

The Coming Storm?



A report on the impact of cloud on broadcast

A report for the Digital Production Partnership by Mediasmiths International

Executive Summary

The Digital Production Partnership (DPP) has commissioned Mediasmiths International to provide an update to *The Reluctant Revolution*, published in 2011. That report initially addressed the question of whether cloud technology and services could benefit the production community. Our research highlighted that the production community was for the most part, not ready for cloud services beyond simple document sharing or email applications, and that their real issue was the emerging need to manage end to end file based workflows, driven by the adoption of file-based cameras.

A lot has happened to cloud services since, and cloud is now marketed as much to consumers as corporates and businesses. At the same time, the production community is much more comfortable and confident in managing end to end file based workflows. That greater understanding of file based workflows, more use of broadcast file delivery technology combined with the evolution of greater standardisation in file delivery, through the DPP File Delivery Format, raised the question;

Is the production community now ready for cloud?

The answer appears to be 'Not Yet'. *The Reluctant Revolution* highlighted three obstacles to the adoption of cloud services in production - the lack of low cost high bandwidth network access, the economics of new services, particularly cloud storage, and the risks associated with cloud services. In all cases the obstacles have been lessened but not sufficiently so to make a fundamental difference at this time. However, this is not true for broadcasters, content owners and distributors, and the development of media specific cloud services for broadcast organisations, particularly around non-linear distribution, has been dramatic. Some of these services are already proven, such as cloud based transcoding while others, like cloud based linear playout are only emerging. For the first time, it is now possible to see how a full end to end broadcast workflow for linear TV could be deployed in the cloud. This is a remarkable achievement in an industry that can only be described as conservative.

Why has this happened? Netflix is often cited as a key driver of this change, as they have a platform built on cloud and have proven how fast a cloud based model for content services can be deployed in new markets. But it is more accurate to view it as representative of the change in viewer behaviour. The adoption of new platforms, on the web or smart devices, has started to commoditise the way in which people view content – now it is more about convenience of what and where people want to watch, not how they choose to do so. But the rules of the game in this new world are far from clear, and the only certainty is uncertainty. In this climate, broadcasters and content distributors have to build platforms that are sufficiently flexible to respond to changing viewer behaviour, and much more rapidly than before. At the same time, they are unwilling to sink large amounts of capital into new platforms because they cannot guarantee that the investment will not be obsolete almost as soon as the money is spent. Cloud provides a compelling answer to both of these issues. It provides inherent flexibility, with the ability to rapidly provision new service and infrastructure (and then shut them down), but critically with a commercial model based on paying for usage and not substantial upfront investment.

While the production community may see cloud as being the broadcasters' technology, and not for them, they will find that once broadcasters and content owners adopt and make substantial use of cloud services, that they too will be expected to participate in new cloud based end to end workflows, in exactly the same way that they now use end to end digital workflows. The challenge will be how, and what new models will emerge to enable them to do so.

Based on our research, we have derived eight predictions about the impact of cloud:

1. Cloud is dead, long live Cloud: Cloud will become so pervasive that the term will simply cease to be important. It will be just another form of infrastructure and the focus will be the services that increase business agility.

2. Adoption will focus on distribution first, then production: The more mature media specific cloud applications will be adopted fastest in non-linear distribution, followed by linear programme traffic workflows, with the core production areas amongst the last to fully embrace cloud.

3. Broadcasters' adoption of cloud services will improve collaboration with the production sector: As broadcasters and content owners fully exploit cloud services, they will expect their suppliers to do the same, and fit within their way of working. This will create a range of opportunities for new services for the production sector to share and work with private and public cloud services, and ultimately removing a lot of the content exchange friction that is present in current workflows.

4. Channels are dead, long live Channels: Cloud will enable more new entrants into the market, and newer ways of consuming content. But Broadcasters will utilise cloud technology to provide new forms of channels, from pop-ups to highly localised or even personalised channels.

5. Traditional outsourcing is dead, re-emergence of the cottage industry: Broadcasters will move to a model of more overall internal control, where they manage a mixture of in-house, external and outsourced services. The traditional "outsource entire functions whole" will struggle to compete. Specialists, large and particularly niche, who know how to utilise cloud, and its economies of scale, will thrive.

6. Cloud will increase, not decrease, the importance of in-house cloud skills and teams: Whilst cloud will shift some operational delivery to external providers, there will be a critical need for internally brokering, managing and supporting internal access to cloud services. This will be accompanied by the need for greater digital skills throughout the broadcast sector.

7. Cloud storage will be about standards, not volumes: The costs of cloud storage mean that there will always be a market and use for disc and LTO storage. Managing content over its entire lifecycle will require a variety of different storage platforms for some time. However cloud could become a primary, but not exclusive, method of storing Masters but for this to be effective, a set of common standards and procedures for storing Masters will be required – in effect an extension of the DPP File Delivery Format work.

The focus of this paper is on what is or will be available in the market, more than the adoption of cloud by broadcasters and media companies. Our research has been based on interviews with technology providers, supported by interviews with broadcasters.

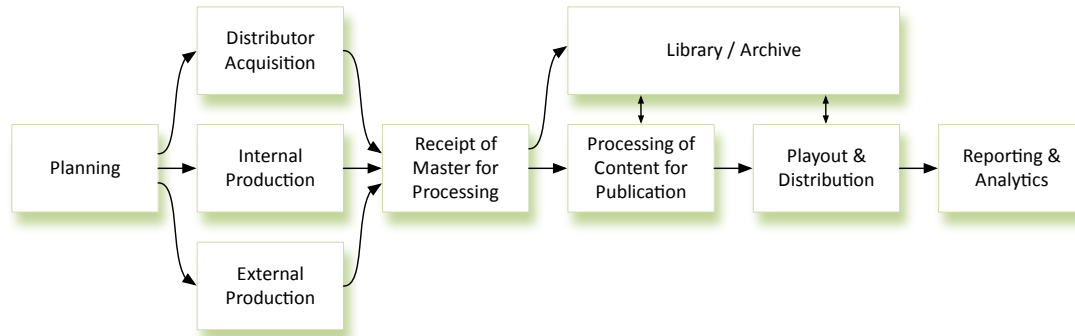
In this paper we refer to products and services provided by specific vendors, either because they contributed to the research or because they are highly present in the market. The paper does not attempt to provide a comprehensive view of all vendors, and instead references vendors to illustrate our findings. Neither the DPP, nor Mediasmiths, endorses the vendors or specific vendor products and services mentioned in this paper.

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Introduction

This White Paper has been commissioned by the Digital Production Partnership (DPP) to provide an assessment of the applicability of cloud technology and services to broadcast processes and key media business areas. The DPP first commissioned Mediasmiths to write a report on the use of Cloud technology and services in 2011, where the focus was on the impact of new services on production and exchange processes. That report became *The Reluctant Revolution*, the first of three DPP workflow reports. The first part of this paper updates the findings from the first report. We will examine cloud services from the perspective of what they are and what they can enable. As with previous reports, we have used a simple workflow framework to assess the applications for cloud in production and distribution. This simple framework is shown below.



When we wrote the first report in 2011 hardly anyone in the production community had heard of “the cloud” or knew what it was. Most broadcasters were becoming aware of cloud, some like Channel 4 had fully embraced it for core IT, and while there was some interest in the economics of cloud storage, it was not taken too seriously. The more traditional technology sourcing model remained firmly in place, and many thought that regardless of the adoption of cloud technology, that certain functions, such as linear playout, would always remain within the domain of onsite or outsourced traditional broadcast technology. By contrast, in 2013, there is now considerably more widespread interest in cloud, and most broadcasters have now at the very least started experimenting with it. The question we address in this report is whether cloud is real, and if so whether it is a game changer or just a natural evolution.

What do we mean by Cloud?

In the first report we found that many people did not really understand what cloud meant, and a lot of vendor marketing has focused on describing the characteristics and benefits of cloud rather than the definition. Our definition of cloud is as follows:

Cloud technology is the abstraction of software from the underlying, virtualised, architecture, where that architecture can be rapidly provisioned and configured, and is fully scalable at the margin of usage.

And therein lies the problem with cloud – defining it is quite a technical task. It is much easier to focus on the typical characteristics of cloud technologies and cloud based services such as usage-based payment, browser based access, pervasive access and pooled resourcing. For this paper, cloud should be considered as “elastic infrastructure”. Historically, infrastructure consists of specific boxes (servers or storage) and cabled networks. This can be thought of as ‘building bricks’, and applications were fastened onto those bricks with mortar, binding them to the infrastructure. Adding infrastructure meant buying more of the right type of bricks, fixing them in and making sure that they fit with the previous bricks and the applications. In a cloud model, the bricks are replaced by putty – you can stretch the putty but you can also easily add more putty by merging it into the existing block. Applications are thinner layers that sit on top and can stretch and bend with the putty, but are not glued solidly to it.

With cloud, it is possible to rapidly provision additional infrastructure or services, meaning that new services can be deployed far faster, have more flexibility and use operational, not capital budgets.

PART ONE:
THE STILL RELUCTION REVOLUTION



The Still Reluctant Revolution

The DPP first looked into cloud provision in 2011, and at that time, the use of commodity storage and IP network technologies had become more common in the TV production community generally, and there was greater adoption of file-based technologies (as opposed to digital video tape) throughout more parts of the end to end workflow. Cloud technologies were beginning to emerge, and prices were falling, and cloud appeared, in theory, to be highly applicable in the production community due to the inherent sharing capabilities and the ability to access scale infrastructure at low cost and on an operational cost basis rather than as a capital investment. Therefore a key focus of the report was to be on whether the time was right for the adoption of cloud services as a means of improving workflows in the production community. When we started our research, we very quickly realised that this was not the right question – while there was greater adoption of IT storage in both production companies and post-production communities, the overall level of understanding of file based technologies, and cloud in particular was low. In fact, most people did not know what cloud was, and certainly were not actively considering it as part of their production workflows. Instead, they were facing more difficulty in understanding how to manage end to end file based workflows, prompted by the increased use of file based HD cameras. This was highlighted in the first report, *The Reluctant Revolution*, expanded in *The Bloodless Revolution* and ultimately the complex relationship between end to end file based technology adoption and creativity was more clearly articulated in *The Creative Revolution*.

Just over two years later, a lot has happened. There is a vast improvement in the understanding of file based workflows, and knowingly or not, many companies and consumers make extensive use of cloud technology for email, document sharing and collaboration. The time appears right to revisit the topic and ask the question – what has changed?

What has changed?

In some respects, nothing, and in other respects, everything.

Even in a relatively short period of time, cloud technologies have evolved considerably. Prices for all forms of IT and IT based technologies have fallen, be that cloud services or file based HD cameras. Within the production community, understanding of end to end file based workflows has been transformed, and there is no longer the fear factor or uncertainty on how to manage those workflows. We have seen the emergence of new roles around workflow and data wrangling, a clearer understanding of how and when to use different cameras and of course the adoption of the DPP file delivery format, which is gaining real momentum. The DPP's work on file delivery formats is a notable achievement, and the DPP has, in our view, succeeded where so many standards and formal bodies have failed. It has taken a very technical standard, AS-11 as a base, and through close working with non-technical real world operational people, come up with a comprehensive definition of codecs, file formats and metadata that meets the needs of broadcasters, and is easily accepted and supported by the production community, and critically, their vendors.

However, in other areas, not much has changed. The pressure on costs is as tight as it was, and arguably in some cases more so, as there is now increased demand for additional content to be created in order to support non-linear outputs. Production companies are as focused on managing costs as they ever were, and any technology innovation needs to either lower costs or provide a creative benefit that justifies the cost. At the same time the level of understanding of innovations such as cloud technology remains mainly unchanged, although this should not be a surprise. *The Creative Revolution* highlighted the fact that the production community is focused on creative outputs – it does not track and look for new technologies to experiment with. It uses new technology only for creative or cost purposes and not for technologies sake.

Obstacles to adoption of cloud within production

The Reluctant Revolution identified three key obstacles to the adoption of new cloud services - the lack of low cost high bandwidth network access, the economics of new services, particularly cloud storage, and the risks associated with cloud services.

1. Network Access

The lack of low cost, high bandwidth, internet access for all but the largest production companies was identified in The Reluctant Revolution as a key obstacle to adopting cloud services. This has not changed. HD content requires “fat pipes” to move it over a network. The DPP File Delivery Format is based on the AVC Intra codec with a bit rate of 100Mbps, and XDCAM HD, an increasingly popular format, at a bit rate of 50Mbps. Even realtime exchange of content would therefore require guaranteed bandwidth speeds of 50Mbps for XDCAM HD and 100Mbps for AVC Intra. While consumer and small business broadband download speeds of 100Mbps are now more common, they are hardly pervasive across the UK and are more confined to major urban areas.

However, consumer and small business connections are ADSL based, and download speeds are far higher than upload speeds. A 100Mbps download connection is likely to have between 5 to 10Mbps upload speed. At the higher end this means that one hour of HD content will take five to ten hours to upload to a cloud service or other destination. Twenty-four hours of rushes could therefore take five to ten days to upload if a continual connection was permitted. Acceleration tools from Aspera and Signiant can help, and are already in use for exchanging content as part of production workflows, but even they are restricted by the laws of physics in the underlying network.

The answer lies in fibre connections, where symmetric speeds of 100Mbps to 1Gbps are readily available. The price for fibre has fallen - in 2011 a 100Mbps connection could cost up to £15,000 per annum even in major urban areas whereas today prices could be as low as £5,000 to £8,000, even for 12 month contracts. However what has become more apparent is that production companies simply do not see the need or application for high bandwidth Internet connections, as there is no obvious problem that it is solving for them at the moment. Production companies have lost a good deal of the nervousness about file based productions, and are also comfortable shipping cards and removable drives between shoots, base location, post-production facilities and broadcasters. Removable drives remain the preferred method of file-delivery for most production companies. In this context, a sufficiently high speed internet connection, that may cost several thousand pounds more money per annum to run, simply does not make economic sense and is money straight off the bottom line.

2. Economics of storage

The Reluctant Revolution highlighted that while cloud storage costs were falling, they did not stack up to long term costs for removable drives or LTO. Since then cloud storage costs have fallen further, by at least a third. In addition, transfer in prices for uploading content have typically fallen to zero, and Amazon Web Services (AWS) have a new storage service, called Glacier that provides backup storage (with restrictions on retrieval) for \$0.011 per GB per month. However, general storage costs have also fallen with some removable drives offering double the capacity for the same price in 2010/11. With LTO, the launch of LTO 6 increases the capacity of the drive from 1.5TB to 2.5TB.

In the original report, we compared the relative costs of storing one hour of DPP File Delivery format content using different media. The updated table is shown below.

Approach	Year 1 Cost per GB	
	In 2010/11	In 2013
Cloud (online)	£1.19	£0.67
Cloud (Glacier)	n/a	£0.08
Removable Drive	£0.43*	£0.20**
LTO	£0.12 (LTO 4)	£0.07 (LTO 5)/£0.05 (LTO 6)

* This was based on 1TB drive typically used in production companies, using up to 800GB

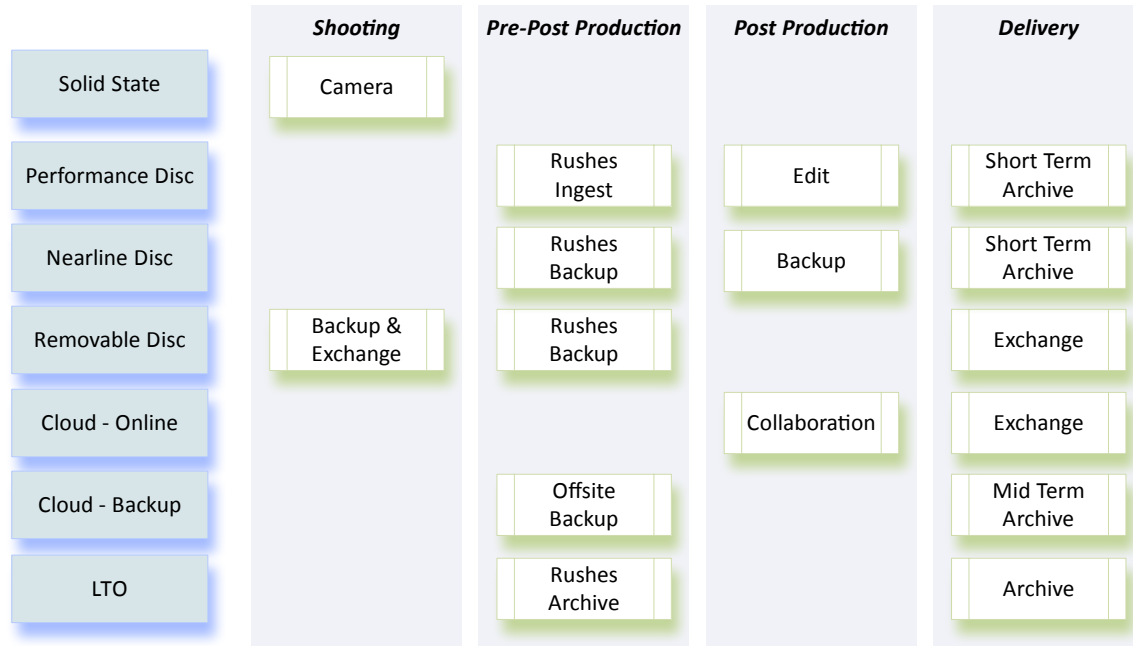
** This could vary between £0.16 and £0.38 depending on the capacity of the drive, the interfaces and the brand. The figure of £0.20 is based on using two 2TB drives.

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The cost per GB has fallen substantially across all media and while ‘regular’ cloud storage remains considerably more expensive than removable drives and LTO, Glacier is an indication of how competitive more restrictive cloud storage can become. That said, while it is approaching the cost of LTO, it needs to be remembered that year 2 costs for LTO are perceived as zero, whereas cloud requires ongoing payment. It should also be remembered that Glacier is not an archive but a backup service, and not designed for regular retrieval.

But the economics are improving. The cost of storing one hour of DPP compliant content for twelve months in a cloud system has fallen from £53 to £37, and one can only imagine that by 2015 this will fall well below £30. For holding a master, if not rushes, this is becoming an affordable proposition.

However this is not really a realistic comparison because it is not about removable disc versus enterprise disc versus cloud versus LTO, but selecting an optimal mix of storage methods. In looking at the end to end workflow for production, one can easily construct a different set of paths depending on budget and preferences. In what we call ‘Pre-Post Production’ i.e. the storage of rushes, production companies or their post facility could use higher performance disc solutions from companies such as Object Matrix or Isilon, or they could use removable drives, or services such as Glacier or LTO for backing up or archiving those rushes. Or they could use a combination of any or all of them. A post-production facility could create a virtualised storage vault on Object Matrix and backup to a cloud service and local LTO. These options can be visualised below.



In post-production itself high performance disc can be used for editing, but cloud services could be used for collaboration, be that review and approve services or remote editing. For delivery, removable disc and online cloud could be used for delivery of final content; some companies with recurring series could use disc solutions for short term archiving; medium term archiving and backup could be done on cloud services such as Glacier or FrontPorch’s Lynx storage platform, and LTO could be used for longer term archiving.

Cloud simply adds more options and flexibility, and the final choice is dependent on infrastructure and the value of the content.

3. Risk of Cloud

There was greater uncertainty around cloud as a model when The Reluctant Revolution was written, and there was a sense of a lack of control for content stored in the cloud. This position has softened

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considerably and many now see cloud as being at least as secure, if not more secure than on-premise equipment because of the major brands that provide it and the industry security standards they work to. Currently this is a moot point as there is very little adoption of advanced cloud services, but it does suggest that perceptions on security and control may be less of an obstacle today than in 2011. That said, production companies would need to fully understand the limitation of the SLA terms (and their own production insurance constraints) before putting all of their content there. Currently there is a strong likelihood that production companies would not check their SLAs.

Will Cloud ever have an impact on the production community?

Our key findings from the original report are predominantly unchanged. Although there are emerging services that should be of interest to the production community, and there will be some take up in certain circumstances, for the most part the nature of funding in the industry makes it difficult to see how there will be more widescale adoption soon.

One key factor that could change this is if post-production and facilities get traction with new services offering remote access and editing to all rushes and work in progress, along with associated storage services. Remote editing is covered in more detail in the next section, but there are now strong technology options for editing content hosted on a cloud solution. In this model, there would be a workflow where content is either shot in a location where high speed connectivity is on offer (e.g. a studio or media campus site) or where rushes can be sent to one of a network of aligned facilities for uploading. The latter is now more achievable as production companies are tending to use media cards like tapes, rather than limiting the number of them and using laptops and drives to help recycle the cards on location. A workflow where one set of rushes, on a drive, is sent to a facility, and another back to base is eminently achievable. This workflow would require a reliable method for production companies, or their post provider, to access and edit that content, and this is where the remote editing services could come into their own. A facility providing Adobe's Anywhere, or a service like Dock10s remote editing would allow remote editing of that centralised content. Forbidden Technologies ForScene also offers this type of capability. The key limitation of consumer ADSL style broadband connections is no longer an issue in a world of remote editing, because the download speeds will be sufficient to access and edit the content, with only the need to send back metadata markers, or potentially small amounts of additional content. This is still early days for those services but they are far more defined than they were when the first report was written, and could provide the key to greater adoption of cloud services.

Another option would be the emergence of a supplier forum, providing a standards based scalable proposition that could create a single cloud post production 'economy' that they as suppliers could all benefit from in terms of reduction in cost of provision across a currently fragmented market space. In many respects, the underlying foundations are in place for this to happen – there are already a range of services from specialist cloud service providers such as Aframe, Prime Focus or Cambridge Imaging, or from facilities such as Deluxe, Dock10, Encompass, JCA, Loft, re:fine or Technicolor that could be constructed to provide an end to end workflow. This could extend into those broadcasters or facilities offering more advanced cloud services on ingest, editing, collaboration and storage. However the key point is that the industry will need to work with the production community for this to happen, not simply to expect a market to emerge.

PART TWO:

GATHERING CLOUDS – EMERGENCE OF CLOUD IN BROADCAST WORKFLOWS

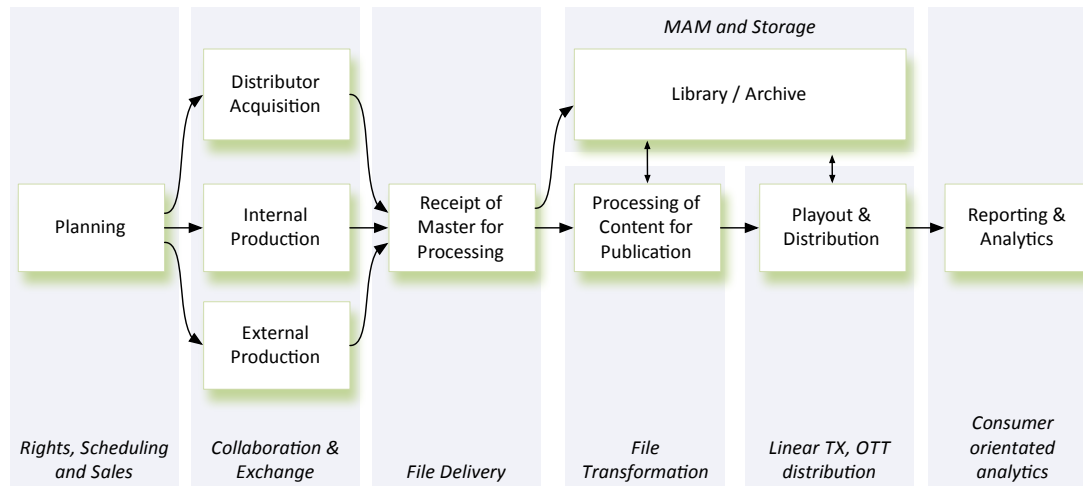


Cloud in Media

Many media companies are already using cloud tools as part of their content production and management processes, with Google Apps and Dropbox as two applications that are heavily used as collaboration technologies. But these are examples where media companies have used generic market products – the question is;

What are the services that have been developed or tuned for our media and broadcast?

There are an increasing number of cloud services on the market, consisting of both cloud deployable software hosted on public or private clouds, as well as newer cloud native software services. Within the content management chain the cloud solutions are tending to focus on specific areas or aspects of the workflow, as highlighted in the chart below.



We would expect to see more emerge with the adoption of cloud, but the earliest applications have tended to focus on two key aspects of cloud – scalable compute and location independence.

Public and private cloud

At this stage we need to make a distinction between different types of cloud offering. At a high level there are two varieties:

- “Public Cloud” where infrastructure or software services are available non-exclusively to anyone who can pay. The underlying infrastructure services are therefore shared between all users.
- “Private Cloud” where infrastructure or software services are provided exclusively for one or a defined set of customers. This could be done internally by an organisation (an owned private cloud) or it could be provided by a service provider (3rd party private cloud), or both.

There is sometimes a perception that public cloud is inherently less secure because the infrastructure is shared, and in the media space the perceived security issues turns some organisations away from public cloud, as there is the fear of highly valuable content being compromised. However, in reality this is not the case. The security procedures that mature public cloud providers will incorporate into their services is likely to be more advanced than most companies, and certainly greater than most small to medium size companies.

The choice of public or private should be made on the basis of cost, control and service levels in addition to specific workflows that are supported by cloud services. In many cases this may result in using a mixture of cloud services. An approach that makes use of the different cloud models, e.g. creating internal owned cloud for core applications but ‘bursting’ using capacity from 3rd party private clouds or public cloud, is referred to as ‘Hybrid Cloud’. This is likely to become the most common form cloud as broadcasters will make use of different forms of cloud (and non-cloud) infrastructure for different needs and applications. Software that is provided on a cloud model is referred to as “Software as a Service” or

SaaS, and to complicate matters SaaS offerings can be deployed on public and private clouds for their own underlying infrastructure. Cloud is frequently used to refer to both the underlying infrastructure component, and to this application or SaaS level, which can add to the confusion.

Outside of media specific applications, and outside of media, cloud has already being deployed in place of traditional infrastructure. All of the large IT vendors are shifting their focus to helping companies migrate to cloud infrastructure, and all have some form of public and private cloud services themselves. Cloud based services such as Google Apps, Dropbox or Box (and a host of other file sharing applications), and Salesforce.com are already pervasive across all industries, and are used in large enterprises as much as small companies. Many of these services don't even mention cloud in their marketing, because their functionality sells the product and not the fact that they are cloud based. The same will happen with core infrastructure, and broadcasters will start to look to their own infrastructure and begin to use cloud instead. Some, like Channel 4, have already been doing this in recent years. As broadcasters become more comfortable with the use of cloud for underlying infrastructure, they will not only become more comfortable with cloud-based media applications – they will expect it.

Planning

The key planning activities at the start of the broadcast process are in the programme commission and acquisition areas, and in commercials management. Until this year, there were very few cloud services for planning or airtime sales. Historically this has been because the main market leading products tend to have “thick” clients (i.e. require a download application on the laptop or desktop), and typically had to be PC based rather than being cross-platform or browser delivered. Historically, this has been needed in order to support real time updating of content and the need to manage complex presentation of detailed schedule views. In larger organisations, the ability to make a change in a schedule and have that effect ripple through potentially thousands of events made it difficult to service in anything other than a client-server model.

However, both of the top market players, Pilat and SintecMedia have made significant progress in optimising performance and both have launched cloud versions in 2013. Both have taken a similar approach in that their cloud service is aimed at smaller organisations that would not normally buy the full enterprise version, and the cloud version is currently based on restricted functionality. This has required significant investment from both companies in being able to provide browser based versions of their software.

In the UK, there is already an established contract rights and music rights managed service, provided by Soundmouse (with the programme rights elements branded under Silvermouse). The Soundmouse/Silvermouse model is a good example of how common platforms could work well in media – the service acts as a middleman between broadcasters, production companies and the collecting societies, significantly reducing the number of touchpoints required for rights management around finished content.

Production

The production sector, which should be one of the key beneficiaries, has not adopted cloud or managed services as quickly as some expected, and our first DPP report, *The Reluctant Revolution*, highlighted the key impediments in this space. The main focus in the production space has been collaboration, and Forbidden Technology's Forscene product continues to grow in popularity amongst production companies, where it is primarily used for reviewing programme rushes, although it offers considerably more functionality for logging and metadata management, online editing and integration with NLEs.

The other significant UK player is Aframe, who were launching just as the first DPP paper was issued. Aframe's launch service offered an online repository aimed at the production community, with centralised storage, transcoding and an outsourced logging service. As Aframe has evolved and expanded into the US, it is becoming clear that its key appeal lies in collaboration around the production process, and its ability to integrate well with post-production environments. Aframe's service was launched on their servers and storage in their datacentres because at the time a public cloud model would have been wholly unfeasible and unacceptable to customers. That has changed, and technically Aframe has the

ability to provision its core software stack on private or public cloud infrastructure, as Aframe's key selling point is collaboration, not storage. We would therefore expect to see Aframe extend its capability to providing collaboration services across multiple different storage environments (although the company are not currently offering this). Sony have also announced their entry into the market with their Media Cloud Services range, which provides some of the same functionality as Aframe with more of a focus on finishing and mastering.

A key theme to emerge is that the market for services directed to the independent production community may be limited, because the cost of cloud services, particularly storage, cannot be directly offset against other production costs, yielding a cost increase and potentially very little incentive to use them. However, better collaboration and sharing should lower the overall time and cost of production, and therefore it may be the case that broadcasters could help to provide these platforms for external collaboration or potentially both internal and external production, bringing benefits to all parties. To take some examples of what can be achieved, it is notable that Prime Focus's CLEAR platform, another media management service has had considerable market traction with broadcasters and larger content companies, with better collaboration and improved production efficiencies being highlighted as benefits. Similarly, Aframe have done well with new productions, particularly events, where there are different production models emerging or with broadcasters directly. In this approach the costs of the platform can be subsumed in the commissioning budget, removing the impediment of perceived costs to external production companies.

The one platform that has successfully transcended both the independent sector and the broadcast world is Adobe. Adobe's Creative Cloud has fundamentally changed the model for creative production tooling. The collaborative elements of Creative Cloud are built on AWS, but it is the combination of cloud backend for collaboration, access and desktop tools that has made the migration very easy for users, in effect because the model adds functionality (cloud storage and sharing) to former Creative Suite users, rather than trying to change the way they work.

Adobe's Anywhere product takes a similar approach to remote editing, where users can edit using their Creative Cloud Premiere Pro clients. The Anywhere system is not part of the Creative Cloud backend, instead the Anywhere software is hosted on a private cloud on the broadcaster or content creative premises. The system provides a workspace environment where users can access and edit a stream served by the back end cloud, where the appropriate bit rate is determined by the connection speed. The user edits using the full client, but the content is conformed on the back end cloud. The system is similar in functionality to other broadcast services from Avid (with their Sphere product) and Quantel (based on QTube). Remote editing could significantly change the production model, as coupled with general collaboration tools, it could completely liberate much of the creative post-production process from a specific geographic location. Challenges remain in the creative process of the edit itself, which has historically consisted of a number of people sitting together in a room arguing until the best result emerges, but a mixed economy is likely to emerge which addresses this, possibly driven on a generational basis.

If these companies can support a more public cloud model for this remote editing then it would open up the market for remote editing even further.

Distribution & Content Receipt

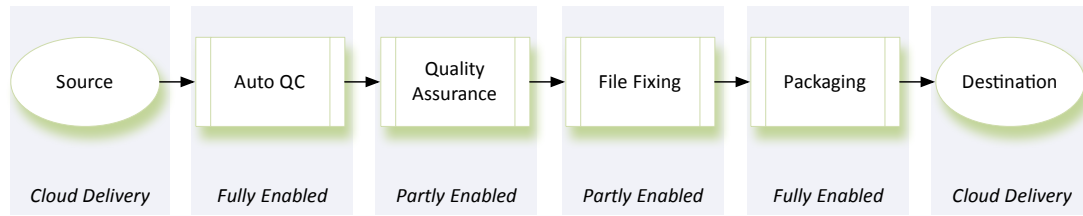
This is now one of the most advanced areas of cloud provision in media with Aspera and Signiant offering cloud services for some time. Both Aspera and Signiant provide software for managing the secure, accelerated movement of files in and out of public and private cloud storage. In both cases, their products can be run on a compute instance in the cloud and connected to associated storage. Aspera makes some software packages available via the Amazon Marketplace and through Microsoft's Azure cloud, and offers the Drive product to provide a desktop explorer view (similar to Dropbox or Box) for cloud-based document syncing. Signiant has a product called Media Shuttle that allows users to send, receive, browse, upload and download, or submit to workflow or destination, through a single user interface. This moves the file transfer logistics layer into the cloud, based on the AWS platform. The affiliated storage can be either on-premises, private cloud, or public cloud, while the software in the cloud element provides

scalability and accessibility. Both Aspera and Signiant are good models of how applications can use cloud infrastructure in addition to non-cloud elements as part of an overall end to end workflow.

Both Aspera and Signiant now offer workflow tools that help automate the process of moving content and associated metadata. Signiant also offers CloudSpeX, a tool that validates the file format prior to transfer and only permits the transfer of compliant files. Files can be tested against either industry standard specifications, such as the DPP File Delivery format, or bespoke-defined specifications registered in a cloud directory.

Workflow Processing

The file delivery capabilities into cloud environments provide the starting point for potentially managing completed content processing in the cloud. The typical programme traffic processing, and the cloud support is shown below.



The ability to get content into the cloud environment is robust and proven, either using WAN acceleration tools, or simple upload. The typical first stage is file validation and Auto QC, that is, checking that the file is not corrupt and that it meets some standard compliance profiles. At this point the file could be rejected and re-ordered, rejected but passed through for processing, or passed. The leading Auto QC vendors, Tektronics (Cerify) and Interra (Baton) provide software packages that can be deployed in cloud environments, although this is not yet a pervasive model.

The Quality Assurance function is an eyeballing activity and is arguably more important in commissioned programme workflows than acquired content where the content will already have gone through significant checking (and where content suppliers are being paid to deliver to a contractually agreed standard). However, for a broadcaster, all content needs to go through compliance and therefore needs to be viewed for assurance purposes. This could be enabled in a cloud model, for example where there is light media asset management and the ability to browse content that would be streamed from the cloud. Many broadcasters want to carry out quality checking for some forms of content using full bit rate and full resolution content, and this would be difficult to provide from a public cloud, or indeed a private cloud over a corporate network as for example the DPP File Delivery Format content bit rate is 100Mbps.

Similarly file fixing is partly enabled depending on what needs to be done. Some functions, such as Aspect Ratio conversion can be supported through tools such as Snell's Alchemist, and simple editing or metadata logging could be provided through browse tools. Sony's Media Cloud Services are focusing on this with their logging, rough cut editing and audio fixing tools. More complex craft editing requirements would require the content to be downloaded and edited on local storage, as most broadcasters would not accept proxy based editing. This is an area where Adobe's Anywhere product could come into its own, but currently this would be restricted to a private cloud.

The packaging of content is, along with file delivery, one of the most advanced and complete cloud based services on the market. A key distinction is that packaging includes metadata management and transwrapping, but even then there are a wide range of services from organisations such as Encoding.com, Brightcove and Ooyala that can provide comprehensive transcoding and transwrapping of content. Most of these are currently focused on the lower bit rate web, mobile and OTT markets but they are all clearly looking at broader marketing including broadcasting – for example Encoding.com is currently providing large scale transcoding for MTV in the US.

The main transcoding vendors are also evolving – Telestream launched Vantage Cloud this year, based on AWS EC2 and S3 infrastructure. This is quite a significant development as Telestream's workflow tools enable management of both on-premise and cloud transcoding capability, which will provide companies

with the ability to tune transcoding demands based on relative urgency or cost. Similarly, Harmonic has launched a cloud service for their Carbon transcoder, also on AWS and with the ability to burst from on-premise devices. The ability to burst demand to the cloud using the same technology lowers some operational overhead for organisations, in terms of keeping down the number of products to manage.

Increasingly these services are able to support more and more broadcast formats, and also to manage live encoding, something that is enabled through management of streamed video entirely through IP. This raises the prospect of moving all transcoding from an on-premise to completely elastic cloud provisioning model. However, feedback from some content providers and in particular concerns about quality and time suggests that many will not be inclined to fully trust cloud transcoding for the majority of their workflow for some time. One specific issue highlighted on AWS based transcoding is that the movement of content out of S3 when it is retrieved for use, represents a time cost in the movement of the asset from source to destination. In addition, content would need to be encrypted as required by programme contracts, which would add time, cost and complexity.

Archive Storage

Archive storage has two elements to it – the actual storage of the content as a file, and the media management software required to manage it. The main collaboration platforms noted above have both of these functions, although they are predominantly focused on temporal storage, i.e. during a production. Storage is one of the areas that is often seen as a strong cloud proposition, but in practice it may be one of the lesser compelling areas for cloud. The cost of cloud storage is dropping, as noted above, but so is the cost of enterprise disc storage and LTO. One major innovation is AWS Glacier storage where the cost of storage is only \$0.011/GB per month. There are substantial restrictions on this, as it is in essence a backup solution, and there are limits on retrieval times and volumes. However at that price point it represents a serious option for Disaster Recovery (DR), backup or secondary storage.

The largest impediment to public cloud storage remains the fear factors of failure or lock-in. Most providers have realised that charging for transferring content into a service is a serious deterrent and have stopped charging for it. Typically, costs remain for transferring content out of cloud platforms, and for very large volumes of content, the transfer of content between platforms could represent too high a cost to contemplate moving it. Coupled with the unease around the potential loss of content in the (unlikely) event of a complete loss of service, there has been a lack of willingness amongst broadcasters to contemplate moving fully to public cloud for storage.

However this is a somewhat specious position, as the reality is that a more appropriate model for broadcasters and content producers is a tiered storage model, where on-premise, managed storage and cloud could co-exist. The tiered model is very well defined for disc and tape storage, and we can see how Cloud could supplement these tiers in the table below.

Traditional Storage Tier	Usage	Role of Cloud
1. Very high performance disc	High bandwidth low latency applications such as craft editing,	None
2. High performance disc	Secure high performance disc used for MAM or transfer caching or general editing	Private cloud, or potentially the use of Cloud disc or Glacier style services for backing up rushes, where the intention is never to retrieve the content
3. Commodity disc	Lower performance disc for caching or proxy storage	Private cloud or S3 style storage could be alternative or complementary for processing content, exchange or back up
4. Robotic Tape	Large scale archive storage or back up	Glacier style services or specific managed services from providers such as Front Porch

The blend of tiered storage and indeed the blend of cloud provision will come down to economics and attitudes and preferences towards keeping content on premises or taking managed services. The argument should be less about disc or tape versus cloud, but how much or little is used at each stage of the workflow. The blend of storage will be a function of the most financially efficient method of storing

content, subject to the need for speed of retrieval, over the lifecycle of the content. The implication is that content will also need to be moved to different storage platforms over its lifecycle, and therefore the cost of transfer needs to be considered upfront.

All of the public and private cloud providers offer online and backup storage, but the focus is on disc storage. Front Porch's Lynx service provides LTO archive and backup storage as a managed service. They can offer a pure outsourced service, where they manage a full tape archive exclusively for one customer, or sharing models where specific tapes, or a combination of drives and tapes, are reserved for a specific set of users, or a common model where the management of customer content is through the software layer.

The MAM element becomes important where the content is actively managed rather than simply used as backup. Products such as the Cambridge Imaging Imagen Cloud, hosted on the Microsoft Azure cloud, Nativ Mio and Vidispine are good examples of cloud based MAM products, where the applications tend to see other services as resources, and are aware of changes in the level of those resources. For example, Vidispine sees a transcode service as a resource pool – it optimises transcoding jobs based on being aware of how much of that resource is available at any one time, which could vary throughout the course of the day. As companies move to multiple cloud and non-cloud storage platforms MAM products will need to be able to know about and manage content across these storage types and pools, and be able to monitor and move that content.

Playout & Distribution

Non-linear or OTT distribution have been supported by managed and cloud services for some time, and vendors such as The Platform, Brightcove, and Ooyala offer a full range of services for delivery of content to multiple platforms and distribution methods such as CDNs and other edge providers, such as Akamai. This is now a comparatively mature area. By contrast, TV or linear playout is an area that many in the industry assumed would be the last to be suitable for cloud services if at all. However, the use of IP as opposed to SDI for audio-visual delivery has changed everything, and we are now seeing the emergence of new cloud services in this space. Deluxe LeapCloud (formerly known as Deluxe MediaCloud) has been at the forefront of this, and they launched a range of cloud based services at NAB 2013 that include:

- Software based playout, based on underlying applications from Cinegy. The service is based on private cloud provision from datacentre partners and it has the capability to virtualise the GPU, providing the opportunity for a totally virtualised real estate.
- A broadcast MAM, linking schedules to playlist components to be pre-built and displayed
- Web-based monitoring and control and record, accessible and viewable from a variety of devices
- Encrypted delivery to end destinations through the public internet or private Ethernet as IP encapsulated streams

At one level, this approach could be seen as a lower cost but highly viable approach to DR. However, the use of IP throughout opens up significantly more opportunities, such as the ability to centralise core playout for distribution across multiple regions or territories, and using edge based delivery to insert localised components such as news or commercials.

Snell & Wilcox, one of the biggest names in the more hardware-bound part of the market are also progressing with cloud based solutions. The software-only Alchemist product is only the first to be launched using Snell's new On Demand framework, which is providing a virtualisation based platform that can be deployed across different cloud models. It may initially seem odd that a vendor that is known for its hardware products has embraced virtualisation, but it is likely to be a reflection of the general trend that customers want more software only and flexible commercial models. It is also likely that as with storage, we will see a hybrid model in playout automation technologies, that would use more traditional hardware-bound infrastructure for some channels, Playout in a Box for others, and Cloud based for yet others, pop-ups and DR.

Reporting & Analytics

The capabilities for cloud-based analytics are already highly present in the market through a wide variety of business analytics systems that can be spun up in public cloud from established vendors. The most advanced of these services have focused on consumer analytics and the analysis of web traffic and social media in particular such as Adobe's Marketing Cloud (based on the acquisition of Omniture). IBM is another big player in the analytics space, and point out that this part of the market may be moving faster than the production side, with the distribution side of the business using these tools for insights into audience behaviour. IBM has used this approach in sport in the UK, using live data from England 6 Nations rugby matches and Wimbledon tennis to provide game tracking information.

The move to end-to-end file based workflows opens up another potential area for reporting and analytics, as it will now be possible to collect data on all content as it moves through a production and distribution process. The deployment of Software Defined Networks (SDNs) and virtualised network re-enforces this, as it would be possible to collect the full stack of content logistics data. Cloud based business analytics is a natural approach for processing this data, which will be by nature spikey and not necessarily all sourced from one company. One can imagine an end state for broadcasters and content providers where a combination of rules and information on events and usages throughout the entire chain could be used to automate network and service provisioning through dynamic self-managing infrastructure .g. the automatic creation of a personalised channel for individuals based on the preference of the view, bandwidth, devices and location.

End to end

So far we have not yet seen a complete end-to-end play that is entirely cloud based. Netflix is a good example of an organisation that has built and deployed an end-to-end system for managing OTT content, but broadcast requires additional components around production management, craft editing and playout that no one has yet stitched together. However, it is clear that this could be done using any or all of the cloud models that are emerging:

- Broadcasters could take their entire stack and deploy to a private cloud
- Amazon could provide the underlying compute and storage for some to build the services
- Microsoft's Media Services approach could provide the framework for assembling an ecosystem of all of the functional components
- HP, IBM and other private cloud providers could build it
- Any software vendor could build and deploy a software service that could use any or all of these models above

In each case the challenge would be a new form of systems integration – that of managing end-to-end integrations between cloud deployable and cloud native applications potentially across a multi-cloud infrastructure. Linked to this will be the evolution of Graphical User Interfaces (GUIs). Traditional broadcast applications have typically had an 'engineering' feel about them, and were often architected in a way that required specific, mainly Windows applications on the desktop. Cloud services are more typically associated with Web 2.0 approaches, meaning more modern and intuitive GUIs for functional services as well as the underlying tools for managing the provision of cloud infrastructure and services. In addition to the systems integration of cloud services, there will need to be GUI-integration as users switch between different services. This is likely to be a substantive 'hidden' issue that will become more critical as soon as there is significant adoption of cloud services in multiple parts of the workflow.

Cloud Bursting – how real will this be?

So how much of this is vapourware? Well, very little we believe. Launching a cloud service is a risky business if there is nothing substantial there, because unlike the software business where products that never appear are pre-announced as spoilers, the whole point behind a lot of cloud businesses is that they are easy to start and scale. For sure, many of these new services are in their infancy, and are at the early stages of managing opportunities rather than managing large volumes of customers. But many are already established and proven, and critically the core infrastructure players, are well beyond infancy and are rapidly maturing into mainstream products.

AWS first launched a public beta in 2004 and officially launched in 2006, and while Amazon does not break out AWS revenue, market analysts have estimated that this could easily be in the range from \$1bn to \$3bn. Netflix has been the poster boy for cloud in media, not just showing that scalable international consumer services could be deployed on public cloud, but also contributing a lot of open source cloud management technology back into the industry. For more user focused services, Google Apps and Salesforce are highly pervasive in small and large companies, Adobe's Creative Cloud adoption has exceeded market expectations as has Microsoft's Office365, launched in 2011.

The point is that the market has clearly shown an acceptance of cloud services and that the underlying infrastructure is clearly in place to support media applications. To the extent that broadcast or media specific cloud services may be comparatively new or immature, they will not be held back by the lack of public or private cloud infrastructure. How soon will the market adopt this new approach? The response from our interviews stated that significant adoption of cloud services for infrastructure and media functionality could happen within 18 months, although many thought that a five year timescale was more realistic for adoption at a more significant scale, particularly as larger broadcasters would need to wait for investment cycles to complete before investing in any serious on or off-premise cloud infrastructure.

The drivers for change

Media is a conservative industry, where change mainly only happens because it is forced due to cost imperatives or technology progression. Many broadcasters did not actively consider cloud as a viable infrastructure options as late as a year ago, but today most broadcasters in markets where network connectivity is pervasive and affordable are now actively using, experimenting or planning to use cloud in some way.

What has driven this change? An oversimplified answer could be summarised in the word 'Netflix' where incumbents have observed just how quickly a cloud based content provider can enter the OTT market. The shift towards audience consumption of content across different platforms – the commoditisation of the means of viewing content – has emphasised the need for flexibility. Broadcasters and existing players do not fully understand how to make money out of new services (or even if they can), but they do know that they have to provide them to maintain market positioning – and provide them quickly, in line with the speed of change in the consumer devices marketplace.

This uncertainty has produced a reluctance to make substantial capital investments in technology that may not produce as agile and adaptive a service as is required. At the same time, continued substantial investment in traditional playout technology looks increasingly misplaced given that this distribution channel, while nowhere near dead, looks certain to decline in terms of overall share of consumption. A world where half of broadcasters output is consumed by means other than linear playout is not that farfetched or even far away, and the investment in it as a delivery infrastructure must also come under pressure. Almost paradoxically, international channel providers are also growing the number of international linear TV channels, to increase their share of that market but also to increase share in markets where consumer OTT services are restricted by poor bandwidth. For these organisations, where the world will only become competitive, a highly cost effective and flexible cost base will be essential.

Cloud offers that flexibility. The elastic nature of the services, and the swapping of upfront capital expenditure for operational and usage-based models makes it the ideal infrastructure platform in an uncertain world. A key feature of this model is the ability to rapidly provision new services, be that new pop up channels, event based second screen content to reality show or sports massive data analytics, and

only cloud offers this capability. Of course, if the overall market revenue is not going to increase, or if competition for growing revenue enhances, then the long term cost of cloud based approaches needs to match or be lower than the traditional legacy build approach. This will require considerably more sophisticated management of cloud services to keep costs under control, but it also emphasises that the infrastructure provision side will need to be all about economies of scale, and the infrastructure providers will need to get bigger and bigger to deliver those savings.

Commercial Models

There were several common themes that emerged out of our interviews and research, and one in particular is that vendors are not entirely certain about the commercial models that will work for both customers and themselves. Customers are clearer – they want flexibility but they also want a large degree of certainty and predictability on how much infrastructure is going to cost them.

One of the ironies of the cloud model, is that while public cloud in particular charges on a per usage or transaction model, this does not significantly reflect their costs. Provision of cloud is predominantly a fixed cost business, in that the main costs of data centre management, such as power, cooling, servers and storage do not vary with marginal changes in demand. As the marginal cost of providing cloud services is very low if not zero, then the aim of the cloud provider is to attempt to maximise utilisation overall and so they will always want to price to fill capacity. The pricing model for basic cloud services is evolving. AWS has the most public cloud pricing structure, which has four components (the pricing is considerably more fine grained than this, but this provides an overall indication to the structure)

- On-demand pricing for usage or storage.
- Volume discounts, so that with services such as storage and CDNs, the pricing is tiered, so that higher volume of usages have lower pricing
- Reserved instances, e.g. AWS instances are reserved for usage at lower prices than On-demand
- Reduced functionality for lower pricing, such as reduced redundancy or restoration times

AWS's pricing structures overall are quite complex but they have to be in order to reflect the wide range of services they offer, and the need for AWS to both optimise its capacity and to allow customers to manage their own costs. For the experienced buyer, with a good understanding of expected usage, the AWS pricing model provides enough information to build a predictable cost model. Larger organisations can overcome the variability of public cloud through the use of private cloud. For smaller organisations, that might be comparatively inexperienced cloud buyers with little understanding of usage, the public cloud infrastructure commercial model could be daunting. As a result, there are emerging players who offer brokerage type services, and also models that remove some of the variability (through pricing per user per month) with fixed amounts of storage and tiered pricing beyond that. This takes the risk of pricing completely out of the end customer's domain, and transfers it to the service provider. This is the model that is becoming predominant for new cloud applications, marketed as SaaS solutions i.e. buying software on a monthly basis. This has mostly evolved in collaboration tools, such as Dropbox or Google Apps, where there is tiered pricing dependent on usage, ranging from free for individual users to 'team' pricing for larger organisations or departments. As many of these applications have been well funded they tend to focus on getting subscribers before then refining the pricing model.

This will be an issue for vendors in the broadcast market, as there are very few 'well funded' start-ups or even vendors with very deep pockets. This is likely to slow down the availability of services being deployed as vendors figure out exactly how to price their services, especially the ones based on public cloud. Pilat modelled the likely usage over a period of several months in coming up with their service pricing for IBMS Express, as the underlying cloud costs to them will vary considerably when customers upload significant volumes of data or add new channels, but they have to provide a smoother cost profile absorbing these fluctuations.

Vendors with solid business hardware-bound applications, who are adding software only versions, face the additional challenge of how to price these new products, particularly as those versions may be sold on a rental basis rather than licence or subscription. If they are too aggressive they risk cannibalising the existing hardware-bound business too soon for too low a price, but if they are too high then they risk

losing out to competition. For most this is likely to be a process of starting with software-only versions that are sold at a premium or with restricted functionality before finding their equilibrium. This will also replace the Total Cost of Ownership (TCO) for the customer, where these models involve replacing product licence sales with subscription sales. Some organisations might have really sweated an asset through staying on a specific version of a product for a long time, but they will no longer be able to do this in a subscription model. The vendor would argue that their productivity should be higher by staying current, but it does remove one element of control from the user.

Skills requirement

Cloud services will increase the need for stronger IT skills across the traditional broadcast technology functions. As video traffic shifts from video networks to IP networks, the need for convergent networking skills will become more critical. An entirely new skill set in provisioning private cloud infrastructure will emerge in broadcast, for broadcasters managing their own cloud, service providers managing public or private cloud and vendors who are architecting cloud native solutions. The ability to manage multiple clouds and to carry out systems integration in hybrid environments will also become important and challenge existing IT and broadcast technical capabilities. As cloud is a more generic cross industry phenomenon there will at least be skills available in the general market, however bringing in these skillsets and getting them skilled up in broadcast environments will take time and will depend on broadcasters and vendors knowing how to spot talent in areas that they may not fully understand themselves. These skills are likely to be initially scarce, and therefore expensive, before they become more commoditised – similar to the market for Cisco certified engineers around the turn of the century.

Outside these new technical skills, there will be a new commercial management skillset required to help organisations manage the cost of cloud. This will not be a simple procurement activity as it will require the ability to continually optimise the use of cloud across the entire workflow. In the short terms broadcasters and media companies may well look to their suppliers for both of these skills, although therein lies the issue of whether the suppliers will be able to provide them.

This skills issue is a significant one, and unless addressed could affect the adoption of cloud services within the industry, as poor management of early cloud services could undermine the entire model for some time.

Impact on market suppliers

The adoption of cloud services is likely to significantly affect the composition of the market. The biggest impact may be on existing resellers and broadcast systems integrators who rely on taking margin from reselling hardware and software. In a cloud model, the market for hardware may rapidly collapse into large datacentre providers and enterprises with their own private cloud who may wish to contract directly with hardware vendors. It is a very real possibility that companies like HP and IBM may become their own biggest customer for hardware. For the traditional hardware resellers, one future route could be to sell cloud capacity as well as hardware. ERA is one such technology vendor in the UK that is now offering cloud services, through their ERA MediaCloud in addition to their core hardware and software business. The ERA MediaCloud offering provides both core infrastructure and some media applications aimed at the broadcast and post-production market. For this type of organisation, the future will involve swapping virtualised infrastructure for physical infrastructure in their product suites.

The challenge for broadcast systems integrators may be greater still. The combined effect of a lower volume of IT servers and storage with a shift from specialist hardware-bound applications to software-only (that may be sold direct), could require a potential mix of more complex software systems integration requirements. At the other end of the spectrum, the existing IT outsourcers may well see a complete disruption to their business model, as the model of outsourcing complete infrastructure and service stacks to one organisation could evaporate and be replaced with a model where only specific functions and layers are outsourced. Those services may be sourced from multiple providers for the same function, and where the service management layer resides with the customer not the outsourcer. In both cases this is also an opportunity, as those that can meet the challenge are likely to find a very receptive audience, although that will require very different operating models to today's business.

PART THREE:
PREDICTIONS – A NEW DAY FOR BROADCAST



Our predictions

Our conclusion is that cloud can and will be a real game changer for media and broadcast. Phrases like grid and utility are often used with cloud, but the analogy could be considerably deeper. In the 20th Century, electricity utilities used economies of scales in building electricity grids through centralising the generation and management of power. This allowed factories to replace their localised power generation with lower cost, more consistent and redundant power supplies from major power companies. Cloud could go a step further in removing the need to operate and manage technology infrastructure, and instead focus on the core business of making, packaging and distributing content.

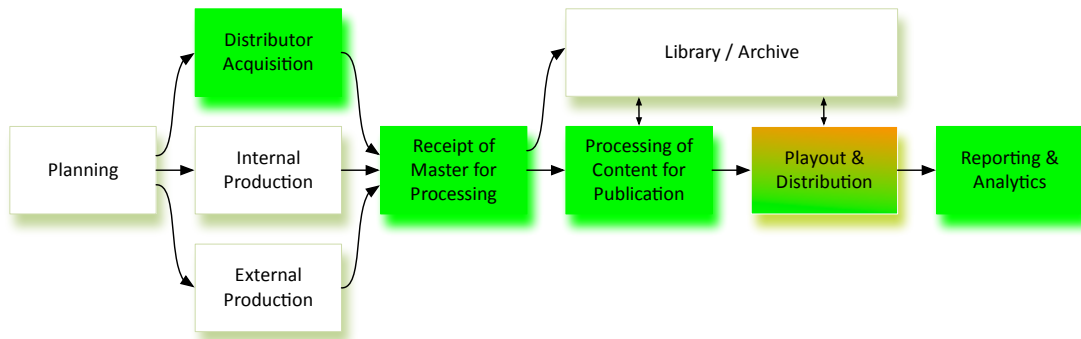
Based on our research we have the following seven predictions.

1. Cloud is dead, long live Cloud

Cloud as a term is poorly understood outside of the technical community, and is certainly not fully understood within the production space. From a corporate infrastructure perspective, it does seem that cloud provision, be that private cloud, outsourced private cloud, public cloud or a combination of all three will become the new standard way of managing core infrastructure. In that respect, Cloud as a term will simply die because it will become the norm – and will be referred to as infrastructure, procured and managed in different ways. Few will mourn its passing as a term, with perhaps the exception of marketing.

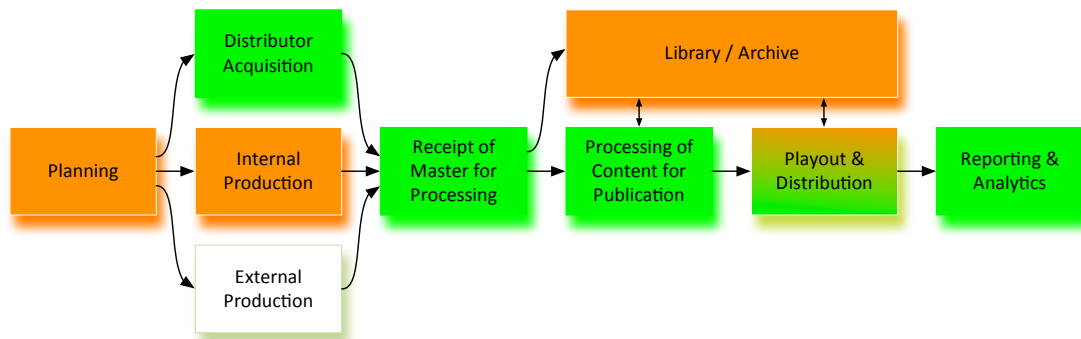
2. Adoption will focus on distribution first, then production

Not all cloud services will be adopted at the same rate. Based on our high level view of content workflows, we can already identify the areas where cloud services are already established and available for use, if not yet pervasive.

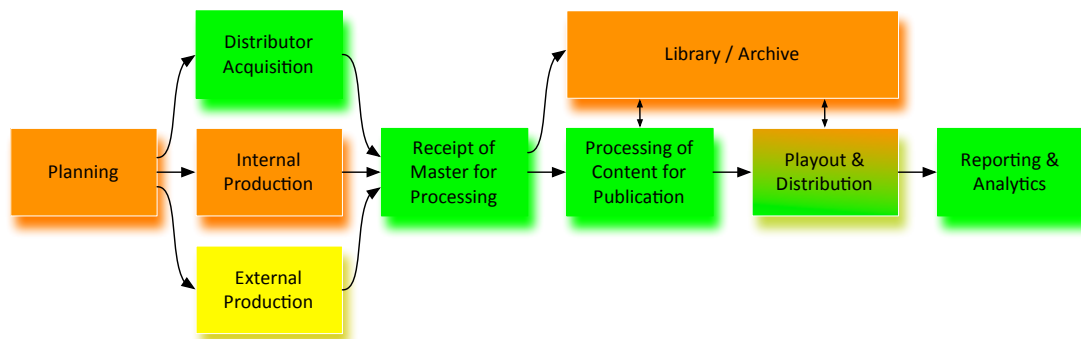


The core areas of distribution and file delivery, packaging and transcoding and delivery for OTT platforms are all there and in use. Cloud based reporting and analytics is very well established although only marginally used in broadcast.

The next wave of cloud services will focus on the planning and management of broadcast quality assets, and we predict that programme traffic workflows (QC, versioning, packaging) will be a primary of focus from both vendors and broadcasters. This is likely to be followed by planning and payout services, and there are now strong emerging cloud based services in channel and platform scheduling and linear TV payout. Many of these have been launched this year, and so the take up of these services is likely to take 2 years or so, given the sort of lead times in our industry. The implication is that by IBC 2015, most broadcast technology vendors will have cloud based versions of their products, and the first to market will have live customers.



The last area to adopt cloud services for media production or management in any scale will be the external production community.



With the exception of the larger independents, the production community faces many of the same impediments to content based cloud services as we identified in the Reluctant Revolution – the network connectivity and bandwidth is just not there to support the upload, let alone download, of HD or even SD content, and budgets are orientated entirely around production costs, not collaboration tooling. The production community do and will continue to make use of cloud services such as Google Apps and Dropbox, but we cannot see them paying for new services where there is no obvious reduction in other costs.

3. Broadcasters adoption of cloud services will improve collaboration with the production sector

There is inevitability to the adoption of cloud by broadcasters and major content companies, in much the same way that other industries have already done so. The flexibility and control that it offers will be just too compelling, although it will take time to gradually replace current infrastructure with cloud services.

Does this mean that the production community will get left behind the technology adoption of their clients? We do not think so. Broadcasters and content owners will expect their suppliers to fit into their way of working, and newer players, who focus heavily on distribution, will not even consider other ways of working. The current problem facing the production community will be how to fit in with broadcasters' cloud workflows and at what cost. The obstacles to adoption that we identified are unlikely to be resolved anytime soon, and the production community is too small a market to sustain a wide range of specific media cloud services.

We therefore expect to see broadcasters, content owners, vendors and service providers working with the production community to facilitate greater collaboration through cloud technology and adoption of common cloud technologies. The production community will begin to utilise some of these new platforms, not because they will be forced to, but because there will be a clear benefit for all sides.

Why would they do this? Because better sharing and collaboration is likely to result in better production workflows with far less friction, and could provide better integration with people planning downstream distribution of the content (from promos through marketing to preparing metadata for distribution channels). The ability to get metadata and teams working together will be increasingly important in a world where more content is consumed via VOD – where the content has to be discovered, and it does not get the free automatic viewer exposure that schedule TV offers.

4. Channels are dead, long live Channels

The rise of the operators like Netflix and multi-device services will continue, and will change the way that audiences view content. Audiences will buy into cloud provision because it gives the choice of how, where and when they view content. However, that does not mean that linear TV delivery is dead, it just means that it is one, probably very important for some time, part of the mix. Moreover, we predict that the channel will bounce back, not just in providing content to consumers in non-linear ways, but actually increasingly linear playout services both around live events and themes, particularly in the use of cloud based playout for pop-up and increasingly personalised delivery. A hybrid model of cloud based playout of scheduled content, coupled with localised and even personalised components through edge based IP delivery is not just possible, but may be essential to preserve the advertising funded model for broadcasters.

5. Traditional outsourcing is dead, re-emergence of the cottage industry

The traditional large scale IT outsourcing will decrease to zero-sourcing. New managed service providers will use virtualisation and increasingly connected media applications delivered as services, coupled with customer, infrastructure and brokerage management to form the next generation of service management offerings. These offerings will need to include current media specific value added services including post-production, access services and content processing to provide a complete service package.

Traditional outsourcers will need to re-invent themselves, through dealing directly with cloud-based applications to compete against new managed services players, who themselves will need to support ecosystems of media applications. Somewhat ironically as the core infrastructure players are likely to get bigger but fewer, the flexibility of cloud means that we could see the re-emergence of smaller players who form symbiotic relationships with the bigger fish. Where the industrial revolution decimated the cottage industry through industrialisation of the production process, cloud enables the cottage industry through the virtualisation of the core infrastructure and the ability to abstract creativity from that infrastructure. It will never be easier to create a new media specific application, and those that are created as specifically for cloud will have inherent scalability. At the same time, those traditional vendors who fail to grasp this model will struggle to adapt and survive. As one IT vendor put it: “it will get Darwinian”, and only those vendors that can adapt, will survive. The key to the symbiotic relationship is that the new niche vendors can focus themselves on domain specific niches, supported by the scale of the infrastructure provider, while the infrastructure provider will need these niche players to drive adoption and usage of its infrastructure.

6. Cloud will increase, not decrease, the importance of in-house cloud skills and teams

So what will happen to the internal functions that historically dealt with technology and procurement? They will refocus on managing the commercial aspects of cloud provision, the creation of user facing applications, technical integration and overall service integration and service management. Developing support teams for cloud based applications and integrated cloud platforms will be both a challenge and a necessity, as no single external provider will be able to do so. A cloud vendor will not be able to provide support for complex multi-cloud systems and they cannot be expected to learn and understand all the specific business and domain knowledge for every customer. Companies will have a greater ability to develop their own applications for departmental needs, and creating wrapping APIs will allow greater flexibility and agility both for internal and external integration. This will require new digital infrastructure, commercial skillsets and functions to manage the service provision from vendors, and will become as much of a service broker as internal service provider.

7. Cloud storage will be about standards, not volumes

The industry move to end-to-end file based workflows has left production companies with a new challenge. Previously, when their content was mastered they received a master tape. Now they are more likely to receive a master file, on a removable drive. Many are already archiving rushes on removable drives and standalone LTOs, but clearly do not understand the significant risk of loss of content from this approach. As they do not value archived rushes, this is not in itself a critical issue, but it is for the content masters. In the same way that the DPP File Delivery Format filled a gap by setting out a clear method for delivering finished content, there is a new gap in understanding how to manage masters for the long term.

Currently, cloud storage economics do not stack up for the storage of all content throughout the entire workflow (from rushes to masters). However, cloud is a natural component in the mix as it can provide secure (and critically off-site) storage as part of an overall content management strategy. The volume of content may not be the large, but defining the formats, procedures and methods involved in that content management could have a major impact on the market. Adherence to a common standard, for example, could make the further distribution of that content considerably easier and lower the cost of distribution. In many respects this is the natural extension of the DPP File Delivery Format work.

From where we are today, this predicted massive adoption of cloud may seem unlikely. But then five years ago, so did watching HD content through the internet on LED, 3D app-enabled Smart TVs, with tablets cradled on our laps. The only real question is whether it will take that long.

The Digital Production Partnership Ltd (DPP) is a not for profit company founded by ITV, BBC and Channel 4 to enable the media industry to maximise the potential of digital in the creation and exploitation of content.

For further information about the DPP please go to:

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