MSO home networking: A primer

The popularity of PCs, smartphones, tablets, and other wireless devices is driving the boom in multimedia and other related services. Home networking has become an essential enabler of communication amongst these devices.

By Joe Darabpour

Development over the past decade

Home networking has gone through multiple phases. Initially, home networking merely involved a simple off-the-shelf bridge or router device that provided connectivity between home computers for file sharing or Internet access. At first, home routers were connected to computers via Ethernet cables. Later, wireless routers were used, providing home users with flexibility and mobility.

With the advent of cable television, premium programming other than ordinary broadcast television was made possible through a set-top box (STB) that would convert and process the received TV signals digitally through coaxial cable. Since coax is capable of transmitting data bi-directionally, and cable television signals use only a portion of the bandwidth available, this left a lot of room for other digital services such as Internet and telephony.

Multiple system operators (MSOs) have used cable modems to provide Internet. Cable telephony, a specialized form of digital telephony over cable TV networks, is accomplished by installing a special telephone interface at the customer’s premises that converts the analog signals from the customer’s in-home wiring into a digital signal which is then sent over the cable connection to the company’s switching center where it is connected to the PSTN.

Currently, cable companies are planning the design of a residential gateway (RG) which would serve as a central point from which services such as voice, video, and Internet access can be provided.

In a future home networking scenario, access center, media center, and control & auto center functions may be provided through an RG. The primary function of an RG is to mediate between access providers’ technologies and the technology of the digital home network. Home network resources, such as RG firewall management, statistics, user profiles, file resources, and phone books, can be managed from the cloud.

Regulatory issues

A U.S. Federal Communications Commission (FCC) mandate in 1998 required multi-channel video programming distributors to separate their conditional access security elements from the device used to navigate programming channels. It has ordered MSOs to allow subscribers to use third-party navigation devices for cable service access at the same price as they themselves would offer; this is meant to give consumers access to cable channels on TV sets, PCs, DVRs, and wireless devices, without leasing a device from their cable company.

CableCard

Originally, the CableCard, a credit card-sized device that basically acts like a cell phone SIM or PCMCIA card in a personal computer, was the solution agreed to by the U.S. cable industry to comply with the FCC orders. As per the ruling, cable operators were required to use removable CableCards in the set-top boxes they lease to subscribers.

Holistically, cable operators failed to support CableCard in practice and the FCC recognized that it did not achieve its goals through the CableCard mandate. In December of 2010, the agency issued a media release indicating that CableCard was having only limited success and was also failing to stimulate competition. However, this requirement remains in effect until a replacement is found.

AllVid

AllVid (all-video) is a CableCard replacement proposed by the FCC. The AllVid hardware acts as a universal adapter for all categories of pay TV
content, delivered through cable, telco, satellite, or Internet. The “gateway” device or adapter takes input from different TV content providers but outputs a signal in a standards-based IP home-network interface format that can be used by DVRs, TVs, set-top boxes and other consumer electronic devices. This is intended to help drive a more vibrant retail market for broadband-connected video devices. The FCC requires U.S. TV operators to supply all their customers an “AllVid” gateway capable of the below functions beginning no later than the end of 2012. The agency has proposed the following design aspects for AllVid, while soliciting feedback from interested parties on a final specification, before going forward for rulemaking:

As many as six different IP video streams should be provided through a home network to TVs, DVRs and other home electronic devices. Two video streams should be decoded and feed directly to a television or consumer electronics device, while encryption and authentication should be done using the DTCP-IP standard that the Digital Living Network Alliance (DLNA) favors.

IP and 100BaseTX Ethernet should be provided as the communications protocol and physical-layer interface. The agency is seeking comment on whether or not it should mandate any other physical connectors that could serve as interfaces between AllVid adapters and retail navigation devices.

AllVid responses

The AllVid proposal has been criticized by the Motion Picture Association of America for providing insufficient protection against copyright infringement and by AT&T for preempting market forces already underway.

As in the CableCard case, the NCTA and cable TV operators argue that AllVid is unnecessary. Furthermore they advocate the use of Tru2way, a brand-name interactive digital cable service that delivers interactive program guides, interactive ads, games, chatting, web browsing, and e-commerce over the cable video network. The FCC’s stance on Tru2way is not known at this point.

On February 16, 2011, several companies announced the creation of the AllVid Tech Company Alliance. This group works to support the implementation of the AllVid standard and specifically addresses issues raised by the NCTA. AllVid supporters argue that consumers need to be freed from leasing access devices from network operators.

Home network standards/technologies

Home networking is a fairly new area for the Internet Engineering Task Force (IETF), whose standards were mostly designed for large-scale organizational networks rather than home use. Another standardization related to home networking is the ITU-T G.hn standard that provides high-speed local area networking of up to 1Gbps over existing home wiring (power lines, phone lines and coaxial cables).

Cable Television Laboratories Inc, also known as CableLabs, was founded in 1988 by a group of MSOs to determine what service requirements should be supported by new technologies and new services. It seeks to support and write those requirements through open interface specifications, in collaboration with the member companies and suppliers.

From a technological point of view, the following components are used by MSOs to facilitate the delivery of multimedia services to the end users.

Cable modem

A cable modem termination system (CMTS) is a piece of equipment, typically located at the MSO’s headend, and is used to provide high-speed data services, such as the cable Internet, VoIP, VoD, OTT and IPTV to cable subscribers. A CMTS provides
Home network physical layer

MoCA has been chosen as the physical layer technology for home networking by the MSOs. MoCA 2.0 was ratified in 2010 and it offers two performance modes, basic and enhanced, with 400Mbps and 800Mbps net throughputs (MAC), using 700Mbps and 1.4Gbps PHY rates, respectively.

MSO residential gateway

The residential gateway is the central point from which managed services can be delivered, and it will function as the centralized media server in the home. Operator-provided RGs usually feature broadband modems, router functionality, security features, encryption, WAN/LAN address translations, QoS configurations, client middleware, Wi-Fi and LAN interfaces.

The current MSO RG design consists of a 6-tuner module for QAM/Docsis, CableCard, whole-home high-definition personal video recorder (HD PVR) with 500GB to 1TB storage, embedded router, embedded multimedia termination adapter (MTA), user interface, four Ethernet ports, MoCA 1.1 home networking technology, and 802.11n (Wi-Fi) capabilities. The gateway may use universal plug and play (UPnP) for service discovery.

Content ordering and billing for VoD and PPV services may be handled via RG-generated screens. It has been proposed that content encoding should support multiple codecs to allow for device flexibility without requiring transcoding by the RG.

A bright future for home networking

Increasing ARPU is especially important for MSOs due to the FCC’s cap on cable ownership that prevents a single operator from serving more than 30 percent of U.S. video subscribers. For Comcast, currently the MSO closest to the cap, home networking could be a way to avoid a revenue hit if customer growth levels off.

From the perspective of the MSO, consumer and vendor, the IP-based home network is the natural choice for reliable and manageable delivery of value-added services. Vendors and solution providers such as Huawei are in a position to leverage their existing terminal devices, networking technologies and infrastructure expertise to assist operators, particularly MSOs, in delivering home networking solutions to each and every subscriber.

In-Stat, the independent research company, recently issued a report stating that the residential gateway sector is prioritizing the broadband customer premise equipment (CPE) market. In-Stat also forecasts that residential gateway shipments will surpass 50 million units in 2011, while the revenues for this market will surpass USD10 billion by 2015.

The number and scope of products connected to home networks continue to increase; 35 million households in the U.S. have data networks, and the figure is expected to grow by 50 million by 2012. Ten years ago, there were only 2.8 million households with data networks. Parks Associates Research projects that the number of connected devices at home will double year on year until 2015.

In 2015, the average bandwidth to the home from telecom, cable, or wireless providers is predicted to have grown exponentially. Consumers will continue to access video content on screens of various sizes, including handheld devices. Physical media such as CDs, DVDs and Blu-ray discs will also continue to be used. However, streaming video from the Internet and from home media servers will more likely become the norm.

Operators are looking at managed home services, particularly home networking, as a vehicle to create revenue opportunities beyond triple-play.

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