



**An Interactive Scotland Whitepaper**

**Cloud Computing Services: A toolkit for digital media SMEs**

**New Media Partners**

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## Introduction

Cloud computing services are at an early stage of market adoption, however as the associated customer benefits become more evident and as cloud business models mature, cloud services are set for significant growth. Whilst cloud computing has applicability across all market verticals this whitepaper focuses upon the opportunities that cloud computing will enable for digital media SMEs

Cloud services offer far-reaching opportunities for the development, management, delivery and monetisation of digital media applications. They have already been shown to revolutionise the ways in which digital media businesses provide services to customers and will increasingly become core to the on-going development of the digital media sector. Cloud services therefore represent an extremely powerful toolkit for digital media SMEs in Scotland.

## Cloud services will become increasingly important across a range of industry sectors<sup>1</sup>

The United States National Institute of Standards and Technology ([NIST](#)) defines cloud computing as:

***"...a model for enabling convenient, on-demand network access to a shared pool of configurable computing resources (e.g., networks, servers, storage, applications, and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction."***

In essence then, cloud services are an extremely flexible form of IT outsourcing that exhibit a range of benefits including:

- *On-demand self-service provision*
- *Internet-wide, device independent, service access*
- *Rapid changes to the quantity of service used*
- *Measured service usage*
- *Shared, common, standard service characteristics*
- *Usage-based pricing (in one or more of its many variants).*

Consumers typically think very little about cloud services. Instead, they see a set of easily-accessible applications like Spotify, Facebook, Google Mail and Twitter that improve their everyday lives. Hence they are unconscious lead adopters of cloud services.

Cloud services are proving increasingly attractive to large corporates as they gain a better understanding of the potential benefits at a time when they have become increasingly sensitive to the high management and maintenance costs associated with existing, often bespoke, solutions.

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<sup>1</sup> This section relies heavily upon the findings of The United States National Institute of Science and Technology e.g. 'The NIST Definition of Cloud Computing', Peter Mell and Tim Grance, Version 15, 7 October 2009 together with prior analysis of cloud computing opportunities for Scotland undertaken by Scottish Enterprise.



There is a general consensus amongst analysts that cloud service revenues will continue to grow strongly in the medium term. For example Gartner forecasts<sup>2</sup> that the global cloud services market will grow to USD149 billion by 2014, up from USD59 billion in 2009 – an annual growth rate of over 20%.

There are three classes of cloud computing services:

- Software as a service
- Platform as a service
- Infrastructure as a service.

The first of the three classes of cloud service is **Software as a Service (SaaS)**. SaaS comprises a range of software applications that run upon an underlying cloud computing infrastructure and are accessible via a web browser. The service user may configure the software application, but does not control the underlying cloud infrastructure. Typically consumers and SMEs would associate cloud services with SaaS, and its major sub-categories include:

- Customer Relationship Management (CRM)
- Enterprise Resource Planning (ERP)
- Supply Chain Management (SCM)
- Content, Communication and Collaboration (CCC).

The second class is **Platform as a Service (PaaS)**. PaaS allows users to deploy applications onto the cloud infrastructure using programming languages and tools supplied as part of the platform. With PaaS the user has control over the deployed applications but does not in any way manage or control the underlying cloud infrastructure. PaaS examples include:

- **Google Apps** provides over 200 Google and third party web-based office tools. Google claims that over three million businesses use Google Apps<sup>3</sup> and more than 4 million Google Apps users utilise third party applications<sup>4</sup>
- **Force.com** is a development environment from CRM SaaS provider salesforce.com. Force.com users, in the main, create applications that extend the functionality of Salesforce. Salesforce.com claim that some 185 000 applications have been developed on the force.com platform<sup>5</sup>

PaaS is the least well-developed class of cloud services. However, in areas such as digital media where applicable toolsets can be significant, the PaaS model has significant potential.

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<sup>2</sup> <http://www.gartner.com/it/page.jsp?id=1389313>

<sup>3</sup> <http://www.google.com/apps/intl/en/business/index.html>

<sup>4</sup> <http://googleenterprise.blogspot.com/2010/09/app-tuesday-celebrate-google-apps.html>

<sup>5</sup> <http://www.salesforce.com/platform/>

The third service class is **Infrastructure as a Service (IaaS)**. IaaS allows the provisioning of processing, storage, networks, and other fundamental computing resources upon which the user is able to deploy and run operating systems and applications. IaaS providers include iomart, Akamai and Amazon Web Services. Given that many digital media services make intensive use of computing resource, the growth in adoption of IaaS services offers significant opportunities.





## Digital Media SMEs stand to benefit significantly from cloud service adoption

Information infrastructures are a key factor in the development and distribution of compelling digital media applications for a global audience. Cloud services can address a number of key challenges facing digital media SMEs:

- ability to participate in multi-organisation collaborations, many of which may only exist for the duration of a particular project, that create and deliver digital media applications
- cost-effective access to content toolsets that enable easy integration with the wider activities of the cluster
- scalable storage requirements both during the development and delivery phases of a particular digital media application
- ability to monetise digital media applications in novel ways.

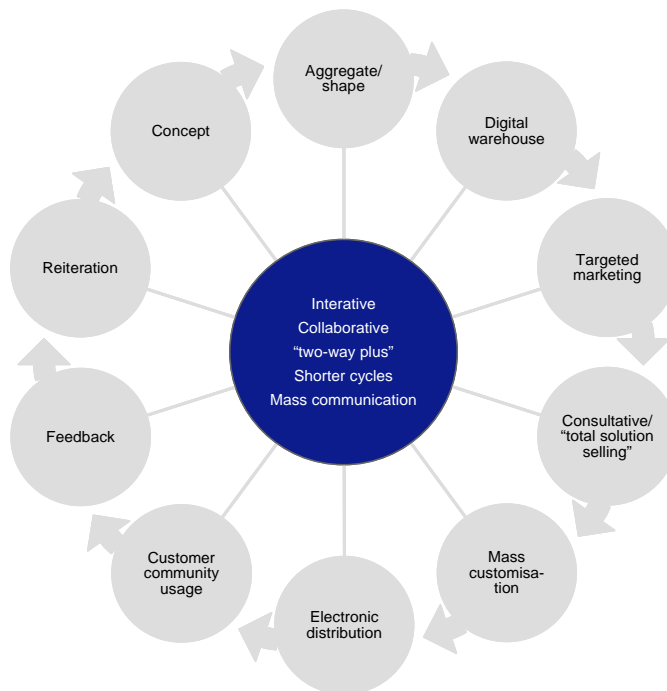
*Cloud services will become a critical enabling technology for digital media collaborations*

The digital media landscape is in constant flux, for example:

- the user can now consume content in a multitude of ways including PDA's, tablets, MP3 players, ebooks, podcasts, vodcasts, PSPs, DS and mobile phones
- new service models demand a constantly evolving user experience including increased resolution and 3D effects
- digital services are increasingly expected to provide the same level of reliability and availability as traditional broadcast services.

In this environment, the need for the rapid creation of new content and software services - plus supporting promotional materials - that can be reliably and robustly delivered over these new delivery channels continues to expand.

The rapid creation and effective delivery of new services will become increasingly reliant on the effective collaboration of specialist organisations, often only for the duration of the project itself. It also relies on on-going interactions throughout the development cycle as demonstrated in Figure 1.



**Figure 1 – Interactions within the development cycle (source New Media Partners)**

Such collaborations will thrive where, for example:

- the cost and complexity of enabling, maintaining and ultimately dissolving the collaboration is low
- accessing and participating in the collaboration is quick and simple.

The dynamic, on-demand, nature of cloud services represents a strong fit with the needs of such collaborations. As a result, digital media collaboration solutions that combine SaaS, PaaS and IaaS services can be expected to emerge.

*Cloud services will reduce the cost and complexity of accessing content development, management & delivery toolsets*

The convergence of traditional broadcast media with the internet, mobile and gaming technologies has created highly sophisticated communication between global communities and is a market rife with innovation. The top down model of broadcasting is shifting as audiences watch less pre-packaged and scheduled genre programming, in favour of time shift consumption, interactive services and internet based activity. Users can also participate in using and making content and interact with each other online through an increasing number of games and services.



As illustrated in Figure 2 below the digital content lifecycle passes from capturing content to playout and finally archiving, and is depicted below as a multi-stage process.



Figure 2 - Digital content lifecycle (source New Media Partners)

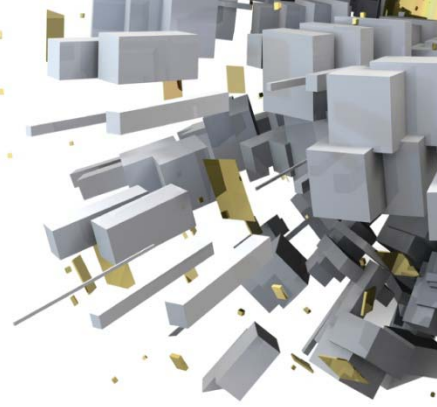
At each stage of the lifecycle a range specialised toolsets, requiring very significant levels of processing and storage, will be applied. The traditional computing model demands that companies invest in the necessary IT equipment and software applications associated with a particular stage. This can be very unattractive and costly particularly where IT and software is being utilised for only a limited period.

In contrast, the cloud model allows such resources – both software and infrastructure - to be purchased only as required. By delivering specialised toolsets, specialist platforms and high-end IT infrastructure only when needed, cloud services can significantly improve the economics of digital media SMEs.

*Cloud services offer a highly flexible approach to the provision of digital media storage.*

Rich media content production creates an explosive demand for storage. 3D movies such as Avatar are bringing incredible eye-catching content and visuals to the big screen. From a production perspective the large file sizes required for high-resolution images lead to an increasing demand for high-capacity storage and data transmission. As shown in Figure 3, increasing resolution and frame rate lead to ever increasing data rates and storage capacity.

In addition it is difficult for digital media companies to predict the level of demand for a particular application or service prior to launch. Demand is typically spiky in that during specific time slots there may be an abnormal demand for a particular service driven, say, by a related TV show or sporting event.



Format	Resolution (width x height)	Frame rate (fps)	Data rates (M8ps)	Storage capacity/hour (GB)
MPEG-4 (compressed)	Varies	Varies	~0.750	~0.337
DVD MPEG 2 (NTSC, compressed)	720x480	29.97	1.22	4.39
SDTV (NTSC, 4:2:2, 8-bit)	720x480	29.97	21	75.6
Blue-Ray Disc (compressed)	1920x1080	24	4.56	16.4
HDTV (1080p, 4:2:2, 8-bit)	1920x1080	24	149	536
Digital Cinema 2K (4:2:2 10-bit) RGB	2048x1080	24	199	716
Digital Cinema 4K (4:4:4 16-bit) RGB	4096x2160	24	1,274	4,586
Ultra-HDTV	7680x4320	60	3,233	11,640

**Figure 3 - storage requirements for different digital media services (Source New Media Partners)**

An interesting service enabling the global delivery of rich media is a content delivery network (CDN). A CDN is a distributed network of servers containing copies of data, placed at various points around the globe. The CDN maximizes bandwidth to access the data by allowing global users to retrieve a copy of the data from a geographic location near to that user, so avoiding possible bottlenecks. A CDN configuration typically comprises:

- an origin server that contains the original content
- knowledge of the locations to which the original content will be distributed
- a distributed network of servers that hold a copy of the original content.

### *Cloud services offer new ways of monetising digital media applications*

A range of cloud services have already emerged that allows creative media to be monetised in new and interesting ways. It is interesting to note that, whilst a cloud service offering will have a dominant cloud service class (e.g. PaaS), it may also utilise other services classes as part of the overall product offer. Such combinations of services will becoming increasingly common in the future as cloud service providers increasingly focus on profitably delivering the full set of customer needs.

Some examples of cloud digital media applications that offer new ways of content monetisation are introduced below. Such services are globally applicable and available, and offer Scottish digital media companies an extremely powerful toolkit to:

- fully capitalise on the appropriate use of such services for the development, management and delivery of digital media applications

- identification of novel ways of monetising digital media applications.

Services such as **Behance Network** and **VFX Marketplace**, that better enable digital media connectivity and collaboration, have emerged. The Behance Network ([www.behance.net](http://www.behance.net)) provides clients with the ability to outsource elements of their creative processes. Creatives are provided with a platform that allows project portfolios, be they text-, image-, video- and/or audio-based, to be created and showcased. The resulting portfolios can then be promoted on the network or via social networks. The Behance network also allows creatives to network with one-another and to sell their work via the site. Currently the network hosts over 600 000 public projects containing over 7.6 million images<sup>6</sup>.

The VFX Marketplace ([www.vfxmarketplace.com](http://www.vfxmarketplace.com)) focuses upon the trading of visual effects. VFX companies put up work they wish to outsource and accredited suppliers by project. The winning individuals undertake the project and are paid on completion. The VFX Marketplace provides a range of tools intended to make the purchase process simple, fast and cost-effective.

Companies such as **Spot Specific** and **Brightcove** offer platforms that simplify the process of creating and distributing digital content.

Spot Specific (<http://www.spotspecific.com/>), based in Glasgow, provides a cloud-based authoring and publication platform for mobile applications. Spot Specific allows application developers to design, test, extend and publish applications to a range of popular applications stores all from a single environment.

To enable the management and distribution of professional-quality online video content the Brightcove Video Platform (<http://www.brightcove.com/en/online-video-platform>) provides a range of tools that enable the delivery of professional-quality online video. Over 150 partners have developed a range of extensions and add-ins to the core video platform<sup>7</sup>. Service pricing starts at USD99 per month.

Companies such as **OnLive** (<http://www.onlive.com/>) and **Playcast** (<http://www.playcast-media.com/>) offer gaming-on-demand platforms. OnLive and Playcast deliver off-the-shelf triple-A games through existing set-top box equipment, eliminating the need for a gaming console or PC. OnLive has recently emerged from seven years of stealth development, while Playcast has recently secured USD10 million in series B funding<sup>8</sup>.

A range of CDNs – both free and commercial – have emerged. **Coral** (<http://www.coralcdn.org/>) is a free peer-to-peer content distribution network. Coral has been running since March 2004 but is not now undergoing any active development. Despite this Coral continues to run on around 200 servers<sup>9</sup>.

Commercial CDN offerings are available from organisations such as **Akamai**, **Limelight Networks** and **Amazon Web Services**. At the very high end is the Akamai HD network

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<sup>6</sup> <http://www.behance.net/facts>

<sup>7</sup> <http://www.brightcove.com/en/online-video-platform/extensions-and-integrations>

<sup>8</sup> <http://www.playcast-media.com/news/2011/1/25/leading-cloud-gaming-company-playcast-raises-10-million-from.html>

<sup>9</sup> <http://blog.gmane.org/gmane.comp.web.coral.user/month=20101101>





(<http://www.akamai.com/html/misc/hdnetwork.html>) that is optimised to provide HD-quality online video in both fixed line and mobile environments. The service is aimed at large-scale content producers such as broadcasters and film distributors and is intended to complement existing means of content distribution and delivery.

Limelight Networks (<http://uk.limelightnetworks.com/index.php>) provides a range of digital media content distribution services. One such service is LimelightSTREAM. This content streaming service is intended to support applications such as live events and feature films, and has a capacity of 1,500 Gigabits/second<sup>10</sup>.

Amazon CloudFront (<http://aws.amazon.com/cloudfront/>) is a component of the Amazon Web Service product family. Unlike some other CDNs CloudFront offers a self-service, pay-as-you-go pricing model based upon the level of data transfer and the number of content requests<sup>11</sup>.

## Cloud service adoption will require careful consideration

An often-cited issue affecting the adoption of cloud services are the issues of privacy and security of information placed into the cloud. There is a perception that, the more that an organisation seeks to outsource storage of customer data and intellectual property, the greater the exposure of the organisation to a security or privacy breach. However breaches exist even when using existing mainstream computer network architectures and associated operating processes. For example, the UK government estimates that cyber-crime currently costs UK businesses alone GBP21 billion per year<sup>12</sup>.

The issues of privacy and trust in the cloud are well-recognised by cloud service providers and there is therefore a compelling market imperative for such organisations to ensure that the privacy and security of cloud services is fit for purpose. Cloud service providers will continue to invest to ensure the security and privacy of their offerings on an on-going basis. With such investments being made it could indeed be argued that cloud based solutions will be more secure than an equivalent self-provided solution from a digital media SME since cloud service providers can amortise the cost of 'good' security across thousands or even millions of customers.

Organisations considering the adoption of cloud services must satisfy themselves that their approach to the adoption cloud services will offer sufficient comfort on privacy and security issues.

When adopting cloud services perhaps the single biggest operational issue is the impact of a service outage. The more business-critical the cloud service the greater the operational impact.

For digital media SMEs it is likely that cloud services will be business-critical. For example, an e-mail outage will cause a degree of disruption, but this disruption will be minimal when compared to, for example, the loss of a CDN node for a digital media company. As such it is important to understand the service level agreement (SLA) associated with cloud services. Important SLA clauses include:

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<sup>10</sup> <http://uk.limelightnetworks.com/limelightstream.htm>

<sup>11</sup> <http://aws.amazon.com/cloudfront/#pricing>

<sup>12</sup> The Cost of Cyber Crime, UK Cabinet Office, February 2011



- **Availability:** a 100% availability guarantee typically indicates that the service provider will compensate for periods in which services are unavailable
- **Time to fault resolution:** As with availability a defined time-to-resolution means that service providers will provide compensation should the time to resolution of a fault be lengthy
- **Compensation:** If the SLA provides for compensation then it is important to understand what level of compensation will apply if the SLA is breached
- **Notification:** It is important to understand where the onus lies for notification of a fault. Where this rests on the user to secure credits then it will add to the frustration of the down-time itself.

Unlike services controlled in-house, cloud services tend to be standard offers with limited ability to customise to meet the exact needs of the organisation. The organisation will need to trade off an element of control over their IT infrastructure in order to reap the benefits of cloud service adoption. Hence the adoption of cloud services may have some impact upon the operations of the organisation, and any such impacts should be explored and understood in advance.

As services migrate into the cloud so the importance of the access network infrastructure of the organisation increases. A robust high bandwidth connection become increasingly important as reliance increases upon the upload and download of large amounts of data. It is therefore important to ensure that the infrastructure requirements are understood in advance, and the availability of the appropriate access infrastructure at a viable cost is confirmed.

## Conclusion

The cloud services sector is maturing rapidly, and the three broad classes of cloud service all have broad applicability across a wide industry sectors. Perhaps uniquely though, cloud services will permeate the full range of digital media application development and delivery cycle, and already allow digital media applications to be monetised in novel ways. Though the adoption of cloud services requires careful consideration it offers Scottish digital media companies an extremely powerful toolkit to develop, manage, deliver and monetise digital media applications.

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