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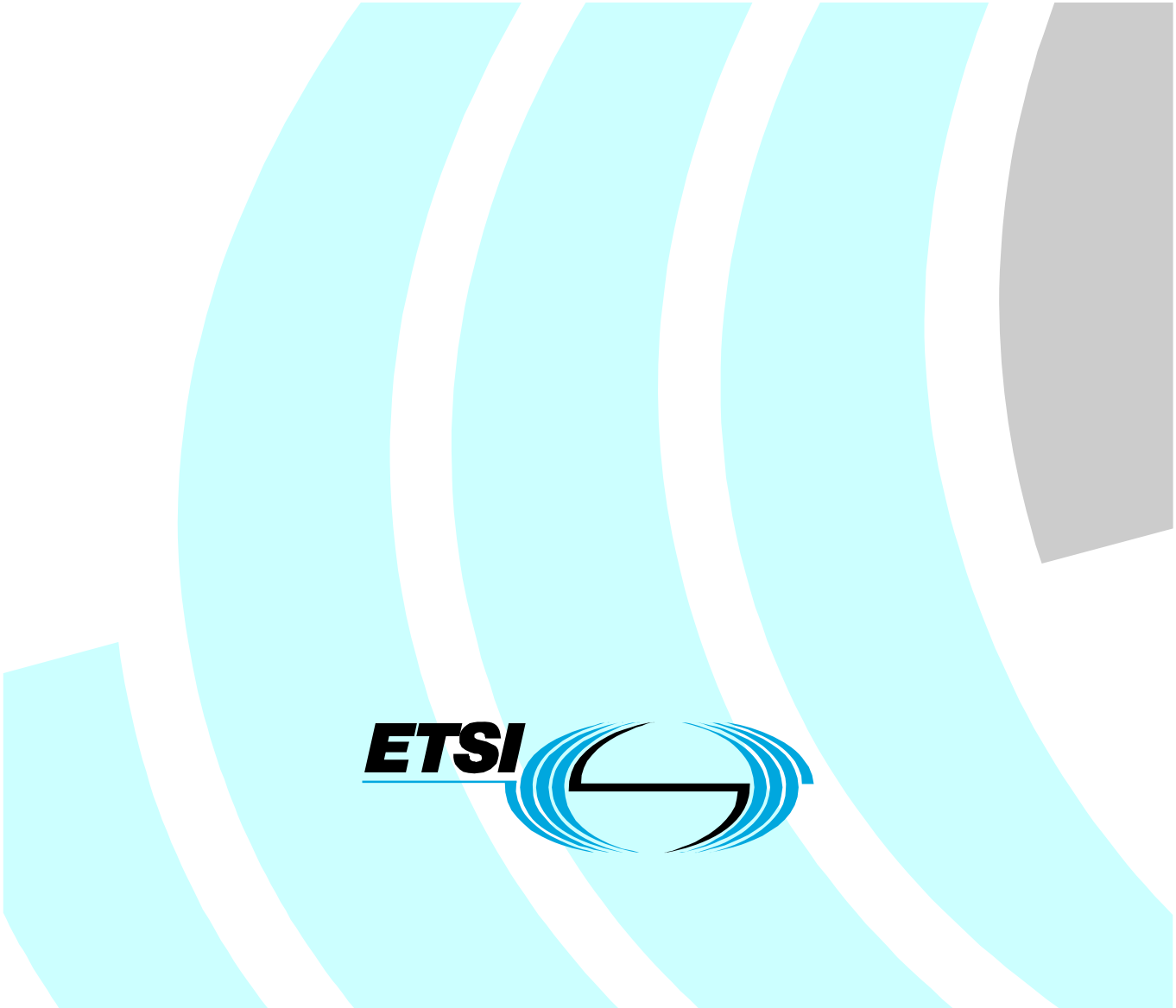
Technical Specification

Telecommunications and Internet converged Services and Protocols for Advanced Networking (TISPAN); Requirements for network transport capabilities to support IPTV services



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Foreword

This Technical Specification (TS) has been produced by ETSI Technical Committee Telecommunications and Internet converged Services and Protocols for Advanced Networking (TISPAN).

1 Scope

The present document specifies the generic network transport capability requirements to support IPTV services, including Broadcast TV and Content on Demand services, based on the characteristics of IPTV services. The present document does not describe the IPTV service per se but the network capabilities that are needed to support these services by specifying the network requirements related to the transport layer, to support these services, taking terminal capabilities into account. Account is therefore taken of the specifications of IPTV services of other organizations as the DVB.

2 References

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2.1 Normative references

The following referenced documents are indispensable for the application of the present document. For dated references, only the edition cited applies. For non-specific references, the latest edition of the referenced document (including any amendments) applies.

[1] ETSI TS 181 016: "Telecommunications and Internet converged Services and Protocols for Advanced Networking (TISPAN); Service Layer Requirements to integrate NGN services and IPTV".

[2] ETSI TS 102 034: "Digital Video Broadcasting (DVB); Transport of MPEG-2 TS Based DVB Services over IP Based Networks".

[3] ITU-T Recommendation Y.2011: "General principles and general reference model for Next Generation Networks".

[4] ETSI TS 102 005: "Digital Video Broadcasting (DVB);Specification for the use of Video and Audio Coding in DVB services delivered directly over IP protocols".

[5] ETSI TS 187 001: "Telecommunications and Internet converged Services and Protocols for Advanced Networking (TISPAN); NGN SECurity (SEC); Requirements".

2.2 Informative references

[6] ETSI TR 102 033: "Digital Video Broadcasting (DVB); Architectural framework for the delivery of DVB-services over IP-based networks".

3 Definitions and abbreviations

3.1 Definitions

For the purposes of the present document, the following definitions apply:

Broadcast TV: television programming transmitted and intended for reception by anyone within range of the transmitter or lawfully connected to a cable distribution system but where the consumer has no control over the content or timing of what he receives, apart from the ability to select a particular channel

NOTE: It is sometimes referred to as "Linear TV".

Consumer: domain where the IPTV services are consumed

NOTE: The consumer domain may consist of a single terminal used directly for service consumption or may be a complex network of terminals and related devices, including consumer operated mobile devices. The domain itself may also be a mobile end device. In this case, the delivery system of a transport provider would be a Wireless Wide Area Network (WWAN). A single consumer domain may be connected via two or more networks to a number of service providers obtaining content from multiple content providers.

Consumer Network: network owned and operated by an end-user relying on the services of a transport provider for external connectivity; in this context, the definition includes home networks, wireless "hot spots", hotel networks, etc**.**

Content on Demand (CoD): Users can select their required content with the assistance of the Electronic Programme Guide (EPG) at the user preferred time

NOTE: The content is then transmitted uniquely (unicast) to that consumer who can usually use VCR-like functionalities (for example, fast-forward, rewind or pause) to control their viewing of the content. A special form of Content on Demand (CoD) is Video on Demand (VoD).

Content Provider: entity that owns or is licensed to sell content or content assets

Electronic Programme Guide (EPG): assistance tool which helps users to locate the content they want and to facilitate the selection of IPTV services for watching, recording, etc.

IPTV Service Provider: entity that offers IPTV services to the Customers making use of the services capabilities provided by the NGN Service Provider

Service Provider: entity providing a service to the subscriber

NOTE: Different types of service providers may be relevant for television services on IP, see IPTV Service Provider and NGN Service Provider.

Transport Provider: entity connecting consumers and Service Providers

NOTE: The delivery system usually is composed of access networks and core or backbone networks, which may use a variety of network technologies and be owned by a number of different operators.

VCR functions: common functionalities of a video cassette recorder, such as select/cancel, start, stop, pause (with or without freeze frame), fast forward, reverse, scan forward or reverse (both with or without image), and setting and resetting memory marks

3.2 Abbreviations

For the purposes of the present document, the following abbreviations apply:

CoD	Content on Demand
DVB	Digital Video Broadcasting
EPG	Electronic Programme Guide (see also IPG)
HD	High Definition (TV)
IP	Internet Protocol
IPG	Interactive Programme Guide (see also EPG)
IPR	Intellectual Property Rights
IPTV	Internet Protocol Television
NGN	Next Generation Network
QoS	Quality of Service
RTSP	Real-Time Streaming Protocol
SD	Standard Definition (TV)
TV	Television
UE	User Equipment
VCR	Video Cassette Recorder
WWAN	Wireless Wide Area Network

4 Overview

The present document describes the requirements on the TISPAN NGN transport layer to support IPTV services irrespective of the service control mechanism employed.

Several standards on IPTV are evolving in other standards organizations, including DVB, ATIS IIF and OMA (see annex C for more information). The ETSI TISPAN architecture shall provide the necessary transport capabilities to support the requirements of the main ongoing standards on IPTV. The present document notes the ongoing developments in this area as well as existing deployments and describes the requirements for the following network transport capabilities:

- Admission control.
- Support of Multicast and Unicast.
- Security.
- User Data.
- Accounting.
- NAT traversal.
- Resource management.

The present document is complimentary to TS 181 016 [1] that contains several examples of relevant IPTV services.

5 IPTV Context Requirements

Many of the following requirements are largely derived from the ATIS IIF document, as generic requirements relevant for the IPTV context. In these, the word "architecture" has been replaced by "solution", since they are not so much functional requirements but rather related to the service that IPTV is to provide to the user. Other requirements specific to the present document have also been included.

5.1 The IPTV solution shall allow for two-way communications between the Service Provider and a UE within the consumer network.

5.2 The IPTV solution shall support services delivered to a consumer network from one or more service providers over an IP transport stream.

5.3 The IPTV solution shall allow the delivery of multiple COD content profiles e.g. HD, SD and multichannel audio to the consumer.

5.4 The IPTV solution shall be capable of supporting multiple IP transport streams providing services from one or more service providers to a single consumer network.

5.5 The IPTV solution may support the delivery of multiple services over common managed IP transport with a controllable IP Quality of Service (QoS).

5.6 The IPTV solution shall support the individual addressability of devices acting as UEs within the consumer network.

5.7 The IPTV solution shall include a mechanism for user provisioning, profiling and registration.

5.8 The IPTV solution shall provide a mechanism to protect privacy of the consumer.

5.9 The IPTV solution shall ensure that the storage and management of user related data is in accordance with the relevant national regulations.

5.10 The IPTV solution shall make efficient use of network transport capabilities.

6 Network transport capabilities required

6.1 Admission Control

The TISPAN NGN transport stratum must offer an Admission Control solution for admission of IPTV services over the Access and Core network resources from the consumer network to the service source In particular, the Admission Control solution must be:

- accurate (i.e. admits the right multicast or unicast sessions on the right resources);
- bandwidth efficient (i.e. only rejects multicast or unicast sessions which are indeed in excess of the current network capacity and accept as many multicast or unicast sessions as possible that can indeed fit in the current network capacity);
- reactive (i.e. adjust fast to changes in network conditions such as failure or dynamic rerouting and adjust quickly to changes in shared resource usage such as a UE switching between a multicast and unicast IPTV services);
- able to handle resources that can be used by either multicast or unicast (e.g. it would not be feasible to partition the available access line bandwidth between unicast only and multicast only IPTV services); and
- able to handle resources shared by other non IPTV services (e.g. internet data and VoIP and other communication services).

6.2 Multicast and Unicast Support

The use of Multicast improves network resource utilization and QoS in large-scale IPTV deployments. . Therefore the access and core networks should have multicast transport and routing capability. The related multicast protocol, multicast management and control should be supported in access and core networks. IPTV solutions shall be able to make use of the underlying multicast facility if it is available (e.g. streaming servers and other service layer elements).

Content delivery of Multicast and Unicast streams types are:

- Multicast contents delivery:
  - Streaming type.

- Unicast contents delivery:
  - Streaming type.
  - Download type.

6.3 Security

The security requirements for IPTV are described in clause 4.13 of TS 187 001 [5].

6.4 User data

It shall be possible to define User profiles for access to IPTV services.

6.5 Accounting

It shall be possible to collect appropriate accounting data.

6.6 NAT Traversal

A mechanism shall be provided for NAT traversal.

Annex A (informative): Admission Control for Multicast and Unicast

The individual services within the general group of IPTV services can be divided into those that multicast-based and those that are unicast-based. Both groups can present a dynamic demand on the network.

The first group of Media Broadcast (multicast) services normally require as much of the network as possible to be provisioned with sufficient capacity to support the total number of multicast streams via preprovisioned multicast routing that will undergo admission control checks at the time of the preconfiguration. However parts of the network (particularly the access network and access link to the consumer network) cannot be preconfigured to simultaneously carry all possible multicast streams and therefore network resources need to be utilized dynamically in these parts of the network and will require admission control at the time of service selection by the user.

It should be noted that an individual IPTV multicast stream would normally utilize preconfigured multicast resources for part of its transport path (e.g. over the core from the head end to the IP edges and possibly on to all access nodes) and utilize dynamically allocated resources for the remaining parts of the multicast tree (e.g. in the access network and link to the consumer network). Not all multicast streams will follow the same network partition of preconfigured and dynamically allocated resources. For example the most popular broadcast channels may use a preconfigured routing allocation from the head end to all access nodes and only use dynamic resources in the home network and on the access link, whereas more specialized channels may use preconfigured from the head end to the IP edge and dynamic resources from the IP edge to the home network..

The second group of Content on Demand (unicast) services are allocated only when required and therefore require mechanisms to control load.

Content on Demand (CoD) services have a number of particular characteristics:

- The take up rate of a CoD service is very hard to predict. It can vary extremely fast and is highly dependent on many parameters which are completely outside the network operator's control such as attractiveness of the accessible content (film catalogue), promotional offers, special programs (sports event, movie release), etc.

- The bandwidth of a single CoD session is fairly high (1,5 Mbit/s to 15 Mbit/s) relative to link speeds found in some segments of the Core network (e.g. 1 Gb/s Ethernet) close to the Access Network. For example, assuming 4 Mbit/s per CoD stream, it only takes 500 users simultaneously using the CoD service (out of the 10 000 s users attached to an IP Edge Device) to entirely consume the bandwidth of two 1 Gb/s Ethernet links which may be connecting the IP Edge Device to the Core network. If non-CoD traffic is also consuming bandwidth, or if additional CoD users also request CoD content, serious congestion will occur on the Core links to the IP Edge Devices resulting in very serious degradation to all the CoD users (possibly to the point where they cannot watch the program at all because of Video coding sensitivity to loss). Failure of one of the two uplinks of the IP Edge Devices means that congestion occurs even earlier (from about 250 simultaneous users, out of 10 000 s).

- The CoD content may be distributed from a limited number of CoD content locations, each feeding potentially a very large CoD traffic aggregate into the core, where the speeds of the CoD aggregate is comparable, and can even exceed, the link speeds used in the core network (e.g. 10 Gb/s). For example, a cluster of CoD Pumps may be able to collectively stream from one location several thousands of CoD streams simultaneously into the Core network. If more than 2 500 of these streams happen to transit through the same 10 Gb/s Core link on their way to their respective destination CoD users (say because perhaps another 10 Gb/s link just went down), serious congestion will also be encountered on this core link.

Core networks are typically engineered such that they can deal with the peak load in the absence of failure as well as under most common failure situations. However, it is not always cost-economical to engineer each and every segment of the network so that it can cope with the peak load under less common but more catastrophic failure situations (e.g. multiple simultaneous failures). Similarly, it is not always cost economical to engineer each and every segment of the network to cope for the absolute worst peak load and absolute worst load distribution (focused overload). In the face of such catastrophic failure and/or unanticipated peak load, traditional Internet-style networks simply offer a degraded service where each user is left with reduced throughput and is expected to adjust accordingly. However, as Next Generation networks are intended to carry non-elastic multimedia applications with strong Service Level Agreements (such as the performance requirements of TS 102 034 [2]), it is important that those networks can react more appropriately in the face of catastrophic failure and/or unanticipated peak load in a segment of the network. In particular, it is essential to avoid a situation where all/many sessions all get affected to the point where they become useless because they all get insufficient throughput. The approach to avoid this is through the support of Admission Control whereby some subset of the sessions (selected according to some operator policy) would be denied service in order to leave sufficient capacity to the remaining sessions.

Annex B (informative): Other considerations

The following requirements should be also considered:

- User traffic model including other service's traffic (e.g. VoIP, Internet access).
- Several qualities of video services, and bandwidths of video traffic (e.g. MPEG, H.264 stream).
- Number of channels offered as the IPTV services.

As a reference, ITU-T Recommendation Y.2011 [3]. Appendix I describes following IPTV requirements.

Typical bandwidth requirements for support of each of the services proposed are:

- HDTV: 20 Mbit/s × 3 channels;
- Videophone: 4 Mbit/s × 4 channels;
- Internet service: 20 Mbit/s;
- High Quality Voice Service: 2 Mbit/s.

EXAMPLE Total bandwidth: approximately 100 Mbit/s.

Annex C (informative): Existing IPTV specifications

Work is proceeding in a number of organizations on the definition of IPTV services and the mechanisms by which they can be provided. For example:

- TR 102 033 [6] describes an architectural framework for the delivery of DVB services over IP based networks and includes descriptions of IPTV services;
- TS 102 034 [2] specifies the transport of MPEG2 based DVB services over IP based networks and defines RTSP profiles for *Live Media Broadcast* (LMB), *Media Broadcast with Trick Modes* (MBwTM) and *Content on Demand* (CoD); and
- TS 102 005 [4] specifies the use of Video and Audio Coding in DVB services delivered directly over IP protocols (i.e. not involving an MPEG2 transport stream). In addition the ATIS IIF has produced an IPTV requirements document.

History

Document history		
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