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SERIES G: TRANSMISSION SYSTEMS AND MEDIA, DIGITAL SYSTEMS AND NETWORKS

Multimedia Quality of Service and performance – Generic and user-related aspects

Performance monitoring points for IPTV

Recommendation ITU-T G.1081

ITU-T G-SERIES RECOMMENDATIONS

TRANSMISSION SYSTEMS AND MEDIA, DIGITAL SYSTEMS AND NETWORKS

INTERNATIONAL TELEPHONE CONNECTIONS AND CIRCUITS	G.100–G.199
GENERAL CHARACTERISTICS COMMON TO ALL ANALOGUE CARRIER-TRANSMISSION SYSTEMS	G.200–G.299
INDIVIDUAL CHARACTERISTICS OF INTERNATIONAL CARRIER TELEPHONE SYSTEMS ON METALLIC LINES	G.300–G.399
GENERAL CHARACTERISTICS OF INTERNATIONAL CARRIER TELEPHONE SYSTEMS ON RADIO-RELAY OR SATELLITE LINKS AND INTERCONNECTION WITH METALLIC LINES	G.400–G.449
COORDINATION OF RADIOTELEPHONY AND LINE TELEPHONY	G.450–G.499
TRANSMISSION MEDIA AND OPTICAL SYSTEMS CHARACTERISTICS	G.600–G.699
DIGITAL TERMINAL EQUIPMENTS	G.700–G.799
DIGITAL NETWORKS	G.800–G.899
DIGITAL SECTIONS AND DIGITAL LINE SYSTEM	G.900–G.999
MULTIMEDIA QUALITY OF SERVICE AND PERFORMANCE – GENERIC AND USER-RELATED ASPECTS	**G.1000–G.1999**
TRANSMISSION MEDIA CHARACTERISTICS	G.6000–G.6999
DATA OVER TRANSPORT – GENERIC ASPECTS	G.7000–G.7999
PACKET OVER TRANSPORT ASPECTS	G.8000–G.8999
ACCESS NETWORKS	G.9000–G.9999

For further details, please refer to the list of ITU-T Recommendations.

Recommendation ITU-T G.1081

Performance monitoring points for IPTV

Summary

Successful deployment of IPTV services requires performance parameters to be monitored at a number of different points in the complete end-to-end chain, including the customer premises, key aggregation points and at interconnect points between disparate and service provider network domains. Recommendation ITU-T G.1081 defines five monitoring points where such performance measurements can be made.

Source

Recommendation ITU-T G.1081 was approved on 22 October 2008 by ITU-T Study Group 12 (2005-2008) under Recommendation ITU-T A.8 procedure.

Keywords

IPTV, monitoring points, performance, QoE, QoS.

FOREWORD

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CONTENTS

Recommendation ITU-T G.1081

Performance monitoring points for IPTV

1 Scope

This Recommendation defines performance monitoring points which will allow the service provider/network operator to monitor the performance of the complete IPTV service delivery to the end-user.

Successful deployment of IPTV services requires performance monitoring at the customer premises (e.g., set-top-box), key aggregation points (e.g., DSL access multiplexer (DSLAM)) or cable modem termination system (CMTS) and at interconnect points between disparate network domains and service provider domain boundaries. Performance monitoring can help in:

- Finding errors in an end-to-end system (system debugging).
- Checking the resource utilization and the workload of system components.
- Comparing values (metrics) regarding performance of different system deployments.
- Providing a base for modelling the system.
- Identifying system bottlenecks.
- Optimizing IPTV network deployment.
- Ensuring that system performance does not degrade with time.

The goal of performance monitoring is to provide end-users of IPTV services with a high user experience by identifying, localizing and quantifying service and network issues.

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.1540] Recommendation ITU-T Y.1540 (2007), *Internet protocol data communication service – IP packet transfer and availability performance parameters*.
<http://www.itu.int/rec/T-Rec-Y.1540>

[ITU-T Y.1543] Recommendation ITU-T Y.1543 (2007), *Measurements in IP networks for inter-domain performance assessment*.
<http://www.itu.int/rec/T-Rec-Y.1543>

[ITU-T Y.1544] Recommendation ITU-T Y.1544 (2008), *Multicast IP performance parameters*.
<http://www.itu.int/rec/T-Rec-Y.1544>

3 Definitions

This Recommendation defines the following term:

3.1 platform: A hardware and/or software architecture that serves as a foundation or base for realizing a certain functionality.

4 Abbreviations and acronyms

This Recommendation uses the following abbreviations and acronyms:

CMTS	Cable Modem Termination System
DSLAM	Digital Subscriber Line Access Multiplexer
EPG	Electronic Programme Guide
IPTV	Internet Protocol Television
NMS	Network Management System
OSS	Operations Support System
QoE	Quality of Experience
QoS	Quality of Service
STB	Set-Top Box
VoD	Video on Demand

5 Conventions

In this document:

The keywords "**is recommended**" indicate a requirement which is recommended but which is not absolutely required. Thus, this requirement need not be present to claim conformance.

The keyword "**may**" indicates a requirement which is optional.

6 IPTV performance monitoring points

The entire IPTV content delivery chain can be divided into multiple *domains*. Operators at domain borders have the option to perform monitoring which, when taken together, forms an end-to-end monitoring topology.

This domain approach is independent of any specific monitoring method.

Monitored performance characteristics, across a single domain or multiple domains, can be integrated with existing or new operations support systems (OSSs) and/or network management systems (NMSs).

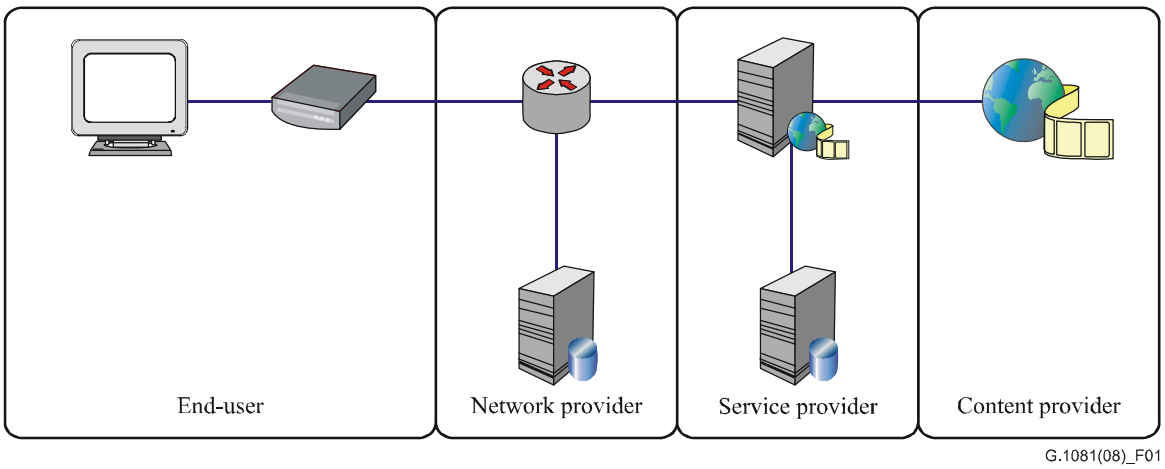

Figure 1 – IPTV domains

The exact topology and domains will vary from one operator to another; however, monitoring can be applied at each domain boundary. An example topology with generalized domain boundaries is shown in Figure 1. These domains are further divided into specific monitoring domains in Figure 2. Within each domain, different aspects can be monitored at each domain boundary as outlined below.

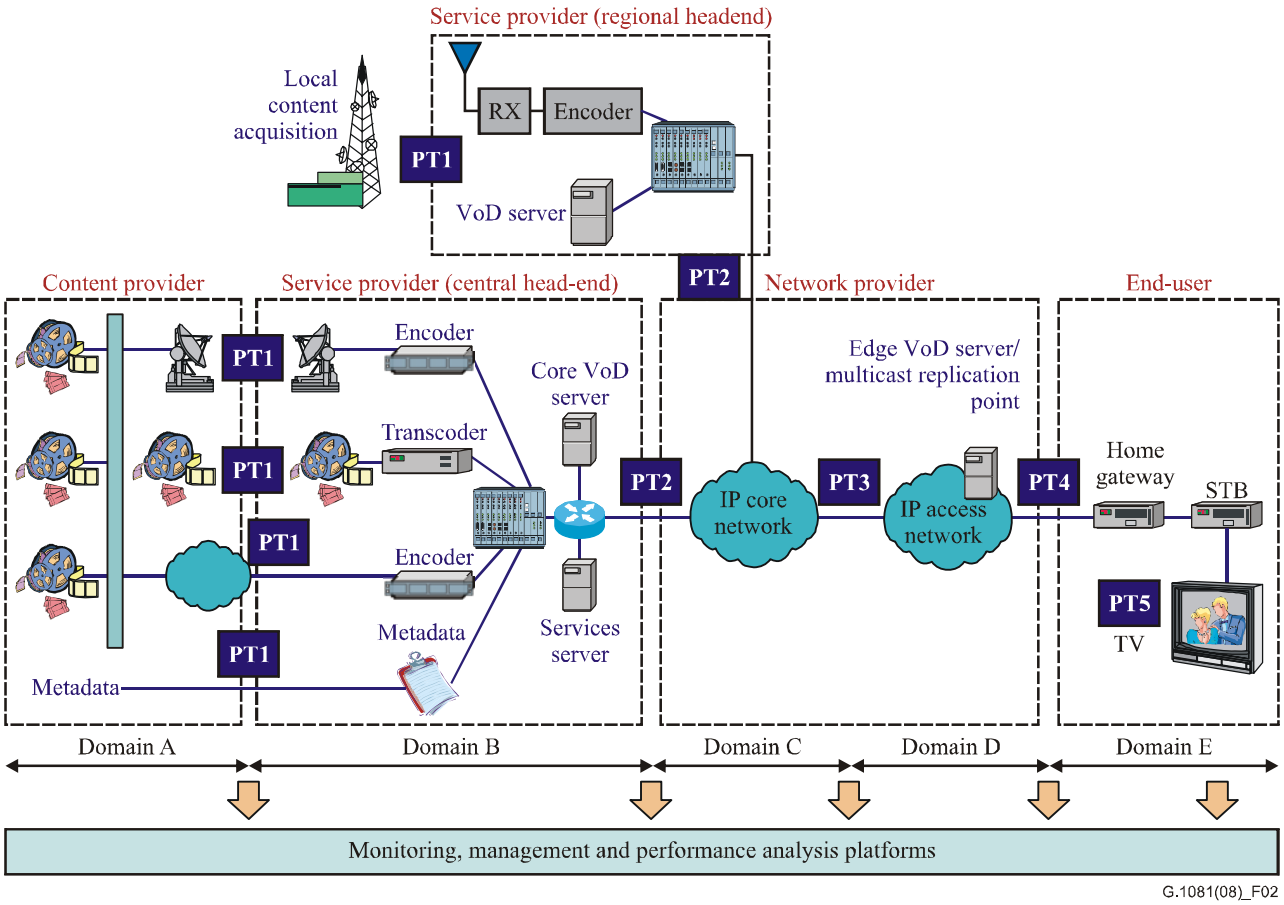

Figure 2 – IPTV performance monitoring points

A complete performance monitoring system is recommended to include a performance monitoring management platform to translate the measured data from the monitoring points into actionable knowledge. Functions of the management platform could include data storage, analysis, correlation, fault identification, root cause analysis, report generation and visualization. The range of the management platform(s) may cover all domains as shown in Figure 2.

The interfaces between the performance monitoring management platform(s) and the monitoring points will be further defined in the future.

7 Performance monitoring point definitions

This clause provides a basic description of each monitoring point shown in the previous clause. The capabilities and parameters listed below are not an exhaustive list. Some parameters may be difficult to obtain in some scenarios. Conversely, there may be some other parameters that are essential. These are still under study.

7.1 Monitoring point 1 – PT1

This point demarcates the domain border between content provision and IPTV control. PT1 is located at the domain border between content providers (content owners and aggregators) and an IPTV service provider.

PT1 enables the measurement of source audiovisual quality and metadata verification, and the analysis of information to be exchanged between the content provider and IPTV service provider.

PT1 may capture the following information:

- coding parameters of video, audio and text content;
- quality parameters of video, audio and text content;
- acknowledgement for the report of source content transfer receipt.

PT1 may support the following capabilities:

- real-time request/response transactions by the protocols involved;
- real-time notifications of asynchronous events;
- reliable and secure delivery of any messages involved;
- clock synchronization with other monitoring points;
- identification of various content providers;
- report testing information for quality parameters of video, audio and text content from various content providers to the service quality monitoring platform.

7.2 Monitoring point 2 – PT2

This point is located at the domain border between the service provider and network provider. It should aim for original streaming quality monitoring. PT2 monitors the service provider stream quality at the head-end egress.

PT2 may capture the following information:

- quality parameters of stream media from the core node of the service provider;
- performance parameters of EPG servers at the core node of the service provider;
- performance parameters of VoD servers at the core node of the service provider;
- performance parameters of service-related servers at the core node of service provider.

PT2 may support the following capabilities:

- real-time request/response transactions by the protocols involved;
- real-time notifications of asynchronous events;
- reliable and secure delivery of any messages involved;
- clock synchronization with other monitoring points;
- identification of various servers;
- report information for quality parameters of video, audio and text content and performance parameters of servers to the service quality monitoring platform.

7.3 Monitoring point 3 – PT3

This point is located at the boundary between the IP core and IP access networks for monitoring of IP-related performance parameters. This point can be placed on any type of interface between the IPTV core network and the access network.

PT3 may capture the following information:

- Source network segment and destination network segment to be measured.
- IP network performance as defined in [ITU-T Y.1540]. Recommended methods of measurement are found in [ITU-T Y.1543]:
  - Mean one-way delay.
  - One-way packet delay variation.
  - Packet loss ratio.
  - Packet loss profile.
  - Path unavailability.
- Multicast IP network performance parameters as defined in [ITU-T Y.1544]:
  - Successful join time.
  - Successful leave time.
  - Group mean one-way delay.
  - Group IP service availability.
  - Mean group loss ratio.

PT3 may support the following capabilities:

- real-time request/response transactions;
- real-time notifications of asynchronous events;
- reliable and secure delivery of any messages involved;
- clock synchronization with other monitoring points;
- submission of information for quality parameters of IP network to service quality monitoring platform;
- access to raw IP information (e.g., packet headers, type of codec) of the audiovisual or text stream;
- able to capture information on quality originating from end-user devices.

7.4 Monitoring point 4 – PT4

This point is closest to the user where monitoring the quality of streaming, audiovisual quality and IPTV service attributes are important. Monitoring at this point can be implemented by introducing the performance monitoring function in home gateways and STBs, for example.

PT4 may capture the following information:

- Source network segment and destination network segment to be measured.
- Access the service quality information and stream media quality information of the IPTV service platform from edge point of IPTV.
- Access to raw IP information (e.g., packet headers, type of codec) of the audiovisual or text stream.
- IP network performance parameters as defined in [ITU-T Y.1540]. Recommended methods of measurement are found in [ITU-T Y.1543]:
  - Mean one-way delay.
  - One-way packet delay variation.
  - Packet loss ratio.
  - Path unavailability.

- Multicast IP network performance parameters as defined in [ITU-T Y.1544]:
  - Successful join time.
  - Successful leave time.
  - Group mean one-way delay.
  - Group IP service availability.
  - Mean group loss ratio.

PT4 may be able to support the following capabilities:

- real-time request/response transactions;
- real-time notifications of asynchronous events;
- reliable and secure delivery of the messages involved;
- clock synchronization with other monitoring points;
- simulate the integrated service flow of IPTV terminal;
- report information for parameters of IP network performance, service quality that access IPTV service platform from edge point, and stream media quality to service quality monitoring platform.

7.5 Monitoring point 5 – PT5

This point is at the final end-point and directly relates to end-user QoE. Monitoring audiovisual quality, text accuracy and IPTV service attributes as perceived by the end-user are important.

PT5 may capture the following information:

- source network segment and destination network segment to be monitored;
- access the quality information of service and stream media of the IPTV service platform from the client.

PT5 may support the following capabilities:

- real-time request/response transactions;
- real-time notifications of asynchronous events;
- reliable and secure delivery of any messages involved;
- clock synchronization with other monitoring points;
- integrated service information of IPTV terminal;
- report information for parameters of IP network performance, service quality that access IPTV service platform from client, and stream media quality to service quality monitoring platform.

8 Security considerations

Security aspects have not been addressed in this Recommendation.

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