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**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**

ITU-T Recommendation Q.3304.2

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ITU-T Recommendation Q.3304.2

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

Summary

ITU-T Recommendation Q.3304.2 specifies the profile of a variant of the resource control protocol no. 4 that uses SNMP at the Rc interface, i.e. between the Transport resource control physical entity (TRC-PE) and the Transport physical entity (T-PE) in the Resource and admission control functional block. This protocol operates across the Rc reference point, as defined in [ITU-T Recommendation Y.2111]. The interface is used for checking the network topology and resource status information of an access or a core network.

FOREWORD

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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.

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NOTE

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

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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

1   Scope

This Recommendation provides the Stage 3 technical specifications for a protocol variant which uses SNMP to satisfy the requirements for information transfer across the Rc reference point, as defined in clause 8.3 of [ITU-T Y.2111]. This protocol allows a Transport resource control physical entity (TRC-PE) to collect network topology and resource status information from elements of an access or a core 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 Q.3300]	ITU-T Recommendation Q.3300 (draft), *Architectural framework for the Q.33xx series of Recommendations*.
[ITU-T Y.2012]	ITU-T Recommendation Y.2012 (2006), *Functional requirements and architecture of the NGN release 1*.
[ITU-T Y.2111]	ITU-T Recommendation Y.2111 (2006), *Resource and admission control functions in Next Generation Networks*.
[IETF RFC 2578]	IETF RFC 2578 (1999), *Structure of Management Information Version 2 (SMIv2)*.
[IETF RFC 2579]	IETF RFC 2579 (1999), *Textual Conventions for SMIv2*.
[IETF RFC 3416]	IETF RFC 3416 (2002), *Version 2 of the Protocol Operations for the Simple Network Management Protocol (SNMP)*.
[IETF RFC 3417]	IETF RFC 3417 (2002), *Transport Mappings for the Simple Network Management Protocol (SNMP)*.
[IETF RFC 3418]	IETF RFC 3418 (2002), *Management Information Base (MIB) for the Simple Network Management Protocol (SNMP)*.
[IETF RFC 4789]	IETF RFC 4789 (2006), *Simple Network Management Protocol (SNMP) over IEEE 802 Networks*.

3 Definitions

3.1 Terms defined elsewhere

This Recommendation uses the following terms defined elsewhere:

3.1.1 transport resource control physical entity (TRC-PE) [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].

3.1.2 transport physical entity (T-PE) [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).

3.2 Terms defined in this Recommendation

None.

4 Abbreviations and acronyms

This Recommendation uses the following abbreviations and acronyms:

MIB	Management Information Base
NACE	Network Attachment Control Entity
OID	Object ID
PD-PE	Policy Decision Physical Entity
PE-PE	Policy Enforcement Physical Entity
SCE	Service Control Entity
SNMP	Simple Network Management Protocol
TRE-PE	Transport Resource Enforcement Physical Entity

5 Conventions

None.

6 Rc interface

The Rc interface allows a TRC-PE to collect network topology and resource status information about an access or a core network. The Rc interface is relevant to a T-PE at the network boundary or inside the network.

6.1 Rc reference model

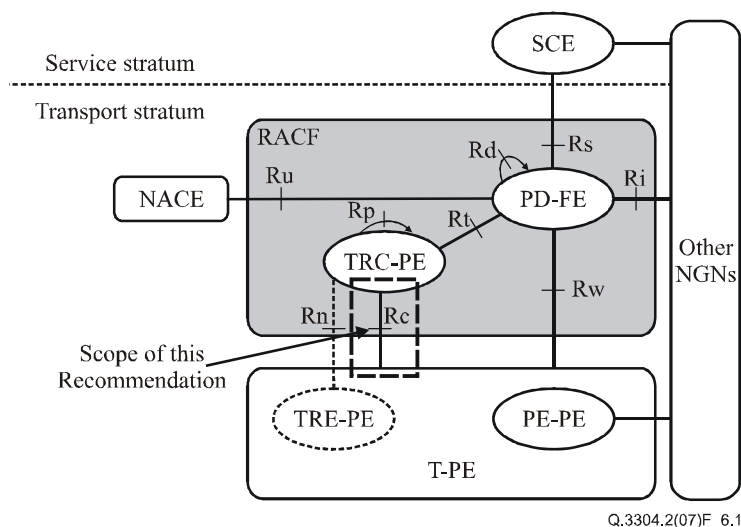The Rc interface, as shown in Figure 6-1, is defined between the TRC-PE and T-PE.

Figure 6-1 – Rc reference model

7 Protocol specification

SNMPv2 [IETF RFC 3416] shall apply to the Rc interface, where the TRC-PE acts as an SNMP manager and the transport elements are SNMP agents. The TRC-PE issues the SNMP-get (resource query message) to T-PE and collects the resource information by retrieving interface information. If a change has occurred in the operational status or administrative status at the interfaces of the T-PE, the change is reported by the SNMP-trap (resource state report message) issued by the T-PE, and then, the TRC-PE updates its resource information.

8 Protocols and messages

8.1 Resource query message

The TRC-PE collects interface information by issuing the SNMP-get to transport elements, as shown in [IETF RFC 3416]. The interface information to be retrieved corresponds to the OIDs under OID:1.3.6.1.2.1. The MIBs and OIDs associated with SNMP-get are shown in Appendix I.

8.2 Resource state report message

The change in the operational status at the interfaces of the transport element is reported to TRC-PE by SNMP-trap [IETF RFC 3416]. The generic SNMP-trap can be used for resource state report messages. SNMP-traps with generic trap Type 2 (linkDown) and generic trap Type 3 (linkUp) are utilized. The OIDs associated with SNMP-trap are shown in Appendix I.

9 Security considerations

There might be several possible security threats at the Rc interface, such as denial of service, message disclosure by unauthorized snooping, and unauthorized message creation and modification.

In general, an attacker can surreptitiously intercept information, attempt to create unauthorized information, and/or send modified or reordered information. There might be a risk that an attacker can impersonate an SNMP manager and illicitly acquire and tamper with the information. Even though the information is encrypted, a reply attack might be possible.

For these security threats, operators need to be aware that no sufficient authentication and encryption mechanisms are provided between SNMP manager (TRC-PE) and SNMP agents (T-PE) in the SNMP version 2 framework. To minimize the risk, the SNMP entity needs to be properly configured so that only authorized SNMP managers and agents can access and exchange information with each other. Particular attention to the credence and information integrity is necessary.

Therefore, the implementers are recommended to consider security features such as authentication and encryption mechanisms at the application level in the case where SNMP messages are open to an insecure domain to prevent possibilities of attacks from such a domain. At the same time, physical and/or logical SNMP traffic separation, packet filtering from an unauthorized SNMP manager (TRC-PE) and SNMP agents (T-PE) need to be considered by operators. Operators should note that a long-term solution would be to consider implementing the SNMP version 3 framework and its security control model described in [b-IETF RFC 3414] and [b-IETF RFC 3415]. However, that is outside of the scope of this Recommendation.

Appendix I

Management information base

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

Table I.1 – Management information base [b-IETF RFC 1213]

RFC	MIB Object					Type	Object Identifier
1213	mib-2						1.3.6.1.2.1
		System					1.3.6.1.2.1.1
			sysDescr			SCALAR	1.3.6.1.2.1.1.1
			sysObjectID			SCALAR	1.3.6.1.2.1.1.2
			sysName			SCALAR	1.3.6.1.2.1.1.5
		Interface					1.3.6.1.2.1.2
			ifTable			TABLE	1.3.6.1.2.1.2.2
				ifEntry		ENTRY	1.3.6.1.2.1.2.2.1
					ifIndex	TABULAR	1.3.6.1.2.1.2.2.1.1
					ifDescr	TABULAR	1.3.6.1.2.1.2.2.1.2
					ifType	TABULAR	1.3.6.1.2.1.2.2.1.3
					ifSpeed	TABULAR	1.3.6.1.2.1.2.2.1.5
					ifPhysAddress	TABULAR	1.3.6.1.2.1.2.2.1.6
					ifAdminStatus	TABULAR	1.3.6.1.2.1.2.2.1.7
					ifOperStatus	TABULAR	1.3.6.1.2.1.2.2.1.8

Table I.2 – Management information base [b-IETF RFC 4293]

RFC	MIB Object					Type	Object Identifier
4293	mib-2						1.3.6.1.2.1
		Ip					1.3.6.1.2.1.4
			ipv6IpForwarding			SCALAR	1.3.6.1.2.1.4.25
			ipAddressTable			TABLE	1.3.6.1.2.1.4.34
				ipAddressEntry		ENTRY	1.3.6.1.2.1.4.34.1
					ipAddressAddrType	TABULAR	1.3.6.1.2.1.4.34.1.1
					ipAddressAddr	TABULAR	1.3.6.1.2.1.4.34.1.2
					ipAddressIfIndex	TABULAR	1.3.6.1.2.1.4.34.1.3
					ipAddressPrefix	TABULAR	1.3.6.1.2.1.4.34.1.5

Table I.3 – Management information base [b-IETF RFC 2863]

RFC	MIB Object					Type	Object Identifier
2863	mib-2						1.3.6.1.2.1
		ifMIBObjects					1.3.6.1.2.1.31.1
			ifIXTable			TABLE	1.3.6.1.2.1.31.1.1
				ifIXEntry		ENTRY	1.3.6.1.2.1.31.1.1.1
					ifName	TABULAR	1.3.6.1.2.1.31.1.1.1.1
					ifHighSpeed	TABULAR	1.3.6.1.2.1.31.1.1.1.15
			ifStackTable			TABLE	1.3.6.1.2.1.31.1.2
				ifStackEntry		ENTRY	1.3.6.1.2.1.31.1.2.1
					ifStackStatus	TABULAR	1.3.6.1.2.1.31.1.2.1.3

Bibliography

[b-IETF RFC 1213]   IETF RFC 1213 (1991), *Management Information Base for Network Management of TCP/IP-based internets: MIB-II.*

[b-IETF RFC 2863]   IETF RFC 2863 (2000), *The Interfaces Group MIB.*

[b-IETF RFC 3414]   IETF RFC 3414 (2002), *User-based Security Model (USM) for version 3 of the Simple Network Management Protocol (SNMPv3).*

[b-IETF RFC 3415]   IETF RFC 3415 (2002), *View-based Access Control Model (VACM) for the Simple Network Management Protocol (SNMP).*

[b-IETF RFC 4293]   IETF RFC 4293 (2006), *Management Information Base for the Internet Protocol (IP).*

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