



# Home ownership

**As technologies such as DLNA begin to make the converged home network a reality, service providers must decide on the role they will play in enabling their customers to exchange content between devices. Stuart Thomson reports.**

**Who** owns the home? The question of who should be responsible for provisioning and managing the 'connected home' has been one that broadband service providers have been able to view from a comfortable distance until recently.

Service providers are already involved in helping their customers set up straightforward home networks – for example by supply-

ing wireless routers that connect a number of PCs to the broadband network. IPTV operators have also provided in-home wiring (or in some cases wireless or powerline solutions) to bridge the gap between the phone socket and the TV. But in the brave new world of consumer electronics, this is home networking for dummies. That overused buzzword 'convergence' – in this case meaning the ability to

exchange content and applications across an ecosystem of different products in the home – could radically change the name of the game. The emergence of a widely-adopted interoperability framework in the shape of the Digital Living Network Alliance (DLNA), which can allow digital content such as photos, music and videos to be shared between devices such as PCs, mobile phones, game consoles and

set-top boxes, could allow consumers to view content wherever they want, whenever they want, on whatever device they want.

Sounds familiar? Service providers have been promising all this for some time, but in doing so they generally refer to the delivery of premium content to multiple devices (set-top, PC and mobile) from a server at their own headend. That leaves it to the consumer to work out how to store, share and view the ever-expanding universe of home-grown digital content (as well as so-called over-the-top content delivered via the open internet). DLNA could make the sharing of content between devices much simpler. That leaves open the question of how much service providers should get involved. The answer could hinge on a number of factors. First, can the cable or broadband operator provision and manage the connected home on behalf of the customer in a way that avoids a torrent of calls to its customer service department from angry customers who have failed to get things to work? Second, can the operator integrate the consumption of premium content with this home network in a secure way? And third, is there a way to make money from any of this?

## Clear benefit

Take the customer service issue. Unless there is a clear benefit to service providers, they could be faced with call centre headaches and little else. "As the operator becomes more involved in home networks, network management has to be addressed," says Tiaan Schutte, general manager, software service platform at technology company Thomson. "What is the responsibility of each? Which of these devices would be under the operator's control? Quality of Service needs to be guaranteed." Schutte believes operators are likely to take a cautious approach. "Interoperability will be key but services need to be managed efficiently and responsibly in the household. Once you start to infringe on the customer it becomes a two-edged sword. You have the possibility to offer a wider range of services but you are also looking at possibly infringing [what the consumer can do]."

In order to avoid customer service meltdown, operators are likely to take baby steps

**Cisco and other technology providers believe the home gateway will be key.**

into the world of the connected home. Pay-TV operators will focus on the distribution of video to second and third TVs in the home within their own controlled networks before they do anything else. "Virtually all operators are talking about DLNA but not in the context of premium content," says Anton Monk, chief technology officer at the Multimedia over Coax Alliance (MoCA), which develops specifications for home networking over in-home coaxial cable. "The first key application will be multi-room DVR. The next thing after that will be PC-to-TV connectivity, but operators can't monetise that yet." Connecting the PC and TV can be enabled in networks based on the DLNA specifications. But while support for such applications could be popular with consumers, it is unlikely to produce a short-term financial benefit for operators – something they are likely to think long and hard about in these financially straitened times.

"There are things that are very interesting – most common is connecting the second and third box in the home," says Andrew Rybicki, chairman of set-top box manufacturer ADB. Rybicki believes more advanced 'place-shifting'-type applications, serving devices that could be outside the home, is still a year off for operators. Wi-Fi, he points out, has not been defined for in-home distribution of video. "We have wireless products running in the lab but they're not ready for commercial deployment," he says. ADB has obtained DLNA 1.5 certification for its products. However, like other technology vendors, Rybicki believe operators will take a cautious approach.

DLNA itself is not a standard but rather a grouping together of existing standards, including network protocol Universal Plug and Play (UPnP) and video compression formats such as H.264, Flash and DivX under a common umbrella that will enable the networked home to function as seamlessly as possible. "Home networks are difficult to set up. With UPnP the home user doesn't have to

hook everything up," says Nick Fielibert, chief technical officer, Cisco service provider video technology group, EMEA and Asia Pacific and principal engineer. "The device is discovered automatically."

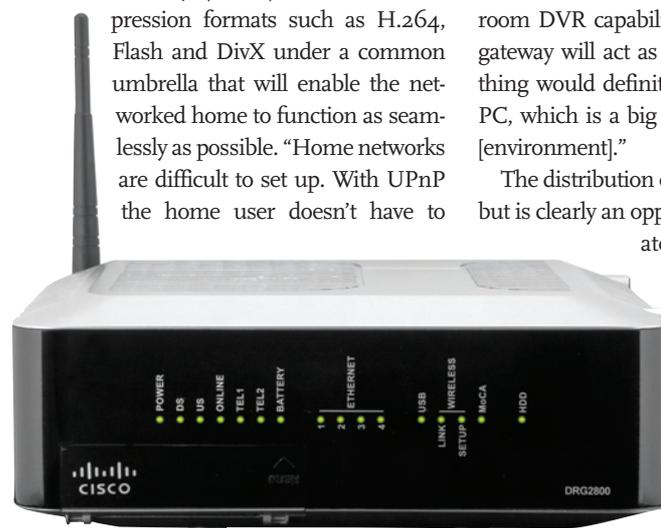
For service providers thinking of getting involved in all of this, the most widely discussed scheme is based on the deployment in the home of a connected central gateway device. "The gateways would be provided by the service provider and they would manage and control them," says MoCA's Monk.

Gateway devices can be used to store content, which could then be accessed from multiple devices with DLNA clients around the home. "We believe that the residential gateway will play a key role in the digital home strategy," says Schutte at Thomson. "From the residential gateway we could start sharing content to multi-room DVR services."

Other companies looking at the in-home distribution of content to DLNA-compliant devices via a gateway-type device include OpenTV. "The approach we have taken is to use a network-attached storage device," says Matthew Huntingdon, vice-president, solutions marketing. This DLNA-compliant NAS acts as a home server that could serve encrypted content to CA-equipped devices.

Enabling the sharing of user-generated content such as photos is seen as a quick win by the DLNA Forum. For service providers, it could be an attractive service add-on, useful as a way to differentiate service offerings and cut churn. "I think it will develop in stages," says Schutte. The home gateway will emerge as a service operator-controlled device for the storage, management and processing of content, followed by the extension of these services to other devices, he says. "We will see multi-room DVR capabilities where the residential gateway will act as a repository, and the next thing would definitely be how to include the PC, which is a big part of the overall storage [environment]."

The distribution of live TV is more complex but is clearly an opportunity for network operators to consolidate their presence in the home. "Digital switchover means that everyone will have two or three rooms needing digital TV signals. That could mean a set-top in each room, but



you need some kind of home networking solution," says David Gillies, set-top box manufacturer Pace's director of technology. Pace has developed a proprietary solution for pay-TV operators that want to connect multiple set-top boxes only, leaving third-party devices alone for the time being. "Pay-TV is a closed environment. We can evolve from the current set-top through to our solution and then evolve the standards through a software download," says Gillies. "It's about making that offer to the operator with a user interface and it's about transferring content between different security domains. The transfer of rights and entitlements is very complex."

DLNA 2.0, due to be deployed next year, addresses some of the issues that could prevent the use of the technology for the distribution of premium content around the home. "DLNA 2.0 should address gaps in the current standard but DLNA is only one part of the puzzle," says Gillies. "You still have to get the signal there. Can you do real-time streaming? Is the bit-rate sufficient? Or do you do progressive download, which means you need to have a hard drive?"

The ability to move premium content would enable operators to launch "follow-me" services, allowing users to press 'pause' on the main TV and resume watching, for example, on a PC or mobile phone. Some of this functionality is already available via proprietary technologies such as Sling Media. Set-top manufacturer EchoStar (whose parent company now owns Sling) has integrated the latter's place-shifting software into its set-top boxes in the US and will likely introduce products with this functionality in Europe.

## Live streaming

The current version of the DLNA may not support live streaming of video between devices, leaving operators with the short-term option to offer a proprietary way of doing this. However, if a service provider wants to enable consumption of content, including live content, across consumer electronics devices, DLNA is effectively seen as the only way to go.

At IBC in September, Pace demonstrated a DVR with some content stored on the hard drive that could be shared over a DLNA network with other DLNA-enabled devices, such as the Sony Playstation 3, in the home. Using its own extensions, Pace also demonstrated

## No new wires: the physical infrastructure

Exchange of content between DLNA-enabled devices can take place over a number of physical network infrastructures (many associated with existing standards initiatives), including phone lines (HPNA), Powerline (HomePlug), coax (MoCA) and, potentially, wireless.

"Different markets have different solutions," says set-top manufacturer Pace's director of technology, David Gillies. "In the US homes have coax. In Europe there is a lot of interest in Powerline or wireless solutions." Gillies says Pace is "physical-layer agnostic". "If you can do Ethernet then do that, but you can't rewire the home," says Gillies. "You might have a hybrid solution with non-time-critical stuff going wirelessly and video over another medium."

At IBC, Pace demonstrated the distribution of HDTV over a wireless connection within the home using unlicensed 5GHz spectrum and its own internal antenna design within the set-top box. The use of wireless also requires the operator to have the ability to force the network to operate according to rules it sets, allowing the prioritisation of video content. The company also demonstrated distribution of content using the CI Plus content security technology over a powerline distribution network.

At the same show, video infrastructure supplier Cisco used Multimedia over Coax Alliance (MoCA) technology as the physical layer for one demonstration, and, like Pace, highlighted its own wireless system (in this case from Celeno, in which Cisco has an investment), also using unlicensed 5GHz spectrum, which the company claims enables the transfer of HD video even in a noisy wireless environment.

While powerline technology has been adopted by a number of European telcos, Steve Farmer, strategy and business development director, video solutions, EMEA at Motorola, is more sceptical about use of wireless technology for video. "I don't think it will be as simple as people think," he says.

In the US, MoCA is expected to dominate the market thanks to the ubiquity of coaxial cabling in homes. Verizon, which has been successful in marketing its hybrid FIOS TV service to US sub-

scribers, has been one of the driving forces behind the MoCA initiative, and cable operators Comcast, Cox and Time Warner as well as DTH provider DirecTV have all played an active role. MoCA 2.0, due to be released next year, promises delivery of up to 100Mbps over the home network. "If you don't have a MoCA network next to your TV or set-top with an Ethernet port...you need a MoCA bridge just like a Wi-Fi bridge," says Anton Monk, chief technology officer at MoCA. "It's a very simple device with

**Gillies: different solutions for different markets.**



Ethernet in, MoCA out, or with multiple ports connected to MoCA. You will also see Wi-Fi to MoCA bridges." Monk says MoCA has a good relationship with HomePlug, the powerline alliance, which he sees as a complementary technology (at least in the US). "You have to reset the expectations about what services you can offer," he says. "If you have coax with 100Mbps of throughput that means there is a certain level of service you can provide."

In Europe, the physical layer that is favoured depends on the territory - but also on the preference of the individual householder. It is likely therefore that operators will need to be flexible.

"I don't know if the operator will want - or has much choice - when it enters into the household to choose what network the customer will deploy," says Tiaan Schutte, general manager, software service platform at technology company Thomson. "It could be powerline, wireless or Ethernet. If it's managed by the service provider, he will have to have some sort of value-add at the end device that will enable him to mandate a certain type of network structure that needs to be in place. I don't know about that. It's up to the customer to decide if it's possible or not."

the distribution of live TV using HTTP, with the intention to move later to Real-Time Transport Protocol (RTP), the standardised packet format for delivering audio and video

over the internet that currently exists as an option in the DLNA specifications. In this set-up a high-end DVR-enabled box functions as the home server, exchanging content with

other devices that can discover each other's presence via UPnP.

The dilemma facing operators is how far and how fast they want to go down the DLNA route. The advantage of a proprietary technology is that it enables the operator to retain control of the devices between which content is shared, providing insurance against a deluge of complaints to its customer service division and maintaining the security of premium content. Operators therefore have to think carefully about what they want to offer. It should be possible, for example, to provide certain services (such as the sharing of home media) over a DLNA network while allowing premium content only to be moved between devices that are approved – meaning supplied – by the operator.

The issue of Quality of Service is of key importance here. "One thing that is clear is that traditional Quality of Service is not sufficient for service provider applications," says MoCA's Monk. "Service providers could designate all the content in the home as priority traffic. But as they open the network up and see personal content come onto premium content devices they can't control the personal content or [determine] the Quality of Service for that." Individual subscribers are likely to want to determine what is important and what deserves prioritisation within their home. One option is to reserve bandwidth for applications such as IPTV.

Operators will increasingly come under pressure from consumers to allow them to view content on a wider range of devices. The activities of consumer-electronics companies, over-the-top content suppliers and others will only add to this. But this contributes to a further dilemma for the service provider, which

favours pay-TV as the best medium for high-quality content. If the operator allows subscribers to feed a growing range of devices inside and outside the home with content via very-high bandwidth networks, so do the opportunities grow for content providers to bypass the operator altogether.

"Some US service providers are very paranoid about this," says Monk. "They don't want to open up their networks to retail solutions. Others say it's inevitable." It is likely that in the long run consumer pressure (and various kinds of pressure exerted by consumer electronics manufacturers) will force operators to embrace this world.

"DLNA started by targeting the consumer electronics vendors. In the last year they made an overt effort to court service providers," says Rob Gelpman, chair of the marketing work group at MoCA. But allied to this is the need to educate the consumer about what can and can't work. DLNA remains a term familiar only to engineers rather than consumers. A logo programme could be one way to enhance consumer knowledge. But if something as apparently straightforward as 'HD-ready' has failed to eliminate consumer confusion about what HD actually means, it may be a step too far to introduce yet another acronym as a badge on consumer electronics devices.

## Security issues

Allied to concerns about managing the home network and opening up the TV to third-party content suppliers is the more specific concern about how to secure the service provider's premium content when it leaves the safe confines of the set-top box. Technology providers have stepped in with solutions that do not necessarily involve relinquishing control. Content security specialist Kudelski, for example, has launched Follow Me, allowing TV viewers to stop watching something on the TV and resume from where they left off on a mobile device. But in this case, everything is delivered from a server and controlled from the head-end – there is no transfer of content between devices in the home. "We also have integration of the TV with the set-top, the PC and the mobile. Follow Me TV is available now," says Philip Stransky, senior vice-president, broad-

cast at Kudelski. "Today it's server-based, and the big advantage is you do not have to work within a home domain." Kudelski is however testing the secure transfer of content within the home, including over wireless networks. The company has developed a USB key that can bridge DVB conditional access and DRM, allowing content to be viewed, for example, on a PC as well as through a set-top box.

One of the central problems in allowing the transfer of content between devices in the home is the requirement that encrypted content (protected by DRM or conditional access technology) stored on the central access device must be decrypted before being re-encrypted and handed on to another enabled device with a different DRM system. The forthcoming DLNA 2.0 specifications will include enhanced security features such as DTCP-IP link protection. This is intended to protect content in transit between a central storage device and a display device. DTCP-IP is a transport protection scheme, not a content protection scheme, so there are fears that the networked home could open the door to content theft. Stransky believes that DVB-CPCM (Content Protection and Copy Management), a DVB standard that can enable the identification of 'authorised devices', can go some way to help secure the transfer of content across home networks. "We still have to work on the management of these rights and authorisations in the context of the home – we have not solved the issue of allowing the consumer to manage content in the home" says Stransky. "But the operator can set the rules from the headend and these rules and rights are taken into account with CPCM."

Some technologists are looking at other DRM initiatives, such as Marlin, a consumer electronics-driven project that has been adopted by the Open IPTV Forum. One of the key players behind this initiative is Ericsson, which unveiled its new IMS-based IPTV middleware at IBC, designed with the convergence of IP-enabled networks and devices in mind. "You can exchange content in a way that was not possible before," says Alan Delaney, business development director, IPTV, at Ericsson. "We'll ensure that our technology is in line with the Open IPTV Forum." The Open IPTV Forum's specifications have been built around IMS, with the first version to be released imminently.

But allowing high-value content to be moved from one content protection environ-



**Thomson's TG870 Femtocell gateway: fixed-mobile convergence will be key.**

## Cable operators and the connected home

For cable operators, which broadcast video over DVB-C RF networks, distribution of TV channels around the home brings an added element of complexity. The deployment of DOCSIS 3.0, which allows channels to be bonded together and gives operators more flexibility, could solve the problem by enabling operators to deliver video via IP.

At IBC in September video technology provider Cisco demonstrated a system where cable operators could deliver a variable bit-rate multiplex of channels at 50-60Mbps using MPEG-4 compression, leaving the rest of a theoretical 100Mbps pipe free for high-speed data. The prime advantage of going down the video-over-IP route is that it would enable the cable operator to deploy low-cost IP set-tops rather than expensive multi-tuner cable boxes. However it would also enable the exchange of content between IP-enabled devices in the home, opening the door to home networking to the PC, gaming console and other devices. "Otherwise stuff comes in DVB-C and you have to do IP encapsulation in the set-top. And the advantage of IPTV is that you can evolve to a standard middleware that's browser-based,"

says Nick Fielibert, chief technical officer, Cisco service provider video technology group, EMEA and Asia Pacific and principal engineer. "The other thing is you can stream to other devices in the home network such as PCs, or even use the PC screen instead of the TV."

Thus, operators with legacy digital deployments could provide basic DVB-C zappers to those customers with no interest in advanced applications and simulcast their TV packages in DVB-C and IP, while delivering VOD over the IP network. Alternatively, TV could be made available via low-cost PC monitors, for example, in children's bedrooms. "One advantage of this technology is it makes every PC a TV," says Charles Cheevers, chief technology officer at Arris Europe. Cable operators will retain the advantage of being able to multicast content to homes. "We can multicast DVB channels on the DOCSIS channel, and when you are ready, you can start sending stuff over IP to the PC, set-top, TV," says Cheevers. "You have to be careful because it's operationally complex. There will be rules defined. The only proviso is that the DOCSIS 3.0 network is in the home. You can't make it happen on single-tuner devices."

ment to another still carries risks. "The current DLNA scheme is based on the decryption at the source and then transmission over DTCP-IP," says Steve Christian, marketing director at Verimatrix, one of the content protection vendors adopted by Ericsson as part of its IPTV ecosystem. "The content is only minimally protected as it is transmitted from the source server to the client machine. Studios are concerned about that."

Verimatrix favours a proprietary approach (called 'multirights') where different versions of DRM-protected content are stored at the headend, and the server sends out the appropriate one for the device that is being targeted – in effect pulling control of premium content back into the service provider's domain (a similar concept to Kudelski's Follow Me). "Our thought is that, rather than do decryption and transcoding on a home server, which could be complex and expensive, you do it on time at the headend," says Christian. Such a

scheme, he says, could also accommodate different levels of content security appropriate to the particular version of the piece of content that was being delivered.

### Business model

The technology may be becoming more robust and reliable, enabling service providers to support home networking without the dreaded impact on their overworked customer-service departments. But that leaves open the question of whether or not they can make money from it. What is the business model for the managed home network?

One view is that the operators simply have no choice: if they don't enable the exchange of

content around the home, someone else will. "They may have to do it. If every consumer electronics [product] has it, then it's a must-have," says Steve Farmer, strategy and business development director, video solutions, EMEA at Motorola, which has a DLNA stack running on its mobile phones and set-tops. "Where we start to see potential is where you take content out of the home." Use of the technology by mobile operators could facilitate the delivery of services to devices in the home via mobile networks. Unlike pure fixed-line operators, who may see enabling mobility within the home as the starting point, mobile operators come at home networking from a different perspective. "If you have a mobile service you can make the mobile the centre of the home experience," says Farmer. "It's the mobile operators' way of getting in on the act. Then they can introduce a gateway with a Femtocell, giving high-speed broadband to the mobile in the home as well. You can move from being mobile to mobile-plus-broadband, and then extend that to high-speed broadband-to-mobile." Piggy-backing on the home network can enable mobile service providers to overcome poor in-home network coverage. However, the identity of the players that are best-placed to 'own the home' remains unclear.

"We want to make this a platform for service providers to generate more revenues and attract more end users," says Cisco's Fielibert. "They can use the presence of the hard drive in the gateway device as a solution to provide back-up services. If people store files on the gateway, it's attached to the service provider's network, which can provide those back-up services."

Operators, in other words, will have to be much more creative than hitherto in their product marketing. No longer will they rely exclusively on aggregating and selling content at a markup, but on providing a range of services that enhance their customers' ability to gain access to a deeper vault of content over a wider range of devices.

"Deploying



Pace demonstrated a DLNA server and client set-top box at IBC.

these platforms means a change in the way service providers do business," says Jean-Christophe François, director of business development, cable modems at Cisco. "It opens up opportunities to deploy additional services but they need to think about what services would fit their market. And it's important for us to integrate these business ideas into the platform."

Networking technology could enable some applications that would have clear benefits for both consumer and service providers. One is the use of peer-to-peer technology to exchange content between all the devices on the network. At IBC, set-top box and TV manufacturer Humax demonstrated the use of this technology to make video-on-demand delivery more efficient. The company teamed up with Korean digital media adapter specialist iCube to demonstrate six different DLNA-enabled DVR set-top boxes and other devices (which could be situated in different homes) working together. A VOD movie is played out from a central server. Over time, pieces of the movie are stored on the hard drives of set-tops on the network. As additional viewers request the

**Humax has demonstrated DLNA set-tops working together to deliver VOD.**

movie, the network enables it to be delivered using peer-to-peer technology from different set-tops and other network-attached devices that have already stored some or all of it.

Home security is another application that could have appeal. Service providers could allow customers to use their TV screens (or possibly their mobile phones outside the home) to view CCTV feeds from cameras around their property, for example.

Another idea is that convergence of devices could more easily enable the integration of over-the-top content into the service provider's offering, permitting for example internet-based video content to be displayed on the TV. "A lot of consumer electronics manufacturers are bringing DLNA devices into the market, enabling you to plug the internet into the TV via Ethernet," says Pace's Gillies.

The service provider could establish business relationships with a wider range of content suppliers that wanted to reach its subscribers. "You could get revenue from a third



party that wants access to our end users, or they could be prepared to share some advertising revenue," says Cisco's François.

For operators this could be a business opportunity. However, if bandwidth ceases to be a scarce commodity (as could be the case if ultra high-speed broadband achieves widespread market penetration) or if regulators step in and mandate 'network neutrality', it could also be a poisoned chalice, allowing over-the-top content providers to bypass the service provider and get access to the TV screens of its premium content subscribers.

Despite the dangers, as the technology become more widely adopted, service providers will likely come to understand that they have little choice but to embrace it – before someone else does it first. "The operators have to do something. Most of the big consumer electronics manufacturers have solutions today," says Gillies. ●

## A shared vision

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