

Trends in Standardization of IPTV

ITU/MIC Training on Bridging the Standardization Gap

NTT

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Agenda

- What is IPTV?
- Why Standardize IPTV?
- Evolution of ITU-T's Work on IPTV
- ITU-T Recommendations on IPTV
- Relationship between ITU and other SDOs

What is IPTV? (1)

- **TV-like service provided via IP (Internet Protocol)**
- **Services may include:**
 - Video On Demand (VOD)
 - Linear (Channel Service) Broadcast TV
 - Audio services
 - Gaming
 - TV yellow pages
 - Photo albums
 - ...
- **ITU-T defines it as “multimedia service over **managed** IP network”**
- **Different from Internet TV**

What is IPTV? (2)

- In the general understanding, it is IP-based Video-centric service, usually provided by Telcos
- Often coupled with other multimedia services such as text, graphics, and also with more enhanced interactive services like e-commerce
- Perceived to have an infinite possibilities, and may encompass broadcasting in the future

Why Standardize IPTV?

Pros and Cons of Proprietary Approach

- Pros:
 - More Versatility and Adaptability
 - More Resources and Control on Terminal
 - Easier differentiation
- Cons
 - More expensive for the Service provider
 - More limited number
 - More control means more responsibility

Standardized IPTV as Market Driver

- Standardized IPTV will create a big market not only for Content but also for various related services
- Standardized IPTV will be the new platform for communication and exchange
- Players in the Content Eco-system will benefit from Standardized IPTV

Evolution of ITU-T's Work on IPTV

- Focus Group on IPTV (2006-2007)
- Creation of Q13/16 on IPTV Multimedia (6/2007)
- IPTV Global Standardization Initiative (GSI) (2008-)
 - WTSA (10/2008)
 - New Study Period

Background of IPTV Standardization at ITU-T

- IPTV is becoming an increasingly important service in the market
- More and more ITU-T Members are facing challenges from technical as well as regulatory issues
- ITU-T has received proposals to strengthen its work on IPTV standardization
- ITU-T has decided to set up a Focus Group IPTV to start work on IPTV standardization.
- The first meeting was held in July 2006.

Work Areas of FG IPTV

WG	Name	Remarks
WG1	Architecture and Requirements	474 Contributions 4 Documents
WG2	QoS and Performance Aspects	188 Contributions 4 Documents
WG3	Service Security and Contents Protection Aspects	122 Contributions 1 Documents
WG4	IPTV Network Control	178 Contributions 3 Documents
WG5	End Systems and Interoperability	109 Contributions 2 Documents
WG6	Middleware, Application and Content Platforms	183 Contributions 5 Documents

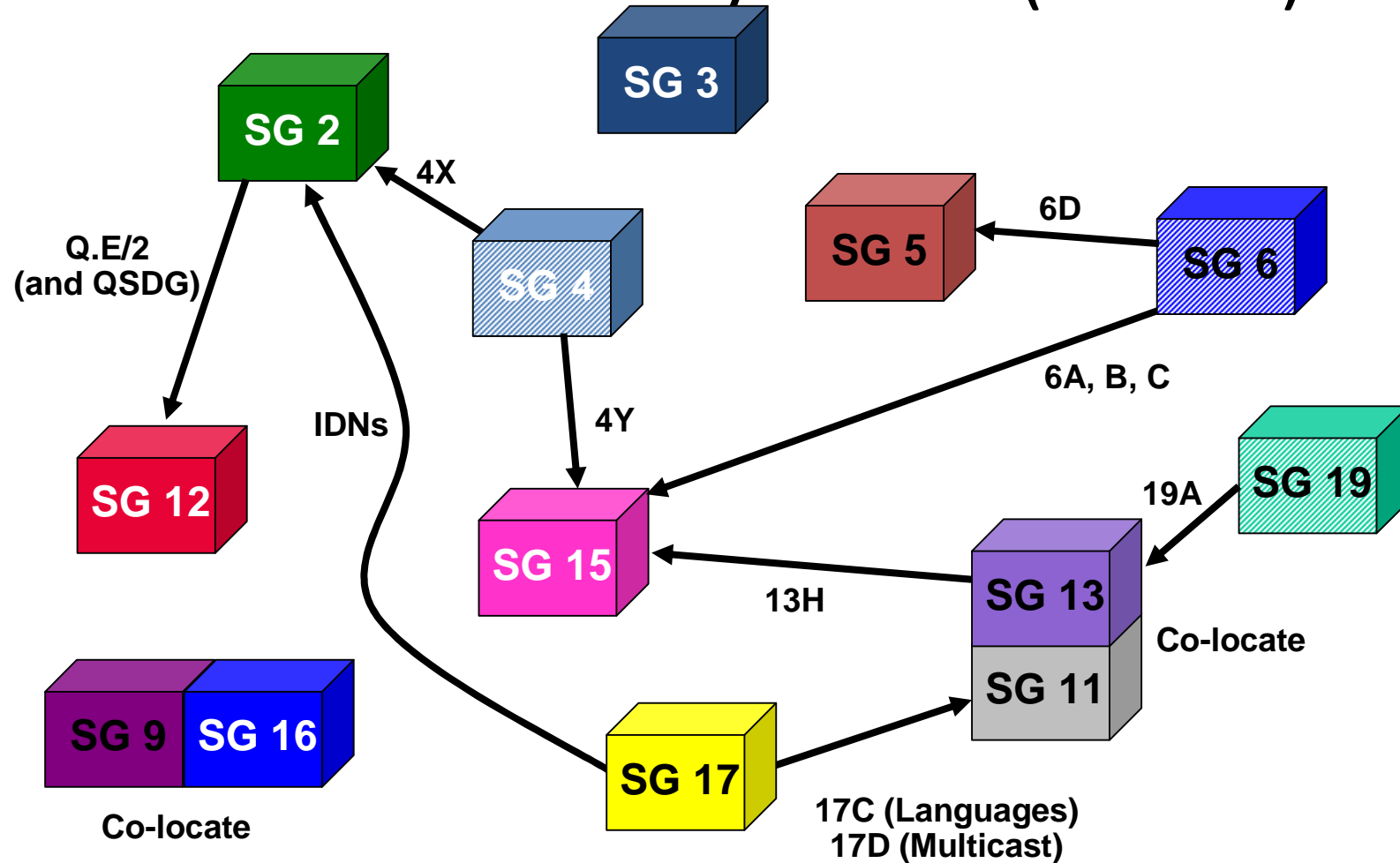
From Focus Group to IPTV-GSI

- ITU-T has decided that the ongoing work after FG IPTV would be carried out under the umbrella of a Global Standards Initiative (the IPTV-GSI).
- The ongoing work on the outputs from the IPTV Focus Group will be done by the study groups (based on allocations developed by the IPTV-JCA) with coordinated planning of the activities and through co-located meetings of the involved rapporteur groups to progress certain areas of the work as appropriate.

FG IPTV Deliverables and IPTV-GSI

Study Group	Question	Documents	Note
SG9	Q4/9	IPTV Middleware	With Q13/16
	Q5/9	Aspects of IPTV End Systems – Terminal Device	With Q13/16
SG11	Q1/11	IPTV Related Protocols	
SG12	Q2/12	IPTV multicast frameworks	
	Q13/12	Performance monitoring for IPTV	
	"	Quality of Experience Requirements for IPTV	
SG13	Q1/13	Service Scenarios for IPTV	With Q2,8/13, Q22/16. Q9/9
	Q2/13	IPTV Service Requirements	
	"	IPTV Network Control Aspects	
	Q3/13	IPTV Architecture	
	Q4/13	Traffic Management Mechanisms for the Support of IPTV Services	
SG16	Q13/16	Application layer error recovery mechanisms for IPTV services	
	"	Aspects of IPTV End Systems – Terminal Device	With Q5/9
	"	IPTV Middleware, Application and Content Platforms	
	"	Toolbox for content coding	
	"	IPTV Middleware	With Q4/9
	"	IPTV Metadata	
	"	Standards for IPTV Multimedia Application Platforms	
	Q21/16	Aspects of Home Networking supporting IPTV Services	
SG17	Q9/17	IPTV Security Aspects	Rights Metadata define by Q13/16

ITU-T in next Study Period (2009 -)



IPTV-GSI: Participating Questions (1)

Question	Title
Q4/9	API for advanced cable television and sound program distribution within the scope of SG9
Q5/9	Functional requirements for a universal integration receiver or set-top-box for the reception of cable television and other services
Q1/11	Network signaling and control functional architectures in emerging NGN environments
Q5/11	Resource control and signaling requirements and protocols
Q13/12	QoE/QoS performance requirements and assessment methods for multimedia including IPTV
Q1/13	Project coordination and release planning for NGN

IPTV-GSI: Participating Questions (2)

Question	Title
Q2/13	Requirements and implementation scenarios for emerging services in NGN
Q3/13	Principles and functional architecture for NGN
Q4/13	Requirements and framework for QoS for NGN
Q7/13	Network and service interworking in NGN environment
Q11/13	General network terminology
Q13/16	Multimedia application platforms and end systems for IPTV
Q21/16	Multimedia Architecture
Q9/17	Secure Communication Services

New Structure of ITU-T Study Groups

- WTSA (World Telecommunication Standardization Assembly)
 - Regular four yearly event that defines the next period (2009-2012) of study for ITU-T
 - Held in Johannesburg during 21-30 October 2008
- Defined Study Group (SG) structure and elected Chairmen and Vice-Chairmen
- Reviewed the work methods and set various guidelines including academia involvement

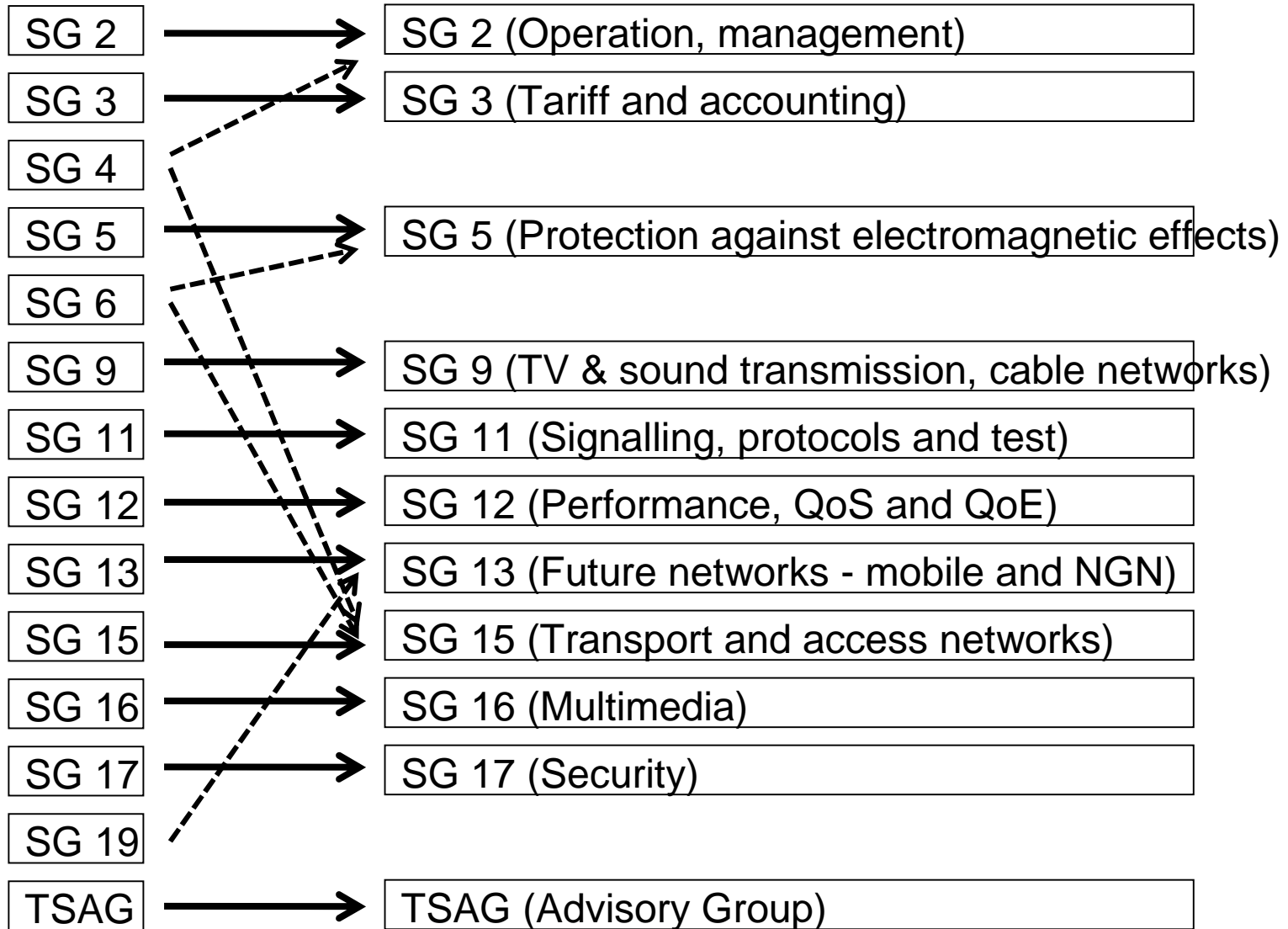
Technical Core SGs:

- SG2 (Service definition, numbering and routing)
- SG3 (Tariff and accounting principles)
- SG5 (Electromagnetic environment effects)
- SG12 (Quality of Service)
- SG13 (Network Architecture)
- SG15 (Access network infrastructures)
- SG16 (Multimedia coding, systems and applications)
- SG17 (Security)

New Study Groups

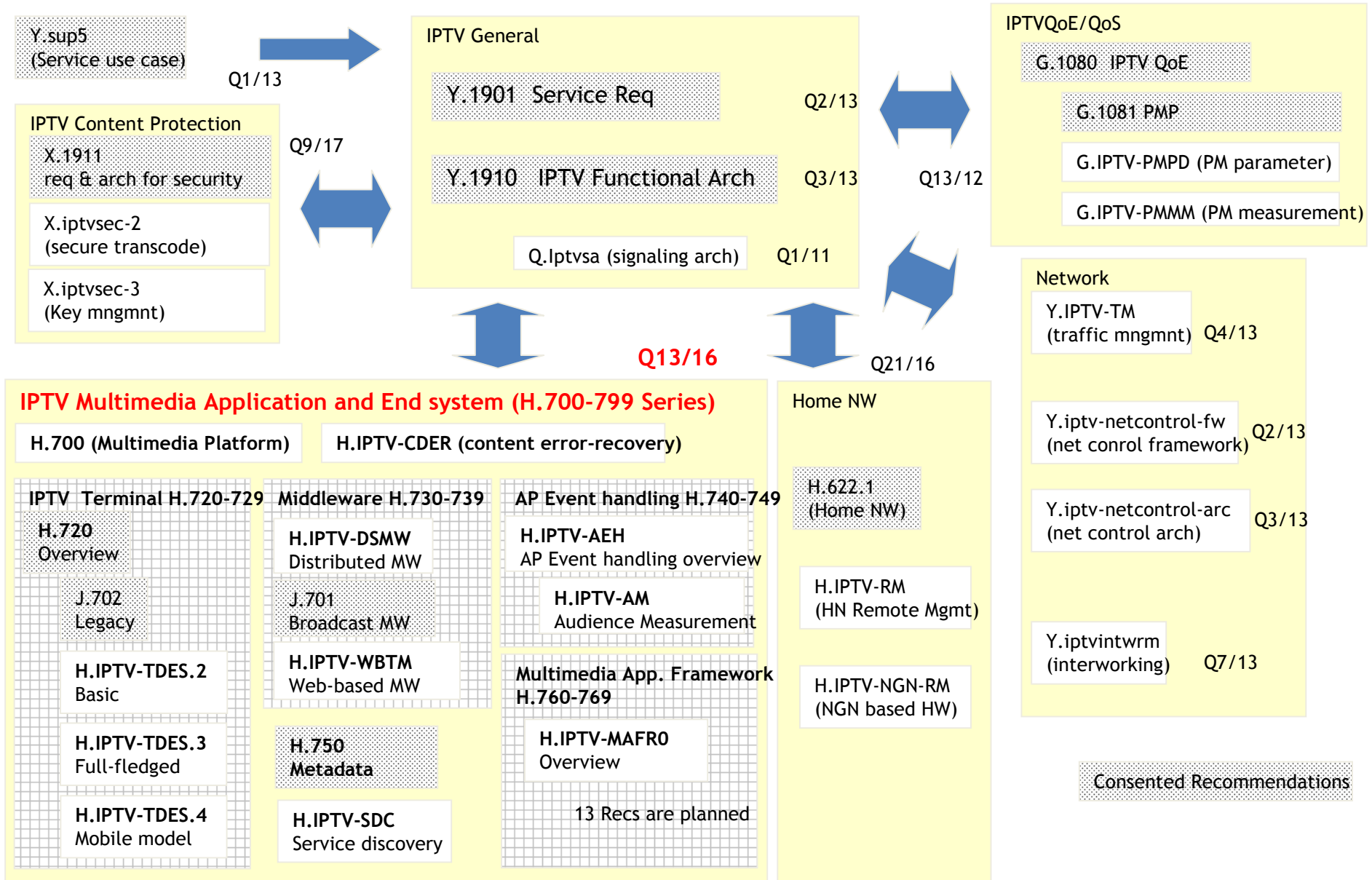
2005-2008

2009-2012



ITU-T Recommendations on IPTV

ITU-T Recommendations for IPTV



ITU-Recommendations for IPTV

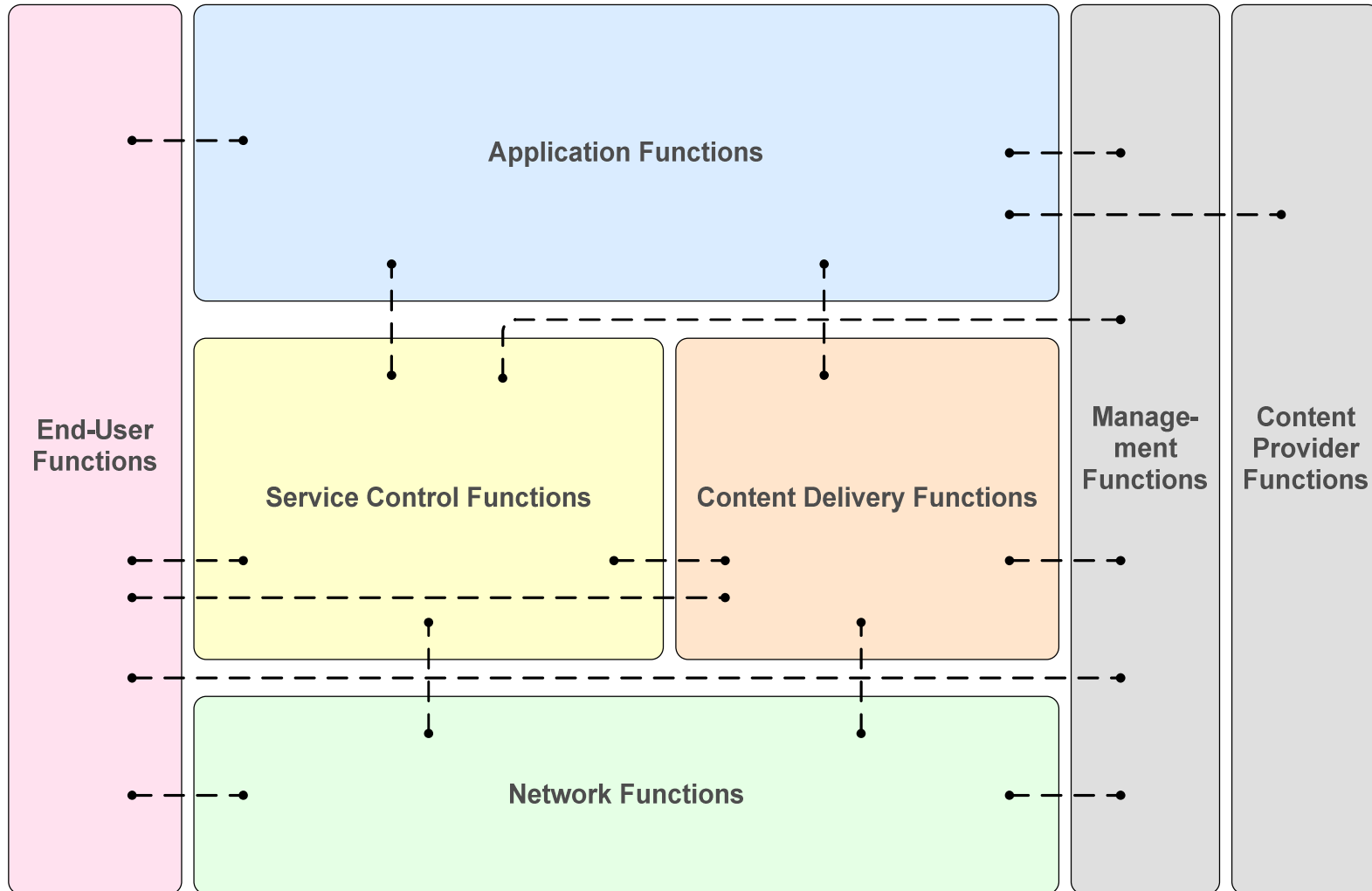
- Y.1900 Series – SG13 (Architecture)
- G.1080 Series -- SG12 (QoS)
- H.700 Series -- SG16 (Multimedia and Application)
- J.700 Series (Cable networks)
- X.1900 Series (Security)

ITU-T Recommendations for IPTV

General Architecture and others

Title	Q	Target
Y.1910: IPTV Functional Architecture (Y.iptv-arch)	Q3/13	Approved
Y.1901: IPTV services requirements(Y.iptv-req)	Q2/13	Consented (2008.09)
Y.Suppl.5: Supplement: IPTV Service Scenarios	Q1/13	Approved (2008.05)
Y.iptv-netcontrol-fw: IPTV network control	Q2/13	TBD
Y.iptv-netcontrol-fw: IPTV network control	Q2/13	TBD
Functional architecture aspects of IPTV network control	Q3/13	TBD
Y.iptv-tm: Traffic management mechanism for the support of IPTV services	Q4/13	2009
Y.iptvtwrm: IPTV interworking in NGN (New: 08.09)	Q7/13	TBD

IPTV Architecture Overview



IPTV Functions

- **Content provider functions**
- The content provider functions are provided by the entity that owns or is licensed to provide (i.e. sell, rent or give free usage permission) content or content assets (i.e. owner of the content, metadata and usage rights).

- **Management functions**
- The management functions perform overall system management (i.e. operations, administration, maintenance and provisioning (OAM&P)). The management functions do not include the functions that provision the behaviour within applications or the functions that gather accounting information within applications.
- As an example, the installation of a software upgrade to a video on demand application would be a management function. However, the provisioning of the multicast addresses of linear TV channels within a linear TV application would not be a management function.

IPTV Functions (cont.)

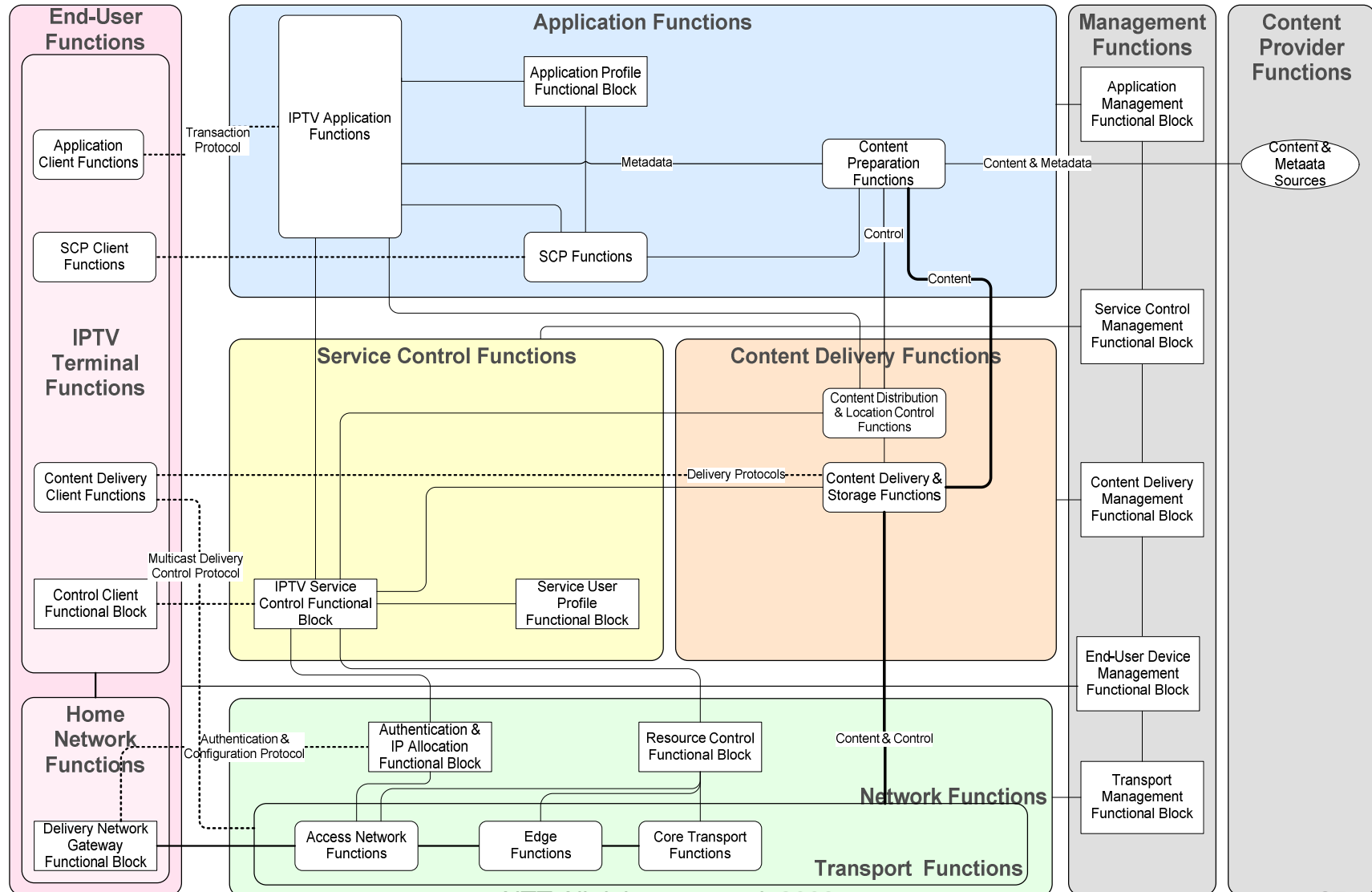
- **Service control functions**
- The service control functions provide the functions to request and release network and service resources required to support the IPTV services.
- The service control functions can request the content delivery functions to allocate resources and request the network functions to reserve required network bandwidth for the content stream. The service control functions can optionally obtain end-user's current location from the network functions.

- **Network functions**
- The network functions provide IP layer connectivity between the IPTV service components and the end-user functions. The network functions are shared across all services delivered by IP to an end-user.
- The network functions contribute to the provision of the quality of service (QoS) required by the IPTV services.

IPTV Functions (cont.)

- **Content delivery functions**
- The content delivery functions receive content from the application functions, store, process, and deliver it to the end-user functions using the capabilities of the network functions, under control of the service control functions
- **Application functions**
- The application functions enable the end-user functions to select and purchase or rent a content item.
- **End-user functions**
- The end-user functions perform mediation between the end-user and the IPTV infrastructure.

Functional Architecture of IPTV System



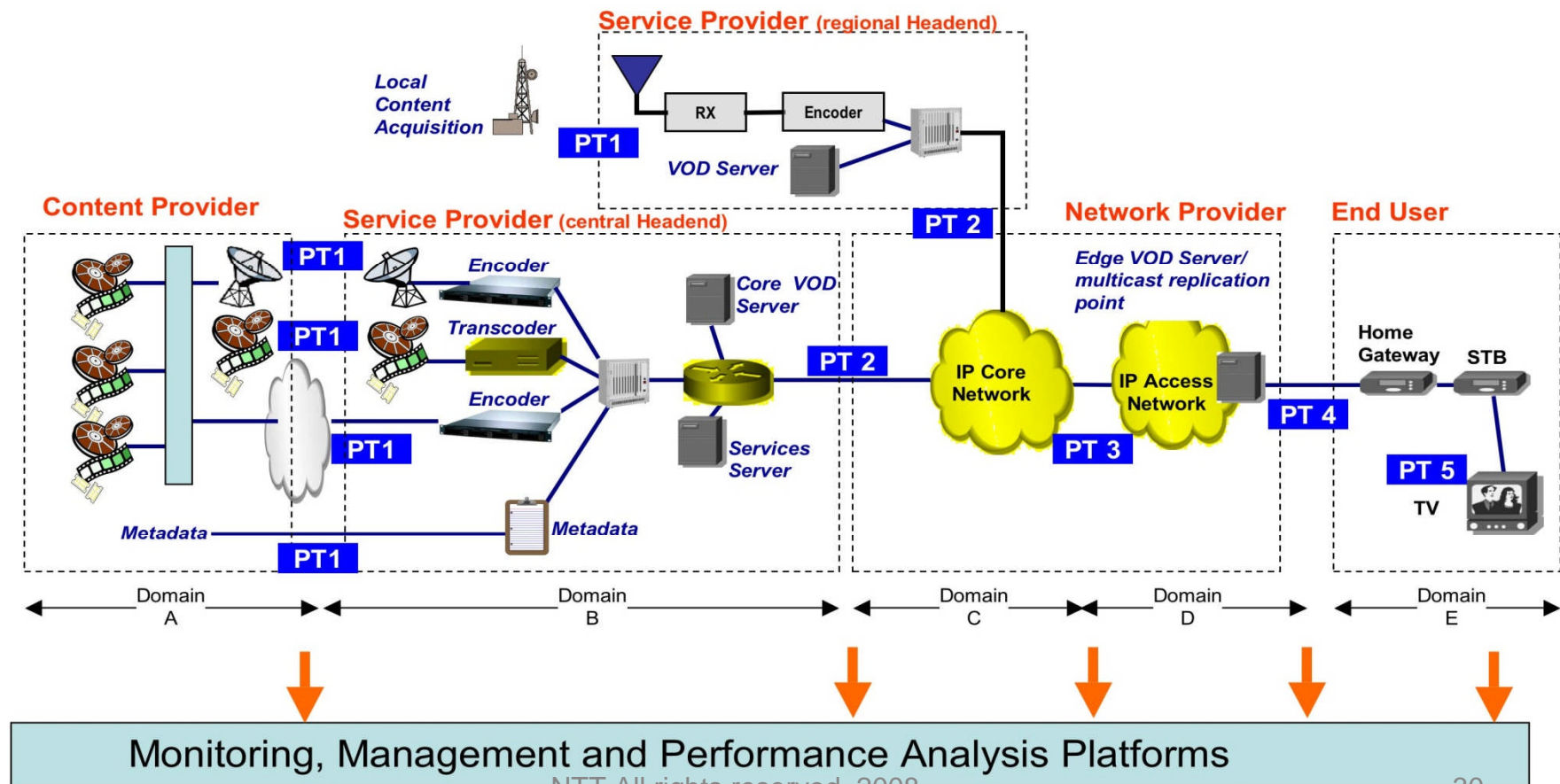
ITU-T Recommendations for IPTV QoS

Title	Q	Target
G.1080		Consented (2008.05)
G. 1081: IPTV Performance Monitoring Points(G. IPTV-PMP)	Q13/12	Consented (2008.05)
G.IPTV-PMPD: IPTV Performance Monitoring – Parameter definitions	Q13/12	2009.11
G.IPTV-PMP: IPTV Performance Monitoring – Measurement methods	Q13/12	2010
H.IPTV-CDER: Content Delivery Error Recovery	Q13/16	2009.2

Content Delivery Error Recovery

- Content Delivery Error Recovery (CDER) is an important aspect for IPTV services. Data being delivered over IP networks may suffer from packet losses. In case of the delivery of video and audio data errors such as packet losses or bit errors being exposed to the media decoder generally degrade the IPTV service quality. Moreover, losses in the metadata such as electronic program guide (EPG), electronic content guide (ECG), and interactive user data may cause more severe problem in IPTV service. Therefore, reliability support for them is essential to IPTV service.

Performance monitoring for IPTV



Traffic Management Mechanisms

IPTV Service Component	IPTV Services	Y.1541 QoS Class							
		5	4	3	2	1	0	7	6
Video Streaming	Linear TV including Pay per View and Multi-view						✓		✓
Video Streaming	VoD, Network PVR, time-shift TV					✓		✓	
Audio Steaming	Music on Demand					✓			
Streaming Control	VoD, Network PVR, time-shift TV				✓				
Video Download	Push VoD, Near VoD		✓						
Video Upload	User generated content		✓						
Data Download	Content guides, pictures, applications download	✓							

Application Layer Error Recovery

Retransmission and Forward Error Correction (FEC) are two well-known methods.

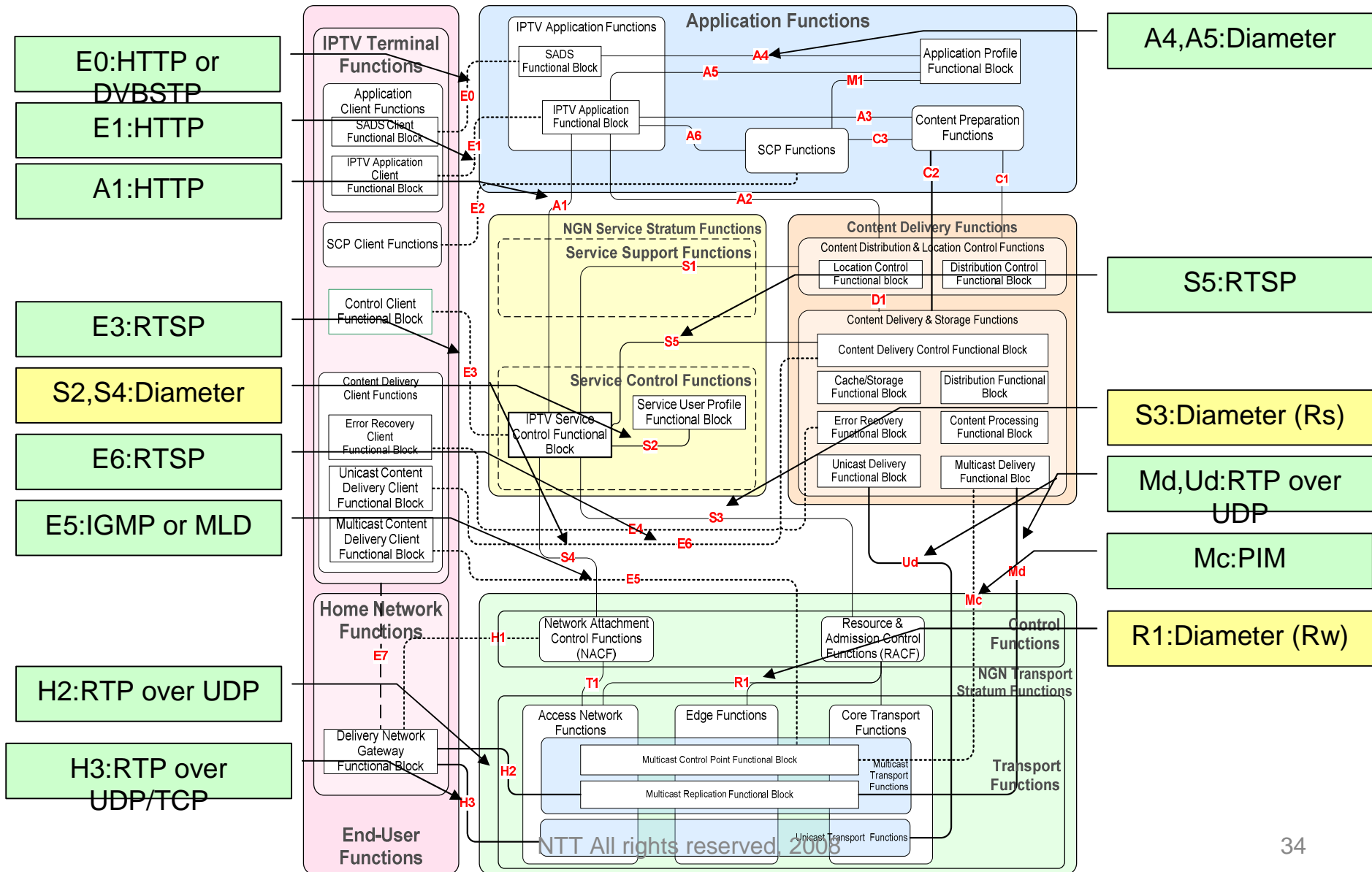
- Retransmission is a way in which to request lost packets to be retransmitted when a packet-loss is detected at the receiving end.
- FEC is a way to send redundant data with the content so that the receiving side can retrieve information even when there is a packet loss.
- These two methods are complementary and can be used in conjunction with each other

ITU-T Recommendations for IPTV

Signaling and Protocols

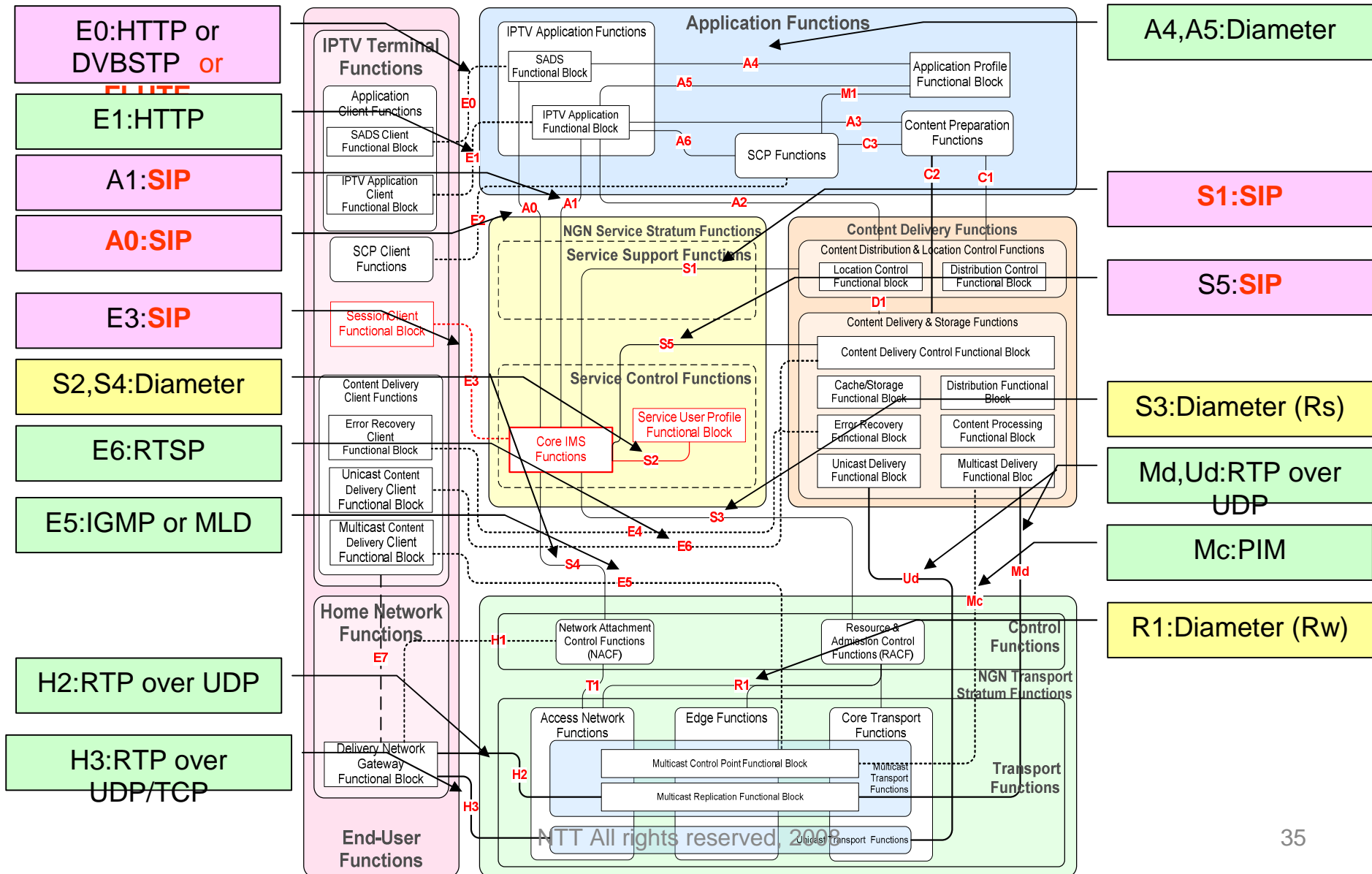
Title	Q	Target
Q.iptvsa: Signalling and control plane architecture for IPTB	Q1/11	TBD
Procedural descriptions and protocol profiles for resource control and traffic management supporting IPTV service (new work item)	Q5/11	TBD

Signaling for NGN non-IMS (Y.1910 Appendix2)



Signaling for NGN+IMS

(Y.1910 Appendix2)



ITU-T Recommendations for IPTV Multimedia, Application, and End System Terminals

Title	Q	Target
H.700: Multimedia application platforms and end system for IPTV	Q13/16	2009
H.720: Overview of IPTV Terminal Device and End systems (H.IPTV-TDES.0)	Q13/16	Consented (2008.09)
H.IPTV-TDES.1: Enablement of current terminal devices for the support IPTV services	Q5/9	2008.09(Consent, SG9)
H.IPTV-TDES.2: IPTV terminal Device and End system (Basic Model) (<i>New: 08.09</i>)	Q3/13	TBD
H.IPTV-TDES.3: IPTV Terminal Device and End system (Full-Fledged Model) (<i>New: 08.09</i>)	Q13/16	TBD
H.IPTV-TDES.4: IPTV Terminal Device and End system (Mobile Model) (<i>New: 08.09</i>)	Q13/16	TBD

ITU-T Recommendations for IPTV

Title	Q	Target
H.IPTV-DSMW: Distributed Service Middleware for IPTV	Q13/16	2009
H.IPTV-WBMW: Web-based Middleware for IPTV	Q13/16	TBD
J.702: Broadcast-centric IPTV Terminal Middleware (J.iptv-bctm)	Q4/9	2008.9(Consent, SG9)
H.IPTV-AEH: Application Event Handling for IPTV	Q13/16	2009
H.IPTV-AM: Audience Measurement for IPTV (<i>New: 08.10</i>)	Q13/16	TBD
H.IPTV-MAFR.0: Overview of Multimedia Application Frameworks for IPTV	Q13/16	TBD
H.750: Metadata for IPTV (H.IPTV-MD)	Q13/16	Consented (2008.09)
H.IPTV-SDC: Mechanism for service discovery up to consumption for IPTV	Q13/16	2009.02

ITU-T Recommendations for IPTV

Title	Q	Target
H.IPTV-WBMW: Web-based Middleware for IPTV	Q13/16	TBD
H.IPTV-AM: Audience Measurement for IPTV (<i>New: 08.10</i>)	Q13/16	TBD
H.622.1: Architecture and functional requirements for Home network supporting	Q21/16	Consented (2008.09)
H.iptv-rm: Architecture and functional requirements for remote management of HN supporting IPTV services	Q21/16	2009
H.iptv-ngn-rm: NGN based home networks supporting IPTV services capabilities (<i>New: 08.09</i>)	Q21/16	2009

ITU-T Recommendations for IPTV

Title	Q	Target
X.iptvsec-1: Functional requirements and architecture for IPTV security aspects	Q9/17	2008.09(DE T, SG17)
X.iptvsec-2: Functional requirements and architecture for secure transcodable scheme for IPTV (<i>New: 08.09</i>)	Q9/17	2009.02
X.iptvsec-3: Key management framework for secure IPTV communications (<i>New: 08.09</i>)	Q9/17	2009.02

**New Series: H.700-H.799 –
IPTV Multimedia Services and applications for IPTV (I)**

- **General aspects: H.700-H.719**
 - **[H.700]** H.IPTV-MAP “Multimedia application platforms and end systems for IPTV” (The overview Rec. of the Recommendation series)
 - H.IPTV-CDER “Content Delivery Error Recovery for IPTV services”
 - H.IPTV-SDC “Mechanisms for service discovery up to consumption for IPTV”
 - H.ProComp: “Profiles of IPTV Services and Compliance”

New Series: H.700-H.799 –
IPTV Multimedia Services and applications for IPTV (I)

- **IPTV Terminal Devices: H.720-H.729**
 - **[H.720]** “IPTV-Terminal Device Overview”
 - H.IPTV-TDES.2 “IPTV-Terminal Device (Basic Model)”
 - H.IPTV-TDES.3 “IPTV-Terminal Device (Full-fledged)”
 - H.IPTV-TDES.4 “IPTV-Terminal Device (Mobile Model)”

**New Series: H.700-H.799 –
IPTV Multimedia Services and applications for IPTV (II)**

- **IPTV Middleware: H.730-H.739**
 - H.IPTV-DSMW “Distributed Service Middleware for IPTV”
 - H.IPTV-WBTM (“Web-based Terminal Middleware”)
- **IPTV Application Event Handling: H.740-H.749**
 - H.IPTV-AEH “Application Event Handling for IPTV”
 - H.IPTV-AM “Audience Measurement for IPTV”
- **IPTV Metadata: H.750-H.759**
 - **[H.750]** “High-level Specification of Metadata for IPTV Services”

New Series: H.700-H.799 – IPTV Multimedia Services and applications for IPTV (III)

- **IPTV Multimedia Application Frameworks: H.760-H.769**
 - H.IPTV-MAFR.0 Overview of Multimedia Application Frameworks for IPTV
 - Web-Affiliated Application Frameworks
 - a) H.IPTV-MAFR.2 "Broadcasting Markup Language for IPTV"
 - a) H.IPTV-MAFR.3 "CEA-2014 for IPTV"
 - a) H.IPTV-MAFR.4 "Cascading Style Sheet for IPTV"
 - a) H.IPTV-MAFR.5 "Document Object Model for IPTV"
 - a) H.IPTV-MAFR.6 "ECMAScript for IPTV"
 - a) H.IPTV-MAFR.10 "Scalable Vector Graphics for IPTV"
 - a) H.IPTV-MAFR.13 "HTML for IPTV"
 - MPEG-based Frameworks
 - b) H.IPTV-MAFR.1 "Binary Format for Scene for IPTV" (joint work with MPEG)
 - b) H.IPTV-MAFR.7 "Lightweight Application Scene Representation and Simple Aggregation Format for IPTV" (joint work with MPEG)
 - b) H.IPTV-MAFR.12 "MPEG Multimedia Middleware for IPTV" (joint work with MPEG)
 - c) H.IPTV-MAFR.8 "MHEG-5 for IPTV" (joint work with MHEG Maintenance Team)
 - d) H.IPTV-MAFR.9 "Nested Context Language and Ginga for IPTV"
 - e) H.IPTV-MAFR.11 "Worldwide TV Markup Language for IPTV"

ITU-T Q13/16

- **Multimedia Application Platforms and end-systems for IPTV**
- IPTV is a multimedia service encompassing television, video, audio, text, graphics and data delivered over IP based networks which are managed to provide the required level of QoS and QoE, security, interactivity and reliability.
- Standards for IPTV, especially those for application and terminal aspects, are of immediate relevance to ITU-T in general and to SG16. SG16 is interested, among other things, in the associated multimedia (including IPTV) application and terminal aspects.
- This Question is intended to produce deliverables related to study IPTV platforms, including, but not restricted to middleware, applications, content formats and their uses, which will facilitate effective and interoperable use of the IPTV systems.

Interests area of Q13/16

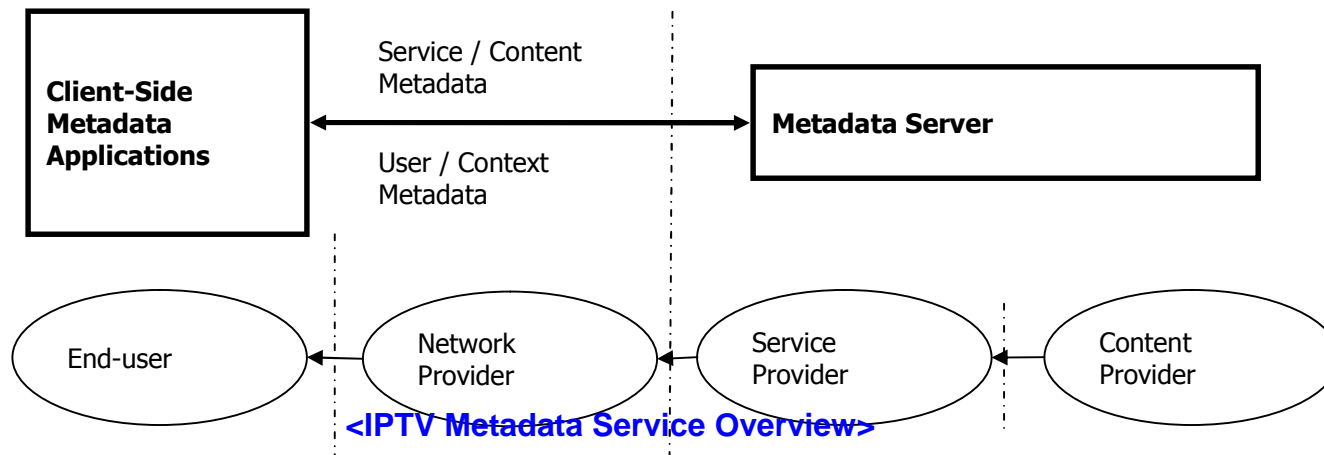
- IPTV Multimedia Application and Content Platform
 - Multimedia Content Formats
 - Multimedia and Hypermedia Description Languages
 - Distributed Service Middleware
- Content Management
 - IPTV Service and Content Processes
 - Provisioning
 - Discovery
 - Navigation and Selection
 - Acquisition
 - Consumption
 - Quality of Application Layer User Experience
 - Application Event Handling
 - Metadata
- IPTV Terminal Device and End-system
 - Core Interfaces for IPTV end-system
 - IPTV Terminal Device Attributes for Configuration and Management
 - IPTV-specific Consumer Premise Environment Aspects
- Profiling and Compliance

H.IPTV-MAP

- **Multimedia application platforms and end systems for IPTV**
- Provides a framework and requirements of multimedia application platforms and end systems for IPTV, including, but not restricted to, service enablers, applications, content formats and their uses, which will facilitate effective and interoperable use of the IPTV systems, including terminals.
- Describes the components of IPTV related to multimedia application platform

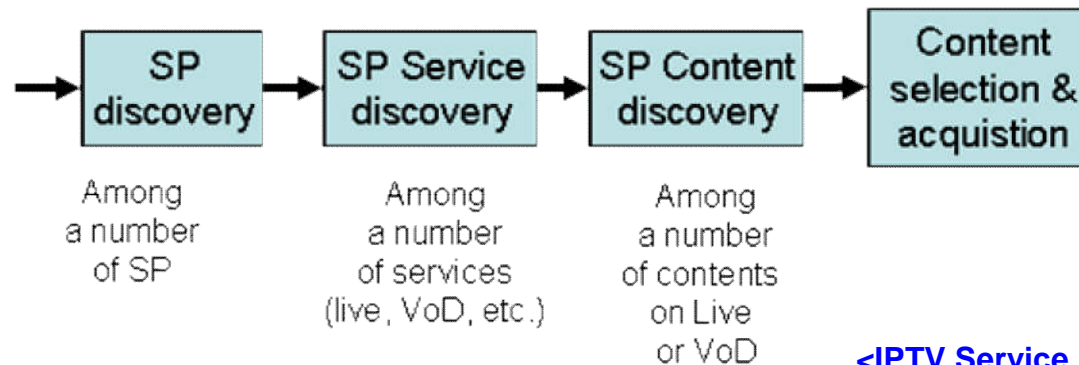
H.750: *Metadata*

- High-level specification of metadata for IPTV services
- This Recommendation gives the overview of the metadata for IPTV services and describes its elements and delivery protocols, identifying relevant standards.
- Aspects of transport, representation, content provisioning, and security of metadata are covered.



H.IPTV-SDC: *Service Discovery*

- **Mechanisms for service discovery up to consumption for IPTV**
- This Recommendation describes service discovery, channel and content identification and location resolution for IPTV.

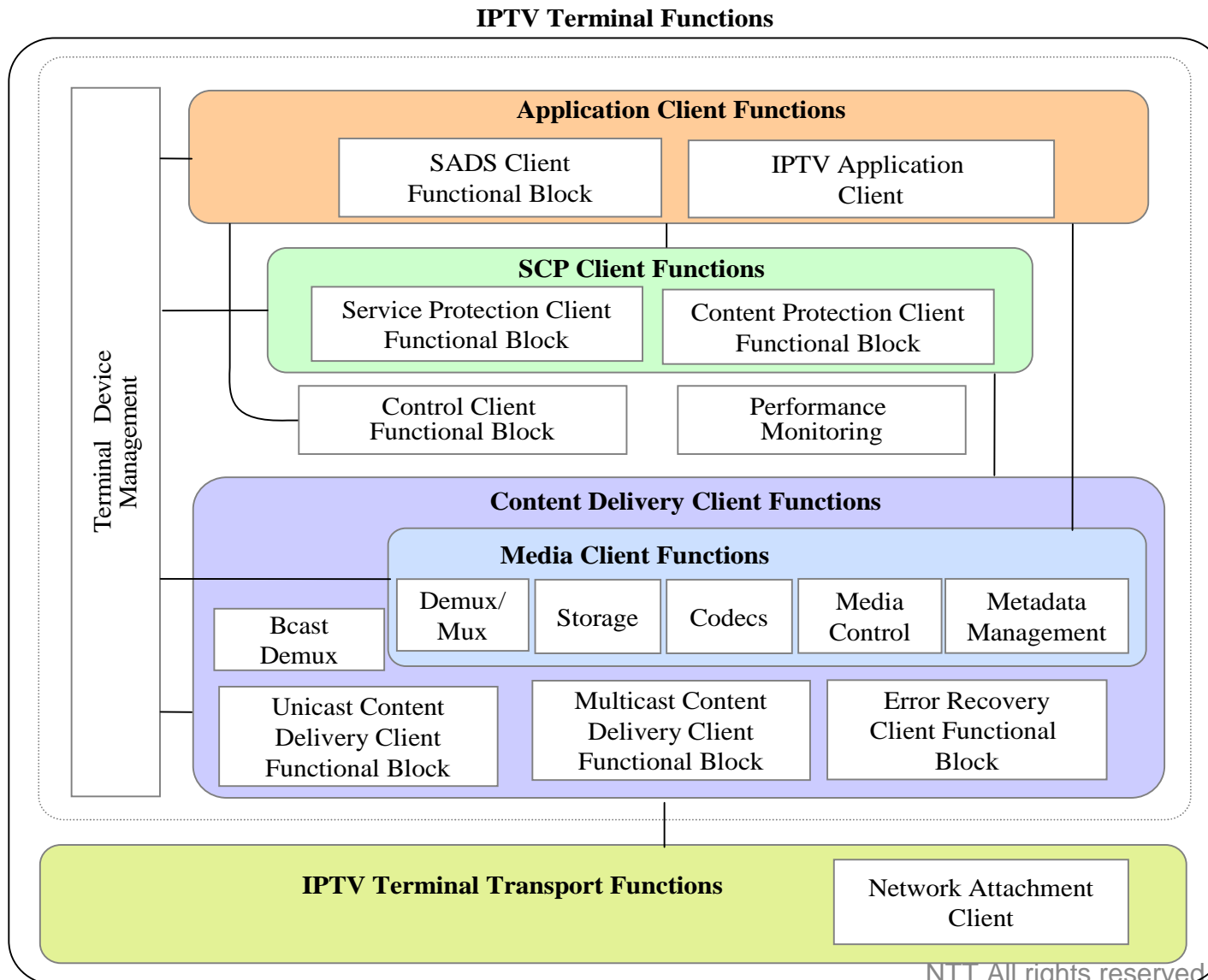


- Aspects covered:
 - Service Provider Discovery Process
 - Service Provider Information
 - Service Provider Information Delivery
 - Service Discovery Process
 - “Detailed Service Offer” information & Delivery Protocol
 - Service Selection Process
 - Service/Content Delivery Protocol
 - Channel Identification and location resolution

H.720: *Terminal*

- **Overview of IPTV Terminal Devices and End Systems**
- This Recommendation gives the overview of the architecture and functional components of an IPTV terminal device and provides a high-level description of functionality necessary to support IPTV services.
 - Services and Key Features of IPTV Terminal Device and End System
 - IPTV Terminal Device Functional Architecture
 - IPTV Terminal Device Physical Interfaces
 - IPTV Terminal Software Architecture

Functional Architecture of IPTV terminal device



H.IPTV-AEH:

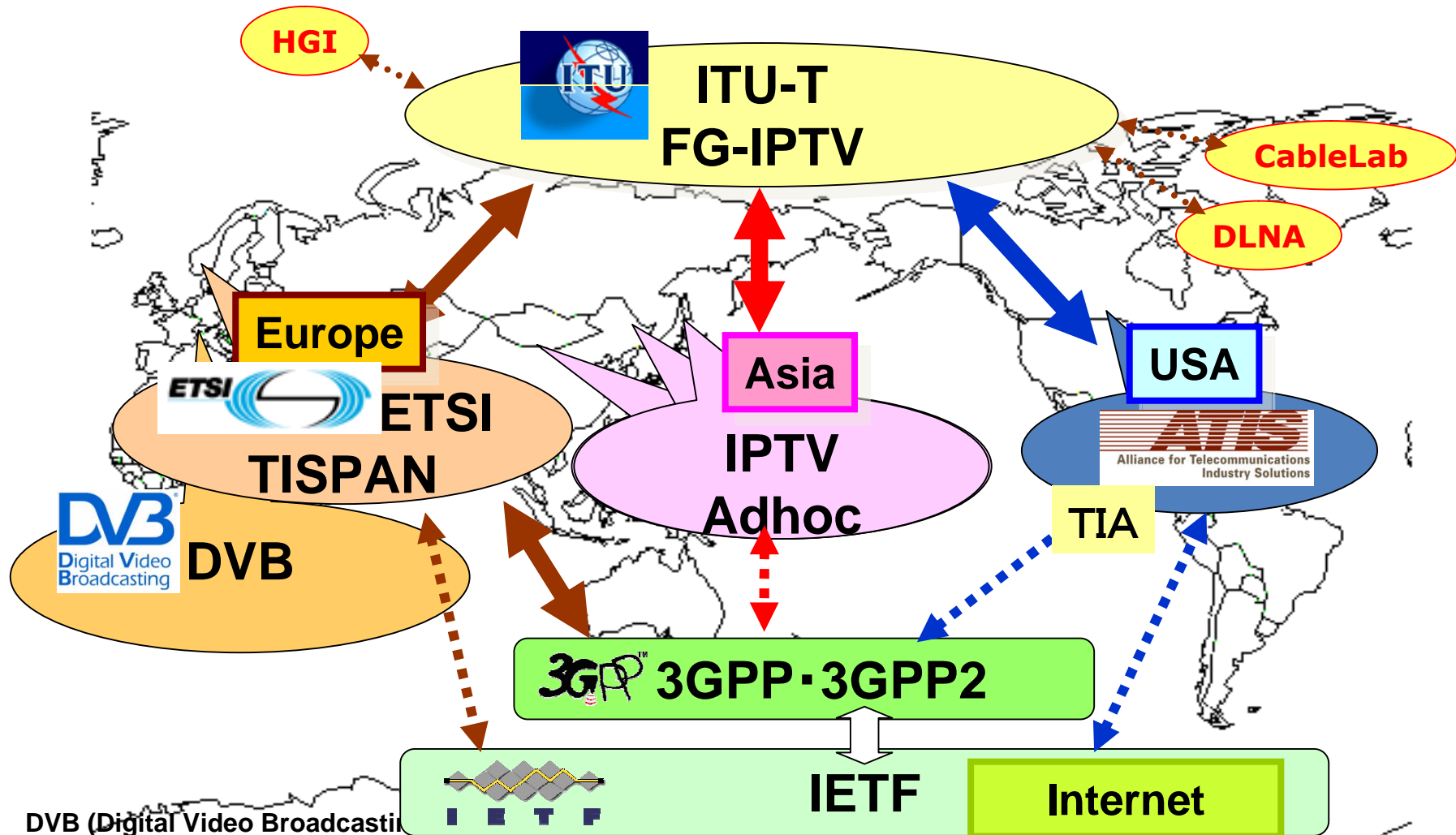
Application Event Handling

- **Application Event Handling for IPTV**
- This Recommendation provides a framework of application event handling for IPTV which will facilitate effective and interoperable use of the IPTV services.
- A specific user interaction or occurrence related with multimedia contents in IPTV can be called an application event.
- Aspects covered:
 - Application event model
 - Application event description and notification
 - Metadata model for Application Event Handling
 - Delivery methods
 - Security mechanism for application event

H.IPTV-MAFR: *Multimedia Applications*

- **Overview of multimedia application frameworks for IPTV**
- This Recommendation identifies and describes the relevant standards for interoperability and harmonization among IPTV multimedia application frameworks.
- Standards for Declarative Application Frameworks
 - BIFS, BML, CEA-2014, CSS, DOM, ECMAScript, HTML, LAsE & SAF, MHEG-5, NCL, SVG, WTVML
- Standards for Procedural Application Frameworks
 - GEM based Application Frameworks
- Other Related Standards
 - M3W
- Drafting sub-series for declarative Application Frameworks
 - H.IPTV-MAFR.1 ~ H.IPTV-MAFR.13

Relationship between ITU and other SDOs



DVB (Digital Video Broadcasting)
 FG IPTV (Focus Group on IPTV
 Standards Institute),

ATIS (Alliance for Telecommunications Industry Solutions)
 TIA (Telecommunications Industry Association)

ETSI (European Telecommunications

CJK (China, Japan, Korea)

IETF (The Internet Engineering Task Force)

- Thank you!
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