International Telecommunication Union

ITU-T

TELECOMMUNICATION
STANDARDIZATION SECTOR
OF ITU

Q.3300

(01/2008)

SERIES Q: SWITCHING AND SIGNALLING

Signalling requirements and protocols for the NGN – Resource control protocols

Architectural framework for the Q.33xx series of Recommendations

Recommendation ITU-T Q.3300

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.3300

Architectural framework for the Q.33xx series of Recommendations

Summary

Recommendation ITU-T Q.3300 provides a framework by means of which the reader may understand the relationships between the various Recommendations of the Q.33xx series. It defines the entities involved in resource control signalling and the interfaces across which this signalling takes place. Appendix I provides a cross-reference between the interfaces defined in the main body of this Recommendation and the Recommendations defining the protocols operating across those interfaces.

Source

Recommendation ITU-T Q.3300 was approved on 23 January 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/.

CONTENTS

		Page
1	Scope	1
2	References	1
3	Definitions	1
4	Abbreviations	2
5	Conventions	2
6	Architectural specification	2
	6.1 The Y.2111 functional architecture	2
	6.2 Principles of mapping	3
	6.3 Implementations of functional entities	3
	6.4 Interfaces and protocols	4
Appendix I – Tabulation of resource control protocol Recommendations		5
Bibliography		6

Recommendation ITU-T Q.3300

Architectural framework for the Q.33xx series of Recommendations

1 Scope

This Recommendation specifies a concrete realization of the functional architecture defined in [ITU-T Y.2111], including the specification of the physical entities involved in resource control signalling, the interfaces across which signalling takes place, and the mapping between these entities and interfaces and the corresponding functional entities and reference points in [ITU-T Y.2111]. Appendix I provides a further mapping between the interfaces and the protocol specifications which realize those interfaces.

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.2111] Recommendation ITU-T Y.2111 (2006), *Resource and admission control functions in Next Generation Networks*.

3 Definitions

This Recommendation defines the following terms:

3.1 policy decision physical entity (PD-PE): A device that implements the policy decision functional entity (PD-FE) as defined in clause 7.2.3.2 of [ITU-T Y.2111].

3.2 transport resource control physical entity (TRC-PE): A device that implements the transport resource control functional entity (TRC-FE) as defined in clause 7.2.3.3 of [ITU-T Y.2111].

3.3 policy enforcement physical entity (PE-PE): A device that implements the policy enforcement functional entity (PE-FE) as defined in clause 7.2.4.1 of [ITU-T Y.2111].

NOTE – One example of such a device is a border router.

3.4 transport resource enforcement physical entity (TRE-PE): A device that implements the transport resource enforcement functional entity (TRC-FE) as defined in clause 7.2.4.2 of [ITU-T Y.2111].

3.5 network attachment control entity (NACE): A general term used to refer to a device exercising one of the network attachment control functions (NACF) as defined in clause 7.2.2 of [ITU-T Y.2111].

NOTE – These functions may be distributed over multiple devices, but identification of specific devices is unnecessary so long as the necessary information flows are supported over the Ru interface.

3.6 transport physical entity (T-PE): A term used to refer to any device implementing the transport functions in the limited sense provided in clause 7.2.4 of [ITU-T Y.2111] (i.e., those with which the RACF interacts).

4 Abbreviations

This Recommendation uses the following abbreviations:

FE Functional Entity

NACE Network Attachment Control Entity

NACF Network Attachment Control Function

PE Physical Entity

PD Policy Decision (Functional or Physical Entity)

PE Policy Enforcement (Functional or Physical Entity)

RACF Resource Admission and Control Function

SCE Service Control Entity (e.g., implementation of a P-CSCF)

SCF Service Control Functions (in the sense used in [ITU-T Y.2111])

TF Transport Functions (in the sense used in [ITU-T Y.2111])

T-PE Transport Physical Entity (e.g., a router)

TRC Transport Resource Control (Functional or Physical Entity)

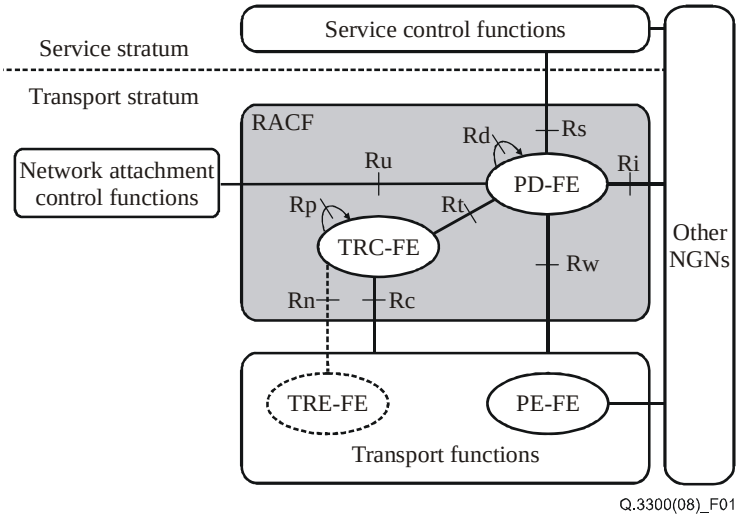
5 Conventions

None.

6 Architectural specification

6.1 The Y.2111 functional architecture

Figure 1 illustrates the RACF functional architecture defined in [ITU-T Y.2111].



Taken from Figure 5 of [ITU-T Y.2111].

Figure 1 – RACF functional architecture

The relevant functional entities are:

– the service control functions;

– the network attachment control functions;

– the policy decision functional entity (PD-FE) within the resource and admission control functions (RACF);
– the transport resource control functional entity (TRC-FE) within the RACF;
– the transport functions, which contain:
  • the policy enforcement functional entity (PE-FE);
  • the transport resource enforcement functional entity (TRE-FE) (for further study);
  • other functions.

6.2 Principles of mapping

The realization presented in this Recommendation accepts the considerations of scalability and domain independence that motivated the development of the functional architecture. As a result, it maps each functional entity of the functional architecture to a separate type of physical entity. Furthermore, each reference point is assumed to map to a separate interface. At a particular interface one protocol, from a set of recommended protocols, may be used. Because the mapping between reference points and interfaces is one-to-one, each interface is named after the reference point to which it corresponds (e.g., Rs interface corresponding to the Rs reference point).

Depending on the technology involved, it may well be that some of the physical entities identified in this Recommendation are combined. In such a case, each combined entity will support the combined set of external interfaces of its component elements. Note that interfaces that would lie between the component elements if they were separate are absorbed into the interior of the combined entity.

6.3 Implementations of functional entities

Table 1 indicates the mapping from the functional entities to the physical entities implementing them.

Table 1 – Mapping from functional to physical entities concerned with resource admission and control

Functional entity	Abbrev.	Physical entity	Abbrev.
Service control functions	SCF	Service control entity (e.g., implementation of P-CSCF)	SCE
Network attachment control functions	NACF	Network attachment control entity	NACE
Policy decision functional entity	PD-FE	Policy decision physical entity	PD-PE
Transport resource control functional entity	TRC-FE	Transport resource control physical entity	TRC-PE
Transport resource enforcement functional entity	TRE-FE	Transport resource enforcement physical entity	TRE-PE
Transport functions in general	TF	Transport physical entity (of various types, possibly limited by context)	T-PE
Policy enforcement functional entity	PE-FE	Policy enforcement physical entity	PE-PE

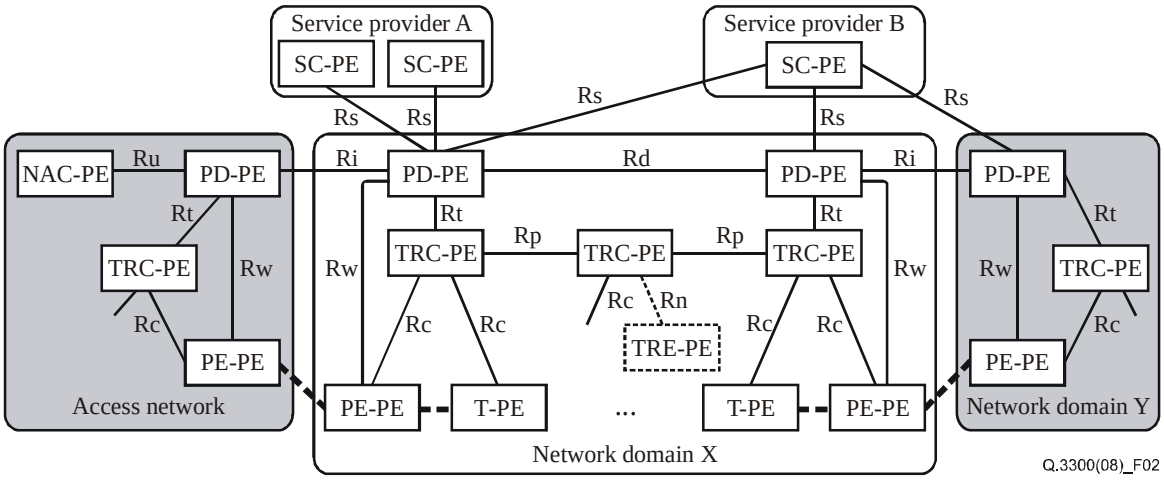
Clause 7.1 of [ITU-T Y.2111] implies a number of relationships between the physical entities named in Table 1. These relationships are listed here and illustrated in Figure 2 below:

– One PD-PE may serve SCE belonging to multiple service stratum service providers (where each SCE is individually owned by a particular service provider).
– Multiple PD-PEs within the same domain may be interconnected via the Rd interface.

– One PD-PE can communicate directly with one or several TRC-PEs belonging to the same network operator's domain, and a TRC-PE may communicate directly with multiple PD-PEs.

– A mode of operation is possible, whereby for a specific request for the allocation of QoS resources, the PD-PE contacts a single TRC-PE. That TRC-PE then communicates to other TRC-PE via the Rp interface as required to fulfil the request.

Figure 2 shows an example configuration of the physical entities identified in Table 1 and the interfaces between them. The actual configuration may vary according to the needs of the network operators concerned.



The heavy dashed lines denote packet flows.

NOTE – The Rn interface is for further study.

Figure 2 – Example physical realization of the RACF architecture

6.4 Interfaces and protocols

Appendix I provides a cross-reference between the interfaces defined in this Recommendation, the protocols used at those interfaces, and the Recommendations within which those protocols are documented.

Appendix I

Tabulation of resource control protocol Recommendations

(This appendix does not form an integral part of this Recommendation)

Table I.1 lists the protocol Recommendations applicable to each resource control interface specified in the body of this Recommendation.

Table I.1 – Resource control protocol Recommendations

Interface	Supporting entities	Protocol base (Note)	Rec. No.
Rs	SC-PE, PD-PE	Diameter	[b-ITU-T Q.3301.1]
Rp	Between TRC-PE	RCIP	[b-ITU-T Q.3302.1]
Rw	PD-PE, PE-PE	Introduction	[b-ITU-T Q.3303.0]
		COPS-PR	[b-ITU-T Q.3303.1]
		H.248	[b-ITU-T Q.3303.2]
		Diameter	[b-ITU-T Q.3303.3]
Rc	TRC-PE, T-PE	COPS-PR	[b-ITU-T Q.3304.1]
		SNMP	[b-ITU-T Q.3304.2]
Rt	PD-PE, TRC-PE	Diameter	[b-ITU-T Q.3305.1]
Rd	PD-PE to PD-PE (intra-domain)	To be selected	Q.3306.x
Ri	PD-PE to PD-PE (inter-domain)	To be selected	Q.3307.x
Rn	TRC-PE, TRE-PE	Interface is for further study	--

NOTE 1 – Diameter: [b-IETF RFC 3588].

NOTE 2 – COPS-PR: Common open policy service – Policy provisioning ([b-IETF RFC 2748] and [b-IETF RFC 3084]).

NOTE 3 – SNMP: Simple network management protocol ([b-IETF RFC 3410] and many others).

NOTE 4 – RCIP: Resource connection initiation protocol [b-ITU-T Q.3302.1].

Bibliography

[b-ITU-T Q.3301.1] Recommendation ITU-T Q.3301.1 (2007), *Resource control protocol No. 1 – Protocol at the Rs interface between service control entities and the policy decision physical entity*.

[b-ITU-T Q.3302.1] Recommendation ITU-T Q.3302.1 (2007), *Resource control protocol No. 2 – Protocol at the Rp interface between transport resource control physical entities*.

[b-ITU-T Q.3303.0] Recommendation ITU-T Q.3303.0 (2007), *Resource control protocol No. 3 – Protocols at the Rw interface between a policy decision physical entity (PD-PE) and a policy enforcement physical entity (PE-PE): Overview*.

[b-ITU-T Q.3303.1] Recommendation ITU-T Q.3303.1 (2007), *Resource control protocol No. 3 – Protocol at the interface between a Policy Decision Physical Entity (PD-PE) and a Policy Enforcement Physical Entity (PE-PE): COPS alternative*.

[b-ITU-T Q.3303.2] Recommendation ITU-T Q.3303.2 (2007), *Resource control protocol No. 3 – Protocol at the interface between a Policy Decision Physical Entity (PD-PE) and a Policy Enforcement Physical Entity (PE-PE) (Rw interface): H.248 alternative*.

[b-ITU-T Q.3303.3] Recommendation ITU-T Q.3303.3 (2008), *Resource control protocol No. 3 – Protocols at the Rw interface between a policy decision physical entity (PD-PE) and a policy enforcement physical entity (PE-PE): Diameter*.

[b-ITU-T Q.3304.1] Recommendation ITU-T Q.3304.1 (2007), *Resource control protocol No. 4 (rcp4) – Protocols at the Rc interface between a transport resource control physical entity (TRC-PE) and a transport physical entity (T-PE): COPS alternative*.

[b-ITU-T Q.3304.2] Recommendation ITU-T Q.3304.2 (2007), *Resource control protocol No. 4 (rcp4) – Protocols at the Rc interface between a transport resource control physical entity (TRC-PE) and a transport physical entity (T-PE): SNMP alternative*.

[b-ITUT Q.3305.1] Recommendation ITU-T Q.3305.1 (2008), *Resource control protocol No. 5 (RCP5) – Protocol at the interface between a transport resource control physical entity (TRC-PE) and a policy decision physical entity (PD-PE) (Rt interface): Diameter-based*.

[b-IETF RFC 2748] IETF RFC 2748 (2000), *The COPS (Common Open Policy Service) Protocol* <http://www.ietf.org/rfc/rfc2748.txt?number=2748>.

[b-IETF RFC 3084] IETF RFC 3084 (2001), *COPS Usage for Policy Provisioning (COPS-PR)* <http://www.ietf.org/rfc/rfc3084.txt?number=3084>.

[b-IETF RFC 3410] IETF RFC 3410 (2002), *Introduction and Applicability Statements for Internet Standard Management Framework* <http://www.ietf.org/rfc/rfc3410.txt?number=3410>.

[b-IETF RFC 3588] IETF RFC 3588 (2003), *Diameter Base Protocol*, <http://www.ietf.org/rfc/rfc3588.txt?number=3588>.

SERIES OF ITU-T RECOMMENDATIONS

Series A	Organization of the work of ITU-T
Series D	General tariff principles
Series E	Overall network operation, telephone service, service operation and human factors
Series F	Non-telephone telecommunication services
Series G	Transmission systems and media, digital systems and networks
Series H	Audiovisual and multimedia systems
Series I	Integrated services digital network
Series J	Cable networks and transmission of television, sound programme and other multimedia signals
Series K	Protection against interference
Series L	Construction, installation and protection of cables and other elements of outside plant
Series M	Telecommunication management, including TMN and network maintenance
Series N	Maintenance: international sound programme and television transmission circuits
Series O	Specifications of measuring equipment
Series P	Telephone transmission quality, telephone installations, local line networks
Series Q	**Switching and signalling**
Series R	Telegraph transmission
Series S	Telegraph services terminal equipment
Series T	Terminals for telematic services
Series U	Telegraph switching
Series V	Data communication over the telephone network
Series X	Data networks, open system communications and security
Series Y	Global information infrastructure, Internet protocol aspects and next-generation networks
Series Z	Languages and general software aspects for telecommunication systems

Printed in Switzerland
Geneva, 2008