

For many involved in the sector, the actual definition of the gateway to the home and who controls it are fundamental issues. Howard Silverman, senior product marketing manager at NDS, speaking on behalf of the digital TV technology expert and its home gateway middleware subsidiary Jungo, points out that in a two-way network the gateway provides a single integrated solution for three core platform services: voice, data and video.

"The supplier of these services will control the gateway," he asserts. "We also see today places where the gateway plays a role in the mobile world. Technologies such as Femtocell or UMA can use the gateway as a micro access point to the mobile network. However, the client devices connected to the gateway can and should be controlled by the consumer as they take increased control of the content they consume, on multiple devices and formats," he advises.

Steve Christian, VP, marketing, at Verimatrix, suggests that quality of the overall experience is the key to the controlling the

THE SEAMLESS TRANSPORT OF ANY MEDIA TO ANY DEVICE AROUND THE HOME IS THE MOST IMPORTANT NEAR-TERM CHALLENGE FOR SERVICE PROVIDERS. IT IS A SIMPLE PROBLEM THAT HAS MANY – OFTEN COMPLEX – SOLUTIONS. COLIN MANN FINDS OUT WHAT THE OPTIONS ARE FROM A RANGE OF INDUSTRY EXPERTS.

opportunity and challenge for next generation entertainment services. On the other hand, this level of in-home support comes at a considerable cost to the service operator and other alternatives may be on the horizon," he admits. Rovi's chief evangelist Richard Bullwinkle points out that every service provider puts a modem or router of some sort into the home. "It can range from a DSL and Telco to Cable or other providers. It depends highly upon the user's preference," he says.

HOME GATEWAYS. According to Richard Nesin, executive director HomePNA, the gateway will typically be installed or specified by a service provider. "It will integrate the



Home Networks

home network. "Whoever controls the quality of experience, will ultimately own the home network. For example, the broadband service provider might manage the in-home service from customer support to an 'always-on' connection point –

perhaps a 'server' STB or a home gateway," he says. "By taking control of the subscriber relationship, they can also control things like the QoS inside the home.

Owning the whole home network seems to some like the Holy Grail for a service provider as it provides the most significant

broadband access modem, wired and wireless home networking interfaces, and software applications such as a firewall. It will be accessed by the communication/entertainment service provider by means of standard interfaces such as TR-069, which will allow remote management and diagnostics. In the future, it may also integrate technologies that support home energy management as well," he predicts.

Michael Weissman, VP, North American marketing for CopperGate Communications, suggests that there will be many gateways into the smart home. "There can be data-oriented gateways such as xDSL or cable modems with WiFi built in. There also can be smart energy or security gateways that talk to systems such as Z-Wave. Another option can be home entertainment gateways that transport IPTV, triple-play, VoD and more. And, the gateway could be a gateway that combines all of these elements."

Richard Leather, director, EMEA home pre-sales, Motorola, argues that ultimately the Home Gateway provides the entry point to the home for the delivery of services. "Within the home, IP provides the converged transport

layer that enables applications to be easily accessed anytime, anywhere from a range of different devices. But significantly for the Home Gateway, the underlying networking technologies, both to the home and in the home, will vary. The demands of the consumer and the service provider in terms of reliability of connection, reliability of throughput, and flexibility of configuration will require that both the consumer and the service provider control the device," he contends. "Beyond this basic definition of the Home Gateway, consumers require that it enable whole home network coverage, enable interconnectivity between multiple devices, exhibit easy install and configuration, be secure, require no new costly home wiring to be installed, and support demanding bandwidth applications."

COST-EFFECTIVE. John Egan, VP, strategic marketing, DS2 says that a DSL or cable modem is commonly used as the gateway to the home and it is controlled by the Service Provider offering the broadband service. "Once connectivity is established, the service provider is faced with a bigger problem: how to manage the last few meters inside the



"Locking down the market today would be devastating to innovation."

**MICHAEL WEISSMAN,
COPPERGATE COMMUNICATIONS**



that Pace is at the heart of convergence. "We're focusing on hybrid solutions plus the connected home. We're driven by whole-home TV." He suggests that the STB in a consumer's home is a managed gateway service anyway, and describes the Bewan acquisition as "a good technical overlap of the sort needed to ensure robust delivery."

NETWORK SOLUTIONS. As to what kind of network will be used to carry all the rich media and value-added services around the home, opinions vary. NDS's Silverman notes that the networks in the US cable market are expect-

ed to initially support MoCA - a technology that provides IP connectivity over coaxial cable - as that is being built directly into chipsets that are on the market today and those that are expected to be on the market shortly. "Other approaches such as Gigabyte Ethernet and USB-2 connections enable additional home network technologies to be added to the Media Gateway in the future," he advises. "Other wired and wireless home networking standards are being pursued by various industry consortia and as these become more prevalent in the future they may be added to future generations of the home network. Such home network standards include HomePNA, FiberHome, PowerLine communications (PLC) and Broadband over Power Lines (BPL), G.hn, and 811N."

Verimatrix's Christian agrees that it is hard to offer a single approach, given the poor performance and reliability of typical home networking equipment and lack of true equipment interoperability at the level of sharing media. He backs Silverman's assertion that in the US, coax infrastructure looks most promising for in-home wiring where CAT-5 is not available. He suggests that one of the big advantages of delivering video to the home over an IP infrastructure is the ability to completely incorporate a home network and service supplied STB within the network



"Technologies that can propagate outside the home require additional security."

**RICHARD NESIN,
HOME PNA**

envelope. "There are still challenges for service management and digital rights management (DRM) since the home network will not be completely controlled by the operator, but IP offers a universal service layer on which DRM implementations can be supported. One option is for operators to install a 'home hub' as part of the service and retain some control over the network behind it," he advises.

Home PNA's Nesin argues that such a definition depends on the consumer/provider. "Communication/entertainment

service providers have installed HomePNA home networks which operate over existing coax and phone wires in millions of customers' homes to deliver triple play IPTV to the TVs in their homes. Wireless 802.11 home networks are also typically supported by the same gateway to provide wireless Internet access. HomePNA features guaranteed QoS and the highest available data rate making it ideal for demanding applications such as pay IPTV service."

HomePlug's Rob Ranck says the home network will primarily be a hybrid of powerline using HomePlug technology, WiFi, coax, and to a lesser extent CAT5/6 Ethernet.

"HomePlug powerline networks will be the backbone of the Home Access Network delivering broadband throughout the home, connecting smart grid devices, and bridging to WiFi, coax, and CAT5. Powerline has the only installed cabling plant with multiple outlets in every room, and the capability to meet both QoS and reliability requirements of high-end consumer applications such as HDTV and smart grid applications throughout the home. WiFi will remain pervasive for mobile devices and computers not needing a HDTV stream, and powerline will serve to extend WiFi coverage with bridged access points."

WIRED/WIRELESS. CopperGate's Weissman suggests that the network will be a combination of wired and wireless networks. "The wired network will be a combination of Ethernet (for within a small space) and G.hn based (for whole-home coverage) and will work over all three existing wires; phone, coax and power lines. The wireless will be a combination of WiFi for data distribution to mobile devices and Z-Wave for command

subscriber's house in a cost-effective way. Well-known network management solutions such as SNMP cannot offer Service Providers the common platform they require for device management on the network because each vendor creates proprietary mechanisms (MIBs) for management," he advises.

Nick Fielibert, CTO, Europe, cable, digital media and IPTV for Cisco agrees that the issue is still under debate. "When the device was just a modem, people would add their own device; that way there was minimum service provider involvement. But more and more service providers are providing the residential gateway. Consumer interaction can be limited if it's managed by the service provider."

Alan Delaney, head of business development IPTV and connected home, Ericsson, notes that such issues are becoming increasingly relevant, referring to the recent acquisition by STB specialist Pace of unified communications solutions provider Bewan. "This sort of integration allows you different ways to grow the business," he notes. Home networks can be end-user or more feature-rich operator driven. "Once you have a two-way connection to the home, there are a lot of services you can run on top of that. It almost becomes a new platform."

Dr Paul Entwistle, Pace's CTO, suggests



"The Gateway will continue to be DSL and Cable modems controlled by the cable companies and service providers."

**ROB RANCK,
HOMEPLUG**



and control and energy management." Rovi's Bullwinkle believes that the provider or the user almost always decides this. "People who live in stone houses might use power-line Internet. People who live in sheetrock homes will probably use WiFi. Some people might have their homes wired with Cat 5 Ethernet cables."

Motorola's Leather agrees that the underlying networking technologies, both to the home and in the home, will vary. "The Home Gateway will need to contend with a range of Wide Area Networking access technologies such as Wireless Broadband, FTTx/GPON, xDSL and Cable. With the exception of Cable, these technologies already deliver services on a converged IP layer to the home. In contrast, today's cable networks typically deliver broadcast and on-demand video as digital RF feeds to the home. In such cases, the Home Gateway has a role to play in the conversion and onward distribution of these feeds over IP within the home environment."

"Networking within the home also faces challenges that the Home Gateway must resolve," says Leather, who suggests that the cost and disruption of installing new wiring is generally unacceptable to consumers. "The choice within the home is then limited to the use of existing wired networking (such as Ethernet cabling), wireless networking or 'piggy backing' on existing home wiring, or power lines. Each technology has different performance characteristics that make it likely that no one technology provides the answer. Instead home gateways will need to exhibit flexibility in supported technologies."

DS2's Egan reports that wired technologies, especially powerline communications technology, are gaining traction as a solution for whole home networking, especially among European service providers. "Powerline technology works well over electric cables and coaxial cable thus avoiding the need to retrofit a house with new cabling, but the fact that powerline solutions are straight forward to set up and make available throughout the home – however many users there are in the household, that puts the icing on the cake for Service Providers. Power-line communications can work regardless of the back-haul technology used to provide a broadband connection."

SAFE HOUSES. Concerns also exist as to the security of such networks, both in terms of premium content vulnerability and the potential for bandwidth freeloaders. Silverman states that the network needs to be secured if the service provider is going to succeed in turning the investment in content and new technologies into a profitable business. "The home network needs to use standard networking protocols such as DLNA and UPnP infrastructure and a comprehensive service and content protection, or DRM layer, to support different security configurations."

"Security is obviously very important, but it becomes even more so as the gateway becomes a common point where content is concentrated. It becomes a type of Fort Knox that hackers are desperate to break into," suggests Christian, who identifies two key

components of security in today's home network environment: Conditional access (CA) and DRM. "CA determines whether or not a given user or device has access to particular content, and DRM determines what the user or device can do with the content. In a multi-device, multi-service environment, the CA and DRM systems may not necessarily come from the same vendor. Furthermore, different devices often use different DRM systems. Supporting a range of native DRM systems can be difficult and costly," he advises.

INBUILT SECURITY. HomePNA's Nesin suggests that the HomePNA network itself is physically secure since it is not accessible outside the home. "Other technologies such as wireless or powerline which can propagate outside the home require additional security. Data flowing over the home network such as service provider TV content is typically already protected in higher protocol layers to the end device such as a set-top box," he points out. Motorola's Leather says that as the applications delivered through the home network become more a part of daily life, so the need for security becomes more necessary. "All the networking technologies previously mentioned have inbuilt security capabilities to secure the data being transmitted. The mechanisms vary between technologies but include characteristics such as AES encryption, WEP, WPA, TLS *etcetera*."

Egan argues that Powerline Communications technology is highly secure: "Consumers have a fast, reliable and secure

connection, anywhere in their home. DS2 Powerline technology is also available with the highest-grade encryption, ensuring consumer data and content security."

Bullwinkle suggests that issues of security matter less and less with managed media systems. "Many customers will store their photos in the cloud network — Picasa, Flickr, Smugmug — these services require password authentication and allow the customer to access their photos from anywhere. Music services like Spotify, Pandora and Slacker are gaining traction for music in the cloud. And Netflix, Love Film, iPlayer and Blockbuster do much the same with video. In the same way you can log into your Gmail account from Internet cafes, you might do the same with your media. The network might not be secure, but your password authentication is. In the short term, playing movies across DTC/IP networks requires security. And if you want to keep the neighbours out of your personal photos, you'd better put a layer of security on your WiFi network," he recommends.

SMART HOME. With ever-increasing technological sophistication, are we seeing the advent of the Smart Home? Christian suggests that the gateway strategy is one attempt to share content across multiple devices in the home. "If it's a smart home, you might think of other sources of value that the gateway can bring, apart from just being a media hub. You could think of it as a logical entry point for energy metering or for home security, or other kinds of applications. As a service provider, you are always considering return on investment, and this is a potentially

expensive device. You must put as many streams of business through it as you possibly can. The collateral applications become very important; it's not just the media services," he advises.

Weissman suggests that once these networks converge into shared gateways and can talk across

various physical layers (both wired and wireless), then the content can freely move from device to device and location to location.

"This cross-communications will allow for a new class of smart applications. For example, soon televisions (through the set-top box) will be able to control all the appliances in the home. This is part of the Z-Wave technology." Egan suggests that Service Providers could help catalyse the growth of additional home networking features, including more smart-home applications because of the unique billing, marketing, and customer-support relationships they have with their customers. "Other players will also contribute to the growth of the Smart Home including utilities and technology providers. However, it is perhaps the development of international standards that will cement interest in widening current offerings beyond communication and entertainment applications to include home control and command applications." He backs the G.hn next-generation wired networking standard to unify the networking of content and devices over any wire to deliver the Smart Home.

"It's perhaps the beginning of the beginning," suggests Ranck. "Major utilities have given direct input into the HomePlug Green PHY spec (GP) for Smart-Grid applications and back its deployment. ZigBee and GP will play major roles in connecting devices and appliances to the Smart Grid utilising the ZigBee/HomePlug smart energy profile and the ability of GP to interoperate with all other HomePlug devices in the home. The smart grid and smart home will both utilise HomePlug technology in a major way. Major utilities are already shipping smart meters with HomePlug technology."

MAINTENANCE MEN. With a range of service provider options and a raft of different devices all likely to play a part in a fledgling home network, issues of maintenance arise. Who will take responsibility for such matters?



Silverman suggests that subscribers want minimal bother with their broadband services. "They expect them to work by simply plugging in the relevant home networking client devices, with clear and quick resolution of issues when they do arise. Service providers require the tools to improve user satisfaction and reduce support costs by minimising technical and usability issues faced by their subscribers. The service providers are taking the responsibility for maintaining the home network, but they should have the right tools to provide quality of service (QoS), superb support, while minimising the costs."

Bullwinkle warns that the customer will only pay for Internet access if it works. "The ISPs will try to push much of the in-home maintenance to the consumers, but ultimately, if it doesn't work the customer will churn out." According to Weissman, the home network will have many potential service providers to provide network management. "Clearly, the telcos are a good candidate, but others are also viable including security companies, ISPs, entertainment delivery companies, retailers, and so on."

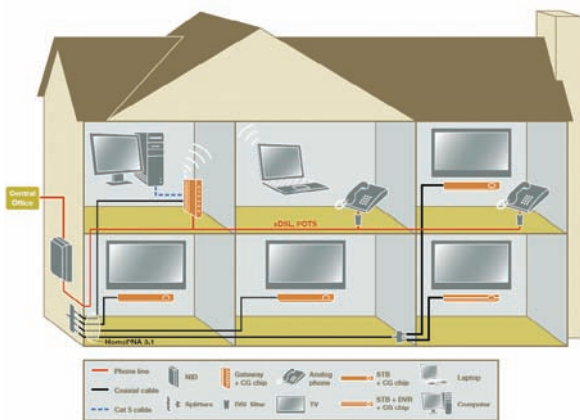
COST BASE. Christian notes that service operators have considered a takeover over of the home router responsibility as well as the home media service responsibility but he suggests that it is largely impractical for an operator to take over the home network. "It is just too significant of a problem and it becomes a huge challenge for the service operator to manage not only the router, but also all of the other devices attached to the router. It's a pretty big challenge and a large cost base to take on. Trying to manage quality of service issues can compound the problem ever further."

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**RICHARD LEATHER,
MOTOROLA**



essential the home network is to providing a revenue bearing service. "With service providers deploying HomePNA we have found that the service provider often wants to manage the home network viewing it as an extension of their delivery network. To that end, HomePNA features the most advanced remote management capability - even more advanced than Ethernet or WiFi - making remote maintenance of a home network a practical way for service providers to increase customer satisfaction while reducing costs."

Leather points out that with the evolving complexity of home networking environments, the challenge comes when a poorly operating home network impacts on the performance of applications and ultimately the consumer experience. "This can reflect badly on the service provider delivering the services even though the fault may lie in the consumer's home networking set-up. In addition, diagnosing and resolving the issues may be beyond the capabilities of the consumer and require external support."

WIZARD SPELLS. Motorola is introducing capabilities such as a Home Networking Wizard that allows a consumer to configure, monitor, troubleshoot and visually map their home network. "For service providers Motorola provides systems that enable the remote support - including configuration, monitoring, fault diagnosis - of home networks. Standards such as TR-069 are key in providing these remote support capabilities."

Egan suggests this depends on the business case adopted by the Service Providers but says the trend is toward offering a home-networking solution as an integral part of the entertainment and communication package. "In this case the Service Provider needs full visibility of what is happening in their network, including customer premises equipment like Set Top Boxes, VoIP gateways and home networking adapters."

Will home networks proliferate without

standardisation? "Yes," affirms Silverman, "though standards are important as they better position service providers to integrate with the leading vendors that offer the most attractive innovations and features. By opening up a large adoption base helps to drive down costs so as competition increases capital expenditure begins to decrease."

Bullwinkle notes that even on a standards-based network, many companies create private or closed systems. "Multi-room DVR often uses standard network protocols, and DLNA discovery, but the providers often lock it down so that only their devices can see the content," he says.

MULTI-VENDOR. As an example of how standards can be useful, Christian points out that TR-069 tries to create a multi-vendor environment for service operators so that they can manage the gateway devices that reside in their customer's premises from an external system. "A standard becomes important like this when it can enable multi-vendor participation. In certain kinds of systems, for instance the DirecTV view of the home media server, standards are only necessary to be able to share the content, they are not necessary to manage the device itself. That device, therefore, can be a completely proprietary system and wholly owned and subsidised by the network or system operator and probably produced exclusively for that network operator, just like traditional set-top boxes have been."

He points out that IP-based standards in networks allow operators an opportunity to cost-effectively deploy a security system and business rules that can satisfy all the demands of content owners while creating the transparent usage model that consumers demand. "We believe that IP and the sophisticated protocols built on IP are the common building blocks to make digital convergence happen inside the home."

According to Nesin, standards are necessary to develop stable interoperable platforms and to drive competition. "In fact HomePNA is supported by two standards organisations: the HomePNA alliance, an industry group that develops and certifies equipment, and the ITU which standardised HomePNA technology as Recommendation G.9954. The ITU standard guarantees equal and open access to HomePNA technology for

everyone while the alliance provides a level of comfort to consumers by testing to insure that equipment that passes HomePNA performs as expected."

MARKET CHOICE.

Especially important for Weissman are open standards such as those made by ITU. "However, this shouldn't imply that one single standard be mandated. The Internet has proven that the Open Systems Interconnection reference model works. By making the layers independent, innovation has been allowed to flourish and within a given layer, the market has chosen which technologies are best. There is still tremendous innovation occurring in the home networking space and locking down the market today would be devastating to innovation. For example, G.hn will deliver roughly double the throughput of HomePlug AV over power line. It makes no sense to keep the market from such improvements," he suggests.

Cisco's Fielibert contends that standards are important, especially when the consumer builds the home network himself, and observes that service providers like a multi-vendor environment.

Egan argues that for over 10 years the proliferation of non-inter operable proprietary standards for wireline home networking technology has stunted market growth. "The G.hn standard aims to deliver a single unified home networking technology that can run over coax, power lines and phone lines. G.hn enables service providers to deploy new offerings including IPTV more cost effectively; and allows consumer electronics manufacturers to provide powerful devices for connecting all types of entertainment, home automation and security products throughout the house. This greatly simplifies consumer purchasing and installation processes," he claims. "Without standards and interoperability, we are left with a confusing mix of proprietary technology that doesn't talk to each other, and can actually conflict to the point of shutting down the network," warns Ranck.



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