International Telecommunication Union

ITU-T

TELECOMMUNICATION
STANDARDIZATION SECTOR
OF ITU

Q.3910

(06/2010)

SERIES Q: SWITCHING AND SIGNALLING

Signalling requirements and protocols for the NGN – Testing for NGN networks

Parameters for monitoring NGN protocols

Recommendation ITU-T Q.3910

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Recommendation ITU-T Q.3910

Parameters for monitoring NGN protocols

Summary

Recommendation ITU-T Q.3910 defines the protocols for measuring and monitoring PSTN/ISDN emulation service (PES) and IP multimedia subsystem (IMS) solutions, including real-time transfer protocol/real-time transfer control protocol (RTP/RTCP), session initiation protocol (SIP), H.248/media gateway control protocol (H.248/MEGACO), signalling transport (SIGTRAN) and bearer independent call control (BICC). How to monitor these parameters is out of scope of this Recommendation.

History

Edition	Recommendation	Approval	Study Group
1.0	ITU-T Q.3910	2010-06-13	11

Keywords

Monitoring parameters, NGN protocols.

FOREWORD

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1 Scope

In order to effectively manage the resources provided by signalling over the NGN network, it is necessary to monitor and measure the present, and estimate the future performance, utilization and availability of these resources. Thus, NGN monitoring and measurement parameters standardization should be provided. This Recommendation defines the protocols for measuring and monitoring PSTN/ISDN emulation service (PES) and IP multimedia subsystem (IMS) solutions, including real-time transfer protocol/real-time transfer control protocol (RTP/RTCP), session initiation protocol (SIP), H.248/media gateway control protocol (H.248/MEGACO), signalling transport (SIGTRAN) and bearer independent call control (BICC). How to monitor and measure these parameters is out of the scope of this Recommendation.

2 References

The following ITU-T Recommendations and other references contain provisions which, through references 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 H.248.1] Recommendation ITU-T H.248.1 (2005), *Gateway control protocol: Version 3*.

[ITU-T Q.752] Recommendation ITU-T Q.752 (1997), *Monitoring and measurements for Signalling System No. 7 networks*.

[ITU-T Q.3902] Recommendation ITU-T Q.3902 (2008), *Operational parameters to be monitored when implementing NGN technical means in public telecommunication networks*.

3 Definitions

None.

4 Abbreviations

This Recommendation uses the following abbreviations and acronyms:

ACM Address Complete Message

ANM Answer Message

APM Application Transport

BICC Bearer Independent Call Control

CFN Confusion

CGB Circuit/CIC Group Blocking

CGBA Circuit/CIC Group Blocking Acknowledgement

CGU Circuit/CIC Group Unblocking

CGUA	Circuit/CIC Group Unblocking Acknowledgement
CIC	Circuit Identifier Code
CON	Connect
COT	Continuity
CPG	Call Progress
CQM	Circuit/CIC group Query Message
CQR	Circuit/CIC group Query Response
CRG	Charge information
FAA	Facility Accepted
FAC	Facility
FAR	Facility Request
FOT	Forward Transfer
FRJ	Facility Reject
GRA	Circuit/CIC Group Reset Acknowledgement
GRS	Circuit/CIC Group Reset
IAM	Initial Address Message
IDR	Identification Request
IMS	IP Multimedia Subsystem
INF	Information
INR	Information Request
IP	Internet Protocol
IRS	Identification Response
IUA	ISDN User Adaptation layer
LOP	Loop Prevention
M2UA	MTP 2 User Adaptation layer
M2PA	MTP2 User Peer-to-Peer Adaptation Layer
M3UA	MTP 3 User Adaptation layer
MG	Media Gateway
MGC	Media Gateway Controller
MEGACO	Media Gateway Control protocol
MTP	Message Transfer Part
NGN	Next Generation Network
NMS	NGN Management System
NRM	Network Resource Management
PES	PSTN/ISDN Emulation Service
PS	Packet Switching (network)
PRI	Pre-Release Information

REL Release
RES Resume
RLC Release Complete
RSC Reset Circuit/CIC
RTCP Real-time Transfer Control Protocol
RTP Real-time Transfer Protocol
SAM Subsequent Address Message
SCCP Signalling Connection Control Part
SCTP Session Control Transfer Protocol
SDM Subsequent Directory Number
SGM Segmentation
SIGTRAN Signalling Transport
SIP Session Initiation Protocol
SLA Service Level Agreement
SLS Service Level Specification
SNMP Simple Network Management Protocol
SS7 Signalling System No. 7
SUA SCCP User Adaptation
SUS Suspend
TM Technical Means
UCIC Unequipped Circuit Identification Code
URI Uniform Resource Identifier
V5UA V5.2-User Adaptation layer
UAL User Adaptation Layer
USR User-to-user information

5 Conventions

The NGN monitoring system is based on the evolution on the SS7 monitoring principles. According to [ITU-T Q.752], the following categories regarding the measured values should be defined in the NMS based on PES and IMS solutions:

– **fault (F)**: Measurement for reporting processes and detecting problems, as well as for finding out some abnormal situations in the SS7, SIP and H.248/MEGACO signalling networks, and for NGN hardware, involving its reconfiguring and restarting procedures;

– **quality (Q)**: Measurement for service level parameters intended for different traffic types involving voice and video under different services; for reporting processes; for assuming measures in providing the guaranteed service level, as well as for developing an operator's policy and strategy for providing a certain service level. It should be also used to have the SLA and/or SLS performed and relevant reports drawn up;

– **traffic (T)**: Measurement for real-time traffic parameters based on IP-flow information for the purpose of identifying any unwanted or unauthorized traffic; studying any inside and

outside impacts on network security; detecting any network abnormal events; defining the requested user-to-user, user-to-network or network-to-user interaction parameters; studying traffic changes trends; and conducting prevention management;

– **accounting (A)**: Measurement for providing accounting and estimation data reliability by comparison;

– **network administration and planning (N)**: Measurement for SS7 and NGN networks administration including the SIP and H.248/MEGACO signalling systems; making decisions on network development and network planning; optimizing network infrastructure enhancement investment; planning applications and services; preparing traffic data to have the network further designed;

– **near-real-time measurements (R)**: Measurement for detecting any faults in the network. It may be considered supplementary to the above-mentioned measurements.

6 Reference model

According to [ITU-T Q.3902], signalling system monitoring subsystems shall be independent of a vendor's NGN TM (for example, MGC, PS, MG). In order to gather and initially process any other subsystems information, the vendor's NGN TM management systems shall be used. SNMP or NetFlow may be used as the interaction protocol among the monitoring system central elements. The message format shall be specified by telecommunication administrations.

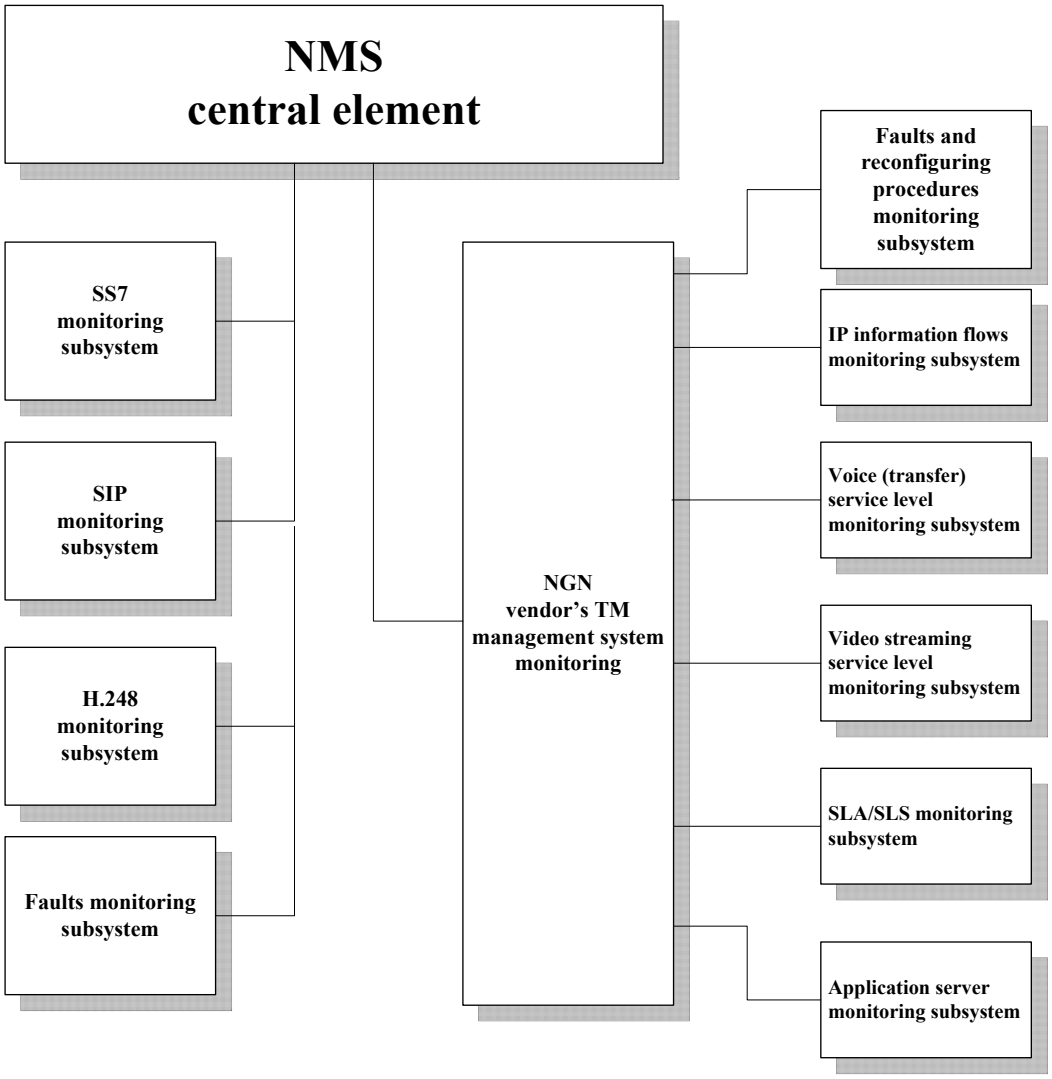

Figure 1 – Basic architecture of NMS [ITU-T Q.3902]

7 RTP/RTCP monitoring and measurement parameters

7.1 General

RTP/RTCP performance, availability and utilization mostly depend on the IP network. RTP/RTCP node status, faults and quality, availability, and utilization indicators are detailed in Tables 1, 2, 3 and 4, respectively.

The 'Usage' column indicates the categories applicable to each parameter.

The 'Interval' column indicates the duration of each parameter.

The 'Units' column is used to indicate the registration items applied at the interval.

The 'Mandatory' column indicates those parameters which must be provided.

7.2 Parameters for RTP/RTCP node status

The following parameters give status information of RTP/RTCP node. The comparison of several parameters might give additional information.

– Item 1.1 indicates the duration of unavailability of the destination node.

– Items 1.2 and 1.3 indicate, respectively, the start and the end of the destination's unavailability.

Table 1 – RTP/RTCP node status parameters

Item	Description of parameters	Units	Usage	Interval	Mandatory
1.1	Duration of the destination node's unavailability	second/node	F, T, N	60 min	Yes
1.2	Start of 1.1	event/node	F, R	On occurrence	Yes
1.3	End of 1.1	event/node	F, R	On occurrence	Yes

7.3 Parameters for RTP/RTCP fault and quality

The most probable failure or poor performance reasons are listed as follows. In some cases, other reasons might apply. The comparison of several parameters might give additional information.

– Item 2.1 indicates packet loss rate in one direction.

– Item 2.2 indicates the maximum packet delay in one direction.

– Item 2.3 indicates the variety of packet delay.

– Item 2.4 indicates the rate of the error packets in the monitored duration.

– Item 2.5 indicates the rate of supposititicus packets in the monitored duration.

Table 2 – RTP/RTCP fault and quality parameters

Item	Description of parameters	Units	Usage	Interval	Mandatory
2.1	One way packet loss rate	1/destination	F, Q	1 min	Yes
2.2	One way delay	millisecond/destination	Q	5 min	Yes
2.3	Jitter	millisecond/destination	Q	5 min	Yes
2.4	Error packet rate	1/destination	F, Q	1 min	Yes
		1/node	F, Q	1 min	Yes
2.5	Supposititicus packet rate	1/destination	Q	5 min	Yes
		1/node	Q	5 min	Yes

7.4 Parameters for RTP/RTCP availability

– Item 3.1 indicates the duration of the RTP/RTCP destination availability.

– Item 3.3 can be derived from 3.2.

Table 3 – RTP/RTCP availability parameters

Item	Description of parameters	Units	Usage	Interval	Mandatory
3.1	RTP/RTCP availability rate	1/node	F	60 min	No
		1/destination	F	60 min	No
3.2	Duration of the destination's availability	second/destination	F	60 min	No
3.3	Duration of the destination's unavailability	second/destination	F	60 min	Yes
3.4	Total number of bytes received	bytes/destination	T	30 min	No
		bytes/node	T	30 min	No

7.5 Parameters for bandwidth utilization

– Item 4.1 indicates the used bandwidth of RTP/RTCP for one node.

– Item 4.2 indicates the maximum available bandwidth used for RTP/RTCP in the bandwidth pipe, based on the destination.

– Item 4.3 indicates the minimum available bandwidth used for RTP/RTCP in the bandwidth pipe, based on the destination.

– Item 4.4 indicates the mean value of the available bandwidth used for RTP/RTCP in the bandwidth pipe, based on the destination.

Table 4 – Bandwidth utilization parameters

Item	Description of parameters	Units	Usage	Interval	Mandatory
4.1	Maximum available bandwidth, based on the node	bit/s/node	T, N	60 min	Yes
4.2	Maximum available bandwidth pipe, based on one destination	bit/s/destination	T, N	60 min	Yes
4.3	Minimum available bandwidth pipe, based on one destination	bit/s/destination	T, N	60 min	No
4.4	Mean available bandwidth pipe, based on one destination	bit/s/destination	T, N	60 min	No

8 SIP monitoring and measurements parameters

8.1 General

Table 5 defines the SIP node status (adjacent node accessibility, routing performance) parameters.

Table 6 defines the SIP availability parameters.

Table 7 defines the SIP signalling utilization parameters.

Table 8 defines the SIP fault and quality parameters.

The 'Usage' column indicates the categories applicable to each parameter.

The 'Interval' column indicates the duration of each parameter.

The 'Units' column is used to indicate the registration items applied at the interval.

The 'Mandatory' column indicates those parameters which must be provided.

8.2 Parameters for SIP node status

The following parameters give status information of SIP nodes. The comparison of several parameters might give additional information.

– Item 5.1 indicates the duration of unavailability of the destination node.

– Item 5.4 indicates the number of the messages discarded due to the transmission error.

Table 5 – SIP node status parameters

Item	Description of parameters	Units	Usage	Interval	Mandatory
5.1	Duration of the destination node's unavailability	second/node	F, R, N	60 min	Yes
5.2	Start of 5.1	event/node	F, R	On occurrence	Yes
5.3	End of 5.1	event/node	F, R	On occurrence	Yes
5.4	Total number of messages discarded due to the transmission error	message/node	N, F	60 min	Yes

8.3 Parameters for SIP availability

– Item 6.1 indicates the SIP node availability rate.

– Items 6.2 and 6.3 indicate the duration of the SIP node availability and unavailability.

– Items 6.4 and 6.5 indicate the total number of bytes the SIP node received and sent.

Table 6 – SIP availability parameters

Item	Description of parameters	Units	Usage	Interval	Mandatory
6.1	SIP availability rate	1/node	F	60 min	No
6.2	Duration of availability	second/port	F	60 min	No
6.3	Duration of unavailability	second/port	F	60 min	Yes
6.4	The total number of bytes received	bytes/port	T	30 min	No
		bytes/node	T	30 min	No
6.5	The total number of bytes sent	bytes/port	F	30 min	Yes
		bytes/node	F	30 min	Yes
6.6	Start of unavailability	event/port	F, R	On occurrence	Yes
6.7	End of unavailability	event/port	F, R	On occurrence	Yes

8.4 Parameters for SIP signalling utilization

– Items 7.1 and 7.2 indicate the total number of SIP registration requests sent and received.

– Items 7.3 and 7.4 indicate the total number of SIP session requests sent and received.

– Items 7.5 to 7.16 indicate the total number of sent and received response messages.

– Items 7.17 and 7.18 indicate the total number of responses to session requests and session completed.

– Items 7.19 and 7.20 indicate the total number of unanswered requests.
– Items 7.21 and 7.22 indicate the total number of responses sent and received.

Table 7 – SIP signalling utilization parameters

Item	Description of parameters	Units	Usage	Interval	Mandatory
7.1	Total number of SIP registration requests sent	message/node	T, R, F	15 min	Yes
7.2	Total number of SIP registration requests received	message/node	T, R	15 min	Yes
7.3	Total number of SIP session requests sent	message/node	T, N	15 min	Yes
7.4	Total number of SIP session requests received	message/node	T, N	15 min	Yes
7.5	Total number of 1xx messages sent	message/node	T, N	15 min	No
7.6	Total number of 1xx messages received	message/node	T, N	15 min	No
7.7	Total number of 2xx messages sent	message/node	T, N	15 min	No
7.8	Total number of 2xx messages received	message/node	T, N	15 min	No
7.9	Total number of 3xx messages sent	message/node	T, N	15 min	No
7.10	Total number of 3xx messages received	message/node	T, N	15 min	No
7.11	Total number of 4xx messages sent	message/node	T, N	15 min	Yes
7.12	Total number of 4xx messages received	message/node	T, N	15 min	Yes
7.13	Total number of 5xx messages sent	message/node	T, N	30 min	Yes
7.14	Total number of 5xx messages received	message/node	T, N	30 min	Yes
7.15	Total number of 6xx messages sent	message/node	T, N	60 min	Yes
7.16	Total number of 6xx messages received	message/node	T, N	60 min	Yes
7.17	Total number of responses to session requests	message/node	T, N	15 min	Yes
7.18	Total number of responses to session complete	message/node	T, N	15 min	Yes
7.19	Total number of unanswered responses to session requests	message/node	T, N	15 min	Yes
7.20	Total number of unanswered responses to session complete	message/node	T, N	15 min	Yes
7.21	Total number of responses sent	message/node	T, N	15 min	Yes
7.22	Total number of responses received	message/node	T, N	15 min	Yes

8.5 Parameters for SIP fault and quality

– Items 8.1, 8.2 and 8.3 indicate the delay of request messages.

– Item 8.4 indicates the total number of failing transactions.

– Item 8.5 indicates the total number of transactions.

– Item 8.6 indicates the total number of received messages with unsupported URIs.

– Item 8.7 indicates the total number of re-sent responses.

– Items 8.8 to 8.10 respectively indicate the total number of the re-sent messages for three different requests.

Table 8 – SIP fault and quality parameters

Item	Description of parameters	Units	Usage	Interval	Mandatory
8.1	Mean delay of registration requests	second/node	T, R, Q, N	15 min	Yes
8.2	Mean delay of session requests	second/node	T, R, Q, N	15 min	Yes
8.3	Mean delay of session disconnects	second/node	T, R, Q, N	15 min	Yes
8.4	Total number of failing transactions	event/node	F, Q, R	15 min	Yes
8.5	Total number of transactions	event/node	T, N	15 min	Yes
8.6	Total number of messages with unsupported URIs received	message/node	F, R	15 min	Yes
8.7	Total number of responses re-sent	message/node	F, R	15 min	Yes
8.8	Total number of REGISTER requests re-sent	message/node	F, R	15 min	Yes
8.9	Total number of CANCEL requests re-sent	message/node	F, R	15 min	Yes
8.10	Total number of BYE requests re-sent	message/node	F, R	15 min	Yes

9 H.248/MEGACO monitoring and measurement parameters

9.1 General

Table 9 defines the H.248/MEGACO [ITU-T H.248] node status parameters.

Table 10 defines the H.248/MEGACO availability parameters.

Table 11 defines H.248/MEGACO utilization parameters.

Table 12 defines H.248/MEGACO service parameters.

The 'Usage' column indicates the categories applicable to each parameter.

The 'Interval' column indicates the duration of each parameter.

The 'Units' column is used to indicate the registration items applied at the interval.

The 'Mandatory' column indicates those parameters which must be provided.

9.2 Parameters for H.248/MEGACO node status

The following parameters give the most probable H.248/MEGACO failure reasons. In some cases, other reasons might apply. The comparison of several parameters might give additional information.

– Item 9.1 indicates the duration of unavailability of the destination node.

– Item 9.4 indicates the total number of messages discarded due to the transmission error.

Table 9 – H.248/MEGACO node status parameters

Item	Description of parameters	Units	Usage	Interval	Mandatory
9.1	Duration of the destination node's unavailability	second/node	F, R, N	60 min	Yes
9.2	Start of 9.1	event/node	F, R	On occurrence	Yes
9.3	End of 9.1	event/node	F, R	On occurrence	Yes
9.4	Total number of messages discarded due to the transmission error	message/node	N, F	60 min	Yes

9.3 Parameters for H.248/MEGACO availability

– Item 10.1 indicates the H.248/MEGACO node availability rate.

– Items 10.2 and 10.3 indicate the duration of availability and unavailability of the interfaces.

– Items 10.4 and 10.5 indicate the total number of bytes the interface received and sent.

Table 10 – H.248/MEGACO availability parameters

Item	Description of parameters	Units	Usage	Interval	Mandatory
10.1	Local MEGACO availability rate	1/node	T, F, N	60 min	No
10.2	Duration of local availability	second/node	T, N	60 min	No
10.3	Duration of local unavailability	second/node	F, R	60 min	Yes
10.4	Total number of bytes received	bytes/node	T, N	30 min	Yes
10.5	Total number of bytes sent	bytes/node	T, N	30 min	Yes
10.6	Start of local unavailability	event/node	F, R	On occurrence	Yes
10.7	End of local unavailability	event/node	F, R	On occurrence	Yes

9.4 Parameters for H.248/MEGACO utilization

– Items 11.1 and 11.2 indicate the total number of pending messages sent and received.

– Items 11.3 and 11.4 indicate the total number of requests sent and received.

– Items 11.5 and 11.6 indicate the total number of replies sent and received.

– Item 11.7 indicates the total number of responses not received. This can be calculated from Items 11.1, 11.2 and 11.6.

Table 11 – H.248/MEGACO utilization parameters

Item	Description of parameters	Units	Usage	Interval	Mandatory
11.1	Total number of pending sent	message/node	T, N	15 min	Yes
11.2	Total number of pending received	message/node	T, N	15 min	Yes
11.3	Total number of requests sent	message/node	T, N	15 min	Yes
11.4	Total number of requests received	message/node	T, N	15 min	No
11.5	Total number of replies sent	message/node	T, N	15 min	No
11.6	Total number of replies received	message/node	T, N	15 min	Yes
11.7	Total number of requests that did not receive responses	message/node	F, R	15 min	Yes

9.5 Parameters for the quality of the H.248/MEGACO service

– Item 12.1 indicates the total number of MGC messages sent.
– Item 12.2 indicates the total number of MG messages received.
– Items 12.3 and 12.4 indicate the total number of requests sent and received.
– Items 12.5 and 12.6 indicate the one way delay of requests and replies.

Table 12 – Quality of H.248/MEGACO service parameters

Item	Description of parameters	Units	Usage	Interval	Mandatory
12.1	Total number of MGC messages sent	message/node	T, N	30 min	Yes
12.2	Total number of MG messages received	message/node	T, N	30 min	Yes
12.3	Total number of requests sent	message/node	T, N	30 min	Yes
12.4	Total number of requests received	message/node	T, N	30 min	Yes
12.5	One way delay of requests	second/node	Q	5 min	Yes
12.6	One way delay of replies	second/node	Q	5 min	Yes

10 SIGTRAN monitoring and measurement parameters

10.1 General

Table 13 defines the parameters related to the SIGTRAN node status.

Table 14 defines SCTP association availability parameters.

Table 15 defines the SIGTRAN utilization parameters.

Table 16 defines the SIGTRAN fault and quality parameters.

The 'Usage' column indicates the categories applicable to each parameter.

The 'Interval' column indicates the duration of each parameter.

The 'Units' column is used to indicate the registration items applied at the interval.

The 'Mandatory' column indicates those parameters which must be provided.

10.2 Parameters for SIGTRAN node status

Table 13 – SIGTRAN node status parameters

Item	Description of parameters	Units	Usage	Interval	Mandatory
13.1	Duration of the endpoint's inaccessibility	second/node	F	60 min	Yes
13.2	Start of 13.1	event/node	F, R	On occurrence	No
13.3	End of 13.1	event/node	F, R	On occurrence	No
13.4	Total number of SCTP packets discarded due to the transmission error	packet/node	N, F, R	30 min	Yes

10.3 Parameters for SCTP association availability

Table 14 – SCTP association availability parameters

Item	Description of parameters	Units	Usage	Interval	Mandatory
14.1	SCTP association availability rate	1/association	F	60 min	No
14.2	Duration of SCTP association's availability	second/association	F	60 min	No
14.3	Duration of SCTP association's unavailability	second/association	F, R	60 min	Yes
14.4	Duration of SCTP association	second/association	F	60 min	Yes
14.5	Duration of the association connection's failure due to loss of communication	second/association	F, R	60 min	No
14.6	Duration of the association connection's failure due to the communication error	second/association	F, R	60 min	No
14.7	Start of 14.5	event/association	F, R	On occurrence	No
14.8	End of 14.5	event/association	F, R	On occurrence	No
14.9	Start of 14.6	event/association	F, R	On occurrence	No
14.10	End of 14.6	event/association	F, R	On occurrence	No
14.11	Total number of bytes received by SCTP	bytes/association	T, N	30 min	No
14.12	Total number of bytes sent by SCTP	bytes/association	T, N	30 min	No

10.4 Parameters for SIGTRAN utilization

Table 15 – SIGTRAN utilization parameters

Item	Description of parameters	Units	Usage	Interval	Mandatory
15.1	Total number of SCTP packets sent	packet/node	T, N	30 min	Yes
		packet/association	T	30 min	Yes
15.2	Total number of SCTP packets received	packet/node	T, N	30 min	Yes
		packet/association	T	30 min	Yes
15.3	Total number of sent SCTP packets with payload data	packet/node	T, N	30 min	Yes
		packet/association	T	30 min	Yes
15.4	Total number of received SCTP packets with payload data	packet/node	T, N	30 min	Yes
		packet/association	T	30 min	Yes
15.5	Total number of sent packets with M2UA	packet/node	T, N	30 min	No
		packet/association	T	30 min	No
15.6	Total number of received packets with M2UA	packet/node	T, N	30 min	No
		packet/association	T	30 min	No
15.7	Total number of sent packets with M2PA	packet/node	T, N	30 min	No
		packet/association	T	30 min	No
15.8	Total number of received packets with M2PA	packet/node	T, N	30 min	No
		packet/association	T	30 min	No
15.9	Total number of sent packets with SUA	packet/node	T, N	30 min	No
		packet/association	T	30 min	No
15.10	Total number of received packets with SUA	packet/node	T, N	30 min	No
		packet/association	T	30 min	No
15.11	Total number of sent packets with IUA	packet/node	T, N	30 min	No
		packet/association	T	30 min	No
15.12	Total number of received packet with IUA	packet/node	T, N	30 min	No
		packet/association	T	30 min	No
15.13	Total number of sent packets with M3UA	packet/node	T, N	30 min	No
		packet/association	T	30 min	No
15.14	Total number of received packets with M3UA	packet/node	T, N	30 min	No
		packet/association	T	30 min	No
15.15	Total number of sent packets with V5UA	packet/node	T, N	30 min	No
		packet/association	T	30 min	No
15.16	Total number of received packets with V5UA	packet/node	T, N	30 min	No
		packet/association	T	30 min	No

10.5 Parameters for SIGTRAN fault

Table 16 – SIGTRAN fault parameters

Item	Description of parameters	Units	Usage	Interval	Mandatory
16.1	Failure caused by the SCTP association	event/association	F, R	On occurrence	Yes
16.2	Failure due to the IUA connection	event/association	F, R	On occurrence	No
16.3	Failure due to the SUA connection	event/association	F, R	On occurrence	No
16.4	Failure due to the M2UA connection	event/association	F, R	On occurrence	No
16.5	Failure due to the M2PA connection	event/association	F, R	On occurrence	No
16.6	Failure due to the M3UA connection	event/association	F, R	On occurrence	No
16.7	Total number of failing transactions	event/association	F	30 min	Yes
		event/node	F, N	30 min	Yes
16.8	Total number of IUA messages re-sent	message/association	F	30 min	No
		message/node	F, N	30 min	No
16.9	Total number of SUA messages re-sent	message/association	F	30 min	No
		message/node	F, N	30 min	No
16.10	Total number of M2UA messages re-sent	message/association	F	30 min	No
		message/node	F, N	30 min	No
16.11	Total number of M2PA messages re-sent	message/association	F	30 min	No
		message/node	F, N	30 min	No
16.12	Total number of M3UA messages re-sent	message/association	F	30 min	No
		message/node	F, N	30 min	No
16.13	Total number of IUA responses re-sent	message/association	F	30 min	No
		message/node	F, N	30 min	No
16.14	Total number of SUA responses re-sent	message/association	F	30 min	No
		message/node	F, N	30 min	No
16.15	Total number of M2UA responses re-sent	message/association	F	30 min	No
		message/node	F, N	30 min	No
16.16	Total number of M2PA responses re-sent	message/association	F	30 min	No
		message/node	F, N	30 min	No
16.17	Total number of M3UA responses re-sent	message/association	F	30 min	No
		message/node	F, N	30 min	No
16.18	Total number of V5UA responses re-sent	message/association	F	30 min	No
		message/node	F, N	30 min	No

Table 16 – SIGTRAN fault parameters

Item	Description of parameters	Units	Usage	Interval	Mandatory
16.19	Total number of UAL messages re-sent	message/association	F	30 min	Yes
		message/node	F, N	30 min	Yes
16.20	Total number of UAL responses re-sent	message/association	F	30 min	Yes
		message/node	F, N	30 min	Yes

11 BICC monitoring and measurement parameters

11.1 General

Table 17 defines the BICC node status parameters.

Table 18 defines BICC node availability parameters.

Table 19 defines the BICC signalling utilization parameters.

Table 20 defines the BICC fault and quality parameters.

The 'Usage' column indicates the categories applicable to each parameter.

The 'Interval' column indicates the duration of each parameter.

The 'Units' column is used to indicate the registration items applied at the interval.

The 'Mandatory' column indicates those parameters which must be provided.

11.2 Parameters for BICC node status

The following parameters give the most probable BICC failure reasons. In some cases, other reasons might apply. The comparison of several measurements might give additional information.

– Item 17.1 indicates the duration of unavailability of the destination node.

– Item 17.4 indicates the total number of messages discarded due to the transmission error.

Table 17 – BICC node status parameters

Item	Description of parameters	Units	Usage	Interval	Mandatory
17.1	Duration of the destination node's unavailability	second/node	F, R, N	60 min	Yes
17.2	Start of 17.1	event/node	F, R	On occurrence	Yes
17.3	End of 17.1	event/node	F, R	On occurrence	Yes
17.4	Total number of message discarded due to the transmission error	message/node	N, F	60 min	Yes

11.3 Parameters for BICC availability

– Item 18.1 indicates the BICC node availability rate.

– Items 18.2 and 18.3 indicate the duration of BICC node availability and unavailability.

– Items 18.4 to 18.7 indicate the total number of bytes and messages the node received and sent.

Table 18 – BICC availability parameters

Item	Description of parameters	Units	Usage	Interval	Mandatory
18.1	BICC availability rate	1/node	F	60 min	No
18.2	Duration of availability	second/node	F	60 min	No
18.3	Duration of unavailability	second/node	F	60 min	Yes
18.4	Total number of bytes received	bytes/node	T	30 min	No
18.5	Total number of messages received	message/node	T	30 min	No
18.6	Total number of bytes sent.	bytes/node	F	30 min	Yes
18.7	Total number of messages sent	message/node	T	30 min	Yes
18.8	Start of unavailability	event/node	F, R	On occurrence	Yes
18.9	End of unavailability	event/node	F, R	On occurrence	Yes

11.4 Parameters for BICC signalling utilization

– Items 19.1 to 19.78 indicate the total number of some important BICC messages sent and received.

Table 19 – BICC signalling utilization parameters

Item	Description of parameters	Units	Usage	Interval	Mandatory
19.1	Total number of IAM messages sent	message/node	T, N	60 min	Yes
19.2	Total number of IAM messages received	message/node	T, N	60 min	Yes
19.3	Total number of ACM messages sent	message/node	T, N	60 min	Yes
19.4	Total number of ACM messages received	message/node	T, N	60 min	Yes
19.5	Total number of ANM messages sent	message/node	T, N	60 min	Yes
19.6	Total number of ANM messages received	message/node	T, N	60 min	Yes
19.7	Total number of REL messages sent	message/node	T, N	60 min	Yes
19.8	Total number of REL messages received	message/node	T, N	60 min	Yes
19.9	Total number of RLC messages sent	message/node	T, N	60 min	Yes
19.10	Total number of RLC messages received	message/node	T, N	60 min	Yes
19.11	Total number of APM messages sent	message/node	T, N	60 min	No
19.12	Total number of APM messages received	message/node	T, N	60 min	No
19.13	Total number of CPG messages sent	message/node	T, N	60 min	No
19.14	Total number of CPG messages received	message/node	T, N	60 min	No
19.15	Total number of CGB messages sent	message/node	T, N	60 min	No
19.16	Total number of CGB messages received	message/node	T, N	60 min	No
19.17	Total number of CGBA messages sent	message/node	T, N	60 min	No
19.18	Total number of CGBA messages received	message/node	T, N	60 min	No
19.19	Total number of CQM messages sent	message/node	T, N	60 min	No
19.20	Total number of CQM messages received	message/node	T, N	60 min	No
19.21	Total number of CQR messages sent	message/node	T, N	60 min	No
19.22	Total number of CQR messages received	message/node	T, N	60 min	No
19.23	Total number of GRS messages sent	message/node	T, N	60 min	No

Table 19 – BICC signalling utilization parameters

Item	Description of parameters	Units	Usage	Interval	Mandatory
19.24	Total number of GRS messages received	message/node	T, N	60 min	No
19.25	Total number of GRA messages sent	message/node	T, N	60 min	No
19.26	Total number of GRA messages received	message/node	T, N	60 min	No
19.27	Total number of CGU messages sent	message/node	T, N	60 min	No
19.28	Total number of CGU messages received	message/node	T, N	60 min	No
19.29	Total number of CGUA messages sent	message/node	T, N	60 min	No
19.30	Total number of CGUA messages received	message/node	T, N	60 min	No
19.31	Total number of CRG messages sent	message/node	T, N	60 min	No
19.32	Total number of CRG messages received	message/node	T, N	60 min	No
19.33	Total number of CFN messages sent	message/node	T, N	60 min	No
19.34	Total number of CFN messages received	message/node	T, N	60 min	No
19.35	Total number of CON messages sent	message/node	T, N	60 min	No
19.36	Total number of CON messages received	message/node	T, N	60 min	No
19.37	Total number of COT messages sent	message/node	T, N	60 min	No
19.38	Total number of COT messages received	message/node	T, N	60 min	No
19.39	Total number of FAA messages sent	message/node	T, N	60 min	No
19.40	Total number of FAA messages received	message/node	T, N	60 min	No
19.41	Total number of FAC messages sent	message/node	T, N	60 min	No
19.42	Total number of FAC messages received	message/node	T, N	60 min	No
19.43	Total number of FAR messages sent	message/node	T, N	60 min	No
19.44	Total number of FAR messages received	message/node	T, N	60 min	No
19.45	Total number of FRJ messages sent	message/node	T, N	60 min	No
19.46	Total number of FRJ messages received	message/node	T, N	60 min	No
19.47	Total number of FOT messages sent	message/node	T, N	60 min	No
19.48	Total number of FOT messages received	message/node	T, N	60 min	No
19.49	Total number of IDR messages sent	message/node	T, N	60 min	No
19.50	Total number of IDR messages received	message/node	T, N	60 min	No
19.51	Total number of IRS messages sent	message/node	T, N	60 min	No
19.52	Total number of IRS messages received	message/node	T, N	60 min	No
19.53	Total number of INF messages sent	message/node	T, N	60 min	No
19.54	Total number of INF messages received	message/node	T, N	60 min	No
19.55	Total number of INR messages sent	message/node	T, N	60 min	No
19.56	Total number of INR messages received	message/node	T, N	60 min	No
19.57	Total number of LOP messages sent	message/node	T, N	60 min	No
19.58	Total number of LOP messages received	message/node	T, N	60 min	No
19.59	Total number of NRM messages sent	message/node	T, N	60 min	No
19.60	Total number of NRM messages received	message/node	T, N	60 min	No
19.61	Total number of PRI messages sent	message/node	T, N	60 min	No

Table 19 – BICC signalling utilization parameters

Item	Description of parameters	Units	Usage	Interval	Mandatory
19.62	Total number of PRI messages received	message/node	T, N	60 min	No
19.63	Total number of RES messages sent	message/node	T, N	60 min	No
19.64	Total number of RES messages received	message/node	T, N	60 min	No
19.65	Total number of RSC messages sent	message/node	T, N	60 min	No
19.66	Total number of RSC messages received	message/node	T, N	60 min	No
19.67	Total number of SAM messages sent	message/node	T, N	60 min	No
19.68	Total number of SAM messages received	message/node	T, N	60 min	No
19.69	Total number of SDM messages sent	message/node	T, N	60 min	No
19.70	Total number of SDM messages received	message/node	T, N	60 min	No
19.71	Total number of SGM messages sent	message/node	T, N	60 min	No
19.72	Total number of SGM messages received	message/node	T, N	60 min	No
19.73	Total number of SUS messages sent	message/node	T, N	60 min	No
19.74	Total number of SUS messages received	message/node	T, N	60 min	No
19.75	Total number of UCIC messages sent	message/node	T, N	60 min	No
19.76	Total number of UCIC messages received	message/node	T, N	60 min	No
19.77	Total number of USR messages sent	message/node	T, N	60 min	No
19.78	Total number of USR messages received	message/node	T, N	60 min	No

11.5 Parameters for BICC fault and quality

– Items 20.1 to 20.7 indicate the total number of some successful and failed call procedures.

Table 20 – BICC fault and quality parameters

Item	Description of parameters	Units	Usage	Interval	Mandatory
20.1	Total number of successful call set-ups	event/node	F, R, N	60 min	Yes
20.2	Total number of successful call answers	event/node	F, R, N	60 min	Yes
20.3	Total number of resources unavailable	event/node	F, R, N	60 min	Yes
20.4	Total number of service not available	event/node	F, R, N	60 min	Yes
20.5	Total number of service not implemented	event/node	F, R, N	60 min	Yes
20.6	Total number of invalid messages (e.g., protocol parameter out of range)	event/node	F, R, N	60 min	Yes
20.7	Total number of protocol errors (e.g., unknown message)	event/node	F, R, N	60 min	Yes

Appendix I

Usage of parameters

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

I.1 Traffic and network planning

The traffic situation of physical ports/nodes is always a concern because traffic reflects the equipment/network's load situation, and provides an important reference for further planning the network. The monitoring parameters which reflect traffic and network planning have been already included in this Recommendation. Examples of such parameters are given as follows:

– total number of bytes received (Item 3.4);

– maximum available bandwidth used for RTP/RTCP in the bandwidth pipe, based on the destination (Item 4.2);

– minimum available bandwidth used for RTP/RTCP in the bandwidth pipe, based on the destination (Item 4.3);

– mean value of the available bandwidth used for RTP/RTCP in the bandwidth pipe, based on destination (Item 4.4);

– total number of SIP registration requests sent and received (Items 7.1 and 7.2);

– total number of SIP session requests sent and received (Items 7.3 and 7.4);

– total number of sent and received messages for different requests and responses (Items 7.5 to 7.16).

I.2 Quality

The quality of service is always interesting for operators. The monitoring parameters which can reflect the quality of voice service are mentioned in this Recommendation. These parameters can be used for providing the service level guarantee, as well as for developing an operator's service level policy and strategy. They can also be used to draw up the SLA and/or SLS performance reports and relevant reports. Part of these parameters is listed as follows:

– packet loss rate in one direction (Item 2.1);

– maximum packet delay in one direction (Item 2.2);

– variation in packet delay (Item 2.3).

I.3 Fault and performance

Some parameters can be used for detecting problems, as well as for detecting some abnormal situations in the SIP and H.248/MEGACO signalling networks. They can also be used for detecting abnormal hardware situations which will result in reconfiguring and restarting the hardware. Part of these parameters is listed as follows:

– duration of unavailability of the destination node (Item 5.1);

– total number of the messages discarded due to the transmission error (Item 5.4);

– duration of the SIP availability and unavailability (Items 6.2 and 6.3);

– SIP node availability rate (Item 6.1);

– total number of bytes the port received and sent (Items 6.4 and 6.5).

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Printed in Switzerland
Geneva, 2010