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OF TELEVISION, SOUND PROGRAMME AND OTHER
MULTIMEDIA SIGNALS

Cable modems

**Requirements for the next generation
of set-top-boxes**

ITU-T Recommendation J.193

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Requirements for the next generation of set-top-boxes

Summary

This Recommendation defines the requirements of a Next Generation Set-Top-Box (NG-STB) that is attached to a CATV. An NG-STB receives broadcast cable services and provides a 2-way communication channel with the cable network for service management.

Source

ITU-T Recommendation J.193 was approved on 29 June 2004 by ITU-T Study Group 9 (2001-2004) under the ITU-T Recommendation A.8 procedure.

FOREWORD

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Requirements for the next generation of set-top-boxes

1 Scope

This is an objectives, requirements and functional architecture Recommendation for next generation set top boxes, supporting a core digital video application suite (i.e., broadcast video), and allowing for a large variety of additional services, such as VoD, VoIP, data services, etc. This Recommendation is designed to be used for cable television networks, but the architecture does not necessarily exclude other access network interfaces.

2 References

2.1 Normative

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 revisions; 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 Recommendation J.112 (1998), *Transmission systems for interactive cable television services*.
- ITU-T Recommendation J.122 (2002), *Second-generation transmission systems for interactive cable television services – IP cable modems*.
- ITU-T Recommendation J.200 (2001), *Worldwide common core – Application environment for digital interactive television services*.

2.2 Informative

- ITU-T Recommendation J.83 (1997), *Digital multi-programme systems for television, sound and data services for cable distribution*.
- ITU-T Recommendation J.125 (2004), *Link privacy for cable modem implementations*.
- ITU-T Recommendation J.126 (2004), *Embedded Cable Modem device specification*.
- ITU-T Recommendation J.181 (2004), *Digital program insertion cueing message for cable television systems*.
- ITU-T Recommendation J.190 (2002), *Architecture of MediaHomeNet that supports cable-based services*.
- ITU-T Recommendation J.191 (2004), *IP feature package to enhance cable modems*.
- ITU-T Recommendation J.192 (2004), *A residential gateway to support the delivery of cable data services*.

3 Terms and Definitions

This Recommendation defines the following terms:

3.1 Next Generation Set-Top-Box (NG-STB): A compilation of hardware and software functional entities contained within one or more physical devices, that at a baseline level provides the receiving functions for cable Broadcast services. In addition, the NG-STB MAY support the interactive functions of IP-based services, additional time-critical services between the HFC and the Home Network as well as extension and supplemental services.

3.2 embedded STB: A Set-Top-Box that does not use a stand-alone interface to connect to a RG.

3.3 LAN IP device: A LAN IP device is representative of a typical IP device expected to reside on Home Networks, and is assumed to contain a TCP/IP stack as well as a DHCP client.

3.4 Portal Services (PS): A functional element that provides management and translation functions between the HFC and Home Network.

3.5 Residential Gateway (RG): A grouping of logical elements used to achieve HFC access for Home Network(s).

3.6 standalone RG: A RG Services element that connects to the CM using only a standalone interface.

3.7 IP-based services: A generic term that includes QoS-controllable both-way and one-way IP-type services rendered over a CATV network on which a high-speed packet-based IP communication system is available. Examples include IP telephony or VoIP, videoconferencing, streaming video feeds, competitive games, and other similar services.

3.8 closed captioning: Text scrolling on a television display that represents the audio portion of the program, typically provided for the hearing impaired.

3.9 home terminal: The device attached to the cable network that receives and renders services for the customer. Also known as a set top box.

3.10 conditional access: The conditional granting of access to cable services and content based upon what service suite has been purchased by the customer.

3.11 portal functions: Functionality that resides within a Residential Gateway that provides connectivity between the cable IP network, and the home network. See ITU-T Recs J.190, J.191 and J.192 for more details.

3.12 2-way communication channel: An IP-based communications link between a NG-STB and the cable network service management system, for the purpose of service management communications.

3.13 core services: The set of services that MUST, at a minimum, be supported by the NG-STB.

3.14 optional services: Services, in addition to the Core Services, that can be supported by the NG-STB.

3.15 key features: Features that MUST be included in the NG-STB in order to support the Core Services identified in this Recommendation.

3.16 optional features: Features that can be added to the NG-STB in order to support the Optional Services identified in this Recommendation.

3.17 middleware: Software within the NG-STB which provides a set of APIs that against which applications can be developed, and that provide access to the resources and services of the NG-STB.

3.18 command and control messaging: Messaging between devices which request particular actions associated with video service such as Play, Rewind, and Pause.

3.19 broadband cable modem: A cable modem built into the STB, which provides full Broadband access to the Internet, and is intended for customer use. In addition, cable services can be delivered via this broadband IP connection.

3.20 emergency alert system: A system, within which the NG-STB participates, that allows a service provider to distribute public emergency alarms and information about the public emergency to all of the customers attached to the cable network.

3.21 system and service information: Information about the video service, for example channel maps that map the programs within an MPEG transport stream, electronic programming guide data, and conditional access information.

4 Abbreviations, acronyms and conventions

4.1 Abbreviations and acronyms

This Recommendation uses the following abbreviations:

HFC	Hybrid-Fibre/Coax
HN	Home Network
HT	Home Terminal
IEEE	Institute of Electrical and Electronics Engineers
IETF	Internet Engineering Task Force
IP	Internet Protocol
MPEG	Moving Picture Experts Group
OSS	Operations Support System
PVR	Personal Video Recording
QoS	Quality of Service
RFC	Request For Comments
RG	Residential Gateway
RTP	Real-time Transport Protocol
STB	Set-Top-Box
TS	Transport Stream
VoD	Video-on-Demand
VoIP	Voice over IP

4.2 Conventions

If this Recommendation is implemented, the key words "MUST" and "SHOULD" as well as "REQUIRED" are to be interpreted as indicating a mandatory aspect of this Recommendation.

The key words indicating a certain level of significance of particular requirements that are used throughout this Recommendation are summarized below.

MUST: This word or the adjective "REQUIRED" means that the item is an absolute requirement of this Recommendation.

MUST NOT:	This phrase means that the item is an absolute prohibition of this Recommendation.
SHOULD:	This word or the adjective "RECOMMENDED" means that there MAY exist valid reasons in particular circumstances to ignore this item, but the full implications should be understood and the case carefully weighed before choosing a different course.
SHOULD NOT:	This phrase means that there MAY exist valid reasons in particular circumstances when the listed behaviour is acceptable or even useful, but the full implications should be understood and the case carefully weighed before implementing any behaviour described with this label.
MAY:	This word or the adjective "OPTIONAL" means that this item is truly optional. One vendor MAY choose to include the item because a particular marketplace requires it or because it enhances the product, for example, another vendor MAY omit the same item.

5 Introduction

5.1 General

Formerly the conventional Home Terminal (HT) was dedicated primarily to the reception of analog broadcasting services on the CATV network. This HT has evolved into a digital-type STB that handles the present MPEG-2 video and audio. This STB is a terminal unit including a tuner, demodulator, video decoding function, and conditional-access function, and is a quality-assurance-type STB. The market has also seen the emergence of a both-way-type STB with an upstream channel to transmit demand information and interactive signals.

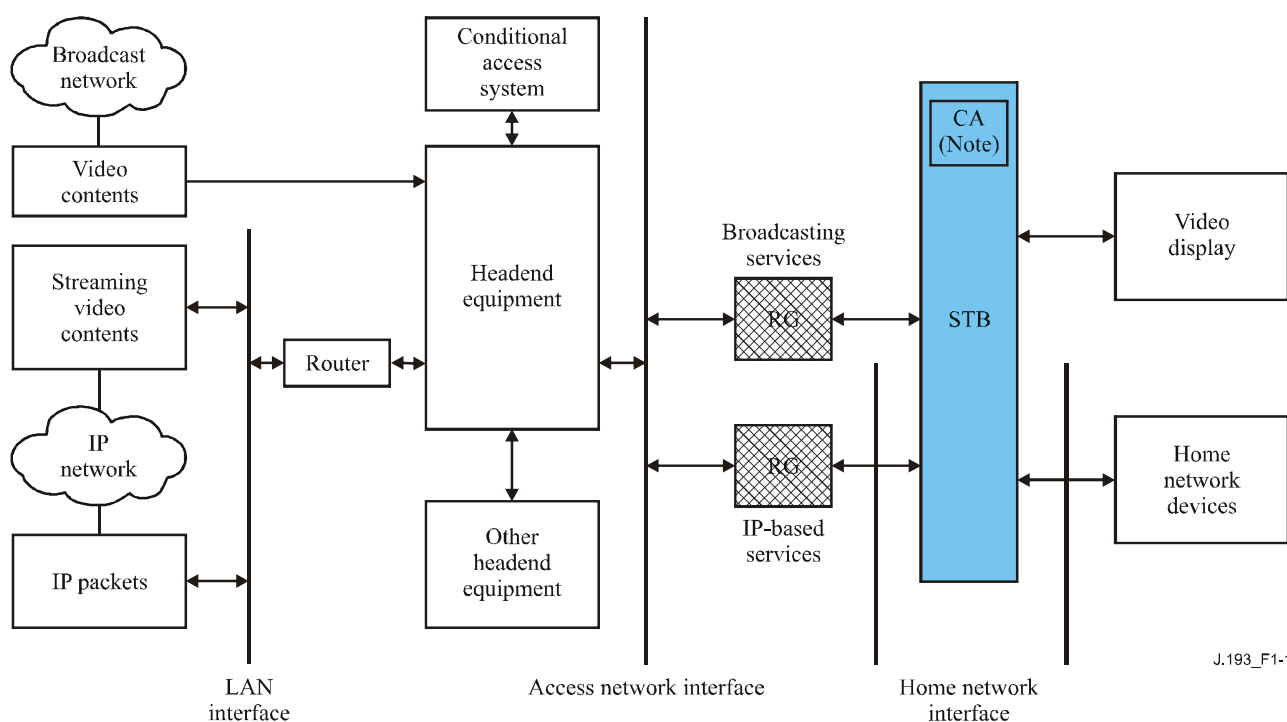
On the other hand, the rapid development of IP technologies enables the STB, with an integrated DOCSIS cable modem, to provide functions for IP-based services, provide connectivity with the Internet, diverse VoIP, real-time services for competitive games, and the like.

ITU-T Rec. J.191 specifies the management of portal function, address portal function, and DHCP portal function, among others. When these portal functions are incorporated into the upper layer of the cable modem, the cable modem will be able to be connected to or integrated into the next-generation STB as a Gateway. In addition, it will be possible to connect, through said portal functions, the STB to the Home Network (referred to as "MediaHomeNet" in ITU-T Rec. J.190), which is specified in ITU-T Rec. J.190.

With regard to the transportation of TS over IP Networks as a kind of IP-based services, RFC 2250 describes IP encapsulation of MPEG Transport Streams for transport of video and audio streams using the Real-time Transport Protocol (RTP). The Specification recommends that consideration be given for encapsulations of the MPEG TS and Programme Stream (PS) with RTP supporting full semantics of an MPEG system.

Furthermore, the next-generation STB needs to provide the function of transferring/processing or modification of content through the use of APIs. ITU-T Rec. J.200 is available as a baseline API document for the next-generation STB.

The focus of this Recommendation is a NG-STB that is attached to a CATV network. The cable access network is expected to deliver broadcasting services and IP-based services with appropriate quality and permissible latency. The NG-STB MAY also be connected with the access network via the RG, as well as to the HN which is an internal network for the home. Moreover, the NG-STB MUST provide access control function and an interface for a video display that is not engaged in HN. Figure 1-1 shows the overall CATV network configuration to be connected with the NG-STB.



NOTE – Removal or embedded.

Figure 1-1/J.193 – CATV network configuration with NG-STB

Note that incorporation of RG functions to the STB is a matter of implementation and left to vendor's choice. ITU-T Rec. J.126 provides direction on how to integrate items with DOCSIS Cable Modem.

The following clauses describe the requirements for the networks (broadband access networks and home networks) to be connected with the STB, and the functional requirements of the STB itself.

This Recommendation outlines the requirements for an NG-STB that receives broadcast cable services and provides a 2-way communication channel with the cable network for service management. In addition, a vendor MAY choose to incorporate a broadband cable modem into the NG-STB, and the requirements for this configuration are covered in this Recommendation. Finally, a vendor MAY choose to incorporate a Residential Gateway into the NG-STB, and the requirements for this configuration are covered in this Recommendation as well. Refer to the scenarios described in clause 8 for further details.

This Recommendation identifies the requirements for the NG-STB. It is anticipated that one or more detailed Recommendations that fully specify the NG-STB will follow.

5.2 Design Objectives

5.2.1 Design objectives for required functionality

The following are the design goals and objectives for NG-STB that supports broadcast video and a 2-way communications channel:

- Provide a network architecture that is scalable and capable of supporting various devices to be connected with STB.
- Support Broadcasting and high quality video next generation capabilities.
- Leverage existing standards. Next generation STB strives to specify open, approved industry standards that have been widely adopted in commercial broadcast and

communication networks. This includes standards approved by the ITU, IETF, IEEE, and other regional broadcasting and communications standards organizations.

- Define an architecture that allows multiple vendors to rapidly develop low-cost interoperable solutions to meet time-to-market requirements.
- Ensure that IP packets and MPEG Transport Stream (TS) can be transported and processed adequately.
- Provide a Conditional Access System that limits illegal access to STB. Also provide a content protection and copy management system that prevents the content from unauthorized copying and unauthorized redistribution.
- Provide Operations Support System (OSS) that enables cable operators to control and manage the STB system and other devices connected.
- Provide for consumer protection inclusive of interests for disabled persons.

5.2.2 Design objectives for optional advanced features

Following are the design goals and objectives for an NG-STB that supports the optional enhanced features, including a broadband cable modem and a residential gateway.

- Ensure the packet loss rate, jitter, and latency (delay) for the Managed IP Network can meet the requirements for STB real-time services, including voice.
- Provide a seamless connection means to Cable2Home Network defined by ITU-T Rec. J.190.
- Support Quality of Service (QoS) architecture that is scalable and capable of supporting IP-based services.

5.3 Services

This clause describes both the core services as well as the optional services to be supported by the NG-STB. The core services encompass conventional broadcasting video service with a 2-way IP-based communication channel to the cable network. The optional services encompass more advanced offerings such as personal video recording, IP-based services, and interactive applications.

5.3.1 Core services

The following services are to be provided by the STB:

Number	Service description
Core Svc 1	Analog broadcast video (clear or unscrambled)
Core Svc 2	Support of Digital Standard Definition video, both broadcast (clear), and subscription-based (scrambled)
Core Svc 3	Support of digital High Definition video by pass through and full decoding. Pass-through decoding involves descrambling the signal and passing the digital signal to a digital device. Full decoding involves both descrambling and decoding of the digital signal to analog format, and passing it to an analog device.
Core Svc 4	Call-ahead and impulse Pay-Per-View (PPV) (scrambled)
Core Svc 5	Electronic Program Guide (EPG)

Number	Service description
Core Svc 6	Program-Specific Information (PSI) and Service Information (SI)
Core Svc 7	2-way IP-based management and application signalling
Core Svc 8	Video-on-Demand and other Interactive Television Services (based on ITU-T Rec. J.200)
Core Svc 9	Music channels

5.3.2 Optional services

The following services are some examples of additional services that MAY be provided:

Number	Service description
Optional Svc 1	Data services: These services include text broadcasting or downloadable applications such as a video/audio interlocked-type service, weather forecasts, traffic information, and game distribution as independent services, and questionnaires, quizzes, and the like as bidirectional-type services
Optional Svc 2	QoS-controllable both-way and one-way IP-type services rendered over a CATV network on which a high-speed packet-based IP communication system is available. These services include IPCablecom, videoconferencing, streaming video feeds, competitive games, and other similar services. Moreover, the IP-based services also include services that provide entertainment and information for the customers independently of the broadcasting services
Optional Svc 3	Full broadband cable modem capability per ITU-T Recs J.112/J.122.
Optional Svc 4	Home networking. The STB MAY be connected to the home network, and in addition could serve as the residential gateway for this home network (per ITU-T Rec. J.191 or J.192)
Optional Svc 5	Storage-type services such as Personal Video Recording (PVR). It is preferable that the STB support storage-type services on its own or by the use of peripheral devices connected to the HN

5.4 Key features

The features and functions of the STB to support core services include the following:

Number	Feature description
Key Feature 1	Analog and digital tuning and demodulation
Key Feature 2	Closed Caption pass-through for analog video output when input is analog video
Key Feature 3	Closed Caption insertion into the analog video output when the input is digital video
Key Feature 4	Copy protection and redistribution control on analog and digital outputs
Key Feature 5	Standard I/Os: Analog output: video and audio Digital output: video and audio, compressed and uncompressed
Key Feature 6	Processing of interactive television services
Key Feature 7	An embedded DOCSIS-compatible cable modem compliant with ITU-T Recs J.112/J.122 for 2-way communications with the cable network
Key Feature 8	An Application Platform Middleware based on ITU-T Rec. J.200

Number	Feature description
Key Feature 9	Descrambling
Key Feature 10	Conditional Access
Key Feature 11	Authentication of the NG-STB
Key Feature 12	Device Provisioning. Provide configuration of functional parameters which are specific to the task of delivering the requested services
Key Feature 13	Device Management Provide management of functional parameters that are specific to the task of delivering the requested services Provide event reporting

The features and functions of the STB to support optional services include the following:

Number	Feature description
Opt Feature 1	Broadband cable modem
Opt Feature 2	Residential gateway, with connectivity to the home network
Opt Feature 3	Support for QoS on the home network
Opt Feature 4	Support for Digital Rights Management, copy protection and redistribution control on the home network
Opt Feature 5	Support for announcing and discovering content on the home network
Opt Feature 6	Rendering of content streams being received on the home networking interface, and sending content streams out home networking interface
Opt Feature 7	Adjusting output video format based on specific knowledge of the receiving device
Opt Feature 8	Digital program insertion (per ITU-T Rec. J.181)
Opt Feature 9	Provide for IP addressing and configuration for data services
Opt Feature 10	Provide command and control messaging for devices connected to the home network
Opt Feature 11	Provide for management of functions and event handling for data services
Opt Feature 12	Discovery of devices connected to the home networks that are capable of supplying and consuming video content
Opt Feature 13	Provide messaging that can communicate what storage units and associated capacity are available, to aid consumers in selecting devices for content storage
Opt Feature 14	Emergency Alert System

5.5 Localization

There are many differences in cable networks around the world. For example, some use PAL while others use NTSC. Some use 6 MHz channel bandwidth while others use 8 MHz. There are a variety of out-of-band two-way communication channels, with proprietary messaging in use (for example DAVIC, DOCSIS with DSG and other proprietary channels). Some other items that MUST be handled on a local basis include: Emergency Announcement Service (EAS), Form of removable security, specifics of the QAM modulation (J.83 Systems A, B and C), specifics of the localization enhancements to ITU-T Rec. J.200 and specifics of system and service information tables. The next generation STB will have to operate in this environment for many years after it is introduced. Thus, regional and national standards development organizations will have to provide additional material to accommodate the regulatory and legacy aspects specific to their particular environment.

6 Functional requirements

6.1 General requirements

Number	General system design requirement	Required/ Optional
General 1	The NG-STB MUST provide support for all of the core services listed in 5.3.1.	R
General 2	As the baseline starting point, the next generation STB MUST be able to receive and process video from HFC delivered MPEG based broadcast and unicast video sources.	R
General 3	The NG-STB MUST support an IP-based 2-way communication channel to the cable network for service management, and also MUST function in the absence of or interruption of the return channel.	R
General 4	The NG-STB MUST implement an API focused middleware, per ITU-T Rec. J.200.	R
General 5	The NG-STB MAY support an integrated broadband cable modem for receiving IP-based video services, other services, and for general use by the customer.	O
General 6	The NG-STB MAY support a Residential Gateway, and the receiving and distribution of video and other services over the home network connected to this RG.	O
General 7	The NG-STB MAY support embedded and/or distributed Personal Video Recording functionality (PVR).	O

6.2 Security requirements

The following table outlines the general security requirements for the NG-STB. Further security requirements MAY be found in the specific functional areas covered later in this Recommendation.

Number	General system design requirement	Required/ Optional
Sec 1	The NG-STB MUST have a renewable security system to perform the functions of Conditional Access, including decryption, authorization, entitlement, and key generation.	R
Sec 2	The NG-STB MUST include copy protection and redistribution control for programming received in analog format, and this MUST be controllable on a per-program basis.	R
Sec 3	The NG-STB MUST include copy protection and redistribution control for programming received in digital format, and this MUST be controllable on a per-program basis.	R
Sec 4	The NG-STB MUST include copy protection and redistribution control for programming being transmitted out analog outputs, for both analog and digital programming received.	R
Sec 5	The NG-STB MUST include copy protection and redistribution control for programming being transmitted out digital outputs, for both analog and digital programming received.	R

Number	General system design requirement	Required/ Optional
Sec 6	Copy protection and redistribution control of digital content MUST include encryption.	R
Sec 7	The NG-STB MUST be authenticated to the network, and MUST be protected from being harmed by other unauthorized devices.	R
Sec 8	The NG-STB MUST implement a secure software download mechanism from the network.	R
Sec 9	The NG-STB MUST implement a minimum of physical security to provide tamper resistance.	R
Sec 10	The NG-STB MUST secure the communications used to support billing.	R
Sec 11	The NG-STB MUST protect the integrity of the A/V copy protection and redistribution control information and systems.	R
Sec 12	The NG-STB MUST prevent unauthorized redistribution of content beyond the local environment (e.g., a home or a car), and this MUST be controllable on a per-program basis.	R
Sec 13	The NG-STB MUST prevent unauthorized redistribution of content to devices other than those which are owned or leased by a single authorized subscriber, and this MUST be controllable on a per-program basis.	R

6.3 Video requirements

Number	General system design requirement	Required/ Optional
Video 1	The NG-STB MUST be able to receive analog services. Analog video and audio is expected to be in accordance with current cable-system practice and applicable rules.	R
Video 2	<p>The STB is required to handle all digital transport streams according to the following requirements:</p> <ul style="list-style-type: none"> – The STB SHALL be able to process MPEG-2 compliant Transport Streams – The STB SHALL support both standard definition and high definition decode – The STB SHALL support System Information (SI) tables – The STB SHALL process in-band System and Service Information – The STB SHALL process out-of-band System and Service Information – If the NG-STB includes a compressed digital interface, digital programs passed through it SHALL contain content advisory information, when present – The NG-STB MUST process emergency messages if they are available in the transmission infrastructure. 	R
Video 3	The NG-STB MUST support pass-through of compressed High Definition (HD) video content through a compressed digital interface to compatible Digital Devices.	R

6.4 Audio requirements

Number	General system design requirement	Required/ Optional
Audio 1	The NG-STB MUST support music channel services.	R
Audio 2	The NG-STB MUST support mono, stereo and multichannel decode.	R

6.5 Input interface requirements

Number	General system design requirement	Required/ Optional
In 1	The mechanical and electrical interface between the cable TV system and the STB SHALL conform to existing cable practice.	R
In 2	The NG-STB MUST support interface for Broadcast channel services.	R
In 3	The NG-STB MUST support interface for IP-based 2-way communication services.	R

6.6 Output interface requirements

Number	General system design requirement	Required/ Optional
Out 1	The NG-STB MUST support audio outputs: both analog and digital.	R
Out 2	The NG-STB MUST support video outputs: both analog and digital, compressed and uncompressed.	R

6.7 Requirements for other Interfaces

Number	General system design requirement	Required/ Optional
OI 1	The NG-STB MUST provide a human control interface (for example an infrared remote-control).	R
OI 2	The NG-STB MAY be controllable via external devices that are connected via a home network, such as PDAs, PCs, game machines, and IP phones.	O
OI 3	The NG-STB MAY be attached to a home network via appropriate home networking interfaces (10/100-base-T, 802.11 etc.).	O

6.8 Provisioning requirements

Number	Device provisioning system design requirement	Required/ Optional
Prov 1	The NG-STB MUST be easy to install and configure for operation.	R
Prov 2	The NG-STB MUST support self- and remote provisioning of services, including network configuration and device-specific service-enabling tasks.	R
Prov 3	The NG-STB MUST provide secure provisioning and configuration mechanisms.	R
Prov 4	The NG-STB MUST be protected from unauthorized configuration.	R
Prov 5	Functions that are specific to the delivery of video (for example CODEC parameters, buffer sizes, etc.) MUST be provisionable.	R

6.9 Management requirements

Number	Device management system design requirement	Required/ Optional
Mgmt 1	The NG-STB MUST support management of cable-based services, including video and other services.	R
Mgmt 2	The NG-STB MUST support local and remote diagnostics tools to assist the consumer and cable operator in troubleshooting problems.	R
Mgmt 3	Loss of connection to the service provider MUST not disable or degrade the operation of internal home video display and distribution functions.	R
Mgmt 4	The NG-STB MUST return to the operational state it was in prior to the outage.	R
Mgmt 5	A method MUST be provided that allows the cable network management system to gather identification information about the NG-STB.	R
Mgmt 6	A method MUST be provided that allows the cable network management system to detect whether the NG-STB is in an operable state.	R
Mgmt 7	The NG-STB MUST secure all management communications.	R

6.10 Content management requirements

Number	Content management design requirement	Required/ Optional
Content Mgmt 1	The NG-STB MUST honour digital rights associated with all content that it processes.	R
Content Mgmt 2	If the NG-STB incorporates an RG it MUST be able to participate in content discovery messaging both to communicate content available via the STB, and to discover content available via peripheral devices on the home network.	O
Content Mgmt 3	If the NG-STB implements PVR functionality, it MUST participate in messaging that identifies what peripheral storage units (and associated capacity) are available, to aid consumers in selecting devices for local video storage.	O

6.11 QoS requirements

Number	QoS design requirement	Required/ Optional
QoS 1	The NG-STB MUST support QoS for cable broadcast video services.	R
QoS 2	If the NG-STB implements a broadband cable modem, it MUST ensure that only authorized access to J.112/J.122 QoS is granted.	O
QoS 3	If the NG-STB implements a broadband cable modem, it MUST ensure that packet loss rate, jitter, and delay meet the requirements for time sensitive services, including voice.	O
QoS 4	If the NG-STB implements a broadband cable modem, and is supporting time-critical services such as voice, it MUST provide dynamic establishment of QoS.	O

6.12 PVR requirements

Number	PVR design requirement	Required/ Optional
PVR 1	The NG-STB MAY support both internal and/or external implementation of PVR functionality.	O
PVR 2	If the NG-STB implements PVR functionality, the NG-STB's middleware implementation MUST include PVR focused APIs.	O
PVR 3	If the NG-STB implements PVR functionality, it MUST provide copy protection and redistribution control for all stored content, MUST preserve the digital rights associated with the content, and MUST appropriately manage content usage in accordance with any digital rights associated with the content.	O

7 Requirements for optional standardized features

7.1 Requirements to incorporate a full DOCSIS cable modem into the STB

If an NG-STB implements a broadband cable modem, the following conditional requirements apply:

Number	Broadband cable modem design requirement	Required/ Optional
DOCS 1	The cable modem MUST be implemented per ITU-T Rec. J.112 or J.122	O
DOCS 2	The implementation MUST use ITU-T Rec. J.126 (eDOCSIS)	O
DOCS 3	The implementation MUST use ITU-T Rec. J.125 (BPI+)	O

7.2 Requirements to incorporate a residential gateway into the STB

If an NG-STB implements home networking interface, the following conditional requirements apply:

Number	Residential gateway design requirement	Required/ Optional
RGW 1	A DOCSIS broadband cable modem per 7.1, MUST be implemented	O
RGW 2	The residential gateway implementation MUST be per ITU-T Recs J.191/J.192	O
RGW 3	Robust content protection MUST be provided on all home networking interfaces out of the NG-STB	O
RGW 4	QoS MUST be provided for A/V sessions that are established on the home network.	O

8 Example architectures

This clause explores a number of possible NG-STB architectural configurations based on the requirements outlined above. Three sample architectures will be explored. The first is intended to accommodate the core services identified in 5.3.1. The two others will explore configurations that incorporate some of the advanced optional features to accommodate the services identified in 5.3.2.

It is envisioned that a more detailed architecture will be defined in the future.

8.1 NG-STB supporting broadcast video and a 2-way communication channel

Figure 8-1 shows the NG-STB supporting broadcast video and a 2-way communication channel. For the broadcasting services, the STB MUST be equipped with a TS decoder, CA module, a decoder set for video audio and data, video processor in the downstream direction, and MUST possess a function for converting broadcasting video signal to a traditional analogue television signal, e.g., NTSC or PAL.

The 2-way IP communication channel for service management is based on ITU-T Recs J.112/J.122.

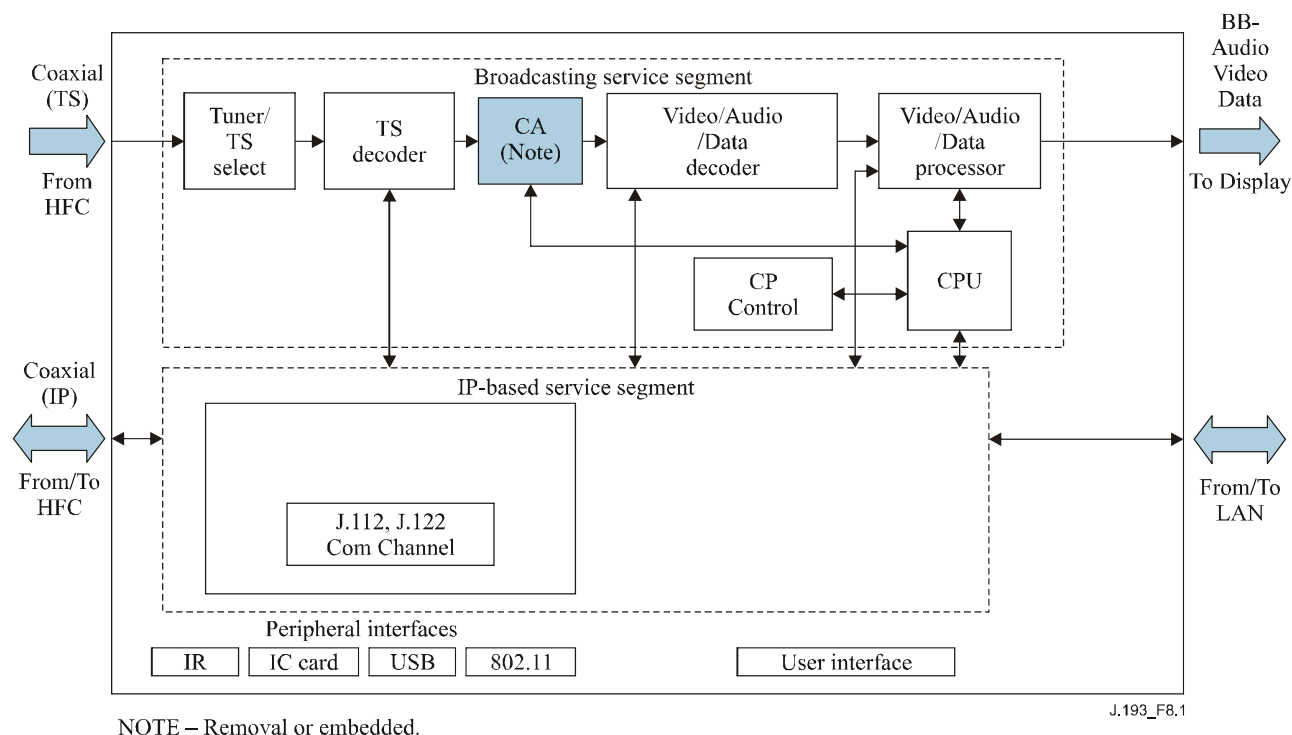


Figure 8-1/J.193 – Example Next-Generation STB with 2-way communication channel

8.2 NG-STB incorporating a broadband cable modem

In addition to the functions described in 8.1, this example includes a broadband cable modem intended for customer use and the possible delivery of IP-based services. This is shown in Figure 8-2.

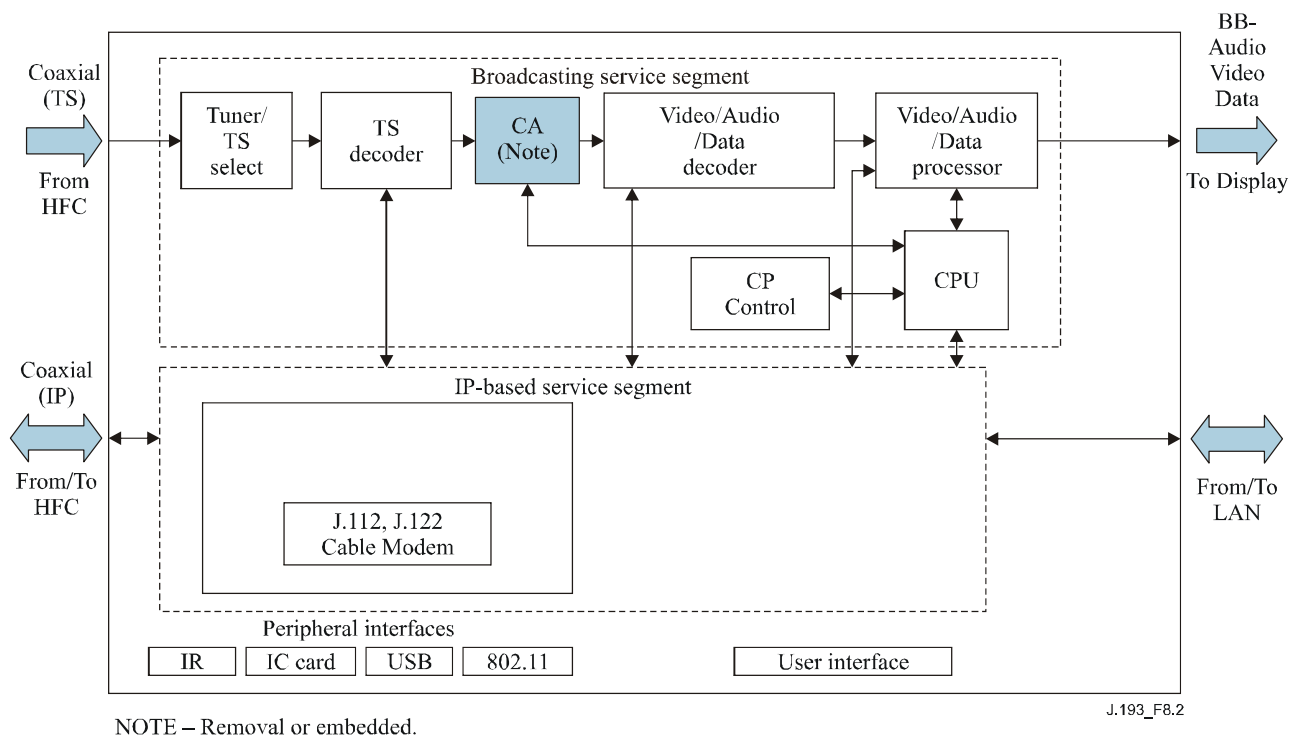


Figure 8-2/J.193 – Example Next-Generation STB with optional embedded cable modem

8.3 NG-STB incorporating a residential gateway

In addition to the functions described in 8.1 and 8.2, this example includes a residential gateway that can extend cable services to the home network. This is shown in Figure 8-3.

For the IP-based services going to the home network, IP packet identification and transfer processing will be required by the RG. The NG-STB MUST ensure QoS and security management incorporated in Portal Services (PS), transfer files using commands from the upper layer, and process applications. Layer-2 Converter (LC) and/or Boundary Point (BP) functions should be embedded in the NG-STB (per ITU-T Recs J.191/J.192). The NG-STB should be connected to the HN with the support of these functions.

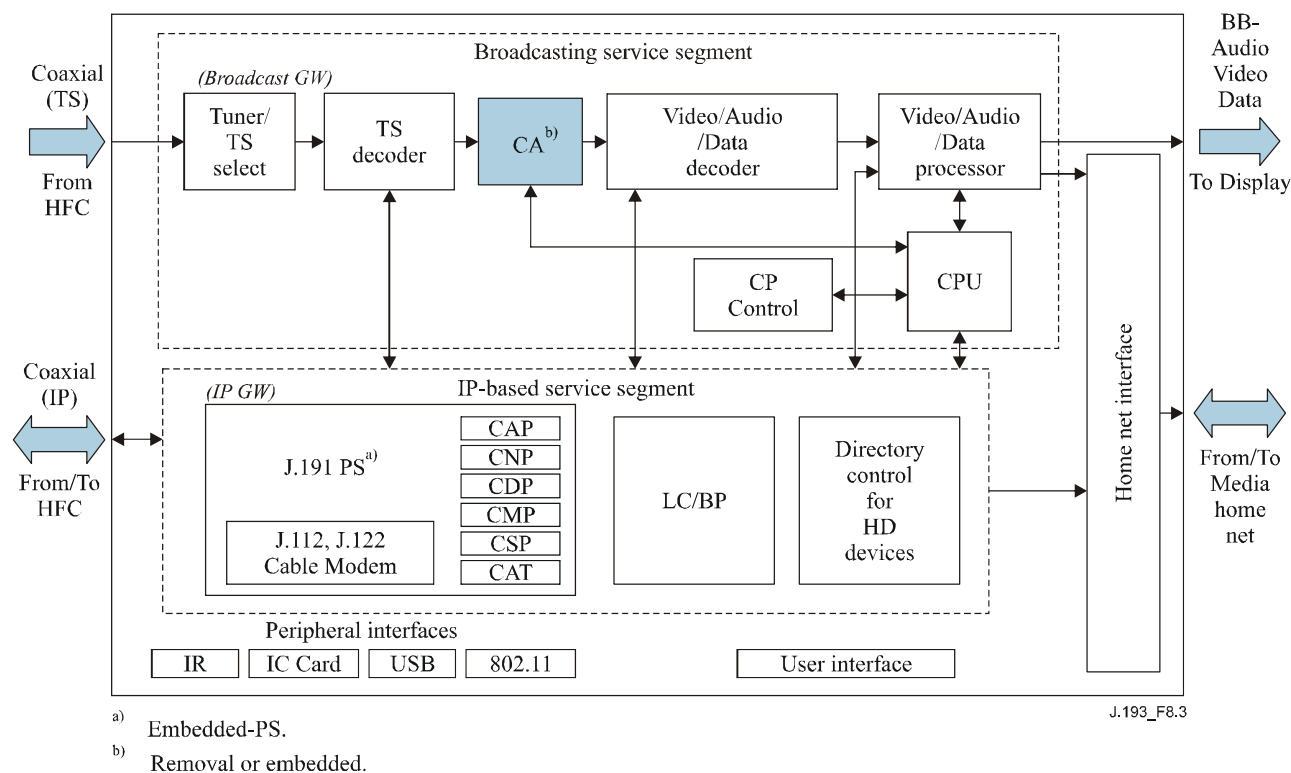


Figure 8-3/J.193 – Example Next-Generation STB with optional embedded residential gateway

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