# CT'S DIGITAL HOME VIDEO TECH GUIDE

**March 2009**

# New Era in Digital Video Dawns

*By Jonathan Tombes*

It's been more than a dozen years since cable operators, following in the wake of their direct broadband satellite (DBS) competitors, first trialed digital video.

Looked at long term, digital video looks like a nearly irresistible force. While DBS hit the all-digital standard at once, in the U.S. cable industry digital penetration is now at 62 percent, according to the NCTA. Comcast is at 70 percent.

Individual cable systems at large and small operators have flipped the all-digital switch.

Even the long-awaited transition to digital over-the-air broadcast—rescheduled from February to June—appears to be at hand.

## BIG CHALLENGES

As the all-digital day dawns, however, not all is sweetness and light. Cable operators face substantial promise but hard work as well.

While the 62 percent nationwide figure is strong, as Linda Hardesty notes in this month's cover story, "the remaining 38 percent is a tough nut to crack."

"(The last decade) was the decade of the Internet and phone ... where the next five years are the era of video again," said Rogers Cable Communications SVP Engineering and Network Operations Dermot O'Carroll at the SCTE Summit in February.

Digital video has a way of creating victims—or at least challenges—from its own success.

First, digital compression by definition increases the number of video streams. That's good, but what cable ops are still working out is how to optimize (A) consumer interaction with those choices and (B) network management and capacity for that increased volume of channels and choices.

Second, the ease with which digital video can be produced, stored and transmitted has ramped up the number of ways that consumers can receive content. There's satellite, cable and broadcast. But increasingly, video is arriving at the home via high-speed data connections, even displacing the DVDs consumers once purchased or rented. (See Netflix.)

That means that the set-top box, or even the TV set, is no longer the only focus of digital video and that the competitive stakes have risen.

## USER INTERFACE

Given the "archaic" (O'Carroll's word) user interface that prevails today, getting that navigation tool right is an urgent task.

"We are at a huge risk of being the incumbent in technology," said O'Carroll.

## REPORT: HDMI ON THE MOVE

As adoption of HDMI ports approaches 100 percent in digital TV sets, the interface is now moving into set-top boxes, DVD equipment and mobile PCs, according to In-Stat report "DVI and HDMI 2008: A Time of Transition." The research firm expects HDMI-enabled product shipments to increase at an annual rate of 23 percent between 2007 and 2012.

A range of device segments spanning consumer electronics (CE), computers and computer peripherals is seeing increased adoption of HDMI as well. In the near future, portable electronic devices, such as camcorders, digital still cameras, and portable media players (PMPs) will be among the emerging categories to watch.

The report further indicates the following:

➜ HDMI adoption in mobile computers is estimated at nearly a quarter of all machines shipped in 2008.

➜ IPTV set-top boxes will see the highest adoption among pay TV set-tops, growing to 85 percent penetration and 17.6 million boxes by 2012.

➜ HDMI penetration in portable media players will approach 10 percent by 2012.

➜ Rising adoption of HDMI and DisplayPort interfaces will negatively impact DVI adoption. DVI-enabled product shipments will decline at an annual rate of 30 percent through 2012.

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## RF REMOTES RISING

ABI Research forecasts a 55 percent compound annual growth rate through 2014 for radio frequency (RF) remote controls to command consumer electronics equipment. The move toward RF is expected to displace the traditional infrared (IR) technology for remotes.

IR one-way line-of-sight remote controls have traditionally been used to command TV sets and set-top boxes, said ABI Senior Analyst Jason Blackwell. RF enables two-way communication between the remote and the device.

"That opens up a whole new world of options for the service providers and consumer electronics (CE) manufacturers," said Blackwell, who cited possibilities such as delivering content to a small screen on the remote control or allowing programming of the digital video recorder (DVR) without interrupting programming on the TV set.

The ABI research found that the move to RF remotes is being driven by original equipment manufacturers (OEMs), not by consumer demand.

"RF in the past has been developed by the tech guys and kind of pushed on the CE guys," Blackwell said. "Finally, the CE manufacturers are developing a standard they are comfortable with and then pushing that down."

Four of the major CE manufacturers—Panasonic, Philips, Samsung Electronics and Sony—have founded the Radio Frequency for Consumer Electronics (RF4CE) industry consortium. The RF4CE Web site states that the purpose of the consortium is to develop a new protocol that will further the adoption of RF remote controls for audio/visual devices.

The consortium founding members will work together with Freescale Semiconductors, OKI and Texas Instruments to create a standardized specification for RF-based remote controls that deliver richer communication, increased reliability and more flexible use, states the site.

*continued from page 1*

Moving into a leading edge position is no trivial task. The design of the navigation tool for Verizon's cable-like FiOS video service involved thousands of coders,

said one engineer close to the project. The impressive display for AT&T's U-Verse product suggests heavy investment.

The industry's largest MSOs have not stood idle.

Time Warner's Mystro Digital Navigator (MDN), deployed widely in support of last year's transition to the tru2way (OCAP) platform, took years to devise.

Also going back several years is TVWorks, the joint venture between Comcast and Cox Communications that took control the assets of interactive TV pioneers and once dot.com darlings Liberate Technologies and MetaTV in 2005.

Are these investments panning out? The initial MDN rollout left some unimpressed. An Oct. 14, 2008, post on engadgetHD had one Bright House Networks subscriber pining for the "antiquated but perfectly usable Passport application," with most of the 12 comments agreeing. (Passport was the guide built by clever programmers at Aptiv, formerly Panasonic.)

The question is open on whether cable-specific solutions will prevail, with analyst Bruce Bahlmann voicing doubts in a December column in CT. He's not alone.

"OCAP may be where we end up," said Rogers SVP O'Carroll at the February event. Yet he confessed interest in hybrid boxes

being deployed in Europe, "where the guide is all done in IP." (See related sidebar, page 4, on ATIS metadata specs.)

Relative scale helps explain

> " **(The last decade) was the decade of the Internet and phone ... where the next five years are the era of video again.** "
>
> — Dermot O'Carroll

O'Carroll's interest. "There are many developers in the IP world," he said. "There's not a lot of OCAP TVs."

The promise of OCAP/tru2way is its potential for nurturing the community of developers who are eager to build to that relatively open platform. There remain additional questions, such as how much effort it takes to certify that an operator's digital video infrastructure is OCAP-compliant.

In any case, a closed platform is not an especially attractive alternative. At the Canada Summit, Shaw Cablesytems VP Engineering Dennis Steiger described the implementation of a proprietary UI as "brutally painful."

## TWO NETWORKS

How to transport increased volumes of digital content across the variously configured and sized cable networks is a question that has preoccupied a large contingent of industry engineers

for several years.

Suffice it to say that digital penetration is one factor. O'Carroll said he likes analog reclamation, but wanted to see higher penetration rates first.

Like Time Warner Cable, Rogers instead bet early and heavy on switched digital video (SDV). Benefits to date have been an accelerated deployment of HD programming, with an upcoming advantage being the ability of the set-top client to inform the network of the box's ability to decode MPEG-4 video.

In other words, SDV will enable the introduction of MPEG-4 efficiency within cable's overwhelmingly MPEG-2 installed base.

For its part, Comcast is moving more quickly toward reclaiming analog and deploying large quantities of digital terminal adapters (DTAs) to handle the subscribers' secondary TV sets.

These network infrastructure trends are reflected in the various products featured in this guide. Other features reflect the rise of another sophisticated digital video network, that within the subscriber's home.

At the Canadian Summit, moderator Leslie Ellis asked the opening session's panelists about their heaviest high-speed data users. (Whether these were their best or worst subscribers depended upon one's perspective, she gamely noted.)

"Two terabytes," said EastLink Director of Internet Engineering & Operations Steve Irvine. "Or 450 HD movies."

Shaw's Steiger raised the ante: "Eight terabytes," again translating into currency of HD.

What's going on here? "Building up libraries," said Irvine. Granted, those populating home servers to such an extent are outliers on the data usage scatter plot. O'Carroll put it this way: tThe heaviest user on Rogers' network equated to 320 customers.

But early adopters set trends, and turning a home into a digital video network of any scale requires two things: storage and internal transport.

As it happens, two of the leading features in home digital media equipment are digital video recording (DVR) capability and high-definition multimedia interface (HDMI) connectors and cables. A related peripheral question involves the humble remote control. (For more on HDMI and remotes, see sidebars, pages 1 and 3, respectively.)

The high-end videophile—the type who posts notes on engadgetHD—is a crucial constituent. But figuring out how to serve digital video to all market segments is what makes home digital video such a complicated equation.

| Advanced Digital Broadcast (www.adbglobal.com) | | |
|---|---|---|
| **Product** | **Application** | **Key Features** |
| **ADB-4820C** | tru2way set-top, Americas market | Features a high speed DOCSIS return channel to support high-bandwidth two-way communications for VOD and secure application download; leveraging HDMI-CEC's bidirectional communication capabilities common on most flat screen TV sets, the unit uses the TV set's own remote to control the hidden set top box. |
| **ADB-6880CDX** | tru2way DVR set-top, Americas market | Provides HD and SD support for MPEG-2 and MPEG-4; subscribers can watch one program and record up to three programs simultaneously plus picture-in-picture for viewing two simultaneous video sources; has a certified DLNA 1.5 stack and can behave as a home networking server or client over Ethernet and optional MoCA interfaces. |
| **ADB-6820CD** | Interactive tru2way set-top, Americas market | Includes a Multi-Stream CableCARD; is an interactive tru2way Host 2.0 Interface and has both HD and SD support for MPEG-2 and MPEG-4 (H.264); has a certified DLNA 1.5 stack and can behave as a home networking client over Ethernet and optional MoCA interfaces. |
| **ADB-7822C-DEV** | OCAP development set-top box kit, Americas market | Supports SD and HD for MPEG-2 and MPEG-4; can be used both for application software testing and for end-to-end OCAP software lab testing; includes a high-speed DOCSIS return channel and conditional access via a Multi-Stream CableCard Host 2.0 interface; PC software tools include Application Upload, Application Debugging and Set-top box Firmware Upgrade. |
| **ADB-2100C** | SD MPEG-2 set-top, Europe/Asia market | Optimized for cable operators offering pay TV and interactive services; features VOD, digital play/pause, up to two smart card slots and an Ethernet port or PSTN V.92 modem. |
| **ADB-2510C** | SD MPEG-2/MPEG-4 set-top, Europe/Asia market | Optimized for cable operators offering pay TV and interactive services; features MPEG-2 and MPEG-4/H.264 decoding, VOD, PIP, Mosaic, Home networking (DLNA), NAS with playback, one smart card slot, up to two USB 2.0 ports and an Ethernet port; integrated with conditional access technologies. |
| **ADB-3810C** | Interactive HD digital cable set-top, Europe/Asia market | Able to display HD 720p and 1080i television MPEG-2 and MPEG-4/H.264 streams; features VOD, digital play/pause, Home networking (DLNA), NAS with playback; is integrated with conditional access technologies. |
| **ADB-3720C** | Interactive DVB-C set-top, Europe/Asia market | Able to display HD HDMI 1.31080p/25 streams; features VOD, PIP, Mosaic, Home networking (DLNA), NAS with playback, up to two USB 2.0 ports, an Ethernet port; integrates conditional access technologies. |
| **ADB-3830CD** | Interactive DVB-C and DOCSIS 2.0 HD set-top, Europe/Asia market | Able to display HD 1080p; features VOD, PIP, Mosaic, Home networking (DLNA), up to two USB 2.0 ports, one Ethernet port, NAS with playback; integrates conditional access technologies. |
| **ADB-5720CDX** | DVB-C/DOCSIS 2.0 PVR, Europe/Asia market | Up to 1 TB PVR; able to display HD HDMI 1.3 1080p streams; up to 3 DVB-C channels; features VOD, PIP, Mosaic, Home networking (DLNA), NAS with playback, up to three USB 2.0 ports, an Ethernet port; integrates conditional access technologies. |
| **ADB-5830CDX** | DVB-C/DOCSIS 2.0 PVR, Europe/Asia market | Interactive HD PVR; able to display HD 1080p up to 1 TB; up to two DVB-C streams; features VOD, PIP, Mosaic, Home networking (DLNA), up to two USB 2.0 Ports, eSATA and NAS with playback; integrates conditional access technologies. |
| **ADB-6720CDX** | DVB-C/DOCSIS 2.0 PVR, Europe/Asia market | High performance up to 1 TB; able to display HD 1080p streams; up to three DVB-C channels; features VOD, PIP, Mosaic, Home networking (DLNA), up to three USB 2.0 ports, NAS with playback, one Ethernet port; integrates conditional access technologies. |

| Cisco Systems (www.cisco.com) | | |
|---|---|---|
| **Product** | **Application** | **Key Features** |
| **Explorer 8300C Series** | HD DVR set-top | 8300C supports SD video, while the 8300HDC DVR supports HD video; both equipped with M-Card interface; dual-tuner DVR with storage of up to 90 hours of SD or 20 hours of HD programs with a 160 GB internal hard drive; also includes an eSATA port for optional hard drive storage expansion and an optional DOCSIS cable modem. |
| **Explorer 4250C and 4250HDC** | Digital interactive set-top | Digital interactive set-top with separable security; tunes analog and digital video signals; features up to 128 MB of application and program memory for maximum performance of multiple tasks with speed and power and provides IP-based, real-time, two-way communication between the set-top and the headend; optional integrated internal DOCSIS cable modem. |
| **8500HDC** | DVR set-top series with M-Card interface | New video ASIC silicon; HD, open platform set-top with coaxial and Ethernet connectivity to the home IP LAN; 160 GB hard drive storing up to 90 hours of SD and up to 20 hours of HD; tunes analog and digital signals; supports MPEG-4 video compression, 1 GHz tuning, and optional OCAP capabilities; also available as a lab development model. |

## Digeo (www.moxi.com)

| Product | Application | Key Features |
|---|---|---|
| Moxi | HD DVR | • Dual-tuner HD DVR<br>• Single-screen interface<br>• Content and services consistency<br>• 500 GB storage, expandable to up to 2 TB<br>• Access to Internet content through MoxiNet and the Moxi SuperTicker<br>• Remote Web and mobile browser scheduling<br>• Connection to PCs through home network<br>• Dolby Digital certified<br>• CableCard-equipped Broadcom BCM7400-based |

## Evolution Digital (www.evolutionbb.com)

| Product | Application | Key Features |
|---|---|---|
| DMS-1002, DMS-1002-CA | MPEG-2 digital-to-analog converter | Converts digital basic channels to analog; comes with a self-install kit including quick start guide, power supply, composite AV cable, IR extender, universal remote control w/batteries, and optional coax cable; composite video and RF outputs; no customer activation required; "Now & Next" information and channel list feature, nearly 200,000 currently deployed. |
| DMS-2042-HD | HD MPEG-4/2 set-top | Digital MPEG-4/MPEG-2 HD set-top; DOCSIS 2.0 cable modem; HDMI and component HDTV outputs; Dolby Digital 5.1 (S/PDIF); full-functionality front or top display; wall mountable; compliant with open standards (DVB, DOCSIS, etc.); Conax CA security smartcard with optional Multistream CableCard (M-Card) support. |
| DMS-2042-HD-PVR | HD dual-tuner PVR MPEG-4/2 set-top | Digital MPEG-4/MPEG-2 dual-tuner PVR HD set-top; 250 GB storage; DOCSIS 2.0 cable modem; HDMI and component HDTV outputs; Dolby Digital 5.1 (S/PDIF); full-functionality front or top display; wall mountable; PPV capable; compliant with open standards (DVB, DOCSIS, etc.); Conax CA security smartcard with optional Multistream CableCARD (M-Card) support. |
| CC-1000 | Multi-stream CableCard (M-Card) | Compliant with open standards such as MPEG-2/4, DVB simulcrypt and common interface, OpenCable (tru2way), OpenCAS and DOCSIS; has Conax CAS7 conditional access; designed to meet OpenCable CableCARD Interface 2.0 specification. |

## Motorola (www.motorola.com

| Product | Application | Key Features |
|---|---|---|
| DCX3200 | All-digital, HDTV, M-Card host set-top | HD all-digital set-top with a single 1 GHz tuner that supports MPEG-2 and MPEG-4 AVC services; includes updated audio and video output interfaces, HDMI and Dolby Digital Plus audio, plus an embedded DOCSIS 2.0 cable modem that supports DSG and downstream channel bonding; optional MoCA home networking upgrade allows it to serve as a multimedia client for accessing content from compatible devices in the home. |
| DCX3400 | All-digital, HDTV, dual-tuner DVR, M-Card host set-top | DVR with dual 1 GHz video tuners that support MPEG-2 and MPEG-4 AVC services; includes updated audio and video output interfaces, HDMI and Dolby Digital Plus audio, plus an embedded DOCSIS 2.0 cable modem that supports DSG and downstream channel bonding; optional MoCA Home Networking upgrade enables it to serve as a media hub within a connected home environment. |
| DCH70 | All-digital, SDTV, M-Card host set-top | Provides a full set of SDTV interfaces and support; runs a wide range of current and future interactive applications running on Motorola's existing DCT legacy APIs. |
| DCH100 | All-digital, SDTV, M-Card host set-top | Provides a full set of SD interfaces and data features; supports a wide range of current and future interactive applications running on Motorola's existing DCT legacy APIs. |
| DCH3416 | All-digital, HDTV, dual-tuner DVR, M-Card host set-top | Provides a full set of SD and HDTV interfaces, data features and DVR capabilities; supports a wide range of current and future interactive applications running on Motorola's existing DCT legacy APIs. |
| DCT700 | All-digital, SDTV, cable set-top | Supports digital SDTV functionality, including interactive program guides, VOD, and commercial-free, CD-quality music; intended for all-digital video networks, which require service operators to furnish a set-top for every TV set in the home. |
| DCT3400 | All-digital, HDTV, DVR set-top series | Combines features of digital cable—extensive programming options, interactive program guides, VOD, and commercial-free, CD quality music—with dual-tuner, all-digital video recording, HDTV; other capabilities include high-performance microprocessor, expanded memory, enhanced graphics, and a full range of A/V inputs and outputs. |

| Motorola (www.motorola.com | | |
|---|---|---|
| DTA100 | Digital-to-analog adapter | Features unidirectional functionality, single in-band tuner, SD decoding, and basic user interface for accessing one-way digital services; offers a cost-effective means of realizing the benefits of an all-digital network where operators can recover analog bandwidth and video subscribers may watch their analog TV sets even when connected to an all-digital network. |
| VIP1216 | HD IP video set-top with DVR | HDTV IP set-top including built-in hard disk drive for DVR; two-way IP capability enables broadcast TV, time-shifted TV, multicast and VOD; compliant with Microsoft Mediaroom; includes a system-on-chip processor and enhanced graphics for HD and SD digital TV and output high-quality surround sound audio. |
| QIP2500 | Hybrid QAM-IP, SDTV set-top | Supports interactive program guides, VOD, and commercial-free, CD-quality music; embedded IP networking supports high bandwidth data applications; can operate as part of a multi-room DVR home network via MoCA protocol. |
| QIP2708 | Hybrid QAM-IP, SDTV, DVR set-top | Hybrid based set-top with integrated DVR; supports interactive program guides, VOD and commercial-free, CD-quality music; embedded IP networking supports high bandwidth data applications; may be used as a home media server to enable viewing of recorded programs on set-tops throughout the home via MoCA protocol. |
| QIP6200 | Hybrid QAM-IP, HDTV set-top | Delivers all-digital HD video and premium sound quality in SD and HD programs; embedded IP networking supports high bandwidth data applications; can operate as part of a multi-room home network via MoCA protocol; supports interactive program guide, VOD, and commercial-free, CD-quality music. |
| QIP6416 | Hybrid QAM-IP, HDTV, DVR set-top | Includes a DVR that records SD and HD programs; embedded IP networking supports high bandwidth data applications; can operate as part of a multi-room home network via MoCA protocol serving as the home media server; supports IPGs, VOD, and commercial-free, CD-quality music. |
| QIP7100 | Hybrid QAM-IP, HDTV, M-Card host set-top | Supports separable security with a standard Motorola M-Card interface; decodes digital SD and HD MPEG-2 and MPEG-4 video formats transmitted via QAM or IP; supports embedded IP networking using MoCA protocol. |
| QIP7216 | Hybrid QAM-IP HDTV, DVR M-Card host set-top | Supports separable security with standard Motorola M-Card interface; decodes and records digital SD and HD MPEG-2 and MPEG-4 video transmitted via QAM or IP; supports embedded IP networking using MoCA protocol; can be positioned as a media server. |

| Pace (www.pace.com) | | |
|---|---|---|
| **Product** | **Application** | **Key Features** |
| **Pace DC100X "Butler"** | SD non-DVR set-top | Designed as a cost effective, full featured, SD set-top; offers interactive digital service through an all digital, MPEG-2 feature set; equipped with a CableCard option to meet current separable security requirements. |
| **Pace DC700X "Apache"** | HD non-DVR set-top | Next generation MPEG-2/4, all digital, CableCard-capable set-top; provides all the latest digital cable services in a compact footprint; can function in either a legacy OOB mode with native application or in a DSG/tru2way mode. |
| **Pace TDC577X "Vegas"** | Dual-tuner SD DVR | Standard definition DVR; has dual tuners and an 80 GB hard disk drive in a cost effective footprint; has a CableCard option for U.S. operators. |
| **Pace TDC787X "Aspen"** | Dual-tuner HD DVR | Designed for MPEG-2/4 advanced digital services; internal hard drive can be expanded with an external drive through the eSATA port; has a CableCard option for U.S. operators. |
| **Pace DC50X** | Digital-to-analog adapter | Designed for operators' bandwidth reclamation plans; has a robust mechanical design coupled with fast channel change and an external power supply; converts 64- and 256-QAM MPEG-2 content into a modulated ch. 3/4 signal that any TV set can display. |

| Thomson (www.thomson.net) | | |
|---|---|---|
| **Product** | **Application** | **Key Features** |
| DCI704 | HD MPEG-4 interactive set-top | Features an integrated DOCSIS/EuroDOCSIS modem and compact and ecological design capable of less than 1 w power consumption in deep standby mode; has HDMI output; decodes MPEG-4 AVC video streams as well as classic MPEG-2 broadcasts. |
| DCI104 | SD MPEG-2 digital-to-analog adapter | Designed as a cost-effective solution for cable operators to recover spectrum space in transitioning to all-digital networks; allows conversion of MPEG-2 digital cable TV signals to analog RF outputs for legacy TV; designed to ensure ongoing network compatibility with the installed base of legacy analog TV sets; features a small, compact and energy-efficient design. |
| DCI707 | HD MPEG-2/4 interactive tru2way set-top | Designed to allow cable operator customers to deploy HD digital TV services in tandem with high-speed Internet access; features an integrated DOCSIS/DNG cable modem; integrates tru2way middleware; supports separable security requirements with an M-Card interface; decodes MPEG-4 AVC video streams as well as classic MPEG-2 broadcasts. |