Service providers must provide what the content consumers want and deliver it with maximum flexibility, convenience and QoE. This requires a Content Delivery Network, but there are a host of business models available. Colin Mann navigates his way through the choices facing industry players.

A t the outset, there is the thorny question of whether providers should build their own Content Delivery Network (CDN), buy something 'off the peg,' rent from a third party or share with other providers. According Rob McManus, product marketing manager at Nokia Siemens Networks, operator networks need the capability to be 'content-aware', primarily to intelligently deal with exponentially increasing data traffic. "With content aware network assets, operators have the opportunity to add unique value to content delivery, breaking away from the perceived mentality they are only the 'last mile' of the delivery chain. Operators are strategically positioned to influence and control the user experience, all the way down to the user device, which gives them a significant opportunity to add value and differentiate. By integrating content delivery into the fabric of their network architecture, operators can deliver content at the right priority level, in the right format, with the right timing and in the most efficient manner," he says.

A typical use-case for an operator-owned Content Delivery Network is to deliver the operator's own content and services, says NSN. "The CDN provides the underlying delivery mechanism and ensures the network infrastructure delivers the best possible and most efficient Quality of Experience (QoE). Operators who own content rights and typically provide services over their network are usually keen to extend their content to other IP-connected devices. As users increasingly consume video content on their PCs, laptops and on their WiFi connected smart devices, even when at home, efficient use of these devices requires a CDN capability in the fixed network. However, once on the move, users

expect their video entertainment to be readily available on their smart devices, which also requires a CDN capability in the mobile broadband network," he advises.

According to McManus, offering content delivery as a service to third parties is a new and attractive business opportunity for operators. "It is important for the services offered by operators to be differentiated from those offered by established global CDN vendors. While their geographical reach gives global CDNs an advantage, global content is not always regionally or locally relevant. Global CDN vendors are an easy target for operator CDN service offerings initially, especially since operators have full control of the content delivery, which makes it possible for them to offer their unique and personalised services."

FLEXIBILITY. In McManus's view, a CDN approach needs to support multiple business models to enable operators to flexibly offer different types of CDN services:

● Direct CDN services agreement with content providers - in this case, the operator has a direct agreement with the content provider. Content requests originating from the operator's domain are redirected to the operator CDN for the most efficient delivery. This is especially relevant for big operators with multi-country operations, but also for smaller operators offering local/regional content. In fact, a surprisingly high proportion of content is applicable only to a narrowly defined locality, due to licensing, language, cultural reasons or relevance to a specific community. For these cases, the reach of global CDN players is not a differentiator and operators can offer delivery services in a more efficient and differentiated manner.

● CDN termination of global CDN content – although global CDNs may have extensive network infrastructure around the world, the operator is the only entity who can control the delivery of the content down to the user device. Global CDNs are starting to realise this and, as a consequence, are increasingly willing to integrate with operator CDNs. The content agreement is still between

the content provider and the global CDN, but the content is delivered by the operator from its own CDN. In this type of arrangement, the operator does not have to interact directly with the numerous OTT content providers, but instead brokers a 'revenue-only' share arrangement with the global CDN provider. Operators can also apply value-added features to this content, raising their position in the value chain and their share of the available revenues. By having their own integrated CDN infrastructure, operators can terminate traffic from multiple global CDNs and offer this content as well as their differentiating value-added services according to the negotiated service levels.

● Wholesale CDN services - in this case, operators offer CDN services 'in bulk' to smaller or regional operators or other

Only an integrated response through an operator CDN will fulfill the increasingly multi-dimensional requirements and opportunities that consumers demand."
DR PAUL STALLARD, ERICSSON

First-class delivery

service providers for re-sell. This is attractive in countries with a large geographical reach or fragmented service provider market.

COMBINATION. McManus believes that a combination of business models will prevail. Operators will have direct content agreements with large global content providers and significant regional content players. As to whether CDNs will be hardware-based, cloud-based or hybrid, he suggests that operator networks will implement content awareness and intelligence to deal with content delivery in their networks. "It makes sense to locally cache some content types and provision these within close proximity to the subscriber. However, this requires storage and processing capability in the operator environment, which can be provided with dedicated hardware but also with private cloud-based infrastructure, which is shared with the other virtualised network elements of the operator network," he advises.

In terms of hybrid content delivery, he notes that while P2P based distribution provides some impressive efficiency gains under certain conditions, it also creates some technical, operational and potential legal issues. "For example, managing P2P traffic is challenging (e.g. the upstream traffic it creates burdens asymmetric networks, causing an

issue for mobile networks). Live traffic in the mobile environment is most likely to be served with emulated multicast techniques and with on-demand methods, both supported by efficient CDN distribution,".

CLIENT. David Treadway, managing director, WRN Broadcast, argues that the market should be dependent on what a client requires rather than trying to shunt content owners and others into pre-determined boxes. "WRNB's approach, as an experienced managed services provider, is to work with the client to understand their needs and then provide the right solution – that could be off the peg, bespoke or shared," he says. "CDNs largely depends on scale and geography; large broadcasters, for example will want the confidence and security of operating their own CDN in their home territory but this is unlikely to be the most appropriate solution for markets elsewhere in the world," he suggests.

Skip Rudolph, VP of CDN marketing at Tata Communications, suggests there are two use cases in the content domain for service providers – servicing content providers or servicing content consumers. "The former would require an extensive CDN, whereas the latter would require a transparent caching functionality. In the latter case, it's all about

"If the OVP operator owns or outsources CDN elements, it is simply a product of economics of scale."
MATT VIDMAR, VISION 247

providing a solution for the content owners or publishers, either directly or indirectly, and delivering a great experience for the content consumers. Since content owners don't usually look at owning and operating infrastructure as their core competency, they need service providers to provide an end-to-end solution for storing, distributing and managing content. In some cases however, content owners may want to keep the original copies of sensitive content on their own premises or under their direct control," he notes.

He recommends that content owners should work with CDN providers that have the flexibility to customise their solution towards the needs of a particular customer. "For example, at Tata Communications, we offer the customer a choice of storing origin content

on their own premises, on a cloud-based service, or using our CDN as an origin store. Customers can also choose from a range of configurations such as the geographies where content should be delivered, the format and speed of media, mobile and other end devices to which the content is delivered, *etcetera*," he advises, adding that in some instances, big CDN players collaborate with smaller regional service providers, which allows the latter to offer their customers a hybrid of home-grown capabilities and a global CDN service.

FUNCTIONS. Dr Paul Stallard, head of TV systems management, Ericsson, suggests that all successful CDNs encompass a set of certain functions and features, including caching; service creation, management and enhancements; and value-added services and features. "The best approach will be subject to each service provider identifying the business model that suits their own specific circumstances. I don't think there is a single model that all service providers should necessarily adhere to, but the test will be to find intelligent ways to redress the balance between reducing costs and finding new revenue streams to exploit the changing landscape."

"One of the key shifts for service providers is to convert from being a passive carrier of other people's content to become an active intermediary, delivering unique functionalities and benefits to the other players involved in this market. CDN technology will be fundamental in handling the growth of this increasing managed and unmanaged network traffic, especially when you consider that consumers are becoming increasingly demanding regarding the quality of service and experience they expect and receive when viewing OTT TV content. As the number of broadband-connected devices grows and consumers demand more and higher quality video, the traffic load on operator networks will only continue to rise," he notes. "CDNs can help to reduce the amount of infrastructure needed to overhaul traditional operator business models and the development of an efficient solution will support network operators in optimising content distribution across their entire infrastructure, to drive content across any platform to any screen via multiple streaming and delivery formats," he adds.

Fearghal Kelly, SVP global partner solution development, KIT digital, suggests that a service provider can add considerable value to a network not by being a CDN but by being able to prioritise and guarantee packet delivery. "Specifically, it's the ability to ensure HD video streams encapsulated in IP packets get to the audiences' homes without any buffering. Fast Channel Switching is another story. The assumption must be that consumers will eventually have unlimited digital highway. The service providers will always be standing at the junctions, however. BT's media delivery offering suggests that CDNs are under threat," he notes.

IN-HOUSE. Jean-Louis Lods, head of projects and proposals at Chello DMC, notes that Chellomedia is launching an OTT service in Q4 2012, and its approach initially will be to buy off the peg capacity to manage the cost for the project. "However, in parallel, we are building a business model to understand when the utilised volumes on the CDN trigger the decision to move towards having our own CDN. We have to be sure that we understand the full operational cost, including having the right level of in-house support, before making this decision," he reveals.

Matt Vidmar, chairman and CTO, Vision247, suggests that depending on the size and business model of the service provider, there is going to be commercial and operational logic for looking at adopting an in-house CDN, whether newly built or through acquisition for fast entry to market. "The recommendation to all content owners/channel operators is to use as a minimum, two CDNs to run their service. Just as with traditional TV signal distribution, any large network will always have their signal carried on at least two satellites in case of outage."

"One could argue that CDNs are always hardware-based due to the fact that CDN implies service facilitated by dedicated hardware servers running live and video on demand (VOD) hosting with streaming server applications. The CDN service can then be configured either as a 'private cloud' where the customer is allocated a pre-agreed number of dedicated hardware boxes which are configured to deliver the bespoke requirements; or a service can be configured as 'public cloud', where server allocation to facilitate a customer is achieved with elasticity automation algorithms that dynamically allocate extra hardware capacity on a per need basis. In practice, the recommendation for larger operators is to configure their CDN solution in a hybrid model, where encoders, transcoders and origin servers which host content are running in a 'private cloud' configuration, whilst streaming edge servers are configured in 'public cloud' configuration" he notes.

RENTING. According to Bart Palmer, CTO GlobeCast Americas, in most cases, a provider seeking to build the network infrastructure necessary to support NOC (Network Operation Centre) operations would find them far too costly, unless you are talking about a massive volume of traffic. "Otherwise, renting is certainly an option. As far as the technology used and whether the CDNs will be hardware-based, cloud-based or hybrid, this will depend on geography, on the volume of content needing to be stored (particularly for catch up TV applications) as well as disaster recovery need as the value of those services increases."

Other fundamental issues to address are whether service providers can leverage their assets such as access networks to become CDNs in their own right, or will the distinction between ISPs, telcos, CDNs and online delivery platforms remain, and what role will partnerships with content owners play?

Chello DMC's Lods feels that service providers can indeed leverage their assets but it's not just about network access and capacity. "These may remain distinct services for some time. The real benefit to a Service Provider like us is in using the more traditional broadcast tools like Channel and Asset management systems and transcoding services. These back office systems required to provide and manage content are already in place," he advises. "There is a distinction in roles but scale and geography of market to be serviced will be the determining factor. Being 'On Network' lowers variable costs, provides better performances and ultimately gives you better control over the delivery of your service, and will determine the relationships with ISPs and Telcos. We believe content owners will want to deal directly with their customers in the end but CDN functionality in itself does not enable that relationship, in fact CDNs can be reduced to the role of heavy lifting only. By its nature CDN are designed to deal with increased bandwidth and the continued placement of edge servers On Net will allow for this growth, getting the final content distribution point as close to the user as possible," he says.

REVENUE. Jacques Le Mancq, president and CEO of Broadpeak, suggests that Network Service Providers (NSPs) are closely looking into the CDN opportunity as a way to grow their revenue but also as a way to organise the 'tsunami' of Internet video over their network infrastructure in order to reduce costs. "But in order to capture the share of the CDN market they deserve, which is the one made of local or national traffic going through their network, Network Service providers need to deal with two issues," he says.

"The first challenge for operators is to leverage their infrastructure to beat CDNs on quality, but also on price. At Broadpeak, we believe that the home network, where NSPs invest billions of dollars every year through STBs or Broadband Home Gateways, is a unique advantage they can use to deliver video to the masses at a very low cost and with a superior Quality of Experience. The idea is to use home devices resources to execute CDN tasks at the home level. Using a CPE device as a tiny CDN or NanoCDN is about distributing the CDN task at a home level. That's even closer than any deployment at the edge of the network. By using this NanoCDN technology, network service providers can tap into unique resources that are not available to traditional CDNs to help them play a growing role in the overall CDNs
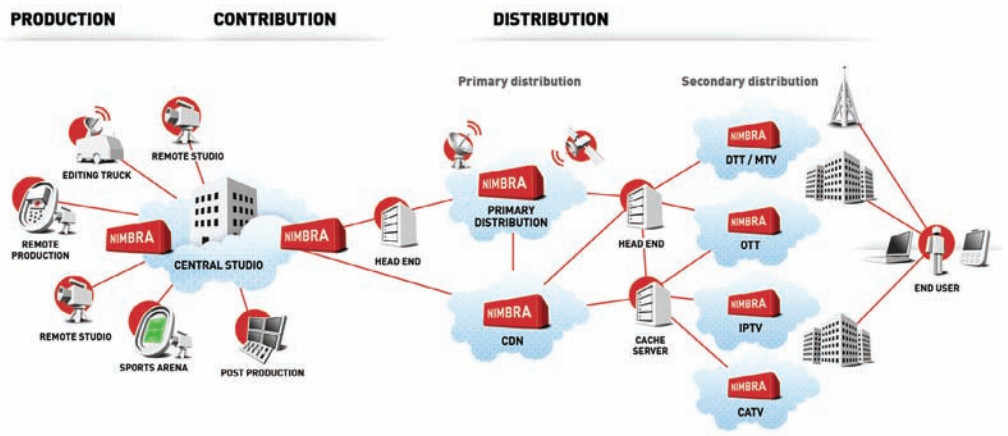
market."

"The second challenge is related to the business relationships that need to be established between content providers and telcos or cable companies. While the federation model offers a solution with a hierarchy between Primary NSPs and sub-NSPs, we believe that nobody wants to be a sub-NSP and work needs to be done to offer a better model to organise the NSP CDN market place," he contends.

LAST MILE. Tata Communications' Rudolph points out that other than infrastructure, there is a big fundamental difference between the 'last mile' service providers and the 'core' service providers. "The former tend to own customer relationships with content consumers, while the latter tend to own the customer relationships with the content publishers and content owners. Because of

these differences, there will likely continue to be some differences in how different providers are positioned in the value chain: standalone CDNs, global carrier CDNs such as Tata Communications' CDN, and last mile service providers. The only way for a service provider to leverage its last mile is to cache content closer to customer eyeballs and try and charge its eyeball subscribers for an improved quality of experience. This business model is still emerging," he admits.

"Standalone CDNs rely on putting their equipment deep inside many ISP networks, in order to achieve the required reach to global audiences. A carrier CDN such as ours already has the peering with hundreds of last mile service providers. Because of these peering relationships, we have the advantage of needing our equipment in relatively fewer locations, while still achieving the perform-

50% of operators to deploy caching, CDNs

For Infonetics Research report *Fixed-Mobile/CDN Routing Strategies and Router Leadership: Global Service Provider Survey*, carriers with Carrier Ethernet Switches (CES) and IP edge routers

were interviewed to assess their needs and analyse trends in the router and CES market. Results suggests they are using caching and content delivery networks (CDNs) to move frequently used content closer to the consumer.

"The three-headed monster of video, mobility, and the

cloud is putting enormous pressure on operator networks, and throwing more routers at the problem isn't the answer because traffic is rising much faster than equipment prices are falling," notes Michael Howard, Infonetics Research's co-founder and principal analyst for carrier networks. "This is driving a fundamental shift in how IP edge networks are being architected, with carriers combining their fixed and mobile networks for operational efficiencies and using caching and content delivery networks (CDNs) to move frequently used content closer to the consumer, speeding up response times and greatly reducing the amount of traffic crossing the network."

According to Howard, the survey shows the top three

drivers for deploying CDNs are providing a better quality of experience for customers, network optimisation, and reducing the cost and traffic load associated with delivering over-the-top (OTT) video content.

Key findings from the Fixed-Mobile/CDN Survey include:
● Over 50% of service provider respondents plan to deploy transparent caching or CDNs by 2014
● Four-fifths of respondent operator networks carry mobile traffic
● Service providers rate Cisco, Alcatel-Lucent, and Juniper as the top service provider edge router and/or CES vendors; Cisco and Juniper also top the list of core router manufacturers

Top Drivers for Deploying Content Delivery Networks

Percent of Respondents Rating 6 or 7, Where 7 is "Critical"
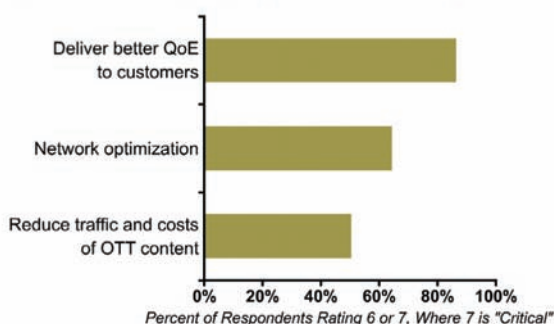
© Infonetics Research, Fixed-Mobile/CDN Routing Strategies and Router Leadership: Global Service Provider Survey, July 2012

ance and reach to global audiences. Since we also have relationships with content owners, we have the opportunity to work with last mile service providers as well, and explore ways of providing managed services such as transparent caching or an extension of our CDN into these last mile providers."

According to Ericsson's Stallard, the revenues generated for the actual network owners by new third party services are failing to keep pace with the investment needed to keep the networks operating efficiently and the customer properly satisfied. "One solution is to use the growth of OTT TV to actually strengthen the future strategies of network operators," he suggests. "As an industry, we need to look for ways to enable service providers to evolve their networks to take on these new challenges. One of the main purposes behind Ericsson's development of its Media Delivery Networks (MDN) infrastructure has been to add power and intelligence to manage the inevitable and continuous growth in traffic, while also helping operators to develop new revenue streams and business models."

DEMOGRAPHICS. "Service providers need to form a better understanding of what their customers are doing to react to the change in consumer viewing behaviours, market demographics and audiences, which are continuing to transform with the emergence of new technologies, displays and devices. They must also look to find new ways to add value and new functionalities to their own networks and back-office systems. It is essential for network operators to develop a common content delivery platform that is able to support multi-channel TV, video-on-demand and over-the-top video content from the same core infrastructure," he recommends.

Thierry Fautier, senior director convergence solutions, Harmonic, notes that new technology advancements are giving content and service providers the flexibility to host part of the CDN, e.g.: the origin server, as opposed to relying on a complete third-party content delivery network. "Harmonic has designed its ProMedia Origin streaming video server to support a variety of CDN architectures, and also offers multiple CDNs to compete on price and SLA, enabling content and

service providers to choose a CDN method that best fits their needs," he advises.

"There are currently three main types of CDN ecosystems: a hosted CDN, where content providers pay as per a 'pay as you go' model by having a third-party CDN operator completely handle the storage and delivery of their assets from an outside network; a managed CDN, where a third-party CDN manages the assets from inside the content provider's network; and a private IP network, where content providers deploy their own CDN through an edge cache," he says. "All three CDN architectures have their own unique benefits and drawbacks; it is up to the content and service provider to decide which model best meets their needs."

PORTFOLIO. According to Vision247's Vidmar, the distinction between ISPs, telcos, CDNs and online delivery platforms will definitely remain, but both CDN business models and technologies are rapidly evolving. "The CDN service portfolio for example is expanding to include traditional broadcast services, which customers expect as a matter of course from CDN operators. A complete service will therefore provide: support for all streaming protocols; satellite downlinking; file transcoding; scheduled playout to originate new channels; content archiving; subscriber management; and payments processing. This market condition is rapidly driving all major CDNs to become a full-blown online video platform (OVP) operator and not just VOD and live stream hosting and delivery providers."

Rory Murphy, content and digital media director at Equinix, suggests there has been a host of developments in provision of content delivery networks over the last couple of years. "This has been driven by increase in broadband speeds, availability of content and proliferation of devices that consumers use to watch content. These elements are surfacing new options to cache and deliver content.
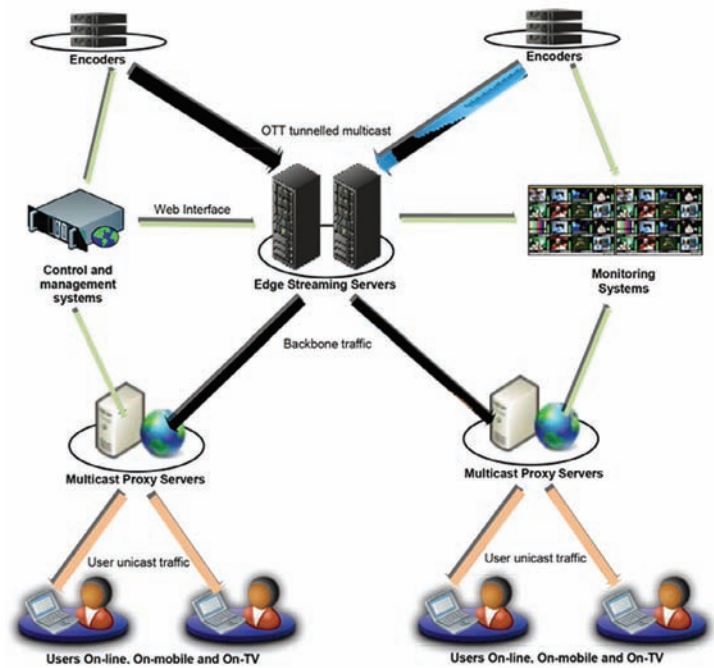
CDNs continue to offer a key service taking in functions across the media workflow, including transcoding and security alongside content delivery itself."

He identifies further options:
- Telcos are developing their own services to deliver content within their own network, like BT's Content Connect, and many Networks can operate transparent caching capabilities through providers like PeerApp;
- Netflix has announced plan to move away from using 'traditional' CDN partners in favour of its own Open Connect (CDN) Network. This puts the Data Centre in a key position as in order to distribute their content Netflix will provide an option for ISPs to get the Netflix data at common internet exchanges, which is where Equinix has a strong presence.

"Partnerships with content owners will remain essential and they in turn will be looking for CDNs to provide quality delivery of VoD and Live TV at attractive prices. To meet these needs, CDN operators will need to look at the infrastructure layer and platform behind the software and choosing the right data centre partner can help give them an advantage," he says.

TURNKEY. GlobeCast's Palmer suggests the distinction will remain for the time being. "The larger players that are currently telcos such as Level 3 have the required infrastructure in place and the largest piece of that is the fibre. However, for large strategically-important projects, service-providers can certainly provide turnkey solutions, including the CDN portion if it makes economic sense for the provider and the client."

Christopher Ryder, business development

manager at Net Insight, believes that telco CDN is and will be a very big thing, for both technical and commercial reasons, highlighting Netflix Open Connect, the accelerating numbers of white label, re-sold pure-play and licensed CDN offerings and many other initiatives speak clearly to this trend and much has been written about it.

"A less explored topic is the apparent dichotomy of QoS versus QoE and how suited the store-and-forward architecture of traditional CDNs really is for primetime video delivery. The local nature of video, the need for quality when moving up onto the first screen and the importance of live creates a challenge worthy of further consideration," he suggests.
INVESTMENT. With Content Owners jealously guarding their content, yet seeking to monetise it, will they increasingly seek to deal directly with the consumer, or will there always remain a need for a CDN in between?

Broadpeak's Le Mancq says the company "strongly believes" there will always be a CDN function in the middle. "Some content providers are deploying their own infrastructure to reduce costs or get more control. While we think, this trend will grow, we do not believe it is going to become the norm. As the CDN market grows more and more competitive and as the network service providers deploy new technology, we believe it is a better investment for content providers to work closer with network service providers than building their own CDNs," he says.

Rudolph notes that CDNs – whether they are standalone companies or services offered by network service operators – improve the end user experience that content owners deliver to their customers. "This means that content owners see improved engagement with their audiences through increased page views and ad impressions, as well as improved conversion rates for content subscriptions and ecommerce. Some service providers go further than stand-alone CDNs by offering not only CDN services, but also other services such as co-location, managed hosting and transit that help content owners address more of their infrastructure requirements with an integrated managed service on a Tier 1 network," he advises.

According to Stallard, there will always be

a need for a CDN; it is just a question of whether that CDN is one of the global players, an operator CDN or one provided by the content provider itself. "In order to support the continued development of content consumption behaviours (while also generating revenues), network operators will need to look for a more holistic approach that will enable them to readily open their network and supporting commercial systems to selected external content partners. Only an integrated response through an operator CDN will fulfil the increasingly multi-dimensional requirements and opportunities that consumers demand," he suggests.
MULTISCREEN. "Although the current threat of over-the-top (OTT) is not going to disappear, consumers are moving towards multi-screen. This means a lot of investment will be required to carry the vast amount of video traffic across the networks and if network operators are to differentiate themselves against OTT offerings and earn additional revenues from their customers, they must offer additional functionalities as well as an enhanced user experience," he recommends.

"Content is becoming implicitly intertwined with second-screen and social networking, so service providers need to offer a service that clearly defines them against pure-OTT providers, which will enable them to earn additional revenues from their customers. Service providers will also need to enhance the user experience for their customers and increase the number of opportunities to generate additional revenues by managing the insertion of strategically located adverts in the content flow or by offering services such as transcoding at appealing prices."

Vidmar suggests that most large content owners have already exposed their content directly to consumers via their own brand portals, although at the same time they also distribute their content via third party portals; simply replicating online the old established cable content syndication model. "There is always CDN technology and infrastructure underneath any OVP (Online Video Platform) service, if the OVP operator owns or outsources CDN elements it is simply a product of economics of scale. For example, Google operates YouTube over its in-house CDN infrastructure, which includes owning most of the fibre that its backbones utilise," he notes.
EXCUSIVITY. Harmonic's Fautier suggests both eventualities can be achieved. "Larger content providers such as ABC, CBS, and NBC have a direct connection to consumers through their website, enabling them to

monetise their content through exclusivity. However, they will always be in need of a CDN to transport the data, as opposed to wired operators who can easily build a CDN infrastructure and therefore reduce their associated CAPEX and provide a better QoS," he notes.

According to Equinix's Murphy, end users will always desire the best quality experience they can get. "They may not care to understand that a single video asset has to be encoded/transcoded into multiple formats and resolutions and distributed over countless networks to playback at good quality on their connected device as that's the challenge for the wider industry to meet," he says, while accepting that core CDN providers will continue to meet the needs of many website and streaming media businesses as they have established networks and crucially can cache close to the end user, using their own or points of presence and interconnection at data centres such as Equinix and/or by working with network providers direct.

For Palmer, the technology provided by CDNs is "absolutely necessary" as a link between content owners and their subscribers. "Providing secure encryption and authentication is a must, and as we mentioned, it would be cost-prohibitive for content owners to build such a system themselves and keep it updated with the latest protection. Pay-TV operators and telcos have done a very good job of implementing ISP-based services to accommodate and handle this," he notes.
CHEQUE-BOOK. KIT digital's Kelly contends that QoS can only be guaranteed by the local service provider/ISP. "If the IP routing issue is higher up the chain, then companies such as Conviva could be hugely influential. There is a gap in the market for organised local caching, which historically CDNs have tried to address. The issue is, however, that the CDN is paid for the data transfer by the content owner and the service provider gets nothing for providing QoS. It's possibly a cheque-book issue as opposed to a technical one," he remarks.

Net Insight's Ryder points out that while the Netflix Open Connect news caused the Akamai stock to drop 6.5% almost instantly, the discussion about content owners building their own CDNs is somewhat exaggerated. "There are perhaps half a dozen content owners worldwide with the volume of data, technical know-how and money to build out their own CDN – and these account only for a minority of the global CDN business. The need for services which deliver video over the Internet will remain – but it is not clear – or perhaps even likely – they will look like they do today," he concludes.