IPTV Standardization at ITU-T
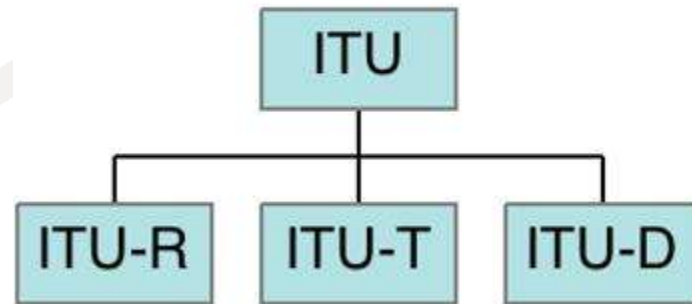
Masahito Kawamori

ITU-T IPTV-Global Standards Initiative

TSR Coordinator

ITU Organization

ITU (International Telecommunication Union)
is a UN agency with the following structure

ITU   International Telecommunication Union
ITU-R Radiocommunication Sector
ITU-T Telecommunication Standardization Sector
ITU-D Telecommunication Development Sector

http://www.itu.int/aboutitu/structure/index.html

Agenda

- Introduction to ITU
  - Membership
  - Standardization Process
  - IPR
- IPTV Standardization at ITU
  - Liaisons with Other SDOs
  - Roadmap
  - Status of Standards
- ITU IPTV Standards and NIMS environment
- Deployments of ITU IPTV Standards
- Conclusion

Membership

- over 700 private members
  - Most of the world's telcos and major manufacturers of equipment and software are Sector Members or Associates of ITU-T
- 191 governments and their regulators
- technical standards are developed primarily by industry members
- a unique partnership between public and private sectors

ITU Standardization (ITU-T)

- A long history of standardization for telecommunications
- Has moved beyond its roots in pure telecommunications
- Has become a strong player in the multimedia field for many years
- ITU-T H.264 (joint work of SG16 with MPEG), Emmy award winning video codec, is a good example.

Study Groups of ITU-T

- SG 2: Operational aspects of service provision and telecommunications management
- SG 3: Tariff and accounting principles including related telecommunication economic and policy issues
- SG 5: Protection against electromagnetic environment effects
- SG 9: Television and sound transmission and integrated broadband cable networks
- SG 11: Signalling requirements, protocols and test specifications
- SG 12: Performance, QoS and QoE
- SG 13: Future networks including mobile and NGN
- SG 15: Optical transport networks and access network infrastructures
- SG 16: Multimedia coding, systems and applications
- SG 17: Security
- TSAG: Telecommunication Standardization Advisory Group

ITU-T Standardization Process

- Unlike some impressions that it is slow, closed, and rigid, ITU-T standardization process is fast, open, and flexible

- technical standards are developed, primarily by industry members, by consensus.

- It has an open (accessible from website), transparent, consensus based, fast working standards process.

- Final approval given by 191 governments around the globe (after consensus is made, it takes 4 weeks until the approval is given).

- Some groups ("Questions") meet every month.

- Tele-conf facility is provided, and conf-calls are promoted

Clear IPR Policies

- Clear Patent and Licensing policy
  - http://www.itu.int/ITU-T/ipr/

- This policy is Common to ITU, IEC and ISO
  - http://www.itu.int/ITU-T/dbase/patent/patent-policy.html.
- According to the policy, request is made for IPR declaration at each meeting.

Accessible to Many Regions

- ITU standards are translated and published in 6 languages:
  - Arabic, Chinese, English, French, Russian, Spanish
- Easily Accessible from different regions and cultures of the world
- Truly global provision

IPTV Standardization at ITU

IPTV and New Generation NW

- IPTV is part of the new wave, and one of the most highly visible services to emerge as part of work on the next generation network (NGN).

- It can be seen as both the business case and principal driver for accelerating deployment of NGN.

- IPTV subscriptions around the world will reach 48.8 million this year (Gartner).
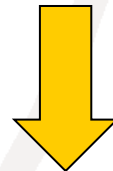
Need for Global Standard

Standardized IPTV environment

- An end to walled-garden approaches where subscribers are limited to content from a particular service provider.

- It would for example make it easier for ex-pat subscribers to consume content from their countries of origin.

Standardized IPTV would mean

- Lower cost

- Wider Market

- Better Quality of Service and Experience

- More consorted security

- Open infrastructure

- Innovation and new services
  - Standardized HTML gave us Web; Standardized IPTV will give a new *Internet*

ITU-T IPTV Standards will

- Facilitate a market where service providers, whether traditional broadcasters, ISPs or telecoms service providers, control over their platforms and their offerings.

- Encourage innovation, help mask the complexity of services, guarantee QoS, ensure interoperability and ultimately help players remain competitive.

Standard IPTV Service

- Deployment of ITU-T compliant products will enable service providers to offer value added services like traditional (linear) TV, video on demand (VoD) and interactive TV over IP-based managed networks such as NGN.

ITU-T's Work on IPTV

- ITU-T has been spearheading the standardization in IPTV for NGN

- Focus Group on IPTV (2006-2007)

  - Responding to market demands for standard

  - First set of draft on Architecture, QoS, Security, End-Systems and Multimedia Application

- IPTV Global Standardization Initiative (GSI) (2008-)

  - Building on the work of Focus Group, Coordinating all ITU-T's IPTV related activities

  - Currently about 20 Recommendations approved by 6 Study Groups, (SGs 9,11, 12,13,16,17)

  - Every two to three months

"Questions" in IPTV-GSI (1)

- **Multimedia**
  - **Q13/16:Multimedia application platforms and end systems for IPTV**
  - **Q21/16:Multimedia Architecture**
- **QoE/QoS:**
  - **Q13/12: QoE/QoS performance requirements and assessment methods for multimedia including IPTV**
- **Network Architecture and NGN**
  - **Q1/13:Coordination and planning**
  - **Q3/13:Requirements and implementation scenarios for emerging services in NGN**
  - **Q4/13:Requirements and framework for QoS for NGN**
  - **Q5/13:Principles and functional architecture for NGN**
  - **Q12/13:Evolution towards integrated multi-service networks and interworking**

"Questions" in IPTV-GSI (2)

- **Security**
  - **Q7/17:Secure Communication Services**
- **Signaling Protocols**
  - **Q1/11:Network signaling and control functional architectures in emerging NGN environments**
- **Secondary Distribution**
  - **Q4/9:API for advanced cable television and sound program distribution within the scope of SG9**
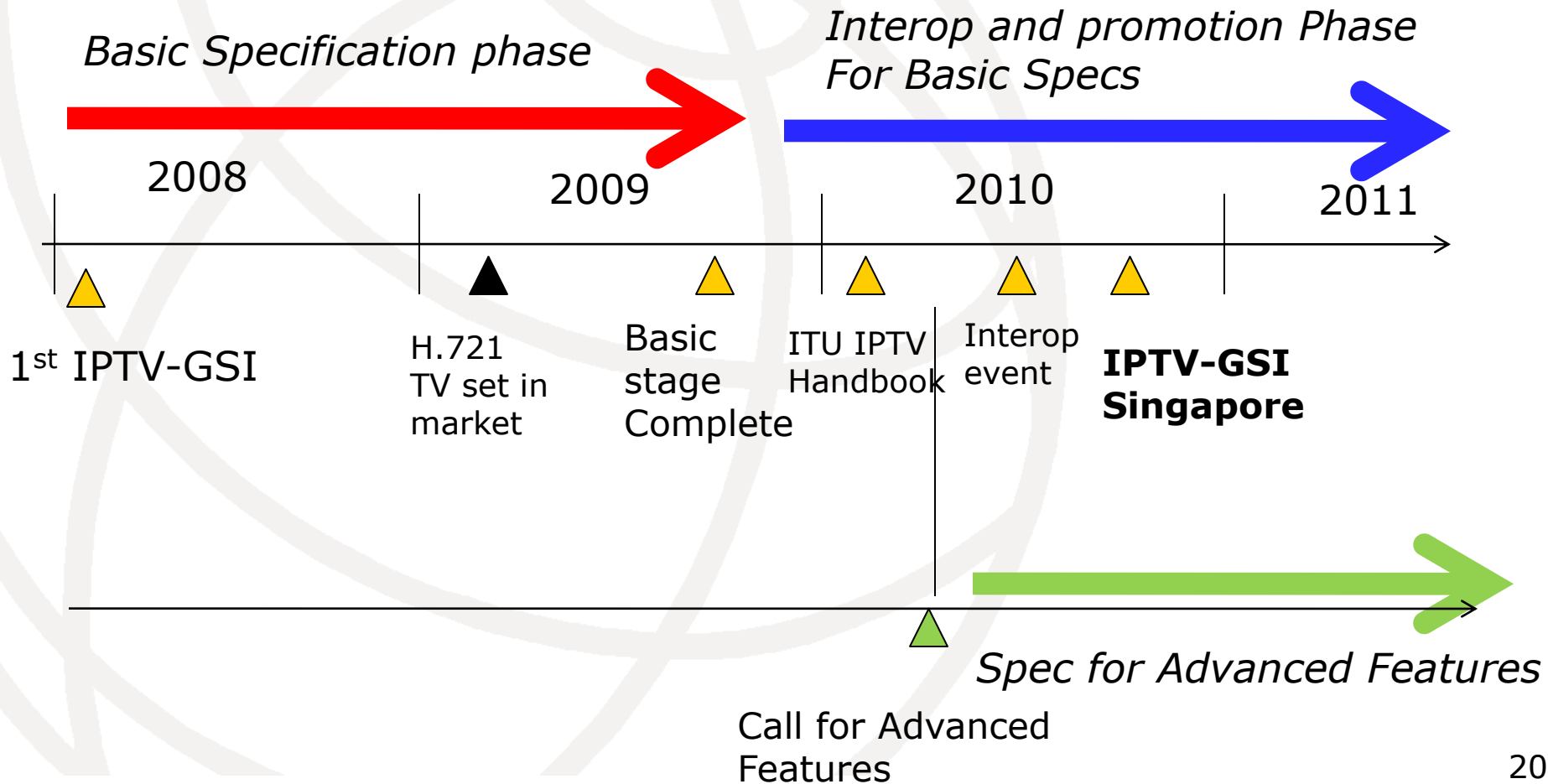 - **Q8/9:Voice and video IP applications over cable television networks**

IPTV GSI events schedule

- 7th: August, 2009 (Mar del Plata, Argentina)
- 8th: October, 2009 (Geneva)
- 9th: January, 2010 (Geneva)
  - March,2010 (SG9,16 Interim Mtg: Shanghai)
- 10th: May,2010 (Geneva)
- 11th: July, 2010 (Geneva)
- 12th: Sept, 2010 (Singapore)

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ITU-T IPTV Roadmap

- Basic stage of Recommendations completed
- Guidelines and Technical Papers are planned
- Interoperability events are planned 2010
- More advanced features will be discussed

Basic Specification phase

*Interop and promotion Phase
For Basic Specs*

2008

2009

2010

2011

1st IPTV-GSI

H.721
TV set in
market

Basic
stage
Complete

ITU IPTV
Handbook

Interop
event

**IPTV-GSI
Singapore**

Call for Advanced
Features

Spec for Advanced Features

Collaboration with other SDOs

ITU's Collaboration with SDOs

- ITU is collaborating with other SDOs not only through liaisons but also through events such as GSC (Global Standards Collaboration) and others.

- GSC is a by-invitation event that brings together the top Standards officials from the US (ATIS,TIA), Canada (ISACC), the EU (ETSI), China (CCSA), Japan (TTC, ARIB), Korea (TTA), Australia (CA), and ITU to discuss their standards work programs and identify areas for collaboration and ways to accelerate global standards for the industry.

- GSC is not a standardization body, but a discussion forum for SDOs for collaboration.

- IPTV has been a topic for discussion for several years and ITU has since collaborated with these SDOs on IPTV
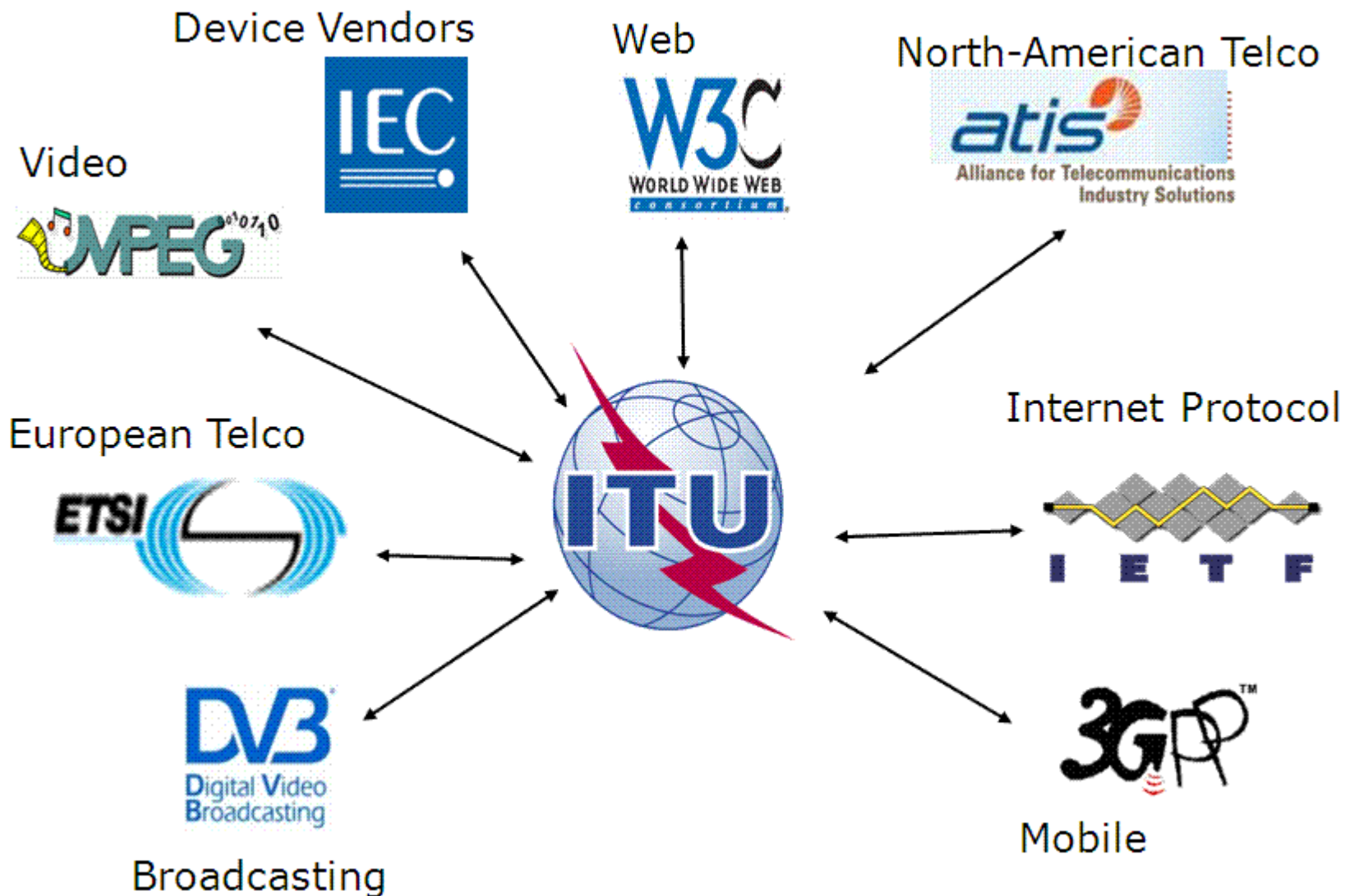
GSC Members

ITU-T Liaisons on IPTV

- To ensure interoperability and quality of standards, ITU-T IPTV is working with many SDOs

Liaison with ATIS-IIF

o ATIS-IIF Active Participant in the IPTV work of the ITU-T

o Contributed guidance to the formation of the 2006 IPTV Focus Group

o Architecture, Requirements, Metadata, Service Discovery, etc. are closely aligned with ITU-T's.

o Held joint meeting with the ITU-T IPTV FG early in 2007

o Maintained a close relationship via liasions thru 2008

o With ITU-T 2008 Reorg and resultant subdivision, lost some alignment

o Once again now interacting closely with ITU-T work

o Active participation from ATIS-IIF in the ITU-T IPTV-GSI

o Forwarded new IIF documents to ITU for distribution

Joint Work with MPEG

- High-level coordination between ITU and ISO/IEC JTC 1

- Joint Video Team (JVT; joint work between MPEG and ITU-T SG16) has been a great success – H.264 awarded with Emmy

- New collaborative groups are initiated

- A joint call for proposal for work on "Advanced IPTV Terminal (AIT)" was issued last week (5 Feb, 2010) – will be a common standard of ITU and MPEG

- New features for more "futuristic" scenarios will be discussed

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Liaison with ETSI

- Close collaboration on Architecture and other issues
- Many ETSI standards are referenced by ITU-T Recommendations (especially those from DVB)
- Collaboration, with IEC, on Power Consumption and Smart Meter
- Collaboration on B2B metadata, audience measurement, etc. has just been initiated

ITU/IEC Joint Coordination on IPTV

- First High-level meeting held in Nov 2008.
    - ETSI, ISO/IEC are also invited
- Since then we had 2 coordination mtgs. Next in May 2010.
- To continue the success story of collaboration on DTV
    - IEC and ITU-R have a long history of collaborative work, ITU-R developing Recommendations for broadcasting systems and IEC doing Standards of receivers
- CE Manufacturers eager to create a market for iDTV (Integrated Digital TV Receiver), including IPTV.
- Areas of Cooperation:
    - Rights information interoperability
    - STB power consumption measurement
    - IPTV receiver specifications
    - End-user network
    - DTCP-over-IP and HDMI

Liaison with DVB

- Close Liaison relationship since the initial stage
- Many inputs from DVB in the initial phase
- Work on Error-recovery (H.701), Service Discovery(H.770), Metadata (H.750) initiated by DVB inputs
- Close harmonization with DVB specs.
- New work items on other issues are on-going

Liaison with W3C

- High-level cooperation in many areas
- On IPTV, especially the Interactive Frameworks
- Profiles of HTML,CSS, DOM, and SVG for IPTV are discussed with W3C Working Groups
  - Reflected in H.762 (LIME)

Status of ITU IPTV Standards

ITU Definition of IPTV

- **Multimedia services,** such as

  Television; Video; Audio; Text; Graphics; Data,

  delivered over IP based networks

  managed to provide the required level of QoS/QoE, security, interactivity and reliability.

  - o IPTV is **_NOT_** EXCLUSIVELY
    - o Video streaming
    - o Over the Internet
    - o For PC

IPTV Value Chain

- ITU-T IPTV Standards cover all IPTV Value Chain

End to End Solution

Interact with content

Discover and acquire service

End-user

Network Provider

Service Provider

Content Provider

Deliver Content

Monitor and Manage service

Announce and advertise service

Content Provisioning
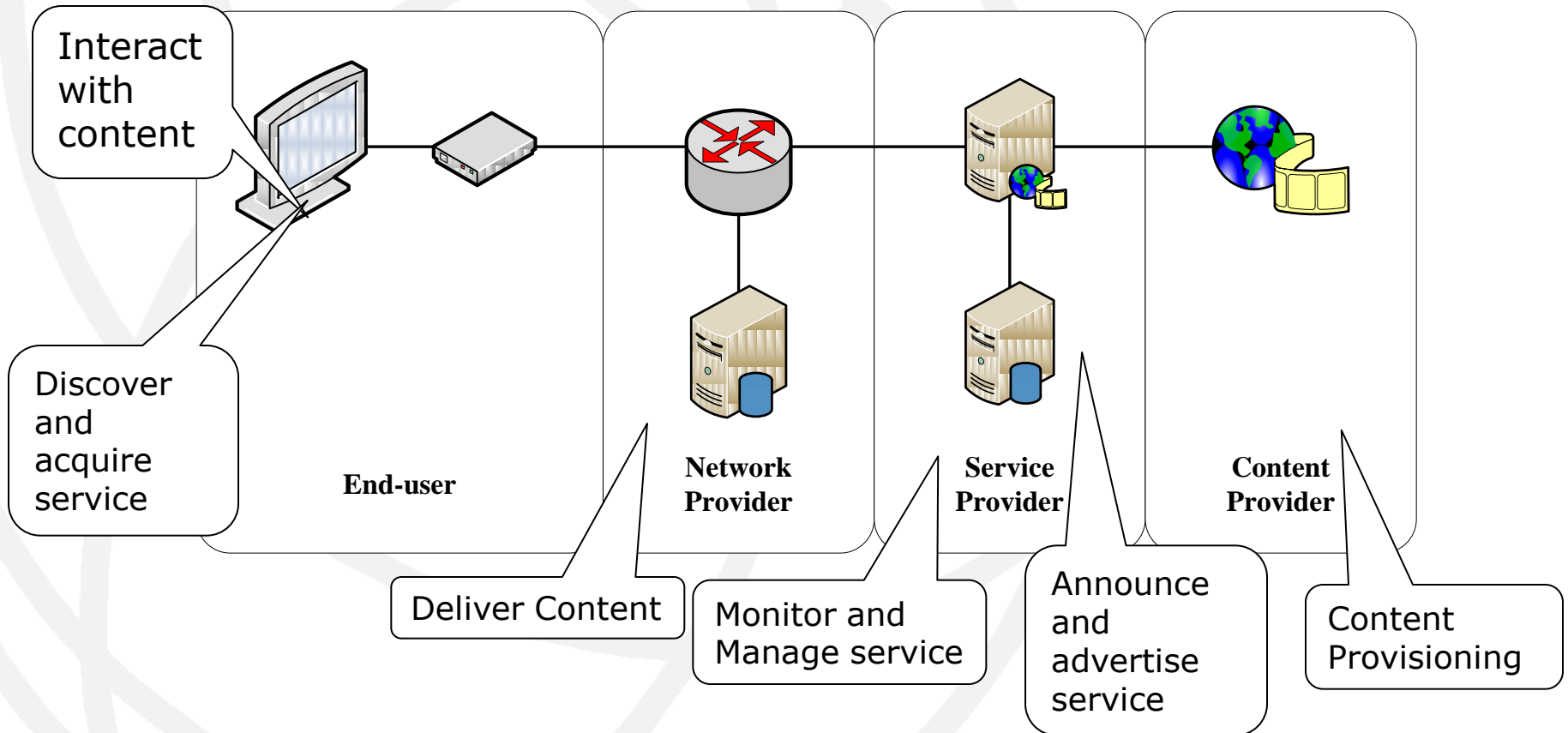
IPTV Services discussed in ITU-T

- Linear (Channel Service) Broadcast TV
- Audio services
- Video On Demand (VOD)
- Karaoke
- Gaming
- E-publishing (e-Books, Newspaper)
- E-commerce (banking, etc.)
- E-Learning (distance learning)
- E-Health (telemedicine)
- Private and Community Broadcasting (sharing videos)
- Photo albums (sharing photos with your friends)
- TV yellow pages
- Public Services (billboards, disaster Alert, traffic news, etc)
- … and much more

Characteristics of ITU-T IPTV

- End-to-End Solution
- Collaboration with CE and other Vendors
- Strong representation from Telcos and other Servicers
- Learning from Broadcasters and other Content Servicers –contributions from DVB
- Strong Liaisons with other SDOs – architecture and requirements harmonized with ATIS and ETSI
- Open and Interoperable

Characteristics of ITU-T IPTV (2)

- Not to "reinvent the wheels"
- Use existing standards as much as possible
- Practical approach for faster deployment and for meeting industry demands
- Close collaboration with other SDOs (requirements/architecture aligned with ATIS, ATIS documents are included in ITU IPTV-Handbook)
- For the truly interoperable global standard

Current Status

- The set of Recommendations for "Basic IPTV Service" ready
  - Published as "ITU-T IPTV Handbook"
  - To incorporate other SDOs work as well
- Conformance and Interoperability are one of the key issues
  - Interoperability events planned
  - Conformance and Certification
  - Implementation Guidelines worked on

ITU-T IPTV-Handbook:
Set of Recommendations for IPTV

- **To address the needs of industry, implementers, service providers, ITU-T IPTV-GSI is compiling a handbook for IPTV, collecting relevant ITU standards for IPTV**

Application and End System

H.750: Metadata for IPTV Services

H.721: IPTV-Terminal (Basic)

H.760: Multimedia App Framework for IPTV

H.770 : IPTV Service discovery

H.701: Content Error-Recovery for IPTV

Home Network

H.622.1: Req & Arch for IPTV Home NW

Y.2007: NGN Capability Set 2

Y.sup5 IPTV Service use cases

Y.sup7 NGN Release 2 Scope

Y.1910   IPTV Functional Arch

Y.1901 IPTV Service Requirements

Architecture, Requirement, Network

Quality of Experience

G.1080:   IPTV QoE

G.1081: Performance Monitoring

Security and Content Protection

X.1911 Req & arch for IPTV security

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ITU –T for Interoperability

- ITU Study Groups are actively developing standards for conformity and interoperability testing – e.g. test suites for IPTV – which can be used by external certifiers.

- a publically available database of products and services meeting ITU standards has recently been launched

- interoperability events are planned to prove interoperability of different vendors equipment including, in particular, IPTV.

- First event planned in Summer 2010.

Implementation Guidelines

- Now basic set of Recommendations are ready
- More work on Implementation guidelines and Conformance is going on

New Work items (Excerpt)

- Guidelines on Widget
- Guidelines on RIA
- Implementation Guide on H.721
- Content Provisioning Metadata
- Internet Sourced Content
- Notification services

Internet- Sourced Content

- Content servers are on the Internet; content is (selected) from the Internet
- IPTV-HE works as "gateway" into Managed NW
- Managed NW is independent of the Internet
- Terminals are protected from viruses and other dangers.
- No free ride on the NW
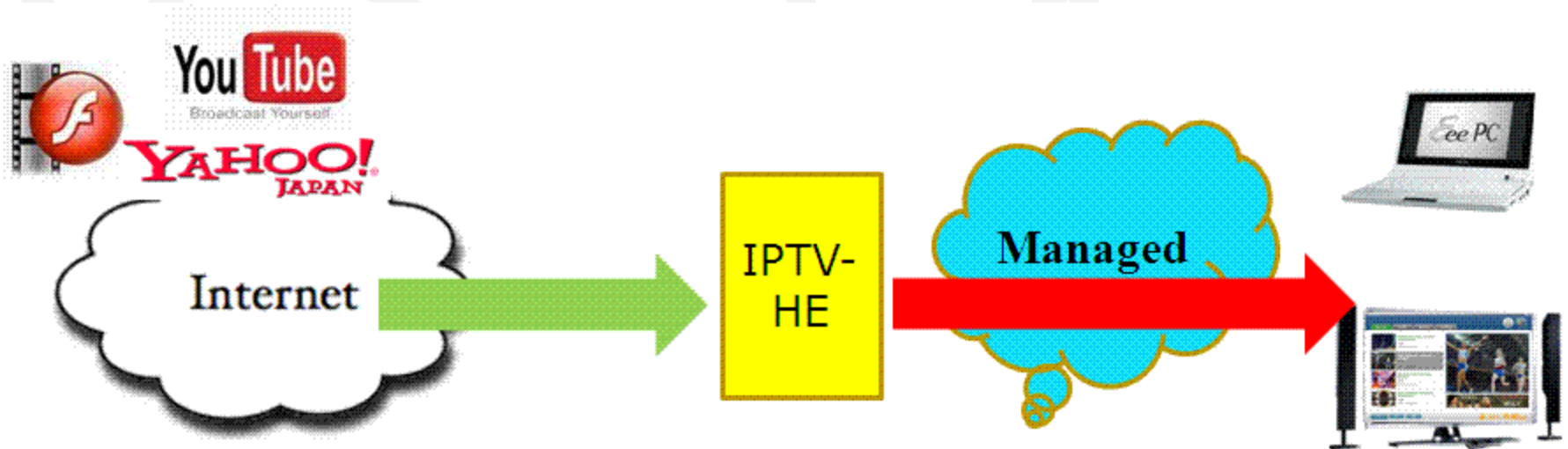
Snapshots of ITU IPTV Recs

Functional Architecture of IPTV System

Y.1910
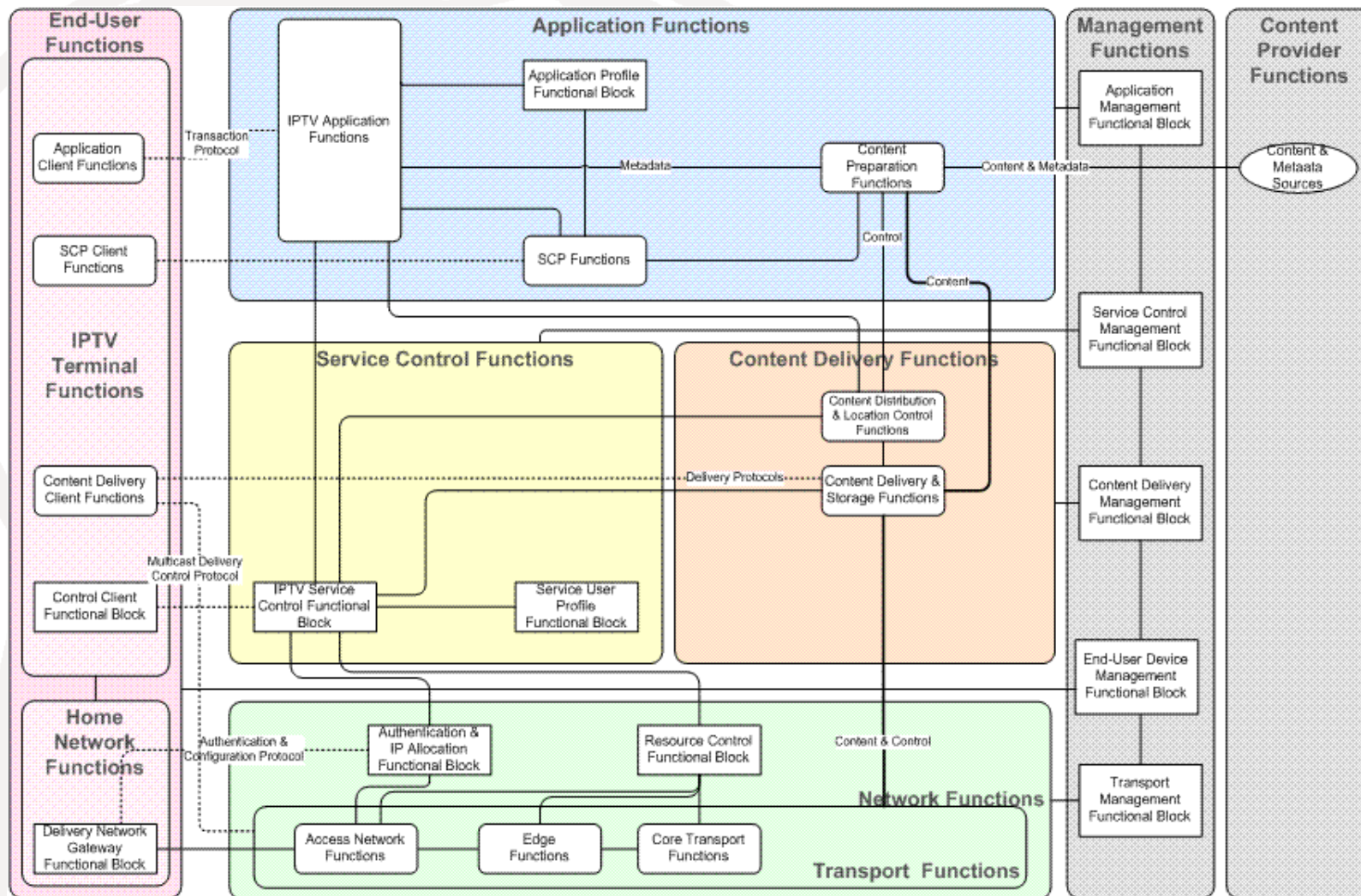
Performance monitoring for IPTV (G.1081)
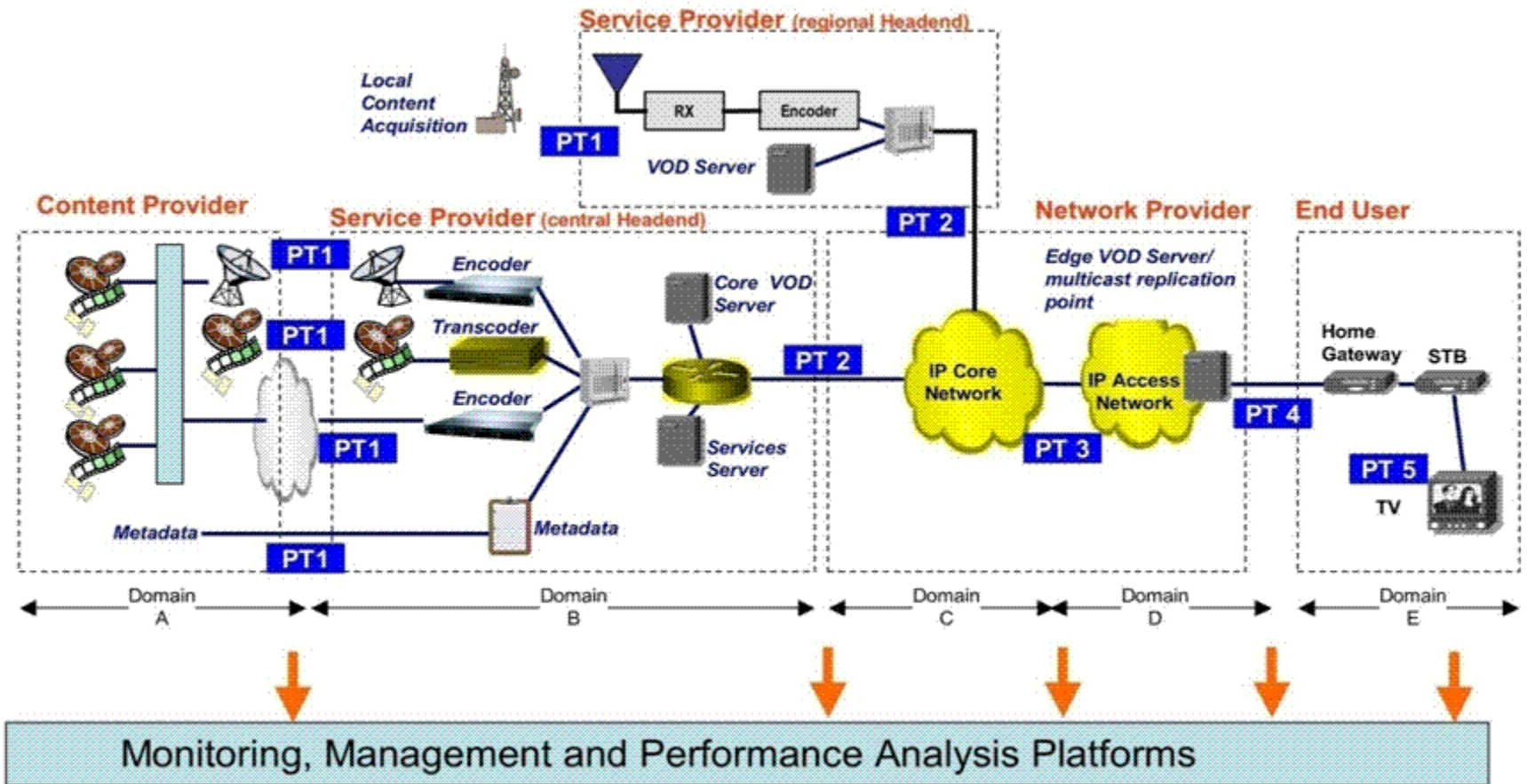
Signaling for NGN non-IMS
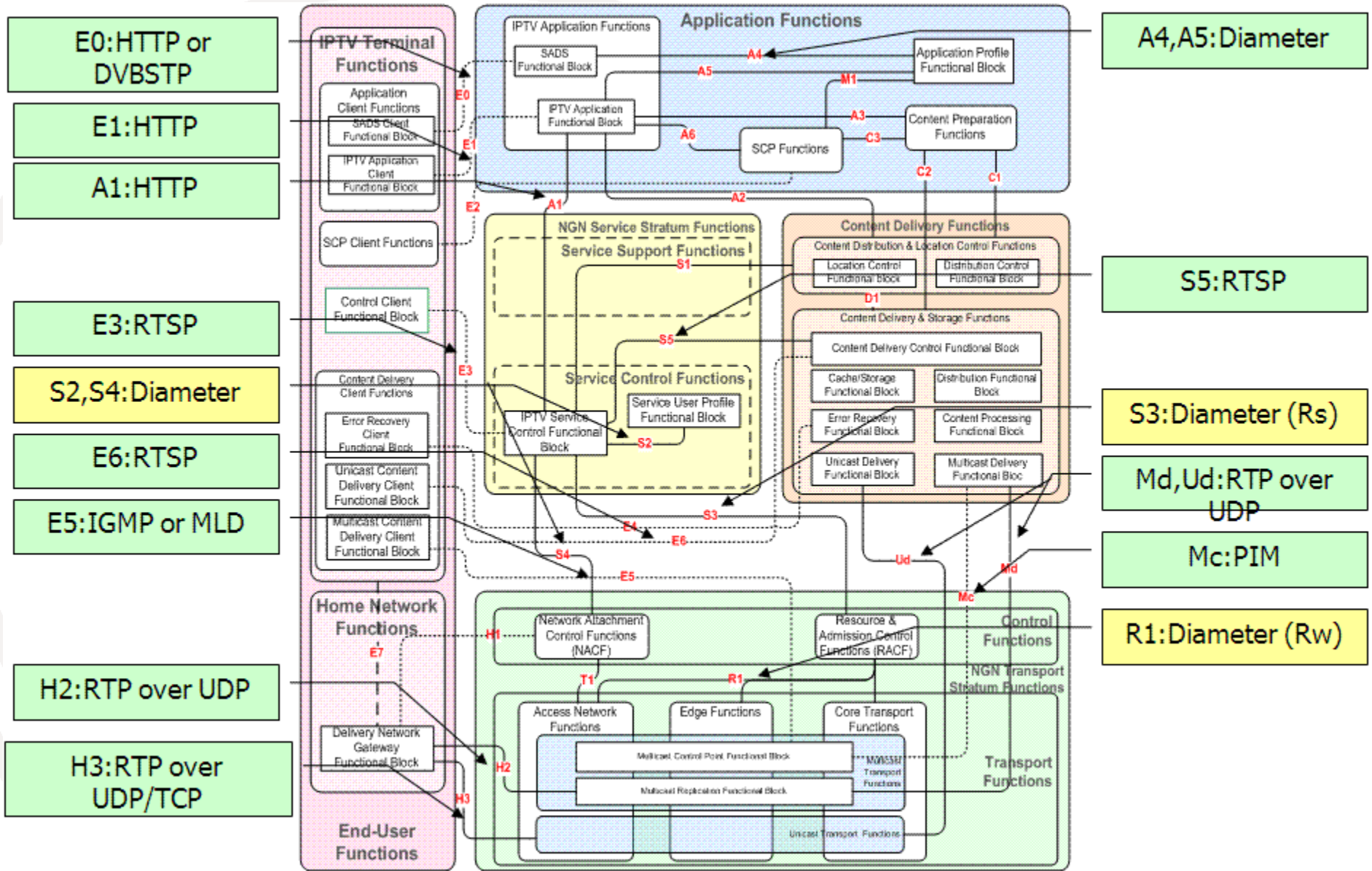
Signaling for NGN+IMS
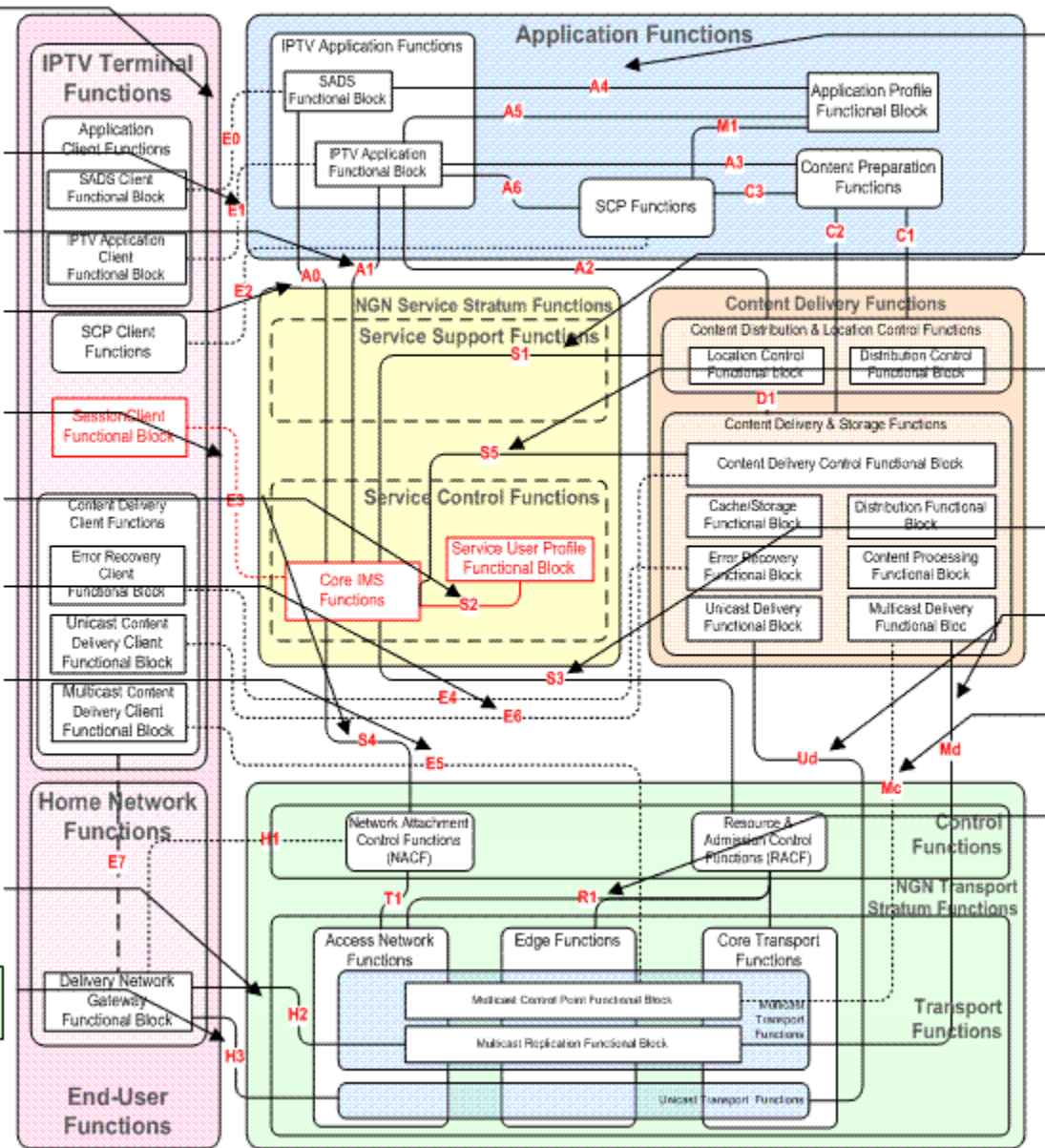
H.700 Series: Multimedia for IPTV

- **A new series of Recommendations for IPTV Multimedia Services and applications for IPTV**

- **Consists of the following subseries:**
    - **H.700-H.719 (General aspects)**
    - **H.720-H.729 (IPTV Terminal Devices)**
    - **H.730-H.739 (IPTV Middleware)**
    - **H.740-H.749 (IPTV Application Event Handling)**
    - **H.750-H.759 (IPTV Metadata)**
    - **[H.750] H.IPTV-MD Metadata for IPTV**
    - **H.760-H.769 (IPTV Multimedia Application Framework)**
    - **H.770 –H.779 (IPTV Service Discovery)**

H.720:
IPTV *Terminal Device*

- Overview of IPTV Terminal Devices and End Systems

- The overview of the architecture and functional components of an IPTV TD and provides a high-level description of functionality necessary for 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

- Basis for Basic Model (TV), Full-fledged (PC), and Mobile Models

H.721: Basic Terminal Model

- Based on Contribution from *IPTV Forum Japan*

- Defines Terminal supporting VoD and Linear TV

- Targeted at Embedded TV sets in the retail market as well as STB

- Managed network model (agnostic as to IMS) – SIP-aware HGW friendly

- Network attachment and Service Discovery compliant with H.750

- FEC for Error Recovery, compliant with H.701

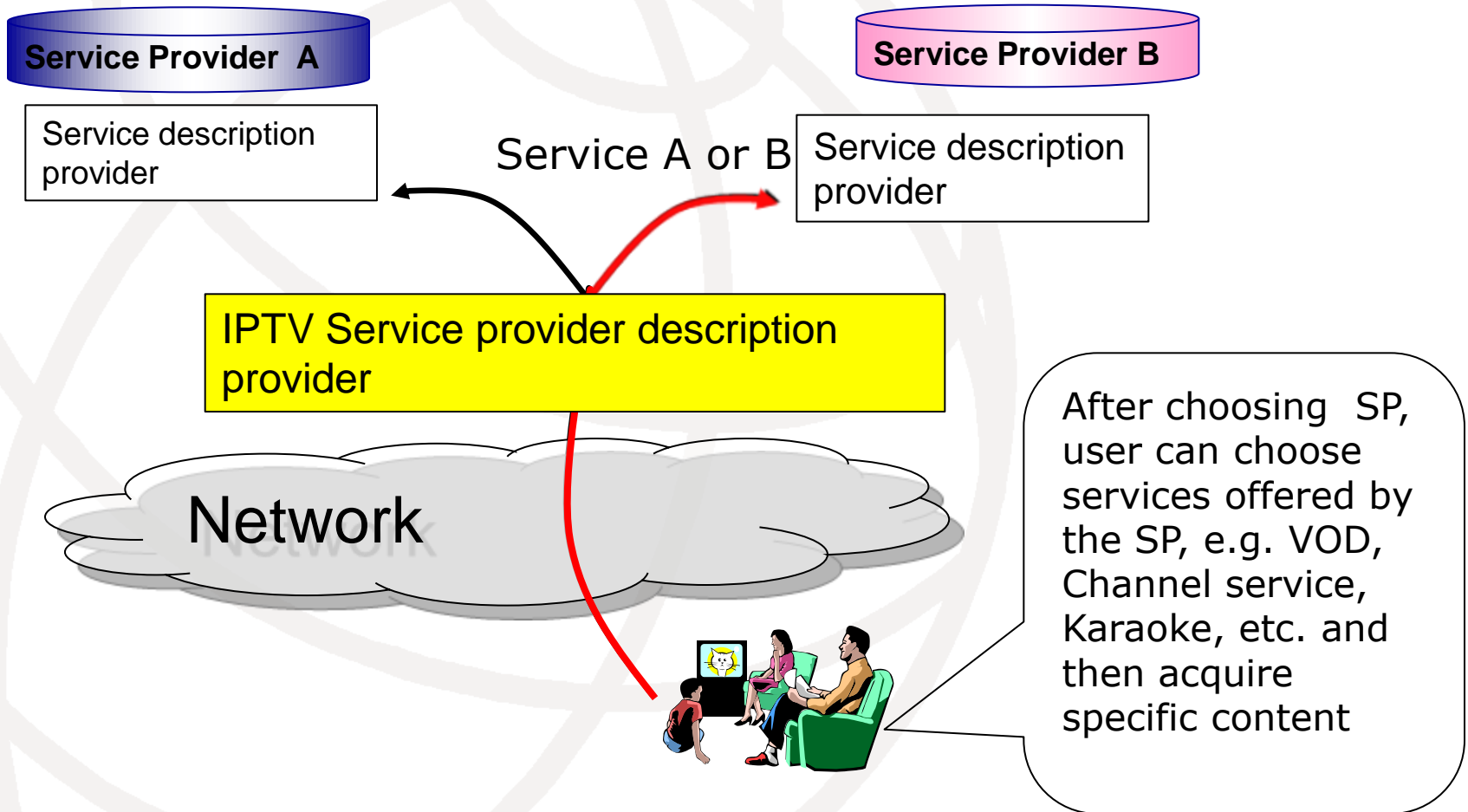- Supports Portal service as well

- Implemented and deployed

H.701: *Error Recovery*

- A method to guarantee the quality of service
- Forward Error Correction (FEC) and Retransmission, two well-known methods, are covered.
  - 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.
- Harmonized with ETSI and IETF (COP3 and Raptor)
- Defining Syntax and Configuration Protocols for FEC

H.770: IPTV Service Discovery

- General Framework for discovering and selecting service providers and services
- Allows user to enjoy various services and service providers easily
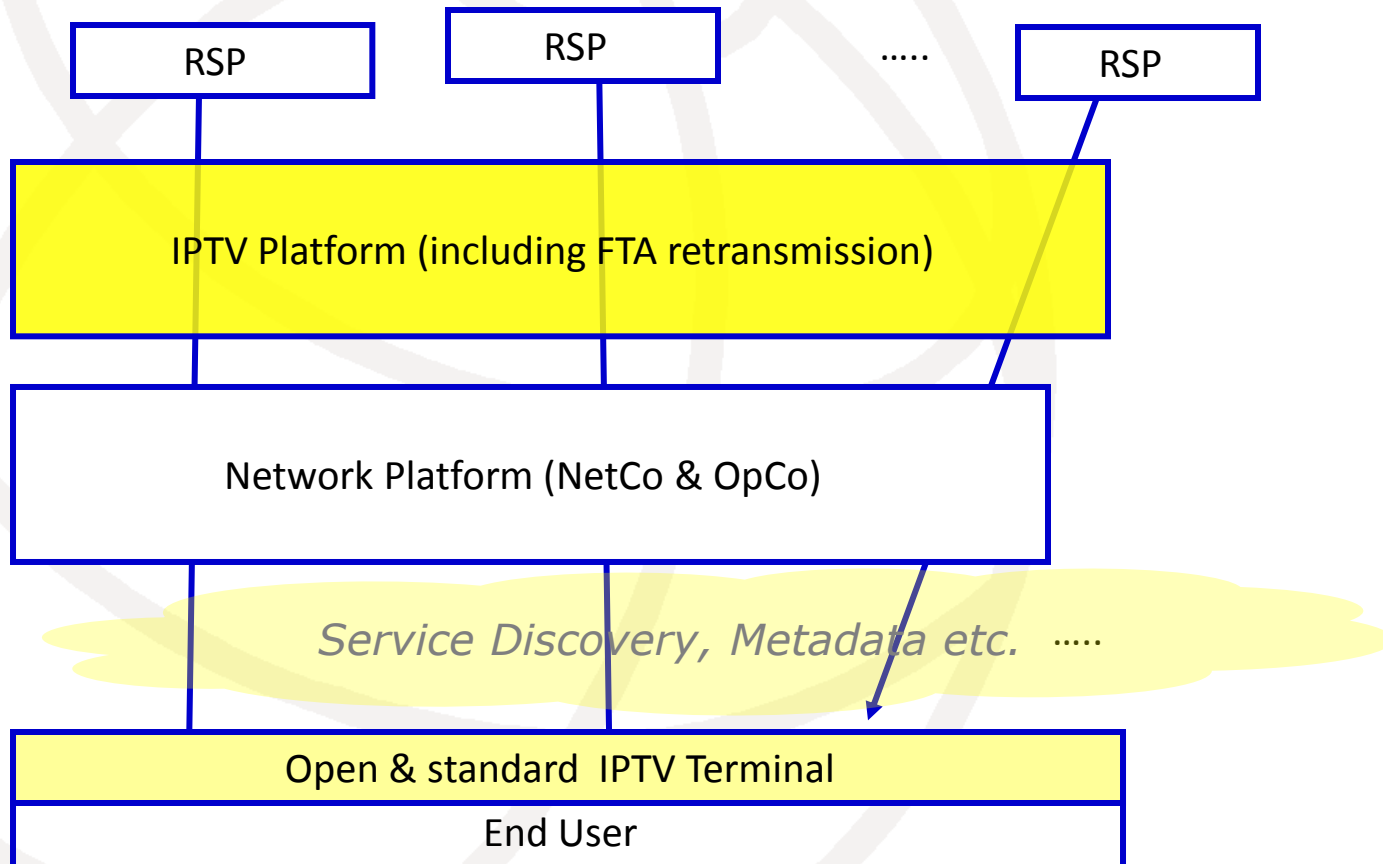- Must-have for open, managed platform

Service Provider A

Service description provider

Service A or B

Service Provider B

Service description provider

IPTV Service provider description provider

Network

After choosing SP, user can choose services offered by the SP, e.g. VOD, Channel service, Karaoke, etc. and then acquire specific content

H.770: IPTV Service Discovery (cont.)

- Defines the basic semantics of service discovery elements
- Harmonized with DVB and ATIS
- Close liaison with ATIS-IIF
- Alignment of Syntax is still on-going

TP on IPTV Service Platform

- Describes the concept of "Open Service Platform for IPTV" within ITU-T's overall IPTV architecture
- It became necessary to specify "IPTV service discovery" in detail
- Much contribution from Singapore

RSP	RSP	.....	RSP

IPTV Platform (including FTA retransmission)

Network Platform (NetCo & OpCo)

Service Discovery, Metadata etc. .....

Open & standard IPTV Terminal

End User

H.740: Application Event Handling for IPTV

- "IPTV application event handling (H.740)" defines higher level concepts of audience measurement (AM) and includes the scenario of AM

Generation	Recognition	Notification	Reception	Consumption

Scenario for IPTV audience measurement
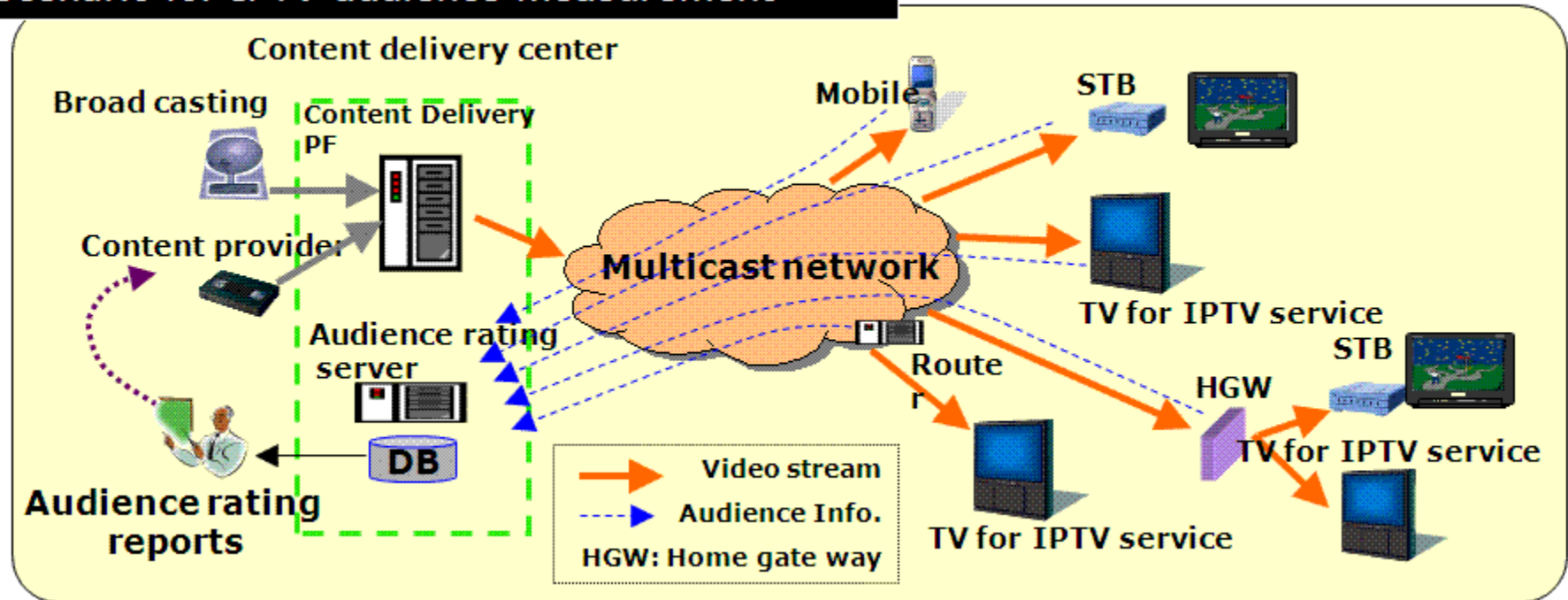
ITU-T H.750 - Metadata for IPTV

- Metadata: *Structured, encoded data that describe characteristics of information-bearing entities to aid in the identification, discovery, assessment, and management of the described entities*

- H.750 Covers:
  - Discovery, Transport and Delivery of Metadata
  - IPTV Service and Content Metadata
  - User metadata
  - Metadata for Content Provisioning and Management
  - Rights and Security related Metadata for IPTV
  - Metadata for Public Interest Services

- Content Metadata based on TV-Anytime (ETSI TS 102 822-3) and is harmonized with ATIS-IIF and DVB Broadband Content Guide

ITU-T H.760 series: Standard Suite for Interactivity

- ITU-T H.760 (Multimedia Application Framework) Series defines a standard suite of Multimedia Application Platform that gives multimedia interactivity to IPTV content.

-
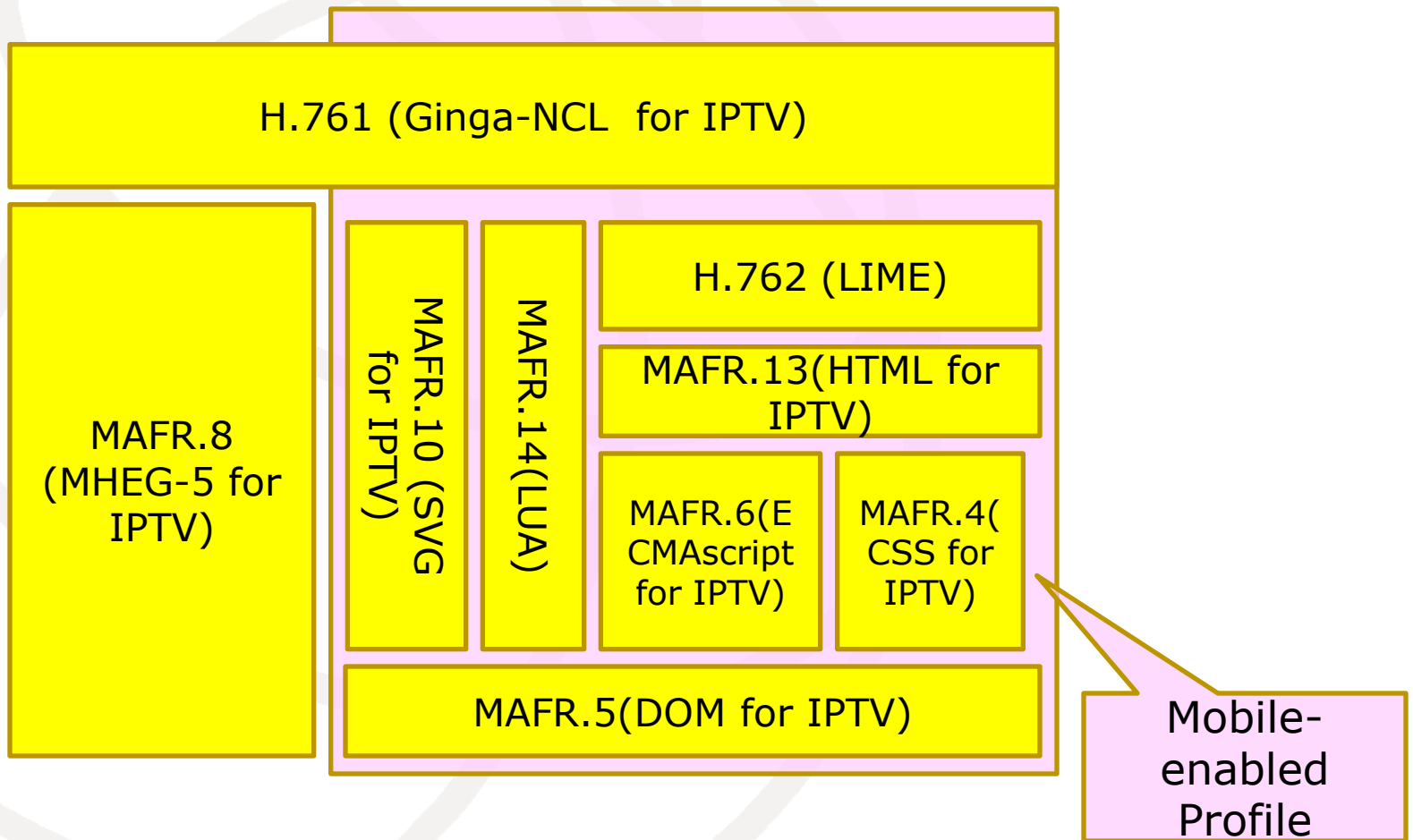
H.761 Ginga-NCL for IPTV

- ITU-T H.761 (Ginga-NCL) is an adaptation of Ginga-NCL, the middleware standard for Brazilian digital TV broadcasting

- Syntactically based on XML and LUA (script language), which is used in games and widgets (e.g. Verizon)

- Similar implementation to W3C SMIL

- Often used as a glue language for other multimedia frameworks, such as HTML and H.762 (LIME).

- Good integration with Video streaming

- Can be used for mobile as well as fixed

H.762: LIME

- ITU-T H.762 – LIME (Lightweight Interactive Multimedia Framework) has evolved from BML(Broadcasting Markup Language), the interactive application platform for Digital TV
- Not a new "language" but a simple profile/framework for creating Interactive content
- Based on simple HTML and JavaScript – Just like very Simple Web designing
- Good integration with Video streaming
- Gives sufficient functionality for Interactivity and GUI
- Suitable for any type of terminals, esp. poor ones like TV
- Can be used for mobile as well as fixed
- Rigorous Test procedure for Integrity – Very robust and mature
- Various SW vendors for tools (content creation)
- Extended for IPTV to include:
  - Interaction over IP, VOD service, Metadata
  - Portal (Web page)

H.761 GUI sample

GUI by ITU-T H.762 (LIME)

- ITU-T H.762 (LIME) is a very lightweight web-based technology, suitable for IPTV as well as Digital TV.

New work on Widgets

Widget

- "a software service available to users for running and displaying small applications that are used frequently, such as calendars and news aggregators, with an easily accessible graphical user interface, often staying on the desktop."

Proprietary Widgets

Verizon Widget Bazaar

Fios Emulator for LUA-Widget

ITU IPTV for NIMS

Widgets on H.762

- Widgets

ITU IPTV for Common Featured STB

- Video Consumption: ITU-T has Recommendation H.264 for video format for High Definition. ITU-T H.721 "IPTV Terminal Device (Basic Model)" includes decoding functionalities which includes H.264 and other important formats.

- Interactivity: ITU-T Recommendations, H.761 and H.762, are both based on. ITU-T H.721 also defines the function a portal or web-page service

- Multi-Operator Support :ITU-T Recommendation H.770 is a harmonized product of ITU-T, ATIS-IIF and DVB. H.721 is compliant with H.770. There is a work item on "IPTV Service Platform", which includes concepts like "Retail Service Provider", "NetCo", "OpCo", and third-party RSP.

ITU IPTV for Common Featured STB (2)

▪ Support for Application:

ITU-T Recommendation H.740 describes ways for application event handling, including audience measurement. ITU-T H.750 has user-metadata.

▪ Remote Management: ITU-T Recommendations G.1081 and G.1082 describes quality control and performance monitoring. ITU-T Recommendation H.740

▪ Network Capabilities:Quality of Service (QoS) Features): Network layer QoS is described in ITU-T G.1080. ITU-T H.701 specifies error correction methods.

▪ Content Metadata Management: ITU-T H.721 describes the management of metadata on a terminal. ITU-T H.750 specifies Content Metadata. H.IPTV-CMD, "Content Provisioning Metadata", which facilitates the transaction and provisioning of content, especially at the head-end side.

Widget Apps on H.762

- Widget Apps for various services
- All made possible by metadata

Smart Meter App. that monitors energy consumption

Remote Device Control

Clinics Watch

Bus traffic Info

News Update Clips

Links to 3rd Party Content

Instant voting & Real time calculation

Color buttons for voting

- H.762 (LIME) App can use its IP connection to send the voting information to the server, which will calculate the number of votes. The LIME app will get the resulting graph information (in whatever format) to display on the screen. Similarly for H.761 (Ginga-NCL for IPTV).

- This can be done for any other similar situation, like Soccer, horse-racing, F1, etc.

- With appropriate metadata provided, this can be customized.

Smart Meter App on H.762

Graph widget showing the daily power use

Courtesy I2R, Singapore
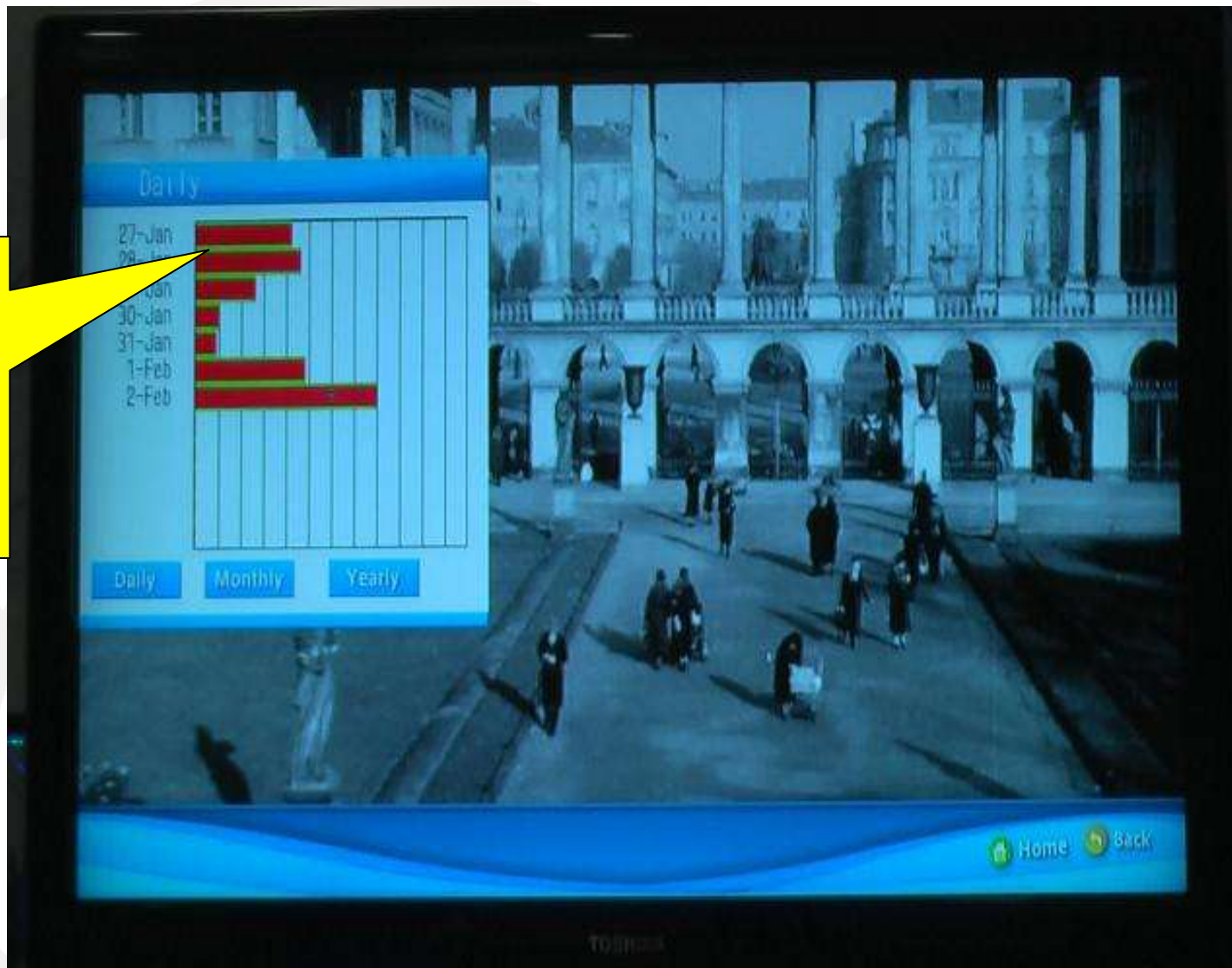
Monitor App on H.762
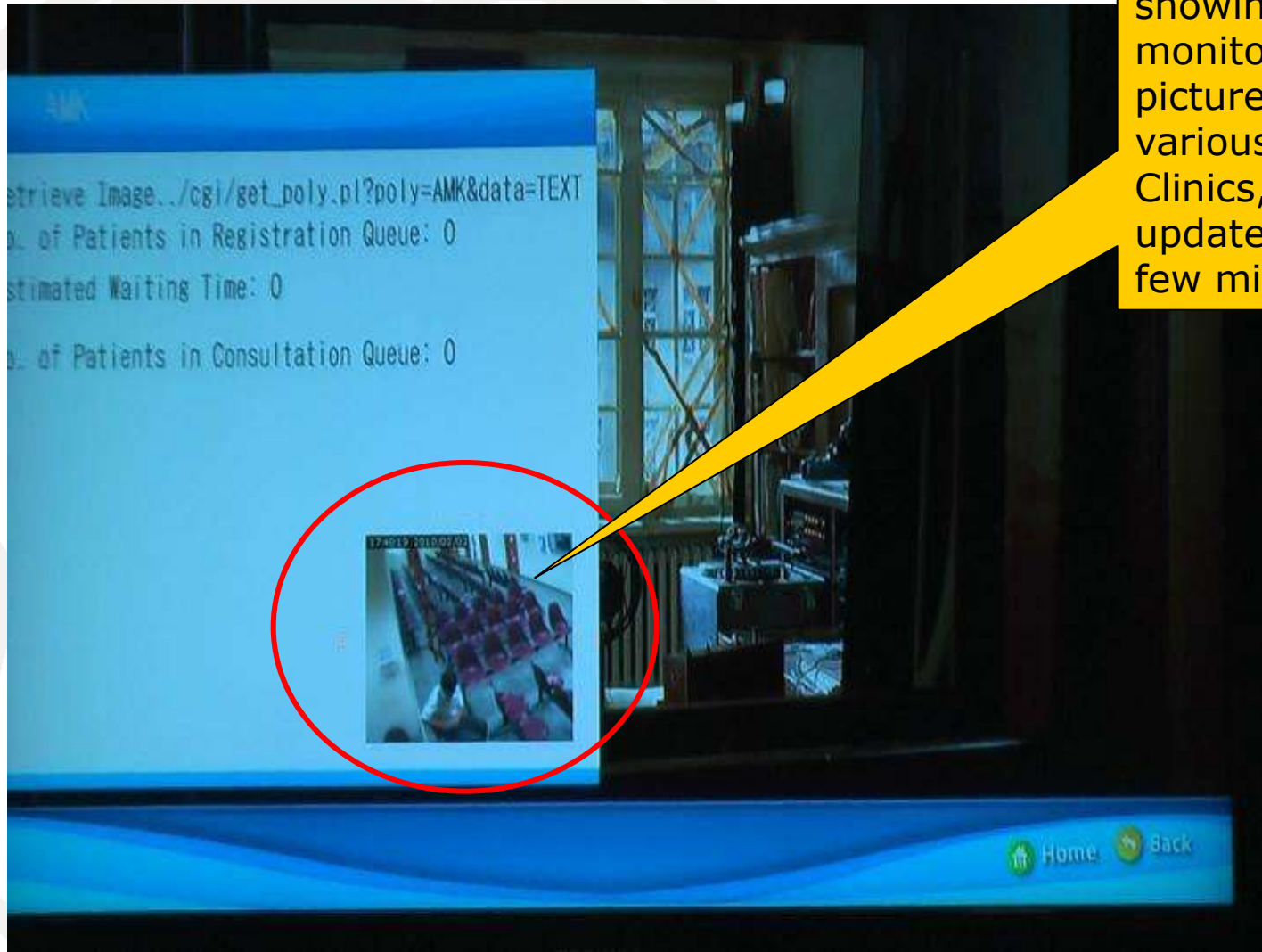
Widget showing the monitored picture of various Clinics, with updates a few minutes

Courtesy I2R, Singapore

Use of Metadata

- in a Formula One race telecast, viewers can call up metadata to check for information like the historical wins or loses of each car racer, or the details of each car model.

- Such metadata may be customised to the viewer's preference.

- Another example include a documentary about car racing could have various metadata including the make of each car, engines, car racer, etc that allows **3rd party applications** to **overlaid** on the television TV screen.

H.762 with "Wine Metadata"
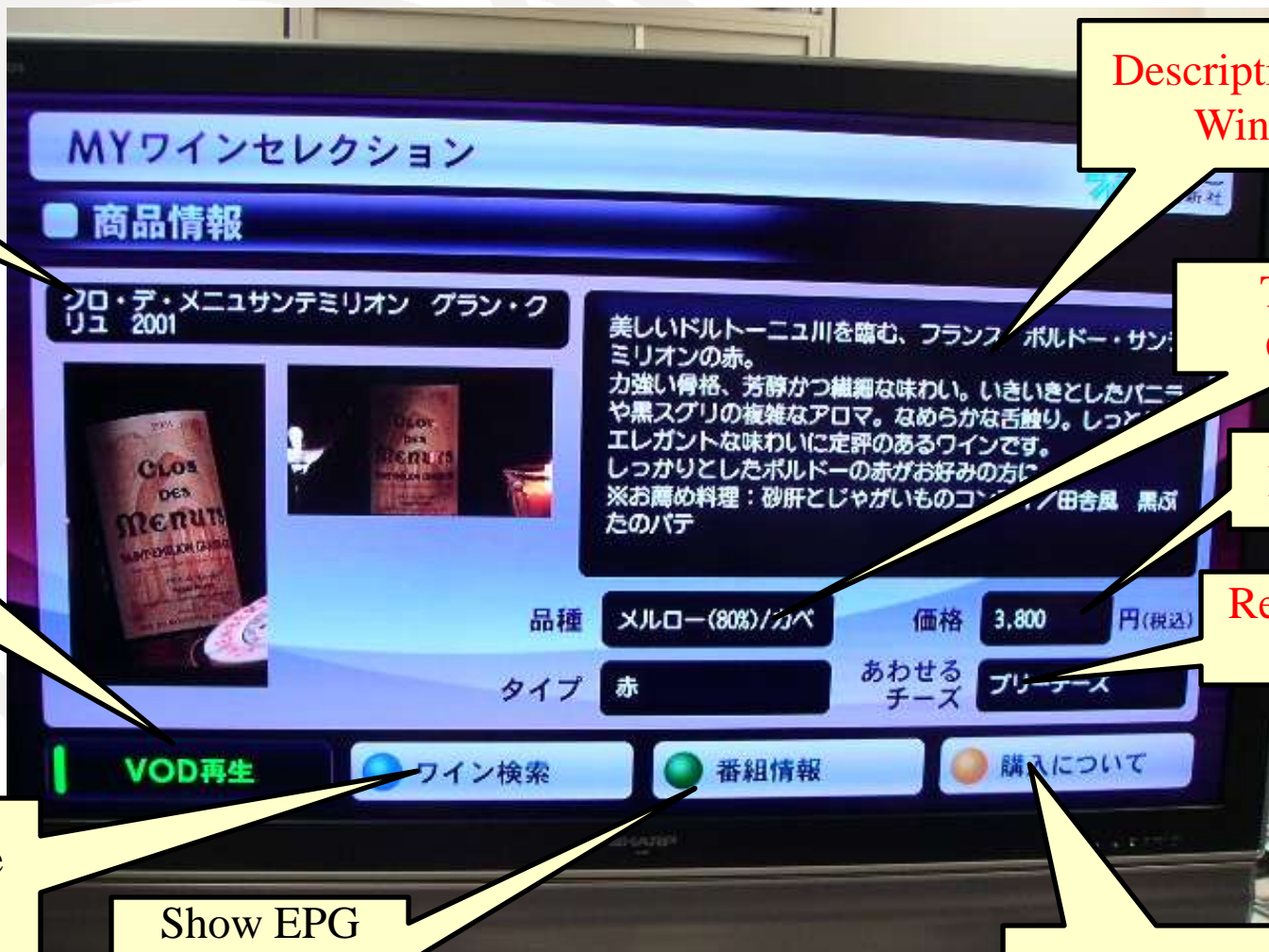
Name of Wine

Description of Wine

Type of Grapes

Price

Link to Video of this Wine

Recommended Cheese

Link to Wine Search (Blue Button)

Show EPG (Green Button)

Buy this wine (Yellow Button)

H.762 for UGC

- for small group of users and non-traditional creators beyond the confines of large studios to create video content that are acceptable for mass viewing experience.

- H.762 (LIME) applications for photo-slideshows, video, and simple games provide a platform for small-time content creators and the general public

- A LIME application can be made using a text editor (for Javascript and HTML), digital video/photo camera, MS-Power point.

- Applications exist that convert well-known formats (e.g. Photoshop) into LIME content .

- With some knowledge of web-designing, anyone can create a broadcast quality interactive content using LIME

H.762 content created with PPT
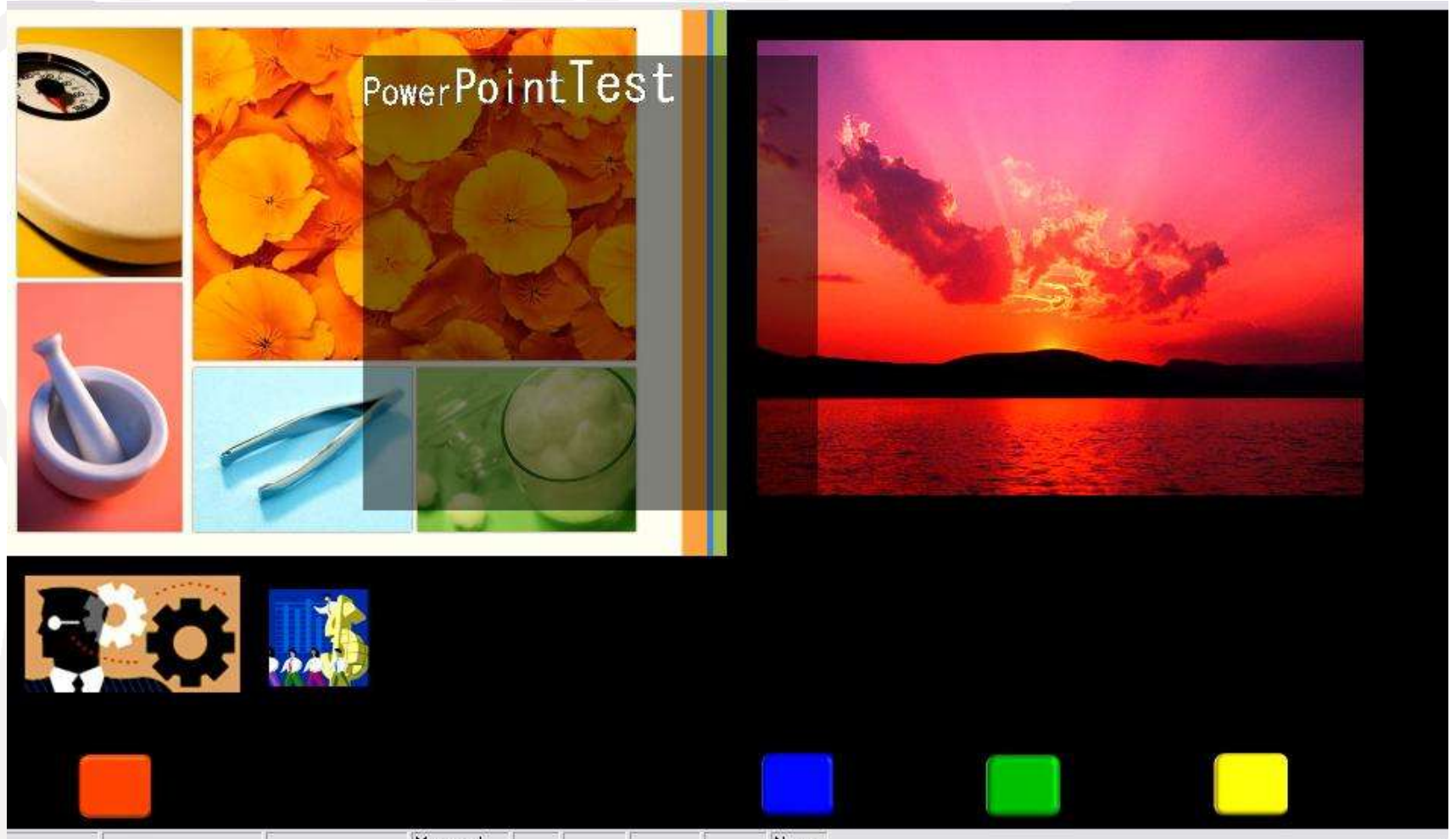
H.762 for Online Games

Sudoku

- H.762 (LIME) can be used to create simple network games like logic games, RPG, classical games (cards, mahjong), etc, that are appealing to all generations

Reversi
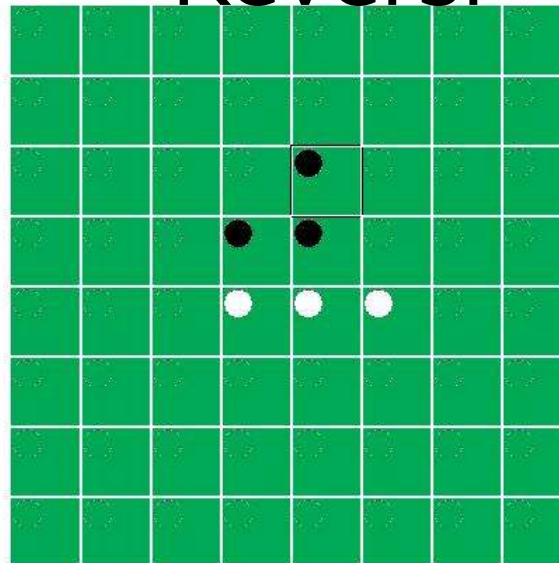
Partnering with Mobile phone

- For example, consumers in a hurry to leave the house can 'transport' the last 5 minutes of the TV content they are watching to their mobile phones. Or consumers can transfer the transaction validation code for purchase of movie tickets from their TV to their mobile phones.

H.761 with Mobile

Deployment of ITU IPTV

Recs for ITU IPTV Deployed

- The following have been implemented and deployed in close to 1 million terminals (STB, TV, PC), and sold in market. H.721 (Terminal Device)
  - H.701 (error recovery),
  - H.762 (Interactive Framework LIME),
  - H.770 (service discovery)
  - H.750 (metadata) are implemented by several vendors, deployed
- At least 2 service providers providing services based on the above ITU Recs. deployed as of end 2009.
- H.761 (Interactive Framework Ginga-NCL for IPTV) prototypes implemented (its DTV version has been deployed)

Terminals for ITU-T H.721

- Terminals based on ITU-T H.721 are available in the retail market in Japan
- Currently 6 brands (TV Sets, PC, and STB) from several manufacturers are available in the retail market
- Customer can buy a TV or PC at a shop, connect to NW, and receive an IPTV service

STB

TV set

PC

PM-700

(Hikari-TV STB)

TOSHIBA **REGZA**

NEC Empowered by Innovation

PM-1000

(Hikari-TV PVR)

65V

SHARP *AQUOS LC-65XS1*

toshiba note pc

TOSHIBA

Example of Remote Controller

Broadband
button
(for service
discovery)

EPG
button

Video Control

Color buttons

H.762 Deployment

- Several vendors in Canada, China, Japan, Korea make (and sell) H.762 compliant browsers

- Content creation tools in the market

- Professional (broadcast level) content creators already doing business

- Terminals deployed and sold in retail market

Tools for H.762

- Automatically converts data made by DTP (Desk-Top Publishing) Software like Adobe InDesign into H.762 (LIME) content

- Similar Softeware that converts various formats (MHEG-5, OpenTV,MHP,etc.) used in Europe into LIME is also being planned.

H.721 Test-bed in Singapore

- Singapore Agency of Science, Technology and Research (A*STAR) is running a test service using H.721 and H.762 for evaluation at Fusionopolis

Brazil's Support for ITU-T

- H.761 has attracted a big media coverage in Brazil.
- Along with H.761 (Ginga-NCL) several Brazilian organizations are planning an interoperability test for H.721, H.770 and H.762
- Synergy with its DTV adoption is expected

ITU-T Demo at Suntec

- ITU-T has a booth at Room 326 to showcase implementations of its Recommendations: H.721 (terminal), H.750 (metadata),H.761 (Ginga-NCL), H.762 (LIME), H.770 (Service Discovery), etc.

- ITU-T member companies, FUCAPI,NEC, NTT, OKI, Pontifical University of Rio de Janeiro, Sumitomo Electric, are demonstrating deployment-quality terminals and services (interactivity, VOD, Linear TV, etc)

- More extensive demo can be seen at:

I2R Starhome, Fusionopolis, Singapore

Conclusion

- ITU standards will encourage innovation, ensure interoperability and ultimately help players remain competitive.

- Enables innovation on Next Generation Networks

- Some ITU IPTV Standards (e.g. H.721) are already implemented and deployed

- Interoperability events expected in 2010

- First publication of "ITU-T IPTV Handbook" is ready

- ITU standards are truly global, open standards deployed for horizontal market.

- **Thank you!**

- **For more information**
  - http://www.itu.int/ITU-T/gsi/iptv/
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