwards a DEREGISTRATION_REQUEST message to the AMF.

3) The AMF responds with DEREGISTRATION_ACCEPT in case if Deregistration Type = Normal deregistration.

4) The AMF responds to the UE, confirming that the emergency IP-CAN has been successfully released.

5) User is informed that the emergency PDU session has been successfully released.

5.5.2 UE Emergency 5G Deregistration with Previously Established Emergency Registration & Emergency Session

Interoperability Test Description		
Identifier:	TD_VoNR_ECO_INT_5DR_02	
Objective:	To demonstrate UE initiated emergency 5G deregistration (emergency IP-CAN session termination) for a UE that is emergency registered to IMS and also has active emergency session.	
Summary:	UE terminates emergency session towards IMS. IMS will take action and terminate ongoing emergency SIP session. IMS release the session with PCF and 5GC removes relevant emergency PDU sessions.	
Configuration:	CF_VoNR_INT_ES (Option 1, Option 2 and Option 3)	
SUT:	IMS A and 5GC A	
Interfaces:	Gm, Mw, N1/N2, N5 or Rx, Mm, Mx, Mi	
References:	Gm, Mw	ETSI TS 124 229 [2], clauses 5.1.5 (1st paragraph), 5.1.6.9, 5.2.8.1.2, 5.4.5.2 and 6.2
	N1/N2	ETSI TS 124 501 [7], clauses 5.5.2.2.3, 5.4.5.2.3 and 6.3.2.3 ETSI TS 123 502 [9], clauses 4.2.2.3 and 4.3.4.2
	N5 or Rx	ETSI TS 129 514 [6], clause B.5 ETSI TS 129 214 [5], clause 4.4.4
Pre-test conditions:	• UE A previously emergency 5G registered to 5GC with a single registration. • UE A previously emergency registered to IMS. • UE A previously established emergency SIP session with PSAP.	

Interoperability Test Description			
Test Sequence:	**Step**		
	1	UE A starts emergency 5G deregistration and perform release of emergency call first.	
	2	Verify that IMS performs P-CSCF-initiated emergency call release on affected emergency SIP sessions.	
	3	Verify that 5GC aborts affected Rx or N5 sessions with IMS.	
	4	Verify that IMS does not performs emergency De-registration.	
	5	5GC triggers removal of all affected PDU sessions. Verify that media is no longer exchanged after these procedures.	
	6	Verify that media between UE and other endpoint can no longer be exchanged and is filtered out by 5GC.	
Conformance criteria of test sequence step:	2	Gm Mw Mm Mx Mi Gm	TP_GM_PCSCF_5G_ECO_BYE_01 (Event 2) TP_MW_PCSCF_5G_ECO_BYE_01 (Event 5) TP_MM_ECSCF_5G_ECO_BYE_01 (Event 6) TP_MX_ECSCF_5G_ECO_BYE_01 (Events 7, 8) TP_MI_ECSCF_5G_ECO_BYE_01 (Events 9, 10) TP_GM_PCSCF_5G_ECO_200OK_BYE_01 (Events 16, 17)
	3	Rx N5	TP_RX_PCRF_5G_ECO_STA_02 (Events 3, 4) or TP_N5_PCF_5G_ECO_PDA_02 (Events 3, 4)
	5	N1N2 N1N2	TP_N1N2_AMF_ECO_PDUM_03 (Events 18, 21) TP_N1N2_AMF_ECO_DRG_01 (Events 23, 24)

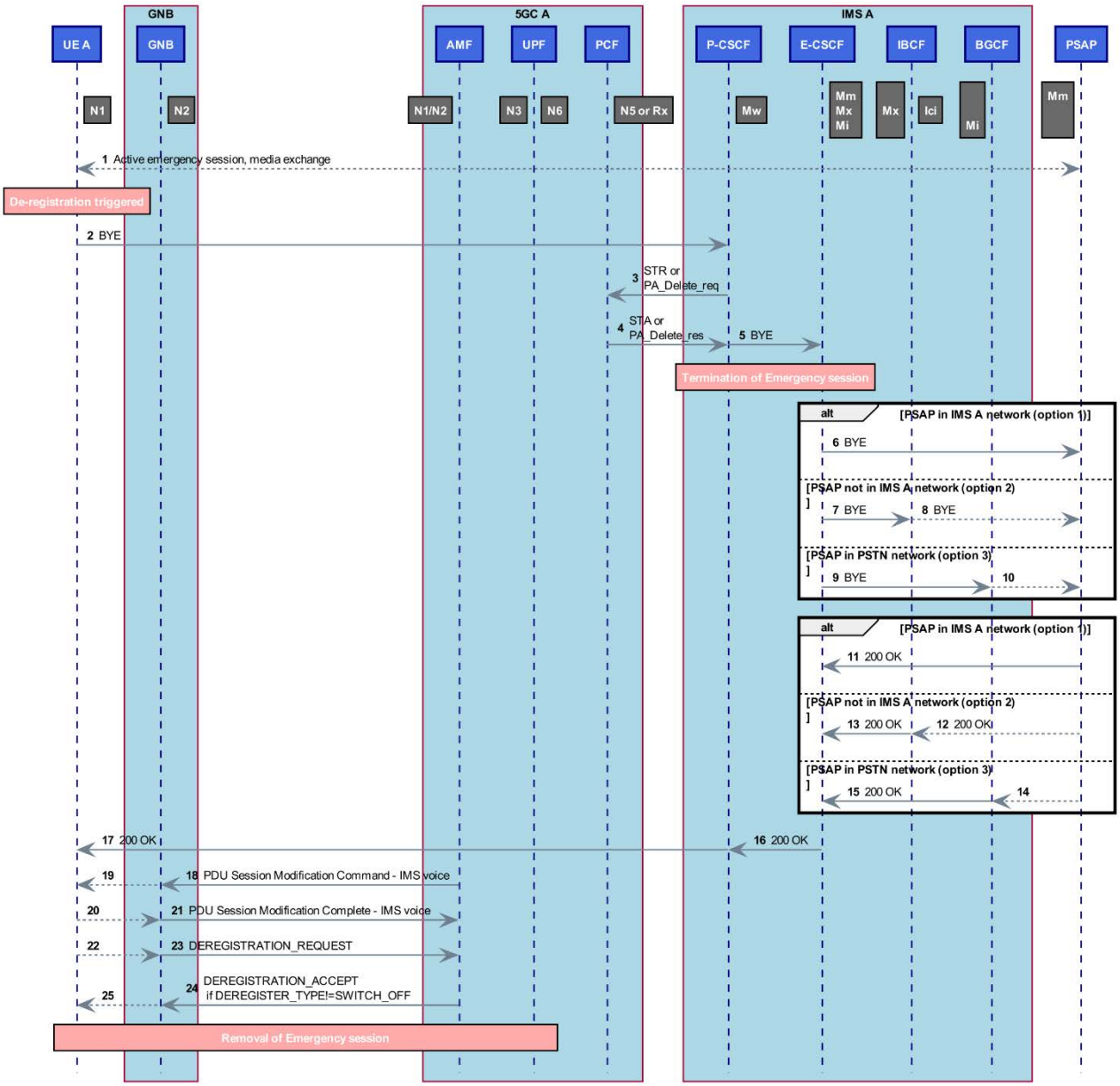


Figure 25: UE 5G Emergency Deregistration (Emergency Registered & Emergency session)

1) UE-A, PSAP active session, media exchange.

2) User initiates 5G deregistration on UE-A. UE-A sends BYE towards P-CSCF over UPF.

3) IMS P-CSCF sends STR or Npcf_PolicyAuthorization_Delete request to abort the Rx or N5 session (emergency session).

4) The PCF removes the emergency SIP session - RAR or Npcf_PolicyAuthorization_Delete response.

5) P-CSCF forwards the BYE to E-CSCF.

6) Option 1: E-CSCF forwards the BYE to PSAP over Mm interface.

7) Option 2: E-CSCF forwards the BYE to IBCF over Mx interface.

8) Option 2: IBCF forwards the BYE towards PSAP in another network.

9) Option 3: E-CSCF forwards the BYE to BGCF over Mi interface.

10) Option 3: BGCF forwards the request towards PSAP in PSTN network.

11) Option 3: PSAP send an answer towards BGCF.

12) Option 3: BGCF responds with 200 OK (BYE) towards E-CSCF.

13) Option 2: PSAP responds with 200 OK (BYE) towards IBCF.

14) Option 2: IBCF forwards the 200 OK (BYE) towards E-CSCF.

15) Option 1: PSAP responds with 200 OK (BYE) towards E-CSCF.

16) E-CSCF forwards 200 OK (BYE) to P-CSCF.

17) P-CSCF forwards 200 OK (BYE) to UE A over UPF.

18) AMF sends PDU Session Modification Command to remove QoS Flow.

19) GNB forwards PDU Session Modification Command to UE.

20) UE answers with PDU Session Modification Complete.

21) GNB forwards PDU Session Modification Complete to AMF.

22) User initiates emergency 5G deregistration on UE-A. The UE-A requests emergency IP-CAN session dis-establishment to the 5GC (AMF).

23) The GNB forwards a DEREGISTRATION_REQUEST message to the AMF.

24) The AMF responds with DEREGISTRATION_ACCEPT in case if Deregistration Type = Normal deregistration.

25) The AMF responds to the UE, confirming that the emergency IP-CAN has been successfully released.

5.6 Emergency Session Fallback 5G to 4G

5.6.0 General

These tests cover fallback from 5GC connectivity to 4G EPC. Fallback typically occurs when a UE or the network determines that 5G connectivity is unsuitable. This can happen during initial access, mobility, or mid-session (e.g. during a voice call).

The main scenarios that trigger fallback are:

- EPC Fallback: Used for voice services when 5G VoNR becomes unavailable. The UE transitions to 4G LTE to use VoLTE.
- Radio-Driven Fallback: Poor 5G signal strength or quality triggers handover to 4G.
- Load Balancing: Network offloads traffic to 4G to alleviate 5G congestion.
- Service or UE Limitations: Services not supported on 5G or UE incompatibility (e.g. legacy devices).

In the present TS, focus was put on the scenario when the gNB triggers the fallback and the handover involves the N26 interface between the 5G AMF and the 4G MME using the test configuration CF_VoNR_FB_INT_ES as described in clause 4.2.3.

5.6.1 Emergency Session Fallback via N26

Interoperability Test Description		
Identifier:	TD_VoNR_EMC_INT_FB_01	
Objective:	To perform fallback on active UE session from 5GC to 4G EPC.	
Summary:	During an active emergency session, it is determined on call release, the P-CSCF A should trigger the removal of all relevant previously created PDU sessions. 5GC A removes the PDU sessions at the originating 5GC for media. Media transport is no longer possible, after the session release.	
Configuration:	CF_VoNR_FB_INT_ES	
SUT:	IMS A and 5GC A and EPC	
Interfaces:	N1, N2, N26, S1. To PSAP: Mm, Mx or Mi	
References:	N1/N2	ETSI TS 138 413 [18], clause 8.4 ETSI TS 123 502 [9], clauses 4.11.1 and 4.13.4.2 ETSI TS 124 501 [7]
	Mm, Mx, Mi,	ETSI TS 123 167 [12], clause 5.2 ETSI TS 124 229 [2], clause 5.1.6.9
	S1	ETSI TS 136 413 [19], clause 8.4
	N26	ETSI TS 129 274 [20], clauses 7.3.1, 7.3.2, 7.3.3 and 7.3.4
Pre-test conditions:	• UE A previously registered to 5GC A. • 5GC A established a emergency PDU session allowing UE A to P-CSCF IP communication and PSAP to P-CSCF IP communication. • UE A previously established an emergency session with PSAP. • N26 is implemented.	
Test Sequence:	**Step**	
	1	Verify that media between UE A and PSAP is delivered in both directions and for all negotiated media stream types after the call establishment.
	2	gNB initiates 5GC to EPC handover using N26 interface towards AMF.
	3	AMF start session relocation towards EPC.
	4	MME initiates handover using S1 interface towards eNB.
	5	Verify that media between UE A and PSAP is still delivered in both directions and for all negotiated media stream types after the call establishment.
Conformance criteria of test sequence step:	1	Rtp TP_RTP_ECO_03 (Events 1, 2)
	2	N2 TP_NGAP_GNB_MMP_01 (Event 3), TP_NGAP_AMF_MMP_01 (Event 8), ETSI TS 103 920-2 [21]
	3	N26 TP_N26_AMF_01 (Event 4), TP_N26_AMF_02 (Event 7), TP_N26_AMF_03 (Events 12, 13)
	4	S1 TP_S1AP_MME_HAS_10 (Event 5), TP_S1AP_ENB_HAS_06 (Event 6), TP_S1AP_ENB_HAS_10 (Event 11), ETSI TS 103 497-2 [22]
	5	Rtp TP_RTP_ECO_01 (Events 14, 15)

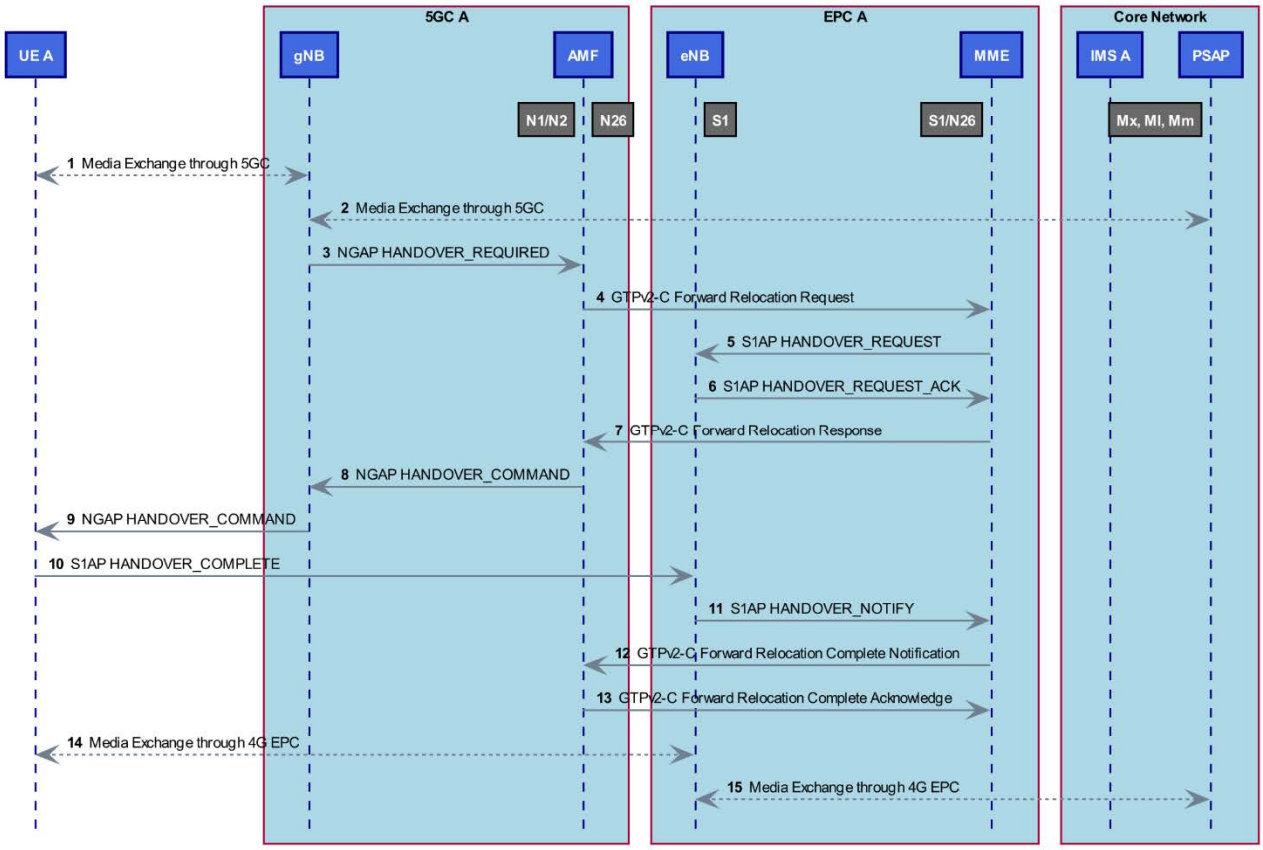


Figure 26: Emergency Session Fallback via N26

1) Media can be exchanged between UE A and PSAP via 5G.
2) Media can be exchanged between UE A and PSAP via 5G.
3) gNB sends NGAP HANDOVER REQUIRED to AMF.
4) AMF sends GTPv2-C Forward Relocation Request to MME via N26.
5) MME sends S1AP HANDOVER REQUEST to eNB.
6) eNB replies with S1AP HANDOVER REQUEST ACK to MME.
7) MME sends GTPv2-C Forward Relocation Response to AMF via N26.
8) AMF sends NGAP HANDOVER COMMAND to gNB.
9) gNB forwards handover information to UE A.
10) UE A informs eNB about handover completion.
11) eNB sends S1AP HANDOVER NOTIFY to MME.
12) MME sends GTPv2-C Forward Relocation Complete Notification to AMF via N26.
13) AMF sends GTPv2-C Forward Relocation Complete Acknowledge to MME via N26.
14) Media can be exchanged between UE A and PSAP via 4G.
15) Media can be exchanged between UE A and PSAP via 4G.

6 Test Descriptions (Roaming)

6.1 Emergency Registration in a visited network

6.1.1 UE 5G Emergency Registration and Establishment of the Emergency Bearer with USIM

Interoperability Test Description		
Identifier:	TD_VoNR_ECO_RMI_5RG_01	
Objective:	To perform UE emergency registration to the visited network with USIM and establish an emergency PDU session.	
Summary:	On successful emergency 5G registration, the UE/IVS should discover the P-CSCF IP address. The 5GC will create the Emergency PDU session which will allow communication only between the UE and the P-CSCF and allow forwarding towards E-CSCF.	
Configuration:	CF_VoNR_RMI_ES	
SUT:	IMS A and 5GC A	
Interfaces:	N1/N2	
References:	N1/N2	ETSI TS 124 501 [7], clauses 5.5.1.2.2, 5.5.1.2.4, 8.2.6, 8.2.7, 5.4.5.2.3, 6.4.1.2, 8.2.10, 8.2.11, 8.3.1 and 8.3.2 ETSI TS 123 502 [9], clauses 4.2.2.2 and 4.3.2.2.1
		ETSI TS 124 229 [2], clauses 9.2.1 and U.2.2.6
Pre-test conditions:	• Network emergency registration provisioned in UE B, 5GC and UDM, PCF. • 5GC and UE B provisioned with selectable emergency PDU configurations for Ipv4, Ipv6 or Ipv4&Ipv6 PDU session types. • P-CSCF address provisioned in the PCF for the purpose of delivery to UE on emergency registration. • Emergency PDU session PCF policies set to allow UE B - P-CSCF communication. • Default 5GC Policy set to "Deny". • UE B contains USIM and is not registered to network and 5GC.	
Test Sequence:	**Step**	
	1	UE B starts emergency network registration to visited 5GC.
	2	Verify that the message sequence is correct and authentication/security may be skipped.
	3	Verify that 5GC establishes Emergency PDU session for allowing UE B - P-CSCF communication, by starting at UE B an emergency registration.
	4	Verify that UE B registered successfully and received the following information: • suitable Ipv4 and/or Ipv6 address(es). • DNS configuration information. P-CSCF IP address or FQDN.
	5	Verify that arbitrary IP packets from UE B to arbitrary node, other than the P-CSCF, are filtered-out by 5GC and not visible on PO_N6.
	6	Verify that arbitrary IP packets from another node (e.g. PSAP sent over PO_N6) to UE B, are filtered-out by 5GC and not visible on PO_UE B.
Conformance criteria of test sequence step:	1, 2	N1N2 TP_N1N2_AMF_ECO_REG_01 (Events 2, 3)
	3	N1N2 TP_N1N2_AMF_ECO_PDUE_01 (Events 8, 9)

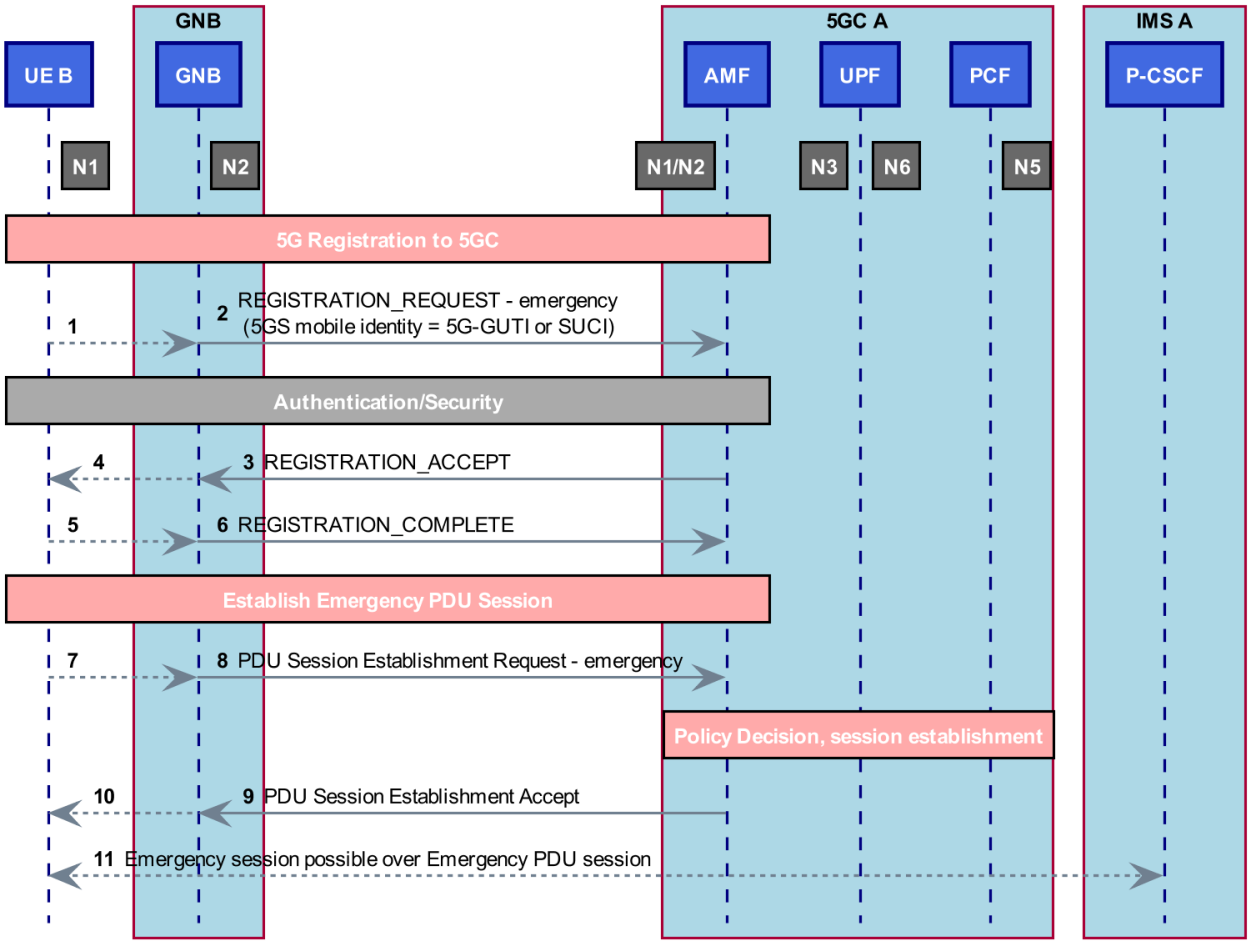


Figure 27: Visited emergency network registration with USIM

1) The UE-B requests IP-CAN emergency registration session with 5GC mobile identity set to 5G-GUTI or SUCI towards the visited 5GC (AMF).

2) The GNB forwards a REGISTRATION_REQUEST message to the AMF.

3) The AMF responds with REGISTRATION_ACCEPT.

4) The GNB forwards message to the UE-B.

5) The UE-B responds with a REGISTRATION_COMPLETE.

6) The GNB forwards message to the AMF, confirming the emergency registration has been successfully set up.

7) User UE-B requests the PDU session establishment for DNN (emergency).

8) The GNB forwards message to the AMF.

9) AMF confirms the PDU session establishment for DNN (emergency).

10) The GNB forwards message to the UE-B.

11) The emergency PDU sessions should be successfully established.

6.1.2 UE 5G Emergency Registration and Establishment of the Emergency Bearer without USIM

Interoperability Test Description		
Identifier:	TD_VoNR_EMC_RMI_5RG_02	
Objective:	To perform UE emergency registration to the visited network without USIM (related only to emergency call) and establish an emergency PDU session.	
Summary:	On successful emergency registration, the UE/IVS should discover the P-CSCF IP address. The 5GC will create the Emergency PDU session which will allow communication only between the UE and the P-CSCF and allowed forwarding towards E-CSCF.	
Configuration:	CF_VoNR_RMI_ES	
SUT:	IMS A and 5GC A	
Interfaces:	N1/N2	
References:	N1/N2	ETSI TS 124 501 [7], clauses 5.5.1.2.2, 5.5.1.2.4, 8.2.6, 8.2.7, 5.4.5.2.3, 6.4.1.2, 8.2.10, 8.2.11, 8.3.1 and 8.3.2 ETSI TS 123 502 [9], clauses 4.2.2.2 and 4.3.2.2.1
		ETSI TS 124 229 [2], clauses 9.2.1 and U.2.2.6
Pre-test conditions:	• Network emergency registration provisioned in UE B, 5GC and UDM, PCF. • 5GC and UE B provisioned with selectable emergency PDU configurations for Ipv4, Ipv6 or Ipv4&Ipv6 PDU session types. • P-CSCF address provisioned in the PCF for the purpose of delivery to UE on emergency registration. • Emergency PDU session PCF policies set to allow UE B - P-CSCF communication. • Default 5GC Policy set to "Deny". • UE A does not contain USIM and is not registered to network and 5GC. • If no USIM is present, the substate shall be NO-SUPI (only PEI).	
Test Sequence:	**Step**	
	1	UE B starts emergency registration to visited 5GC.
	2	Verify that the message sequence is correct and authentication/security may be skipped.
	3	Verify that 5GC establishes Emergency PDU session for allowing UE B - P-CSCF communication, by starting at UE B an emergency registration.
	4	Verify that UE B registered successfully and received the following information: • suitable Ipv4 and/or Ipv6 address(es). DNS configuration information P-CSCF IP address or FQDN.
	5	Verify that arbitrary IP packets from UE B to arbitrary node, other than the P-CSCF, are filtered-out by 5GC and not visible on PO_N6.
	6	Verify that arbitrary IP packets from another node (e.g. PSAP sent over PO_N6) to UE B, are filtered-out by 5GC and not visible on PO_UE B.
Conformance criteria of test sequence step:	1,2	N1N2 TP_N1N2_AMF_ECO_REG_02 (Events 2, 3)
	3	N1N2 TP_N1N2_AMF_ECO_PDUE_01 (Events 8, 9)

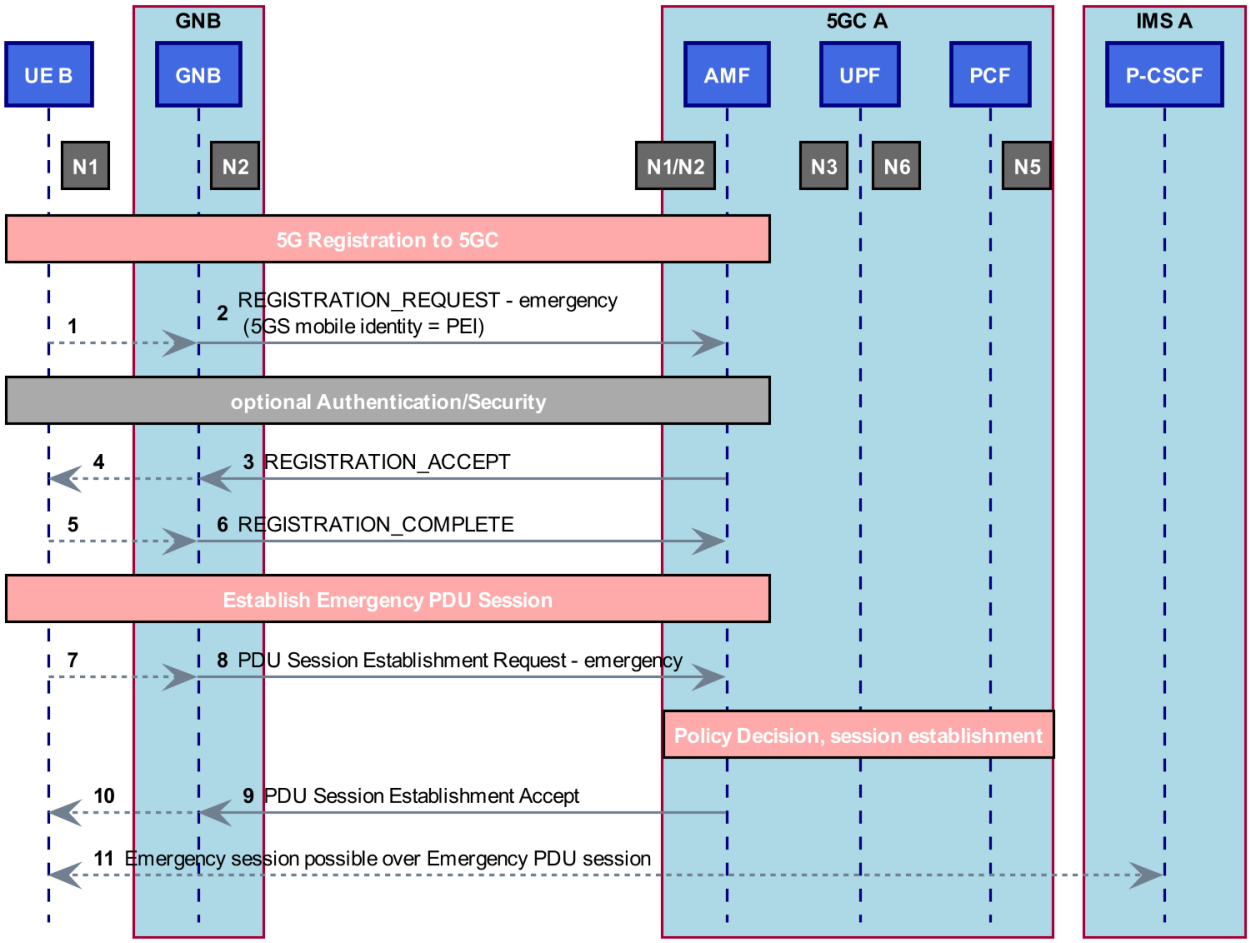


Figure 28: Visited emergency network registration without USIM

1) The UE-B which does not hold a valid 5G-GUTI or SUCI requests IP-CAN emergency registration session with 5GC mobile identity set to PEI towards the visited 5GC (AMF).

2) The GNB sends/encapsulates a REGISTRATION_REQUEST message to the AMF.

3) The AMF responds with REGISTRATION_ACCEPT.

4) The GNB forwards message to the UE-B.

5) The UE-B responds with a REGISTRATION_COMPLETE.

6) The GNB forwards message to the AMF, confirming the emergency registration has been successfully set up.

7) User UE-B requests the PDU session establishment for DNN (emergency).

8) The GNB forwards message to the AMF.

9) AMF confirms the PDU session establishment for DNN (emergency).

10) The GNB forwards message to the UE-B.

11) The PDU sessions should be successfully established.

6.2 IMS Emergency Registration in a visited network

6.2.1 IMS Emergency Registration - Rejection

Interoperability Test Description		
Identifier:	TD_VoNR_ECO_RMI_REG_01	
Objective:	To attempt initial IMS emergency registration via the established emergency PDU session for a roaming UE. In this case, the IMS emergency registration is rejected due to visited network or due to not supported GIBA at UE side. Emergency call can be established without emergency registration in visited network (see TD_VoNR_ECO_RMI_INI_02).	
Summary:	On failed UE emergency Registration to IMS, IMS will be able to transport emergency signalling.	
Configuration:	CF_VoNR_RMI_ES	
SUT:	IMS B and 5GC B	
Interfaces:	Gm, Mw, Cx, N5 or Rx	
References:	Gm, Mw	ETSI TS 124 229 [2], clauses 5.1.6.2 and 5.2.10.5 ETSI TS 134 229-1 [11], clauses 19.4.6 and 19.4.7
	N5 or Rx	ETSI TS 129 514 [6], clause B.5 ETSI TS 129 214 [5], clause A.5
	Cx	ETSI TS 129 228 [3], clause 6.1.1.1
Pre-test conditions:	• UE B previously registered to 5GC, but not registered to IMS. • 5GC established an emergency PDU session allowing UE B - P-CSCF IP communication. • HSS of IMS not provisioned with UE B's subscription. • UE B discovered the P-CSCF address.	
Test Sequence:	**Step**	
	1	UE B triggers IMS Emergency registration with not acceptable credentials.
	2	Verify that the Emergency registration has been rejected.
	3	Verify that the PCF is not invoked.
Conformance criteria of test sequence step:	2	Gm TP_GM_PCSCF_5G_ECO_REGISTER_04 (Events 1, 9) or Gm TP_GM_PCSCF_5G_ECO_REGISTER_05 (Events 1, 11) Mw TP_MW_ICSCF_5G_ECO_REGISTER_04 (Events 5, 8) or Mw TP_MW_ICSCF_5G_ECO_REGISTER_05 (Events 5, 10) Cx TP_CX_HSS_5G_UAA_03 (UAR, UAA - Events 6, 7)
	3	Rx TP_RX_PCSCF_5G_ECO_AAR_01 (AAR - Event 3) or N5 TP_N5_PCSCF_5G_ECO_PCR_01 (Event 3) Rx TP_RX_PCRF_5G_ECO_AAA_01 (AAA - Event 4) or N5 TP_N5_PCF_5G_ECO_PCA_01 (Event 4)

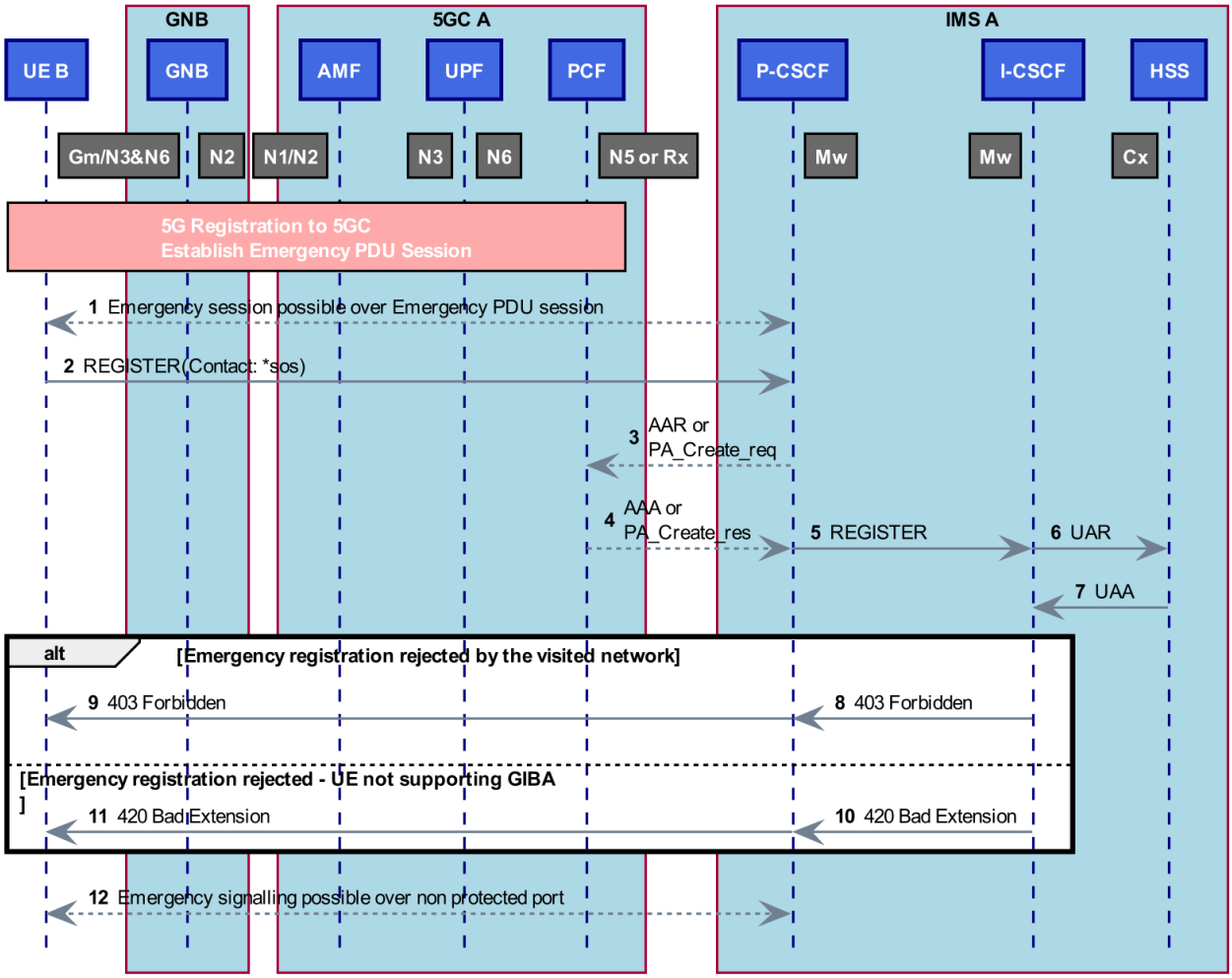


Figure 29: IMS Initial Registration - unsuccessful (Roaming)

1) Emergency session possible over emergency PDU session.

2) The UE B requests IMS B Registration to P-CSCF over UPF.

3) P-CSCF optionally sent AAR or Npcf_PolicyAuthorization_Create request to PCF to provide 5GC-level identities (MSISDN, IMSI, IMEI).

4) PCF responds with AAA or Npcf_PolicyAuthorization_Create response.

5) P-CSCF forwards the REGISTER to I-CSCF.

6) I-CSCF sends UAR to HSS.

7) HSS responds with UAA - USER_UNKNOWN.

8) Option 1: I-CSCF sends 403 response to P-CSCF due to emergency registration rejected by the visited network.

9) Option 1: P-CSCF forwards 403 response to UE B over UPF.

10) Option 2: I-CSCF sends 420 response to P-CSCF due to emergency registration rejected because UE does not support GIBA.

11) Option 2: P-CSCF forwards 420 response to UE B over UPF.

12) Emergency signalling possible over non protected port in visited network.

6.3 Emergency Session Establishment (Roaming)

6.3.1 Roaming UE calling PSAP with emergency registration

The emergency session establishment for emergency registered roaming UE to which the exceptions in ETSI TS 124 229 [2], clause 5.2.10.3 case 1B) a) do not apply is the same as for not roaming UE described in clause 5.3.1.2.

Interoperability Test Description		
Identifier:	TD_VoNR_ECO_RMI_INI_01	
Objective:	To demonstrate the establishment of dedicated PDU session at the originating 5GC due to SIP roaming emergency session establishment with an emergency registration. PSAP is located in the IM CN subsystem of IMS A.	
Summary:	An emergency call is setup between the roaming UE B and the PSAP located in the IM CN subsystem of IMS A. UE-B is registered to 5GC A and registered to IMS A, has performed the emergency registration to IMS A, and requests emergency session establishment using an emergency URN. The P-CSCF derives descriptions of the Service Data Flow from the SDP data, requests creation of adequate PDU session from PCF and 5GC, and forwards the request to the E-CSCF. The E-CSCF retrieves the PSAP URI from local configuration and forwards the request to this PSAP. Media transport is possible only after the successful establishment of the session. Media negotiation happens during INVITE/200 OK (UE B sends SDP-offer, PSAP responds with SDP-answer).	
Configuration:	CF_VoNR_RMI_ES option 1	
SUT:	IMS A, 5GC A	
Interfaces:	N6/Gm, Mw, N5 or Rx, Mm	
References:	Mm	ETSI TS 124 229 [2], clause 5.11.2 ETSI TS 123 167 [12]
	Gm, Mw	ETSI TS 124 229 [2], clauses 5.1.6.8.3, 5.1.6.11, 5.2.6.3.3, 5.2.10.3 case 1B) and 5.11.2
	N5 or Rx	N5 : ETSI TS 129 514 [6], clauses 4.2.2, B.1, B.2, B.5 and Annex C Rx: ETSI TS 129 214 [5], clauses 4.4.1, A.1, A.2, A.5 and Annex B
	N6	ETSI TS 129 561 [17], clause 13.2
Pre-test conditions:	• UE B previously registered to 5GC A. • UE B previously registered to IMS A. • 5GC A established an emergency session allowing UE B - P-CSCF IP communication. • PSAP is registered or connected to the IMS A and ready to accept the session establishment. • UE B previously performed emergency registration.	

Interoperability Test Description		
Test Sequence:	**Step**	
	1	Verify that media between UE B and PSAP is not delivered in any direction before call establishment.
	2	UE B initiates an emergency call to establish a communication session using an emergency service URN.
	3	Verify that the UE B inserts in the INVITE request, a From header field that includes the public user identity registered via emergency registration or the tel URI associated with the public user identity registered via emergency registration and a To header indicating one of the emergency URNs defined in Table 2.
	4	Verify that IMS A (P-CSCF, E-CSCF) routes the emergency call to the PSAP in the same IM CN subsystem of the own network.
	5	Verify that the IMS produced a Media Description for the session according to SDP-offer in SIP INVITE Request and SDP-answer in SIP 183 to the PCRF.
	6	Verify that the P-CSCF in the IMS interacts with the Policy Control Function (PCF) in the 5GC (via the N5 interface) to request policy for the emergency call, providing the media description. The PCF evaluates the media description and invokes the Session Management Function (SMF) in the 5GC to establish a dedicated QoS Flow for the requested media.
	7	Verify that media between UE B and PSAP is successfully routed over the dedicated PDU session with appropriate PCC characteristics enforced by the UPF based on policies from the PCF.
Conformance criteria of test sequence step:	2	N6/Gm TP_GM_PCSCF_5G_ECO_INVITE_02 (Event 1) N6/Gm TP_GM_PCSCF_5G_NGC_INVITE_01 for eCall (Event 1)
	3	N6/Gm TP_GM_PCSCF_5G_ECO_REGISTER_02 (Pre-test)
	4	Mw TP_MW_PCSCF_5G_ECO_INVITE_02 (Event 7) Mm TP_MM_ECSCF_5G_ECO_INVITE_01 (Event 8)
	6	Rx TP_RX_PCSCF_5G_ECO_AAR_02 (AAR - Event 3) N5 TP_N5_PCSCF_5G_ECO_PCR_02 (PA_Create_req - Event 3) Rx TP_RX_PCRF_5G_ECO_AAA_02 (AAA - Event 4) N5 TP_N5_PCF_5G_ECO_PCA_02 (PA_Create_res - Event 4) Rx TP_RX_PCSCF_5G_ECO_RAA_01 (RAR, RAA - Events 5, 6) N5 TP_N5_PCSCF_5G_ECO_PNA_01 (PA_Notify_res - Events 5, 6) Rx TP_RX_PCSCF_5G_ECO_AAR_04 (AAR - Event 11) N5 TP_N5_PCSCF_5G_ECO_PUR_04 (PA_Update_req - Event 11) N5 TP_N5_PCF_5G_ECO_PUA_01 (PA_Update_res - Event 12)
	7	Rtp TP_RTP_ECO_03 (Event 28)

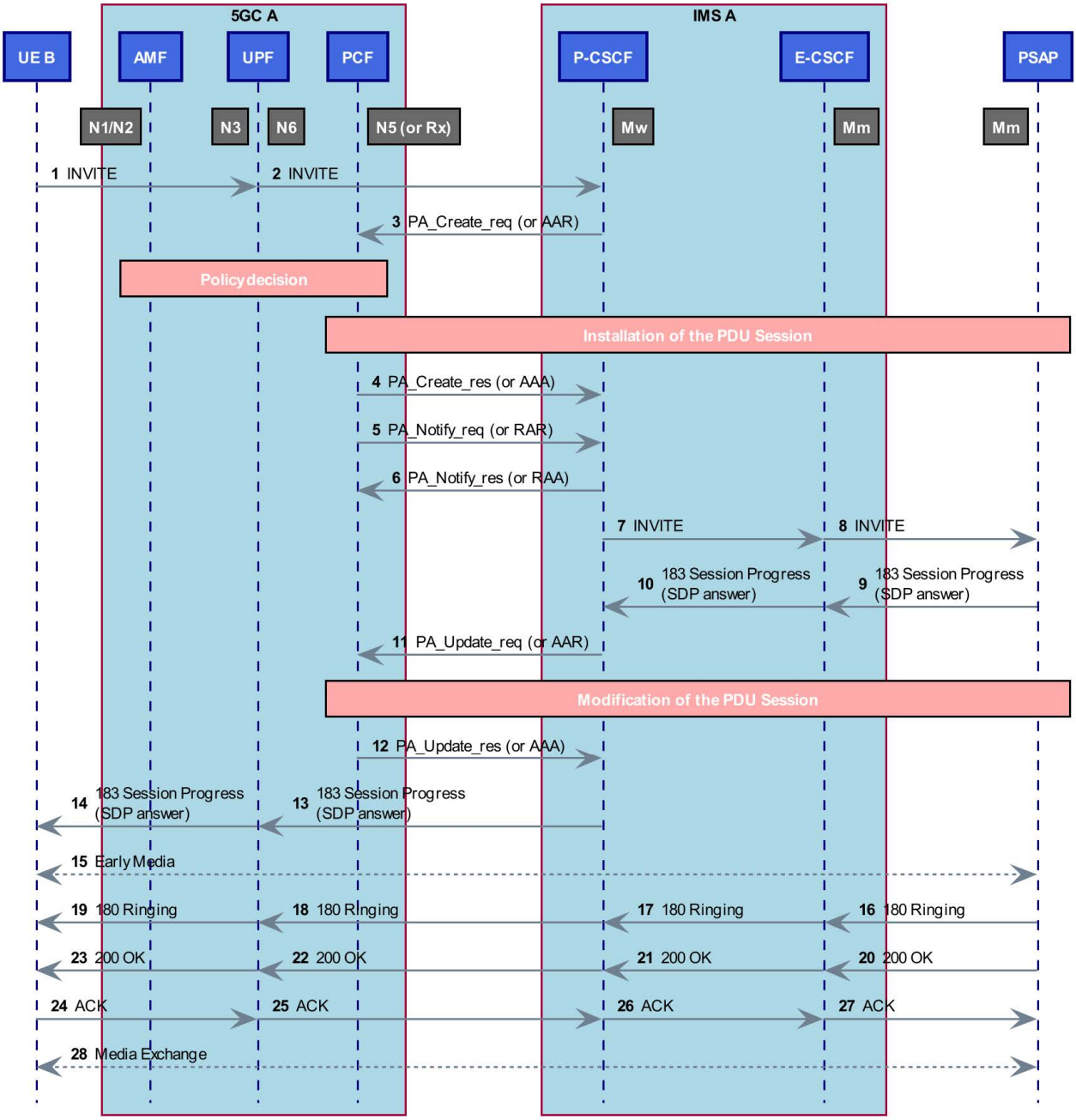


Figure 30: Emergency Session Establishment with emergency registration, PSAP in same IM CN subsystem, UE in another subsystem

1) UE B initiates the emergency session with an INVITE request to the UPF. The From header field includes the public user identity (registered via emergency registration) or the tel URI associated with the public user identity (registered via emergency registration).

2) UPF forwards the INVITE request to P-CSCF.

3) The IMS A P-CSCF invokes the PCF with PA_Create_req over N5 or AAR over Rx.

4) PCF responds to IMS A P-CSCF with PA_Create_res over N5 or AAA over Rx.

5) PCF sends PA_Notify_req over N5 or RAR over Rx to P-CSCF.

6) P-CSCF responds with PA_Notify_res over N5 or RAA over Rx.

7) P-CSCF sends the INVITE to E-CSCF.

8) E-CSCF sends the INVITE to PSAP.

9) PSAP responds with the 183 response with SDP answer to E-CSCF.

10) E-CSCF sends the 183 response to P-CSCF.

11) The IMS A P-CSCF invokes the PCF with PA_Update_req over N5 or AAR over Rx.

12) PCF sends PA_Update_res over N5 or AAA over Rx to P-CSCF.

13) P-CSCF forwards the SIP 183 (SDP) to UPF.

14) UPF forwards the SIP 183 (SDP) to UE B.

15) Early media may flow between the UE B and PSAP.

16) The PSAP responds with the 180 Ringing to E-CSCF.

17) E-CSCF forwards the 180 to P-CSCF.

18) P-CSCF forwards the SIP 180 to UPF.

19) UPF forwards the SIP 180 to UE B.

20) PSAP sends 200 OK to E-CSCF.

21) E-CSCF forwards the 200 OK to P-CSCF.

22) P-CSCF forwards the 200 OK towards UPF.

23) UPF forwards the 200 OK towards UE B.

24) UE B sends ACK to UPF.

25) UPF sends ACK to P-CSCF.

26) P-CSCF sends ACK to E-CSCF.

27) E-CSCF sends ACK to PSAP.

28) Media Exchange.

6.3.2 Roaming UE calling PSAP with non-emergency registration

6.3.2.1 Roaming UE calling PSAP in same network

If the UE is roaming and the P-CSCF is in the same network as the UE is roaming, the emergency session establishment is treated as if the UE is not roaming. ETSI TS 124 229 [2], clause 5.2.10.4, case 0A) b).

Interoperability Test Description		
Identifier:	TD_VoNR_ECO_RMI_INI_02	
Objective:	To demonstrate the establishment of dedicated PDU sessions at the originating 5GC due to roaming SIP emergency session establishment within non-emergency registration. PSAP is located in the IM CN subsystem of IMS A.	
Summary:	An emergency call is setup between UE B and the PSAP located in the IM CN subsystem of IMS A. UE-B is registered to 5GC A and registered to IMS A, has **NOT** performed the emergency registration to IMS A, and requests emergency session establishment using an emergency URN. The P-CSCF derives descriptions of the Service Data Flow from the SDP data, requests creation of adequate bearers from PCF and EPC, and forwards the request to the E-CSCF. The E-CSCF retrieves the PSAP URI from local configuration and forwards the request to this PSAP. Media transport is possible only after the successful establishment of the session. Media negotiation happens during INVITE/200 OK (UE B sends SDP-offer, PSAP responds with SDP-answer).	
Configuration:	CF_VoNR_RMI_ES option 1	
SUT:	IMS A and 5GC A	
Interfaces:	N6/Gm, Mw, N5 or Rx, Mm	
References:	Mm	ETSI TS 124 229 [2], clause 5.11.2 ETSI TS 123 167 [12]
	Gm, Mw	ETSI TS 124 229 [2], clauses 5.1.6.8.3, 5.1.6.11, 5.2.6.3.3, 5.2.10.3 case 1B) and 5.11.2
	N5 or Rx	N5 : ETSI TS 129 514 [6], clauses 4.2.2, B.1, B.2, B.5 and Annex C Rx: ETSI TS 129 214 [5], clauses 4.4.1, A.1, A.2, A.5 and Annex B
	N6	ETSI TS 129 561 [17], clause 13.2
Pre-test conditions:	• UE B previously registered to 5GC A. • UE B previously registered to IMS A. • UE B has not performed emergency registration. • 5GC established a non-emergency session allowing UE B - P-CSCF IP communication. • PSAP is registered or connected to the IMS A and ready to accept the session establishment.	
Test Sequence:	**Step**	
	1	Verify that media between UE B and PSAP is not delivered in any direction before call establishment.
	2	UE B initiates an emergency call to establish a communication session using an emergency service URN (To header indicating one of the emergency URNs defined in Table 2).
	3	Verify that IMS A (P-CSCF, E-CSCF) routes the emergency call to the PSAP in the same IM CN subsystem of the own network.
	4	Verify that the IMS produced a Media Description for the session according to SDP-offer in SIP INVITE Request and SDP-answer in SIP 183 to the PCRF.
	5	Verify that the P-CSCF in the IMS interacts with the Policy Control Function (PCF) in the 5GC (via the N5 interface) to request policy for the emergency call, providing the media description. The PCF evaluates the media description and invokes the Session Management Function (SMF) in the 5GC to establish a dedicated QoS Flow for the requested media.
	6	Verify that media between UE B and PSAP is successfully routed over the dedicated PDU session with appropriate PCC characteristics enforced by the UPF based on policies from the PCF.

Interoperability Test Description		
Conformance criteria of test sequence step:	2	N6/Gm TP_GM_PCSCF_5G_ECO_INVITE_02 (Event 1) N6/Gm TP_GM_PCSCF_5G_NGC_INVITE_01 for eCall (Event 1)
	3	Mw TP_MW_PCSCF_5G_ECO_INVITE_02 (Event 7) Mm TP_MM_ECSCF_5G_ECO_INVITE_01 (Event 8)
	5	Rx TP_RX_PCSCF_5G_ECO_AAR_02 (AAR - Event 3) N5 TP_N5_PCSCF_5G_ECO_PCR_02 (PA_Create_req - Event 3) Rx TP_RX_PCRF_5G_ECO_AAA_02 (AAA - Event 4) N5 TP_N5_PCF_5G_ECO_PCA_02 (PA_Create_res - Event 4) Rx TP_RX_PCSCF_5G_ECO_RAA_01 (RAR, RAA - Events 5, 6) N5 TP_N5_PCSCF_5G_ECO_PNA_01 (PA_Notify_res - Events 5, 6) Rx TP_RX_PCSCF_5G_ECO_AAR_04 (AAR - Event 11) N5 TP_N5_PCSCF_5G_ECO_PUR_04 (PA_Update_req - Event 11) N5 TP_N5_PCF_5G_ECO_PUA_01 (PA_Update_res - Event 12)
	6	Rtp TP_RTP_ECO_03 (Event 28)

The message sequence as depicted in Figure 30 applies.

6.3.2.2 Roaming UE calling PSAP in home operator's network

Void.

NOTE: The scenario "if the UE is roaming and the P-CSCF is in the home operator's network" (ETSI TS 124 229 [2], clause 5.2.10.4. item 0A.a) is independent from 5G and does only affect the IMS network. This scenario is already covered in TD_VoLTE_ECO_RMI_INI_03 in ETSI TS 103 795-2 [i.7].

6.3.2.3 Roaming UE calling PSAP with non-registration

Interoperability Test Description		
Identifier:	TD_VoNR_ECO_RMI_INI_04	
Objective:	To demonstrate the establishment of emergency session for a roaming UE B without any registration. PSAP is located in the IM CN subsystem of IMS A.	
Summary:	An emergency call is setup between UE B and the PSAP located in the IM CN subsystem of IMS A. UE-B connects to the visited network A registered to the 5GC A but NOT registered to IMS A, has NOT performed the emergency registration to IMS A, and requests emergency session establishment using an emergency URN. The P-CSCF derives descriptions of the Service Data Flow from the SDP data, requests creation of adequate bearers from PCF and 5GC, and forwards the request to the E-CSCF. The E-CSCF retrieves the PSAP URI from local configuration and forwards the request to this PSAP. Media transport is possible only after the successful establishment of the session. Media negotiation happens during INVITE/200 OK (UE B sends SDP-offer, PSAP responds with SDP-answer).	
Configuration:	CF_VoNR_RMI_ES option 1	
SUT:	IMS A and 5GC A	
Interfaces:	N6/Gm, Mw, N5 or Rx, Mm	
References:	Mm	ETSI TS 124 229 [2], clause 5.11.2 ETSI TS 123 167 [12]
	Gm, Mw	ETSI TS 124 229 [2], clauses 5.1.6.8.3, 5.1.6.11, 5.2.6.3.3, 5.2.10.3 case 1B) and 5.11.2
	N5 or Rx	N5 : ETSI TS 129 514 [6], clauses 4.2.2, B.1, B.2, B.5 and Annex C Rx: ETSI TS 129 214 [5], clauses 4.4.1, A.1, A.2, A.5 and Annex B
	N6	ETSI TS 129 561 [17], clause 13.2
Pre-test conditions:	• UE B connects to the visited network A registered to the 5GC A. • 5GC established a default session allowing UE B - P-CSCF IP communication. • UE B previously not registered to IMS A. • UE B has not performed emergency registration. • UE B discovered the P-CSCF address.	

Interoperability Test Description		
Test Sequence:	**Step**	
	1	Verify that media between UE B and PSAP is not delivered in any direction before call establishment.
	2	UE B initiates an emergency call to establish a communication session using an emergency service URN.
	3	Verify that the UE B sets the From header field of the INVITE request to "Anonymous" as specified in IETF RFC 3261 [10] and a To header indicating one of the emergency URNs defined in Table 2.
	4	Verify that IMS A (P-CSCF, E-CSCF) routes the emergency call to the PSAP in the same IM CN subsystem of the own network.
	5	Verify that the IMS produced a Media Description for the session according to SDP-offer in SIP INVITE Request and SDP-answer in SIP 183 to the PCF.
	6	Verify that the P-CSCF in the IMS interacts with the Policy Control Function (PCF) in the 5GC (via the N5 interface) to request policy for the emergency call, providing the media description. The PCF evaluates the media description and invokes the Session Management Function (SMF) in the 5GC to establish a dedicated QoS Flow for the requested media.
	7	Verify that media between UE B and PSAP is successfully routed over the dedicated PDU session with appropriate PCC characteristics enforced by the UPF based on policies from the PCF.
Conformance criteria of test sequence step:	2	N6/Gm TP_GM_PCSCF_5G_ECO_INVITE_02 (Event 1) N6/Gm TP_GM_PCSCF_5G_NGC_INVITE_01 for eCall (Event 1)
	4	Mw TP_MW_PCSCF_5G_ECO_INVITE_02 (Event 7) Mm TP_MM_ECSCF_5G_ECO_INVITE_01 (Event 8)
	6	Rx TP_RX_PCSCF_5G_ECO_AAR_02 (AAR - Event 3) N5 TP_N5_PCSCF_5G_ECO_PCR_02 (PA_Create_req - Event 3) Rx TP_RX_PCRF_5G_ECO_AAA_02 (AAA - Event 4) N5 TP_N5_PCF_5G_ECO_PCA_02 (PA_Create_res - Event 4) Rx TP_RX_PCSCF_5G_ECO_RAA_01 (RAR, RAA - Events 5, 6) N5 TP_N5_PCSCF_5G_ECO_PNA_01 (PA_Notify_res - Events 5, 6) Rx TP_RX_PCSCF_5G_ECO_AAR_04 (AAR - Event 11) N5 TP_N5_PCSCF_5G_ECO_PUR_04 (PA_Update_req - Event 11) N5 TP_N5_PCF_5G_ECO_PUA_01 (PA_Update_res - Event 12)
	7	Rtp TP_RTP_ECO_03 (Event 28)

The message sequence as depicted in Figure 30 applies.

Annex A (informative): Message Sequence Charts (MSCs)

A.1 The MSC files

The MSCs have been produced using the PlantUML tool with recommended ETSI styles.

The PlantUML text files and the derived Portable Network Graphics files (.png) of the MSCs related to the test descriptions are released in the ETSI forge repository:

- https://forge.etsi.org/rep/int/vx5g/emergency-5g-iop/-/tree/main/msc_scripts

Annex B (informative): Change history

Date	Version	Information about changes
January 2025	V0.0.1	Skeleton draft
February 2025	V0.0.2	First draft - clean version
June 2025	V0.0.3	Draft prepared for INT#61
July 2025	V0.0.4	New TDs/review
October 2025	V0.0.5	New TDs/review; Draft prepared for INT#62
December 2025	V0.0.6	Review of TDs and TP numbers
February 2026	V0.0.7	Review of TDs and TPs and MSC update
March 2026	V0.0.8	Final draft prepared for INT#63

History

Version	Date	Status
V1.1.1	May 2026	Publication