

ITU-T

TELECOMMUNICATION
STANDARDIZATION SECTOR
OF ITU

Q.3221
(10/2008)

SERIES Q: SWITCHING AND SIGNALLING

Signalling requirements and protocols for the NGN –
Signalling and control requirements and protocols to
support attachment in NGN environments

**Requirements and protocol at the interface
between the service control entity and the
transport location management physical entity
(S-TC1 interface)**

Recommendation ITU-T Q.3221



International
Telecommunication
Union
Documents

Document Sharing Hub

ITU-T Q-SERIES RECOMMENDATIONS

SWITCHING AND SIGNALLING

SIGNALLING IN THE INTERNATIONAL MANUAL SERVICE	Q.1–Q.3
INTERNATIONAL AUTOMATIC AND SEMI-AUTOMATIC WORKING	Q.4–Q.59
FUNCTIONS AND INFORMATION FLOWS FOR SERVICES IN THE ISDN	Q.60–Q.99
CLAUSES APPLICABLE TO ITU-T STANDARD SYSTEMS	Q.100–Q.119
SPECIFICATIONS OF SIGNALLING SYSTEMS No. 4, 5, 6, R1 AND R2	Q.120–Q.499
DIGITAL EXCHANGES	Q.500–Q.599
INTERWORKING OF SIGNALLING SYSTEMS	Q.600–Q.699
SPECIFICATIONS OF SIGNALLING SYSTEM No. 7	Q.700–Q.799
Q3 INTERFACE	Q.800–Q.849
DIGITAL SUBSCRIBER SIGNALLING SYSTEM No. 1	Q.850–Q.999
PUBLIC LAND MOBILE NETWORK	Q.1000–Q.1099
INTERWORKING WITH SATELLITE MOBILE SYSTEMS	Q.1100–Q.1199
INTELLIGENT NETWORK	Q.1200–Q.1699
SIGNALLING REQUIREMENTS AND PROTOCOLS FOR IMT-2000	Q.1700–Q.1799
SPECIFICATIONS OF SIGNALLING RELATED TO BEARER INDEPENDENT CALL CONTROL (BICC)	Q.1900–Q.1999
BROADBAND ISDN	Q.2000–Q.2999
SIGNALLING REQUIREMENTS AND PROTOCOLS FOR THE NGN	Q.3000–Q.3999
General	Q.3000–Q.3029
Network signalling and control functional architecture	Q.3030–Q.3099
Network data organization within the NGN	Q.3100–Q.3129
Bearer control signalling	Q.3130–Q.3179
Signalling and control requirements and protocols to support attachment in NGN environments	Q.3200–Q.3249
Resource control protocols	Q.3300–Q.3369
Service and session control protocols	Q.3400–Q.3499
Service and session control protocols – supplementary services	Q.3600–Q.3649
NGN applications	Q.3700–Q.3849
Testing for NGN networks	Q.3900–Q.3999

For further details, please refer to the list of ITU-T Recommendations.

Recommendation ITU-T Q.3221

Requirements and protocol at the interface between the service control entity and the transport location management physical entity (S-TC1 interface)

Summary

Recommendation ITU-T Q.3221 provides the signalling requirements and protocol for the interface between the service control entities (SCEs) in the services stratum and the transport location management physical entity (TLM-PE) in the network attachment control function block of the next generation network (NGN) release 1. This protocol can be used to retrieve the location information attached by the user equipment. It satisfies the requirements for information flows across the S-TC1 reference point as specified in Recommendation ITU-T Y.2014.

Source

Recommendation ITU-T Q.3221 was approved on 14 October 2008 by ITU-T Study Group 11 (2005-2008) under Recommendation ITU-T A.8 procedure.

FOREWORD

The International Telecommunication Union (ITU) is the United Nations specialized agency in the field of telecommunications, information and communication technologies (ICTs). The ITU Telecommunication Standardization Sector (ITU-T) is a permanent organ of ITU. ITU-T is responsible for studying technical, operating and tariff questions and issuing Recommendations on them with a view to standardizing telecommunications on a worldwide basis.

The World Telecommunication Standardization Assembly (WTSA), which meets every four years, establishes the topics for study by the ITU-T study groups which, in turn, produce Recommendations on these topics.

The approval of ITU-T Recommendations is covered by the procedure laid down in WTSA Resolution 1.

In some areas of information technology which fall within ITU-T's purview, the necessary standards are prepared on a collaborative basis with ISO and IEC.

NOTE

In this Recommendation, the expression "Administration" is used for conciseness to indicate both a telecommunication administration and a recognized operating agency.

Compliance with this Recommendation is voluntary. However, the Recommendation may contain certain mandatory provisions (to ensure e.g. interoperability or applicability) and compliance with the Recommendation is achieved when all of these mandatory provisions are met. The words "shall" or some other obligatory language such as "must" and the negative equivalents are used to express requirements. The use of such words does not suggest that compliance with the Recommendation is required of any party.

INTELLECTUAL PROPERTY RIGHTS

ITU draws attention to the possibility that the practice or implementation of this Recommendation may involve the use of a claimed Intellectual Property Right. ITU takes no position concerning the evidence, validity or applicability of claimed Intellectual Property Rights, whether asserted by ITU members or others outside of the Recommendation development process.

As of the date of approval of this Recommendation, ITU had not received notice of intellectual property, protected by patents, which may be required to implement this Recommendation. However, implementers are cautioned that this may not represent the latest information and are therefore strongly urged to consult the TSB patent database at <http://www.itu.int/ITU-T/ipr/>.

© ITU 2009

All rights reserved. No part of this publication may be reproduced, by any means whatsoever, without the prior written permission of ITU.

CONTENTS

Page

1	Scope	1
1.1	Relationship	1
2	References.....	1
3	Definitions	2
4	Abbreviations and acronyms	3
5	S-TC1 interface.....	3
5.1	Overview	3
5.2	S-TC1 reference model.....	4
5.3	Physical entities and capabilities	4
6	Signalling requirements	5
6.1	Information query	5
6.2	Event registration.....	6
6.3	Notification event	7
7	Description of procedures.....	8
7.1	General	8
7.2	Procedure on the TLM-PE – SCE interface	8
8	Use of the Diameter base protocol.....	16
8.1	Securing Diameter messages	16
8.2	Accounting functionality	17
8.3	Use of sessions	17
8.4	Transport protocol	17
8.5	Routing considerations	17
8.6	Ad 8.6vertising application support	17
9	Message specification.....	18
9.1	Commands	18
9.2	Experimental-Result-Code AVP values	21
9.3	AVPs.....	21
9.4	Use of namespaces	25
10	Security considerations.....	26
Annex A	– Scenarios using S-TC1	27
A.1	CASE 1: NACE-SCE bundled authentication based on line information.....	27
A.2	CASE 2: NACE-SCE bundled authentication based on the authentication context	29
A.3	CASE 3: Information of PD-PE in RACE for providing QoS	30
A.4	CASE 4: Location service based on fixed access line information with bundled authentication.....	32
Bibliography		34

Recommendation ITU-T Q.3221

Requirements and protocol at the interface between the service control entity and the transport location management physical entity (S-TC1 interface)

1 Scope

This Recommendation defines the requirements and protocol for the interface between the transport location management physical entity (TLM-PE) and the service control entity of ITU-T NGN release 1.

At the stage of NGN release 1 [ITU-T Y.2012], this Recommendation is applicable to the interface between TLM-PE and SCE.

1.1 Relationship

Work for this Recommendation is based on the context of [ITU-T Y.2014] and [ITU-T Y.2012]; this Recommendation satisfies the requirements for information flows across the S-TC1 reference point as specified in [ITU-T Y.2014] and the functional requirements and architecture specified in [ITU-T Y.2012].

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 (2006), <i>Functional requirements and architecture of the NGN release 1</i> . |
| [ITU-T Y.2014] | Recommendation ITU-T Y.2014 (2008), <i>Network attachment control functions in next generation networks</i> . |
| [ITU-T Y.2701] | Recommendation ITU-T Y.2701 (2007), <i>Security requirements for NGN release 1</i> . |
| [ETSI TS 129 209] | ETSI TS 129 209 V6.7.0 (2007), <i>Universal Mobile Telecommunications System (UMTS); Policy control over Gq interface</i> . |
| [ETSI TS 129 229] | ETSI TS 129 229 V7.8.0 (2008), <i>Cx and Dx interfaces based on the Diameter protocol; Protocol details</i> . |
| [ETSI TS 129 329] | ETSI TS 129 329 V6.7.0 (2006), <i>Digital cellular telecommunications system (Phase 2+); Universal Mobile Telecommunications System (UMTS); Sh interface based on the Diameter protocol; Protocol details</i> . |
| [ETSI TS 187 003] | ETSI TS 187 003 V1.7.1 (2008), <i>Telecommunications and Internet converged Services and Protocols for Advanced Networking (TISPAN); NGN Security; Security Architecture</i> . |
| [ETSI TS 283 034] | ETSI ES 283 034 V2.2.0 (2008), <i>Telecommunications and Internet converged Services and Protocols for Advanced Networking (TISPAN); Network Attachment Sub-System (NASS); e4 interface based on the Diameter protocol</i> . |



- [ETSI ES 283 035] ETSI ES 283 035 V2.5.1 (2008), *Telecommunications and Internet converged Services and Protocols for Advanced Networking (TISPAN); Network Attachment Sub-System (NASS); e2 interface based on the Diameter protocol*.
- [IETF RFC 2960] IETF RFC 2960 (2000), *Stream Control Transmission Protocol*.
- [IETF RFC 3309] IETF RFC 3309 (2002), *Stream Control Transmission Protocol (SCTP) Checksum Change*.
- [IETF RFC 3554] IETF RFC 3554 (2003), *On the Use of Stream Control Transmission Protocol (SCTP) with IPsec*.
- [IETF RFC 3588] IETF RFC 3588 (2003), *Diameter Base Protocol*.

3 Definitions

This Recommendation defines the following terms:

3.1 attribute-value pair (AVP): An attribute-value pair corresponds to an information element in a Diameter message. Source of definition is [IETF RFC 3588].

3.2 mobility: The ability for the user or other mobile entities to communicate and access services irrespective of changes of the location or technical environment. Source of definition is [b-ITU-T Y.2001].

NOTE 1 – The degree of service availability may depend on several factors including the access network capabilities, service level agreements between the user's home network and the visited network (if applicable), etc. Mobility includes the ability of telecommunication with or without service continuity [b-ITU-T Y.2001].

NOTE 2 – In [b-ITU-T Y.2001] this is called generalized mobility.

3.3 nomadism: The ability of the user to change their network access point. When changing the network access point, the user's service session is completely stopped and then started again, i.e., there is no service continuity or hand-over used. Source of definition is [b-ITU-T Q.1706].

NOTE – It is assumed that normal usage pattern is that users shut down their service session before attaching to a different access point.

3.4 roaming: This is the ability of users to access services according to their user profile while outside of their subscribed home network, i.e., by using an access point of a visited network. This requires the capability for access to the visited network, the existence of an interface between home network and visited network, as well as a roaming agreement between the respective network operators. Source of definition is [b-ITU-T Q.1706].

3.5 service control entity (SCE): Element of the service layer architecture offering applications that require information about the characteristics of the IP-connectivity session used to access such applications.

3.6 single sign-on: The ability to use an authentication assertion from one network operator/service provider to another operator/provider for a user either accessing a service or roaming into a visited network. Source of definition is [b-ITU-T Y.2201].

3.7 subscriber: The person or organization responsible for concluding contracts for the services subscribed to and for paying for these services. Source of definition is [b-ITU-T M.3050.1].

4 Abbreviations and acronyms

This Recommendation uses the following abbreviations and acronyms:

ABNF	Augmented Backus-Naur Form
AM-PE	Access Management Physical Entity
AVP	Attribute-Value Pair
CPE	Customer Premises Equipment
IMPI	IMS Private User Identity
IMPU	IMS Public User Identity
IMS	IP Multimedia Subsystem
NACE	Network Attachment Control Entity
NACF	Network Attachment Control Functions
NAC-PE	Network Access Configuration Physical Entity
P-CSC-PE	Proxy – Call Session Control Physical Entity
PD-PE	Policy Decision Physical Entity
RACE	Resource and Admission Control Entity
RACF	Resource and Admission Control Functions
SCE	Service Control Entity
SCF	Service Control Functions
SCTP	Stream Control Transport Protocol
SDP	Session Description Protocol
SIP	Session Initiation Protocol
TAA-PE	Transport Authentication and Authorization Physical Entity
TLM-PE	Transport Location Management Physical Entity

5 S-TC1 interface

5.1 Overview

The network attachment control entity (NACE) maintains information on IP-connectivity access sessions associated with user equipment connected to the NGN network. This information is stored in the transport location management physical entity (TLM-PE) and made accessible to other control functions and applications through two interfaces (see Figure 5-1):

- The S-TC1 interface enables the service control entity (SCE) to retrieve session data related to IP-connectivity.
- The Ru interface enables session data related to IP-connectivity to be exchanged between the NACE and the resource and admission control entity (RACE) as defined in [ITU-T Y.2012].

This Recommendation specifies the protocol for the S-TC1 interface.

In this Recommendation, a service control entity (SCE) is defined as a generic term representing any element of the service layer architecture. It offers applications requiring information on the characteristics of the IP-connectivity session being used to access the applications. One example of a service control entity is the P-CSC-PE in the service control functions.



Documents

Document Sharing Hub

Rec. ITU-T Q.3221 (10/2008)

3

5.2 S-TC1 reference model

The S-TC1 interface, as shown in Figure 5-1, is defined between the SCE and the TLM-PE.

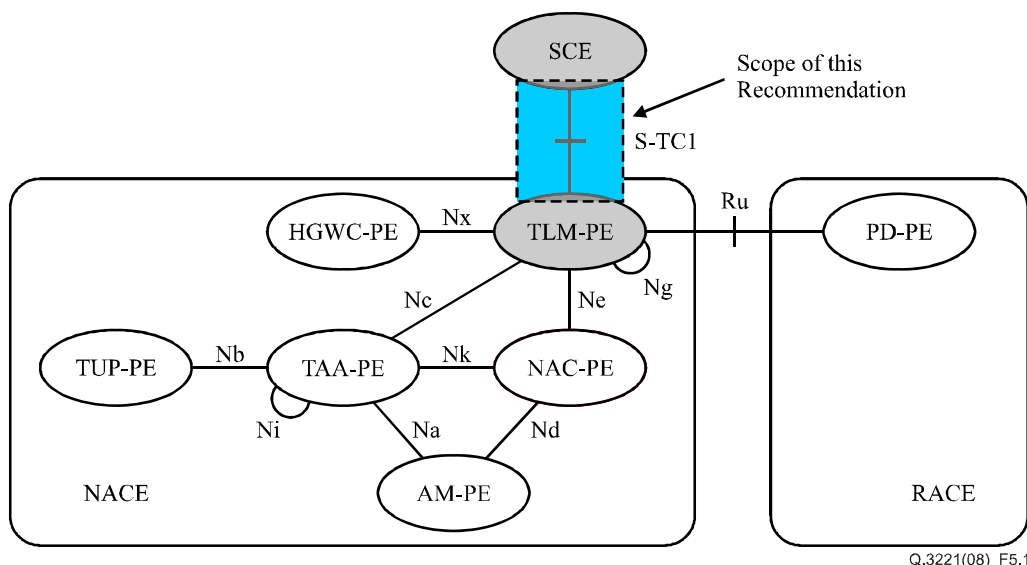


Figure 5-1 – S-TC1 reference model

5.3 Physical entities and capabilities

5.3.1 Transport location management physical entity (TLM-PE)

The TLM-PE responds to location queries from service control functions and applications. The actual information delivered by the TLM-PE may take various forms (e.g., network location, geographical coordinates, postal address, etc.) depending on the agreements with the requester and on user preferences regarding the privacy of its location.

The TLM-PE is able to correlate the information received from the NAC-PE and the TAA-PE based on the logical connection identifier.

The TLM-PE may also store the identity of the user/CPE to which the IP address has been allocated (information received from the TAA-PE) as well as the user network QoS profile and user preferences regarding the privacy of the location information. In case it does not store the identity/profile of the user/CPE, the TLM-PE shall be able to retrieve this information from the TAA-PE.

The TLM-PE registers the association between the IP address allocated to the CPE and related network location information provided by the NAC-PE (e.g., access line identifier). The TLM-PE interfaces with the NAC-PE to derive the association between the IP address allocated by the NAC-PE to the end user equipment and the identity of the logical access used by the attached user equipment (i.e., logical connection identifier).

The TLM-PE may provide the SCE with user network profile information through the TLM-PE of the visited network to support mobility when the user is nomadic.

Similarly, the TLM-PE is able to provide the SCE with user network profile information through the TLM-PE of another service provider for roaming on such access network.

The functionality of the TLM-PE is further detailed in clause 7.2.3 of [ITU-T Y.2014].

5.3.2 Service control entity (SCE)

In this Recommendation, the SCE is used as a generic term representing any element of the service layer architecture. SCE offers applications requiring information on the characteristics of the IP-connectivity session being used to access the applications. The SCE shall use the S-TC1 interface to get connection-related information with TLM-PE. One example of a SCE is the P-CSC-PE. The SCE requests for location information from TLM-PE, which in turn responds to location queries [ITU-T Y.2012]. The SCE needs network session information such as IP-connectivity status, access network type from TLM-PE and device information such as terminal type.

Moreover, the SCE needs to know the RACE contact point to get resources for a service. Specifically, the P-CSC-PE needs to know the address of the PD-PE to send a QoS request for a service. The PD-PE will check between the QoS request sent from the SCE and QoS profile stored in TUP-PE and determine whether the requested QoS is applicable to the service.

The SCE requests the user network QoS profile and user preferences regarding the privacy of location information.

In addition, the SCE requests location information to provide nomadism for mobility. In cases wherein the access network technologies are identical and are owned by the same access network operator, service continuity or handover may be supported.

Finally, the SCE requests location information for bundled authentication [ETSI TS 187 003].

6 Signalling requirements

This reference point enables applications and service control functions to retrieve network location information from the TLM-PE. The primary parameter for retrieving the location information shall be the assigned IP address allocated to the terminal.

The form of location information provided by the TLM-PE depends on the requestor.

The following information flows are used on this interface:

- Information query request/response
- Event registration request/response
- Notification event request/response

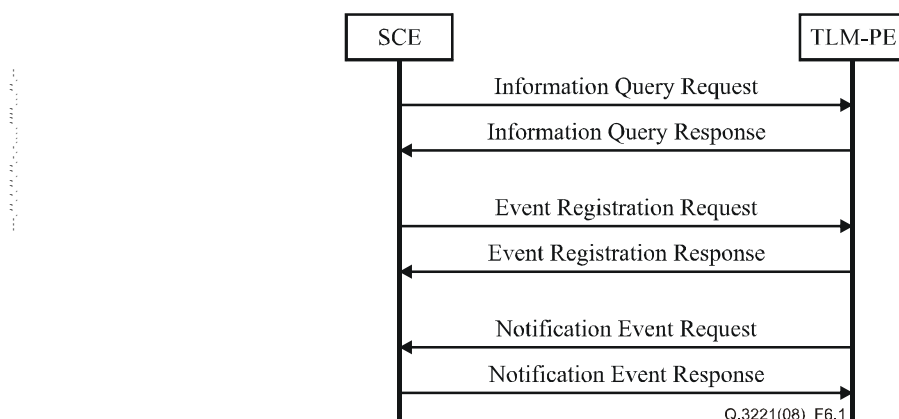


Figure 6-1 – Information flow

6.1 Information query

The information query request information flow contains the following information (see Table 6-1).

Table 6-1 – Information query request (SCE → TLM-PE)

Globally unique IP address information	A set of IP address information used for locating the access network in which the CPE is attached.
– Unique IP address	The IP address for identifying the attached CPE.
– Address realm	The addressing domain of the IP address (e.g., subnet prefix or VPN ID).
Transport subscriber identifier	A globally unique identifier of the attached CPE. This identifier can be used for locating the transport subscription information for the CPE.
Requested items	The item list to the requested information
SCE identity	The identifier of the requesting service control entity.

The information query response information flow contains the following information (see Table 6-2)

Table 6-2 – Information query response (TLM-PE → SCE)

Transport subscriber identifier (optional)	A globally unique identifier for the attached CPE. (Note 1).
Location information (optional) (Note 2)	Location information (or a pointer to such information) in a form that is suitable for the requesting service control entity.
RACE contact point (optional)	The FQDN or IP address of the RACE where resource request shall be sent (i.e., PD-PE address).
CPE type (optional)	The type of CPE.
Type of access transport (optional)	The type of access network to which CPE is attached.
IP connectivity status (optional)	Whether IP connectivity to/from the user equipment is currently available.
Physical connection identifier (optional)	A local identifier for physical connection of access transport network that the CPE is attached to (e.g., IP address of PE-FE device, and MAC address or link ID and physical port).
Logical connection identifier (optional)	A local identifier for logical connection of access transport network to which the CPE is connected (e.g., ATM VPI/VCI, PPP, MPLS label, GTP tunnel and logical port). It can be used to locate the layer 2 connection and pertinent network devices for a particular CPE requesting the access transport resource.
NOTE 1 – This identifier may be used by the SCE when interacting with the RACE.	
NOTE 2 – Location information disclosure depends on the requesting application and the subscriber's privacy restrictions. Privacy restrictions are defined in the privacy indicator stored in the TLM-PE.	

6.2 Event registration

The event registration request information flow contains the following information (see Table 6-3)

Table 6-3 – Event registration request (SCE → TLM-PE)

Subscription duration	Duration for which the subscription for a particular event will be active.
Transport subscriber identifier (optional)	A globally unique identifier of the attached CPE.
Event	Event-Type (e.g., user logon event) and format for event relay/notification description.
Globally unique IP address information (optional)	A set of IP address information used for locating the access network in which the CPE is attached.
– Unique IP address	The IP address for identifying the attached CPE.
– Address realm	The addressing domain of the IP address (e.g., subnet prefix or VPN ID).
SCE identity (optional)	The identity of the requesting service control entity.

The event registration response information flow contains the following information (see Table 6-4).

Table 6-4 – Event registration response (TLM-PE → SCE)

Update action	Administrative action/information for an event: e.g., ACTIVATED (event registration successfully received and event notification for "Event" activated).
Transport subscriber identifier	A globally unique identifier for the attached CPE.
Event	Event-Type (e.g., user logon event)
Globally unique IP address information	A set of IP address information used for locating the access network in which the CPE is attached.
– Unique IP address	The IP address for identifying the attached CPE.
– Address realm	The addressing domain of the IP address (e.g., subnet prefix or VPN ID).

6.3 Notification event

The notification event request information flow contains the following information (see Table 6-5).

Table 6-5 – Notification event request (TLM-PE → SCE)

Globally unique IP address information	A set of IP address information used for locating the access network in which the CPE is attached.
– Unique IP address	The IP address for identifying the attached CPE.
– Address realm	The addressing domain of the IP address (e.g., subnet prefix or VPN ID).
Transport subscriber identifier	A globally unique identifier for the attached CPE.
Event	Event-Type (e.g., user logon event)

The notification event response information flow contains the following information (see Table 6-6).