

International Telecommunication Union

ITU-T

TELECOMMUNICATION
STANDARDIZATION SECTOR
OF ITU

J.295

(01/2012)

SERIES J: CABLE NETWORKS AND TRANSMISSION
OF TELEVISION, SOUND PROGRAMME AND OTHER
MULTIMEDIA SIGNALS

Cable modems

**Functional requirements for a hybrid cable
set-top box**

Recommendation ITU-T J.295



Recommendation ITU-T J.295

Functional requirements for a hybrid cable set-top box

Summary

Recommendation ITU-T J.295 defines the functional requirements of a hybrid cable set-top box. The hybrid cable set-top box is equipped with reception functionalities for broadcasting services, as well as functionalities for IP-based interactive services. In addition, the hybrid cable set-top box supports many up-to-date functions to enable cable television operators to provide advanced services. Examples of primary functions are as a portal screen, as application software plug-ins, and as an interface device capability between cable television access networks and an in-home network.

History

Edition	Recommendation	Approval	Study Group
1.0	ITU-T J.295	2012-01-13	9

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.

INTELLECTUAL PROPERTY RIGHTS

ITU draws attention to the possibility that the practice or implementation of this Recommendation may involve the use of a claimed Intellectual Property Right. ITU takes no position concerning the evidence, validity or applicability of claimed Intellectual Property Rights, whether asserted by ITU members or others outside of the Recommendation development process.

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/>.

© ITU 2012

All rights reserved. No part of this publication may be reproduced, by any means whatsoever, without the prior written permission of ITU.

Table of Contents

	Page
1	Scope 1
2	References..... 1
3	Terms and definitions 2
3.1	Terms defined elsewhere 2
3.2	Terms defined in this Recommendation..... 2
4	Abbreviations and acronyms 4
5	Conventions 5
6	General requirements..... 5
6.1	Services provided 6
6.2	Assumed cable network..... 6
6.3	Cross platform 7
6.4	Open software..... 7
6.5	Multi-tasking support 7
6.6	CPU architectures 7
6.7	Security..... 7
6.8	Adaptation for technical evolution and compatibility 7
6.9	Service enhancement 7
6.10	User interface (UI)..... 7
6.11	Cable portal 7
6.12	Content protection 7
6.13	Home network connections 8
7	Service requirements 8
7.1	General 8
7.2	Requirements for content reception..... 8
8	Broadcasting service..... 10
8.1	Navigation of a broadcasting service 10
8.2	Reception of broadcasting content provided by the broadcaster..... 10
8.3	Programme selection 10
8.4	Conditional access 10
8.5	Schedule recording 11
8.6	Programme recording 11
8.7	Notice of additional broadcast service 11
9	IP interactive services 11
9.1	Network connection..... 11
9.2	Network connection setting 12
9.3	Delivery of IP interactive services 12
9.4	Service navigation 13

	Page
9.5	Multidevice support for IP interactive services..... 13
9.6	IP multimedia streaming..... 13
9.7	Content selection 13
9.8	Conditional access for IP interactive services 13
9.9	Character input for an interactive service..... 13
9.10	Communication error and time-out 13
9.11	Notice of additional IP interactive services..... 13
10	Display functions for a web/interactive service..... 14
10.1	Web browsing..... 14
10.2	Reception of broadcasting and IP interactive services 14
10.3	Cable portal 14
10.4	Customization of the cable portal..... 14
11	RCU functions 14
11.1	Conventional remote 14
11.2	Connection method for RCU..... 14
11.3	HN type RCU 15
11.4	Personalization of an HN type RCU screen 15
11.5	Update of HN type RCU software..... 15
11.6	Internet type RCU..... 15
12	User interface (UI)..... 15
12.1	General requirements for UI..... 15
12.2	Broadcasting content presentation on the UI..... 15
13	Connection interface 15
13.1	Coaxial cable interface 15
13.2	Wireless LAN (Wi-Fi) interface..... 16
13.3	WAN interface..... 16
13.4	Wired LAN interface 16
13.5	Peripheral device interface 16
13.6	RCU interface 16
13.7	Output interface 16
13.8	CA card interface..... 16
14	Authentication and authorization..... 16
14.1	Device authentication and authorization 17
14.2	User authentication 17
14.3	Authorization of application execution 17
15	Hybrid broadcasting and web services 17
15.1	Cable portal screen 17
15.2	Broadcasting content 18

	Page
15.3	Simultaneous display of IP interactive services and broadcasting content 18
15.4	Overlaying information on the broadcasting content 18
15.5	Services associated with EPG 18
16	Download function for system software/firmware update 18
16.1	Download methods for system software/firmware..... 18
16.2	Process in case of download failure 19
16.3	Scheduling of download and report of result 19
16.4	Indication of system software/firmware version 19
17	Download function for application software 19
17.1	Operator initiated application download method 19
17.2	User initiated application download method..... 19
17.3	Indication of application software version 19
17.4	Subscriber authentication and authorization for pay application software download 20
18	Home network connection 20
18.1	Transport for HN 20
18.2	Routing function..... 20
18.3	Protocols 20
19	Management functions..... 20
19.1	Provisioning function 20
19.2	STB remote management 20
19.3	Management of subscriber information..... 21
19.4	Monitoring of reception quality..... 21
20	Power saving..... 21
21	Mechanical requirements..... 21
Appendix I – Cable network and service delivery 22	
I.1	Cable network architecture 22
I.2	Type of service delivery 22
Appendix II – Use case 24	
II.1	Use case 1: seamless multi-device TV watching experience 24
II.2	Use case 2: social media-assisted TV watching 25
II.3	Use case 3: livelihood support service 25
II.4	Use case 4: recommendation service..... 26
Bibliography..... 28	

Recommendation ITU-T J.295

Functional requirements for a hybrid cable set-top box

1 Scope

Recommendation ITU-T J.295 defines the functional requirements of a hybrid cable set-top box (STB) to enable cable television operators to provide advanced services to their subscribers. The hybrid cable set-top box is intended to apply to the services provided by cable television operators, where many types of access network technologies have been recently introduced, e.g., HFC, PON, RFoG. Cable television operators have the capability to provide both broadcasting and interactivity over its own network which was originally intended to distribute broadcasting television programmes, and the hybrid cable set-top box is a core device for the delivery of attractive advanced services.

Functionalities to be implemented in the head-end systems of cable television operators are outside the scope of this Recommendation.

The hybrid cable set-top box is primarily equipped with reception functionalities for broadcasting services and IP-based interactive services. In addition, the STB performs as an interface device between cable television access networks and in-home network devices by being equipped with wireless LAN and IP routing capabilities.

In this Recommendation, portal screen support and application software plug-ins capability are also required by the STB to allow cable television operators to provide various types of services to their subscribers not only from their own service delivery platforms but also from other third-party platforms interconnected with cable operators' platforms.

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 J.190] Recommendation ITU-T J.190 (2007), *Architecture of MediaHomeNet*.
- [ITU-T J.205] Recommendation ITU-T J.205 (2012), *Requirements for an application control framework using integrated broadcast and broadband digital television*.
- [ITU-T J.218] Recommendation ITU-T J.218 (2007), *Cable modem IPv4 and IPv6 eRouter specification*.
- [ITU-T J.700] Recommendation ITU-T J.700 (2007), *IPTV service requirements and framework for secondary distribution*.
- [ITU-T J.701] Recommendation ITU-T J.701 (2008), *Broadcast-centric IPTV terminal middleware*.
- [ITU-T F.790] Recommendation ITU-T F.790 (2007), *Telecommunications accessibility guidelines for older persons and persons with disabilities*.
- [ITU-T H.222.0] Recommendation ITU-T H.222.0 (2006) | ISO/IEC 13818-1:2007, *Information technology – Generic coding of moving pictures and associated audio information: Systems*.

[ITU-T Y.1901] Recommendation ITU-T Y.1901 (2009), *Requirements for the support of IPTV services*.

[BBF TR-069] Broadband Forum TR-069 (2007), *CPE WAN Management Protocol v1.1*.

3 Terms and definitions

3.1 Terms defined elsewhere

This Recommendation uses the following terms defined elsewhere:

3.1.1 integrated broadcast and broadband DTV service [ITU-T J.205]: A service that simultaneously provides an integrated experience of broadcasting and interactivity relating to media content, data and applications from multiple sources, where the interactivity is sometimes associated with broadcasting programmes.

3.1.2 cable integrated broadcast and broadband DTV service [ITU-T J.205]: An integrated broadcast and broadband DTV service managed by cable operators.

3.2 Terms defined in this Recommendation

This Recommendation defines the following terms:

3.2.1 cable platform: This refers to the entire provision infrastructure of the cable business, including the service delivery platform (SDP), cable network, hybrid cable set-top box, home network and others.

3.2.2 cable television operator: A service provider and/or network provider providing television programmes and other interactive services, via a cable television network with radio frequency (RF) signals through coaxial cables or digital light pulses through fixed optical fibres.

3.2.3 cloud terminal: A terminal that has at least a client function, browser and Internet connectivity for cloud network connection.

3.2.4 content: Information content transmitted via various media through the communication network, including the broadcasting network and IP.

3.2.5 cross platform: A coordination service between platforms.

3.2.6 digital rights management (DRM): Digital rights management is for the protection of digital content.

NOTE – In these requirements, use within a home network is assumed.

3.2.7 home network: A network within a home compliant with Recommendation ITU-T J.190, consisting of IP-based transport including a wired LAN (Ethernet: IEEE 802.3) and wireless LAN (WiFi: IEEE 802.11a/b/g/n) and non-IP-based communication methods such as ZigBee (IEEE 802.15.4), where the hybrid cable set-top box is equipped with all of the HA, HB, HC and HD functionalities defined in Recommendation ITU-T J.190

3.2.8 home network (HN) type remote control unit (RCU): An RCU connected to the set-top box via an IP home network. Interactive operation is supported. In addition to communicating and controlling the set-top box, the HN type RCU can also access directly services provided by cable operators or other content and/or service providers.

3.2.9 hybrid cable set-top box (STB): An STB that satisfies the requirements defined in this Recommendation. Unless specifically noted, STB shall mean the hybrid cable STB in this Recommendation.

3.2.10 Internet type remote control unit (RCU): A terminal with RCU functionalities that allow users to control the set-top box from a remote location via the Internet, e.g., remote setting of schedule recording. This type of RCU may be mobile phones (smart phones, feature phones, etc.), tablet devices, PCs, etc. In addition to communicating and controlling the set-top box, the Internet type RCU can also access directly services provided by cable operators or other content and/or service providers.

3.2.11 infrared rays (IR) type RCU: An RCU operating on infrared rays. Only uni-directional operation is supported.

3.2.12 IP interactive service: A type of service provided by the cable operator or service provider where the subscriber requests and/or responds to services.

3.2.13 multichannel video distribution: A digital television distribution service over cable networks that provides a wide range of multichannel television programmes to subscribers.

3.2.14 multi-task: A simultaneous process of live viewing or playback and one or multiple recordings of broadcasting content; the viewing of IP streaming content; and other applications such as games.

3.2.15 network: A wired or wireless communication network for the provision of broadcasting and communication services. In this Recommendation, this shall include the in-house communications network, in addition to the access network operated by the cable operator.

3.2.16 operator: The cable TV service operator.

3.2.17 personal information: Recorded information about an identifiable individual.

NOTE – This may include (1) name, address, email address, (2) race, nationality, ethnicity, origin, colour, religious or political beliefs or associations, (3) age, sex, sexual orientation, marital status, family status, (4) identifying number, code, symbol, (5) finger prints, blood type, inherited characteristics, (6) health care history including information on physical/mental disability, (7) educational, financial, criminal, employment history, (8) others' opinion about the individual, and (9) personal views except those about other individuals.

3.2.18 plug-in: Software for displaying, installed independently from the browser.

3.2.19 provisioning: Automated initial setting activity.

3.2.20 radio frequency (RF) type remote control unit (RCU): An RCU using wireless technology such as RF4CE.

3.2.21 second screen: This refers to a display screen of mobile phones or other network-enabled devices that show services associated with the television screen.

3.2.22 social television: This is a general term for technology that supports communication and social interaction in either the context of watching television, or related to TV content. It includes the study of television-related social behaviour, devices and networks. Social television systems can for example integrate voice communication, text chat, presence and context awareness, TV recommendations, ratings, or video-conferencing with the TV content, either directly on the screen or by using ancillary devices

3.2.23 subscriber: The registered subscriber (representative) to the cable TV service; shall include all persons in the household.

3.2.24 target advertising: An advertising service from the operator that targets an individual, a viewer segment, specific markets, specific areas, or facilities, etc.

3.2.25 terminal: Equipment consisting of hardware and software with communication means, and equipped with a user interface to enable the user to connect to the network.

3.2.26 transcoder: An image conversion process to convert images to match the display capability of the terminal.

3.2.27 user: The user of a device connected to a set-top box and a home network. This refers not only to human beings, but may also include logical elements for the communication and usage of applications between devices.

3.2.28 user interface (UI): The basic UI is provided by the operating system and defines the display format of information to the user and the data input and operation methods by the user. These requirements assume the use of both character based UIs (CUI) and graphics based UIs (GUI).

3.2.29 viewer: A subscriber who is receiving video, audio and/or other information services.

4 Abbreviations and acronyms

This Recommendation uses the following abbreviations and acronyms:

API	Application Program Interface
CAS	Conditional Access System
CPE	Customer Premises Equipment
CPU	Central Processing Unit
DHCP	Dynamic Host Configuration Protocol
DOCSIS	Data Over Cable System Interface Specification
DTCP	Digital Transmission Content Protection
EPG	Electronic Programme Guide
FEC	Forward Error Correction
FTTH	Fibre To The Home
HFC	Hybrid Fibre/Coax
HN	Home Network
H-STB	Hybrid Set-top box
HTML	Hypertext Markup Language
IP	Internet Protocol
LAN	Local Area Network
MIB	Management Information Base
MVPD	Multichannel Video Programming Distributor
OS	Operating System
PCM	Pulse Code Modulation
PPV	Pay Per View
QoS	Quality of Service
RCU	Remote Control Unit
RF	Radio Frequency
SDK	Software Development Kit
SDP	Service Delivery Platform
SNMP	Simple Network Management Protocol

SNS	Social Network Service
STB	Set-top box
UI	User Interface
UPnP	Universal Plug and Play
VOD	Video On Demand
WAN	Wide Area Network

5 Conventions

In this Recommendation:

The phrase "**is required to**" indicates a requirement which must be strictly followed and from which no deviation is permitted if conformity with this document is to be claimed.

The phrase "**is recommended**" indicates a requirement which is recommended but which is not absolutely required. Thus this requirement needs not be present to claim conformity.

The phrase "**is prohibited from**" indicates a requirement which must be strictly followed and from which no deviation is permitted if conformity with this document is to be claimed.

The phrase "**can optionally**" indicates an optional requirement which is permissible, without implying any sense of being recommended. This term is not intended to imply that the vendor's implementation must provide the option and the feature can be optionally enabled by the network operator/service provider. Rather, it means the vendor may optionally provide the feature and still claim conformity with this Recommendation.

In the body of this document and its annexes, the words *shall*, *shall not*, *should*, and *may* sometimes appear, in which case they are to be interpreted, respectively, as *is required to*, *is prohibited from*, *is recommended*, and *can optionally*. The appearance of such phrases or keywords in an appendix or in material explicitly marked as *informative* are to be interpreted as having no normative intent.

6 General requirements

Figure 6-1 illustrates overall cable architecture which consists of a service delivery platform, a cable network, mobile network, home network and the hybrid cable STB as a core device for advanced cable services. Figure 6-1 also shows some service aspects and the collaboration of applications based on this architecture.

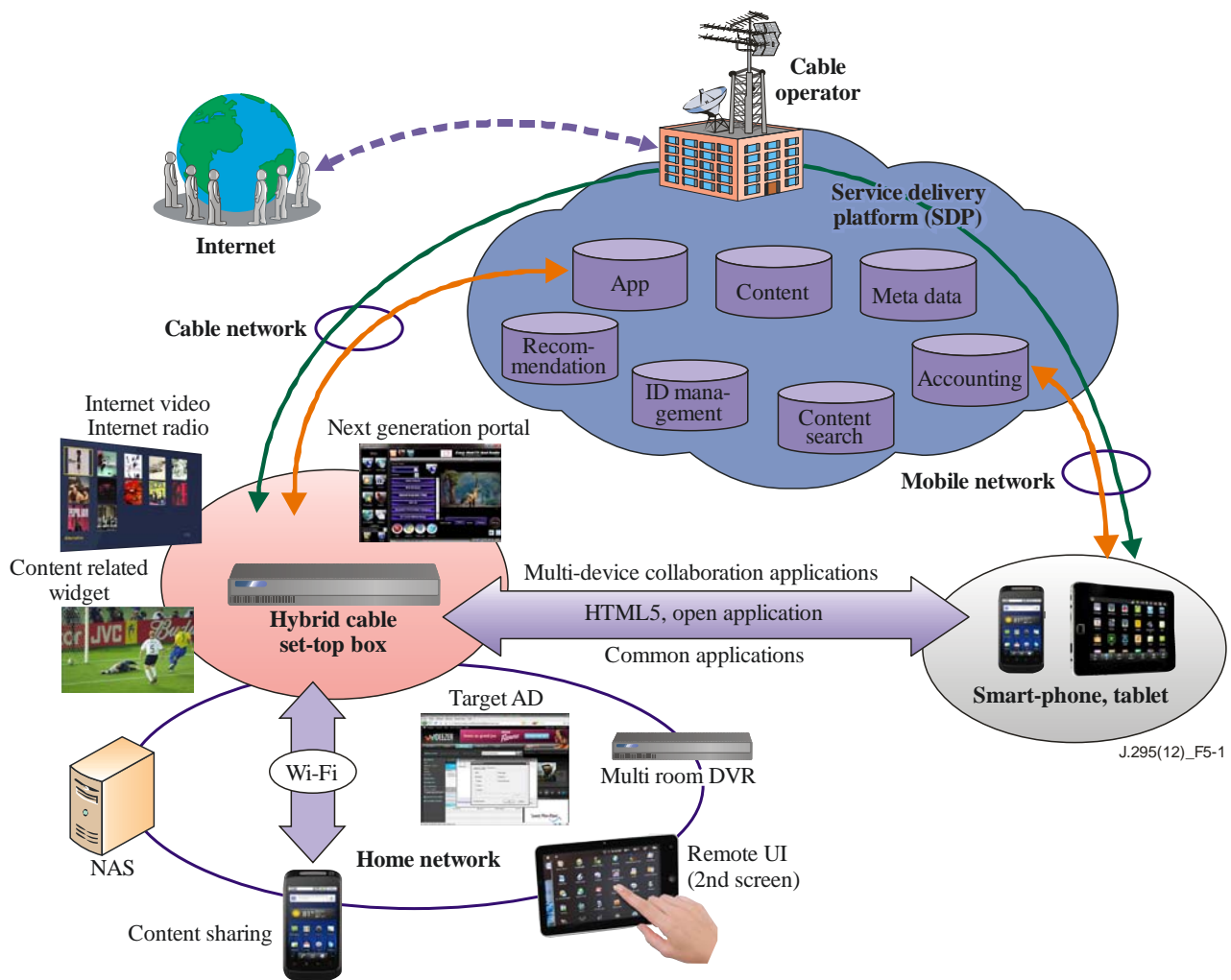


Figure 6-1 – Overall cable architecture supported by the hybrid cable STB

The hybrid cable STB assumes the following conditions in the actual deployment stage.

6.1 Services provided

The hybrid cable STB is required to support cable integrated broadcast and broadband DTV services.

The STB is required to receive terrestrial and satellite broadcasting re-transmitted (by trans-modulation) over an RF (not over IP) on the cable access network. The STB is required to receive RF-based multichannel video programmes and can optionally support IP-based ones. The STB is also required to support interactivity such as VOD, voice over IP, TV telephony and electronic commerce.

6.2 Assumed cable network

The network where the hybrid cable STB is to be used shall be the fibre to the home (FTTH), hybrid fibre/coax (HFC) or interactive coaxial network, which is currently provided by cable operators. The network is required to be a content delivery network managed by the cable operator. The network assumes interoperability with the networks provided by other operators (broadcasting networks, mobile phone networks, etc.). The network is required to have an Internet connection capability. Furthermore, it is required to connect with the home network inside the subscriber's residence.

6.3 Cross platform

The hybrid cable STB is required to provide services available not only on cable platforms but also on other platforms by coordination between the cable operator and other service providers operating those platforms.

6.4 Open software

The hybrid cable STB is recommended to apply open technologies as much as possible. Attention is drawn to possible IPR implications, e.g., consistency with the ITU-T IPR policy and guidelines. Open-based OS, API, SDK (software development kit), etc. are recommended for the hybrid cable STB.

6.5 Multi-tasking support

The hybrid cable STB is required to support multi-tasking at the CPU kernel level.

6.6 CPU architectures

The hybrid cable STB is required to not depend on any specific type of CPU architecture.

6.7 Security

The hybrid cable STB is required to be equipped with tampering check functions (including tampering prevention functions for the OS, firmware and middleware), application execution permission control, tamper resistance, etc. Enhancement of the CPU internal security is also required to protect it from software hacking by an open OS.

6.8 Adaptation for technical evolution and compatibility

The hybrid cable STB is required to support the cable application framework to ensure backward compatibility and also to support an open platform to prepare for future technical evolution.

6.9 Service enhancement

The hybrid cable STB is required to support service enhancement on the application layer.

6.10 User interface (UI)

The TV screen (first screen) and terminal device screen (second screen) are required to have the capability to support the various implementations of the user interface (UI). The UI is required to provide an intuitive operation for the user with minimum delay of the operation. The UI is required to have the capability to promote advanced services. Personalization and customization of the UI are required to follow the intention of the cable operator. The hybrid cable STB is required to enable subscribers to customize the UI within the permissions given by the cable operator.

6.11 Cable portal

The cable portal is the initial interactive presentation for the subscribers to access various services (TV broadcasting, VOD, web browsing, other interactive services, etc.) provided by the cable operator. It is required to enable the cable operator to customize the cable portal.

6.12 Content protection

It is required for the hybrid cable STB to be equipped with the conventional conditional access system (CAS) to protect broadcasting content. The hybrid cable STB is also required to support a conventional copy protection system already deployed in the cable industry. If content is re-distributed from the STB (e.g., to the home network) after the conditional access has been removed,

the hybrid cable STB is required to apply the content protection method (e.g., DTCP-IP or higher capability) approved by the broadcasting industry.

6.13 Home network connections

The hybrid cable STB is required to support IP network connections in the home network. The hybrid cable STB is required to support both the dynamic host configuration protocol (DHCP) server and client functions, logically. A Digital Living Network Alliance (DLNA) connection is required for video and audio content delivery within the home. The hybrid cable STB can optionally support connections to non-IP devices for various home appliances.

7 Service requirements

7.1 General

7.1.1 Open software, open interface

The hybrid cable STB is recommended to support open software and open interfaces, especially for OS and middleware.

7.1.2 Compatibility with existing standards

The hybrid cable STB is required to follow existing domestic and international standards when it is applicable.

7.1.3 Connection to a home terminal device

The hybrid cable STB is required to support services described in clause 9.3 with home terminal devices connected to the home network.

7.1.4 Backward service compatibility

The hybrid cable STB is required to support limited functionalities of the software for future platforms without STB platform upgrade. The full functionalities can be realized by STB platform upgrading.

7.2 Requirements for content reception

7.2.1 Simultaneous viewing and recording

The hybrid cable STB is required to support simultaneously any combination of viewing including content delivery in-home and recording of at least two programmes on the same incoming broadcasting network. It is also required to support the simultaneous viewing of IP streaming content and the recording of a broadcasting programme.

7.2.2 Content quality monitoring

The hybrid cable STB is recommended to have a quality monitoring function to provide feedback to the cable operator.

7.2.3 Codec requirements

The hybrid cable STB is required to support the following codecs for broadcasting and interactive services in accordance with the regional broadcasting system requirements.

- Video decoder
 - Decode MPEG-2 video and MPEG-1 video streams.
 - Support still-picture decoding on MPEG-1 I-frame.
 - Decode ITU-T H.264 streams.

- Audio decoder
 - Decode MPEG-2 audio AAC stream.
 - Decode MPEG-1/-2 audio layer 2 stream.
 - Decode AC-3 stream.
 - Decode DTS stream.
 - Replay AIFF-C (Audio Interchange File Format – Compression) format, limited to the pulse code modulation (PCM) only.
 - Support audio mixing method.
 - Support audio mixing of MPEG-2 AAC and AIFF-C code.
- Transcoder
 - Support conversion of codec, bit rate and file format for the above-mentioned codecs is required. Real time conversion is required in the reception of broadcasting content, and the degradation of picture quality shall be minimum. Post conversion for stored content is also required.
 - At least two simultaneous transcoding is required for the hybrid cable STB.
 - For post conversion, the hybrid cable STB is required to support the appropriate transcoding scheduling for minimum delay viewing by a smart phone, tablet or PC via the DLNA connection.
 - De-interlacing conversion is also required.
- 3D broadcasting support
 - Support of full HD quality 3D broadcasting is required.

7.2.4 Multiple content reception and its recording

The hybrid cable STB is required to receive at least two broadcast programmes simultaneously regardless of whether HDD is embedded in the STB or not.

7.2.5 Content selection

Regardless of the source or type of the content, the hybrid cable STB is required to provide a content selection means so that the subscriber can select content easily and intuitively.

7.2.6 Content sharing

Regardless of the source or type of content, the hybrid cable STB is required to have the function for content delivery among the terminal devices in the home network in accordance with the policy determined by the stake holders, i.e., cable operator, content originator, etc.

7.2.7 Remote UI

The hybrid cable STB is required to support a remote UI function on a terminal device connected in the home network or via a public telecommunication network. For example, scheduling a recording from outside the home via the network will be provided by the remote UI.

7.2.8 Social television service

The hybrid cable STB is required to support social television services such as exchanging social network information, voting for, ranking or comment indication from viewers.

7.2.9 Subscription control

The hybrid cable STB is required to have a subscription control function where the cable operator may control the delivery of the services based on the subscription status.

7.2.10 Device authentication and subscriber authentication

The hybrid cable STB is required to support the CAS system for the identification of the CAS module of the STB and/or the subscriber.

8 Broadcasting service

8.1 Navigation of a broadcasting service

The hybrid cable STB is required to navigate broadcasting services via the portal screen on either the first screen or the second screen.

8.2 Reception of broadcasting content provided by the broadcaster

The hybrid cable STB is required to receive television broadcasting content including related data (e.g., EPG) and 3D content.

The hybrid cable STB is required to receive the following services:

- Emergency alert information and special programmes.
- Multi-view (e.g., several pictures on the same screen).
- VOD, PPV.

In particular, the hybrid cable STB is required to receive emergency alert information even in its stand-by state, then quickly turn to power-on state automatically, and to process the emergency alert signal. The behaviour for the emergency alert signal is required to be pre-configured by the subscriber.

NOTE – Refer to the download function (clauses 16 and 17) for downloads.

8.3 Programme selection

The hybrid cable STB is required to support the following methods of programme selection using an RCU and other tablet devices:

- Switching broadcasting types (e.g., multichannel video and re-transmission).
- Input of channel number (e.g., three-digit tuning).
- Channel up/down.
- Favourite channel list/short-cut button to favourite channel.
- EPG.
- Keyword search (matching of keywords, such as title, cast, genre, etc.).
- Return to previous programme (previously viewed channel).

It should be noted that the following control options for the programme will be available after programme selection:

- Audio selection (including stereo/mono, main/sub, and language selection).
- Caption on/off, language selection.

8.4 Conditional access

The hybrid cable STB is required to support the CA module satisfying the requirements defined by the cable operator.

The following provides examples of the functional requirements to the CA module:

- To support the conditional access used in each region.
- PPV system for each digital broadcast (including viewing history collection).

- Viewing restrictions for each channel using a PIN (PPV).
- To cope with copy control using an appropriate rights protection method.

8.5 Schedule recording

The hybrid cable STB is required to support schedule recording as follows:

- Support for both schedule recording and reminders.
- Support for the schedule by date and time, and from the EPG.
- Support for the checking or deletion of scheduled programmes using the screen.
- If a scheduled recording has been specified using the EPG, and if the start and/or end time happens to change, the hybrid cable STB is required to perform the schedule recording as per the updated schedule of the programme.
- A lock function is required to prevent the cancellation of a recording after the recording has started, unless the subscriber specifically intends to cancel the recording. A warning notification is required for such an action.

8.6 Programme recording

The hybrid cable STB is required to record broadcasting content onto a storage device as follows:

- A re-compression function of recorded content is recommended.
- An intuitive user interface is recommended for recorded content management.

The hybrid cable STB is required to support the following functions when it connects to the external storage device:

- Recording onto the external storage device is only allowed if the functions for content rights protection and copy protection are properly provided.
- When the external storage devices such as HDD or DVD are connected to the hybrid cable STB through a LAN, it is required to support the DTCP-IP connection.
- When the hybrid cable STB records the content onto USB connected HDD, only that STB is allowed to playback the stored content. If the STB has been replaced due to machine trouble, it is required to move the stored content from the troubled STB to the new STB with the copy protection linked to the subscriber. USB 2.0 or higher is required.
- The hybrid cable STB is required to support a copy control function which has been indicated by the original digital copy control information which is embedded in the content, when the STB records the programme onto an external HDD.

8.7 Notice of additional broadcast service

The hybrid cable STB is required to support the functionality to notify subscribers when a broadcasting service has been added (e.g., addition of a community channel).

9 IP interactive services

9.1 Network connection

The hybrid cable STB is required to have a dual-stack function to support both IPv4 and IPv6 as defined in [ITU-T J.218].

9.2 Network connection setting

The following setting is required to be configurable:

- LAN communication (wired and wireless LAN, access point, IP address, DNS setting).
- Cable modem or WAN port (IP address, DNS setting).

Also the following setting is recommended:

- Proxy server (address and port number to be set manually and automatically).

9.3 Delivery of IP interactive services

The hybrid cable STB is required to deliver IP interactive services using the browser and/or application download functions. It is recommended to, but not limited to, support the following services:

- IP streaming service
- IP-based VOD and PPV service
- IP-based download service
- Remote access for a scheduled recording manager
- Multi device service (TV watching on a second screen device, multi-room viewing)
- Video telephony
- TV watching enhancement by social media (micro-blog, view ranking, etc.)
- E-mail service
- Online municipal or local government information service
- E-commerce
- Local information service
- Targeted advertisements, content recommendations
- Net supermarket
- Electronic flyers
- Online shopping
- Ticket reservations and purchases
- News, weather reports, stock market information
- Remote banking
- Games, network games
- Karaoke
- Internet radio

Additionally the following services can be optionally supported:

- Energy management (real time monitoring, indication, and automatic control of electricity, gas, water, etc.)
- Interphone connection
- Home security
- Infant monitoring, pet monitoring
- Healthcare
- Senior person safety monitoring
- Remote operation of home appliances

9.4 Service navigation

Refer to clause 15.1.

9.5 Multidevice support for IP interactive services

The hybrid cable STB is required to support IP interactive services including multimedia content viewing on a TV display, as well as other terminal devices. It is also required to support necessary copy control to the output signals, in accordance with content rights protection requirements given by content providers.

9.6 IP multimedia streaming

The hybrid cable STB is required to receive unicast signals and recommended to receive multicast signals. As the transmission protocol, RTP/UDP is required, HTTP/TCP is optional. In the cable network, QoS control is required to suppress jitter and packet loss in transmission streaming. The hybrid cable STB is required to absorb the jitter by buffering in accordance with memory capacity, while a clock synchronization mechanism is also required for long term multimedia reception. It is also required to compensate packet loss with FEC.

9.7 Content selection

The hybrid cable STB is required to provide content selection using an RCU and other tablet devices.

9.8 Conditional access for IP interactive services

The hybrid cable STB can optionally support the conditional access to the content delivered by IP. When the STB supports conditional access, it is required to support the following functionalities:

- Conditional access for broadcasting IP streaming
- On-demand IP streaming
- Access control on a channel basis or the browser using a password
- Copy control in accordance with the content rights protection method.

9.9 Character input for an interactive service

The hybrid cable STB is required to support the input of characters using the RCU or the soft keyboard of the HN terminal device defined in [ITU-T J.190].

9.10 Communication error and time-out

The hybrid cable STB is required to notify communication errors and time-outs to the operator. The hybrid cable STB is required to provide a recovery functionality from the communication waiting status. Note that an application on the STB may notify errors to the users including communication problems.

9.11 Notice of additional IP interactive services

The hybrid cable STB is required to support the functionality to notify subscribers when an IP interactive service has been added.

10 Display functions for a web/interactive service

10.1 Web browsing

The hybrid cable STB and/or the second screen device are required to have the capability to display web pages. It is required to have a function to receive the URL input and other information from the search site on the web access screen indicated on the screen through the RCU or the software keyboard displayed on the screen. It is also required to support password control to restrict the direct input of URLs. The hybrid cable STB is required to support the latest version of browsers and protocols.

10.2 Reception of broadcasting and IP interactive services

Either broadcasting services or IP interactive services are required to be selectable through the use of the RCU or icons on the second screen.

10.3 Cable portal

The hybrid cable STB is required to display the cable portal when the STB is turned on or the STB receives an operational command from the RCU. It is required to be selectable by the subscriber and/or operator whether the STB primarily displays the cable portal or not. The appearance of a portal is required to be configurable by the subscriber through the application download.

10.4 Customization of the cable portal

It is required to support the customization of the cable portal by the operator within the range listed in clause 10.3 (by age, generation, etc.) or by the subscriber.

11 RCU functions

The advanced cable STB is required to have the capability to accept controls from the following four types of devices:

- Conventional remote with IR
- Conventional remote with radio access
- Second screen terminals on a home network (HN)
- Tablet and/or smart phone connected to the Internet

The RCU described in this Recommendation is required to provide stress-free operation for subscribers. This clause gives descriptions for each type of RCU.

11.1 Conventional remote

The conventional remote of the hybrid cable STB is required to have the minimum number of buttons for simple operation, by taking advantage of graphical navigation shown on the screen.

11.2 Connection method for RCU

The hybrid cable STB is required to support multiple communication methods for an RCU. Multiple connection support is required for each transmission method.

11.3 HN type RCU

The HN type RCU is required to connect to the STB via the HN and to display the cable portal screen. Through the portal screen, a user can operate the STB with the HN type RCU. In addition, the HN type RCU can access various applications or services provided by cable operators or content providers via the HN. A hardware or software based keyboard and graphical UI including a desktop icon are required for the RCU. It is recommended to implement microphone and voice recognition functions to realize voice input (programme selection, etc.).

11.4 Personalization of an HN type RCU screen

An HN type RCU is required to have the capability to support personalization of the screen in accordance with the preference of subscribers or age groups within the family.

11.5 Update of HN type RCU software

The HN type RCU is required to have the capability of upgrading its functions and application software (refer to clause 16).

11.6 Internet type RCU

The Internet type RCU is required to connect to the STB via the Internet. In addition, the Internet type RCU can access various applications or services provided by cable operators or content providers via the Internet. A hardware or software-based keyboard and graphical UI including a desktop icon are required for the RCU.

12 User interface (UI)

12.1 General requirements for UI

The hybrid cable STB is required to equip the UI with the following requirements:

- 1) Quick response.
- 2) Intuitive operation:
 - 2.1) Effortless navigation to new services.
 - 2.2) Literacy level agnostic operation.
- 3) State-of-the-art graphical appearance.
- 4) Telecommunications accessibility for older persons and persons with disabilities [ITU-T F.790].

12.2 Broadcasting content presentation on the UI

The hybrid cable STB is required to allow cable operators to specify the position and the size of broadcasting content presentation on the UI.

The hybrid cable STB is required to have the capability of ensuring that the broadcasting content presentation complies with the technical report [b-EBU-TR 013].

13 Connection interface

13.1 Coaxial cable interface

To provide all the services described in this Recommendation for subscribers, the hybrid cable STB is required to equip a coaxial cable connector as an input terminal. In the hybrid cable STB, an RF tuner receives video signals and the DOCSIS cable modem sends and receives IP packets through this interface.

13.2 Wireless LAN (Wi-Fi) interface

The hybrid cable STB is required to provide wireless LAN (Wi-Fi) functions. It is required to work selectively as an access point or client. The hybrid cable STB is recommended to embed this functionality, but can optionally support this functionality with an external USB Wi-Fi module.

13.3 WAN interface

The hybrid cable STB is required to support an Ethernet WAN interface for non-HFC cable networks, where the embedded cable modem is not used.

13.4 Wired LAN interface

In addition to the wireless LAN (Wi-Fi) interface described in clause 13.2, the hybrid cable STB is required to support wired LAN interface for the same purpose. This interface can also be used for WAN access when the LAN is accessible to the WAN network.

13.5 Peripheral device interface

The hybrid cable STB is required to be equipped with at least two USB terminals for peripheral device support. The STB is required to support the following devices:

- Storage (USB mass storage class)
- Wi-Fi (USB wireless controller class)
- Camera (USB video class)
- Microphone (USB audio class)
- Hub (USB hub class)

The hybrid cable STB is required to allow applications to utilize these peripherals through the APIs.

13.6 RCU interface

The hybrid cable STB is required to support the four types of RCU interfaces defined in clause 3, i.e., the IR type RCU uses an infrared interface; the RF type RCU uses a wireless interface e.g., RF4CE; the HN type RCU uses a wireless LAN interface e.g., IEEE 802.11n, and the Internet type RCU uses an IP access interface e.g., WAN or wired/wireless LAN. The first three interfaces are used for in-house operation, while the fourth interface is used for STB operation from outside the home.

13.7 Output interface

The hybrid cable STB is required to be equipped with an HDMI interface for HD digital output. The HDMI interface is required to be HDMI 1.4a or higher. The STB is required to support power the on/off control of the external device (e.g., TV set) by HDMI-CEC. The STB is recommended to be equipped with an optical audio interface (IEC 60958). For legacy support, RCA composite with analogue audio (yellow, red, white) are required. The hybrid cable STB is prohibited to include any S terminal, analogue component or IEEE1394 interface.

13.8 CA card interface

The hybrid cable STB is required to be equipped with a CA card interface that complies with the conditional access system used in each region.

14 Authentication and authorization

The hybrid cable STB is required to support authentication and authorization mechanisms of the device and of the user that satisfy the requirements in this clause.

14.1 Device authentication and authorization

The hybrid cable STB is required to support the following device authentication and authorization functions:

- A CA card or downloadable CA is used to authorize broadcasting service reception by the STB.
- DOCSIS authentication is used to authenticate the STB by the head-end.
- DTCP-IP is used for device authentication between the hybrid cable STB and other DLNA-capable devices connected to the home network.
- LLC-HDCP is used for device authentication between the hybrid cable STB and other HDMI devices such as a TV set.
- The hybrid cable STB is required to support authentication mechanisms to authenticate external devices connected to the home network such as a smart phone or a tablet, where the STB is required to support both types of authentication, i.e., direct authentication between devices (e.g., DLNA remote UI) and authentication via a server (e.g., id and password controlled). After device authentication, authenticated devices will be linked to the STB.

14.2 User authentication

The hybrid cable STB is required to be equipped with the following user authentication functions:

- User authentication using ID and password.

The following authentication methods can optionally be used to provide more advanced services:

- User authentication using image recognition
- User authentication using voice recognition
- User authentication using fingerprint recognition

14.3 Authorization of application execution

Considering the situation that subscribers will be able to obtain both applications developed specifically for cable television services and applications available on the open application markets, it is required to define functions that can be accessible only by the privileged applications from the security point of view such as service and content protection. Thus, the hybrid cable STB is required to be equipped with mechanisms to authorize the applications accessible to significant functions including broadcasting-related components.

15 Hybrid broadcasting and web services

15.1 Cable portal screen

The cable portal screen is the initial screen, provided by the cable operator for subscribers to enter TV broadcasting, IP content delivery such as VOD and IP interactive services including web browsing, and hence it is very important for cable television services. The portal screen will also be applicable to various advertising services because it can show banner ads, picture ads, movie ads, etc. It will also provide customization of the portal screen used with personal devices to enable quick service navigation based on viewing history of the subscriber. Refer to clause 10 for the description of display functionalities and browsers.

Although the cable portal screen is supposed to be initially displayed on the TV screen when the hybrid cable STB is turned on, the STB is required to allow the subscriber to choose whether to display the last channel initially or to show the cable portal screen at the time of turn-on of the STB.

The hybrid cable STB is required to support the following installation methods of the cable portal function:

- Pre-installation of the default portal function to the hybrid cable STB before delivery to the user.
- Automatic download of the cable portal function from the head-end via the IP network after deployment of the STB.
- Download of the cable portal function as intended by the cable operator's application server.

15.2 Broadcasting content

The hybrid cable STB is required to use the full-screen mode when the STB only shows one broadcast.

15.3 Simultaneous display of IP interactive services and broadcasting content

The hybrid cable STB is required to support the simultaneous display of broadcasting content and IP interactive services which may contain graphic elements such as buttons and icons. The size and position of the broadcasting content may be controlled by the IP interactive services, or by other means to separate their areas to distinguish their own context. However, the STB is required to comply with regulations and/or guidelines for simultaneous display defined by the authorities in each region to the extent defined by such regulations and/or guidelines according to their scope.

15.4 Overlaying information on the broadcasting content

When any information is overlaid on the broadcasting content, the hybrid cable STB is required to comply with regulations and/or guidelines defined by authorities in each region to the extent defined by such regulations and/or guidelines according to their scope.

15.5 Services associated with EPG

The hybrid cable STB is required to support services associated with an EPG. The STB is required to support the application software enabling search and display of related web information based on the attribute information obtained from the EPG.

16 Download function for system software/firmware update

The hybrid cable STB is required to support the following download methods for the system software/firmware update:

- Download via broadcasting RF signals.
- Download via an IP network, i.e., wired LAN or wireless LAN.

The STB is required to be capable of software download regardless of its power on/off state.

16.1 Download methods for system software/firmware

If the software is downloaded by a broadcasting RF, the hybrid cable STB is required to have the capability to receive the elementary stream service defined in [ITU-T H.222.0] while the STB is in power-off state. The STB is required to support both global head-end insertion and local head-end insertion of the engineering stream. If the STB downloads the software in power-on state, the STB is required to show the warning to the user.

If the system software/firmware is downloaded by an IP, the STB is required to support the download initiated by the cable operator (push download), and software download initiated by the customer support representative at subscriber's premises (pull download). The STB is also required to allow the customer support representative to put software image into the STB from the external storage (USB, etc.). After the system software/firmware update, the STB is required to show the proper notification for the necessary user action (e.g., power-off and on for reboot).

The hybrid cable STB is required to allow the user to choose the behaviour of an operator-initiated download as follows:

- Automatic downloading.
- Showing notification for downloading each time.

16.2 Process in case of download failure

The hybrid cable STB is required to stop the software update and rollback to the previous version when the software download is not completed normally.

16.3 Scheduling of download and report of result

The hybrid cable STB is required to provide the scheduling of a download and report the result.

It is required to schedule the download and report the result as logs of the STB. It is also required to allow users to see these logs. If the result is abnormal termination, and/or there is an error message with an error code, it is required to include this information in the log.

16.4 Indication of system software/firmware version

The hybrid cable STB is required to allow subscribers to see the device manufacturer ID, model name, model number and software version on the TV screen.

17 Download function for application software

There are two types of download methods for application software. One is the operator-initiated application download which is deployed to the multiple addressing by the cable operator, the other is the user initiated application download which is downloaded from the download server corresponding to the individual subscriber's request.

17.1 Operator initiated application download method

The hybrid cable STB is required to support the automatic download of the application software without the user's awareness. A typical use case of this functionality is for the deployment of new services. After the download of a new service application, the STB is required to provide a notification on the service portal screen.

17.2 User initiated application download method

When a subscriber accesses the application download site and selects the software from the catalogue, the hybrid cable STB is required to download the selected application. The STB is required to support the application with an expiry date and one time application in addition to the normal application. Regarding the download site, the hybrid cable STB is required to support the download from an operator's site, as well as from third party sites.

17.3 Indication of application software version

The hybrid cable STB is required to enable the subscriber to easily confirm the software version on the TV screen.

17.4 Subscriber authentication and authorization for pay application software download

In the case of pay software download, the hybrid cable STB is required to authorize the subscriber by coordination with the cable operator's platform. The subscriber will be authorized based on the individual contract between the cable operator and the subscriber. With the normal completion of the download, the billing process is conducted at the cable operator's platform. The STB is required to support the capability to clearly display billing transaction to the subscriber.

18 Home network connection

The hybrid cable STB is required to support various services using the HN such as content sharing with terminal devices connected to the HN.

18.1 Transport for HN

The hybrid cable STB is required to support wired and wireless IP transport methods, e.g., Ethernet, Wi-Fi (IEEE 802.11a/b/g/n). The STB is recommended to support RF-based transport methods to communicate with non-IP devices within the home, e.g., IEEE 802.15.4 [b-IEEE 802.15.4].

18.2 Routing function

The hybrid cable STB is required to support an IP routing function between WAN and LAN.

18.3 Protocols

The hybrid cable STB is required to support a universal plug and play (UPnP) connection among IP devices in the HN. The latest version of the DLNA standard is required to transfer multimedia within the HN. It is required to adopt the latest version of the DTCP-IP for device authentication and content protection. Proprietary protocols can be used optionally for the transmission of specific information with such devices in the HNs that only support non-IP protocols.

19 Management functions

19.1 Provisioning function

The hybrid cable STB is required to provide a provisioning function in coordination with the head-end system. It is also required to support simple network management protocol (SNMP) and Broadband Forum TR-069 [BBF TR-069].

19.2 STB remote management

The hybrid cable STB is required to enable the cable operator to manage terminal devices remotely in coordination with the head-end system by means of [BBF TR-069]. It is also required to apply SNMP using a cable specific management information base (MIB) to acquire and set parameters for STB specific information for backward compatibility with the existing cable network's management system.

If the STB fails to operate properly, the hybrid cable STB is required to restore to normal operation, as much as possible, from the head-end by means of the [BBF TR-069] reset function.

The STB is required to maintain broadcasting-related services such as watching, recording, scheduled recording regardless of failure, for example, communication function (DOCSIS, Ethernet and WiFi) and application platforms.

19.3 Management of subscriber information

The hybrid cable STB is required to support a gathering function of the subscriber information including viewing history. The STB is also required to protect the collected information. The STB is required to protect transport for sending the collected information to the cable operator. It is also required that personal information can be easily eliminated either by the cable operator or the subscriber.

19.4 Monitoring of reception quality

The hybrid cable STB is required to support a function for monitoring the reception signal quality and reporting the result to the head-end system.

20 Power saving

The hybrid cable STB is recommended to have four power states: Power-on, Function stand-by, Stand-by, and Power-off for energy saving. The STB is required to enable the subscriber to set the power status. In the Function stand-by state, remote scheduled recording and the reception of emergency alert signals shall be supported. EPG information and RCU signal reception are also required in the Stand-by state.

The hybrid cable STB is required to have a power ON/OFF communication function with the TV receiver. The STB is required to allow other external devices to control the power status of the STB via Wi-Fi/LAN within the HN.

21 Mechanical requirements

The hybrid cable STB is recommended to have a mechanical structure for space saving, simple operation and cost reduction. The requirements are listed below:

- External adapter type power source is recommended for space saving.
- Card slots for conditional access shall be provided.
- An LED shall be mounted for the indication of the being in operation stage. The hybrid cable STB is required to have at least one LED to indicate its status. The STB is also required to receive signals from an IR type RCU.
- The meaning, method and colour of the LED shall be left to the manufacturer's product planning.
- The following switches shall be provided for direct control of the STB Power on/off, hardware reset, channel up/down, selection of broadcast types (e.g., multichannel video reception or re-transmission).
- The input and output interfaces listed in clause 13 shall be provided.
- It is recommended to support both vertical and horizontal placement.

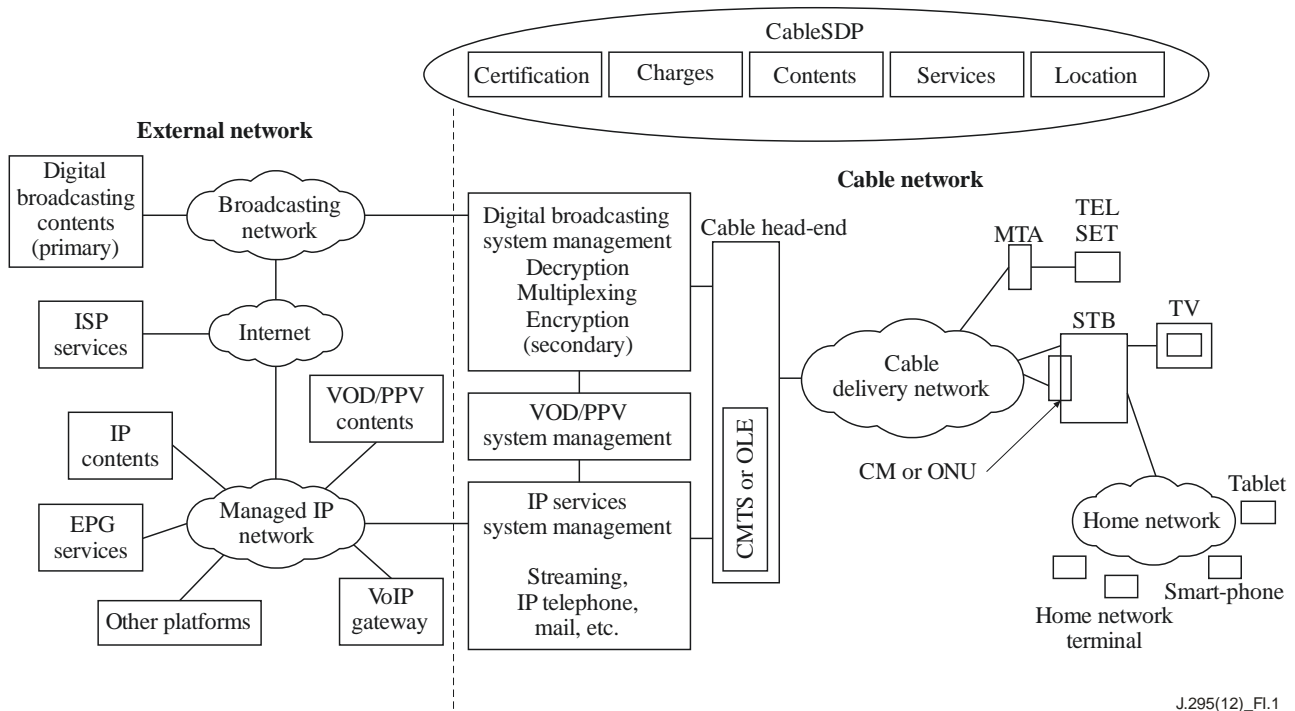
Appendix I

Cable network and service delivery

(This appendix does not form an integral part of this Recommendation.)

I.1 Cable network architecture

The cable network architecture including the hybrid cable STB is shown in Figure I.1. It is configured to distribute broadcasting and interactive services to the subscriber through the cable network where the transmission quality is guaranteed. However, if the source of the content is via the Internet, the quality cannot be guaranteed due to the best effort connection.



J.295(12)_Fl.1

Figure I.1 – Cable network architecture

I.2 Type of service delivery

Figure I.2 shows the type of service delivery using the hybrid cable STB:

- 1) Multichannel, re-transmission of digital broadcasting and VOD/PPV service.
- 2) Scheduled recording service linked with a mobile device.
- 3) Distribution of cable content through the mobile communication network to the terminals of cable subscribers (this service bypasses the hybrid cable STB).
- 4) Distribution of IP services through the Internet.
- 5) Collaboration services with other platforms.

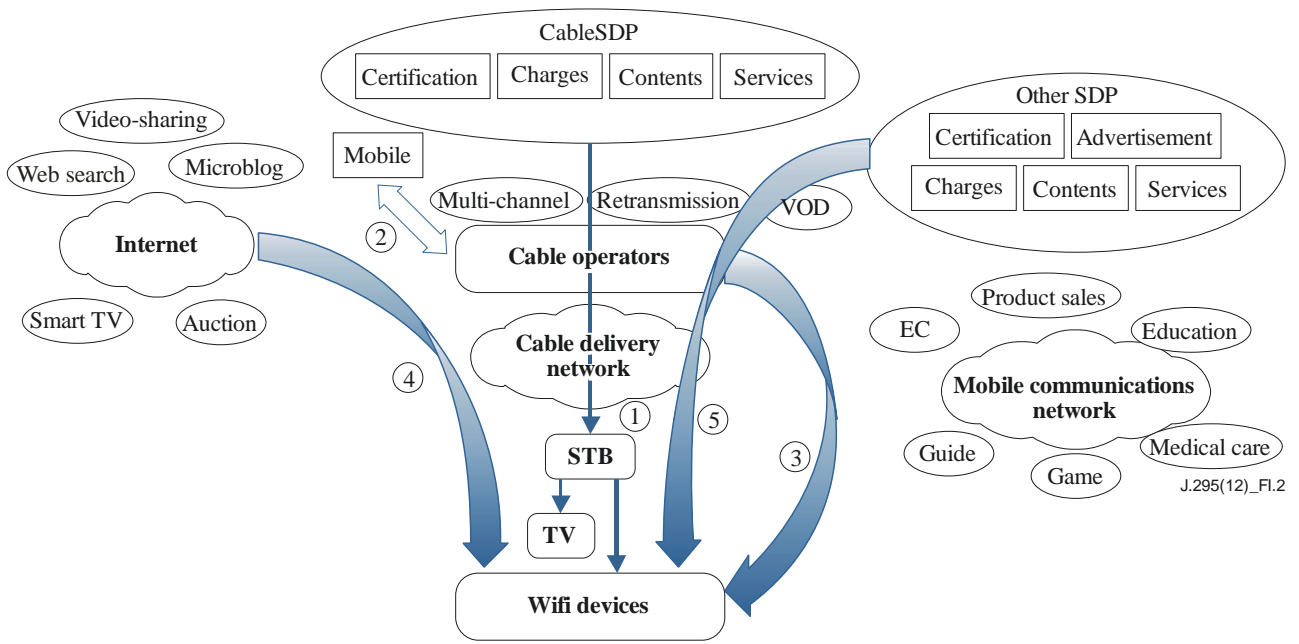


Figure I.2 – Type of service delivery

Appendix II

Use case

(This appendix does not form an integral part of this Recommendation.)

Expected use cases for a hybrid cable STB are described below.

II.1 Use case 1: seamless multi-device TV watching experience

This use case means seamless video content delivery without noticing the origin point of content or the delivery method between different devices through the collaboration of a VOD server, set-top box, smart phone and tablet devices in the cloud network.

Let us suppose that a multichannel broadcast content server, streaming server for multi-device on the network side and a set-top box, smart phone and tablet devices in the home network are connected as shown in Figure II.1. If a user's information on viewing time, i.e., content resume point, becomes common in the network, it will be able to resume the content on the screen of a different device seamlessly without noticing the delivery route.

In the case where a user is watching recorded content on a TV screen and then moves to another of the user's rooms to watch the remaining content on the display of a smart phone, the smart phone disseminates a request command to the set-top box. Upon receipt of the command, the set-top box begins trans-coding from the resume point then delivers content to the smart phone, which means a seamless video content delivery service. The resume point is shared in the network as the common information for each part of the content and each user. The content resume service will be available not only in home but also outside through the mobile network in which a streaming video service is available by smart phones or tablet devices. The associated services such as authentication between devices, parental lock, etc. shall be provided as a set of functions of a video delivery server under the viewing situation in which a common set-top box and multiple smart phones exist.

In addition, a collaboration service will be available for audio content which means music programme delivery to the speakers on TV from a smart phone by a DLNA media transition.

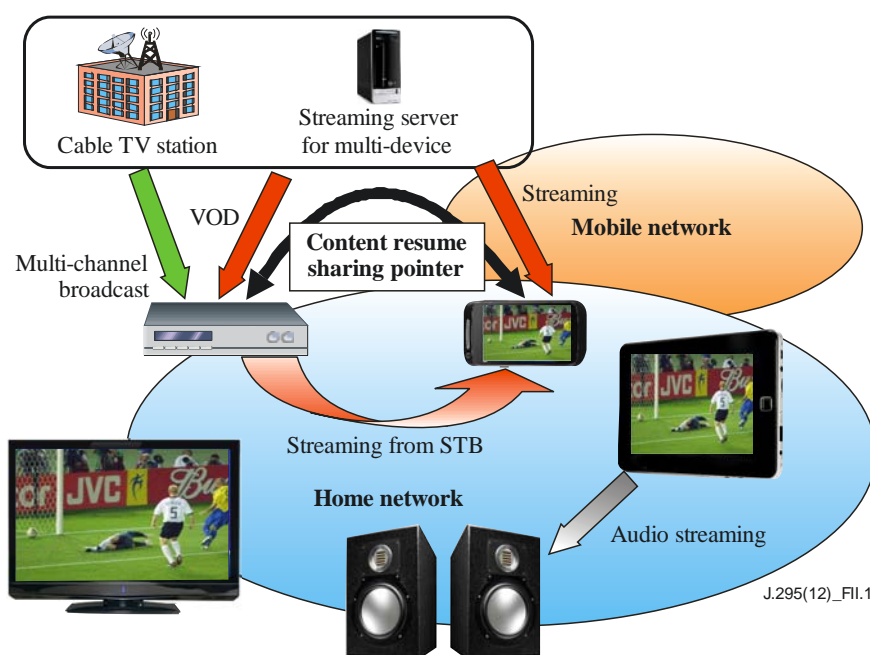


Figure II.1 – Seamless multi device TV watching experience

II.2 Use case 2: social media-assisted TV watching

This use case enables value-added services for content viewing, by showing a viewer's real-time impression and reputation regarding current programmes on the screen of a user's device (i.e., tablet device or smart phone) which has authentication-coupling with a set-top box. As shown in Figure II.2, a social media coordination server collects a user's impression and/or tendency of comments regarding a programme from a microblog, blog, social network service (SNS), etc., based on blog topics or hash-tags. In the user's home, a tablet device or smart phone catches the present channel information of the set-top box and gets comments and statistical data from a social media coordination server. During the programme these real-time comments and/or impressions are collected and displayed on the TV screen with statistical data.

Other usage of social media is a text message transaction through a TV screen by sharing information (presence) of a programme that is being watched among the user's friends and family. This service enables a user to recommend the programme to a friend with VOD, while enabling them to share comments when viewing the programme.

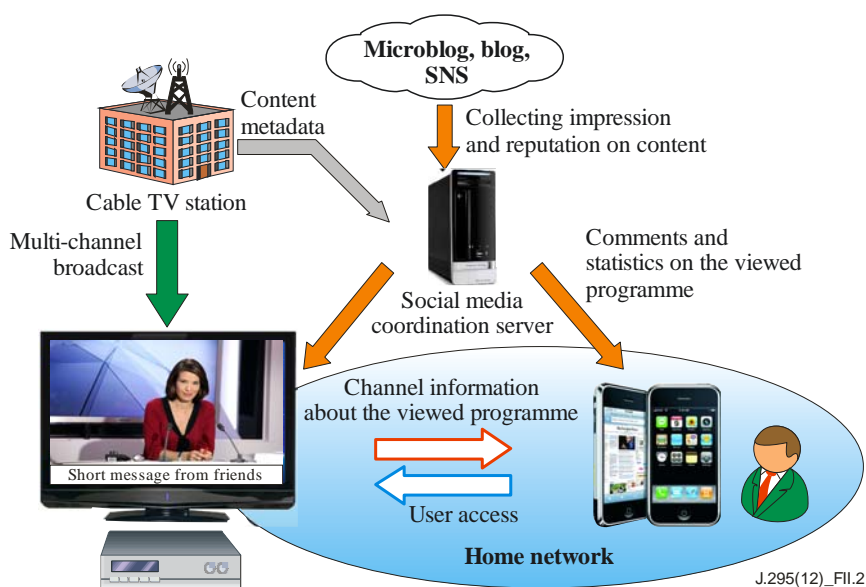


Figure II.2 – Media assisted TV watching

II.3 Use case 3: livelihood support service

This use case describes a livelihood support service utilizing the set-top box and cable television network. Figure II.3 shows a remote healthcare service using home healthcare devices. The data from a blood pressure monitor, the bathroom scales (weight) and pedometer are collected in the set-top box through WiFi or a Bluetooth system and presented to the user on a TV screen. At the same time the set-top box delivers the collected data to a hospital, pharmacy and health consultant that relate to the user through the personal data server. Based on the stored data in the server, various services such as health consultancy, remote diagnosis-aid will be available by utilizing a TV telephony system provided by the cable network.

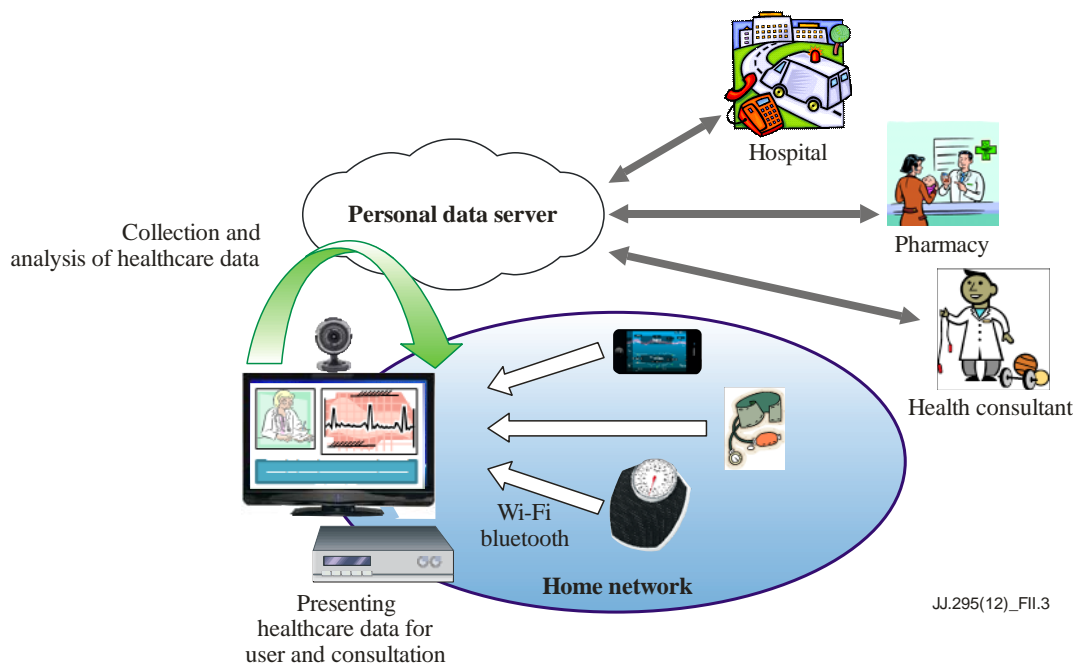


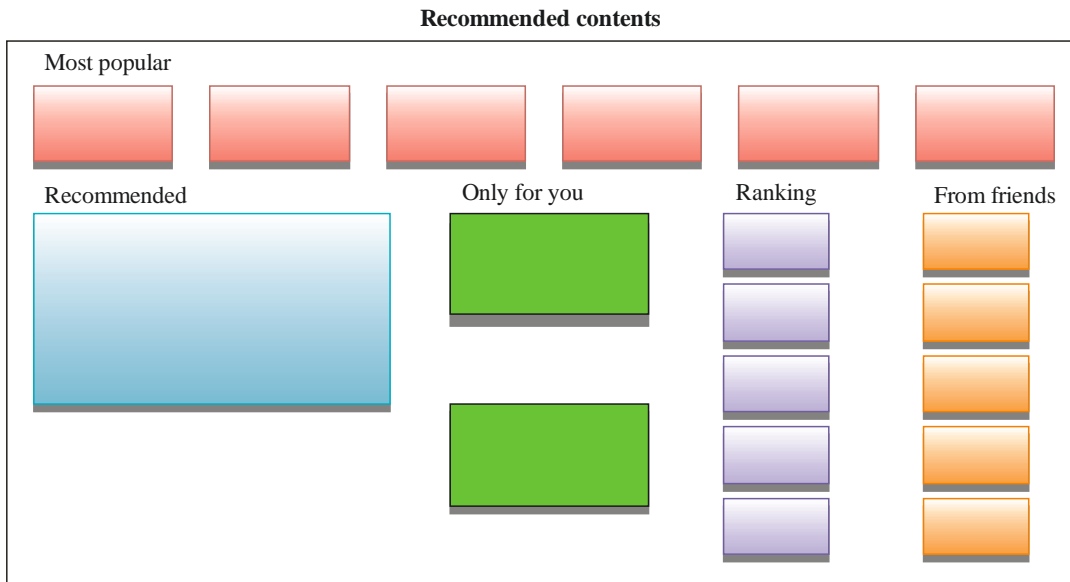
Figure II.3 – Livelihood support service – healthcare

II.4 Use case 4: recommendation service

This use case assumes that the cable operator will provide a recommendation service to the subscriber by acquiring and utilizing various pieces of information on the user, to recommend content and goods which are most suited to the subscriber (means personalized recommendation). It is also recommended to deliver the following services without using a subscriber's personal information, where the subscriber does not explicitly indicate the conditions of recommendation.

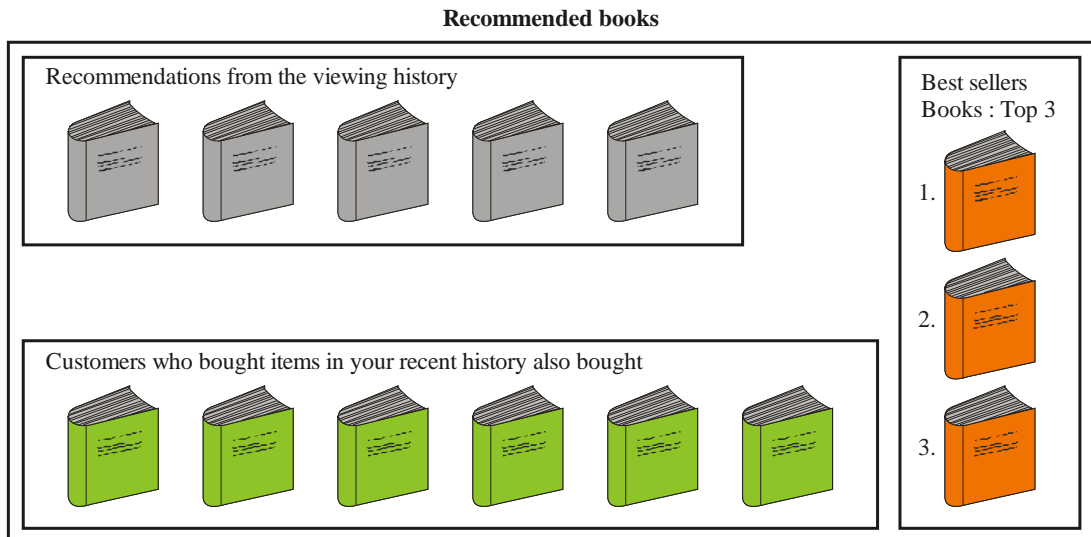
- Ranking
- Highly recommended by the shop
- Goods recommendation linked to viewing history
- Meta-data related content (director, artist, cast links, etc.)
- Recommendation by friends
- Recommendation from other users

Based on the viewing history obtained from the hybrid cable STB which may include a subscriber's tastes, after keyword search and data aggregation by the search engine and weighting by the cable operator's business rules (e.g., delivery of new titles first), the recommendation service is distributed to the subscriber. Figures II.4, II.5 and II.6 show sample screens for content recommendations, and goods recommendations, respectively.



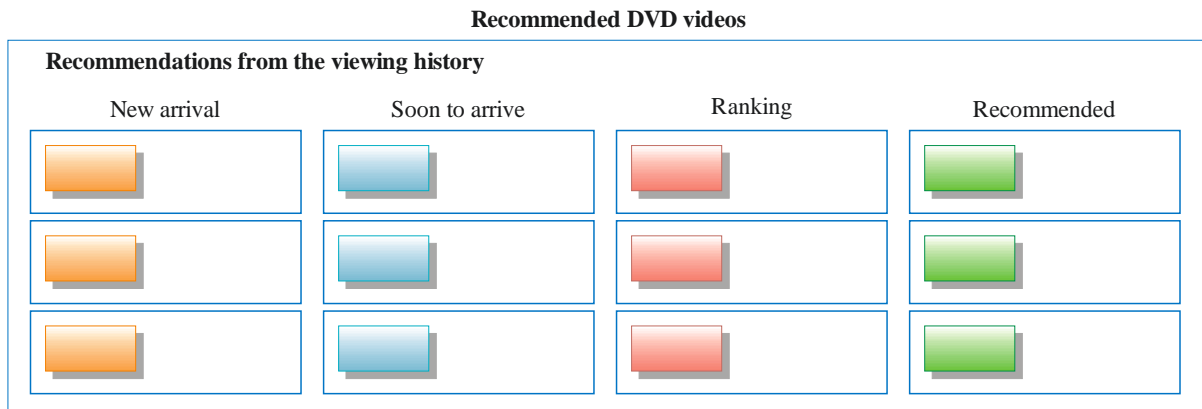
J.295(12)_FlI.4

Figure II.4 – Sample screen of a content recommendation service



J.295(12)_FlI.5

Figure II.5 – Sample of a goods recommendation screen



J.295(12)_FlI.6

Figure II.6 – Sample of a goods recommendation screen

Bibliography

- [b-IEEE 802.15.4] IEEE 802.15.4-2006, *IEEE Standard for Information technology – Telecommunications and information exchange between systems – Local and metropolitan area networks – Specific requirements Part 15.4: Wireless Medium Access Control (MAC) and Physical Layer (PHY) Specifications for Low-Rate Wireless Personal Area Networks (WPANs)*.
- [b-EBU-TR 013] EBU-TR 013 (2011), *The Future of Terrestrial Broadcasting Version 1.1 (2011), EBU Technical Report*.
- [b-JCL SPEC-001] JCL Spec-001, Version 1.01 (2008), *Operational specifications for BS digital satellite broadcasting trans-modulation*.
- [b-JCL SPEC-003] JCL Spec-003, Version 2.1 (2010), *Operational specifications for re-max digital broadcasting (independent broadcasting)*.
- [b-JCL SPEC-004] JCL Spec-004, Version 2.1 (2010), *Operational specifications for re-max digital broadcasting (i-HITS)*.
- [b-JCL SPEC-005] JCL Spec-005, Version 2.2 (2010), *Operational specifications for JC-HITS trans-modulation*.
- [b-JCL SPEC-006] JCL Spec-006, Version 2.01 (2008), *Operational specifications for digital terrestrial television broadcasting pass through*.
- [b-JCL SPEC-007] JCL Spec-007, Version 2.01 (2008), *Operational specifications for digital terrestrial television broadcasting trans-modulation*.

SERIES OF ITU-T RECOMMENDATIONS

Series A	Organization of the work of ITU-T
Series D	General tariff principles
Series E	Overall network operation, telephone service, service operation and human factors
Series F	Non-telephone telecommunication services
Series G	Transmission systems and media, digital systems and networks
Series H	Audiovisual and multimedia systems
Series I	Integrated services digital network
Series J	Cable networks and transmission of television, sound programme and other multimedia signals
Series K	Protection against interference
Series L	Construction, installation and protection of cables and other elements of outside plant
Series M	Telecommunication management, including TMN and network maintenance
Series N	Maintenance: international sound programme and television transmission circuits
Series O	Specifications of measuring equipment
Series P	Terminals and subjective and objective assessment methods
Series Q	Switching and signalling
Series R	Telegraph transmission
Series S	Telegraph services terminal equipment
Series T	Terminals for telematic services
Series U	Telegraph switching
Series V	Data communication over the telephone network
Series X	Data networks, open system communications and security
Series Y	Global information infrastructure, Internet protocol aspects and next-generation networks
Series Z	Languages and general software aspects for telecommunication systems