OpenCable™ Specifications
Host Extensions

OpenCable Host Home Networking Extension 2.0

OC-SP-HOST-HN2.0-I04-100507

ISSUED

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Key to Document Status Codes:

Work in Progress	An incomplete document, designed to guide discussion and generate feedback, that may include several alternative requirements for consideration.
Draft	A document in specification format considered largely complete, but lacking review by Members and vendors. Drafts are susceptible to substantial change during the review process.
Issued	A stable document, which has undergone rigorous member and vendor review and is suitable for product design and development, cross-vendor interoperability, and for certification testing.
Closed	A static document, reviewed, tested, validated, and closed to further engineering change requests to the specification through CableLabs.

Trademarks

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Tables

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1 SCOPE

1.1 Introduction and Overview

The OpenCable Host specification [HOST2.1] defines bidirectional digital set-top boxes (OCS2) and bidirectional integrated terminal devices (OCT2). This specification defines the requirements for either OCS2 or OCT2 devices to be extended to include IP-based Phase 2 home networking support and enable home networking features to be implemented using the OCAP Home Networking Extension specification [OCAP HN]. Phase 2 home networking includes support for new physical networks, QoS, and secure transmission of MSO premium content.

Three primary use cases are specifically supported to enable multi-room DVR functionality. The three use cases are:

- Playback of DVR-recorded content from a non-DVR device,
- Scheduling DVR recording from a non-DVR device,
- Trick Modes (Pause/rewind/fwd) from a non-DVR box.

1.2 Purpose of Document

This specification defines minimum technical requirements that must be added to an OpenCable Host device to support OCAP Phase 2 Home Networking Extensions.

1.3 Requirements

Throughout this document, the words that are used to define the significance of particular requirements are capitalized. These words are:

"SHALL"	This word means that the item is an absolute requirement of this specification.
"SHALL NOT"	This phrase means that the item is an absolute prohibition of this specification.
"SHOULD"	This word 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 behavior is acceptable or even useful, but the full implications should be understood and the case carefully weighed before implementing any behavior described with this label.
"MAY"	This word 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.

2 REFERENCES

2.1 Normative References

In order to claim compliance with this specification, it is necessary to conform to the following standards and other works as indicated, in addition to the other requirements of this specification. Notwithstanding, intellectual property rights may be required to use or implement such normative references.

[47CFR76] Code of Federal Regulations, Part 76, Subpart W - Encoding rules, §76.1908.

[HN-MIB] OpenCable Home Networking MIB Specification, OC-SP-MIB-HN-I02-100507, May 7, 2010, Cable Television Laboratories, Inc.

[HNP2] OpenCable Home Networking Protocol 2.0, OC-SP-HNP2.0-I02-091217, December 17, 2009, Cable Television Laboratories, Inc.

[HOST DVR] Host DVR Extension, OC-SP-HOST2-DVREXT-I01-050502, May 2, 2005, Cable Television Laboratories, Inc.

[HOST2.1] OpenCable Host Device 2.1 Core Functional Requirements Specification, OC-SP-HOST2.1-CFR-I11-100507, May 7, 2010, Cable Television Laboratories, Inc.

[IEEE 802.1D] IEEE 802.1D-2004 IEEE standard for local and metropolitan area networks--Media access control (MAC) Bridges (Incorporates IEEE 802.1t-2001 and IEEE 802.1w)

[IEEE 802.3] IEEE 802.3-2002: IEEE Standard for information technology – Telecommunications and information exchange between systems – Local and metropolitan area networks – Specific requirements – Part 3: Carrier sense multiple access with collision detection (CSMA/CD) access method and physical layer specification, March 8, 2002.

[MoCA Ext] MoCA MAC/PHY v1.1 extension spec; MoCA-M/P-SPEC-V1.1-09032008.

[MoCA SMI] MoCA Enterprise Structure of Management Information, document MOCA-SMI-V1.0-09222008.

[MoCA] MoCA MAC/PHY v1.0 spec; MoCA-M/P-SPEC-V1.0-08292008.

[OCAP DVR] OCAP Digital Video Recorder (DVR), OC-SP-OCAP-DVR-I05-090612, June 12, 2009, Cable Television Laboratories, Inc.

[OCAP HN] OCAP Home Networking Extension, OC-SP-OCAP-HNEXT-I04-091217, December 17, 2009, Cable Television Laboratories, Inc.

[OCAP] OpenCable Application Platform Specification (OCAP), OC-SP-OCAP1.1.2-090930, September 30, Cable Television Laboratories, Inc.

[RFC 2863] IETF RFC 2863, K. McCloghrie and F. Kastenholz, The Interfaces Group MIB, June 2000.

[RSD PROT] Reserved Services Domain Protocols 1.0 Specification, OC-SP-RSD-PROT-I01-080828, August 28, 2008, Cable Television Laboratories, Inc.

[RSD TECH] Reserved Services Domain Technology 1.0 Specification, OC-SP-RSD-TECH-I01-080630, June 30, 2008, Cable Television Laboratories, Inc.

2.2 Informative References

This following documents are informative references.

[OCHN ARCH] OpenCable Home Networking Architecture 2.0 Technical Report, OC-TR-HN-ARCH2.0-D01-080418, April 18, 2008, Cable Television Laboratories, Inc.

2.3 Reference Acquisition

- Cable Television Laboratories, Inc., 858 Coal Creek Circle, Louisville, CO 80027; Phone 303-661-9100; Fax 303-661-9199; Internet: http://www.cablelabs.com /
- IEEE, www.ieee.org
- Code of Federal Regulations, National Archives and Records Administration, www.gpoaccess.gov/cfr/index.html

3 TERMS AND DEFINITIONS

This specification contains the following terms and definitions.

OpenCable Digital Media Player	An OpenCable Home Networking device capable of playing digital media across an IP-based network. It is a UPnP-compliant Digital Media Player with additional requirements imposed by OpenCable.
OpenCable Digital Media Server	An OpenCable Home Networking device capable of serving digital media across an IP-based network. It is a UPnP-compliant Digital Media Server with additional requirements imposed by OpenCable.

4 ABBREVIATIONS AND ACRONYMS

This specification uses the following abbreviations:

AV	Audio/Video
HNHost	Home Networking Host
LAN	Local Area Network
MAC	Media Access Control
OC-DMP	OpenCable Digital Media Player
OC-DMS	OpenCable Digital Media Server
OCAP	OpenCable Application Platform Specification
OCAPHN	OCAP Home Networking Extension

5 TECHNICAL REQUIREMENTS

This section contains the technical requirements for this specification.

5.1 General Requirements

5.1.1 OpenCable HOST 2.1 Compliance

The HNHost SHALL comply with all normative requirements in [HOST2.1].

If the HNHost implements Digital Video Recorder (DVR) functionality, the device SHALL comply with all normative requirements in [HOST DVR].

5.1.2 Middleware

The HNHost SHALL comply with all normative requirements of [OCAP HN].

The HNHost SHALL support the mapping between the OCAP Home Networking Extension API [OCAP HN] and LAN protocol messaging as defined in [HNP2].

5.2 Network Interface

5.2.1 Physical and MAC Layers

The HNHost MAY implement one or more physical network interfaces that meet the requirements as specified in [RSD TECH]. Such network interfaces are termed the RSD Technology interface.

If an HNHost includes a MoCA interface, it SHALL do so as per the [MoCA] and [MoCA Ext] specifications.

The HNHost SHALL provide a 10BASE-T / 100BASE-TX Ethernet physical interface and MAC layer for the LAN interface as specified in IEEE 802.3i and IEEE 802.3u [IEEE 802.3].

The HNHost MAY implement bridging between multiple physical network interfaces as defined in [IEEE 802.1D].

5.2.2 Network Layer

The HNHost SHALL provide a network and transport layer for the LAN interface as specified in [HNP2].

5.3 Media Types

The HNHost SHALL support rendering of AV media types and formats as specified in [HOST2.1], [OCAP], and [HNP2]. This includes both broadcast streaming and monomedia-based content formats.

The HNHost SHALL support serving of AV media types and formats as specified in [HOST2.1], [OCAP], and [HNP2] if the device implements [HOST DVR]. This includes both broadcast streaming and monomedia-based content formats.

5.4 Quality of Service (QoS)

The HNHost MAY implement RSD Manager and RSD Controller functionality as defined in [RSD PROT].

If the HNHost consists of only one RSD Technology interface or multiple non-bridged RSD Technology interfaces, then the HNHost SHALL implement RSD Host functionality as defined in [RSD PROT].

If the HNHost implements multiple bridged RSD Technology interfaces, then the HNHOST SHALL comply with the RSD Bridge functionality as defined in RSD-PROT Specifications [RSD PROT].

If the HNHost implements Ethernet interface that is bridged to the RSD Technology interface, then the HNHost SHALL comply with the PSD Bridge functionality as defined in the [RSD PROT] specifications.

5.5 Content Security

The HNHost SHALL follow encoding and distribution rules for distribution of protected cable-delivered content as specified by [47CFR76].

5.6 Device Interoperability

The HNHost SHALL comply with the requirements specified in [HNP2].

5.7 SNMP Requirements

5.7.1 OpenCable Home Networking Extension 2.x SNMP management requirements.

The HNHost SHALL implement the MIB objects of OC-HOME-NETWORK-MIB as described in Annex A of [HN-MIB].

The HNHost SHALL utilize the same SNMP Access Control method(s) as the OCHD2.1.

The HNHost SHALL NOT allow SNMP access through the Home Network interface(s).

The HNHost SHALL implement the eSTB IF-MIB [RFC 2863]as defined in Table 2 in accordance with the following requirements:

The HNHost SHALL implement the ifAdminStatus object to provide administrative control over the MAC interfaces. This object may be used to reset the interface remotely.

The HNHost SHALL assign ifIndex integer values 3 and above to the HN interface(s).

Note: The OCHD2.1 uses the ifIndex values of "1" and "2" for the eSTB(1) and the Card(2) respectively.

The HNHost SHALL report the interface technology manufacturer, current hardware/software interface version, and the highest hardware/software interface version supported in the ifDescr object described in Table 1.

The HNHost SHALL report each type-value pair in Table 1 separated with a colon and blank space. Each pair is separated by a ";" followed by a blank space. For instance, an ifDescr of an RSD technology from vendor X, current version 1.3.a, highest supported version 1.4 will be as follows:

any text<<MFG: X; CURR_VER: 1.3.A; HIGHEST_VER: 1.4 >>any text

Table 1 - [RFC 2863] ifDescr Format

To report	Format of each field
Technology Mfg Name	MFG: <Manufacturer name>
Current interface version	CURR_VER: <current version of i/f>
Highest interface version	HIGHEST_VER: <highest version of i/f>

The HNHost SHALL report the IANA technology type of the RSD technology implemented by the interface in the ifType object.

Table 2 - [RFC 2863] ifTable, MIB-Object Details for Home Network Interfaces

MIB Object	eSTB (see [HOST2.1])	Card (see [HOST2.1])	RSD Technology
ifIndex:			≥ 3
ifDescr			See requirement above
ifType			IANA assignment
ifMtu			(n)
ifSpeed			(n)
ifPhysAddress			I/F MAC Address
ifAdminStatus			up(1), down(2) *
ifOperStatus			up(1), down(2)
ifLastChange			[RFC 2863]
ifInOctets			(n)
ifInUcastPkts			(n)
ifInDiscards			(n)
ifInErrors			(n)
ifInUnknownProtos			(n)
ifOutOctets			(n)
ifOutUcastPkts			(n)
ifOutDiscards			(n)
ifOutErrors			(n)
ifXTable			
ifName			[RFC 2863]
ifInMulticastPkts			(n)
ifInBroadcastPkts			(n)
ifOutMulticastPkts			(n)
ifOutBroadcastPkts			(n)

*All interfaces start with ifAdminStatus in the up(1) state. Changing the ifAdminStatus to down forces a reset of the interface but does not bring the interface to "up" status. This must be done by an SNMP Set command. This allows the operator to control when the interface is enabled.

5.7.2 MoCA SNMP MIBs

When an HNHost supports a MoCA network interface, it SHALL make the MoCA SNMP MIBs available to applications from the MIBManager API at the OIDs defined by the [MoCA SMI] specification. See the [MoCA] specification for the MoCA MIB definition.

The [OCAP] specification defines how applications are granted read and write access to Host device MIBs.

5.8 Jitter

The HNHost performs the de-jitter operation. The MPEG standard allows only about 4-ms of jitter. Network jitter often may exceed this threshold. The HNHost provides a de-jitter buffer.

When operating as an OC-DMP, the HNHost SHALL support a de-jitter operation and provide a de-jitter buffer of at least 200 ms.

When operating as an OC-DMS, the HNHost SHALL maintain an index file based on PCR chunks and provide a de-jitter buffer of at least 200 ms.

Appendix I Revision History

The following ECN was incorporated into OC-SP-HOST-HN2.0-I02-090508:

ECN	Accepted Date	Title
HOST-HN2.0-N-09.1383-1	4/17/09	Inclusion of MoCA, MoCA MIBs, and mandatory RSD support

The following ECN was incorporated into OC-SP-HOST-HN2.0-I03-091211:

ECN	Accepted Date	Title
HOST-HN2.0-N-09.1430-3	11/6/09	SNMP requirements update

The following ECN was incorporated into OC-SP-HOST-HN2.0-I04-100507:

ECN	Accepted Date	Title
HOST-HN2.0-N-10.1541-1	4/30/10	Network Interface requirement updates