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Parameters to be monitored in the process of operation when implementing NGN technical means in public telecommunication networks

Summary

This Recommendation describes the main requirements of NGN monitoring system which could be used on the model networks for NGN technical means testing and as a part of OSS for monitoring operation flows on the existing provider networks.

The basic principles of NGN monitoring system building, the common parameters to be monitored and the requirements for NGN monitoring system usages on the public telecommunication networks are given in this recommendation.

The common clause of text include:

Abbreviation include the short and detailed description of terms which used in this document.

Definition to determine the common notations which is used in document.

References include all list of normative documents which used in this document.

1. **Introduction** include the short description purpose of this document.
2. **Conventions** does not include any information.
3. **Compatibility issues** does not include any information.
4. **NGN monitoring system requirements** include the requirements to architecture of NMS, basic principle of operation and it implementations in accordance with legacy NGN ITU-T Recommendations.
5. **NMS common measured values** include the common principle and types of measurements which could be used during NMS operation.

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Key words

New generation networks, NGN, PSTN, testing, model networks, technical means, monitoring system, OSS

Contents

References

[1] ITU-T Recommendation Y.2001, "NGN overview"
[2] ITU-T draft Recommendation Y.2011, "General principles and general reference model for next generation networks"
[3] ITU-T draft Recommendation Y.2012, "Functional requirements and architecture of the NGN of Release 1"
[4] ITU-T Recommendation M.3060/Y.2401, "Principles for the Management of Next Generation Networks"
[5] ITU-T Recommendation Q.3900, "Methods of testing and model network architecture for NGN technical means testing as applied to public telecommunication networks"
[6] ITU-T Recommendation Q.752, "Monitoring and measurements for Signalling System No. 7 networks"
[7] ITU-T Recommendation X.295, "OSI conformance testing methodology and framework or protocol recommendations for ITU-T applications – protocol profile test specification"
[8] ITU-T Recommendation Y.1540, "Internet protocol data communication service - IP packet transfer and availability performance parameters"
[9] ITU-T Recommendation Y.1541, "Network performance objectives for IP-based services"
[10] ITU-T Recommendation Y.1542, "Framework for achieving end-to-end IP performance objectives"
[11] ITU-T Recommendation M.3010, "Principles for a telecommunications management network"
[12] ETSI TS 188 001 V1.2.1, Telecommunications and Internet Converged Services and Protocols for Advanced Networking (TISPAN); NGN management; Operations Support Systems Architecture

Definitions

Model network — a network which simulates the capabilities similar to those available in present telecommunication networks, has a similar architecture and functionality and uses the same telecommunication technical means.

NGN Technical means — the NGN basic equipment which serves as a basis for building new generation network solutions, including for application in public telecommunication networks.

NGN monitoring systems (NMS) — system which is responsible for online (under payload) measurement values of NGN protocols which realizing on different NGN stratum.

Abbreviations

AAA	Authentication Authorization Accounting
ACE	Application Creation Environment
AS	Applications Server
BS	Billing system
CS	Circuit switching network
ETSI	European Telecommunication Standard Institute

GW	Gateway
GW-LTE	Media gateway for Legacy Terminal Equipment
IMS	IP Multimedia subsystem
IP	Internet protocol
MeS	Messaging server
MG	Media gateway
MGC	Media gateway controller
MPLS	Multiprotocol label switching
MS	Media server
NMS	NGN monitoring system
NGN	Next Generation Network
NGN-IAD	NGN integrated access devices
NGN-TD	NGN terminal devices
OSS	Operational support system
PS	Packet switching network
PSTN	Public Switch Telephone Network
SG	Signaling gateway
SIP	Session Initiation Protocol
TM	Technical means
TNE	Transport Network Environment

1 Introduction

A concept of NGN [1] is a perspective evolutionary direction in public telecommunication networks development. All stages of NGN evolution could be divided on networks which realizing by PES architecture with co working two domain CS and PS networks and networks which architecture based on IMS platform with the wide range of services and different types of content.

Independent of existing stage of networks evolution network provider have to be realized on the network monitoring system which could be allow to control quality of network operation and prevent the fault situations.

The NGN monitoring system (further NMS) have to be built in accordance with NGN functional stratum and have to control all protocols which realized on it. For example, in control protocol list may — services layer (SIP, H.323, H.248, MGCP and etc.), transport layer (MPLS, BGP, EGP, Diffserv and etc.), application layer (Diameter, SIP, AAA, Parlay and etc.). Also In accordance with NGN evolution NMS could be include the protocols which realizing in CS networks (SS7, EDSS1, Q.Sig and etc.).

Also NMS could be used as a part of OSS systems and take a part in fault management and in performance management systems [4]. The results of monitoring parameters is an initial data for different layers (LLA) of OSS architecture [4]. NMS could be control and compare different parameters of protocols and interfaces operation and in accordance with ITU-T Recommendations M.3010 [11] could be control all networks elements and services.

NMS allow to control not only stand alone elements. One of task this system is control different types of NGN call scenarios and control of main parameters which could be give information for QoS testing.

As a result NMS is important and basic measurements instrument which must to be realized on the provider NGN network. NMS must be used on the Model network in accordance with ITU-T Recommendation Q.3900 [5] and is a basic and main system for NGN technical means testing.

This standard determined the basic requirements of NGN monitoring system and allow to understand what parameters have to be control by NMS.

2 Conventions

None

3 Compatibility issues

None

4 NGN monitoring system requirements

NMS has to work in all stages of NGN evolution. Basically NMS realizing have to begin from hybrid environment — co working CS and PS networks. In this case networks will be include wide set of different types of technical means. In accordance with ITU-T Recommendations Q.3900 [5] the set of TM have to include:

- Call Session Control System
  - Media Gateway Controller (MGC)
  - Proxy Server SIP (PS)
  - IP Multimedia Subsystem (IMS)
- Voice and signaling transmit system
  - Media Gateway (GW)
  - Signaling Gateway (SG)
  - Transport Network Environment (TNE)
- Application servers
  - Application Server (AS)
  - Media server (MS)
  - Messaging Server (MeS)
  - Application Creation Environment (ACE)
- Management and billing system
  - Management System (MS)
  - Billing system (BS)
- Access Environment
  - NGN Integrated Access Devices (NGN-IAD)
  - Media gateway for Legacy Terminal Equipment (GW-LTE)

On the first step of NMS built when it based on the PES architecture NMS has to include two combined measurement modes — PS protocols measurement mode and CS protocols measurement mode. As an example NMS must to allow measurement CS signaling protocols (SS7, EDSS1, Q.Sig and etc.) and PS signaling protocols (SIP, H.323, H.248, MGCP and etc.).

On the second step of NMS evolution when it based just only on the IMS architecture NMS must to realize all kind of NGN protocols on all NGN functional architecture stratums. For example the set of protocols could be include MPLS, BGP, EGP, Diffserv, Diameter, SIP, AAA, Parlay and etc.

As a result all NGN TM in accordance with NMS evolution would be divided on two parts:

PES NGN TM part:

- Call Session Control System
  - Media Gateway Controller (MGC)
  - Proxy Server SIP (PS)
- Voice and signaling transmit system
- Management and billing system
- Access Environment
  - NGN Integrated Access Devices (NGN-IAD)
  - Media gateway for Legacy Terminal Equipment (GW-LTE)

IMS NGN TM part:

- Call Session Control System
  - IP Multimedia Subsystem (IMS)
- Voice and signaling transmit system
- Application servers
- Management and billing system
- Access Environment
  - NGN Terminal devices (NGN-D)

Each of this parts could be include different type of signalling protocols. The main difference of PES NGN TM and IMS NGN TM is the functionality and type of realizing protocols on it. In the PES part the Call session control system based on the Softswitch technologies. In this case the common issue of PES is interworking with legacy TDM networks. While the Call session control system based on IMS part is responsible for call control between NGN terminal devices.

The distribution of signalling protocols by different types of TM which monitored by NMS shown below.

PES NGN TM part:

- Call Session Control System (H.248, MGCP, SIP, SIP-I, SIP-T, BICC)
- Voice and signaling transmit system (H.248, MGCP, SIP, Sigtran, SS7, Q.sig, R1, R.2, EDSS1)
- Management and billing system (AAA, Diameter, SIP)
- Access Environment (MGCP, H.248, H.323, SIP)

IMS NGN TM part:

- Call Session Control System (SIP, SIP-I)
- Voice and signaling transmit system (SIP, SS7, Q.sig, R1, R.2, EDSS1)
- Management and billing system (AAA, Diameter, SIP)
- Access Environment (SIP)

As shown the basic set of protocols must to be realizing in NMS on the first step (PES NGN).

Next step of NMS evolution must to include all left signalling protocols and take in account specific signalling requirements which IMS realizing.

The architecture of NMS must to include different type of subsystems. On the figure 1 shown the basic functional architecture of NMS. The NMS would consist of the follows subsystems:

- SS7 monitoring subsystem;
- SIP protocol monitoring subsystem;

- H.248 protocol monitoring subsystem;
- voice (transfer) service level monitoring subsystem;
- streaming video service level monitoring subsystem;
- service level Agreements performance monitoring subsystem;
- IP information flows monitoring subsystem (RTP/RTCP protocols level);
- application server monitoring subsystem;
- hardware faults and reconfiguring procedures monitoring subsystem.

The signaling system monitoring subsystems shall be independent from a vendor's NGN TM (as example MGC, PS, MG and etc.). In order to gather and initially process any other subsystems information the vendor's NGN TM management systems shall be in use. The SNMP or NetFlow may be used as the interaction protocol among the monitoring system central elements. The message format shall be specify by Telecommunication Administrations.

The shown architecture of NMS include the common blocks of NMS for two evolution stages (PES and IMS architecture).

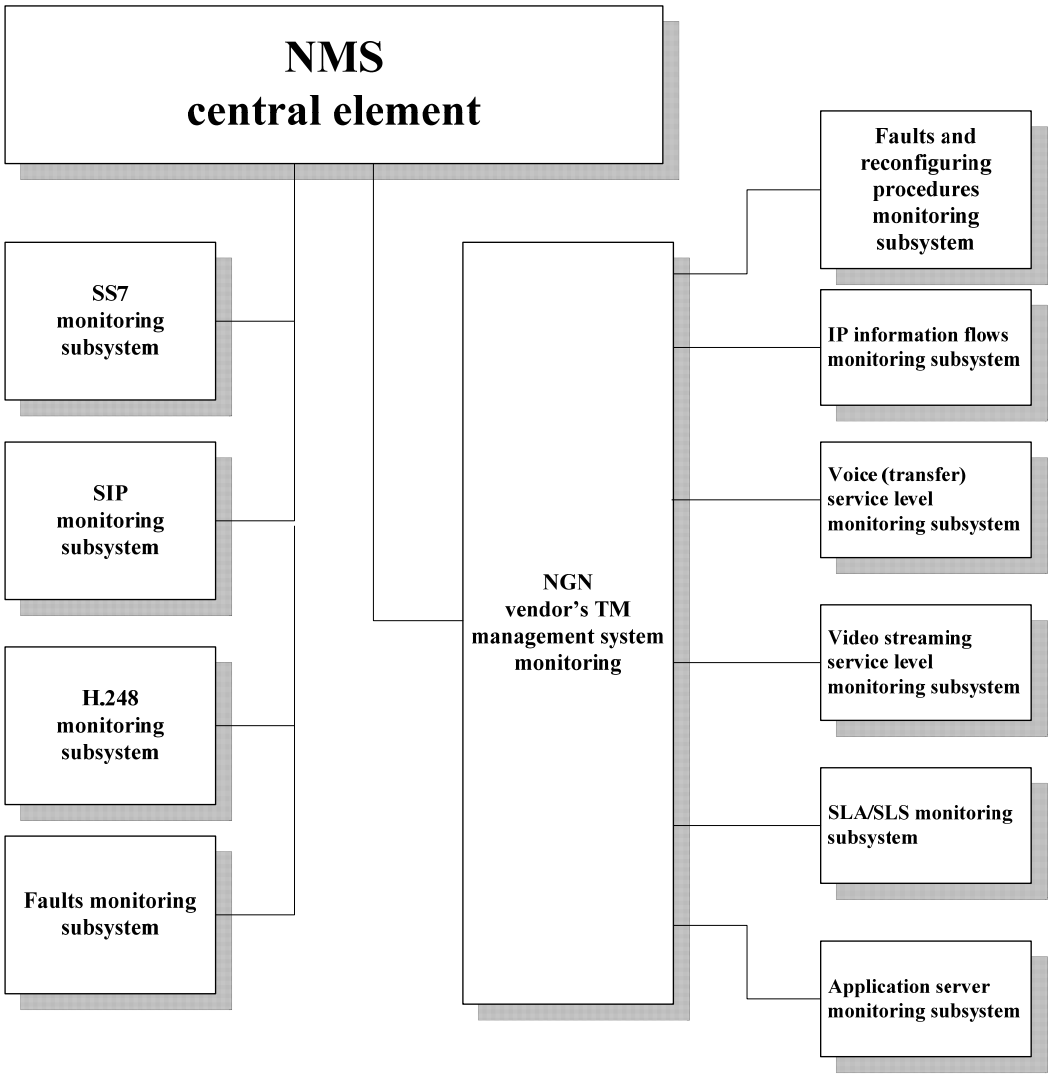

Figure 1 Basic architecture of NMS

5 NMS common measured values

As mentioned above NMS must to include the CS protocols. In this case the monitoring system must build in accordance with ITU-T Recommendation Q.752 ~~[6]~~[6]

According with ITU-T Recommendation Q.752 [6] the following categories as regards 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 signaling 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 ones under different services; for reporting processes; for assuming measures in providing the service level guaranteed, as well as for developing an operator's policy and strategy in the field of 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 the IP flows information for the purpose of identifying any unwanted and unauthorized traffic; studying any inside and outside impacts on network security; finding out any network abnormal events; defining when requesting the user-to-user, user-to-network, network-to-user interaction parameters; studying traffic changes trends; and conducting preventing management;
- **accounting (A).** Measurement for providing accounting and estimation data reliability by comparing;
- **network administration and planning (N).** Measurement for SS7 and NGN networks administration including the SIP and H.248 signaling systems; making decisions on networks development, further network planning; optimizing network infrastructure enhancement investment; planning applications and services; preparing traffic data to have network further designed;
- **near-real-time measurements (R).** Measurement for finding any faults out in the network . It shall be considered supplementary one to the abovementioned measurements.

5.1 SS7 MS NMS measured values

The SS7 monitoring subsystem should be provide the implementation of all functions submitted for NMS based on PES and compatibility with ITU-T Recommendation Q.752 ~~[6]~~ [6] According to the Q.752 ~~[6]~~ [6] Recommendation, the following categories of values measured by the SS7 monitoring subsystem NMS processes are selected:

- **fault (F).** Measurements carried out to issue reports and detect faults as well as to reveal emergency situations in the SS7 signaling system;
- **configuration (C).** Measurements carried out in the course of dynamic re-confuguration due to faults elimination or administrative actions;
- **perfomance (P).** Measurements carried out to estimate a stability and reliability of the SS7 signaling network in services providing;
- **accounting (A).** Measurements carried out to ensure by comparison a reliability of account and subscribers billing data;

– **network administration and planning (N).** Measurements carried out to administrate the SS7 signaling network, make decisions on its development and further planning;

– **near-rul-time measurements (R).** Measurements carried out to reveal emergencies in network operation, they are considered as additional to those listed above.

5.2 SIP MS NMS measured values

The SIP monitoring subsystem should be provide implementation in accordance with basic NMS architecture based on PES solutions too. As a result the SIP monitoring subsystem have to include:

– **fault (F)** – complete, except for reconfiguring and restarting processes;

– **quality (Q).** – complete, except for the functions concerning the SLA and/or SLS execution monitoring;

– **traffic(T).** – to the extent of detecting any unwanted traffic, studying inside and outside impact on network security, finding abnormal situations out in the network;

– **accounting (A).** – complete;

– **network administration and planning (N).** – complete.

5.3 H.248 MS NMS measured values

The H.248 monitoring subsystem should be provide implementation in accordance with basic NMS architecture based on PES solutions too. As a result the SIP monitoring subsystem have to include:

– **fault (F)** – in full, except for reconfiguring and restarting processes;

– **quality (Q).** – in full, except for the SLA and/or SLS execution;

– **network administration and planning (N).** – in full;

– **near-rul-time measurements (R).** – in full.

5.4 IP MS NMS measured values

The IP monitoring subsystem should be provide implementation in accordance with basic NMS architecture based on PES and IMS solutions too. IP monitoring subsystem specify **traffic(T)** and **network administration and planning (N)** functions.

5.5 Requirements of monitoring NGN management system

Based on the functional division of the goals concerning next generation operation support system (NGN OSS) networks management and operation, the following functions may be found out for the monitoring systems:

– service level monitoring both at the network management level and at the resource management one;

– problems monitoring both with the Problem Detection and the Problem Response. The latter shall be similar to p.4.1.2 hereof. The Problem Detection shall be related to the Resource Management level, and the Problem Response shall meet the Network Management level;

– Service Level Agreement (SLA) and Service Level Specification (SLS) implementation monitoring;

– IP information and traffic performance flows monitoring.

Quality of service monitoring subsystem for voice transmission should ensure execution of function Q as per voice data transmission.

Quality of service monitoring subsystem for video bit rates should ensure execution of function Q as per video data transmission.

SLA/SLS monitoring subsystem should ensure execution of function Q as per SLA/SLS performance and relevant reporting. Application server monitoring subsystem should ensure execution of functions F and R.

Failure and reconfiguration monitoring subsystem should ensure execution of functions F and R.