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SERIES Q: SWITCHING AND SIGNALLING, AND
ASSOCIATED MEASUREMENTS AND TESTS

Signalling requirements and protocols for the NGN –
Network signalling and control functional architecture

**Signalling architecture and requirements for
IP-based short message service over ITU-T
defined NGN**

Recommendation ITU-T Q.3053

ITU-T



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Recommendation ITU-T Q.3053

Signalling architecture and requirements for IP-based short message service over ITU-T defined NGN

Summary

Recommendation ITU-T Q.3053 specifies the signalling architecture for Internet protocol (IP) based short message service (SMS) over next generation network (NGN), and identifies the signalling requirements for the interworking between NGN and mobile network supporting SMS.

History

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Recommendation ITU-T Q.3053

Signalling architecture and requirements for IP-based short message service over ITU-T defined NGN

1 Scope

This Recommendation specifies the signalling architecture for Internet protocol (IP) based short message service (SMS) over next generation network (NGN), and identifies the signalling requirements for the interworking between NGN and mobile networks supporting SMS.

The IP-based short message over NGN is encapsulated in accordance with the SMS layer defined in [ETSI TS 124 011].

With regard to SMS over mobile networks, this Recommendation conforms to [ETSI TS 123 040] and [TIA-637] which specifies the technical implementation of SMS in circuit switch (CS) domain of GSM/UMTS networks and cdma2000 network.

2 References

The following ITU-T Recommendations and other references contain provisions which, through reference in this text, constitute provisions of this Recommendation. At the time of publication, the editions indicated were valid. All Recommendations and other references are subject to revision; users of this Recommendation are therefore encouraged to investigate the possibility of applying the most recent edition of the Recommendations and other references listed below. A list of the currently valid ITU-T Recommendations is regularly published. The reference to a document within this Recommendation does not give it, as a stand-alone document, the status of a Recommendation.

- [ITU-T Y.2012] Recommendation ITU-T Y.2012 (2010), *Functional requirements and architecture of next generation networks*.
- [ETSI TS 123 040] ETSI TS 123 040 V13.2.0 (2016), *Technical realization of the Short Message Service (SMS)*.
- [ETSI TS 123 204] ETSI TS 123 204 V13.1.0 (2016), *Support of Short Message Service (SMS) over generic 3GPP Internet Protocol (IP) access; Stage 2*.
- [ETSI TS 124 011] ETSI TS 124 011 V13.3.0 (2017), *Point-to-Point (PP) Short Message Service (SMS) support on mobile radio interface*.
- [ETSI TS 124 229] ETSI TS 124 229 V13.8.0 (2017), *IP multimedia call control protocol based on Session Initiation Protocol (SIP) and Session Description Protocol (SDP); Stage 3*.
- [ETSI TS 129 002] ETSI TS 129 002 V13.6.0 (2017), *Mobile Application Part (MAP) specification*.
- [IETF RFC 3588] IETF RFC 3588 (2003), *Diameter Base Protocol*.
- [TIA-1109] Telecommunications Industry Association, TIA-1109 9th Edition (2009), *Short Message Service Over IMS*.
- [TIA-41.540] Telecommunications Industry Association, TIA-41.540 Revision E (2010), *PART 540: Mobile Application Part (MAP) – operations signaling protocols*.
- [TIA-637] Telecommunications Industry Association, TIA-637 Revision D (2013-01), *Short Message Service (SMS) for Wideband Spread Spectrum Systems*.

3 Definitions

3.1 Terms defined elsewhere

None.

3.2 Terms defined in this Recommendation

This Recommendation defines the following term:

3.2.1 circuit switch domain: The circuit switch domain refers to a set of the core network entities offering "Circuit Switch type of connection" for user traffic as well as all the entities supporting the related signalling. A "Circuit Switch type of connection" is a connection for which dedicated network resources are allocated at the connection establishment, and are released at the connection release.

NOTE – In this Recommendation the circuit switch domain includes the CS domain defined in cdma2000 and in GSM/UMTS.

4 Abbreviations and acronyms

This Recommendation uses the following abbreviations and acronyms:

3GPP	3rd Generation Partnership Project
3GPP2	3rd Generation Partnership Project 2
AS	Application Server
CDMA	Code Division Multiple Access
CS	Circuit Switched
HLR	Home Location Register
IMSI	International Mobile Subscriber Identity
IP-SM-GW	IP Short Message Gateway
GSM	Global System for Mobile Communication
MAP	Mobile Application Part
MSC	Mobile Switching Centre
NGN	Next Generation Networks
P-CSC-FE	Proxy Call Session Control Functional Entity
RPDU	Relay Protocol Data Unit
SC	Service Centre
S-CSC-FE	Serving Call Session Control Functional Entity
SIP	Session Initiation Protocol
SMS	Short Message Service
SMSC	Short Message Service Centre
SMS-GMSC	Short Message Service – Gateway Mobile Switching Centre
SMS-IW MSC	Short Message Service – Interworking Mobile Switching Centre
SUP-FE	Service User Profile Functional Entity
UE	User Equipment
UMTS	Universal Mobile Telecommunications System

5 Signalling architecture for IP based SMS over NGN

5.1 Architecture model

Figure 5-1 below shows the overall architecture for providing IP based SMS over NGN.

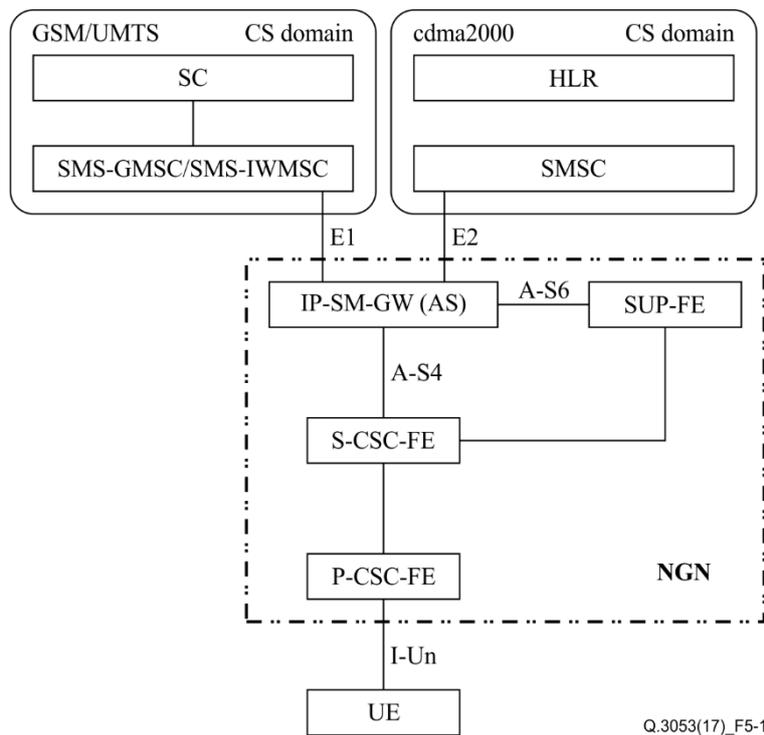


Figure 5-1 – Architecture model for providing IP-based SMS over NGN

Figure 5-1 illustrates the functional entities providing IP based SMS. The functions of user equipment (UE), proxy call session control functional entity (P-CSC-FE), serving call session control functional entity (S-CSC-FE) and service user profile functional entity (SUP-FE) are identified in [ITU-T Y.2012]. The functional entities in CS domain of a global system for mobile communication/universal mobile telecommunications system (GSM/UMTS) are defined in [ETSI TS 123 040] and [ETSI TS 123 204]. The functional entities in CS domain of cdma2000 are defined in [TIA-1109].

5.2 Functional entities in support of IP based SMS

With regard to IP based SMS, some functional entities are enhanced as described in the following.

The UE of next generation networks (NGN) supports the encapsulation and de-encapsulation of relay protocol data units (RPDUs) in an IP-based SMS as defined in [ETSI TS 124 011].

The P-CSC-FE receives the IP based short message from a NGN user, and delivers the IP based short message to a NGN user.

The S-CSC-FE executes the third party registration and de-registration of a NGN user supporting IP based SMS. The S-CSC-FE also receives and delivers the IP based SMS message from and to a NGN user.

The SUP-FE stores the IP based SMS subscription data, the registration status, the authentication and authorization information and the routing information of a NGN user.

IP short message gateway (IP-SM-GW) for transport layer interworking provides the protocol interworking between NGN and CS domain of GSM/UMTS and cdma2000 networks. It provides the

protocol interworking for the transfer of short messages between a NGN user and a CS domain user, and for the status reports of SMS.

IP-SM-GW acts as an application server (AS) in NGN. It supports the third party registration procedure of a NGN user and stores the registration status of a NGN user.

5.3 Reference points

The clauses below describe the required enhancements and specific considerations to existing reference points in order to support SMS over NGN.

5.3.1 Reference point between the IP-SM-GW and the SUP-FE: A-S6

The reference point between the IP-SM-GW and the SUP-FE is used for:

- Supporting the registration and de-registration from the IP-SM-GW to the SUP-FE for short message delivery.
- Forwarding of the send routing information for a short message from SUP-FE to IP-SM-GW in order to retrieve the address where the short message should be forwarded.
- Interrogating the SUP-FE using send routing information for a short message to retrieve the international mobile subscriber identity (IMSI) and the current mobile switching centre (MSC) address.
- Informing the SUP-FE when memory capacity exceeded condition occurs or ceases.
- Retrieving SMS related data from the SUP-FE: subscriber data of the short message service and additional service data on the service authorisation of the encapsulated short message delivery via NGN, and service centre (SC) address for service-level interworking from IP-based short message to CS-based short message if the SC address is stored in the SUP-FE.

The reference point A-S6 is recommended to use DIAMETER protocol as per [IETF RFC 3588].

5.3.2 Reference points between the IP-SM-GW and the S-CSC-FE: A-S4

The reference point between the IP-SM-GW and the S-CSC-FE is used for:

- transferring of short messages between IP-SM-GW and the S-CSC-FE via NGN;
- supporting of registration and deregistration of NGN users for SM delivery.

The reference point A-S4 is recommended to use session initiation protocol (SIP) as per [ETSI TS 124 229].

5.3.3 Reference point between the IP-SM-GW and the SMS-GMSC: E1

The reference point between the IP-SM-GW and the SMS-GMSC is used for:

- Connecting to the SMS-GMSC, acting as a MSC towards a SMS-GMSC within GSM/UMTS networks defined in 3GPP.

The reference point E1 is recommended to use mobile application part (MAP) over No.7 signaling as per [ETSI TS 129 002].

5.3.4 Reference point between the IP-SM-GW and the SMSC: E2

The reference point between the IP-SM-GW and the short message service centre (SMSC) is used for:

- Connecting to the CS domain of cdma2000 networks, acting as a MSC or MSCe towards a SMSC within CDMA 1x network defined in 3GPP2.

The reference point E2 is recommended to use mobile application part over No.7 signaling as per [TIA-41.540].

5.3.5 Reference point between the UE and the P-CSC-FE: I-Un

The reference point between the UE and the P-CSC-FE is used for:

Supporting the UE to send and receive the IP-based short message and status report via NGN.

The reference point I-Un is recommended to use SIP as per [ETSI TS 124 229].

6 Signalling requirements for IP-based SMS over NGN

6.1 General requirements

The signalling architecture for IP-based SMS supports the following signalling requirements:

- A notification shall be sent to the SUP-FE when a previously unreachable UE becomes reachable.
- It is required to be able to select the domain for message delivery between NGN and CS, and to deliver the message to the selected domain.
- It is required to determine whether to transform a message format or not according to the types of networks (NGN or CS) that provide short message service to the users. If the originating user and the terminating user are under different types of networks (NGN and CS), the transformation of the message format is required.
- The interworking function shall generate the appropriate charging-related information and provide the appropriate online charging mechanism for the interworking services.

6.2 Transport layer interworking requirements

For transport layer interworking, the signalling architecture supports the following requirements:

- A registration and de-registration mechanism shall be supported where UEs are required to explicitly indicate their ability to send and receive encapsulated short messages in format of RPDUs defined in [ETSI TS 124 011], or in format of RPDUs defined in [TIA-637].

6.3 Service layer interworking requirements

For service layer interworking, the signalling architecture supports the following requirements:

- The service layer interworking, which is a value added service, requires service subscription. In addition, operators' policies shall be taken into account if available (e.g., checking on the barring setting of the subscriber to determine whether to provide this interworking or not), and authorisation shall be supported before the interworking is executed.
- The service layer interworking is applied only if the users cannot communicate with each other using their chosen messaging service according to the users' preferences and/or operators' policies. The interworking functions can be implemented in the originating network or in the terminating network.
- The service layer interworking is required to take the capability of the terminating UE into account when possible.
- The service layer interworking is required to be transparent to the end user.
- An SMS status report is required to be generated when an SMS user requests an SMS status report that the message was delivered to the recipient.

The interworking functionality shall be executed in the following cases:

- Originating network:
 - The originating UE supports the encapsulation of IP-based short message according to the SMS layer as defined in [ETSI TS 124 011];

- The originating UE is an IP-based SMS user who has subscribed to the interworking functions and the terminating UE is not routable in NGN;
 - The operator policy on the originating side has been set to send the IP-based short message via short message service as defined in [ETSI TS 123 040] and [TIA-637].
- Terminating network:
- The users' preferences and/or the operators' policies of the terminating UE have been set to receive the short message service via IP-based SMS;
 - When IP-SM-GW is deployed, none of intermediate node shall modify or terminate the message between the IP-SM-GW and the terminating user.

7 Security considerations

The signalling architecture for IP based SMS over NGN is required to support security mechanisms for message transfer in both transport layer and service layer by the protocols identified in clause 6. Other service specific security requirements are out of the scope of this Recommendation.

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