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SERIES Q: SWITCHING AND SIGNALLING

Signalling requirements and protocols for the NGN – Resource control protocols

Architectural framework for the Q.332x series of Recommendations

Recommendation ITU-T Q.3320

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Recommendation ITU-T Q.3320

Architectural framework for the Q.332x series of Recommendations

Summary

Recommendation ITU-T Q.3320 provides a framework by means of which the reader may understand the relationships between the various Recommendations of the Q.332x series. It defines the entities involved in resource control signalling and the interfaces across which signalling occurs. 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.

History

Edition	Recommendation	Approval	Study Group
1.0	ITU-T Q.3320	2010-03-01	11

Keywords

Physical entity, RACF.

FOREWORD

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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

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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 table illustrating the mapping between these interfaces and the protocol specifications which realize those interfaces.

NOTE – [ITU-T Y.2111] (11/2008) is a Revision 1 of ITU-T Y.2111 (09/2006), which was the base for [b-ITU-T Q.3300].

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 (2008), *Resource and admission control functions in next generation networks*.

3 Definitions

3.1 Terms defined elsewhere

This Recommendation uses the following terms defined elsewhere:

3.1.1 network attachment control entity (NACE) [b-ITU-T Q.3300]: 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.

3.1.2 policy decision physical entity (PD-PE) [b-ITU-T Q.3300]: A device that implements the policy decision functional entity (PD-FE) as defined in clause 7.2.3.2 of [ITU-T Y.2111].

3.1.3 policy enforcement physical entity (PE-PE) [b-ITU-T Q.3300]: 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.

3.1.4 transport physical entity (T-PE) [b-ITU-T Q.3300]: 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).

3.1.5 transport resource control physical entity (TRC-PE) [b-ITU-T Q.3300]: 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].

3.1.6 transport resource enforcement physical entity (TRE-PE) [b-ITU-T Q.3300]: 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].

3.2 Terms defined in this Recommendation

This Recommendation defines the following term:

3.2.1 CPN gateway policy enforcement physical entity (CGPE-PE): A device that implements the CPN gateway policy enforcement functional entity (CGPE-FE) as defined in clause 7.2.4.2 of [ITU-T Y.2111].

4 Abbreviations and acronyms

This Recommendation uses the following abbreviations and acronyms:

CGPE	CPN Gateway Policy Enforcement
CPN	Customer Premises Network
FE	Functional Entity
NACE	Network Attachment Control Entity
NACF	Network Attachment Control Functions
PD-FE	Policy Decision Functional Entity
PD-PE	Policy Decision Physical Entity
PE	Physical Entity
RACF	Resource Admission and Control Function
SCE	Service Control Entity (e.g., implementation of a P-CSCF)
SCF	Service Control Functions (as used in [ITU-T Y.2111])
TF	Transport Functions (as used in [ITU-T Y.2111])
T-PE	Transport Physical Entity (e.g., a router)
TRC-FE	Transport Resource Control Functional Entity
TRC-PE	Transport Resource Control Physical Entity

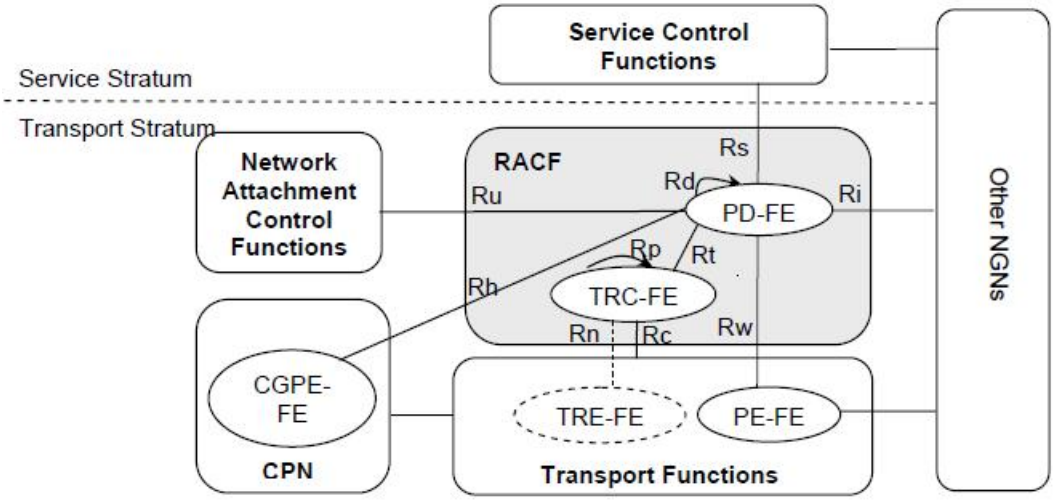
5 Conventions

None.

6 Architectural specification

6.1 ITU-T Y.2111 functional architecture

Figure 6-1 illustrates the RACF functional architecture defined in [ITU-T Y.2111].



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

Figure 6-1 – Generic resource and admission control functional architecture in NGN

The relevant functional entities are:

- SCF (service control functions)
- PD-FE (policy decision functional entity)
- TRC-FE (transport resource control functional entity)
- TRE-FE (transport resource enforcement functional entity)
- PE-FE (policy enforcement functional entity)
- CGPE-FE (CPN gateway policy enforcement functional entity)
- NACF (network attachment control 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, some of the physical entities identified in this Recommendation could be 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 6-1 indicates the mapping from the functional entities to the physical entities implementing them.

Table 6-1 – 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
CPN Gateway Policy Enforcement Functional Entity	CGPE-FE	CPN Gateway Policy Enforcement Physical Entity	CGPE-PE

Clause 7.1 of [ITU-T Y.2111] implies a number of relationships between the physical entities named in Table 6-1. These relationships are listed here and illustrated in Figure II.1 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. The TRC-PE then communicates to other TRC-PEs via the Rp interface as required to fulfil the request.

Appendix II contains an example of configuration of the physical entities identified in Table 6-1 and the interfaces between them.

6.4 Interfaces and protocols

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, is provided in Appendix I.

Appendix I

Tabulation of resource control protocol Recommendations

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

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

Table I.1 – Resource control protocol Recommendations

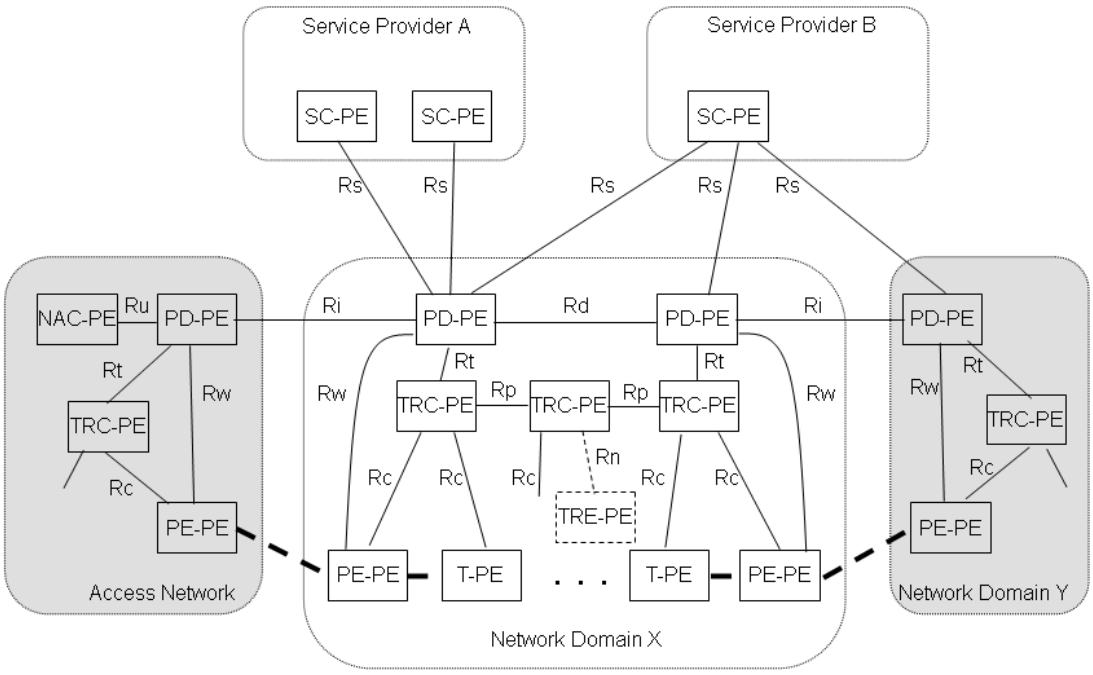
Interface	Supporting entities	Protocol base (Notes)	Rec. No.
Rs	SC-PE, PD-PE	Diameter	[b-ITU-T Q.3321.1]
Rp	Between TRC-PEs	RCIP	TBD
Rw	PD-PE, PE-PE	–	TBD
		COPS-PR	TBD
		H.248	TBD
		Diameter	TBD
Rc	TRC-PE, T-PE	COPS-PR	TBD
		SNMP	TBD
Rt	PD-PE, TRC-PE	Diameter	TBD
Rd	PD-PE to PD-PE (intra-domain)	Diameter	[b-ITU-T Q.3306.1]
Ri	PD-PE to PD-PE (inter-domain)	Diameter	[b-ITU-T Q.3307.1]
Rh	PD-PE to CGPE-PE	Interface is for further study	TBD
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], [b-IETF RFC 3084]). NOTE 3 – SNMP: Simple Network Management Protocol ([b-IETF RFC 3410] and others). NOTE 4 – RCIP: Resource Connection Initiation Protocol.			

Appendix II

Example of physical realization of the RACF architecture

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

Figure II.1 shows an example of the physical realization of entities identified in Table 6-1 and the interfaces between them. The actual configuration may vary according to the needs of the network operator(s) concerned.



The heavy dashed lines denote packet flows.
NOTE – The Rn interface is for further study.

Figure II.1 – Example physical realization of the RACF architecture

Bibliography

[b-ITU-T Q.3300] Recommendation ITU-T Q.3300 (2008), *Architectural framework for the Q.33xx series of Recommendations.*

[b-ITU-T Q.3321.1] Recommendation ITU-T Q.3321.1 (2010), *Resource control protocol No. 1, version 2 – Protocol at the Rs interface between service control entities and the policy decision physical entity*.

[b-ITU-T Q.3306.1] Recommendation ITU-T Q.3306.1 (2009), *Resource control protocol No. 6 (rcp6) – Protocol at the interface between intra-domain policy decision physical entities (PD-PE) (Rd interface)*.

[b-ITU-T Q.3307.1] Recommendation ITU-T Q.3307.1 (2009), *Resource control protocol No. 7 – Protocol at the interface between inter-domain policy decision physical entities (Ri interface)*.

[b-IETF RFC 2748] IETF RFC 2748 (2000), *The COPS (Common Open Policy Service) Protocol*.

[b-IETF RFC 3084] IETF RFC 3084 (2001), *COPS Usage for Policy Provisioning (COPS-PR)*.

[b-IETF RFC 3410] IETF RFC 3410 (2002), *Introduction and Applicability Statements for Internet Standard Management Framework*.

[b-IETF RFC 3588] IETF RFC 3588 (2003), *Diameter Base Protocol*.

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