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SERIES Y: GLOBAL INFORMATION
INFRASTRUCTURE, INTERNET PROTOCOL ASPECTS
AND NEXT-GENERATION NETWORKS

Internet protocol aspects – IPTV over NGN

Guidelines for the use of traffic management mechanisms in support of IPTV services

Recommendation ITU-T Y.1920

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

Recommendation ITU-T Y.1920

Guidelines for the use of traffic management mechanisms in support of IPTV services

Summary

Recommendation ITU-T Y.1920 describes a set of traffic management mechanisms which are aimed to facilitate the efficient support of IPTV services over the network infrastructure and provides guidelines on the use of the traffic management mechanisms in various IPTV services such as VoD and Live TV.

History

Edition	Recommendation	Approval	Study Group
1.0	ITU-T Y.1920	2012-07-29	13

FOREWORD

The International Telecommunication Union (ITU) is the United Nations specialized agency in the field of telecommunications, information and communication technologies (ICTs). The ITU Telecommunication Standardization Sector (ITU-T) is a permanent organ of ITU. ITU-T is responsible for studying technical, operating and tariff questions and issuing Recommendations on them with a view to standardizing telecommunications on a worldwide basis.

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.

In some areas of information technology which fall within ITU-T's purview, the necessary standards are prepared on a collaborative basis with ISO and IEC.

NOTE

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

Compliance with this Recommendation is voluntary. However, the Recommendation may contain certain mandatory provisions (to ensure, e.g., interoperability or applicability) and compliance with the Recommendation is achieved when all of these mandatory provisions are met. The words "shall" or some other obligatory language such as "must" and the negative equivalents are used to express requirements. The use of such words does not suggest that compliance with the Recommendation is required of any party.

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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/>.

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Recommendation ITU-T Y.1920

Guidelines for the use of traffic management mechanisms in support of IPTV services

1 Scope

This Recommendation defines functional requirements which are derived from the high-level requirements of traffic mechanisms in [ITU-T Y.1901]. Based on them, a set of traffic management mechanisms at the transport stratum in support of IPTV services are described from the perspectives of control plane, data plane and management plane. Guidelines on how such mechanisms can be used to effectively meet the functional requirements are also provided in detail.

The network supporting IPTV services will span a number of network domains which may be designed, deployed and operated by different providers and which may differ in their traffic management capabilities. Therefore, it is expected that the network provider(s) will implement a set of these mechanisms described in this Recommendation by following the guidelines to ensure that IPTV service objectives are satisfied efficiently. Furthermore, the traffic management mechanisms also depend on the specific network architectures used for IPTV services as defined in [ITU-T Y.1910].

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 G.1081]	Recommendation ITU-T G.1081 (2008), <i>Performance monitoring points for IPTV</i> .
[ITU-T Y.1291]	Recommendation ITU-T Y.1291 (2004), <i>An architectural framework for support of Quality of Service in packet networks</i> .
[ITU-T Y.1541]	Recommendation ITU-T Y.1541 (2006), <i>Network performance objectives for IP-based services</i> .
[ITU-T Y.1901]	Recommendation ITU-T Y.1901 (2009), <i>Requirements for the support of IPTV services</i> .
[ITU-T Y.1910]	Recommendation ITU-T Y.1910 (2008), <i>IPTV functional architecture</i> .
[ITU-T Y.2701]	Recommendation ITU-T Y.2701 (2007), <i>Security requirements for NGN release 1</i> .

3 Definitions

3.1 Term defined elsewhere

None.

3.2 Term defined in this Recommendation

None.

4 Abbreviations and acronyms

This Recommendation uses the following abbreviations and acronyms:

AF	Assured Forwarding
BA	Behaviour Aggregate
BE	Best Effort
BRAS	Broadband Remote Access Server
BTV	Broadcast TV
CAC	Connection Admission Control
CLS	Controlled Load Service
CoS	Class of Service
CS	Class Selector
DF	Default Forwarding
DNGF	Delivery Network Gateway Functions
DSCP	Differentiated Services Code Point
DSLAM	Digital Subscriber Line Access Multiplexer
EF	Expedited Forwarding
GS	Guaranteed Service
HG	Home Gateway
IGMP	Internet Group Management Protocol
IMS	IP Multimedia Subsystem
IP	Internet Protocol
IPDV	IP packet Delay Variation
IPER	IP packet Error Ratio
IPLR	IP packet Loss Ratio
IPRR	IP Packet Reordering Ratio
IPTD	IP Packet Transfer Delay
IPTV	Internet Protocol Television
LAN	Local Area Network
MAC	Media Access Control
MF	Multi-Field
MPEG	Moving Picture Experts Group
NAL	Network Adaptation Layer
NVoD	Near Video on Demand
OSPF	Open Shortest Path First

PHB	Per-hop Behaviour
PVR	Private Video Recorder
QoS	Quality of Service
RACF	Resource Admission Control Function
RSVP	Resource Reservation Protocol
SLA	Service Level Agreement
ToS	Type of Service
VLAN	Virtual LAN
VoD	Video on Demand
VoIP	Voice over IP
VTC	Video Teleconference
WAN	Wide Area Network
WLAN	Wireless LAN

5 Conventions

In this Recommendation, functional requirements are identified using the following convention:

- Functional requirement number xx in clause n.m is of the form FR n.m-xx.

6 Requirements

6.1 High-level requirements

Clause 6.2.2 of [ITU-T Y.1901] specifies the high-level traffic management requirements for IPTV services. For the convenience of the reader, the traffic management related mandatory requirements are listed below:

R 6.2.2-01: The IPTV architecture is required to support traffic management mechanisms for the differential treatment of IPTV traffic.

R 6.2.2-02: The IPTV architecture is required to support the ability to configure quality of service (QoS) rules at the delivery network gateway functions (DNGF) that govern traffic mapping (upstream or downstream) for the different IPTV services.

R 6.2.2-03: The IPTV architecture is required to support a mechanism for assigning IPTV traffic priorities.

R 6.2.2-04: The IPTV architecture is required to support the relevant mechanisms for IPTV traffic identification, classification and marking, policing and conditioning, scheduling and discarding.

6.2 Functional requirements

This clause describes the functional requirements, derived from high-level requirements, on three different planes: control plane, management plane and data plane.

6.2.1 Control plane functional requirements

FR 6.2.1-01: The traffic management mechanisms are required to support admission control capability.

FR 6.2.1-02: The traffic management mechanisms are required to support the capability of controlling network congestion and improve network utilization by selecting an appropriate path.

FR 6.2.1-03: The traffic management mechanisms are required to support exchanging the network traffic information with the network management systems.

6.2.2 Management plane functional requirements

FR 6.2.2-01: The traffic management mechanisms are required to enable policy control and management capabilities.

FR 6.2.2-02: The traffic management mechanisms are required to support capability of obtaining performance information for IPTV QoS assurance.

FR 6.2.2-03: The traffic management mechanisms are required to support service level agreement (SLA) capability in IPTV.

6.2.3 Data plane functional requirements

FR 6.2.3-01: The traffic management mechanisms are required to enable the differentiation of traffic to provide the expected delivery of IPTV services with corresponding level of quality and reliability.

FR 6.2.3-02: The traffic management mechanisms are required to support traffic marking capability to associate packets with different priorities.

FR 6.2.3-03: The traffic management mechanisms are required to support buffer management capability to deal with received packets.

FR 6.2.3-04: The traffic management mechanisms are required to support traffic queuing and traffic scheduling capability.

FR 6.2.3-05: The traffic management mechanisms are required to support traffic policing and traffic shaping capabilities for rate control.

FR 6.2.3-06: The traffic management mechanisms are required to support congestion management capability.

6.3 Mapping among high-level requirements, functional requirements and mechanisms

Table 1 – Mapping table among requirements, mechanisms and sections

High-level requirement	Related functional requirements	Related mechanisms	Related clause
R 6.2.2-01	FR 6.2.3-01	traffic classification	7.2 data plane
	FR 6.2.3-02	packet marking	
	FR 6.2.3-03	buffer management	
	FR 6.2.3-04	queuing and scheduling	
	FR 6.2.3-05	traffic policing and shaping	
R 6.2.2-02	FR 6.2.1-01	admission control	7.1 control plane
	FR 6.2.1-02	QoS routing	
	FR 6.2.1-03	resource control	
	FR 6.2.2-01	policy	7.3 management plane
	FR 6.2.2-03	service level agreement	

Table 1 – Mapping table among requirements, mechanisms and sections

High-level requirement	Related functional requirements	Related mechanisms	Related clause
R 6.2.2-03	FR 6.2.2-01	policy	7.3 management plane
	FR 6.2.2-02	performance measurement	
	FR 6.2.2-03	service level agreement	
R 6.2.2-04	FR 6.2.1-01	admission control	7.1 control plane
	FR 6.2.3-01	traffic classification	7.2 data plane
	FR 6.2.3-02	packet marking	
	FR 6.2.3-04	queuing and scheduling	
	FR 6.2.3-05	traffic policing and shaping	
	FR 6.2.3-06	congestion avoidance	

7 Traffic management mechanisms for control plane, data plane and management plane

IPTV traffic management mechanisms are typically used for dealing with IPTV service traffic directly as well as other user traffic. Traffic management systems enable delivery of IPTV services with required level of quality and reliability, and can be deployed with other network mechanisms as a comprehensive QoS solution.

This clause provides an overview of the basic traffic management mechanisms that are commonly deployed in a managed network. A provider may choose to deploy a subset of these mechanisms depending on the performance objectives of applications supported by the network.

The traffic management framework contains mechanisms dealing with the user traffic directly, the pathways through which user traffic travels, and the operation, administration and management aspects of the network. As depicted in Figure 1, its building blocks are organized into three planes: control plane, data plane and management plane.