

Emergency Services

Ericsson Service-Aware Policy Controller

FACILITY DESCRIPTION

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Abstract

This document describes the Emergency and Multimedia Priority Services functionality provided by the SAPC.



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1 Emergency Services Introduction

This document describes the Emergency Services function provided by the SAPC.

Emergency services function includes support for emergency IP-CAN sessions and IMS emergency calls.

2 Emergency Services Function

2.1 Emergency Services Overview

The SAPC supports IMS emergency services according to the principles and requirements of 3GPP TS 23.167 (Reference [2]).

The functionality involves support of two inter-related aspects:

- Emergency bearer service: IP-CAN session provided through an emergency APN.
- IMS emergency call: dynamic service initiated by the AF (P-CSCF) that uses an emergency IP-CAN session.

The following picture shows a high-level flow for the establishment of an IMS emergency call over LTE/EPC access.

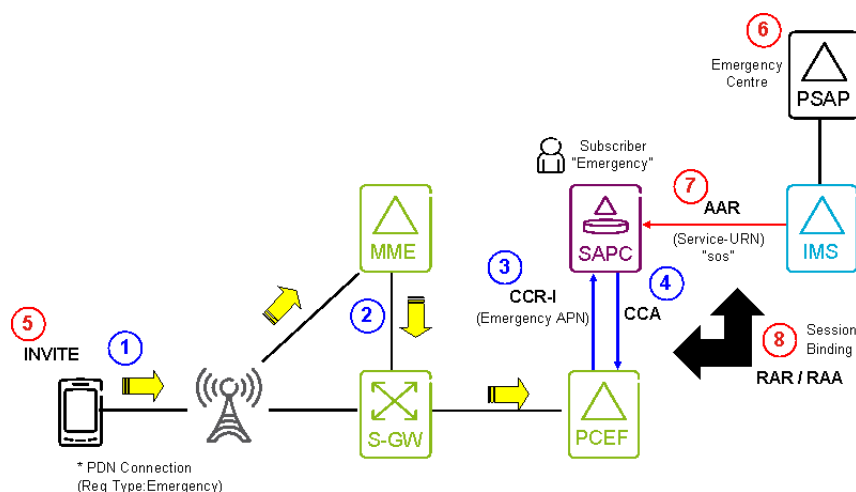


Figure 1 Overview of IMS Emergency Call



- 1. When the UE terminal wants to establish an IMS emergency call, first it requests a PDN connection for emergency purposes by sending a PDN connectivity request with a Request Type set to Emergency.
- 2. The MME/S-GW verifies that the request is allowed and triggers the establishment of the IP-CAN session through an emergency APN. The PDN-GW allocates an IP address and initiates the Gx session establishment.
- 3 -4. The SAPC identifies that the IP-CAN session is for emergency services upon detection of an emergency APN at initial CCR, then the SAPC installs PCC rules to restrict the traffic to emergency destinations and IMS signalling, with the authorized QoS that applies to the default EPS bearer for emergency services.
- 5 - 6. Once the radio bearer is established, the UE may initiate the IMS emergency call by sending the INVITE request to the IMS network and subsequent application layer signalling.
- 7. The AF (P-CSCF) establishes an Rx session towards the SAPC indicating in the AAR message that the new AF session relates to emergency traffic.
- 8. The SAPC performs session binding and ensures that the AF session relates to emergency traffic. Then the SAPC performs dynamic service classification and qualification, and provides the PCC rules with the authorized QoS for IMS emergency calls.

2.2 Emergency Subscriber Profile

To support emergency services, the SAPC makes use of a special Emergency Subscriber Profile configured with all operator policies required to make authorization and policy decisions for IP-CAN sessions restricted to emergency services. This allows the SAPC to provide IMS emergency services to roaming and non-roaming subscribers regardless of being provisioned in the SAPC subscriber database, even when the Subscription-Id AVP is not received during IP-CAN session establishment.

The Emergency Subscriber Profile can be provisioned as any other subscriber. However, there is data not applicable to emergency services. Policy controls applicable for emergency session shall be IP-CAN Session Access Control, Service Access Control, Charging Control and Bearer QoS Control and BW Management.

Autoprovisioning and unknown subscriber functionality does not apply to emergency services. If the Emergency Subscriber Profile is not provisioned in the SAPC and a request for emergency IP-CAN session is received, the request is handled using an empty default Emergency Subscriber Profile.

2.3 Emergency Bearer Service

Emergency bearer services are network services provided through an emergency APN to support IMS emergency calls. Emergency bearer services do not require



a subscription, and restrict data traffic to emergency destinations and IMS signalling.

The SAPC allows the configuration of a list of emergency APNs and determines, based on the information received on the Called-Station-ID AVP, if the IP-CAN session establishment request refers to an emergency service. Then the SAPC makes use of the information stored in the Emergency Subscriber Profile to evaluate the operator configured policies and obtain the data to be sent towards PCEF.

Note: The most relevant policy controls for emergency services are: IP-CAN Session Access Control, Service Access Control, and QoS Control for the Default Bearer.

For emergency services, the UE terminal may not have sufficient credentials to be authenticated in the network and provide only an equipment identifier. The SAPC offers the possibility to accept requests to establish emergency bearer services where the PCEF does not include the Subscription-Id AVP in the CCR Initial message, but includes the IMEI within the User-Equipment-Info AVP. The functionality to accept unauthenticated emergency services with IMEI identifier can be enabled or disabled by configuration of the SAPC.

2.4 IMS Emergency Calls

IMS emergency calls are prioritized Multimedia Telephony (MMTel) calls that connect the UE to an emergency center/PSAP and binds to an emergency IP-CAN session. The P-CSCF indicates that the new AF session relates to emergency traffic by setting the Service-URN AVP to a top-level service type of "sos" (for example "sos.ambulance", "sos.police").

On reception of a request for AF session establishment, the SAPC reads the information received in the Service-URN AVP, performs session binding, service classification, authorization, and qualification.

When performing session binding, the SAPC needs to make sure that there is no misuse of emergency IP-CAN sessions, and that the emergency bearer service is not used to make normal IMS calls. Hence, if an AF session for a non-emergency call binds to an emergency IP-CAN session, the request is rejected by the SAPC.

The SAPC allows the operator to use the Service-URN information received from the AF in the dynamic service classification process. Example of typical service classification patterns for IMS emergency calls is the following:



Classification Patterns for IMS Emergency Calls			
Application Identifier	Media Pattern	Service-Urn	Service-Id
urn%3Aurn-xxx%3A3gpp-service.ims.icsi.mmtel	type=audio	sos.police	EmergencyPolice
urn%3Aurn-xxx%3A3gpp-service.ims.icsi.mmtel	type=audio	sos.ambulance	EmergencyAmbulance

Figure 2 Example of Dynamic Service Classification Patterns for IMS Emergency Calls

Emergency services can be prioritized, according to operator local policies and regulations, during the dynamic service qualification process by provisioning the ARP value in the QoS profile that applies to IMS emergency calls.

3 Emergency Services Network Deployments

The SAPC can provide Emergency Services in the following Network Elements:

- In the bearer plane (PCEF) side:
 - Ericsson EPG, through Ericsson Rel9 Gx+ onwards.
 - Non-Ericsson PCEF, through standard standard Rel9 Gx onwards.
- In the application plane (AF) side:
 - Ericsson SBG, through standard Rel9 Rx onwards.
 - Non-Ericsson AF, through standard Rel9 Rx onwards.

4 Emergency Services Traffic Cases

This chapter explains the interfaces and the traffic interactions between the network nodes involved in Emergency Services. For detailed description of each of the interfaces supported, the corresponding interface description should be consulted.

The precondition to all traffic cases is that a diameter connection is already established between the SAPC and the PCEF and between the SAPC and the AF. In addition, all the required policy controls are enabled for the PCEF, and support for dynamic PCC rules is enabled for the GGSN/PDN GW:



- The Service Access policy control is required to perform Service Access control. The Bearer QoS policy control is required to perform QoS control. The Service Charging policy control is required to perform Service Charging Control.
- “Dynamic Policy control” functionality, under license control, need to be active; otherwise SAPC rejects any Gx/Rx message by answering with Result-Code DIAMETER_UNABLE_TO_COMPLY=5012.I.

Note: Emergency establishments shall never be rejected because of license capacity exceeded. Nevertheless, emergency sessions are taken into account for the overall IP-CAN and AF session capacity count.

4.1 Protocol Binding for Rel9 Rx Onwards and standard Rel9 Gx Onwards

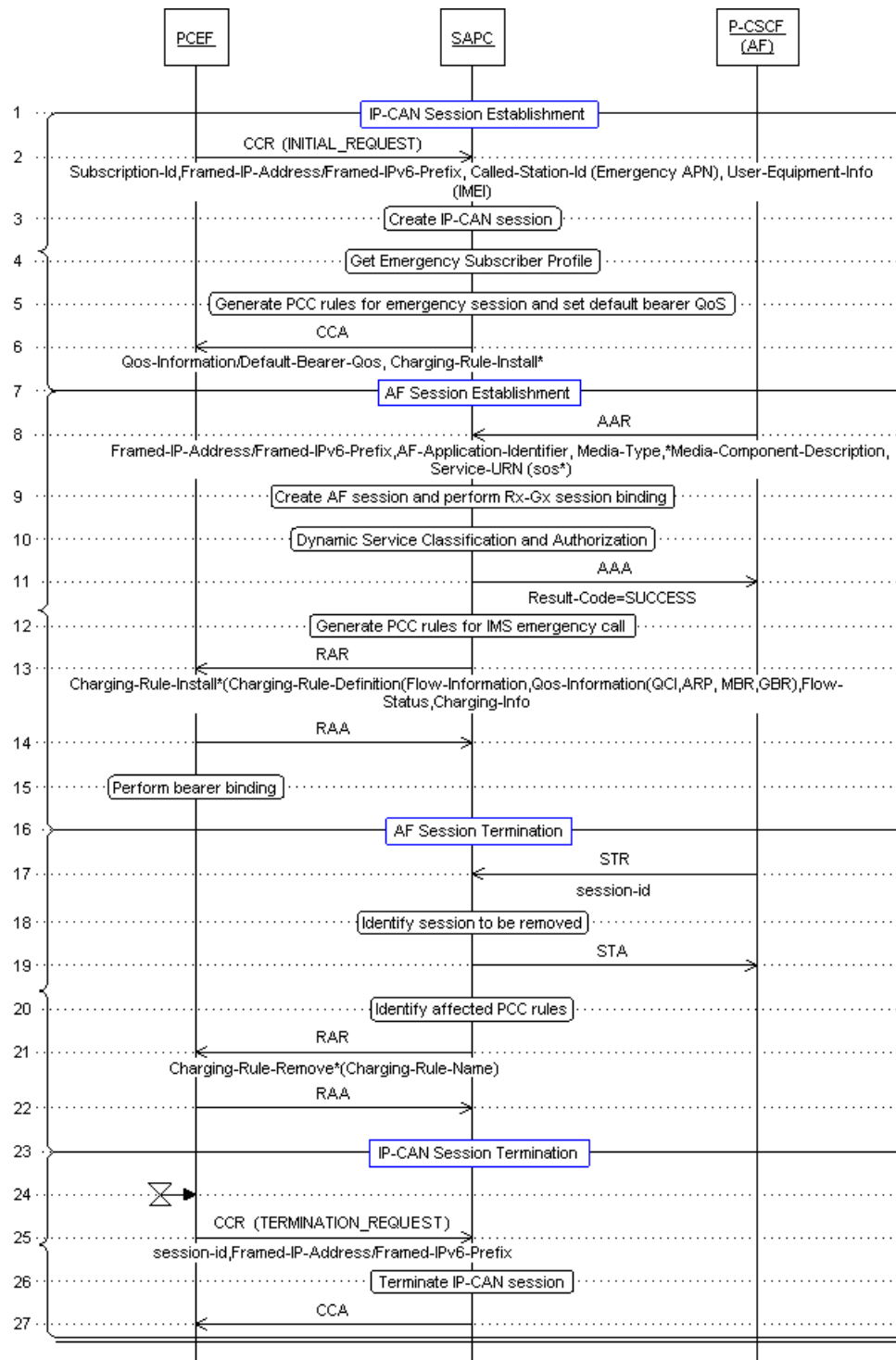


Figure 3 IMS Emergency Call Establishment



IP-CAN session establishment

- 2.The SAPC receives a Gx CCR-initial message from the PCEF indicating IP-CAN session establishment for an emergency bearer service by using the standard IP-CAN session establishment procedures with the following main differences:
 - Called-Station-ID AVP contains an emergency APN that is defined in the SAPC list of emergency APNs.
 - If Subscription-Id AVP is received, the User-Equipment-Info AVP is optional. If Subscription-Id AVP is not received, the CCR-initial message must include the IMEI within the User-Equipment-Info AVP. If neither Subscription-Id AVP nor User-Equipment-Info AVP are received, the SAPC returns a CCA message with experimental result code DIAMETER_ERROR_INITIAL_PARAMETERS (5140). Similarly, if Subscription-ID AVP is missing and unauthenticated emergency services are not allowed according to the SAPC configuration, the SAPC rejects the session establishment with the same experimental result code (5140).
- 3–5.The SAPC creates an IP-CAN session for this subscriber request and PCEF, and calls for the special Emergency Subscriber Profile. This profile contains the static and preconfigured services that are authorized to be installed at the PCEF, the authorized QoS of default bearer for emergency services and the configured operator rules to make policy decisions for emergency IP-CAN sessions. SAPC can handle emergency sessions without the Emergency Subscriber profile provisioned.
- 6.The SAPC sends a CCA message to the PCEF including PCC rules, charging information and default bearer QoS.

AF session establishment

- Steps 8–15 are similar to the ones explained in [Dynamic Policy Control \(Rx\)](#), Reference [1] during standard AF Session Establishment, with the following differences highlighted below.
- 8. The AAR message includes the Service-URN AVP to indicate that the new AF session refers to an IMS emergency call.
- 9. When performing session binding, the SAPC needs to make sure that there is no misuse of emergency IP-CAN sessions so that the prioritized bearer service is used to make normal IMS calls. Hence if the AF session is bound to an emergency IP-CAN session and the Service-URN AVP is not received or it does not contain a top-level service type of "sos", the SAPC returns an AAA command with Experimental-Result-Code AVP set to the value UNAUTHORIZED_NON_EMERGENCY_SESSION (5066) to the P-CSCF.
- 10–11.The SAPC identifies and classifies the IMS emergency call by using the Service-URN information received from the P-CSCF in the dynamic service classification process. If an IMS emergency call binds to a non-emergency IP-CAN session, the SAPC does not ignore the value of Service-URN AVP. In addition, the SAPC performs dynamic service authorization.



- 12–13. The SAPC derives the dynamic PCC rules and sends this information to the PCEF. The QoS per media subcomponent is obtained by using the Dynamic Services Qualification function. Provisioning of the PCC rules at the PCEF shall ensure that a new dedicated bearer is established for the Emergency service.
- 14–15. The PCEF accepts the installation of PCC rules and performs bearer binding.

AF session termination

- 17–22. The P-CSCF sends an STR message to indicate the termination of the AF session for an IMS Emergency service, and the SAPC removes the PCC rules assigned to the terminated IMS emergency call by using a RAR command with Charging-Rule-Remove AVP.

IP-CAN session termination

- 24–26. Once the IMS emergency call has been terminated and when the inactivity timer expires, the PCEF initiates an IP-CAN session termination request for the IP-CAN session restricted to emergency services.

4.2 Emergency Services Error Handling

Table 1 Error Handling

Error Condition	Action	Code
The SAPC receives a AAR to request an emergency service and the “Dynamic Policy control” functionality license is not active.	The SAPC returns an AAA indicating an error	Result-Code AVP set to DIAMETER_UNABLE_TO_COMPLY (5012)
The SAPC receives a CCR for an emergency IP-CAN session establishment where Subscription-ID AVP and User-Equipment-Info AVP are missing.	The SAPC returns a CCA indicating an error	Experimental-Result-Code AVP set to DIAMETER_ERROR_INITIAL_PARAMETERS (5140)



Error Condition	Action	Code
The SAPC receives a CCR for an emergency IP-CAN session establishment where Subscription-ID AVP is missing and unauthenticated emergency services are not allowed.	The SAPC returns a CCA indicating an error	Experimental-Result-Code AVP set to DIAMETER_ERROR_INITIAL_PARAMETERS (5140)
The SAPC receives an AF session that binds to an emergency IP-CAN session and the Service-URN AVP is missing or does not contain a top-level service type of "sos".	The SAPC returns an AAA indicating an error	Experimental-Result-Code AVP set to UNAUTHORIZED_NON_EMERGENCY_SESSION (5066)

5 Emergency Services Restrictions

The following list shows the functions that are applicable to Emergency subscriber profile:

- Bearer QoS and Bandwidth management.
- Access and Charging (except One Time Redirect and Content Filtering).

Subscriber groups are not applicable to Emergency subscriber profile.





Reference List

Ericsson Documents

- [1] Dynamic Policy Control (Rx), 5/155 34-CSH 109 215/7 Uen

Standards

- [2] IP Multimedia Subsystem (IMS) emergency sessions, 3GPP TS 23.167