

TV AND DIGITAL VIDEO

The challenges of IP TV **and video delivery**



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INTRODUCTION

TV and video production and distribution are undergoing a period of disruptive change that looks set to continue for the foreseeable future. Massive growth in IP-delivered and over-the-top (OTT) video, the rise of multiscreen viewing and TV Everywhere, and the availability of an ever-increasing range of consumer devices are combining to drive a significant shift in viewer behaviour. Alongside this shift in viewer behaviour, game-changing developments in distribution technology and market structure have opened up fresh opportunities to new entrants and established players alike, but also bring challenges that must be addressed.

Drawing on findings from research interviews with a range of companies across the value chain, this white paper discusses strategies that companies in the digital media sector can adopt to help them meet the challenges and take advantage of the opportunities.

It will be of interest to companies involved in the production and distribution of video and TV content, especially:

- **Content owners and distributors** — including studios, post-production companies, broadcasters and OTT service providers
- **Providers of media solutions and services** — technology and service providers who support content owners throughout the production and distribution workflow

A companion white paper, 'The role of cloud in content production and delivery', looks in more detail at the adoption of cloud in multiscreen video and TV delivery, and the factors to consider in order to strike the right balance between public cloud, private cloud and dedicated infrastructure.

RESEARCH METHODOLOGY

UK-based research agency FirstPartner undertook qualitative research to explore the commercial and technical challenges facing digital media companies. In-depth telephone interviews were held with a range of companies representing all stages of the video production and distribution workflow.

THE EVOLVING TV AND VIDEO LANDSCAPE

Viewing habits are changing dramatically thanks to the availability of more connected devices, OTT services, social video and time-shifted viewing. How is the TV and video industry responding, and what is the impact on monetisation models?

The TV and video sector is experiencing a period of disruptive change resulting from wide-ranging interdependent developments in viewer behaviour, technology and the competitive landscape. We believe the following key trends will continue to disrupt the way content is produced, delivered and monetised for the foreseeable future.

MULTISCREEN VIEWING AND TV EVERYWHERE

By embracing the viewing opportunities offered by the proliferation of connected devices and OTT services, people are fundamentally changing the way they watch TV and video. Established service providers and new entrants are responding — and further fuelling the trend — by offering richer services with more, higher-quality content.

Leading multiscreen OTT services continue to experience significant growth in viewers and, therefore, revenues. In 2013 Netflix grew its subscriber base by 33% to over 44 million members — more than double the subscriber base of Comcast, the world's largest pay TV operator — and its revenues increased by 21%¹.

BBC iPlayer TV requests for 2013 were up 27% on 2012 and reached a record 248 million requests in March 2014. Mobile phones and tablets are now the source of nearly 50% of iPlayer requests². The market has reached the stage where TV drama content is being commissioned by OTT providers for online-only premieres. High-profile examples include Netflix's successful 'House of Cards' series and its recent commissioning of the 20-hour £100m series 'The Crown'.

Social video also accounts for a significant share of viewer time. Over 6 billion hours of video are watched every month on YouTube and 100 hours of video are uploaded every minute³. Social video services are an important distribution channel for content owners of all types.

In North American and Western European markets, many established broadcasters, cable companies and IPTV-based multi-system operators (MSOs) have responded to the multiscreen challenge — and the threat to their audiences and revenues posed by new entrants — by launching TV Everywhere services that incorporate both live content and video on demand (VoD).

Leading multiscreen OTT services grow around 30% per annum

GROWTH OF VIDEO REQUESTS ON BBC IPLAYER 2013 vs. 2012

+27%



+33%

GROWTH IN NETFLIX ACTIVE USERS IN 2013

Source: NetFlix Annual Report 2014

Source: BBC iStats - iPlayer performance pack

Online TV and video revenues increased ten fold in 3 years

63% CAGR

€1.8 bn



2009



€7.9 bn



2012

Source: FirstPartner Analysis of data from Ofcom International Communication report 2013. Only includes UK, France, Italy, Germany, Japan and US. Original Data in GBP converted using Exchange rate of 1.23 GBP/EUR

Smartphones have become a major channel for video distribution

91%

USE SMARTPHONE FOR ENTERTAINMENT ACTIVITIES



73%

WATCH VIDEO CONTENT ON SMARTPHONE

Source: Ericsson ConsumerLab TV & Media, August 2013

Figure 1. The growth in OTT and multiscreen TV and video

TIME-SHIFTED VIEWING

Time-shifting now accounts for around 7.5% of TV viewing hours⁴ with people increasingly preferring online catch-up TV and other VoD services to the traditional personal video recorder (PVR). This means that viewers are moving away from consciously selecting and pre-recording content, and instead expect it to be available whenever and wherever they want to watch it.

This shift in viewer behaviour further implies a likely move away from the traditional PVR/set-top box (STB) form factor towards low-cost, thin-client STBs deployed in the cloud or provided on HDMI dongle-based hardware, similar in concept to Google's Chromecast. This move will be facilitated by:

- HTML5, which allows services to be rendered in a web browser by cloud-based network digital video recorders (nDVRs)
- Hybrid cloud-storage technologies that enable recorded content to be securely stored on and streamed from other storage devices owned by the viewer

Despite the growing popularity of time-shifted viewing for some types of content, linear broadcast (via traditional and IP delivery channels) remains critical for news, sports and 'event TV' content. As we will see later, this is a major consideration for service providers delivering the content distribution workflow.

QUALITY EXPECTATIONS

Viewers want more than choice and flexibility, however: they also have high expectations when it comes to quality. Analysis by online video optimisation company Conviva⁵ indicates that consumers are rapidly becoming less tolerant of video buffering: in 2013, people watched an average of 11 minutes less video as a result of a 1% increase in buffering.

Quality expectations will increase as Ultra HD content becomes an increasingly important part of the online and multiscreen mix. Sony launched a 4K download service in late 2013 and Netflix announced the launch of its 4K catalogue in May 2014. Other providers will follow, but take-up of 4K will be a gradual process, for reasons that include the following:

- 4K standards are still evolving
- A critical mass of content is yet to be developed
- Widespread take-up of 4K-enabled TVs — which are still expensive — is yet to happen

MONETISATION MODELS IN TRANSITION

Monetisation models are also in transition, with advertising models widely expected to change. Unicast delivery of content to individual viewers makes targeted TV advertising possible; and increasing convergence of TV and the web will drive convergence of commercial models, as TV spend starts migrating to performance-based models.

Shorter release windows for films and TV programming put additional pressure on studios and production companies, who must prepare multiple localised versions along with trailers and other promotional assets for simultaneous worldwide, multi-platform release.

But it's not just about film and TV. Video is a key part of the content mix for news, information, sports, retail and corporate sites and apps.

“...the digital marketing use case is driving an enormous amount of content production... that is where a lot of people are focusing their marketing budgets. We see [this] really driving significant volumes of video and of consumption”

Video distribution service provider

These changes are creating audiences that are much more fragmented and less predictable than they ever were in the linear broadcast world. So how is the industry responding, and what is the impact on the TV and video production and distribution value chain and workflow?

THE VALUE CHAIN IN TRANSITION

Changes in viewing habits and the advent of Ultra HD and 4K are forcing content producers and distributors to change how they work — leading to the adoption of IP-based workflows, software- and cloud-based services, and hybrid distribution models.

To put the issues and challenges in context it is worth considering the value chain and workflow from video capture through to delivery to the viewer's device. For the purposes of this paper we define the stages as shown in Figure 2.

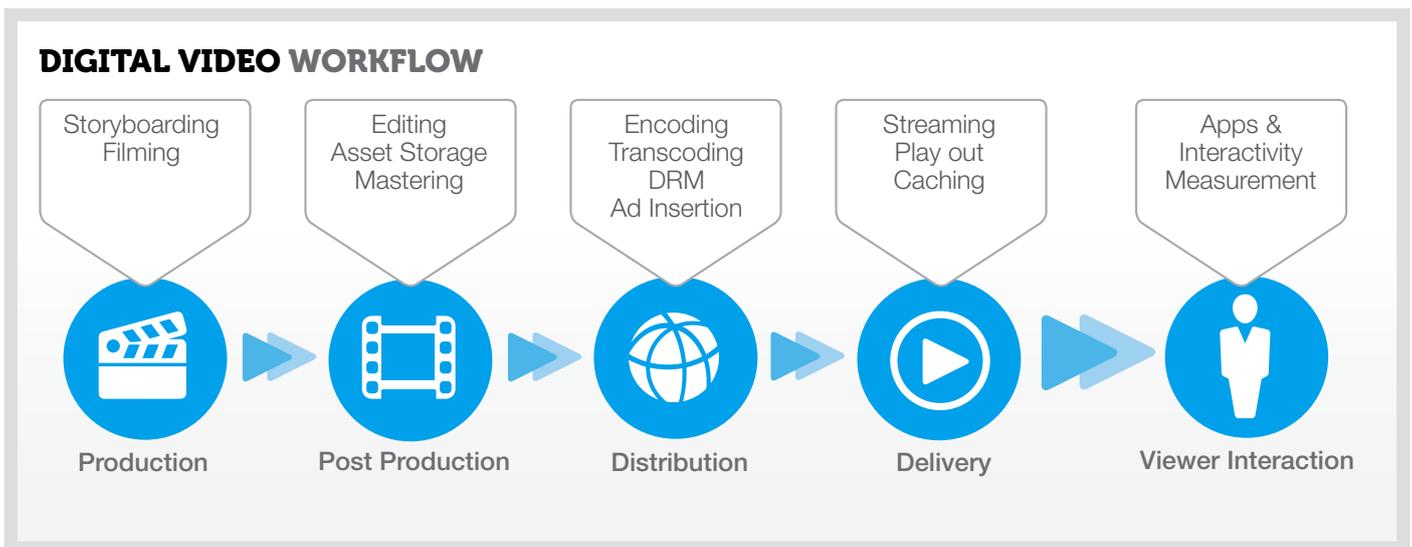


Figure 2. The digital video workflow

In addition to the changes in consumer behaviour and the growth in IP and multiscreen distribution, three further factors are disrupting the workflow and the landscape in which production and distribution companies operate:

- The emergence of end-to-end IP workflows
- The move to cloud-based infrastructure and services
- The blurring of boundaries in the distribution value chain, as studios and channel operators increasingly distribute content to consumers directly as well through third-party broadcasters and MSOs

Many organisations are finding that their roles — and the expertise and resources they need access to — are also changing. For example, production companies and studios must now manage parts of the distribution workflow that were traditionally the domain of broadcasters and cable companies — putting them in the role of media solution providers who bring various outsourced distribution partners together. At the same time, many broadcasters, MSOs and cable service providers are moving from a directly controlled, dedicated distribution infrastructure to a hybrid model that incorporates OTT delivery, cloud-based infrastructure and third-party distribution partners.

As a consequence, providers of software- and cloud-based outsourced services are increasingly relied on for solutions ranging from collaborative production and storage facilities to encoding, workflow management and distribution services.

Providers of software- and cloud-based outsourced services include:

Adobe	AFrame
Avid	Brightcove
Cisco	Deluxe
Elemental	Envivio
Ericsson	Harmonic
MobiTV	RGB Networks

The next section looks in more detail at the challenges presented by these changes.

THE CHALLENGES FOR PRODUCTION AND DISTRIBUTION COMPANIES

Production and distribution companies are dealing with challenges in many areas: how to meet growing demand for content and deliver it in a timely way; and how to connect efficiently with workflow partners, keep content secure, and manage multiple file formats.

The rise in demand for multiscreen video, the fragmentation of audiences and devices, and the changes taking place in the industry value chain pose a number of fundamental challenges for production and distribution companies. The key challenges that emerged from our research were:

- How to accommodate growth and fluctuation in demand
- How to optimise connectivity with an increasing number of service and distribution partners
- How to ensure the security of content throughout the workflow
- How to deal with the multiple file formats required to deliver to a rapidly expanding and diverging device base

THE GROWTH CHALLENGE: MANAGING UNCERTAINTY

“You have almost got the perfect storm where the tools to create the content are more available and cheaper. Then requirements for multi-platform, multi-device viewing mean that each piece of content needs to be multiplied to reach all of those different devices. Finally you've got the consumer wanting to watch the content on each of those devices. So if you take those three pieces together, what you see is an absolute explosion in the amount of video content that is being produced and distributed”

Video distribution service provider

Demand for IP video is growing rapidly — a trend that can be seen by comparing streaming video traffic for NBC's coverage of popular events at the 2012 Summer Olympics in London and the 2014 Winter Olympics in Sochi. According to Akamai, the peak in demand for streaming video from Sochi was nearly 2.9 times that for London just two years earlier⁶, even though the summer games have a much broader appeal.

The 2014 World Cup further showed the importance of online and mobile distribution. Of more than 2.7 billion rebroadcaster World Cup online video starts analysed by the Adobe Digital Index, on peak days, nearly one in four was on a smartphone or tablet⁷.

Video will represent more than two thirds of Internet data traffic in 2018

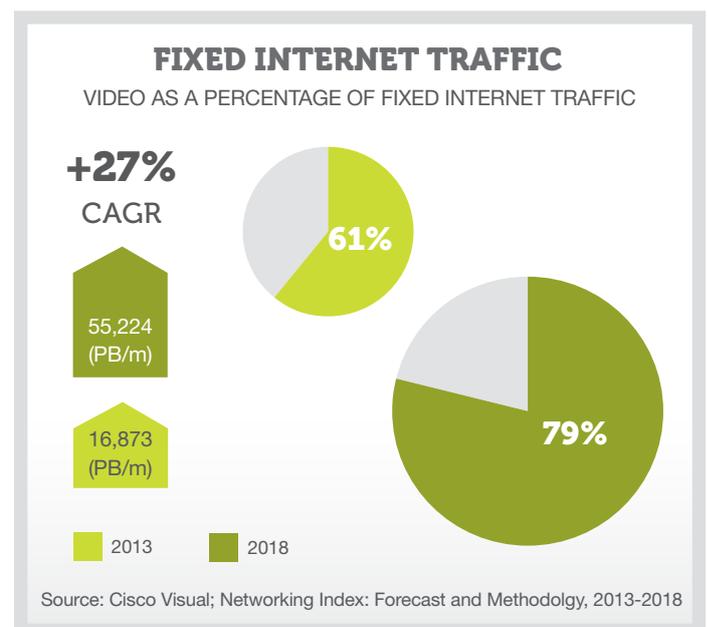
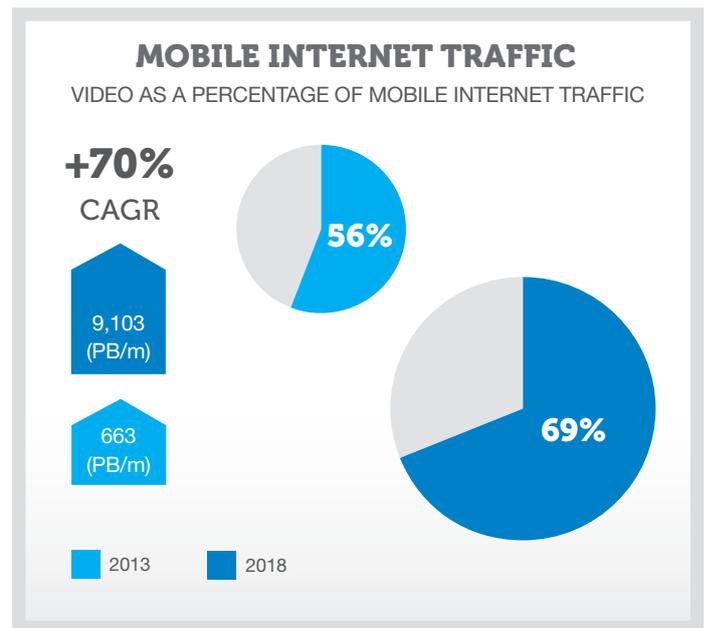


Figure 3. Projected growth in Internet video traffic

Organisations will be affected to a different degree depending on their size and the type of content they produce or distribute. Most companies in the TV and video sector, whatever their role, are factoring in the following considerations:

- Underlying growth in throughput capacity, driven by the processing of more and larger files through the workflow
- Underlying growth in the volume of requested streams
- Short-term fluctuations in demand, for example, accommodating unicast streaming of a live event
- Uncertainty about levels of consumer demand for new streaming and TV Everywhere services

Cloud infrastructure and services are proving to be a cost-effective way to absorb short-term capacity fluctuations and gain the flexibility to launch IP-based services quickly, with minimal capital expenditure risk. A recent example is Telecable's launch of a TV Everywhere offering in Spain that uses cloud-based management modules from Alcatel Lucent and solution provider thePlatform.

Firms such as Aframe, Ooyala and Brightcove that provide collaborative editing, storage, transcoding, packaging and live-streaming distribution services may use public cloud services from providers like Amazon Web Services or Microsoft Azure to provide capacity to process the workflow. Cloud adoption, and the benefits and considerations associated with it, are discussed in more detail in our companion white paper, 'The role of cloud in content production and delivery'.

Content delivery networks (CDNs) such as Akamai, Limelight, Edgecast and Level 3 are used for OTT delivery to the viewing public. Using CDNs takes the pressure off content, service and solution providers when it comes to optimising the caching and delivery of streams to match fluctuating demand across geographically diverse audiences.

Naturally, increasing use of cloud and CDNs by content, service and solution providers to help them accommodate growth and uncertainty makes network connectivity an increasingly important success factor.

CONNECTIVITY: SPEED AND SECURITY

Good connectivity between all the workflow partners is critical, especially at key content handover points:

- Content acquisition/ingest
- Transfer of content to and from cloud infrastructure and service providers
- Transfer of content between the owner or distributor and the CDN

At each of these points, the same five factors must be considered: transfer speed, bandwidth availability, reliability, security and cost.

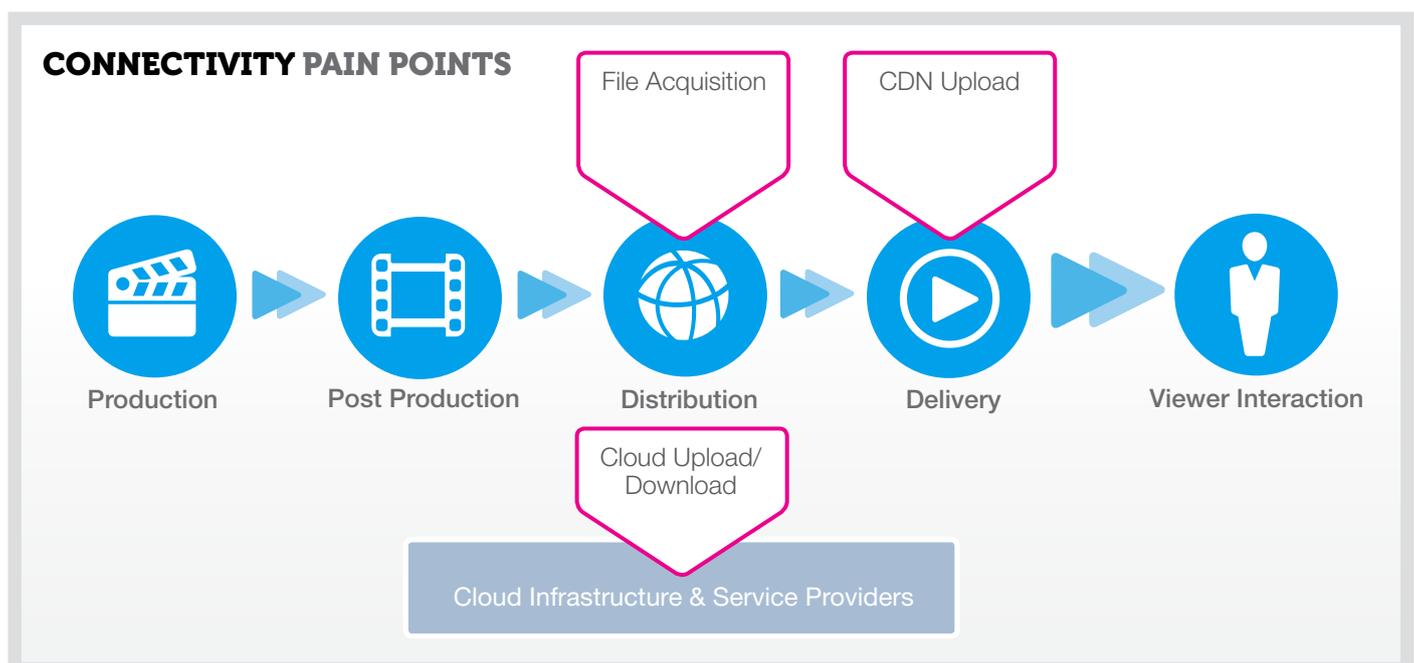


Figure 4. Connectivity pain points

CONTENT ACQUISITION: LIVE STREAMING DEMANDS HIGH SPEEDS

According to Ooyala⁸ “sports fans are amongst the hungriest consumers of video on any screen”, and particularly on mobile — the analytics company reports that people watch three times more live sports video than VoD on their mobiles. For live event streaming, and in particular live simulcast streaming of sporting events, the focus has to be on speed of acquisition — nobody watching online will put up with following a live game or event minutes behind its broadcast via satellite or terrestrial TV.

“Especially for live sports, the lack of delay between broadcast live and streaming live is very important. Broadcasters are always trying to make their workflows better, to get less delay between the digital stream and the TV... If you are watching a game and you hear your neighbour saying 'goal' before you, that's not good.”

Video distribution solution provider

It is, however, recognised that event streaming cannot be instantaneous. There is a delay in both live broadcast TV and IP video streaming, typically a matter of seconds. Although millisecond latency isn't a requirement, the challenge is still to minimise the lag, regardless of the content capture location — often a remote studio, arena or venue, or the feed — which may be via satellite, fibre or IP.

“[Connectivity] is critical — at this point in the game, one of the biggest pieces of the puzzle we have to help our customers solve is how to get their content from wherever it is — from a stadium or from their satellite signal — how we are going to physically route that data through to our cloud, but also how we are going to do the conversions that are needed to get that content into a format that our product will ingest. And this is the same challenge that everybody in the industry has to work with together to solve every time they do this.”

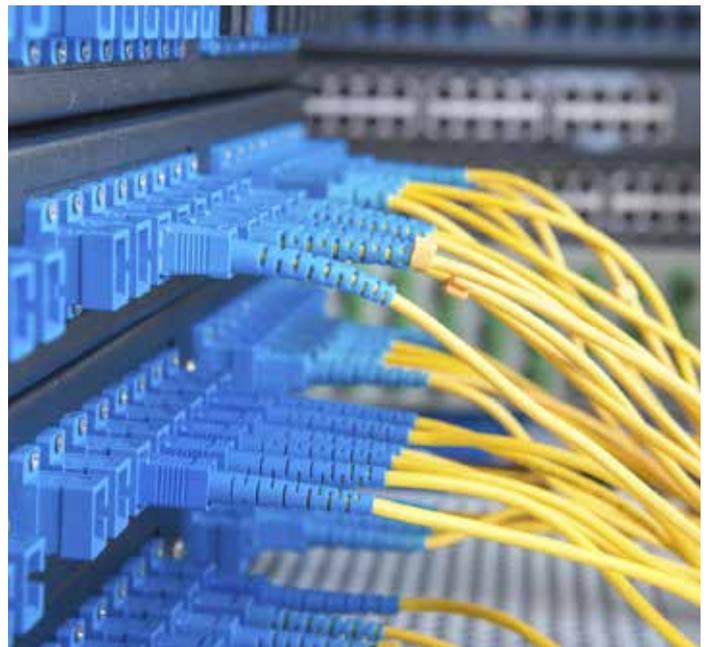
Video distribution solution provider

There's no doubt that broadcasters and their distribution partners will continue to focus on optimising the speed of acquisition, transcoding and delivery of live content for some time to come. At a practical level there are advantages in being close to the teleports and carriers delivering the broadcast traffic.

“Having those big pipes and those direct connections and cross-connects within the data centre really simplifies this process for us.”

Video distribution solution provider

The need for high bandwidth, guaranteed availability and high service quality means major broadcasters and studios often use dedicated connections or specialist providers such as Sohonet to connect to key IP distribution service providers. Ensuring critical network connections are supported by a stringent SLA is also key to maintaining very high levels of availability. Content owners and their distribution partners need ready access to a choice of appropriate carriers to help them do this as cost effectively as possible.



CONNECTING TO THE CLOUD FOR ENCODING AND TRANSCODING

The critical encoding and transcoding processes during the distribution stage of the workflow are increasingly handled by third-party service providers, such as Adobe, Elemental, Cisco, Harmonic and Amazon Elastic Transcoder; or processed using self-managed applications running on public cloud services such as Amazon Web Services or Microsoft Azure.

Realising the full flexibility benefits of cloud infrastructure and services depends on having connectivity in place that enables rapid transfer of large files. The challenge becomes particularly acute when very high-bitrate, high-quality content — such as live broadcast and time-sensitive content like news video — needs to be uploaded with minimal delay and maximum reliability.

“ [Content owners and service providers] need to upload very high-bitrate broadcast-quality content up to the transcoder. ...the less time it takes, the faster they can publish the content. If I am a news company, I want that piece to be published very, very fast. It is critical for me to be the first one publishing that content. That's where things start to get critical and broadcasters and news organisations will start to pay more money for having that line up there. ”

Video distribution solution provider

File transport software solutions from companies like Aspera and Signiant will help to address the issue of fast file-transfer speed. Content owners and service providers can themselves help to minimise the challenges associated with upload by implementing high-capacity, reliable connectivity to their main service providers.

Some data centre providers offer connectivity services to leading public cloud providers such as Amazon, that enable customers to establish private connections between the public cloud platform and their own dedicated IT infrastructure. These connections can help to:

- Reduce network costs
- Increase throughput
- Provide a more secure and consistent network experience than Internet-based connections

DELIVERY TO THE VIEWER

Successful delivery of large volumes of content via OTT services depends on good connectivity with CDNs and other delivery partners. The best approach will vary according to the type of content and where the origin is hosted:

- For VoD content whose origin is hosted on the CDN, Internet connectivity is generally all that's needed
- If the content owner hosts the origin and large volumes of content need to be pulled by the CDN in real time, dedicated links should be considered
- For live streaming, a reliable CDN link is critical

“ For those customers managing their origins in their own infrastructure, very, very good IP connectivity towards the CDN or a direct link to the CDN or cloud provider is key. ”

Video distribution solution provider

As the amount of content distributed over IP grows, the pressure on bandwidth will increase significantly, even in the short term.

“ Uptake now for TV Everywhere is still relatively low but the numbers we expect to see are between tens and hundreds of thousands of simultaneous sessions in the reasonably short term. If you imagine 100,000 simultaneous sessions and each one going at 3 Mbit/s, you are talking about 300 Gbit/s. Obviously, a lot of that video is similar so it gets replicated in the CDN, but even if you take 20% of that as the long tail you are talking 60 Gbit/s, and that is a lot of connectivity. ”

Video distribution solution provider

And as broadcasters and service providers increasingly switch to IP distribution, the pressure on bandwidth will only become more intense.

“ A lot of operators are signalling that they want to move to pure IP delivery... even it only half happens, it's a phenomenal amount of unicast traffic, so I think the need for very high-throughput origin services that are very close to the content origination is going to increase a lot. ”

Video distribution solution provider

Instead of relying purely on third-party CDNs to deliver their content, some larger broadcasters and service providers are opting for direct distribution and peering with leading carriers and ISPs, especially for VoD services where demand is more predictable. The network access agreements that Netflix is reported to have signed with Comcast and Verizon in the US are an example of a service provider adopting this approach with the aim of improving quality for subscribers to those leading ISPs.

“What are the benefits of delivering via your own CDN? The main thing is assuring the delivery. We are very mindful that delivering IPTV, and delivery over the Internet does bring some 'roughness' and so we do a lot of analysis of operational logs and feedback and try and assure that delivery.”

Video distribution service provider

“Our [in-house] CDN is implemented the way that a lot of companies do now which is the big point-of-presence set-up. So we have two PoPs in Europe — one in Sweden, one in Holland — that cover all of Europe. We do peering heavily though. About a third or a half of our traffic is direct peering with ISPs. On top of that, we use the highest quality Internet providers for connectivity. That guarantees very good performance through Europe.”

Video advertising network

Peering with key ISPs or deployment of an in-house CDN can also make sense when a service provider is addressing a geographically limited audience.

“We also work with some companies who really only have a national audience, and so having lots of servers all over the world is not necessarily a plus for them. So they are very happy to go with something simpler, maybe a peering arrangement with their local ISP, so I think that there is going to be more fragmentation in that space.”

Video distribution service provider

“We decided to develop our own CDN for [our domestic markets]. If we are distributing to another country we use Akamai. We work with data centres in different domestic regions to deploy dedicated points of presence.”

Video distribution service provider

Our research also identified that broadcasters and media owners want more specific control over how content is delivered, taking account of factors such as geography, performance, cost and distribution. This will lead service and solution providers to implement complex decisioning logic to dynamically select between multiple delivery channels and partners.

Plainly, there's a case to be made for content owners and service providers to carefully consider how to optimise connectivity between content origins, CDNs and other delivery partners. When the content owner or distributor also manages the origin, co-locating in a data centre where key CDNs, carriers and Internet exchanges are also co-located is an option worth considering.

INCREASED CONNECTIVITY PRESSURES WITH NETWORK DVRs

Connectivity is an issue for service providers who operate nDVRs. The nature of the content — primarily TV — means that nDVRs have a higher rate of usage than movie-focused VoD services, and a higher concurrency rate. A service provider deploying an nDVR therefore needs to plan for more storage and higher-bandwidth connectivity.



ENSURING CONTENT SECURITY

Security, especially for premium content such as pre-release movies and TV dramas, is a key requirement. The cost and other implications of inadvertent release or theft would be significant. The shift to cloud- and file-based workflow has placed new emphasis on protection of content, which is at its most vulnerable during production and post-production. Studios and other major content owners are highly security conscious and impose strict conditions on distributors and service and solution providers, including restricting where content can be stored and how it can be transferred between locations. These conditions are expected to become even stricter as Ultra HD content comes to the fore.

“ [The studios] are coming with very strict requirements for protection and distribution of 4K content that includes hardware security and watermarking and a lot of different security requirements that do not exist today for the other [non STB] devices, so there really is the trend to more security on that side. ”

Content security solution provider

Security is a factor that content owners and service and solution providers will also need to take into account when choosing their connectivity providers.

“ When talking about high-end media, security is a key part.... [Major content owners] will never use a service that is not ensuring the security of their content ”

Video distribution service provider

MANAGING MULTIPLE FILE FORMATS

The BBC's iPlayer reportedly serves content to nearly 1,000 different handsets, tablets, STBs, consoles and media-streaming adaptors. Managing all the formats and bitrate versions needed to deliver high-quality video to an ever-increasing number of devices is one of the main challenges faced by content owners and media service and solution providers.

At the heart of the issue is a continuing lack of convergence on common standards. This means multiple renditions of every piece of content must be created to cover varying combinations of compression format, adaptive bitrate (ABR) streaming protocol and DRM. This is shown conceptually in Figure 5. The appendix gives more detail about encoding for different devices — see page 15.

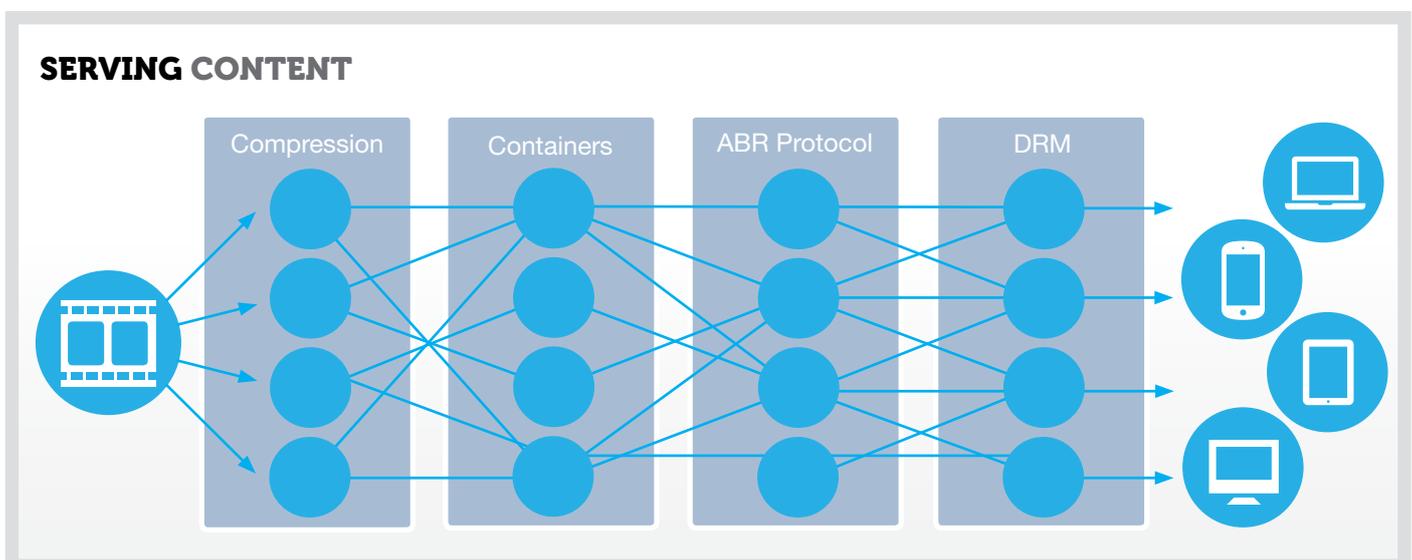


Figure 5. Serving content to multiple devices requires multiple renditions

“We transcode into about 20 different formats. One of the challenges we have is being able to manage the scale of that and its performance.”

Broadcaster with TV Everywhere service

“Our default now is 12 renditions per video file in order to account for the device, the CPU usage, the bandwidth and so forth... and that can double for some of our more sophisticated customers in the high-end media and broadcast sectors.”

Video distribution service provider

For content to be deliverable to all target devices, it needs to be:

- Stored and cached in multiple formats; or
- Transcoded into the requested format on the fly

Storing multiple versions of content libraries reduces real-time processing requirements but imposes a significant storage capacity and cost overhead on service providers.

The advantage of transcoding on the fly is that content is transcoded into a specific delivery format only when it is requested, which provides more flexibility to respond to unpredictable viewer demand and maximise efficiency. Transcoding on the fly can also reduce origin storage costs for content that isn't regularly accessed. The disadvantage, however, is that transcoding is processor intensive. If demand for a piece of content spikes, so too does the processing overhead. This can be mitigated to a degree by using a CDN, as the most popular versions of regularly accessed content are likely to be held in the edge caches, reducing the potential impact.

Adoption of the MPEG-DASH adaptive bitrate streaming standard should go some way towards resolving transcoding complexity, but it won't happen overnight. Migration is likely to take several years and it isn't yet clear whether the standard will be universally adopted. Apple, for example, remains uncommitted.

In the meantime, to help them deal with the challenge of multi-format workflow and delivery, broadcasters and service and solution providers are turning to public and private cloud and virtualised environments for processing and storage capacity that can flex in line with fluctuating demand. Public cloud requires the lowest capital investment; while services realised in software running on virtualised commodity hardware can reduce hardware purchase and operational support costs. There's more on the topic of what needs to be taken into account when looking at cloud infrastructure options in our companion white paper, 'The role of cloud in content production and delivery'.



CONCLUSION

This paper has looked at some of the challenges faced by content owners and distributors, and media solution and service providers, given the:

- Massive growth in demand for IP-delivered TV and video
- Need to deliver content to multiple devices
- Emergence of IP-based workflows

As they work to optimise the throughput, quality and costs of multichannel video production and distribution, we expect the majority of studios, broadcasters and larger OTT content providers to deploy hybrid infrastructure models across the post-production and distribution stages of the workflow for the foreseeable future. These hybrid models will combine dedicated infrastructure, private and public cloud.

Adopting a hybrid approach will enable companies to progressively take advantage of the flexibility and workflow innovation offered by cloud, without risking content security or operational performance, and without disrupting core workflow processes.

THE ROLE OF THE DATA CENTRE: CONNECTIVITY

Ensuring excellent connectivity, underpinned by stringent SLAs, is a core requirement for any multi-platform, multi-partner solution. Companies need to ask some fundamental questions to check their connectivity is optimised for acquisition and ingest of content, and for its transfer between all infrastructure, solution and service providers in the workflow.

Connectivity checklist

To ensure connectivity is optimised, you'll want answers to the following questions:

- How do we optimise the speed and cost of file transfers to and from our customers, cloud partners and CDNs?
- How do we handle the massive potential growth in the size and volume of these file transfers as demand for IP-delivered services and Ultra HD grows?
- How do we make sure that files are transferred and stored securely?
- How do we ensure interoperability with the cloud providers we work with now and in the future?

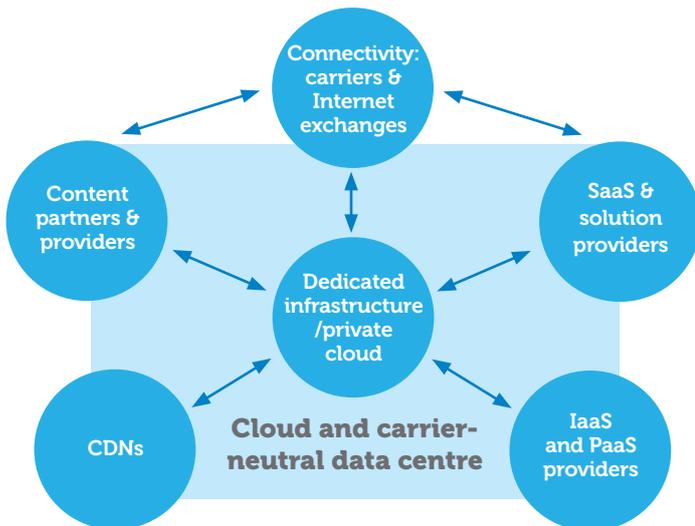
This is where the choice of data centre provider and location becomes critical. Significant benefits can be gained by locating dedicated and private cloud infrastructure at facilities that offer:

- A wide choice of carriers able to provide high-bandwidth, high-availability Internet and dedicated connectivity at competitive prices
- Direct access to leading Internet exchanges for peering
- Direct access to major public and private cloud providers
- Cross connects between distributors, leading CDNs and other media community partners

If you have very high-bandwidth file-transfer requirements with a small number of critical partners, it may be well worth co-locating your infrastructure in a data centre where those partners have a point of presence. This will enable you to implement cost-effective, highly secure, direct cross-connects to your partners, significantly reducing your dependence on dedicated transit or Internet-based connectivity.

Colocating with key partners can also enhance the security of your content; and mitigate license compliance issues as there is no need to physically move premium or unencrypted content from one data centre to another as it progresses through the workflow.

Operators of cloud and carrier-neutral data centres, such as Interxion, offer digital media companies that want to deploy their own and hybrid infrastructures a highly secure environment, with the widest choice of connectivity options. Major carriers, Internet exchanges and CDNs have points of presence at these data centres, ensuring a highly competitive selection of transit connectivity and peering options in addition to high-capacity cross-connects among partner, supplier and customer organisations within the data centre. These neutral data centres are also home to cloud-based video service providers and specialist cloud providers, and offer solutions for direct connection to the main public cloud providers.



Selecting a data centre provider that can demonstrate an in-depth understanding of the media sector and has a track record of supporting media production and distribution companies can also be advantageous. This type of provider will be in a better position to advise you on hosting and connectivity options; to attract a diverse community of organisations from within and serving the media sector; and to support you in optimising the deployment of your infrastructure.

Figure 6. The cloud and carrier-neutral data centre environment

KEY TAKEAWAYS

- ✔ Consumer demand for Internet-delivered multiscreen viewing is growing rapidly
- ✔ Content and service providers are responding through increasingly rich VoD and OTT live-streaming services
- ✔ The resulting move to IP workflows is fragmenting the value chain and changing relationships
- ✔ Delivering multiscreen OTT services raises a number of challenges, including:
 - How to scale to meet growing but unpredictable demand
 - How to move increasing amounts of data to and from partners and cloud service providers, often in real time
 - How to transcode into multiple formats to reach multiple devices
 - How best to handle content security
- ✔ Cloud is a key enabler to mitigating many of these challenges, but a pure-cloud approach is unlikely to meet all requirements
- ✔ Hybrid models combining dedicated infrastructure, private and public cloud will be the favoured solution for most media companies for the foreseeable future
- ✔ Choosing the right location for dedicated or private cloud infrastructure can be critical, with connectivity to partners, cloud service providers and CDNs a major consideration

APPENDIX: ENCODING FOR DIFFERENT DEVICES

Delivering a high-quality optimised content stream to multiple devices and browsers involves transcoding every piece of content into multiple different files — primarily because device vendors have adopted different encoding formats and protocol standards. The main ones are described here.

ENCODING FORMATS

Video must be encoded or compressed for storage and transmission. Two main video compression technologies (or codecs) must be supported currently, and two more are emerging.

Current

H.264 or Advanced Video Coding (AVC) is the most widely used format standard. It is supported by most devices, browsers and players — but not by Google Chrome, Firefox or Opera. A further complication is that, within H.264, a variety of compression profiles and levels need to be applied, depending on the playback capabilities of the target device.

WebM VP8 is an open-source format favoured by Google for Chrome and YouTube, and supported by a limited number of other browsers and video players.

Emerging

HEVC or H.265 is the successor to H.264. It enables higher-definition video through more efficient compression and higher screen resolutions. This format is at an early stage of adoption: H.264 is expected to coexist alongside it for some time.

VP9 is the high-definition successor to the WebM VP8 codec.

CONTAINER FORMATS

Encoded video and audio streams are encapsulated in containers. Leading container formats include MPEG 4, Microsoft ASF, Apple Quicktime, and Flash Video FLV.

ADAPTIVE BITRATE STREAMING PROTOCOLS

Current

ABR streaming optimises viewing quality through automatic selection by the video player of the best bitrate for a stream, depending on available bandwidth and processor load. Typically four streams with different bitrates will be available for each piece of content. A number of ABR protocols exist, the main ones being Apple HTTP Live Streaming (HLS), Microsoft Smooth Streaming and Adobe Dynamic Streaming (HDS).

Emerging

MPEG-DASH is an international standard for ABR streaming that offers a single standard protocol addressing all devices. It was ratified in 2011 and is being adopted by a number of leading OTT distributors, broadcasters and mobile network operators. On the device and player side, Microsoft, Adobe and others are migrating to DASH, but Apple remains uncommitted.

DRM TECHNOLOGIES

Digital rights management (DRM) is often applied to premium content before it is distributed to protect against piracy. Commonly used proprietary DRM technologies include Adobe Access, Google Widevine, Microsoft PlayReady and Marlin.

- 1 Netflix 2013 Annual Report
- 2 BBC iPlayer Performance Pack March 2014
- 3 Google: YouTube Official Statistics Page
<https://www.youtube.com/yt/press/en-GB/statistics.html>
- 4 Nielsen: Cross Platform Report 2013 — based on US data
- 5 Conviva: 2014 Viewer Experience Report
- 6 Akamai and NBC sports data compiled and published by fierceonlinevideo, 26 February 2014
- 7 Adobe Digital Index, 14 July 2014
- 8 Ooyala Global Video Index Q4 2013

INDUSTRY ASSOCIATIONS

Cofounder: Uptime Institute
EMEA chapter

Founding member: European
Data Centre Association

Patron: European Internet
Exchange Association

Member: The Green Grid,
with role on Advisory Council
and Technical Committee

Contributor: EC Joint Research
Centre on Sustainability

Member: EuroCloud

ACCREDITATIONS

ISO 22301 Business
Continuity Management



BCMS 560099

ISO/IEC 27001 Information
Security Management



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