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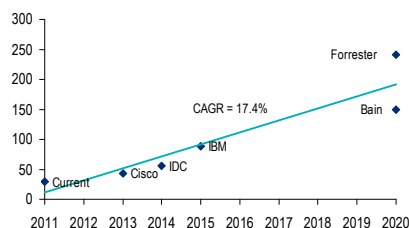
Telecommunications Services (Citi)  
Global

## Cloud Computing

### Every Silver Lining Has a Cloud\*

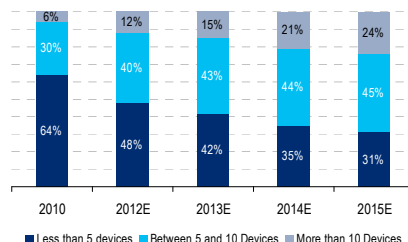
- **Migration to cloud driving industry change** — We expect enterprise cloud computing to continue to grow fast as CIOs recognise the benefits in flexibility, lower costs and releasing resource for more business affecting matters. With Europe put at 3-4 years behind the US in terms of corporate take up (due partly to data protection laws) recent increases in momentum are encouraging.
- **Sizeable market opportunity** — Most market forecasts coincide around \$45-50bn pa of revenue globally by 2013-2014 (more than double the level in 2011) and we expect a 20% CAGR to 2020. According to Informa, telcos took 16% of a \$20bn cloud services market in 2011 (~\$3bn). Cisco expects telcos share to rise to c.20% by 2014 implying a three-fold increase to around \$9bn of revenue.
- **US Tech players lead in the cloud** — Web-grade IaaS providers **Amazon** and **Rackspace** as well as software challengers like **VMWare**, **Salesforce.com**, **RedHat** have been first movers and we see the early days of the move to cloud as a net positive for such companies, while incumbents **Microsoft**, **Oracle** and **IBM** are catching up and focus more on enterprise-grade cloud. However, we anticipate price competition on the back of limited product differentiation, and argue that, ultimately, providing cloud services will only be economical on a large scale.
- **Telecoms operators are raising their game to capture the growth opportunity** — Telcos are, rightly in our view, mainly focusing on enterprise-grade infrastructure outsourcing rather than mass market web hosting. Stocks which provide meaningful exposure among the European telcos include **BT**, **Portugal Telecom** and **Colt**. Among the US telco names are **Cogent** and **TW Telecom**.
- **Colocation providers remain key in the value chain** — Connectivity and data centres remain key to the cloud story. Well connected, carrier-neutral data centre operators such as **Equinix**, **Interxion** and **Telecity** should remain well positioned to benefit from cloud services based traffic growth.

Cloud Computing Market Forecasts (\$bn)



Source: Cisco, IDC, IBM, Bain, Forrester, Citi Rsch

Per-User Ownership of Internet Devices



Source: Cisco Global Cloud Index

#### ■ Industry Overview

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\*Amendment: we have included some additional content on page 87 discussing KPN's cloud offering

See Appendix A-1 for Analyst Certification, Important Disclosures and non-US research analyst disclosures.

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## Every Silver Lining Has a Cloud

The megatrends in IT point to adoption of cloud computing continuing until what was exceptional only a year or two ago becomes the norm. Consumers are accustomed to cloud-delivered services such as email or online shopping without giving a moment's thought to the way they are delivered. Users of Amazon's Kindle already have a rich, multi-device experience that corporates are now seeking to emulate with their own platforms so they can not only support a mobile, multi-device community but also the even more flexible (and security-challenged) concept of Bring Your Own Device. Further dramatic increases in processing power, storage and bandwidth at falling unit costs tilt industry economics further in favour of cloud computing architectures. The opportunities in IT Services, software, data centres and telecommunications are significant but incumbent vendors in some segments could come under pressure.

Movement of applications into a shared public cloud environment has extensive implications across our coverage. In the corporate world the pace may be slow due to the need to get comfortable with security (the most important issue for 43% of CIOs in Europe – Figure 28). Cloud offerings need to overcome reluctance to change what's working in companies' legacy systems and deliver reliability and predictability of costs. Telcos that move quickly should see benefits. While initial revenues may somewhat cannibalize existing business, the prospect of much more extensive outsourcing of infrastructure by companies as network and IT continue to become more mutually dependent suggests real growth to come.

### Key Findings

Informa expects global enterprise spending on cloud in 2012 to be \$26.4bn (+32% yoy).

- **A growing market** – According to Informa Telecoms and Media, the total cloud market was \$20bn in 2011 and is expected to reach \$26.4bn in 2012, equating to 32% growth yoy.
- **Scale economies and technological developments are drivers** – Cloud is a transformational technology because it represents a new model for IT consumption, namely 'utility computing', where resources are employed flexibly, delivered on demand and can support multiple devices. Estimates on savings due to cloud vary considerably: Microsoft states cloud computing could decrease IT spending by 80% while an EEOC case study suggests 40% is a reality. Our industry interviews suggest that by adopting shared cloud architectures corporates might be able to save around 50% vs. in-house options and 25% vs. outsourced dedicated systems.
- **Security and legacy inertia remain barriers to adoption** – In Europe, a 43% majority of respondents to Citi's 1Q12 CIO survey cited security concerns as the most significant barrier to moving to a cloud computing model. Lack of compatibility with legacy applications (18%) and reliability concerns (11%) also featured. In addition, telecom operators regularly cited sunk costs in legacy infrastructure as a barrier.
- **Variety of business models** – The provision of software (SaaS), an application platform (PaaS) or storage and compute infrastructure (IaaS) are the core business applications of the cloud. Opportunities also exist for cloud consultants, integrators and aggregators who allow enterprises to move progressively into the cloud and manage a range of cloud services.

## In this report

In this report we look at the disruptive impact that the emergence of cloud computing is having on IT providers, telcos and data centre operators, giving particular attention to European telecoms. With Europe at least a year behind the US in adoption of hosting and cloud services (and 3-4 years in corporate take-up of cloud according to one industry contact) we explore the US experience and, though extensive industry interviews, site visits, independent market research and our own desk research examine the state of play for the industry.

We aim in this report to answer the following questions:

- **What is cloud computing** and what are the benefits for consumers, businesses, administrations and ultimately cloud providers?
- What are the **drivers, risks and limitations** of the cloud?
- What is the market opportunity and **who is best positioned amongst our global coverage universe** to capture valuable share?
- What are the **current and future trends** in cloud computing and can we establish a development path?

## Implications for Telecoms

Operators are targeting enterprises with SLA-based cloud infrastructure

- **Telecom operators are leveraging core competencies** – Operators are focused on the provision of enterprise-grade infrastructure, which, unlike the mass-market offerings from Amazon and other technology majors, include Service Level Agreements (SLAs) and a service wrap providing management information, increasingly through a single portal. Further differentiation is being achieved through targeting specific industry verticals and aggregating SaaS offerings through partnerships. We think this end-to-end cloud provisioning has high long-term growth potential, especially as appetite for IT upgrades picks up. BT, Telefónica, Verizon, Deutsche Telekom, France Telecom, Portugal Telecom and Colt are all following this development path and we expect Vodafone to elaborate upon its intentions at its Enterprise Day on 27 September.

Informa expects telecom operators' cloud revenues to reach \$4.3bn in 2012 (+32% yoy)

- **Strong growth in cloud revenues**– Informa estimates telecom operators' cloud revenues at \$3.2bn in 2011 and expects c. \$4.3bn in 2012 (+32% yoy). Although growing from a small base this revenue pie could become significant from an operator's point of view by 2015. For instance Orange generated €50mn of cloud revenues in 2010 and is targeting €500mn by 2015. Similarly, Telefónica estimates its revenue opportunity from Security & Cloud at €500-700mn by 2015. This is consistent with SFR's objective for Andromède to achieve a €400-500mn turnover figure by 2016.

Cloud may cannibalize at first but in time we expect more incremental revenue gains for outsourcers including telecoms

- **Some of this will not be incremental** – In enterprise, sales of cloud services are likely to cannibalize existing data and hosting services. In time, though, we expect more incremental gains as CIOs become more comfortable with outsourcing and the upgrade cycle rolls over more legacy platforms. Consumer cloud applications may be positioned as loss-leaders. At little or no marginal cost, cloud 'entertainment' type of offers (cloud radio, cloud gaming, picture storage and sharing, VoD) could make the customer base more 'sticky' and by reducing churn the lifetime customer value should in theory increase.

**We expect cloud EBITDA margins to be in the range of 15%-20% at maturity**

**Migrating in-house IT to cloud reduced PT's IT-related Opex by 30%-50%**

**M&A in cloud will remain significant as a fast way of building expertise**

**The EC is trying to address the question of a coherent European regulation on 'privacy' and 'data security'**

- **Cloud revenues will come at lower margins** – These 'network-centric IT' revenues will be lower-margin for telecom operators, in our view. Whereas Colt emphasizes it can achieve up to 50% gross margins on SLAs in basic access to compute, we expect cloud EBITDA margins to be in the range of 15-20%, below the current level of roughly 33% for incumbent telecom operators. If we were to draw a comparison with the migration to triple-play bundles in fixed broadband, whereas these bundles are ARPU accretive, higher programming costs associated with the TV offering imply lower margins percentage-wise.
- **Being cost-effective is key** – We expect strong competition in cloud computing and in particular in less differentiated web-grade offerings. As such, differentiation (network quality, security proposition, service features), the ability to negotiate financially viable partnerships with external SaaS providers, scale and cost control will be key in being competitive in this area. In a good example of using itself as a case study, PT claims internal IT opex savings of 30-50% by migrating more than 50% of its internal infrastructure to cloud and consolidating its in-house data centres.
- **The market is moving fast** – Given the relatively low upfront cost for developing cloud applications and the significant number of players in this area, the technological developments in cloud computing are occurring rapidly. The difficult macro environment is helpful to a degree as it incentivizes cost-consciousness and outsourcing to a cloud supplier can reduce cost as well as move up-front capex to an operating cost basis of payment. That said, the speed of change is such that telcos are unlikely to be able to rely on converting in-house cloud applications to create a relevant cloud offering in a sufficiently timely manner. We believe partnerships will be key and M&A will remain significant as a fast way of getting needed expertise in new areas (see Telefónica's partnership with SaaS provider Joyent and Vodafone's acquisition of CWW).
- **Regulation is a challenge in Europe** – One of the main reasons for Europe lagging behind the US on the cloud market development is a fragmented and incoherent European regulatory framework. A 2011 paper by the EC on the roadmap for a Digital Single Market by 2015 states: *"Internet Europe is still a patchwork of different laws, rules, standards and practices, often with little or no interoperability. This hinders the development of on line services and undermines the confidence of existing or future users on both the supply and the demand side"*. These are issues related to the online world generally, but the cloud model intensifies them; stakeholders are concerned about uniformity on **privacy** and **security of data** entrusted to the cloud. Efforts are being made to encourage further development of cloud computing by including relevant actions in the programme for the Digital Agenda for Europe. That said, the strength of European laws protecting data privacy may now be becoming an advantage.
- **Who is best positioned to monetize the cloud?** – We view as best placed those players that are acting quickly today to deliver high-quality, enhanced service cloud offerings to corporates, at scale and with strong cost control and predictable pricing. In our view, convergent offers with orchestration will be key in cloud packaging. On the basis that cloud also needs to be material to the business, we identify BT, Colt and Portugal Telecom as among the best plays on cloud in European Telecoms, while noting that most incumbents are developing increasingly sophisticated offers. Among the US telco names we highlight **Cogent** and **TW Telecom**.

## Implications for Technology

**Software: incumbents readying for the challenge**

■ **In many cases, we believe it is too early to call winners and losers in software.** Companies such as Oracle, Microsoft and IBM are incumbents while VMware and Red Hat are challengers in this market. Given their relatively low shares in application infrastructure (notably middleware), it is likely the move to PaaS will be a net positive for VMW and RHT. However, for Oracle, Microsoft and IBM, which are all incumbents, their position in the application infrastructure market will depend on how well they adapt to the evolution in the market.

**IT Services: pure-play providers such as Salesforce.com encroach upon incumbents**

■ **Traditional IT Outsourcing firms face significant risks associated with the cloud.** Virtualisation and other cloud attributes diminish the value proposition offered by traditional data centre outsourcers. Eventually, service providers that maintain internal systems or provide system integration services could suffer material revenue cannibalisation, though we do note a long runway for this to happen. This effect is mirrored in the SaaS marketplace, as pure-play providers like **Salesforce.com** encroach upon incumbents like **Oracle**. On the other hand, we believe that colocation providers such as **Equinix**, **Interxion** and **Telecity** are well placed to defend their position and may benefit from partnering with bespoke cloud services. For an IT Services vendor with the right strategy the net result can be positive. **IBM** expects cloud initiatives to contribute around \$7bn of revenue by 2015, although there is also around \$4bn of revenue cannibalization envisioned in its plan.

■ **In software, we expect outsized growth in SaaS** – Software as a service, in which software is delivered through a browser and run in a third-party data center instead of 'on premise', is a growing trend. This trend is expanding the market, as it brings sophisticated software within reach of smaller companies with little IT expertise. At the same time, this trend is shuffling the competitive ranks, as incumbents such as **Oracle** and **SAP** have only in the last two years begun to react, but are investing significantly here. **Microsoft** was earlier to embrace the cloud. Early SaaS leader **Salesforce.com** has built a significant (\$2bn+) business in customer relationship management and we see other early entrants following this lead (**Service-now**, for example).

**Well connected, carrier-neutral data centre operators should be well positioned**

■ **Data centre players well positioned** – Well connected, carrier-neutral data centre operators such as **Equinix**, **Interxion** and **Telecity** should be well positioned to benefit from growth in cloud propositions, in our view. Indeed, cloud-related traffic, alongside increased digital content and high velocity trading, is a key driver of increased internet content (aggregated IXP traffic was up c.40% YoY in the first seven months of 2012). These companies have high barriers to entry due to restrictions in planning and availability of power and connectivity, although we expect the telcos to become increasingly competitive at the managed services end of the market in particular.

■ **Software Defined Networking (SDN) is getting serious attention** following VMware's \$1.26bn acquisition of Nicira, despite it still being at an early stage commercially. It is potentially disruptive to the hardware players, which could find their core products denied their intelligence functions. The telcos will recognize the conceptual similarities with the voice intelligent network (for number translation), with positive connotations for richer services, but could also be concerned at handing over intelligent control of the network to a client application, seeing that as a possible new route to commoditization.

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# Today's Cloud Outlook

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# An Introduction to the Cloud

**Cloud computing is another step in the convergence of infrastructure in telecoms and IT, with parallels with the changes in call centres that started in the 1990s**

Cloud computing is the provision of computing services to customers on demand using network access to a shared pool of configurable computing resources. It represents a different model for the delivery of information technology, where software applications are run on centralised computer hardware and, in turn, is connected to users via high-speed telecoms links. Cloud computing can be provided on a per-use basis or can represent a lower-cost architecture with new features (BYOD, for example).

It is important to recognise at the outset that cloud computing by its very nature involves a unique hybrid of telecommunications and IT infrastructure technologies. In our view, the growth of the cloud computing market will initiate competition between these previously relatively distinct industries.

**Under cloud, IT services are delivered on-demand, at consumptive pricing**

The technological upheaval that appears an inevitable consequence of cloud computing is turning IT services into a resource comparable with a utility like electricity, in that it can be delivered on-demand and, where desired, with consumptive pricing. As we will see, this implies numerous usage benefits, not least because of the simple economies of scale that accrue from the concentration of computing hardware in a single location which services many end-users.

## Our approach

In the next chapter, we will analyse these new business models across the cloud computing value chain and look at which companies have the ability to monetise each area. In this section we will consider the following key questions regarding the nature of the industry:

- What makes the cloud model different?
- What forms of cloud computing exist?
- What services can be provided to consumers and to enterprises?

We then go on to describe which factors have driven and inhibited the development of the cloud, from both a 'technology push' and a 'market pull' perspective.

- What technological developments have allowed the cloud model to emerge?
- What benefits can the cloud provide to customers?
- What barriers exist to the widespread use of the cloud?

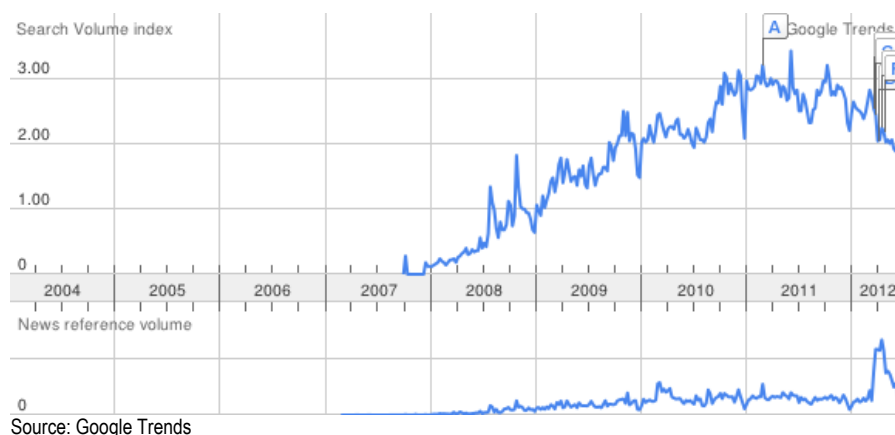


The hype surrounding the cloud is subsiding, but how will the market mature?

## Why the topic is relevant?

The decrease in the number of Google weekly search volumes since 2011 might suggest the fact that we are beyond the 'hype factor' surrounding the cloud services opportunity. This is probably related to a better understanding of the topic and its implications as well as maturing of industry vernacular, most likely related to the macro economic environment as much as the concerns we raise later in this report.

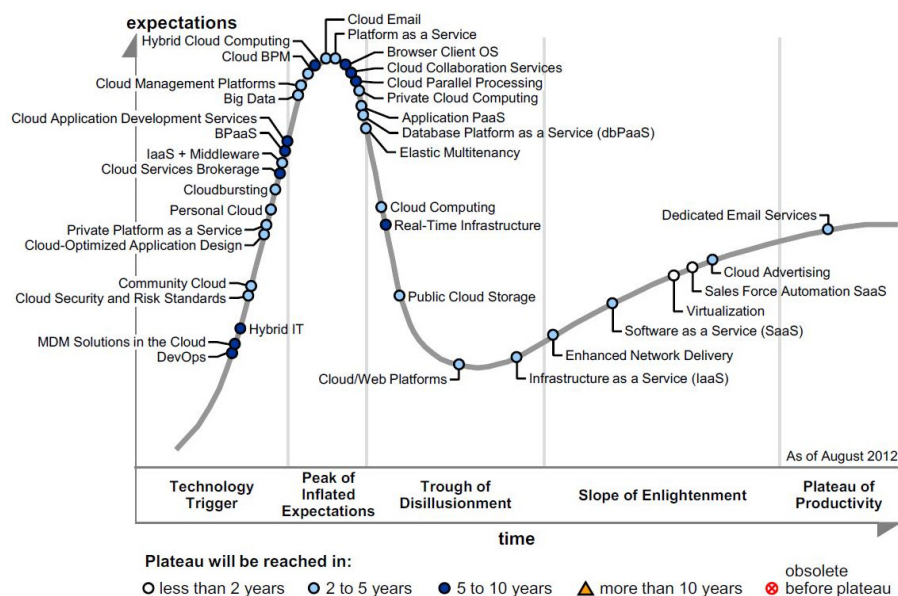
Figure 1. Cloud Computing, Average Weekly Search Volumes



## Cloud in a 'trough of disillusionment'

The 2012 version of Gartner's cloud hype cycle positions a variety of cloud products at different levels of expectation. Notice that many of the core cloud services we will discuss in due course, such as infrastructure as a service, platform as a service, and private cloud computing, are positioned spread across the 'trough of disillusionment', having already achieved the maximum level of expectation and now being surrounded by uncertainty before the market fully matures.

Figure 2. 2012 Gartner Cloud Computing Hype Cycle

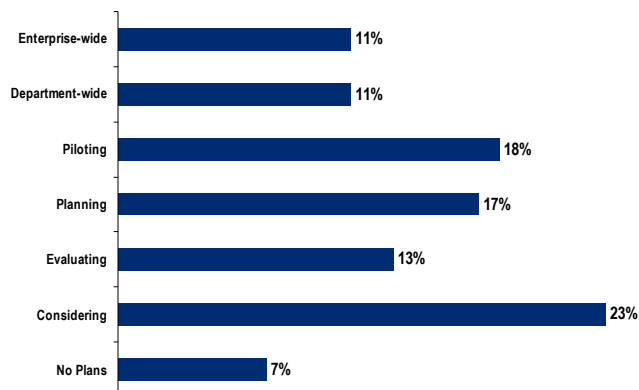


Source: Gartner, August 2012

**The top driver cited for cloud adoption is business agility**

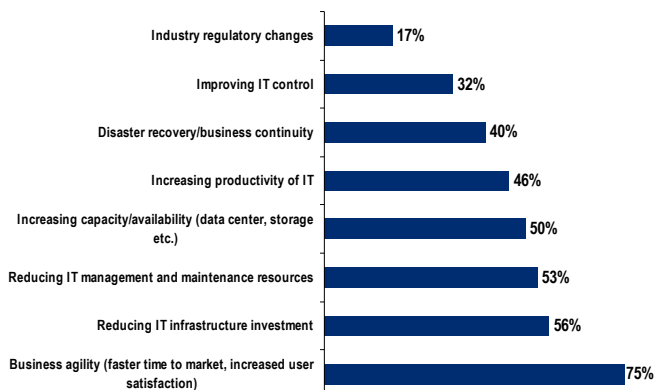
The top driver cited for cloud adoption is business agility. According to a CIO/IDG survey conducted globally among 636 enterprise IT-decision makers, cloud services adoption is maturing quickly: 2/3 of respondents were planning on adopting cloud as of end-2010 and 22% were already in department or enterprise-wide deployments.

**Figure 3. Stage with Regard to Utilizing Cloud Computing**



Source: CIO Global Cloud Computing Adoption Survey Results, January 2011

**Figure 4. Cloud Adoption Drivers**

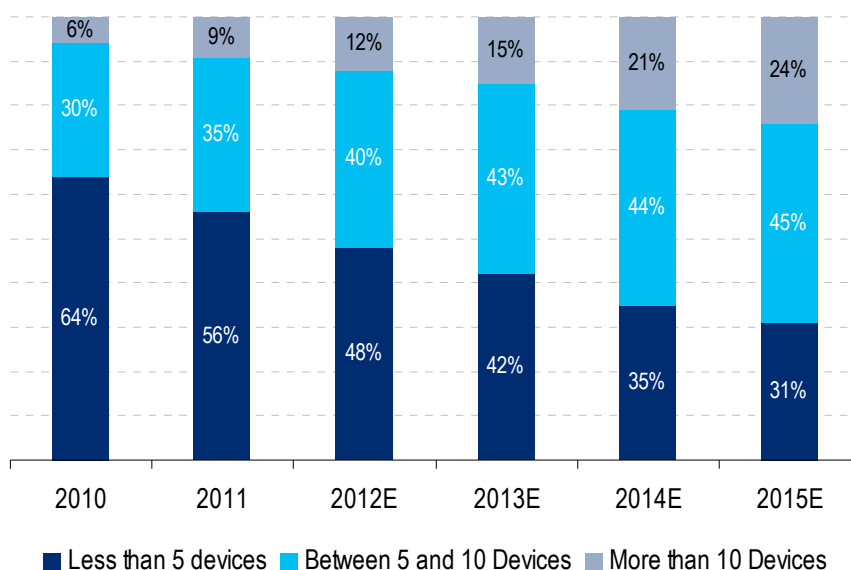


Source: CIO Global Cloud Computing Adoption Survey Results, January 2011

As Figure 3 and Figure 4 above show, Citi's quarterly CIO Survey supports the earlier indicated data, showing that the vast majority are moving in the direction of the cloud, with only a small 7% minority with no plans of any kind.

**Figure 5. Per-User Ownership of Devices Connected to the Internet**

Nearly 70% of internet users will use more than five network-connected devices by 2015



Source: Cisco Global Cloud Index

**Cisco estimates that the average business will need to support twice as many end-user devices in 2015 as in 2010**

Another significant driver of cloud adoption is the increase in mobility and the number of connected devices (Figure 5) which shows the proliferation of multiple device ownership. Connected devices include devices include laptops, desktops, smartphones, tablets, internet-connected TVs, set-top boxes, game consoles and digital photo frames. Cisco's cloud index anticipates the average business will need to support twice as many end-user devices in 2015 as in 2010, hence the incentive to adopt cloud-based infrastructure and applications.

**\$13.5bn committed in 2011 alone by telecom operators to the acquisition of cloud assets**

The telecom operators are investing a significant amount of money into the cloud opportunity, hence the question of return on the cloud investment is a particularly relevant one to investors in the telecom sector. According to Informa's Telecom Cloud Monitor, the European operators accounted for only 7% of the \$13.5bn that operators committed globally to acquiring cloud assets in 2011. North American and Asian operators accounted for 90%, or \$12bn, of this committed capital.

# What Makes Up the Cloud?

*"A cloud is made of billows upon billows upon billows that look like clouds. As you come closer to a cloud you don't get something smooth, but irregularities at a smaller scale." Benoit Mandelbrot*

The key to understanding how the cloud differs from traditional IT services is recognizing that it is not so much the technology that is new, but rather the way in which it is supplied to the end user. IT becomes a utility, supplied via high-speed networking links to wherever the user is, sometimes paid for on a per-use basis. This, in turn, relies on virtualisation, the process of separating the logical component of computing, storage or network from the underlying hardware resource.

We make two distinctions between cloud services. Firstly, the public, private and hybrid clouds refer to the extent to which the underlying resources are shared i.e. whether one customer's resources exist on the same physical server as another's. Secondly, different levels of IT can be provisioned, namely infrastructure, platform or software. Cloud becomes a model for robustly outsourcing significant corporate IT infrastructure, lowering costs and freeing up internal resources to address business objectives.

## Why is the cloud different?

The 'cloud' itself constitutes the physical data centre and hardware assets and the telecom network that allows users access to them. While there is nothing particularly revolutionary about the underlying hardware, the capacity of each key component is growing fast and features supporting visibility (where's my data?) and security are becoming more sophisticated.

What is fundamentally different, though, is the manner in which the service is provisioned.

The notion of a 'cloud' describes its performance from the view of the customer, who can access IT services (including storage, hardware and software) remotely, with much greater flexibility than historically. The cloud experience is only made possible by a combination of **secure data centres** and **high-speed connectivity**.

From a service point of view, three aspects of cloud computing are different relative to the traditional stand-point:

- The appearance of infinite computing resources **available on demand**, thereby eliminating the need for cloud computing users to plan far ahead.
- The ability to pay for use of computing resources on a **short-term basis** as needed, and release them when required – often on an automated/self-service basis, without actively involving a services intermediary.
- The **elimination of an up-front commitment** by cloud users, allowing small companies to start small and increase hardware resources only when there is an increase in demand, avoiding big, advance payments ahead of business need.

From a provider's perspective (and this has implications for the user also), enabling such cost and volume flexibility for users can generally make sense only when the associated concept of **multi-tenancy** is implemented. Much like a time-share in the lodging industry, the pure 'public cloud' definition works best from an economic standpoint when the underlying resources are used by multiple users over time to maximize resource utilisation. Of course, in an open cloud definition, this can have implications for data security also.

## Cloud is a new service model based on existing technologies

It has been noted that in many ways the cloud model resembles old mainframe systems, where processing was similarly centralised before the increased processing potential of individual machines made the client/server model realisable. The growth in connectivity makes this shift possible, and allows future computing systems to incorporate the convenience of the modularity and agility of individual computers with the cost benefits of centralised mainframes. Thus, cloud computing represents not so much a new technology but a new service model for existing technologies.

This observation is the source of much criticism of the hype surrounding the cloud. In some circles it has been dismissed as simply a rebranding of existing technologies. From a purely technological perspective, this rings true, but from the point of view of the customer, the complete rethinking of how IT services functionality is offered marks a paradigm shift in the way the consumer and corporate world uses and relates to information technology.

## The evolution of the cloud

### A paradigm shift in IT infrastructure

While structural issues may hold back movement into the cloud in the short run, the underlying benefits of cloud infrastructure suggests that it is the future for at least a sizable proportion of total IT provisioning. We address these benefits more fully in subsequent sections, but the table in Figure 6 below describes the core economic and business benefits of the cloud when compared with the previous mainframe, client/server and web models.

Figure 6. Evolution of Technology

	Technology	Economics	Business Model
<b>Mainframe</b>	Centralised compute and storage, thin clients, highly proprietary	Optimised for efficiency due to high unit cost of resources	High up-front costs for hardware and software, single provider
<b>Client/Server</b>	PCs and servers for distributed compute, storage etc., still proprietary	Optimised for agility because of reduced cost of desktop PCs.	Up-front costs for hardware and software, lower because of more vendor competition
<b>Web</b>	Web browser clients (open) and introduction of open servers	Parallel computing achieves increased efficiency without agility loss.	Commodity hardware meaningfully reduces up-front costs
<b>Cloud</b>	Highly centralized commodity server and storage, 'any' client	Optimised for both efficiency and agility by centralizing resources that can be virtualised.	Ability to pay-as-you-go, and only for what you use

Source: Citi Research, Microsoft

## Virtualisation involves the separation of the logical component of computing, storage or network from the underlying resource

## Virtualisation

The concept of virtualisation has been a key enabler of the evolution towards cloud computing. Virtualisation involves the separating of the logical component of computing, storage or network from the underlying hardware. This model has been broadly adopted in the computing model and is working its way into storage and networking. In server virtualisation, application workloads (an operating system and application running on the OS) run on top of hardware, but with a hypervisor layer between the physical hardware and the application workload. The hypervisor enables this separation of software and hardware through partitioning hardware to be shared among application workloads. Server virtualisation technology is not new, first appearing on the mainframe and later Unix-based systems at least two decades ago. However, server virtualisation has gained significant momentum in the last 10 years, as IT organisations have standardized on x86 server

architectures. IT organisations initially deployed server virtualisation to help improve hardware utilisation as many times x86 servers were running at 5-10% utilisation. By partitioning one server, this utilisation could increase to 50%+, enabling massive server consolidation to take place and driving significant hardware cost savings. As organisations have evolved their use of server virtualisation, the value of the technology has expanded beyond higher hardware utilisation. More recent applications for server virtualisation include the ability to move application workloads among various physical servers for purposes of hardware maintenance, disaster recovery or increasing underlying hardware capacity to support higher loads required by the application.

**VMware has become the market leader in enterprise virtualisation**

While virtualisation technology was not invented by **VMware**, the company has become far and away the leader in x86 server virtualisation, which is the market where virtualisation technology has first gone mainstream. The majority of application workloads that are virtualised on VMware's platform are Microsoft Windows Server-based and, as a result, Microsoft entered the market with its Hyper-V technology. This product has failed to see meaningful up-take as it has lacked feature parity with VMware. With each subsequent release, including the more recent Windows Server 2012, Hyper-V has improved and we are starting to hear of some up-tick in adoption in Europe as a result.

**Open source Xen is the hypervisor of choice for service providers and other large market players, but has not meaningfully penetrated enterprise**

Open source **Xen** is the standard hypervisor being deployed by service providers and other large players in the market, although it has not meaningfully worked its way into enterprise. **Citrix** is the largest commercial distributor of Xen, although the largest users of Xen in the world, including Amazon's Web Services, do not purchase commercial support from Citrix. Similarly, Red Hat commercially distributes the KVM hypervisor and a set of associate management tools, although it has not yet seen enterprise up-take. Thus VMware remains in a strong position in the server virtualisation market. As the penetration of server virtualisation has expanded to beyond 50%, VMware has moved into network virtualisation through the acquisition of **Nicira** and has a very early leadership position in a market filled with start-ups. In storage virtualisation, nearly all storage vendors employ some sort of virtualisation technology to help improve customer economics, but overall storage virtualisation technology is in the very early stages.

In the end-state, when an IT organisation has virtualised a majority of its servers, it is in a position to run the underlying hardware as a resource independent of the application workloads and allocate this capacity in an optimal way. As virtualisation moves beyond servers into storage and network, there are not only the above benefits of higher hardware utilisation, but also the benefits of increased agility, as application workloads are not tied to or otherwise inhibited by limitations in inflexible hardware configurations. Application workloads can be spun up, torn down, moved around, given more or less capacity and moved to an entirely different physical location with no friction and in a very short amount of time.

**Short term, virtualisation is the key to the cloud, putting its purveyors in a strong position.**

Cloud computing takes the concept of virtualisation, where the logical components of computing, storage and network are defined separately from the physical equipment, to the next level. Fundamentally, when leveraging cloud-based services, the consumer (IT organisation, consumer, etc.) need not worry at all about the underlying components (hardware and in some cases software) and instead takes advantage of these resources to build value on top. Today, however, the most common means of implementing cloud still is taking a pool of shared hardware and partitioning it with virtualisation technology.

Long term, the cloud can evolve independently of virtualisation

Ultimately, cloud computing does not require a hypervisor and traditional virtualisation technology, however as cloud is likely to be adopted in an evolutionary manner, the purveyors of virtualisation technology are in a strong position to be technology suppliers. Long term, we can see scenarios where 'the cloud' evolves independently from 'virtualisation'. For example, in multi-tenant software as a service applications, all customer data is stored in one very large instance of an application. There are examples where this is true in the platform as a service (PaaS) layer as well.

Public cloud: multi-tenancy implies customers share resources

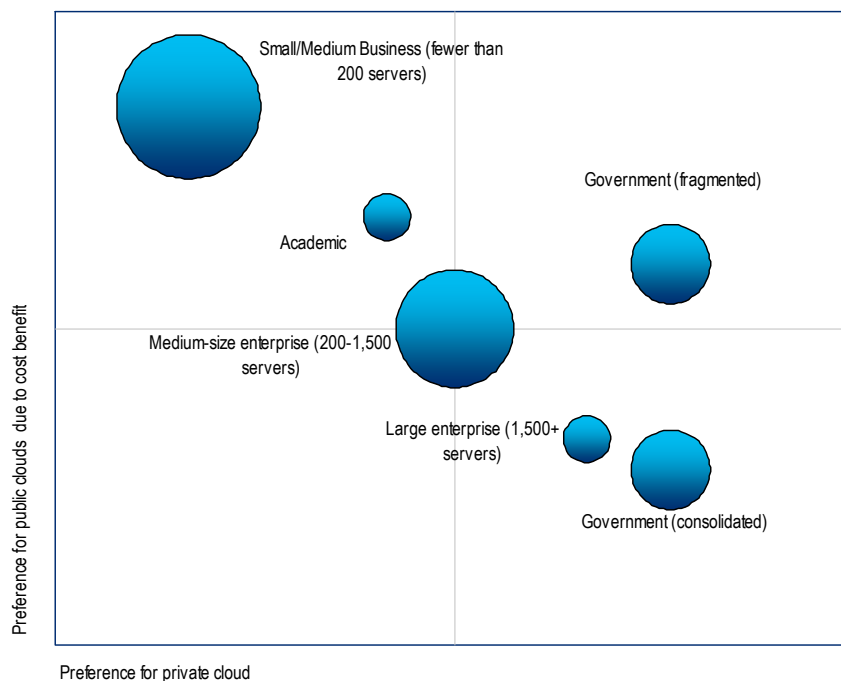
## Forms of Cloud: Public, Private and Hybrid

**Public clouds:** In a *public cloud* resources are shared between customers, so stored data from one organisation can coexist on a particular server with that from another customer. A Microsoft study suggests that the use of public clouds over traditional virtualised data centres can result in a tenfold cost saving, due to the resultant economies of scale outlined below.

Private cloud: Departments in a single organisation share resources

**Private clouds:** the term *private cloud* is used to refer to internal data centres of a business or other organisation that are not made available to the general public. In this model, resources are pooled across an entire company or business unit. These clouds are incapable of providing the full benefits of a public cloud, but may improve efficiency and availability by moving workloads across physical servers. In addition, scalability is potentially limited, and so these will be most beneficial for already large organisations.

Figure 7. Anticipated Uptake of Public and Private Clouds



Source: Citi Research



## Some market stagnation, but cloud growth to remain strong

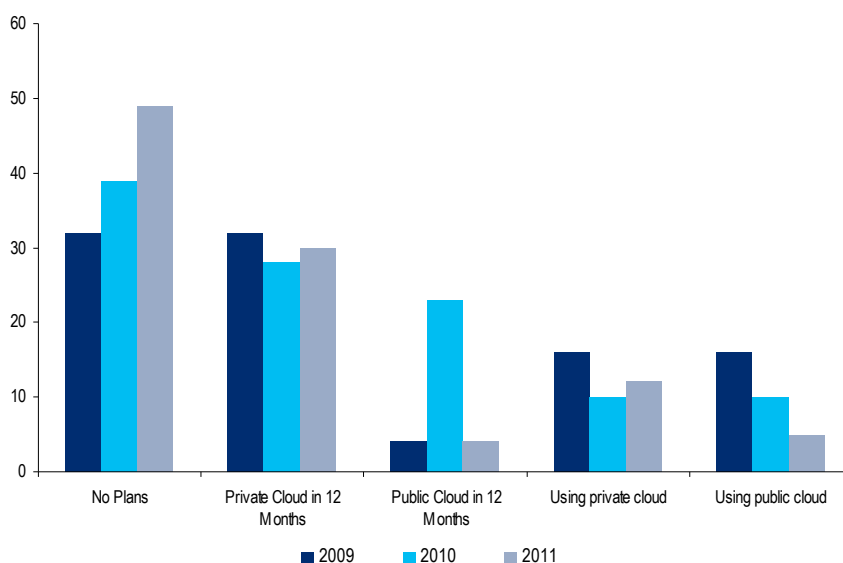
Figure 7 shows how we think different sizes and types of organisation are likely to have differing preferences between public and private clouds. The size of the bubbles represents share of total cloud revenues, and their position is governed by the relative preference for public and private clouds. Smaller enterprises will benefit more from economies of scale savings than larger corporations, while certain organisations (especially governments) are likely to show an inherent inclination for private clouds, due largely to security concerns. Local regulatory concerns and restrictions that affect the benefits of implementation are also important for global organisations. We anticipate that, as these concerns are addressed, there will be a general trend towards the upper left of this chart.

However, the momentum in this direction appears somewhat limited. Figure 8 from the results of a Gartner questionnaire of between 46 and 75 participants suggests that private clouds remain preferable for most businesses, with a growing majority still having no plans to move into the public cloud. This data comes with a 'health warning' due to small sample sizes and the self-selecting nature of the audience, but we believe the observation of a general stagnation in the industry in recent months is valid<sup>1</sup>, corroborating our belief that the 'hype factor' surrounding the cloud is beginning to wane. On the other hand, the long-term benefits of the cloud as outlined below are undeniable, and the growth of cloud revenues over the next decade will be still be strong if not spectacular, in our view.

## Hybrid clouds – the middle road

**Hybrid clouds:** A third option which is gaining popularity is the hybrid cloud, a composition of at least one private and at least one public cloud which are managed together to enable data and application portability. For example, an organisation might use a public cloud service, such as Amazon Simple Storage Service (Amazon S3) for archived data but continue to maintain in-house storage for operational customer data. In principle, this allows a business to take advantage of the scalability and cost-effectiveness that a public cloud computing environment offers without exposing critical applications to third-party vulnerabilities.

Figure 8. Gartner Questionnaire on the Timing of Cloud Investment

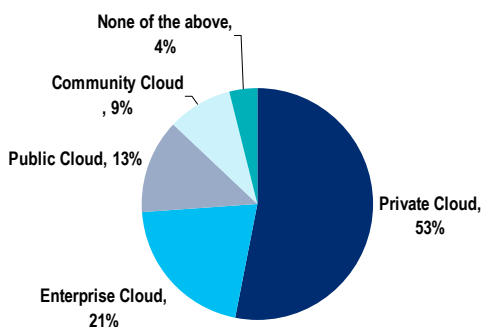


Source: Gartner, Citi Research

<sup>1</sup> The result in 2010 is slightly skewed, as the audience was allowed to provide more than one answer, resulting in an aggregate percentage of 110%.

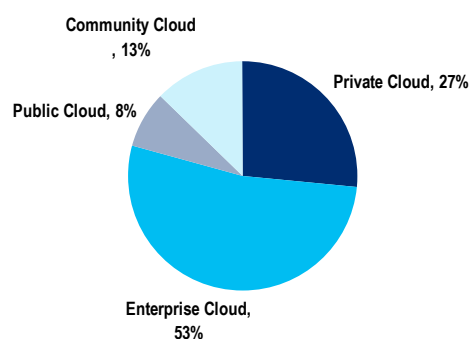
According to a Colt European CIO survey from May 2011, private cloud deployment remains the preferred option in Europe, due mainly to the sentiment that private clouds overcome security concerns whilst allowing for more limited scalability and cost savings compared with the public cloud. Private clouds are particularly popular as an option in Spain (58%), Germany (57%) and the UK (56%). Enterprise (Hybrid) clouds are the preferred choice for one in five companies (21%).

Figure 9. Preferred Deployment of Cloud 2011



Source: Colt European CIO Cloud Survey May 2011

Figure 10. Preferred Deployment of Cloud 2010



Source: Colt European CIO Cloud Survey May 2011

## Negotiating the cloud

**A broad array of cloud services are available...**

Not all cloud services are created equal, and there are many different types of cloud product available. Indeed, any form of computing where information is accessed from an external source could be described as being 'in the cloud'. This includes a wide range of consumer products in the social media, communication and media spaces, such as Facebook, Gmail and Over The Top TV. In 2008, Oracle CEO Larry Ellison famously said that, "the interesting thing about cloud computing is that we've redefined cloud computing to include everything that we already do... It's complete gibberish. It's insane."

### **Our focus: the winners and losers of the value chain**

**...but we focus on the *entire* value chain**

We emphasize that, while these services appear a long way away from the cloud model of corporate IT infrastructure, they work on the same basic principle of remote access. The difference is the degree to which the hierarchy of IT components are done externally, as shown in Figure 11 and discussed in more detail below.

Traditional IT is at one extreme, where the entire chain of functions is internal – in reality, some of these functions are likely to be outsourced but the point is that even then there is an implied contractual ownership of assets and/or their usage. For a typical (large) corporation, storage and servers will be physically separate from all the other tasks (which are performed at individual workstations), but everything is managed by the firm's own IT department. This is the basis of the prevailing client/server model of IT infrastructure. Social media and web email are at the other extreme, where the line between cloud computing and simple web hosting is blurred.

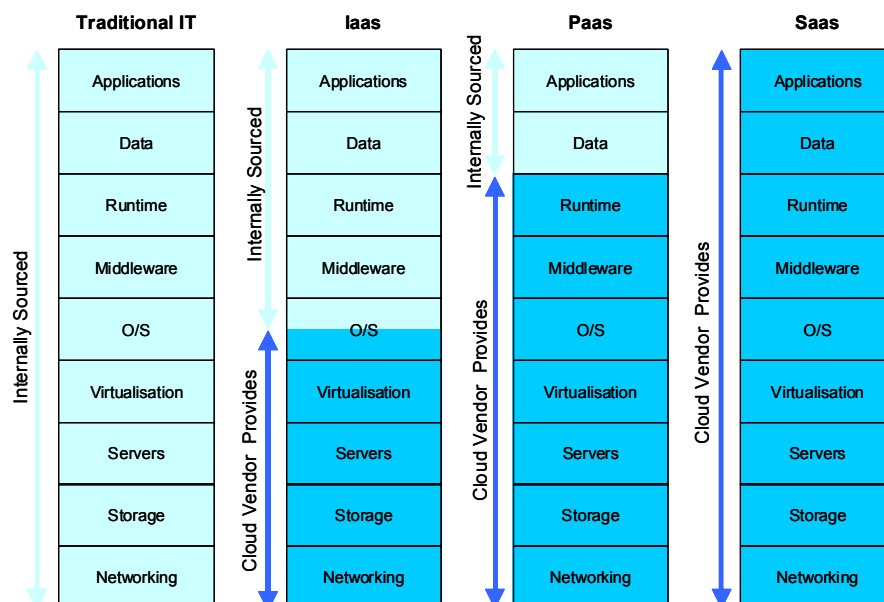
**Our core theme is which players will be successful in extracting the most value from the new customer-supplier relationships the cloud represents**

Although social media and similar digital services form an important part of the cloud story, they are not typically regarded as pure cloud services and are largely beyond the scope of this note, not least because their coverage is already extensive. Instead, we concentrate on cloud computing in the sense that its core theme is the changing relationship it produces between consumer and supplier. In the context of the layer model below, this means looking at all actors involved in utility computing, from those providing the basic data centre infrastructure and networking upwards through virtualisation, platform provision and software. Most importantly, we will look to determine who is most effectively placed to monetize the different opportunities.

## The Cloud Services: IaaS, PaaS and SaaS

With these parameters in mind, we discuss the three layers of cloud computing that have been universally identified. These are listed below, but should not be treated entirely in isolation, since they have mutual interrelationships that are taken into account when analyzing business models (see next chapter). Figure 11 below describes this interrelationship in terms of the levels of IT services, demonstrating how each service level builds on those that go before it.

Figure 11. Layer Model of Cloud Computing



Source: Microsoft, Citi Research

### Infrastructure as a Service (IaaS)

**IaaS:** Raw hardware resources are delivered on demand from data centres

This is the most basic cloud service model, where raw hardware resources such as storage, computing, security or network capacity are delivered on demand and priced consumptively. The consumer of this resource does not need to understand the technical details of the hardware elements being delivered as part of the service, but simply uses them as if they were locally located instead.

Infrastructure providers supply these resources on demand from their large pools installed in data centres. Typically, local area networks including IP addresses are included, providing a completely virtualised service.

Two forms of IaaS can be identified. The distinction is slightly subjective, but is useful nevertheless, particularly with respect to the different positioning of existing industry verticals relative to the cloud.

#### 1. Web-grade IaaS

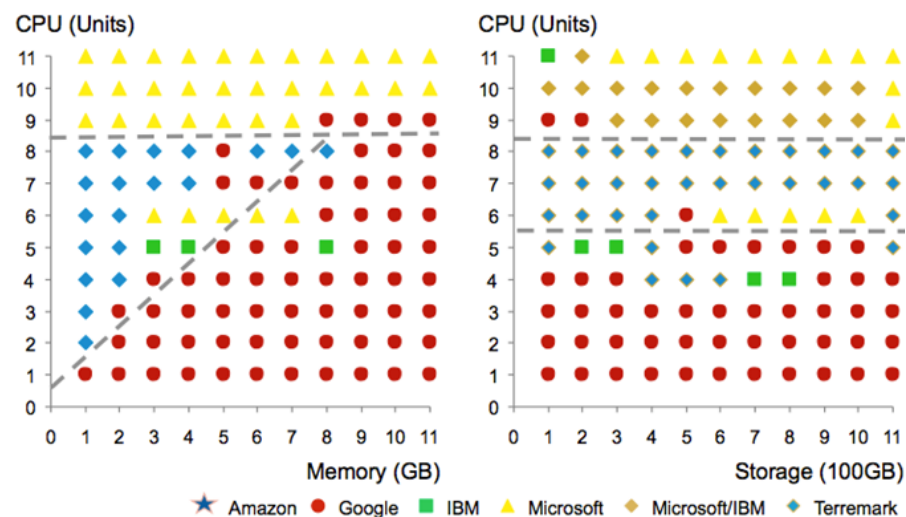
Web-grade infrastructure can be purchased using a credit card and offers a **low-end, generic storage and compute service**. It is typically charged on a monthly basis, and different levels of computing power can be specified dependent on requirements.

## Web-grade IaaS pioneered by Amazon

The Web-grade IaaS was the first cloud computing business model and was pioneered by Amazon, which remains the market leader in this segment, primarily through its Elastic Compute Cloud (EC2). EC2 provides a web service through which a user can boot an Amazon Machine Image to create a virtual machine, containing any software desired. EC2 was first offered as a public beta in 2006, and now Technology Business Research estimates that Amazon Web Services (AWS) revenue for Q1 2012 reached \$283 million, up 37% year to year. AWS operates on a cost-plus pricing model, where it maintains **10% margins**, continually cutting prices as costs fall due to improved economies of scale.

Other examples of web-grade IaaS include Rackspace, Google Compute Engine, Rightscale and Terremark vCloud. It is difficult to compare prices directly, because some providers charge separately for each service characteristic and in fact the industry is characterized by a lack of price transparency. However, an interesting study by El Kihal et al. uses a hedonic price/characteristic decomposition method to separate offers from providers. This produces Figure 12, where the cheapest of six of the largest providers are shown for three different combinations of performance metrics.

Figure 12. Cheapest IaaS Provider at a Specific Combination of CPU and Memory or CPU and Storage

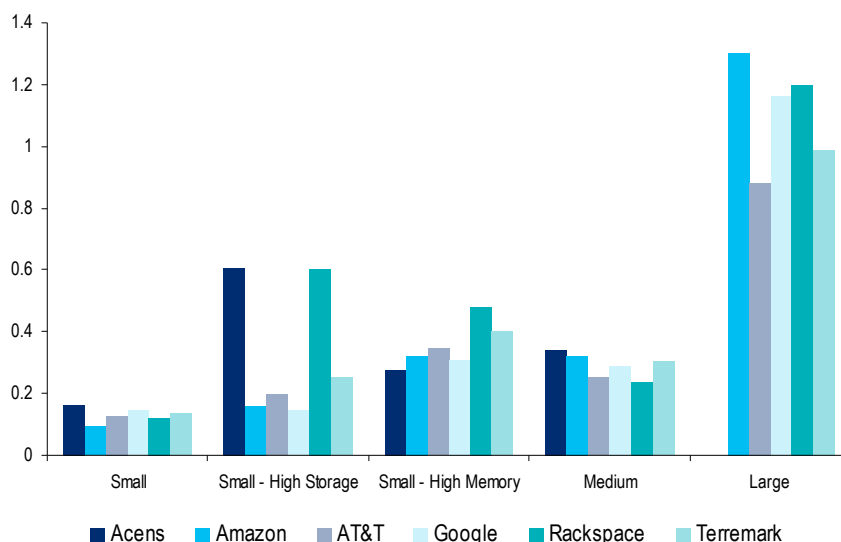


Source: El Kihal et al.<sup>2</sup>

Citi Research's web-grade IaaS price analysis yielded the results in Figure 13, where a number of minimum configuration instances have been chosen and prices compared across six providers. We note that AT&T and Terremark are at an advantage in this study because of the ability to specify very exactly the customer's necessary requirements. Acens and Rackspace suffer from only a few options, and end up being priced out in competitive instances. Google also offers few options, with comparatively high storage levels, but still achieves competitive pricing across our chosen range. Amazon offers a large number of competitively priced options and is differentiated in its ability to offer extremely large options, well beyond our chosen range.

<sup>2</sup> El Kihal et al. *Price comparison for Infrastructure-as-a-Service*. Goethe University Frankfurt, 2012

Figure 13. Web-grade IaaS Pricing for Multiple Configurations (\$/hr)



Small = 1CPU, 2GB RAM, 50 GB Storage; Small – High Storage = 1CPU, 2GB RAM, 400 GB Storage; Small – High Memory = 1CPU, 8GB RAM, 100 GB Storage; Medium = 2CPU, 4GB RAM, 100 GB Storage; Large = 8CPU, 12GB RAM, 500 GB Storage.

Source: Company Websites, Citi Research

The market suffers from lack of price transparency, but is structurally suited to a high level of price competition due to minimal differentiation

Clearly, the market for this form of IaaS is highly competitive since all incumbents are offering a minimally differentiated product. In fact, insurance-style cloud price comparison sites such as Clouddorado.com have begun to emerge which contrast prices for similar requirements.

One area where differentiation is possible is in customer support, where, for example, Rackspace is renowned for its high quality of customer service.

A scale game which the tech majors look set to dominate

Ultimately, however, **economies of scale** and **cost-control** are the name of the game.

#### Case Study: Perform and Amazon Web Services (AWS)

Perform is a fast growing digital sports content group focused on commercialising/distributing media sporting content across a variety of internet channels. The company brings together 60TB of digital sports content and associated rights from 200+ leagues and then resells them through its own channels, as well as licensing to bookmakers, media companies and consumers.

Perform utilises Amazon's EC2 IaaS product for compute and storage functions. The key trigger to its adoption of the cloud was the potential for technical flexibility since ePlayer (which provides digital content to media websites) traffic levels are very variable. In addition, an important part of Perform's business is the managing of complex rights agreements (e.g. content restricted to geographies), and IaaS allows decisions over content provision to be made locally. Perform indicates that on a per unit basis, AWS is more expensive than internal IT provisioning, but that for just the flexible component of its business that was moved into the cloud, approximately a 70% cost saving was achieved. This approach has also enabled the business to scale rapidly, helping to underpin strong growth within the group.

As the market leader and having considerable global reach, AWS was the obvious choice for Perform's requirements. Smaller IaaS competitors are increasingly attempting to up-sell with service layers, but Amazon's very basic provisioning suited Perform because of its existing technical skills from an IT department of 300 employees. The company also uses Rackspace as a load balance and hints to the potential of cloud balancing as a business model (Perform uses DynEct). This means that in the case of an Amazon outage (although to date it has been unaffected), critical workloads are transferred to Rackspace servers temporarily in order to ensure service reliability.

Going forwards, Perform anticipates that, while its content management system will remain in an Equinix data centre, all servers that are accessed through its web services will become cloud-based. Although Perform initially employed Amazon EC2 for computing capacity, it is also using it increasingly for storage of files relating to its ePlayer.

High-end SLAs, security and accountability differentiate this from web-grade IaaS

## 2. Enterprise-grade IaaS

In contrast, enterprise-grade platforms are used where customers sign contracts and arrange service agreements with cloud providers. They typically incorporate high-end storage and are more rigorous about security certification. There is also greater accountability for reliability through SLAs.

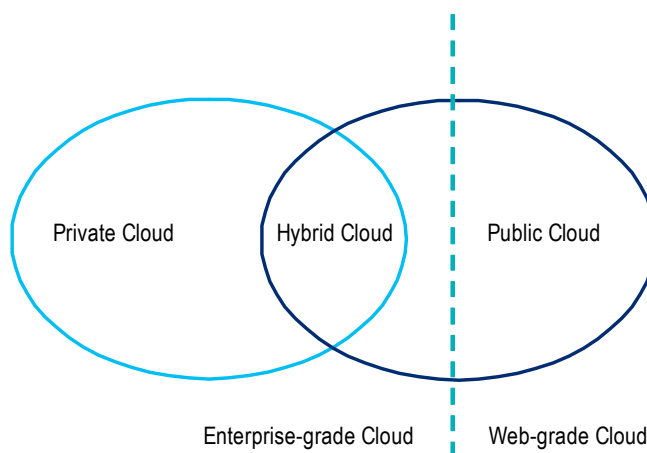
Consequently, these providers are capable of charging a premium. There is also scope for further differentiation, by offering services targeting particular industry verticals or further specific functional requirements such as hybrid clouds and provision for customised enterprise software requirements.

This differentiation permits premium pricing

Examples in this area include Terremark Enterprise Cloud, Savvis and Virtustream.

It is important to note that the distinction between enterprise-grade and web-grade clouds is not the same as between private and public clouds. **Enterprise-grade cloud providers typically provide a range of public, hybrid and private clouds.** On the other hand, web-grade clouds are almost exclusively public clouds.

Figure 14. How the IaaS Models Fit Together



Source: Citi Research



## Platform as a Service (PaaS)

**PaaS is the provision of a platform aimed at developers who use it to design their own software**

Platform as a Service is a software platform including infrastructure elements such as database, middleware, messaging, security, development tools and a presentation layer that are used to develop custom applications. It is also worth explaining the overlap between 'platform' and 'software', because some advanced platforms are built on complex software solutions that go well beyond simple operating systems and some infrastructure software. The key differentiator between platform and software is that a platform is standardized and to an extent commoditized, with the software being the bespoke element.

Today, PaaS is targeted primarily at developers with start-ups and software companies the initial target. Many of the early PaaS offerings also leverage new development frameworks where a development ecosystem (above infrastructure elements and developer tools) is less established. These include Ruby on rails, nodeJS and PHP. In this case, the PaaS helps these developers quickly build and then deploy and manage an application without having to worry about the underlying infrastructure.

**In enterprise, PaaS will be used to increase software development speed**

In the enterprise market, PaaS will likely be used in two ways. First, many enterprises have divisions that develop software on a faster cadence than the pace around core systems (ERP and other mission-critical applications) and in these areas, they can benefit from the rapid time-to-market that a PaaS brings. We had heard of examples here of consumer-facing organisations using PaaS for this, the most notable is Disney's use of Salesforce.com's Heroku. The second use of PaaS is adoption of the underlying platform that has already come in through a SaaS application. Notable examples here include salesforce.com's Force.com platform and ServiceNow's platform. In these cases, customers first use the SaaS application and then look to the platform to extend this application. They generally first build 'custom objects' in the application to integrate with their business processes and then build out stand-alone applications for new business processes not covered by the core SaaS application.

**Enterprise, not start-ups/ISVs will likely be the target market**

Ultimately, there is likely much more money to be made in PaaS selling to enterprises than there is in selling to start-ups and ISVs. However, it may be necessary for PaaS offerings to first be vetted and gain initial traction among the start-ups and ISVs before seeing up-take by enterprise. Enterprise development organisations generally move more slowly and only deploy new technologies at scale that have been thoroughly vetted and this endorsement by start-ups and ISVs is an important part of that process.

**Unlike SaaS or IaaS, PaaS can be used to put company-specific applications into the cloud**

PaaS offers the opportunity for cloud applications to be specialized, in that it is a cloud service capable of serving different industry verticals. This is because developers take the platform and build the applications most useful to their business on top of it. For example, the airline **Aer Lingus** used leading PaaS Windows Azure to develop an interactive web application that integrates route maps with its reservation and booking process. This is in contrast to both IaaS and SaaS, which both currently focus on generic offerings that can serve many different businesses.

## Software as a Service (SaaS)

**SaaS delivers a complete software application to the end user**

Software as a Service is a cloud-based resource that is delivered as a complete software application to the end-user. The broadest definition encompasses any on-demand software in which the software application and associated data are centrally hosted on the cloud.

On the consumer side, this ranges from SaaS applications that have been cloud-based for many years including email (**Gmail**, **Hotmail**) to a newer set of applications for file sharing (**Dropbox**). We've seen over the past five years a number of existing consumer applications such as multimedia move to the cloud as SaaS versus previously being client-based (**iTunes**, **Spotify**, etc). Even traditional consumer applications such as desktop productivity (**MS Office**) are moving to the cloud (**MS Office Web Apps** and **Google Docs**) as well as Intuit's **TurboTax**. The key distinction between traditional client applications and cloud-based apps is that cloud-based apps don't require client-side software (although their experience can be enhanced by client software) and the application is accessible from anywhere.

There has been a similar evolution in the corporate software arena and the most popular SaaS applications have been non-core applications such as CRM, talent management, collaboration and travel and expense. These applications can be moved to SaaS without disrupting other areas of IT, especially the core, mission-critical applications that are often highly customized and difficult and risky to change. We see a push towards SaaS beginning in other areas such as email and back-up.

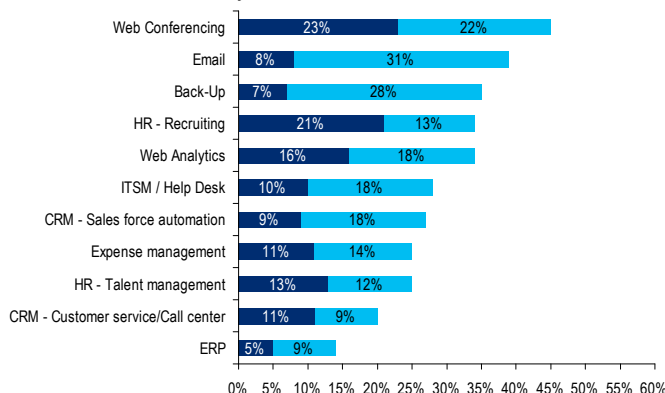
**54% saving over traditional application ownership and 5x quicker deployment with SaaS**

According to an IDC report, the average cost saving from using SaaS over traditional application ownership is 54%. Furthermore, applications can be deployed 5x quicker.

SaaS has brought more robust technology to both consumers and corporate customers and, as a result, has helped to expand the market for software to both customers. For example, a customer that has no IT professional and minimal in-house expertise is able to adopt very powerful software as it takes no more than a web browser to do so, as compared with traditional software that required an IT department to manage the deployment. As a result, we see SaaS expanding the software market in the low end (into smaller customers), while we see it more often as a replacement technology for on-premise software in larger enterprises.

**Figure 15. Adoption of Different SaaS Applications in Europe**

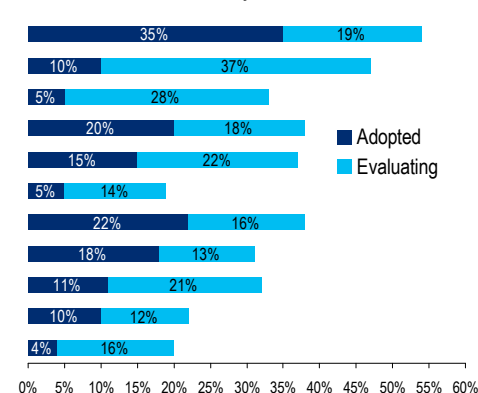
Citi Research CIO Survey 2Q11



Source: Citi Research

**Figure 16. Adoption of Different SaaS Applications in Europe**

Citi Research CIO Survey 2Q12

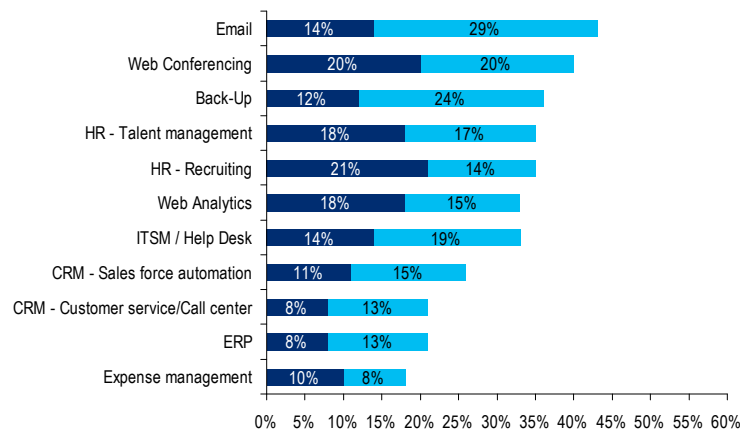


Source: Citi Research

Our survey of 260 CIOs across Europe and North America supports this observed market growth, as businesses are increasing their interest in and use of cloud services. The most mainstream applications lead the way, closely followed by generic business processes products.

**Figure 17. Adoption of Different SaaS Applications in the US**

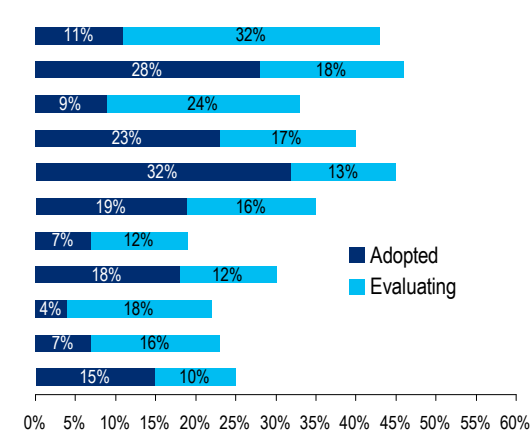
Citi Research CIO Survey 2Q11



Source: Citi Research

**Figure 18. Adoption of Different SaaS Applications the US**

Citi Research CIO Survey 2Q12



Source: Citi Research

### SaaS Case Study: Salesforce.com

Salesforce.com is the market leader in Software as a Service, accounting for approximately one in six software dollars spent on SaaS. In 1999, San Francisco-based Salesforce.com started with its web-based sales force automation product called Sales Cloud, which constitutes about 75% of revenue. Since its IPO in June 2004, the company has broadened its offerings to include Service Cloud (customer service automation), Force.com/Heroku (Platform as a Service), Chatter (social networking for the enterprise), and Radian6 (marketing automation).

## Emergence of the Cloud – Drivers and Barriers

The emergence of the cloud has been driven largely by two key technology ‘push’ drivers – improved broadband connectivity and excess computing infrastructure – as well as economies of scale derived from the advantages of shared utility computing and centralised IT infrastructure. Benefits also accrue to the consumer of cloud in terms of increased business agility.

On the downside, we find that security continues to be the largest barrier, with 43% of respondents to Citi’s 1Q12 CIO survey citing it as their primary concern. A spate of recent outages, most notably at Amazon and Google, also underline potential users’ reliability concerns and argue against the transition of mission-critical applications into the cloud.

### Technological Drivers

Today’s technology is pushing IT into the cloud

Two main technological factors can be identified that have accelerated the move towards cloud computing.

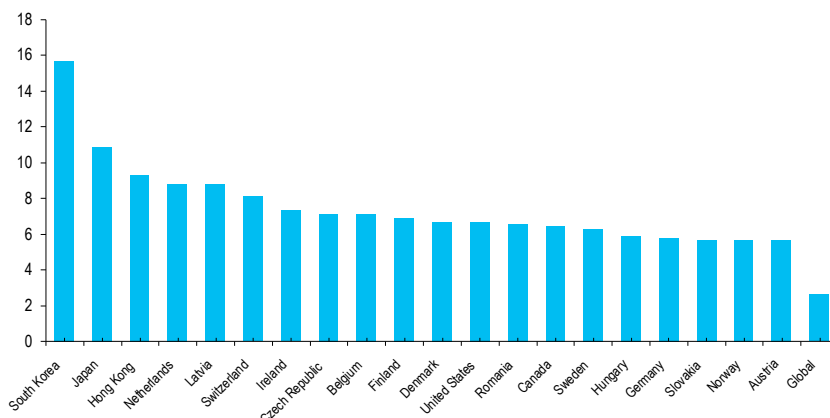
- Improved broadband connectivity and penetration
- Excess computing infrastructure

### Broadband connectivity: speeds are now high enough

Advanced high-speed telecommunications networks are the key enabler of cloud architecture and their existence relies on recent technological developments in speed, sophistication and penetration. Developments include both an **increase in the raw capacity of networks** as well as their **improved intelligence** in being able to prioritise certain data packets over others. Reversing the decline seen in the fourth quarter of 2011, global average connection speed increased by 14% quarter-over-quarter in the first three months of 2012 to 2.6 MBps, according to Akamai research (Figure 19).

Figure 20 from Cisco demonstrates network requirements for different levels of cloud service. Figure 21 and Figure 22 demonstrate that average business speeds in almost all regions are sufficient, and network quality will only be an issue for advanced cloud apps in some emerging markets.

Figure 19. Average Network Connection Speeds Across Top 20 Countries Worldwide (MBps)



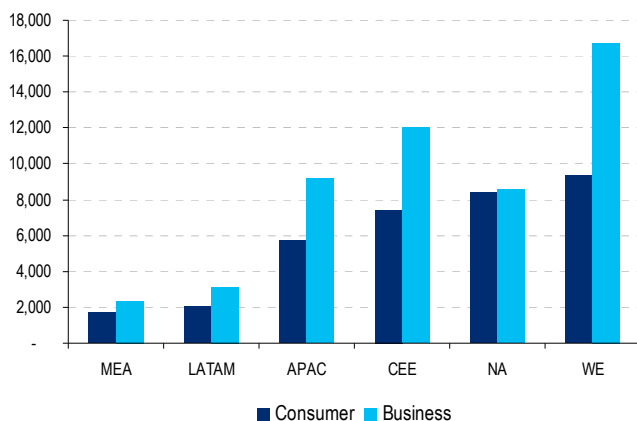
Source: Akamai

Figure 20. Sample Business and Consumer Cloud Service Categories and Requirements

Basic Cloud Apps <a href="#">Network Requirements</a>	Intermediate Cloud Apps <a href="#">Network Requirements</a>	Advanced Cloud Apps <a href="#">Network Requirements</a>
Download Speed: Up to 750 kbps	Download Speed: 750 - 2,500 kbps	Download Speed: Higher than 2,500 kbps
Upload Speed: Up to 250 kbps	Upload Speed: 250 - 750 kbps	Upload Speed: Higher than 750 kbps
Latency: Above 140 ms	Latency: 140 - 50 ms	Latency: Less than 50 ms
<ul style="list-style-type: none"> <li>• Email, Instant Messaging</li> <li>• Web Browsing</li> <li>• File Sharing (Basic)</li> <li>• Web Conferencing</li> <li>• Social Networking</li> <li>• Stream Basic Video &amp; Music</li> </ul>	<ul style="list-style-type: none"> <li>• File Sharing (High)</li> <li>• IP Telephony</li> <li>• ERP &amp; CRM</li> <li>• Basic Gaming</li> <li>• Basic Video Chat</li> <li>• IP Audio Conferencing</li> <li>• Basic Video Conferencing</li> <li>• Advanced Social Networking</li> <li>• HD Video Streaming</li> </ul>	<ul style="list-style-type: none"> <li>• Advanced Gaming</li> <li>• Advanced Video Chat</li> <li>• HD Audio Conferencing</li> <li>• HD Video Conferencing</li> <li>• Stream Super HD Video</li> </ul>

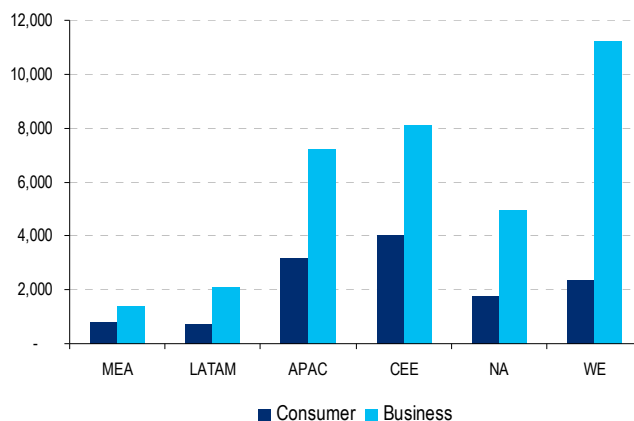
Source: Cisco Global Cloud Index

Figure 21. Fixed Network Download Speeds (kBps)



Source: Ookla Speedtest Data and Cisco Analysis 2011

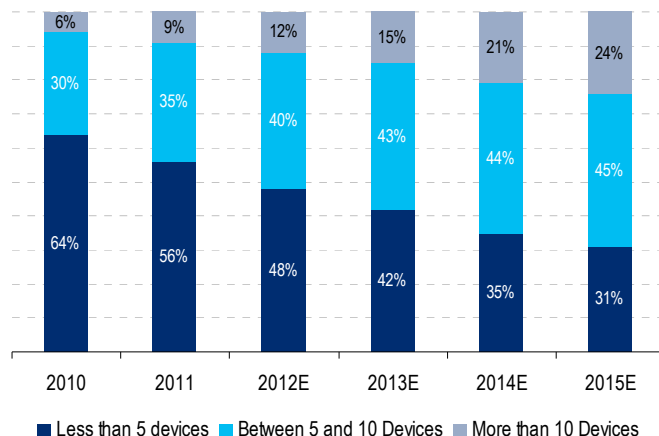
Figure 22. Fixed Network Upload Speeds (kBps)



Source: Ookla Speedtest Data and Cisco Analysis 2011

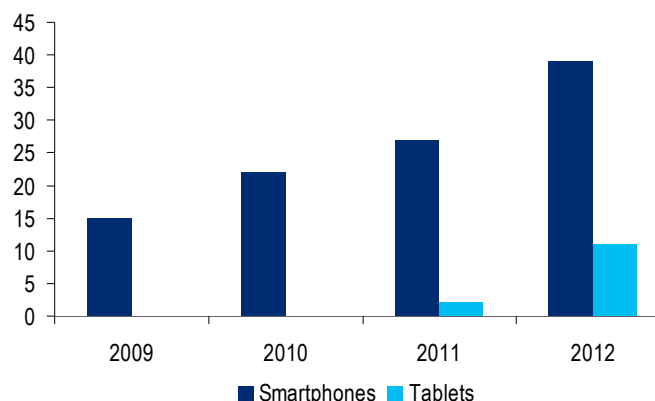
In addition, there has been a massive **increase in the number of connected devices** (Figure 23), particularly the proliferation of smartphones and tablets, shown in the data from the August 2012 Ofcom communication market report (Figure 24). Highlighting this trend, recent Telefónica Digital estimates suggest that by 2015, 70% of its customer base will have more than 5 connected devices.

Figure 23. Per-User Ownership of Devices Connected to the Internet



Source: Cisco Global Cloud Index

Figure 24. UK Smartphone and Tablet Penetration (% of pop.), 2009-2012



Source: Citi Research, Ofcom Communications Market Report, August 2012

## Excess computing Infrastructure is the starting point

### The first clouds: selling excess capacity

Fundamental to the initial move into cloud computing was the enormous computing infrastructure built by major companies, especially Amazon, Google and Microsoft. These companies began to offer their excess capacity for data storage and computing services to other companies, allowing them to present virtualised environments to customers.

While this gave these companies a useful first-mover advantage in the early stages of cloud, the importance of this technological head-start is now much diminished as rivals continue to expand data centre capacity for their cloud offerings.

## Market Drivers

### What is moving today's clouds?

In our view, market-side drivers have been far more relevant in driving forward the cloud computing agenda and will continue to provide its momentum into the future. We consider both the advantageous supply- and demand-side economies of scale, before looking at other associated advantages for cloud customers.

### Supply-side economies of scale

Cloud computing is not a return to the mainframe era, but in fact offers economies of scale and efficiency that exceed those of a mainframe. The key feature on the supply-side is **multi-tenancy**, which allows for data to be concentrated at a single physical location. In other words, one data centre can host resources for multiple customers. This results in the following economies of scale:

- **Cost of power.** The operators of small data centres must pay the prevailing local rate for electricity, but it is possible for larger operators to pay a fraction of the average rate by locating their data centres in locations with inexpensive electric supply and through bulk purchase agreements. This rapidly decreases the cost per MIP (million instructions per second) as the scale of the operation increases.

Significant economies of scale are possible due to the centralization of computing services

- **Infrastructure labour costs.** The workforce required to service, maintain and update a given number of servers decreases markedly when those servers are concentrated in a single physical location. Whereas one IT professional could previously service around 140 servers at different locations, he or she can now look after a data centre of 10,000. This in turn permits IT employees to concentrate on higher value-add activities such as building new capabilities and improving user control.
- **Infrastructure buying power.** Bulk buying data centre hardware and software reduces unit costs, favouring the larger cloud data centre controllers.

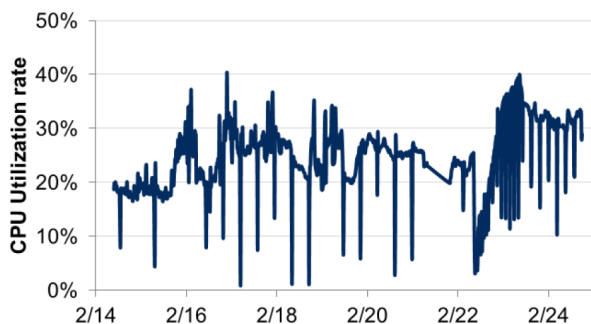
### Demand-side economies of scale

#### Demand aggregation produces additional economies of scale

The efficiency with which the capacity is used also plays a role in achieving economies of scale, and this is improved with demand aggregation.

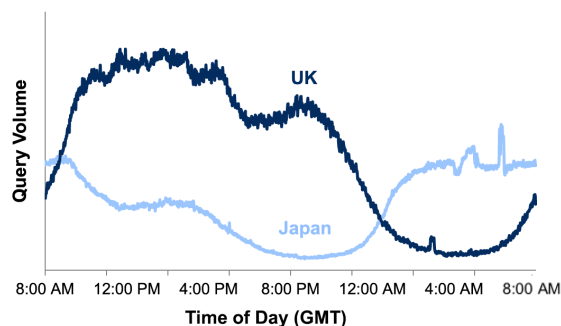
- **Time-of-day patterns.** Behavioural patterns dictate the degree of server utilisation at different times of the day. In business use, peaks tend to be observed during nine-to-five working hours. Capacity has to be built-in to anticipate these peaks, but under conventional server systems it would remain unused at other times. Cloud data centres are able to run the same workload for multiple time zones on the same server. Equally, multi-location scheduled processing can 'follow-the-moon' to consistently make use of cheaper night-time electricity costs.
- **Randomness.** Random usage can account for spikes in required server capacity. However, the pooling of servers will necessarily smooth this as the total number of users increases.
- **Multiplexing.** On the cloud, capacity is shared and when not being employed by one user, it can be allocated to another. This is antithetical to the case with individual desktops, where processing power is locked up on individual machines which is plainly extremely wasteful. The same is true on the software side, and so a smaller number of copies of pieces of software are required, again reducing costs.

Figure 25. Random Usage Variability of Exchange Server



Source: Microsoft

Figure 26. Time-of-Day Patterns for Search



Source: Microsoft



## Customer Usage Benefits

The main customer benefit is the ability to only pay for the resources that you need

In addition to the economies of scale that result in lower unit costs, consumers also benefit from the elasticity of cloud usage. We identify below different circumstances where this might turn out to be the case:

- **Demand varies with time.** The Pay-As-You-Go quality of cloud services means that a company that experiences, for example, peak use for a few days a month (such as an online ticket seller) can pay only for the resources it needs, without having to build capacity for itself that would normally be superfluous.
- **Working Capital Management.** The ability to lease IT as required provides companies with improved flexibility when managing their working capital.
- **Batch analytics.** Companies that are required to complete computationally expensive activities can benefit from speed/time advantages. For example, using 1,000 servers for 1 hour costs the same as using one server for 1,000 hours.
- **Addresses resource / talent management issues.** We note two sub-points here. (1) Usage of the cloud has first taken off among small businesses, which have been historically underserved by traditional IT, largely because serving this client base in the traditional manner was less profitable (small businesses have very limited budgets over which to spread overhead costs). (2) Take-up of cloud is also rising for repeatable and lower-risk functions where technology offers a chance to re-allocate scarce resources to more meaningful tasks. This is a factor because of the extremely low 2%-5% unemployment rate for IT talent in most western countries.

Cloud turns CapEx to OpEx

It has been observed cloud computing moves IT services from a capital expenditure model to a lower operating expenditure model. This implies a decrease in sunk costs for firms, increasing their flexibility and decreasing barriers to entry for technology-intensive businesses.

Savings estimates from cloud vary considerably: industry estimates suggest 25-80% is possible

According to Microsoft, cloud computing savings could be as high as 80% based on the aggregation of these benefits. An EEOC case study suggests 40% is more realistic while Colt has indicated this figure might in practice be even lower, and believes its enterprise-grade IaaS offering stands to save customers about 25% over do-it-yourself IT.

## Barriers – Every Silver Lining Has a Cloud

We identify a number of relevant barriers to the uptake of cloud services:

The risk of information outages turns many business away from the cloud

- **Availability.** There are currently concerns amongst potential customers about whether cloud services have adequate availability. Google Search has a high reputation in this regard such that material disruption to the service is almost unthinkable. The same is not yet true for many cloud services, and there have been a number of high profile outages in recent years, such as Amazon EC2's recent downtime which affected 150,000 customers in April of this year. A temporary loss of server access could be catastrophic for many firms, and certain industries will avoid the concept entirely until these issues are satisfactorily resolved. Google, Microsoft and Amazon have all had well publicized and significant cloud outages in the past 12 months.

**There are currently limited guarantees for data confidentiality and security**

■ **Confidentiality/auditability.** Worries about availability have been compounded by other security concerns, particularly regarding confidentiality and auditability. There is general uneasiness amongst many firms with trusting essential data to an external location. The threats facing cloud are similar to those already facing large data centres. In the cloud, however, the responsibility is divided among potentially many parties. Virtualisation is the primary security mechanism in today's clouds, and it protects against most attempts by users to attack one another or the underlying cloud infrastructure. However, not all resources are virtualised and not all virtualisation environments are bug-free.

**The requirements of cloud-associated regulations can outweigh the benefits of its implementation, leading to initiatives like Andromède in France**

■ **Local regulations can supersede global business needs.** It is useful to note at this stage the European concerns with the US Patriot Act, which is acting as a major inhibitor for the expansion of US cloud services into Europe. This requires any data centre to make its contents available to the US government on request, a state of affairs that is unacceptable to many foreign companies. Consequently, there have been a number of government-led initiatives (most notably the French Andromède) alliance and we note the potential for a market in which cloud services are divided up along territorial borders. British, German and Italian governments are also considering the creation of a 'sovereign cloud'.

We also note that certain countries (e.g. Singapore) have stringent rules that prohibit certain citizen and client data from being moved to / processed from / located outside that country's borders. This can create inherent diseconomies of scale. We know of at least one large Fortune 100 entity having to scale back its cloud (SaaS) implementation due to such rules, which of course can lower the benefits of a global rollout.

**Many different services, and limited market consolidation**

■ **Industry fragmentation.** Another potential concern is the myriad of cloud computing options, which has led to confusion amongst potential customers who may wait until the market matures and more product clarity is available. We believe that product differentiation and the targeting of specific market groups will be the key to success in the medium term.

**There is a perceived lack of specialised services available**

■ **Specialisation.** It is clearly more difficult to implement cloud computing at a company that uses specific applications that relate to its needs. Most companies rely mainly on basic software and hardware requirements, so products such as Office 365 (which provides a virtual suite of traditional Microsoft Office Tools) will be in demand. However, certain enterprises demand more specific software and connectivity requirements. Again, we observe the need for a breadth of differentiated products from cloud providers and see considerable potential in this area, especially from the telecom operators.

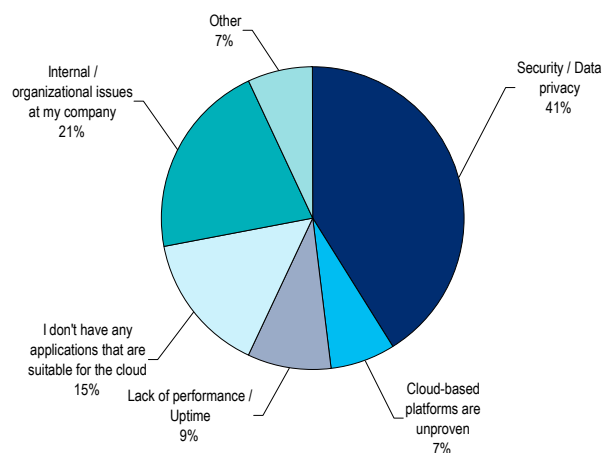
**The cost of moving to the cloud may outweigh its benefits**

■ **Existing sunk costs.** Many firms are understandably reluctant to write-off enormous sunk costs in IT facilities and begin afresh with cloud infrastructure, especially given the macro climate. Nevertheless, numerous services are becoming available which structure and control the transition to the cloud, including CloudBridge from Citrix and VMware's vCloud.

**If it works, don't fix it**

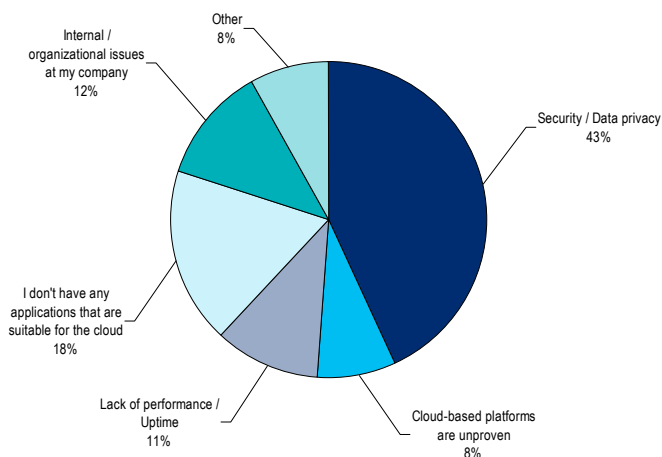
■ **Inertia.** Working on the 'if it works don't fix it' principle, many IT departments are slow to adopt the cloud simply on the grounds that their existing systems fulfil requirements adequately and a major overhaul of infrastructure will have disruptive and therefore potentially harmful effects before any benefits are realised. Consequently, many cloud vendors are targeting the niche role of smoothing the transition into the cloud with various integrating systems to try to overcome this objection.

Figure 27. CIOs' Objections to the Cloud in Europe  
1Q2011



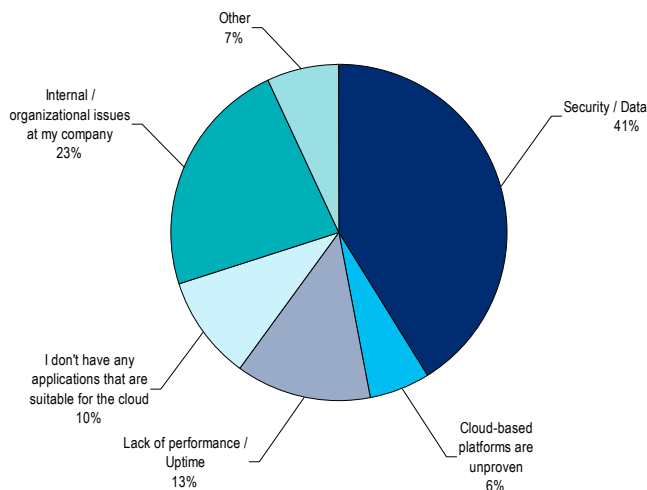
Source: Citi Research

Figure 28. CIOs' Objections to the Cloud in Europe  
1Q2012



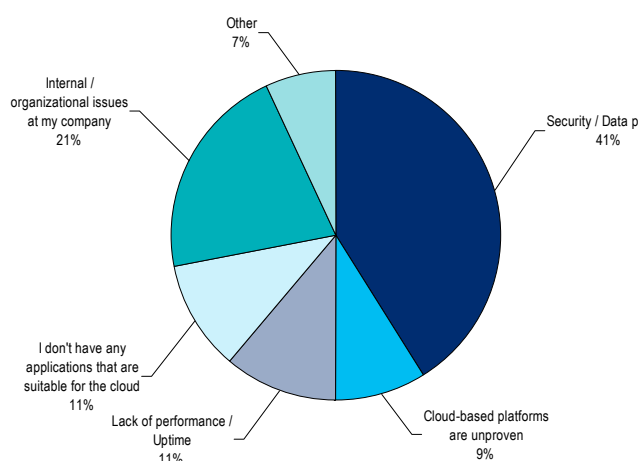
Source: Citi Research

Figure 29. CIOs' Objections to the Cloud in the US  
1Q2011



Source: Citi Research

Figure 30. CIOs' Objections to the Cloud in the US  
1Q2012



Source: Citi Research

Figure 27 to Figure 30 show the results from Citi's recent CIO Surveys in Europe and the US, where respondents were asked what the main obstacle was to their progression into the cloud.

**Security remains the most pressing concern for most CIOs.**

The clearest conclusion to draw from these results is that security remains the largest and most pressing concern for most CIOs, and these fears have shown no sign of subsiding in the last year, despite the efforts of cloud vendors.

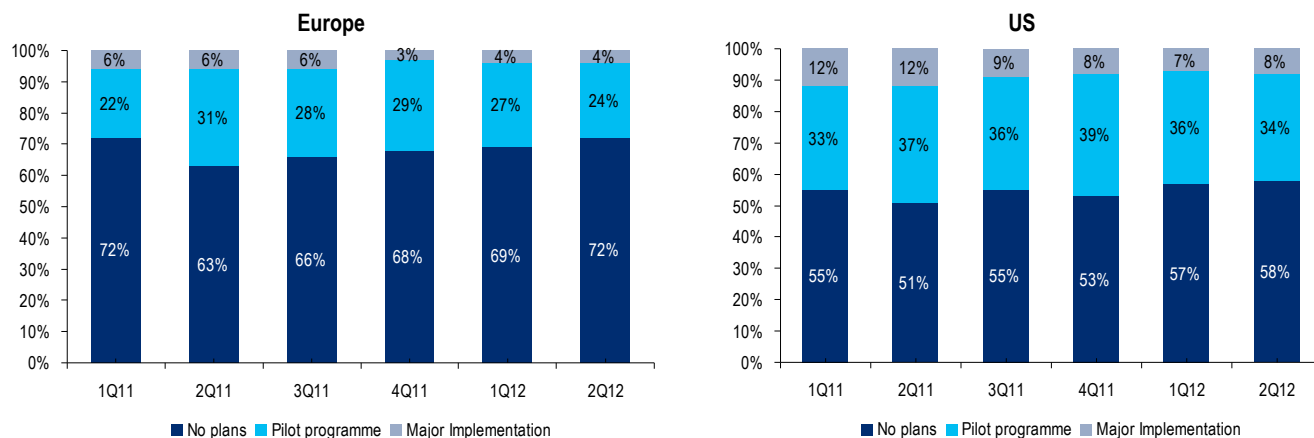
**In the US we see a reduction in focus on internal/organisational issues**

A secondary point is that, although in general there have been minimal changes to the reasons cited as major barriers to the cloud, in the US we see a reduction in focus on internal/organisational issues, implying that companies are becoming more accepting of the shift. In Europe, this shift is yet to occur, suggesting a considerable time-lag in developments between the two markets.

## Cloud Penetration – Citi CIO Survey

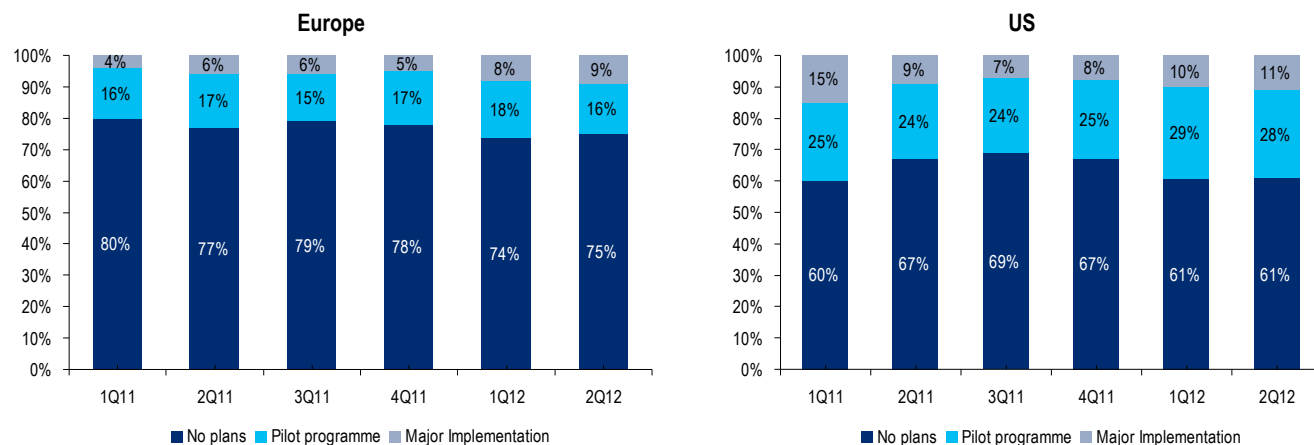
We now look to determine the level of penetration of cloud services, both across different regions and across the three service layers. Figure 31 to Figure 33 come from Citi's latest CIO surveys which questioned 130 CIOs in Europe and the US as part of a global questionnaire.

Figure 31. IaaS Penetration



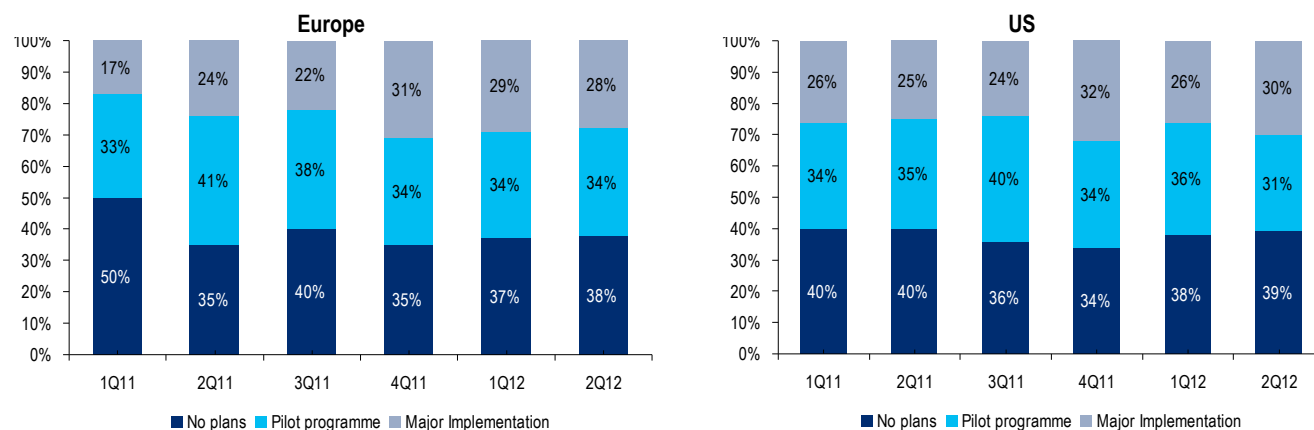
Source: Citi Research

Figure 32. PaaS Penetration



Source: Citi Research

Figure 33. SaaS Penetration



Source: Citi Research

**Europe is at least one year behind US in all areas of the cloud**

Informa suggested that Europe is one year behind the US in terms of cloud adoption but based on this data, we estimate that this is a minimum.

In the SaaS market, penetration growth appears slower as the market reaches increased maturity and sophistication. In the US, SaaS is very mainstream as companies gain significant benefits from the flexible pricing structure. In Europe it is slightly less widespread, but is nevertheless increasingly becoming the standard for enterprise customer relationships management.

**SaaS leads the way, with IaaS following strongly and PaaS penetration a little more doubtful**

IaaS is significantly less well penetrated than SaaS, and is currently more likely to be adopted by smaller companies with reduced compliance issues. It is unusual that large corporations, especially those with significant security or privacy concerns, are using anything beyond private hosting.

However, one observable trend is that departments within larger corporations are using web-grade services such as Amazon EC2 to quickly increase their IT capacity at short notice for a relatively low cost. This tends to be on an informal basis with no standardised approach. In a sense this is a challenge for internal IT departments, who are being superseded due to the convenience of these services. This suggests potential growth in the market for the enterprise-grade cloud and associated opportunities for those able to monetise it.

**Gartner estimates the IaaS market will grow from \$3.7 billion in 2011 to \$10.5 billion by 2014**

In general, the concept of IaaS is relatively simple and its benefits are immediate and obvious. We anticipate increased penetration to go along with revenue growth, which Gartner estimate will rise from \$3.7 billion in 2011 to \$10.5 billion by 2014.

As for PaaS, the jury is still out. In its current form, it is neither a finished good and nor a raw material that the customer knows how to consume. It mainly targets developers and we believe this will be the slowest cloud technology market to develop.

## Regulation: An Addressable Challenge

In its 2012 Cloud Computing study as part of the 2010-2020 EU Digital Agenda work, it is highlighted *"cloud computing has been gaining in importance due to its expected macroeconomic benefits, such as helping start-up small businesses enter the market, which could foster innovative new online applications and save administrations taxpayers' money on ICT provision"*. Fragmentation of the regulatory framework at a national level is recognized by the EU Commission as a hurdle to the development of the European cloud market and encouraging steps are being taken to address this, albeit at a relatively slow pace in light of the global market development.

The EU Commission divides the main risks related to the lack of a unified regulatory framework for cloud into three main categories:

- **Legislative framework-related:** legal fragmentation; jurisdiction; compliance and liability; enforcement and redress
- **Contracts/terms and conditions related:** Service level agreements; end user agreements; privacy terms and conditions; clarity and transparency
- **Standards-related:** interoperability, portability, vendor lock-in

The following action areas are included in the programme for the Digital Agenda for Europe:

- Address legislation-related gaps
- Improve terms and conditions for all users
- Address stakeholder security concerns
- Encourage the public sector cloud
- Promote further R&D in cloud computing

We note a willingness from EC's side to proceed fast with the Digital Agenda: 2015 is the first target for the Digital Single Market (see figure below). In a speech at the World Economic Forum in Davos this year, Neelie Kroes announced the launch of a partnership between the main players in the cloud computing field with an initial €10mn investment. This will look into finding solutions to the issues identified above, but start with public procurement.

Figure 34. EC Digital Agenda Performance Targets and Timetable

Action	Timeframe	Target
EU Broadband Coverage	2013	1. Entire EU to be covered by broadband (vs 95.3% now)
EU Broadband Coverage	2020	2. Entire EU to be covered by broadband above 30Mbps by 2020 and 50% of EU to subscribe to broadband above 100Mbps
Development of on-line purchases	2015	3. 20% of population to buy on-line cross-border (vs 8.8% now)
Development of on-line purchases	2015	4. 33% of SMES to conduct online purchases/sales (web shop or portal based messaging ) (now 28% but web based only )
Equalize roaming & national speed	2015	5. The difference between roaming and national to approach zero
e-Government use	2015	6. 50% of citizens to use eGovernment, with more than half of them returning filled-in forms
Key cross-border public services	2011	7a. All key cross-border public services to be agreed by Member States
Key cross-border public services	2015	7b. All key cross-border public services to be available online
Energy Reducement	2020	8. Reduce energy use of lighting by 20%
ICT R&D Investment	2020	9. Double Investment in ICT R&D to €11bn

Source: EC Commission Staff Working Paper; May 2011 Digital Agenda Scoreboard

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# Sizing the Cloud

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## Market Size: c. 20% CAGR to 2020E

Although it is difficult to estimate the size of the market opportunity from cloud services given the industry remains in its early days in terms of adoption – 3% of enterprise IT spending was on cloud in 2011, according to Gartner – a number of sources forecast decent growth in this area, above the overall IT spending.

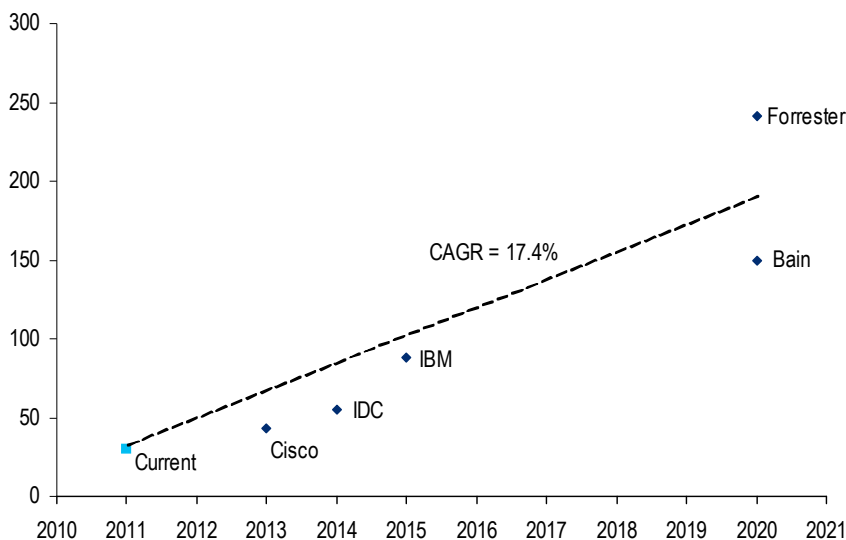
**Most market forecasts for the cloud services market are for c. \$45-50bn revenue by 2013-2014 from c. \$20bn in 2011**

Most market forecasts are that the total cloud services market will reach c. \$45-50bn revenue by 2013-2014. Estimates for the market range from the more conservative (Cisco forecasts \$43bn overall market by 2013) to the most optimistic (Gartner forecasts the cloud market to reach \$207bn by 2016 – including BPaaS – and Forrester sees an overall market of \$241bn by 2020). Bain Consulting anticipates global cloud spending to grow fivefold from \$30bn in 2011 to \$150bn by 2020. Forrester includes growth in the size of the public cloud market from \$25.5bn to \$159.3bn in the same period.

IBM's Market Insights Cloud Phase 2 assessment of September 2011 expects the cloud market to grow to \$88.5bn by 2015. Cisco's more short-term analysis predicts a \$43bn dollar market by 2013. On a similar short-term basis, IDC expects a \$55.5 billion market by 2014.

These forecasts are summarized in Figure 35 below and suggest a CAGR of 17.4% up to 2020 based on a linear best fit. Note, of course, that these forecasts are unlikely to be truly independent and that a linear growth assumption is inevitably simplistic, but we think that this gives a good general sense of the likely trajectory of the cloud computing market.

**Figure 35. Total Cloud Computing Market Growth Predictions (\$bn)**



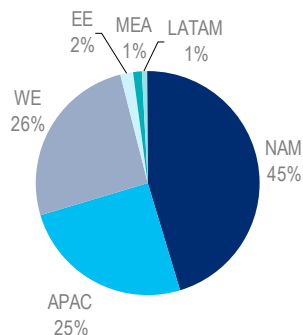
Source: Cisco, IDC, IBM, Bain, Forrester, Citi Research

**Cisco estimates that telecom operators could generate c. \$9bn (from \$1bn in 2011) cloud revenues globally by 2014**

Within this, according to Informa Telecoms & Media, telecoms stood at around 16% share of \$20bn annual cloud services revenues in 2011. Informa expects the telecom market share to remain stable in 2012, at 16% of a total \$26.4bn, i.e. 32% growth yoy at \$4.3bn. Further out, a Cisco study expects the telecom share of the

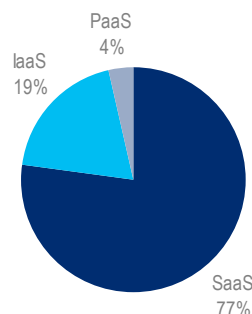
overall cloud pie to go to c. 20% by 2014, i.e. roughly \$9bn of revenue from cloud by 2014.

**Figure 36. 2011 Telecom Cloud revenue: \$3.2bn in total**  
Regional distribution: North America and Asia Pacific leading



Source: Informa Telecoms & Media

**Figure 37. 2011 Telecom Cloud revenue: \$3.2bn in total**  
Distribution by application: SaaS dominates

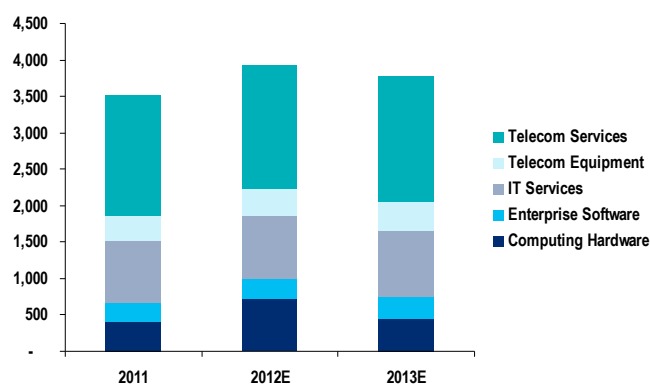


Source: Informa Telecoms & Media

**Gartner predicts total cloud spending expected to exceed \$200bn by 2016.**

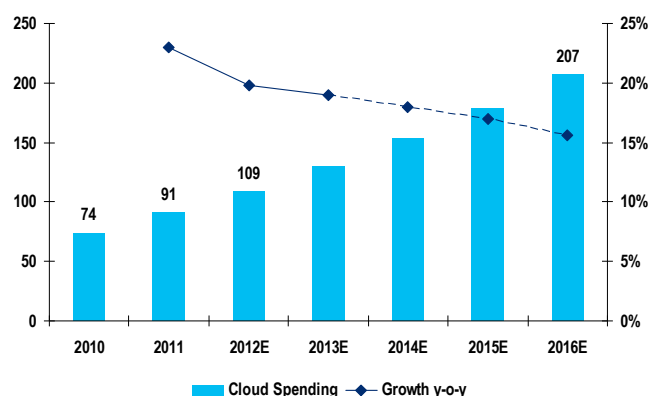
**Gartner World Public cloud services market:** In a report published in July 2012, Gartner expects enterprise spending on public cloud services to reach \$109bn in 2012E (+20% yoy) and then almost double by 2016E to \$207bn (Figure 39). Included within these numbers is spending on Business Processes as a Service (BPaaS), which includes Cloud Advertising, Payments, E-Commerce Enablement and other more traditional IT services which are on the edge of our cloud computing definition.

**Figure 38. Worldwide IT Spending Forecast (\$bn)**  
Telecom Services remains the largest IT spending sector (+1.4% in 12E)



Source: Gartner, July 2012

**Figure 39. Enterprise Spending on Public Cloud Services (\$bn)**  
\$91bn was spent on public cloud services in 2011, to reach \$207bn by 16E



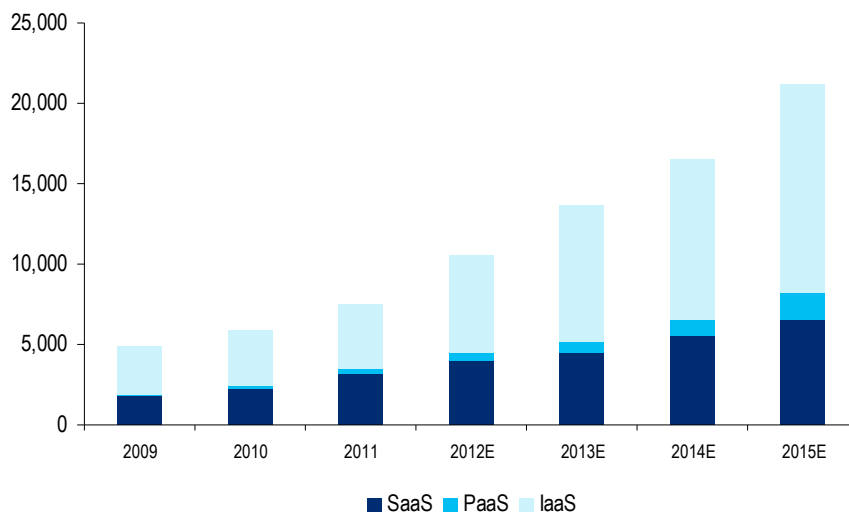
Source: Gartner, Oct. 2011 & July 2012, Citi Estimates for 2013-2015E

**IaaS represents the largest chunk of the European cloud market**

**European cloud services market:** In a recent study published by the Policy Department of the European Parliament, the estimated value of different categories of cloud services across the EU was expected to reach just **above €21bn by 2015E**, with IaaS representing the biggest chunk of this market.

**Figure 40. Value of Cloud Services Across the EU (€mn)**

Storage as a service is included in the IaaS total



Source: PAC's Cloud Computing Worldwide by countries datamart 2012, 2011, Citi Research estimates

According to IDC, European SaaS cloud market will be worth approximately €6bn by 2015.

**SaaS cloud services market:** In a 2010 study IDC (International Data Corporation) estimated the global market for cloud services at \$44.2bn (€35bn) in 2013, with the European market worth c. €6bn. This refers to SaaS cloud services only. According to a European Parliament study, North America-based cloud services providers (Amazon, Google, Microsoft) currently share 56% of the market against 25% share for European providers (Cloud4Com, City Cloud, MESH...). The study suggests European providers will take share by 2014: 29% vs. 50% for US providers.

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# The Business of the Cloud

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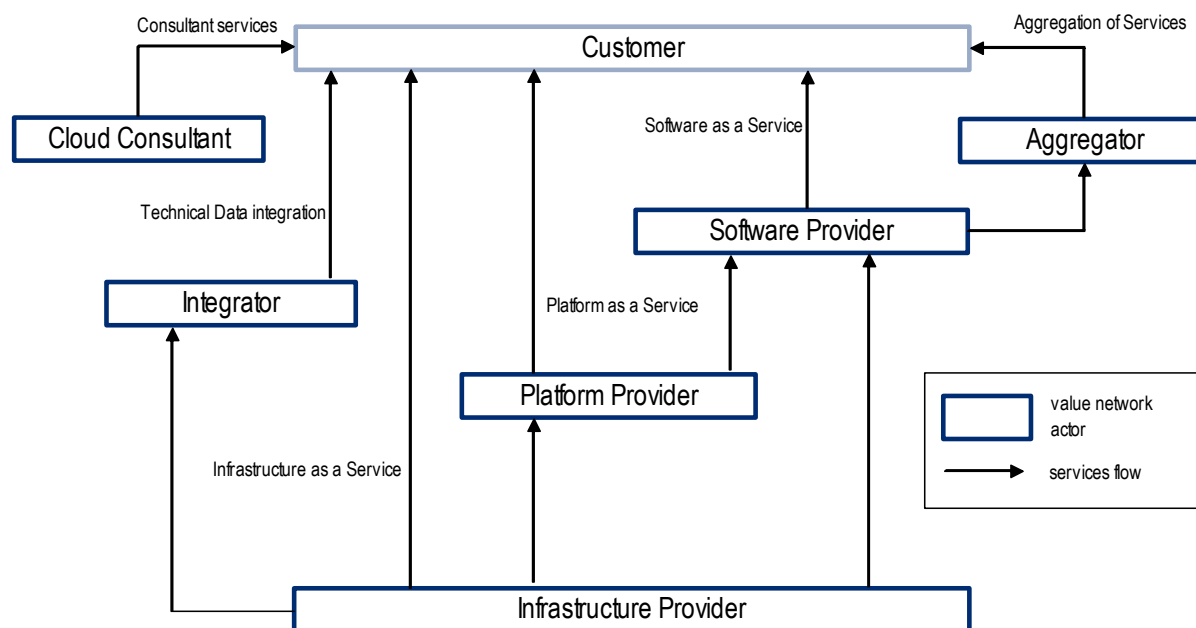
## A Value Network for Cloud Computing

In this section, we look to establish a framework with which to determine eventual winners and losers from an investment perspective. We believe a value network approach offers more clarity for the investor in determining what business models exist in cloud computing. It also allows us to position today's cloud opportunities and to discuss the ultimate winners and losers in this competitive marketplace.

### A who's who of the cloud

Figure 41 shows how the various business models fit together in our value network. The infrastructure, platform and software providers make up the **cloud vendors**, while the integrators, consultants and aggregators are the **cloud brokers**.

Figure 41. A Value Network for Cloud Computing



Source: Citi Research (adapted from Leimeister et al.)<sup>3</sup>

Within this network, value is created by providing services that are useful to other participants in the network. Infrastructure services, for example, are essential for all other actors within the network, who consume this service in order to provide their service offering.

The following sections break down the different business models in the cloud value network in Figure 41. It is important to note that, while each role is distinctive, many real-world cloud companies fulfill two or more roles.

<sup>3</sup> Leimeister et al. *The Business Perspective of Cloud Computing: Actors, Roles and Value Networks*. Munich University, 2010.

## Customer

The customer buys services through various distribution channels. This can be directly from the service provider or indirectly through a platform provider. Examples are any business that chooses to move some or all of its IT infrastructure into the cloud. Modern customers expect to be able to fulfil their IT requirements on a variety of devices including personal computers, smartphones and tablets.

In a report published in April 2011, Bain Consulting identified five types of cloud customers:

- **Transformational.** These are early adopters of the cloud model, with more than 40% of their IT environments relying on one or more cloud models. They are typically dynamic businesses, looking to make IT a catalyst rather than an impediment to growth.
- **Heterogeneous.** These companies typically have a diverse mix of legacy systems and are in the process of migrating to various newer technologies such as virtualisation and cloud computing.
- **Safety-conscious.** Companies that are especially concerned with the security and reliability of their IT environments. Private and hybrid-public private cloud models have the most appeal. They may recognise the benefits of cloud in terms of economies of scale, but security is a more pressing concern.
- **Price-conscious.** Companies focused on the bottom line, who will primarily take up cloud in order to benefit from its cost savings.
- **Slow and steady.** Companies that, at the moment, do not yet appear ready to adopt cloud computing. This may be because, at the moment, the value they see in cloud offerings does not warrant the loss of control, security risks and regulatory issues they expect to face.

## Infrastructure providers

e.g. Telecity, Interxion

Infrastructure providers underpin the value network with all the computing and storage services needed to run applications within the cloud. In this sense they provide a technical backbone and offer the necessary scalable hardware and networking for the servers upon which the service providers offer their services.

Clouds, unlike data centres, imply  
location independence

The core infrastructure component of the cloud is of course the data centre, but there is ongoing confusion about the relationship between clouds and data centres. Importantly, clouds are not data centres. A data centre is the physical facility in an individual location that houses computer systems and associated components. Clouds, on the other hand, imply location independence. A cloud provider will typically host the cloud across several data centres, such that it can be accessed from anywhere. The reliability of a cloud partly derives from the fact that it is not entirely dependent on one location.

Therefore an infrastructure provider will own multiple data centres and host a cloud which 'rides' on top of them. However, it is worth noting for reasons central to our pro-Telco stance on the cloud that, while the position of an individual data centre is irrelevant, the network locality and topography is not. **There are inherent advantages in terms of low latency to having the data centres positioned relatively close to the market being served.**

The infrastructure provider can deliver an IaaS service (either web-grade or enterprise grade) directly to the customer, or it can rent out its infrastructure to other members of the value network.

### Software provider

e.g. Salesforce.com, Oracle, SAP

The software providers develop and operate software services that offer value to the customer. They sell applications that are then offered and deployed on the cloud computing platform and access the hardware of the infrastructure providers. An enormous variety of providers exist, and there is a high level of competition in this sphere between emerging technology businesses – see SaaS in previous section.

### Platform providers

e.g. Google App engine, Microsoft Azure

Platform providers offer an environment within which cloud applications can be deployed. In many ways platform providers are the fundamental players in the cloud computing environment, as indicated by their centrality in the network value chain below. They provide the central marketplace where all other actors come together, trade their services, and interact with each other. Platform providers act as a kind of catalog in which different service providers offer services.

There are several options as to how the platform provider can generate revenue. Most commonly, they use a fee or subscription based system which can be charged either to the provider to register the service, the consumer to access the registry, or both. This is the case with both Amazon and Salesforce.

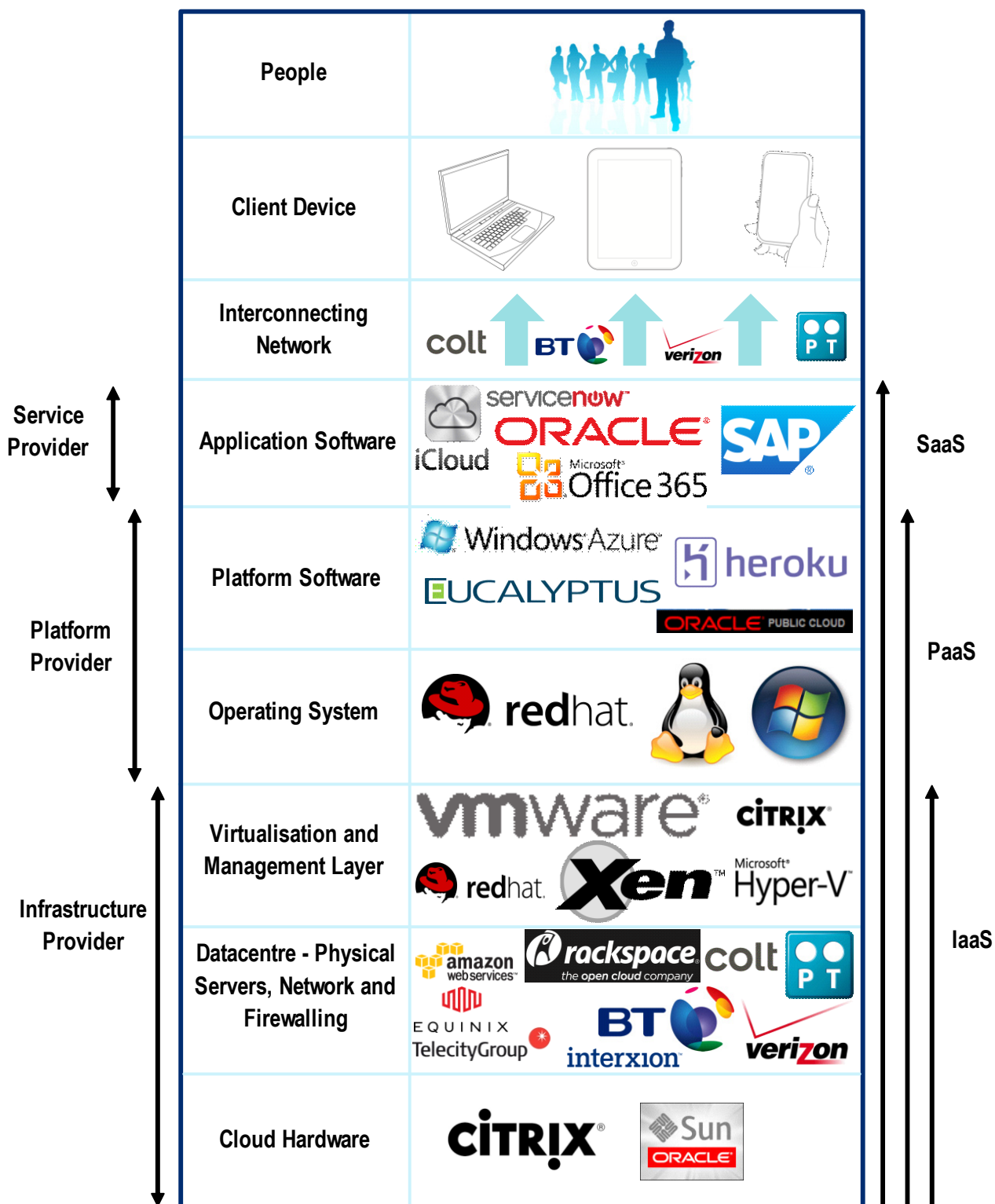
SaaS is often packaged with PaaS by the same provider e.g. Salesforce

It is also common for the platform provider to offer its own services through its own platform. This is the case with Salesforce, which is a supplier of applications for consumer relationship management (CRM) and the automation of sales organisation. However, this software is not sold 'off-the-shelf', but as a service via Salesforce's cloud computing platform.

The Service Provider, Platform Provider and Infrastructure Provider business models clearly correspond to the three services SaaS, PaaS and IaaS. However, it is assumed that 'as a service' means all services within the definition are fully integrated up to and including the respective level, thus incorporating any sub-levels. Therefore, SaaS providers could either sub-contract to a PaaS provider, or would incorporate the PaaS themselves and provide it as part of the SaaS 'stack'. In turn the IaaS could be sub-contracted or incorporated. The customer would see an integrated service. Figure 42 demonstrates this relationship, where the business models are indicated on the left, and the services on the right.



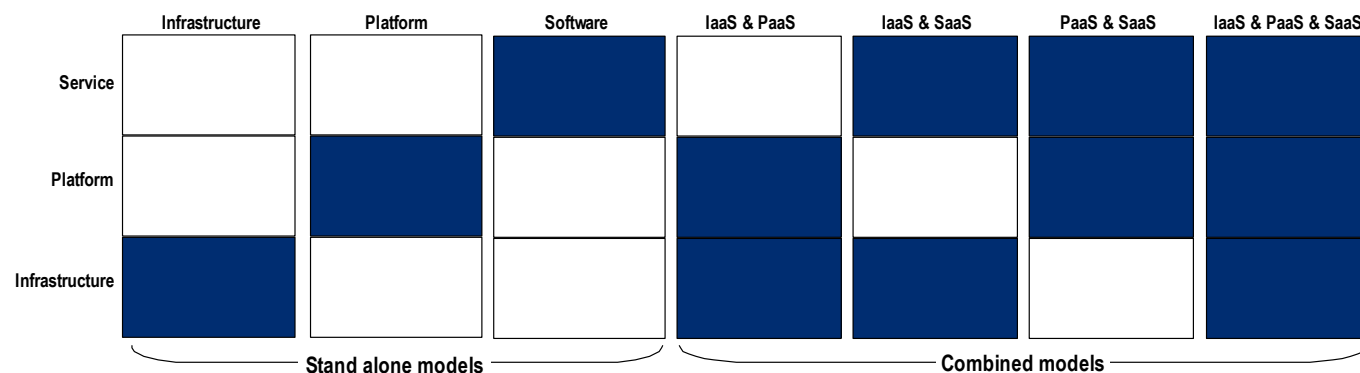
Figure 42. Comparison of Business Models and Example Products Within the Cloud



Source: Company Reports, Citi Research

We choose to distinguish between these three types of providers, but some approaches have grouped them under the single umbrella of 'Cloud Service Vendors' (CSVs). This term encompasses providers of SaaS, PaaS and IaaS products, and it is useful because many stakeholders in the cloud ecosystem supply more than one of them. Figure 43 depicts business models of possible combinations of services that are in existence. However, we should also recognise that not all pure-play infrastructure providers produce an IaaS product. As shown in Figure 42, companies like VMWare can fulfil a particular niche, in this case in providing the virtualisation software.

Figure 43. Cloud Computing Business Models

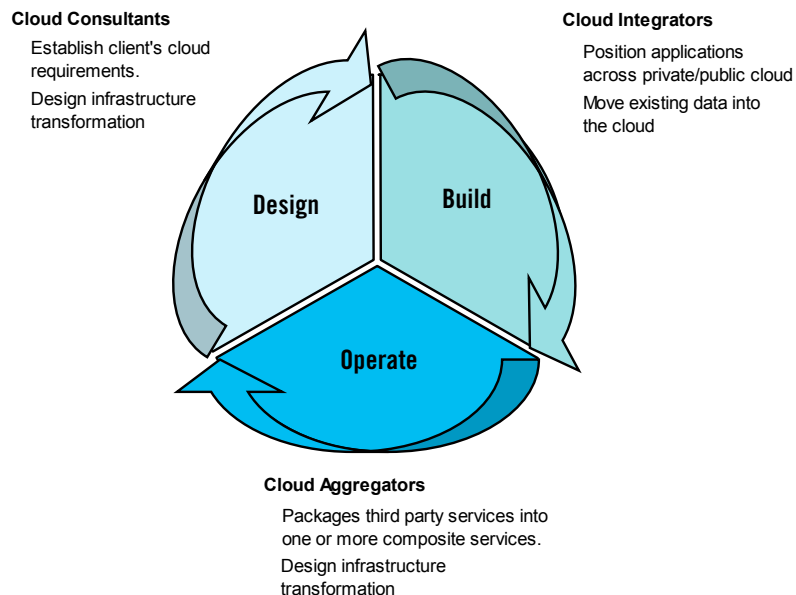


Source: Siemens "Cloud Computing - Business Models, Value Creation Dynamics and Advantages for Customers"

**Beyond these three core business models, there is an opportunity in helping companies move to the cloud.**

These three business models are not the only ones that exist in the cloud ecosystem, and the following three complete our value network. The common theme amongst these three is the enablement of cloud adoption. Most businesses have existing IT infrastructure and somewhat specialist needs and these value network participants cater to those requirements. These business models are still evolving, and there is considerable overlap between the different roles and even some variation as to how they have been defined. However, we will use the following distinctions, which we believe are clearest and most universally accepted and fall broadly into the Design, Build and Operate categories (Figure 44).

Figure 44. Helping Businesses Move to the Cloud – Three Additional Business Models



Source: Citi Research

### Consultants

e.g. Capgemini

Consultants provide support for the selection and implementation of relevant services. They will be able to consult on technology services such as system integration, cloud migration and maintenance and work alongside enterprises to help them maximize their opportunities within the cloud. Their role is to establish the requirements of the client and then design the IT infrastructure transformation that will best suit them.

Recent work that Citi's IT Services team has done in the space supports the notion that 'cloud' has become mainstream. Our anecdotal conversations with stand-alone cloud consultants indicates that they continue to grow rapidly and project duration, complexity and investments considerably larger than they were just 12 months ago. While this has helped their growth, two factors have helped draw traditional consultants such as Accenture, IBM, Capgemini and Deloitte into the mix as well. Firstly, as the cloud client mix shifts from small businesses to mid/large entities, they tend to require formal bids from multiple vendors – so, salesforce.com and WorkDay can no longer move work to their traditional consultant, but have to include an IBM or Cap in the mix. Second, as traditional software companies beef up their 'cloud' offerings, they often continue to use their historical partners, who can better service the client base in terms of not just the traditional offerings but also the new cloud offerings.

### Integrators

e.g. VMware CloudBridge, IBM Smartcloud

A cloud integrator service (confusingly sometimes referred to as Integration-as-a-Service) is like a systems integrator that specializes in cloud computing. A cloud integrator provides a business with a range of options in terms of where to locate its IT requirements across different cloud models.

Most organisations are implementing a hybrid cloud model, in which some of the business' applications, services and data are transitioning to the cloud while others are managed in a traditional manner (see Figure 46). Integrating enterprise applications and other business resources in such an environment can be complicated because legacy systems, sensitive data and security can all pose potential problems.

Therefore, although the role of the cloud integrator is to offer deployment and self-provisioning (without requiring any coding on the part of the user), this is rapidly changing to include systems integration work for traditional IT vendors, so that they can build and manage the interfaces between the newer cloud-based applications in the clients' stack and the traditional non-cloud applications. Cloud integrators tend not to exist as stand-alone businesses, but instead are offered by infrastructure providers who own the public and private data centre assets and provide the software required to combine them.

### **Aggregators**

Aggregators offer new services or solutions by combining pre-existing services or parts of services to form new services and offer them to customers. They use several types of brokers and platforms to enhance service delivery and ultimately service value.

Cloud aggregators typically offer multiple third-party cloud services to channel partners. There is a growing demand for the ability to act as intermediaries between end-users and cloud providers. The aggregator, or broker, handles all cloud-related issues for a customer, from SLAs to compliance and security. In the US, service distributors are starting to adopt this business model, while in Europe some of the telecom operators are moving towards it.

We see two interesting trends emerging in this space. Firstly, service providers can sell a form of cloud 'app store' where customers can instantly provision third-party SaaS applications to suit their immediate requirements. Secondly, IaaS providers can act as aggregators by partnering with SaaS companies and bundling their software applications as part of their infrastructure provisioning deal.

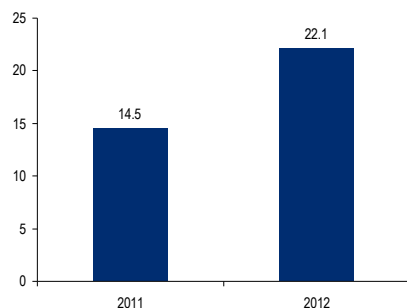
**Our outlook for systems aggregators** – We see potential in the role of cloud aggregators, but think that cloud vendors need to provide something in terms of underlying infrastructure to be successful. Pure-play aggregators may struggle because it is a service easily bundled by SaaS/PaaS/IaaS providers. This may be a danger for a name like Accenture.

## Market Dynamics – 4 Battlegrounds

### The cloud battlegrounds

Several companies are competing aggressively to grab the largest share of the lucrative cloud computing market. This section looks at the current battlegrounds across the cloud business models and product categories.

**Figure 45. Predicted SaaS Market Growth 2012-15 (\$bn)**



Source: Gartner, July 2012

**Key battleground between pure-play SaaS (e.g. Salesforce.com) and existing ISVs (e.g. Oracle)**

**Enterprise software under threat from SaaS alternatives, but vertical applications are likely to be safer**

#### 1. SaaS: Incumbents vs. new entrants

SaaS is the early winner in the cloud space, generating both the largest revenue and greatest absolute growth of the three cloud service models. Gartner estimates suggest that revenue for the worldwide SaaS market will grow by 18% annually in 2012 to \$14.5 billion and expand to \$22.1 billion by 2015. We believe SaaS has so far garnered the most revenue as the end-product is complete and easily consumable. This contrasts to other cloud-based offerings such as IaaS and PaaS, which are 'raw' materials and must be built on top of to derive value.

At the moment, the key software subcategories that have been the first to migrate to SaaS are non-core applications such as CRM, talent management, collaboration and travel and expense. These applications can be moved to SaaS without disrupting other areas of IT, especially the core, mission-critical applications that are often highly customized and difficult and risky to change. We see a push towards SaaS beginning in other areas such as email and back-up.

The main battleground is between the pure-play SaaS entrants and the existing Independent Software Vendors (ISVs), who have been forced to rework many of their applications to run on a SaaS platform. This old world vs. new world struggle is likely to intensify as SaaS increasingly penetrates into the core applications. For the existing ISVs, the question has now become one of 'how bad will it be?' as their loss of some market share to the pure-plays looks inevitable.

Oracle as of now has faced the brunt of the competitive threat, with its Siebel (customer relationship management) and Peoplesoft (human resources) software most vulnerable. We note that more recently, BMC Software has begun to face more pressure in IT Service Management and some of the legacy call centre vendors such as Alcatel-Lucent and Cisco are also beginning to feel some pressure. We believe that, as large areas of the packaged applications software market are refreshed by customers, these customers will increasingly evaluate and select SaaS.

It is likely, in our view, that vertical applications and core enterprise resource planning (ERP) software will be more sheltered from SaaS competition. In both areas, customers can be more risk-averse and the software is often highly customized, making it difficult to supplant existing systems with SaaS.

Beyond competition between the technology majors, both old and new, the SaaS opportunity is a clear target for the next generation of Silicon Valley entrepreneurs. Cloud storage company Box raised \$125m in August 2012 and \$280m in total which, according to the Financial Times (1 August 2012), put a private valuation of \$1.2bn on the company. These businesses have become increasingly targeted for takeover, such as VMware's recent purchase of Nicira, which designs software for data centre automation, and Microsoft's acquirement of Yammer, a networking and collaboration service for office workers.

**The battle between web-grade and enterprise grade IaaS will continue with massively scalable cloud data centres competing with vertically integrated hosting facilities serving enterprises directly**

The next generation of SaaS software is likely to be from those applications that are still not dependent on a particular vertical industry, such as Office applications and unified communications. Microsoft 365 is predictably winning market share with respect to the former, but, while its movement into the cloud will be essential in order to maintain its market share relative to Google, Oracle and Salesforce.com, it is likely to squeeze margins for the company as it invests in data centre assets.

## **2. IaaS: Web-grade vs. enterprise-grade infrastructure services**

This is the struggle for market share between the generic pay-per-use web-based cloud providers such as Amazon, Rackspace and Google Compute Engine, and those which sell directly to enterprises through Service Level Agreements (SLAs).

The web-grade infrastructure services are characterized by a high level of price competition between firms selling a minimally differentiated product. Consequent low prices are traded off against increased security and reliability concerns, including a spate of recent outages.

### **Web-grade IaaS Case Study: UK2 – carving out a low-cost niche**

UK2 is a private internet service provider based in the UK which offers web hosting, dedicated servers and reseller hosting. It has built up its business across the hosting space gradually, seeking to provide the most cost-efficient service possible while supporting multiple international hosting locations and low latency connectivity into internet hubs.

In September 2010 the company launched Virtual Private Server cloud hosting, offering IaaS. It sells infrastructure in nodes, multiples of fixed combinations of storage, compute and memory. Adding UK2's low up-front cost philosophy and existing customer base, the company aims to ensure it can sustain margins in IaaS.

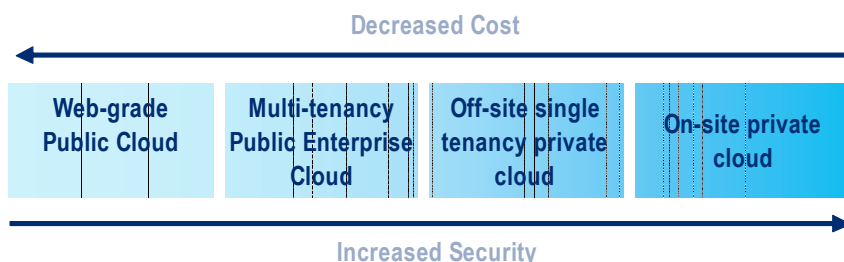
Enterprise-grade infrastructure offers an increase in guaranteed reliability and security, and providers aim to attract enterprise customers through the use of high-level SLAs. As businesses put more and more important business applications into the cloud, these become increasingly attractive. IaaS vendors in this space include Terremark and Savvis, which have recently been acquired by US Telcos Verizon and CenturyLink, respectively (see below).

We expect that the battle between these two data centre architectures will continue, with massively scalable data centres in the cloud competing with vertically integrated data centres serving enterprises directly.

**One resultant trend is IaaS vendors selling a range of services so customers can make a cost/security trade-off for their different applications**

One consequence of this battle is an interesting trend in IaaS where companies are beginning to offer a spectrum of infrastructure standards in order to try to corner both ends of this market. This extends the hybrid cloud concept we focused on above but offers a larger range of options. This allows companies the ability to choose where they place applications depending on how mission-critical they are.

Figure 46. The Spectrum of IaaS Standards



Source: Citi Research

The most sophisticated example of this we have seen in Europe is at **Colt**. The business' enterprise services division provides a sophisticated automation and orchestration layer which allows customers to choose a combination of infrastructure assets positioned across the spectrum in Figure 46 (and to easily commission additional assets when required). For example, an internet service provider can put its servers in a public cloud, but retain its core business applications privately, all managed end-to-end by Colt. Simultaneously, it can also choose the level of service management, from self-service through monitoring to a full managed service.

In terms of future trends in IaaS, we expect increasingly critical workloads to move on to enterprise-grade clouds and that this trend will support corresponding growth. Web-grade platforms are gaining reliability and performance, and will continue to remain attractive to smaller businesses with minimal compliance issues, in our view.

### 3. PaaS: A possible new frontier

PaaS is the least penetrated of the three cloud models. Although it currently represents a minority of cloud revenue (see Figure 40), PaaS is today gaining traction amongst web developers and there are some very early signs of traction among ISVs and enterprises. We believe PaaS has been slower to be taken up because it fits in between a 'raw material' (IaaS) and a 'finished good' (SaaS). PaaS generally requires developers and enterprise IT organizations to make more substantial changes to the way they develop and deploy applications. As a result, these more significant changes will take more time to evolve. Like SaaS, we believe PaaS will ultimately be market-expansive, as well as somewhat cannibalistic to traditional application development. PaaS should help to democratize application development, ultimately enabling businesses to develop applications that meet their needs.

### 4. The emergence of cloud brokers

Many companies are attempting to become cloud brokers and fulfil various roles in the aggregator, integrator and consultant positions we discussed earlier. However, we think that only a few companies will attract the required ecosystem to succeed.

Approaches to cloud brokerages are very diverse. The two main ones we have observed are:

- Reselling SaaS applications
- Finding cheapest IaaS capacity amongst various vendors and then matching this capacity with the key performance indicator requirements specified by buyers

A diverse range of companies want to be cloud brokers

**Successful cloud brokers must provide underlying infrastructure; pure-play aggregators may struggle**

We see potential in the role of cloud aggregators, but think that cloud vendors need to provide something in terms of underlying infrastructure to be successful. Pure-play aggregators may struggle because it is a service easily bundled by SaaS/PaaS/IaaS providers.

**Telecom operators are uniquely placed for SaaS resale**

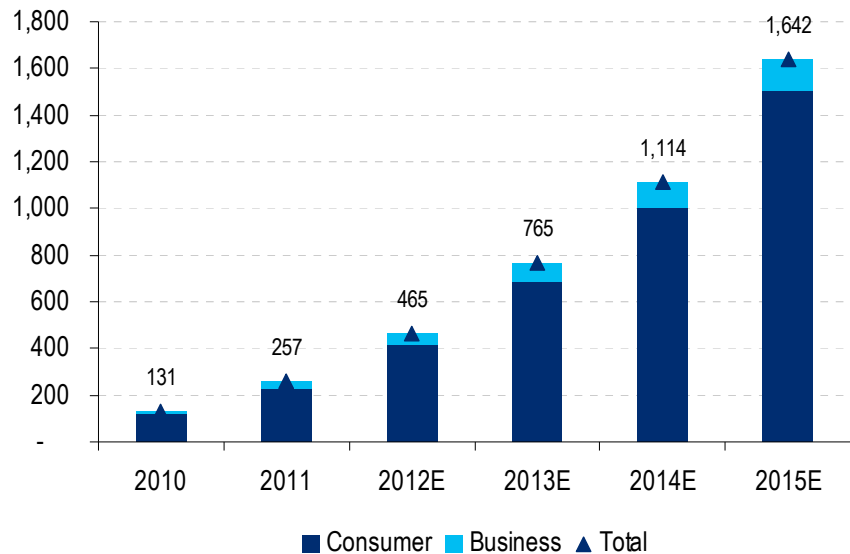
Consequently, we believe the telecom operators are best placed to resell simple SaaS applications because of their extensive sales channels and ability to bundle them with security and performance guarantees. This is an approach adopted by many operators under our coverage (see company section).



## Cloud Products

The following provides a non-exhaustive list of current products available. The emphasis is on SaaS and web-grade IaaS. Although the emphasis of this report is on telecom operators' cloud opportunity from enterprise-grade services, we highlight the fact that consumer cloud applications like cloud music, gaming, VoD streaming could become a significant chunk of the total cloud IP traffic. As such, there could be interesting revenue opportunities in this area.

Figure 47. Global Cloud IP Traffic, 2010-2015, in PB per Year



Source: Cisco Global Cloud Index

## Corporate

Figure 48. Examples of Corporate Cloud Services

Cloud Service	Category	Service Description
Amazon EC2/S3	IaaS	Amazon EC2 presents a true virtual computing environment, allowing you to use web service interfaces to launch instances with a variety of operating systems, load them with your custom application environment, manage your network's access permissions, and run your image using as many or few systems as you desire.
Basecamp (37signals)	SaaS	Basecamp offers to-do lists, wiki-style web-based text documents, milestone management, file sharing, time tracking, and a messaging system. It also offers integration with 37signals' own Campfire product.
Box	SaaS	Box is an online file sharing and cloud content management system for enterprise companies. It provides a service by which users can upload files and then work collaboratively on them.
Huddle (Ninian Solutions Ltd)	SaaS	The Huddle software platform provides cloud-based file sharing, file storage, content management, collaboration, task management, meeting organisation, discussion boards, custom branding, security and authorization control, as well as an API. It is a tool for project collaboration in the cloud, used to get work done efficiently and effectively. User profiles allow you to connect with the specific people you need to contribute to your project.
Microsoft Office 365	SaaS	Microsoft Office 365 is a commercial software plus service offering a set of products from Microsoft Corporation, with the initial plan including a Professional subscription (for organisations of 25 and smaller) and an Enterprise subscription (for organisations with more individuals). Office 365 includes the Microsoft Office suite of desktop applications and hosted versions of Microsoft's Server products (including Exchange Server, SharePoint Server, and Lync Server), delivered and accessed over the Internet.
Salesforce.com CRM	SaaS	Salesforce.com's CRM (Customer Relationship Management) aims to get various departments within a business, such as sales, technical support and marketing, to share the useful information that they collect from interactions with customers. The application runs in the cloud, so that the user can access it anywhere.
Google App Engine	PaaS	PaaS cloud service for developing and hosting web applications in Google-managed data centres. It is free up to a certain level of consumed resources, then fees are applied for additional storage, bandwidth or instance hours.
VMware vCloud	IaaS	vCloud is a cloud computing initiative from VMware which will allow customers to migrate work on demand from their own servers on to the cloud. The goal of the initiative is to provide the power of cloud computing with the flexibility allowed by virtualisation. It forms a part of VMware's standardised three-stage transition for companies to move into the cloud.

Source: Citi Research

## Consumer

Figure 49. Examples of Consumer Cloud Services

Cloud Service	Category	Service Description
Google Gmail	SaaS	Gmail is a web-based email client, which also links to Google's other services, including Calendar and Docs. It is free to use, and can be accessed from any computer with an internet connection. It also provides phone-based apps for ease-of-use on mobile devices.
Amazon Cloud Drive	Storage	Amazon Cloud Drive is a personal cloud hard drive used to store any files on Amazon's secure data centres.
Apple iCloud	SaaS	iCloud is a tool to store music, photos and documents and push them to all your devices. It is also a platform for which App developers can provide their own services, as well syncing email, contacts and calendars across devices.
Dropbox	Storage	Dropbox is a cloud hard drive, which can be used either by teams or individuals to store data of any kind. A free service is available with 2GB of storage, which can be upgraded to 100GB for £10 per month, or 200GB for £20 per month.
Evernote	SaaS	Evernote collects clips of data from Web sites that the user visits and gathers them into categories which can be synced in the cloud and accessed from many devices. It has received considerable acclaim in academic circles.
Google Apps	SaaS	Google Apps is a service from Google which provides independently customizable versions of several Google products under a custom domain name. It features Gmail, Groups, Calendar, Talk, Docs and Sites. Free Google Apps is available to users with limited storage capacity.
Microsoft Skydrive	Storage	Skydrive is a file hosting service that allows users to upload and sync files to cloud storage and then access them from a Web browser or their local device. The service offers 7GB of free storage for new users, and additional storage is available for purchase.
SpiderOak	Storage	SpiderOak is an online backup tool for Windows, Mac and Linux. It can also be used to share, sync, access and store data using an offsite server. SpiderOak distinguishes itself from competition by providing encryption, automatic syncing and automatic de-duplication of data. It offers a free 2GB version, with paid subscriptions for increased storage.
Spotify	SaaS	Spotify is a web-based service which streams on-demand music. It offers two levels of subscription - for £5 per month it removes adverts from their free service and allows unlimited access, and for £10 per month it allows users to access their playlists while offline. It has recently developed an built-in App service, allowing customisable content.
Do.com	SaaS	Do.com from Salesforce is a file sharing and collaboration tool. It looks to compete with Microsoft Exchange, by providing a system which links meetings, tasks and email and puts them in the cloud. It links with Gmail, and looks to undermine Microsoft's hold on the market.
Waze	SaaS	Waze uses GPS information being detected from iPhone, Android, Windows Mobile and Symbian devices to report on traffic. It learns from user's driving times to provide real-time routing and traffic updates. It reached 20 million users in July 2012, and is now linked with Twitter to provide information on major accidents.

Source: Citi Research

# Cloud Mergers, Acquisitions, Partnerships

## An overview of M&A activity

### Widespread M&A activity in the last 18 months

As is typical of a relatively new technology industry, M&A activity has been widespread and in general we are witnessing a very high pace of cloud consolidation. In 2011 and the first half of 2012 this accelerated, and in some senses this is indicative of a market beginning to mature. While cloud was once a breeding ground for new software start-ups, these companies have begun to gain credibility and now stand ripe for acquisition by the computing and telecom giants who look to quickly fill their rosters with a wide variety of products and services. Microsoft, IBM, Verizon, Google, HP, Oracle and SAP have all made this kind of acquisition in the last 18 months.

### Yet there are risks...

On the other hand, there is a key risk associated with this pattern of consolidation, namely that when an innovative new business is acquired it tends to lose the people who are its key assets as they disengage from the innovation. Their novel ideas then get overtaken by the more agile businesses that have gained credibility. This was the case when Siebel acquired Upshot just as CRM (Customer Relationship Management) was gaining prominence. Upshot very quickly lost out to rival Salesforce.com, which now has a very significant market presence in its own right.

Below is a list of notable cloud M&A and two major themes can be observed. Firstly, we see the gradual consolidation of cloud technology companies in the US, as many promising start-ups are taken over by the traditional giants. Secondly, some emphasis has been given to telecom operators, where we observe a general pattern of acquiring software-based specialists to improve the vertical integration of their cloud offerings.

## Notable Recent M&A

### Consolidation of US cloud

Figure 50. M&A - Consolidation of US Cloud

Date	Target	Acquirer	Value (\$ bn)	Comments
Oct-10	RightNow	Oracle	1.5	<p>In October 2010 Oracle Corporation announced that it had entered into a definitive agreement to acquire RightNow Technologies Inc., a Bozeman, Montana-based web-based customer services software developer, for \$43 per share. The offer price valued RightNow's 33.25 million shares outstanding at \$1,429,750,000, with the deal valued at around a reported \$1.5 billion net of cash and debt. The offer price represented a 19.6% premium over RightNow's closing share price of \$35.96 on the last day of trading before the announcement.</p>
Jul-10	Dimension Data Holdings	NTT	2.12	<p>In July 2010, NTT announced that it would acquire South African Dimension Data Holdings, a London-based networking, security, operating environments, storage and contact centre technologies company. This represented an offer of £1.20 per share in cash, a premium of 18.11% over Dimension's closing share price of £1.016. The offer valued Dimension at approximately £2.12bn.</p> <p>NTT believes that it will be able to provide 'end-to-end, global-one-stop and high quality ICT services'. The deal improves NTT's exposure to emerging markets, especially in Africa, South America and the Middle East, a significant high-speed growth area for cloud computing due to a lack of existing IT legacy infrastructure.</p>
Mar-11	Successfactors	SAP	3.4	<p>On 03/12/11 it was announced that SAP had signed a definitive agreement to acquire SuccessFactors Inc., a San Mateo, California-based human capital management software developer. SAP offered to pay \$40 in cash per outstanding SuccessFactors ordinary share, representing a bid premium of 52.4% based in the closing share price of \$26.25 on the last trading day before the announcement. Based in the 84.197 million shares outstanding, the offer represented a reported enterprise value of approximately \$3.4 billion.</p> <p>SAP views the cloud as being central to its future growth, and the acquisition of Successfactors, a leading SaaS provider, allows it to achieve end-to-end capabilities.</p>
Jul-12	Yammer	Microsoft	1.2	<p>On 13/06/12 it was reported that Microsoft Corporation is in negotiations to acquire Yammer Inc., a San Francisco, California-based online enterprise social network website operator started in 2008, for over \$1 billion. On 14/06/12 it was announced that Yammer Inc. had agreed to be sold to Microsoft for \$1.2 billion, and the acquisition was completed on 19/07/12. Yammer was unquoted. Yammer has been dubbed 'Facebook for the workplace', and it is Microsoft's latest attempt to protect its dominant Office products from a challenge from Google. Yammer claims its corporate customers include Ford, Shell, Deloitte and Ebay.</p>

Source: Company data, Citi Research

## Telco acquisitions of cloud assets

Figure 51. M&A – Telco acquisitions of cloud assets

Date	Target	Acquirer	Value (\$ bn)	Comments
Jan-11	Terremark	Verizon	1.4	<p>On 27/01/11 Verizon Communications Inc. announced that it had entered into a definitive agreement to acquire Terremark Worldwide Inc., a Miami, Florida-based provider of managed IT infrastructure and cloud services, in a transaction with an equity value of \$1.4 billion. Verizon offered \$19 in cash for each Terremark share, which represented a premium of 38.9% over Terremark's closing share price of \$13.70 on 26/01/11, the last day of trading prior to the announcement. The deal positions it to directly compete with Amazon in IaaS, a market which the Corum Group described as Amazon's to lose.</p>
Mar-11	Savvis	CenturyLink	3.2	<p>Savvis is an American internet service and web-hosting provider and content software developer. On 27/04/11 CenturyLink announced it had entered into a definitive agreement to acquire Savvis for \$40 per shares for a reported amount of approximately \$2.5 billion, plus net debt of approximately \$700 million, giving an approximate deal value of \$3.2 billion.</p> <p>CenturyLink offered \$30 in cash and \$10 in shares for each Savvis share. The offer represents a premium of 19.1% over Savvis' closing share price of \$33.600 on the last day of trading prior to the takeover rumour, and a premium of 11% over Savvis' closing share price of \$36.02 on 26/04/11, the last day of trading prior to the takeover offer announcement.</p> <p>"As migration to cloud-based services continues to accelerate rapidly, a strategic combination was a natural choice to create significant scale and become part of a large global network for the benefit of our customers, stockholders and employees," according to Mr James E. Ousley, Chairman and CEO.</p>
Aug-11	CloudSwitch	Verizon	<0.1	<p>In May 2011 Verizon announced that it was looking to acquire small software companies worth less than \$100 million. In August the same year, it announced that it had acquired Cloudswitch, a Burlington, Massachusetts-based cloud management software developer and publisher. Cloudswitch provides a 'gateway to the cloud' by providing a software platform which allows customers to access virtualised machines in the cloud.</p> <p>Verizon said that CloudSwitch would be combined with Verizon's existing IT subsidiary, Terremark. Verizon said that its rationale was that "The cloud market is a rapidly growing opportunity, with very real benefits both for our business customers and the consumers they serve" (Bob Toohey, president of Verizon's global enterprise unit).</p>
Jan-12	Joyent	TEF (partner)	0.085	<p>Joyent Inc. is a San Francisco-based online SaaS provider and software developer, which in January 2012 announced that it had raised \$85 million in funding in a round led by Weather Investments II and including new investment from Telefónica Digital and other investors. Joyent was chosen by Telefónica as its software fits within Telefónica's own in-house technologies and allows it to offer a more end-to-end service, rather than merely infrastructure.</p>

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Aug-12	Fidelity Telecom (ThinkGrid)	Colt	Un-disclosed	On 13/08/12 Colt Group SA announced that it had acquired Fidelity Telecom Ltd (trades as ThinkGrid), the Eastleigh, UK-based cloud computing platform operator, for an undisclosed consideration. Financial details were not disclosed.
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Colt's channel partners will benefit from ThinkGrid's advanced capabilities of auto-provisioning and fully flexible billing. ThinkGrid's comprehensive training programme to facilitate the development of resellers' cloud capabilities will be rolled out to Colt's indirect sales team and channel partners. This move makes the information delivery platform real for Colt's indirect channel, with a comprehensive range of cloud-based services guaranteed by Colt's SLAs to provide a best-in-class partner experience.

Source: Company data, Citi Research

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## Implications for Our Coverage

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# Cloud's Impact on the Industry

## Winds of change

**In the early days of the cloud, the main drivers were cost benefits**

Cloud computing continues to grow. Now that the market is just beginning to mature and as the understanding of cloud computing improves, the initial drivers and deployment scenarios that once framed cloud computing have begun to subside. Primarily, this was the simple desire to lower costs through efficiency gains.

**Today, it is the demand for business agility**

According to Forrester, companies today now want to use cloud computing technology to facilitate business innovation and growth. Business agility was considered as a key benefit of SaaS by only 32% of respondents to their 2009 enterprise survey, compared with 72% at the beginning of 2012.

Patterns of client adoption are also different to expected. Whereas the initial business model focused on small businesses with minimal latent IT infrastructure, in fact it is larger enterprises that have contributed to the majority of cloud revenues.

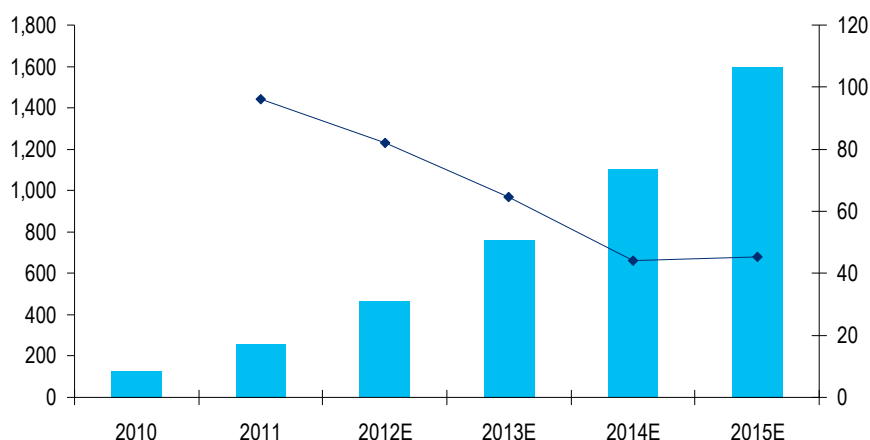
The primary reason for this is that enterprises are looking to complement existing IT infrastructure with cloud capabilities rather than overhaul it completely. We highlighted earlier the existence of legacy IT infrastructure as a major barrier, but providing the capabilities to migrate progressively into the cloud turns out to be a highly prized competency and is something to look out for when evaluating the cloud services portfolio of a provider.

## Data growth

**Cisco expects 65% aggregate yoy growth in cloud traffic until 2015**

Looking forwards, Cisco expects aggregate year-on-year growth of 65% in world cloud traffic over the next three years as capacity is constantly increasing.

**Figure 52. World Cloud Data Centre Traffic Growth (Exabytes per year)**



Source: Cisco

## Outlook for Telecom Operators

The core strength of the telecom operators in the cloud is the provision of underlying infrastructure built upon their existing network assets, in our view. Operators' familiarity with SLAs, established scale, network and ownership of the customer relationship should allow them to provide high-quality enterprise-grade IaaS at a premium over web-grade alternatives. However, we believe sustained competitive advantage will only be achieved by those capable of augmenting this with additional services, including IT integration, SaaS aggregation and the targeting of niche industry verticals.

In the US, cloud computing is still in the nascent stages of adoption and has emerged as a valuable tool for companies to drive cost efficiencies and revenue growth. We find the most significant barrier to greater cloud adoption remains the security of data within the cloud, as well as the uncertainty associated with companies losing control of their data and concerns about reliability. We believe that, as cloud providers continue to ensure secure, reliable, integrated cloud solutions for their customers, cloud computing adoption will continue to grow and benefit all US telcos tied to the cloud, including AT&T, Verizon & Equinix. However, smaller infrastructure services providers, such as those offering data center colocation, and pure-play bandwidth providers, such as Cogent and TW Telecom, may be the greatest beneficiaries from a value perspective given their greater exposure to selling colocation and/or bandwidth services tied to the cloud. In contrast, growing cloud-derived revenue for AT&T and Verizon may get lost in their massive revenue streams and diluted by the continued cannibalization of legacy wireline voice and data services.

In Europe, some telecom operators are lagging behind their US counterparts. In many cases their approach to cloud remains too fragmented and sometimes defensive rather than driven by a strategic vision. To this contribute to some extent the lack of regulatory consistency across borders and so far minimal incentive from governments to invest. We see the need for future legislative harmonisation, but are positive about the opportunities for companies with substantial existing network facilities and those able to carve out a niche in this disjointed marketplace. Our top cloud picks in telecoms are **Colt**, **BT Group** and **Portugal Telecom** due to the scale of their corporate operations in their business mix and/or the focus they are putting on developing their cloud offerings. However, we recognize that most of the European incumbents are placing a high priority on cloud and a number of them are well placed.

**Telcos are naturally well positioned in cloud due to network assets**

As revenue growth in their traditional businesses declines, telecom operators are increasing their investment in new growth areas such as cloud computing. At least in theory, the carriers are naturally very well positioned to take advantage of this revenue opportunity. This is primarily because of their ownership – and expertise – in the underlying connectivity assets. Cloud computing is utterly dependent on the existence of an underlying high-speed 'next generation' network (NGN). These networks are extremely complex, and, although their ability to profit from them may be limited due to competition between operators, as a sector it puts them in a strong initial position.

**However, development of SaaS will likely remain the domain of software providers**

However, as has been the case in terms of telecoms services historically, we think it is likely that the final software services that are provided to consumers will be produced by others, and it is improbable that they will choose to challenge Google or Microsoft in producing a software platform. For example, **Portugal Telecom's** cloud offering involves partnerships with **SAP**, **Oracle** and **Microsoft**, all of which they can host depending on customer preference.

In addition to providing infrastructure, telcos can act as cloud aggregators

Where operators are able to compete with players in the technology sector is in selling cloud-related services. This is primarily in the acquisition of data centre assets and a subsequent role as aggregators of cloud products. In other words, although as a business you may interact with an **SAP** software platform, you may sign up for a **Verizon** cloud, hosted at Verizon data centres and connected through a Verizon network. We think this is as close to an end-to-end cloud service as the telcos can realistically achieve, but they are potentially uniquely placed to succeed in doing so.

Informa research emphasizes that, although telecom operators are not the first movers in the cloud market, they are certainly not too late. Operators have been approximately doubling their cloud revenues on an annual basis and Informa believes that this pattern can continue for at least the next five years.

### The telecom operators have some key advantages

Telcos are able to leverage their networking capabilities, existing scale, SLA experience and enterprise customer base.

Telcos are capable of offering a very high-quality product in the cloud computing space. The four areas in which they compare favourably to other competitors in the cloud space are:

- **Ownership of the underlying connectivity assets.** The reliance of the cloud on shared networks means that in some form or another, telcos, the owners of these assets, will be involved. The level of capital expenditure required to set up data centre infrastructure is relatively small compared to the start-up costs of building an in-ground network. In the current economic environment, this represents a considerable barrier to entry, giving the telcos a degree of competitive power in this feature of the cloud.
- **Existing scale.** Telcos such as Verizon, AT&T, Telefónica and Vodafone are all global players with strong international reach and existing customer base. They have the potential to expand their portfolios into cloud to protect their connectivity services.
- **Ability to offer end-to-end service level agreements.** Telcos are able to guarantee an end-to-end service agreement on application performance and availability. With the combination of service assurance and data centre and network redundancy, telcos are better positioned to offer secure and reliable cloud services to enterprise customers. For example, a specialized organisation wishing to transfer sensitive, high-quality data will potentially pay a premium to a telco that can guarantee its service. In terms of the language of the previous section, it is able to offer convincing differentiation by providing enterprise-grade IaaS. A series of recent outages, especially at Amazon, confirms this point's significance.
- **Existing customer relationships.** Telcos already provide extensive enterprise services and their existing customer relationships are likely to prove valuable as and when those businesses choose to migrate into the cloud.

The consequence of these differentiators, in our view, is that the **Telcos are effectively placed to offer an enterprise-grade cloud offering as opposed to a web-grade IaaS offering.** In other words, they are able to charge a premium over the 'stack it high, sell it cheap' model preferred by the web-grade offerings by ensuring data security, reliability and high-quality connectivity. Many operators are already proficient in providing managed hosting, and in collaboration with technology partners, they will be able to virtualize their existing data centre infrastructure.

Figure 53. Recent Cloud Computing Outages

Cloud Provider Outage	Description
Amazon Web Services, April 2012	Amazon cloud infrastructure suffered a power outage, creating problems for clients which lasted more than 12 hours. Several notable sites were affected, including Foursquare, Quran, Moby and Reddit, and some business customers ended up losing valuable business data.
Microsoft, September 2011	Microsoft suffered a disruption which lasted approximately two and a half hours. This was caused by a major server failure, and Hotmail, Office 365 and Skydrive were all affected. It is estimated that over a million Microsoft customers were affected.
Google Docs, September 2011	Google Docs is a widely used document sharing site which experienced an outage of about 30 minutes due to a bug which became apparent under heavy usage. It was caused by a change designed to improve real time collaboration within the document list.
Amazon Web Services, April and August 2011	In April 2011, Amazon EC2 suffered an interruption in service which lasted 47 hours for some consumers. It affected thousands of websites which rely on AWS, especially start-ups and web companies.
Intuit, June 2011	In March 2011, Intuit's services TurboTax, Quicken and QuickBooks went offline twice within a single month. The worst case was a 36-hour outage in June which was reportedly caused by a power failure. A second occurred two weeks later, lasting another 25 hours.
Gmail, February 2011	Gmail represents one of Google's primary challenges to Microsoft's stranglehold on both enterprise and consumer email clients. In February 2011, 150,000 Gmail users were unable to access their emails, and it took as long as four days for the data of some affected users to be recovered.
Hotmail, December 2010	Information for 17,000 hotmail accounts, Microsoft's long-standing web email service, was accidentally deleted, and it took Microsoft two days to restore normalcy. Improper load balancing between servers was blamed.
Salesforce.com, January 2010	Salesforce.com's entire 68,000 strong customer base experienced a one hour outage due to 'systematic failure' in its data centre. This included failure of all services, including backup.

Source: Citi Research

## Value extraction remains dependent on differentiation

### Simple IaaS provision will be insufficient to sustain margins in competitive environment

Even with the advantages telcos bring to the table, we expect that the simple provision of infrastructure is likely to be insufficient to drive sustained strong margins in the cloud space. We are already seeing the increasing commoditization of IaaS, and, as competition increases and service differentiation dilutes, margins will fall.

Instead, basic infrastructure provision, including storage and compute on demand, SaaS enablement and on-demand hosting, is only the 'low-hanging fruit' for the telcos. We think carriers that limit themselves to this level will end up simply using their investment in cloud to protect their core connectivity business. We see two further levels of telco development in existing organisations.

### To move beyond basic infrastructure, telcos are investing in differential services provision

Firstly, some organisations are introducing supplementary services with the aim of further benefitting from their innate differential advantages. These include adding security and reliability guarantees, providing unified communications (bundling cloud with all their existing enterprise services) and acting as integrators and consultants in helping businesses to move into the cloud and orchestrate their IT. As Informa research points out, localized services are also of particular value here, and IaaS margins will rise with high-quality infrastructure serving specific business communities.

### The most advanced telcos are fulfilling a cloud aggregator role

Secondly, the most advanced telcos in the cloud are those that are fulfilling the aggregator business model. They act as intermediaries between end-users and cloud providers, forming partnerships with software providers and delivering them via their own clouds. The telcos are once again naturally strong in this area, since they are used to delivering services on demand, and have strong existing relationships with enterprises' IT departments. The latest buzzword for this role is

IPaaS (Integration Platform as a Service), which describes the provision of a single interface through which multiple SaaS applications can be accessed. Research firm Ovum predicts an annual growth of 8.3% in IPaaS between 2011 and 2016, reaching \$14.4bn by the end of 2016. However, it argues that they are not yet completely mature and currently offer less functionality than traditional integration solutions.

Our qualitative metric for judging the relative merits of telcos' cloud offerings in the companies section are the extent to which they have successfully moved along this development path and achieved substantial differentiation.

## US Telecoms in the Cloud

Cloud based services generally have 3 distinctive features relative to managed hosting: 1) service is sold on-demand; 2) capacity is elastic; and 3) service is fully managed by the "Cloud" provider. We highlight the suppliers, service offerings and examples in Figure 54.

Figure 54. Examples of Cloud-Based Services within the US

	Service Offerings	Suppliers	Examples
Data Center Colocation	Provide secure, reliable environment to co-locate network and computing infrastructure Rich environment for Telecom network connectivity Deployments vary in size between retail, managed wholesale, and pre-built space	Equinix Digital Realty Dupont Fabros Interxion Coresite	Network providers co-locate in data centers to interconnect their networks Companies deploy portions of mission critical infrastructure as the primary location for such computing and/or for disaster recovery purposes Connect to Ecosystems – For example, financial exchanges deploy in a variety of data center locations to provide a fast, secure way for trading partners to interconnect with each other.
Infrastructure as a Service (IaaS)	Customer purchases raw computing, storage and other components, delivered as a service Can be packaged with additional value such as software components and operational responsibilities	Traditional outsourcing and service providers such as HP New providers such as Amazon and Rackspace Specialized providers such as OpSource	Traditional providers offer a range of services from dedicated hosting to shared, virtualized "cloud hosting" in order to scale up and down with customer requirements for performance. Specialized providers cater to needs of specific communities of customers such as ISVs, government, large enterprise, etc.
Platform as a Service (PaaS)	Builds on IaaS Generally includes software development, testing, deployment / runtime and management capabilities	Salesforce.com's Force.com and Heroku Microsoft Azure VMware CloudFoundry	Platform offering focused on mobile and social applications that have requirements that are different from traditional enterprise applications Support for traditional programming frameworks such as Java and .Net as well as new frameworks such as Ruby on Rails.
Software as a Service (SaaS)	Builds on PaaS, delivering software application as a service Replaces or is a substitute for software installed and managed "on premise"	Salesforce.com Cisco Webex Intuit TurboTax Web and QuickBooks online	Salesforce.com enables companies to have enterprise class sales force automation with minimal upfront investment and no IT management burden Consumers don't have to be burdened with installing software, saving files locally and integrating with external services.

Source: Citi Research

**Carriers within the US can capture varying degrees of benefits from cloud-based services including from provision of connectivity, colo, uninterruptable power, cooling, and security**

Carriers within the US can capture varying degrees of benefits from cloud-based services. As a starting point, most telcos can benefit to some degree from an increase in demand for fiber- and Ethernet-based services that provide connectivity for companies and data centers that enable and house cloud-based services. A number of wireline telcos also provide data center colocation services from which they get paid for offering space, uninterruptable power, cooling, and security that house the computing infrastructure (public, private, and hybrid services) that enable cloud-based services to operate, including AT&T, Verizon, CenturyLink, Cogent, TW Telecom, Equinix, Interxion (in Europe), and Windstream.

**Verizon, Rackspace, Windstream, AT&T, and CenturyLink, among others, directly offer varying forms of managed computing services**

Some of the companies, such as Verizon, Rackspace, Windstream, AT&T, and CenturyLink, directly offer varying forms of managed computing services from which they capture incremental revenue. The business model for cloud-based services is still evolving for the telcos and we do not believe one winning business model has yet emerged. That being said, we prefer infrastructure services providers and smaller bandwidth providers that can get the most direct benefit from cloud-based services over the next few years.

**At around 24% of service revenue cloud and managed services is now the largest revenue segment for Equinix**

**We believe Equinix is poised to benefit from the transition to the cloud**, as the cloud and managed service segment is now the largest revenue segment for Equinix, at around 24% of its service revenue, although private cloud deployments could be incorporated into other revenue segment definitions. We believe that Equinix can be a net beneficiary of cloud services based on: 1) breadth of network diversity creates an advantage for Equinix to host public and private cloud networks and network provider nodes for larger cloud providers, such as Amazon and Rackspace; 2) rising demand for computing services is consuming the power efficiencies facilitated by virtualization and cloud deployments, which we believe reduces cannibalization risk for data center colocation revenue; 3) Companies looking to connect to public cloud networks can leverage Equinix facilities to deploy a secure service node. The opportunity for Equinix to create an ecosystem of cloud computing nodes is an emerging theme that we believe is encouraging for the company's role in the deployment of cloud-based services over time. We believe the same cloud-based revenue opportunities exist for Interxion and other network-neutral data center colocation providers, while we view Equinix as making favorable progress on capturing incremental cloud-based revenue based on taking its exchange-based concept into cloud services.

**Amdocs case study**

**Focus: Amdocs – an interesting way to play the growth of the cloud?**

Over the past couple of years, Amdocs, the global leader in telecom carrier billing and CRM, has launched multiple cloud-based products. These include a cloud-based mobile payments solution that enables telcos to quickly launch direct carrier billing services; a machine-to-machine solution to enable onboarding of numerous connected devices (utility meters, electric vehicles) as well as a connected home solution to launch pre-packaged services such as home security. The billing for these services depends on the growth of its telecom clients' cloud businesses, since Amdocs will bill the telcos based on their growth.

## European Telecoms in the Cloud

According to Informa, European Telecoms generated €900m of cloud revenues in 2011. This is expected to grow by c.42% in 2012. While disparate regulations had been holding back development of corporate cloud services this may now be changing. Indeed, local data storage in European countries under stricter data privacy regulations (e.g. in Finland, France and Germany), and away from the US Patriot Act, seems to be an important selling point for their cloud services.

**Only 7% of a total \$13.5bn in global telecom investment in the cloud is down to European CSPs**

According to Informa's Cloud Monitor, currently only 7% of the total \$13.5bn in telecom global cloud investment is being done by European CSPs, suggesting a risk that the European telcos are being left behind by more dynamic foreign rivals. Lack of government investment in cloud computing may not be helping, and in France and Germany decisions around copyright scope have been shown to negatively impact investment in cloud.<sup>4</sup> We contrast this directly with Singapore, where the government has offered subsidies for SMEs to move into the cloud, with considerable success.

**The evidence of our industry interviews is that corporate demand is now picking up**

However, the evidence of our interviews is that corporate demand is now picking up and that the telcos are both conscious of being left behind and acting quickly to bring new services on stream. Investment looks to have picked up even in the last 12 months and a number of the initiatives mentioned by companies, including in orchestration as well as data centre space, are either recently brought to market or only now about to go live commercially.

The European Commission's recent report on Cloud Computing concedes that the digital marketplace remains disjointed due to legal regimes that differ across member states. Different nations' internet service providers (ISPs) are bound to different jurisdictions with different access regimes and different transparency regulations. A cloud service vendor must oversee many ISPs to ensure its service remains ubiquitous and this is associated with high transaction costs. We expect the Commission to do more to try to tackle this over the next 12-18 months as the renewal of the Telecoms Framework approaches at the start of 2014.

From our analysis and stock coverage, we judge BT, Colt and Portugal Telecom as the top plays on the cloud from European telecoms, due in part to the particular focus that they are each giving it and in part to the scale of their corporate operations in their overall business mix.

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<sup>4</sup> "The Impact of Copyright Policy Changes in France and Germany on Venture Capital Investment in Cloud Computing Companies. Lerner, Josh, 2012.



## Outlook for Technology

Traditional IT Outsourcing firms face significant risks associated with the cloud. Virtualisation and other cloud attributes diminish the value proposition offered by traditional data centre outsourcers. Eventually, service providers that maintain internal systems or provide system integration services could suffer material revenue cannibalisation, though we do note a long runway for this to happen. This effect is mirrored in the SaaS marketplace, as pure-play providers like Salesforce.com encroach upon incumbents like Oracle. On the other hand, we believe that colocation providers are well placed to defend their position and may benefit from partnering with bespoke cloud services.

## Outlook for IT Services: a Mixed Bag

Strategy consultants and data centre outsourcing vendors are likely to see an initial negative impact

The outlook for traditional IT Services companies depends on which service offerings their historical revenue base is comprised of as well as what investments each vendor has made to adapt to the cloud. There are risks as well as opportunities associated with the cloud and, clearly, not every vendor will be affected in a similar manner. Our take is as follows:

Important to be an early mover in the cloud

- **Almost all vendors except the highest level strategy consultants are likely to see some negative impact from the move to cloud** – The key to deciding whether cloud is a net positive or a net negative for the other trends is to analyse how each vendor is adapting.

- **Market acceptance will take time** – The impact grows over time and some of these offerings need a prolonged time period to be accepted in the marketplace in a material way. So it is important to be an early mover and to have some say in the market direction by providing consulting and advisory services.

- **Different vendors are likely to be affected at different times** – We do expect the initial impact is likely to be felt by data centre outsourcing vendors. By the same token, the impact on the important channel partners of the major independent software vendors (ISVs like SAP and Oracle) is likely to be muted and probably determined by the actions of those software vendors.

The cloud makes the ownership of assets and equipment less important and virtualization implies less equipment to manage

- **Data centre outsourcing vendor negatives** – (i) The cloud inherently moves work from 'internal' facilities (whether in-house or outsourced) to external ones. So, if a company like HP or CSC was being paid to maintain a client's e-mail infrastructure and that client moves to a cloud-based e-mail solution, clearly it means less work for the IT services vendor. (ii) Virtualisation implies there is less equipment to manage, in general. (iii) The cloud trend has in general made the ownership of assets / equipment less important and an important part of the data centre outsourcing value proposition has always been the presumed lower costs and capex associated – the cloud diminishes this value proposition.

IBM's integrated 'PureSystems' could offset some of the equipment management revenue loss

- **Data centre outsourcing vendor positives** – (i) Temporary benefit from the virtualisation trend as it means changes to existing infrastructure – this can be significant especially if the client decides on a private cloud rather than a public cloud. (ii) Vendors such as IBM, which introduced integrated systems (e.g. PureSystems), can create a partial offset to the negative trend. (iii) Heightened awareness and need for security solutions.

- **Systems development and integration vendor negatives** – (i) As the acceptability and upward reach of cloud-based solutions continues, the demand for certain categories of application / systems development work should decline. (ii) Large ISVs continue to make their own cloud investments and have tried to actively address the total-cost-of-ownership (TCO) issue, which puts pressure on the overall demand for customized systems work.

**Client IT departments are stretched and need cloud functionality within their private cloud set-ups**

■ **Systems development and integration vendor positives** – (i) It is quite clear that in the near to mid term, the vast preponderance of most Fortune 1000 IT budgets will not be on the cloud, even as cloud applications gain share – this is a built-in base of business for major IT vendors because the multiple sets of applications and their underlying data will need interfaces developed and will need to be integrated and managed together. (ii) There is a market to build custom-SaaS solutions. While this is a seemingly contradictory term, it is actually a source of business for IT firms because client IT departments are stretched and need cloud functionality within their private cloud set-ups. (iii) Many of the leading players are introducing their own industry-specific SaaS solutions, which actually play well with underlying 'Platform BPO' work that many of these vendors have.

■ **Applications maintenance vendor negatives** – (i) As the percentage of cloud applications in an organisation increases, there should be correspondingly fewer systems to maintain. (ii) Even if an organisation does not move to a public cloud but chooses a private cloud instead, there should be a general tendency away from smaller support organisations toward larger ones that can provide more global support.

■ **Applications maintenance vendor positives** – (i) The move towards organisations that can offer global support should be a positive for the global IT companies we tend to cover.

**The risk of considerable revenue cannibalization remains even for the best positioned cloud players**

For an IT Services vendor with the right strategy the net result can be positive, as stated before. For example, **IBM** expects its multi-pronged cloud initiatives to contribute around \$7 billion of revenue by 2015. Note, however, that there is around \$4 billion of revenue cannibalization envisioned in its plan and so the net contribution from the cloud is approximately \$3 billion. Clearly without an appropriate strategy and investments, the new revenues needed to offset the inevitable cannibalization would have been difficult to fathom.

## Outlook for Software: Too Early to Call

**Position of incumbents ORCL, MSFT and IBM will depend on how they are able to adapt to the new market requirements**

In Figure 55, we have listed the major sub-segments of software in our coverage universe. For each we have noted the impact of the aforementioned cloud trends on the sub-segment and then our investment conclusion. Lastly, we have noted companies in this sub-segment that are impacted by these trends and whether we see a positive (+) or negative (-) impact.

**The move to PaaS is a net positive for challengers VMW and RHT**

In many cases, we believe it is too early to call winners and losers in these markets and thus many of the companies impacted are simply listed but not noted as winners or losers. For example, in application infrastructure, the platform as a service opportunity is just emerging. Companies such as Oracle, Microsoft and IBM are incumbents while VMW and RHT are challengers in this market. Given their relatively low shares in application infrastructure (notably middleware), it is likely the move to PaaS will be a net positive for VMW and RHT.

**MSFT is ahead of ORCL and IBM**

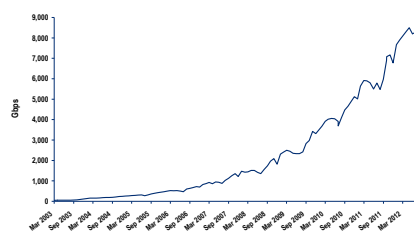
However, for Oracle, Microsoft and IBM, which are all incumbents, their position in the application infrastructure market will depend on how well they adapt to the evolution in the market. At this point, Microsoft is ahead of both, with Windows having made the transition to PaaS with Azure (although adoption has been slow). Oracle is in beta with its PaaS offering and IBM has no offering commercially available. Nevertheless, while Microsoft has an offering, it may still be a net share loser overall. We see similar situations for incumbents in markets such as server operating system.

Figure 55. Outlook for Software – Summary

Software sub-segment	Cloud impact	Conclusion	Companies impacted (+ = winners, - = losers)
Management software	Management becomes part of underlying cloud platform; must support hybrid and multi-cloud	Risk to incumbents, revenue opportunity for platforms	VMW(+), CTXS(+), MSFT(+), BMC(-), CA(-)
Network security	Network security will not be deployed as physical appliance, but as virtual appliance or SDN application. Policy management, not enforcement, becomes differentiator.	Favors those with commodity hardware architecture and robust management	CHKP(+), FTNT, FIRE, PANW, WBSN
End-point security	Desktops become virtual or logical instead of physical	Those that adapt with technology shift will benefit	SYMC(-)
Server operating system	Computing, storage and networking are managed in a new way, as a commodity, pooled resource	Hypervisor becomes the operating system; incumbents must be competitive in this new market	VMW(+), CTXS, RHT, MSFT
Desktop virtualization	Ubiquitous network, SaaS applications and mobile devices cause evolution in desktop delivery model.	Desktop ceases to be a physical element and instead is a virtual or logical collection of applications and other resources. New software layer emerges to provide this.	CTXS(+), MSFT(-), VMW
Enterprise applications	SaaS grows the applications market, opens up new markets with business units and SMB segment	Market expansive in SMB, enterprise SaaS cannibalizes traditional, on-premise applications	CRM(+), NOW(+), JIVE(+), WWW(+), INTU(+), CRCL(-), SAP(-)
Database	New applications (SaaS/ cloud) drive demand for new types of databases	Transactional database market unchanged, data is still growing, long-term will need to be delivered as a service and innovate in areas such as in-memory and scalability	CRCL, MSFT
Application infrastructure (middleware, etc.)	Development tools and run-times will be bundled into PaaS offerings on top of IaaS	Long-term incumbents must embrace PaaS. Very early and no clear leaders yet.	VMW(+), RHT(+), MSFT, CRCL
Desktop applications	SaaS applications likely in most categories	Will be slow to move, incumbents have time	ADSK, ADBE, MSFT(+), QLIK

Source: Citi Research

Figure 56. Aggregated peak Euro-IXP Traffic



Source: Euro IX, Citi Research

### Three advantages from the cloud for collocation providers

We do not expect Telecity to migrate significantly into a more integrated IaaS product

Software Defined Networking (SDN) is getting serious attention despite it still being at an early stage commercially

## Outlook for Colocation Providers

A key element of the cloud story is connectivity and data centres. As such, well-connected carrier-neutral data centre operators such as Equinix, Interxion and Telecity should be well positioned to benefit from growth in cloud propositions. Indeed cloud-related traffic, alongside increased digital content and high velocity trading, is a key driver of increased internet content (aggregated IXP traffic up c.40% YoY in 1<sup>st</sup> 7 months of 2012).

These companies, which enjoy city centre locations (often hosting internet exchanges), have good barriers to entry due to restrictions in planning, power and connectivity. That said, we note some telecom providers are becoming increasingly clever in providing connectivity (e.g. Geo, which lays data cables in London sewers).

The rich returns have also seen new entrants look to enter the market by building new data centres (alongside the 15-20% capacity increase being rolled out by these providers in 2012). That said, the strong demand noted above, as well as their high degree of connectivity, should help them differentiate their services from new entrants to the market and has to date kept pricing robust.

We view these companies as being able to benefit from the cloud in three ways:

- **Providing capacity to large services businesses** – Companies such as IBM Global Service and HP Services are large clients of the colocation companies and are looking to offer cloud solutions from their own as well as third-party data centres (e.g. Telecity).
- **Providing an environment for bespoke cloud companies** – As well as the larger players, the likes of Telecity have seen good demand from cloud-focused start-ups such as Linode, which are looking to offer cloud solutions from their data centres.
- **Bespoke connections into large-scale IaaS providers** – Telecity in Europe and Equinix in the US and Asia are looking to offer customers in their respective data centres direct connection into Amazon Web Services.

We believe it is unlikely that the companies will look to migrate to a more integrated approach taken by Savvis or Terremark which are providing customers with an integrated IaaS solution. Such an approach would not only bring the likes of Telecity into direct competition with one of their larger customers but also introduce them to a competitive, lower-margin business with lower operational gearing.

## Outlook for Network Hardware Providers

Following VMWare's \$1.26bn acquisition of Nicira, Software Defined Networking (SDN) is getting serious attention despite it still being at an early stage commercially. It is potentially disruptive to the hardware players, which could find their core products denied their intelligence functions. The telcos will recognize the conceptual similarities with the voice intelligent network (for number translation), with positive connotations for richer services, but could also be concerned at handing over intelligent control of the network to a client application, seeing that as a possible new route to commoditization.

**SDN aims to separate routing intelligence from the packet forwarding engine in routers, potentially reducing cost and increasing flexibility**

**Software Defined Networking is widely viewed as the most important innovation in networking of the last few decades.**

At the same time, it is also viewed as a potentially disruptive force, with analogies made to the impact from the rise of the PC to IBM mainframes and workstations or the impact of virtualisation on the server market. The most aggressive view of SDN is that it will commoditize the networking hardware market and carve out industry margins. A more benign view of SDN holds that, while SDN is a revolutionary concept, the technology will likely be adopted in an evolutionary manner.

SDN aims to "crack open" (the term used by Nicira co-founder Martin Casado at the initial Open Networking Summit) these closed hardware elements and separate the control plane (i.e. the intelligence) from the data plane (i.e. the packet forwarding engine). This is accomplished by the use of a network operating system that has knowledge and intelligence of the entire network and can offer a logical map of available resources to control applications and services that are implemented above it. In this way the network becomes quickly reconfigurable by the application without the application needing to have any knowledge of the individual network elements.

Although the opposing camps may not agree on the ultimate implications of SDN adoption, they do agree on its ultimate aim of network programmability, or the ability to change network configuration or resources through the use of APIs and a network operating system. In the traditional network, individual network elements are vertically integrated hardware components containing a single OEMs ASIC for switching or network processing, an operating system, and often non-standard APIs. This 'closed' environment leads to vendor lock-in, rigid networks that aren't readily adaptable to new demands or changing requirements, and overall lower utilisation of networking assets. Additionally, this closed environment is viewed by some as the key driver of the rich margin profile of networking hardware in general, and Cisco and Juniper in particular.

**Optimising data centre assets one anticipated role for SDNs**

The promise of SDN – programmability – implies different goals to different users and markets: universities and researchers look to SDN for its ability to slice network segments and allow for innovation; data centres and service providers will increasingly require programmatic network access through APIs to respond quickly and economically to changing demand; and enterprises view SDN as a critical element in their ability to optimize data centre assets, improve network performance, reduce data centre operating expenses, and enable new usage models and application delivery methods.

**OpenFlow as part of the SDN solution**

OpenFlow has become synonymous with SDN, though it is more correctly viewed as a part of the SDN solution. OpenFlow is the protocol that allows communication between the control plane and forwarding plane of an SDN, enabling direct communication and access to network elements (switches and routers) and therefore driving programmability of the network. OpenFlow is seen as the key change agent of the current networking paradigm, particularly for those who view SDN as an eventual commoditizer of networking.

**Commoditized view of SDN: intelligence or control plane disaggregated from the hardware and resident in the network operating system instead**

### Scoping the SDN threat to Cisco's margins

In the commoditized view of SDN closed, vertically integrated network elements (e.g. Cisco switches and routers) would be replaced by commodity hardware with merchant switching silicon, with the intelligence or control plane disaggregated from the hardware and resident in the network operating system. In this view, there would be a carving out of the typical 65% networking hardware gross margin, with the direct impact felt by Cisco, which stands as the dominant vendor by a wide margin.

Before addressing the contra view of commoditization, we think the commoditization view itself deserves further investigation. Cisco, Juniper and other networking equipment companies historically used in-house designed ASICs in their products. Over the last few years, both established and start-up semiconductor vendors have brought merchant solutions to market and gained design wins at leading networking OEMs.

**The very companies that are expected to help commoditise the networking hardware industry are themselves earning fairly rich gross margins**

These semiconductor companies are often fabless, relying on foundry partners for manufacturing and therefore able to focus entirely on design, performance and cost. In this way they are exactly like Cisco and Juniper, which design many of their ASICs, but outsource the manufacture. The networking semiconductor companies also tend to enjoy fairly rich margins in the 50% to 65% range. In thinking about the commoditization view, we believe it is worth considering that the very companies that are expected to help commoditise the networking hardware industry are themselves earning fairly rich gross margins.

Additionally, one could argue that established network vendors are compensated in gross margins at similar levels for their own ASIC design efforts, as well as their operating systems and systems level design and knowledge, resulting in the typical 65% gross margin seen in the networking hardware market. In this vein, it is unclear to us if the commoditization view of SDN would actually be realised given the margin structure of the same companies that are expected to lead the charge against the established incumbents. Clearly there is a risk that Cisco, Juniper or any OEM could see margin compression if it falls behind the performance curve, but in our view that is a very different argument from all-out industry commoditization.

### Cisco's recently more aggressive and visible posture on SDN

The network hardware market is dominated by Cisco and, given Cisco's long-standing dominance and enviable margin profile, the company is often viewed as the prime target of SDN, particularly by those who view the industry as locked in stasis and over-earning in terms of margins. Some investors and industry participants have perceived the company as lacking a cohesive vision around SDN, or alternatively understanding the risks that an SDN-led paradigm shift presents but being unable to capitalize on the trend given the risks to its established business (i.e. being unable or unwilling to commoditize itself). This latter view was only reinforced by Cisco's relative silence on SDN through much of the CY11 and CY12 timeframe.

**Cisco's (officially) unacknowledged spin-in (Insieme) is widely viewed as an SDN skunk works project**

However, the company has more recently taken an increasingly aggressive and visible posture towards SDN, beginning first with its discussion at the annual Cisco Live! event for channel partners, followed by broad, but forceful blog comments by CTO Padmasree Warrior, and lastly in comments by CEO John Chambers on the company's most recent earnings call. Additionally, Cisco has an (officially) unacknowledged spin-in (Insieme, which is Italian for "ensemble") that is widely viewed by industry press as an SDN skunk works project.



**Unsurprisingly, Cisco strongly believes that SDN will not lead to commoditization**

Unsurprisingly, Cisco strongly believes that SDN will not lead to commoditization, but instead believes that SDN will actually drive increased demand for higher-end equipment. This view is best captured by CTO Warrior's early August blog post:

*"...Now the question on many people's minds is whether the current transition in the market – a transition defined by terms such as Software Defined Networking and network virtualisation -- represents a threat or an opportunity for Cisco. As you might expect, Cisco has a strong point of view on this.*

*First, SDN, network virtualisation and overlay networks (choose your favorite descriptor) are not going to commoditize the underlying networking infrastructure. These architectures actually place more demands on the core infrastructure to enable network virtualisation securely, with high performance, at scale..."*

**Cisco ONE (Open Network Environment) – its SDN strategy**

Cisco's Software Defined Networking strategy is encapsulated in its Cisco ONE (Open Network Environment), which was formally unveiled in June 2012. Cisco views its ONE approach as more comprehensive than competitor approaches. ONE seems designed to capitalize on Cisco's large incumbency and on the intelligence and value embedded in the network itself. Cisco believes ONE is complementary to emerging SDN approaches, while being more scalable and offering protection to existing investment in networks.

Key elements of ONE include:

- onePK, a software development kit that offers APIs across Cisco operating systems including IOS, IOS-XR, and NX-OS
- Proof of concept controllers and SDN/Open Flow agents that can be used by researchers
- Overlay network solutions for scalable cloud deployments including multi-tenancy

In our view, onePK seems to address the primary concern of SDN advocates, namely the need for network resource access from the application layer, opening up Cisco's proprietary operating systems to third-party applications or developed management tools. Overlay networks are virtual networks that are abstracted from existing physical networks, driving efficiency in both allocation and utilisation of network resources.

**Cisco ONE is not without risks: open source is moving rapidly and VMware's acquisition of Nicira may mean full commercialization of SDN is approaching**

While an encouraging step forward, Cisco ONE is not without risks and hurdles: the open source movement is moving rapidly and VMware's acquisition of Nicira may mean full commercialization of SDN is approaching quickly; additionally, ONE will require significant investment from Cisco in terms of R&D, ecosystem development, and channel/partner support and education. However, we believe ONE is an important strategic initiative for Cisco and expect the company will have time to adapt to the changing landscape.

In summary, we acknowledge the risks presented to established network vendors and industry margins by SDN. However, we think it is extremely premature to write off incumbents' ability to adopt and thrive in an SDN-dominated world. Additionally, as we stated in our recent initiation ([\*All Holds Barred: Buy the Data Networkers - A Mix of Cyclical Opportunities & Pockets of Secular Growth\*](#)), while SDN may be an revolutionary concept, we think its actual adoption and impact will likely be an evolutionary process.

## Glossary

- **Applications** – Computer software designed to help the user achieve a specific task.
- **Availability** – the level of operational performance which will be met during a contractual measurement period by a service. 100% implies an always-available service.
- **AWS** – Amazon Web Services: the sub-division of Amazon which markets and sells cloud computing services.
- **BPaaS** – Business Process as a Service: The provision of business tools as a cloud service. This includes cloud advertising, cloud payments, customer management, e-commerce enablement, finance and accounting, human resources and supply management.
- **Carrier cloud** – A class of cloud which integrates wide area networks (WAN) with other attributes of communications service providers' carrier-grade networks to enable the deployment of applications in the cloud.
- **CIO** – Chief Information Officer: the title typically given to a head of IT at an organisation.
- **Cloud aggregator** – Cloud aggregators offer new services or solutions by combining pre-existing services or parts of services to form new services and offer them to customers.
- **Cloud consultant** – Cloud consultants provide support for the selection and implementation of relevant services.
- **Cloud integrator** – A cloud integrator is a systems integrator that specializes in cloud computing. They provide customers with a range of options in terms of where to locate their IT requirements across different cloud models.
- **Cloud operating system** – A computer operating system that is designed to run in a particular provider's data centre and to be delivered to the user over the Internet or another network.
- **Cloud provider** – A company that provides cloud-based platform, infrastructure, application, or storage services to other organisations.
- **Cloud service vendor (CSV)** – the seller of any form of cloud service, including IaaS, PaaS or SaaS.
- **Community cloud** – a collaborative effort in which infrastructure is shared between several organisations from a specific community with single concerns (security, compliance, jurisdiction etc.).
- **Colocation** – The provision of equipment space and bandwidth which is available for rental to retail customers. Colocation facilities provide space, power, cooling and physical security for the server, storage and networking equipment of other firms.
- **CRM** – Customer relationship management is a model for managing a company's interactions with customers, clients and sales prospects. It involves using technology to organise, automate and synchronize business processes.



- **Data centre** – a facility used to house computer systems and associated components, such as telecommunications and storage systems. It generally includes redundant or backup power supplies, redundant data communications connections, environmental controls (e.g. air conditioning, fire suppression) and security devices.
- **E-commerce** – The buying and selling of products or services using the internet as a medium.
- **E-Health** – a healthcare practice referring to the use of the internet to monitor and provision healthcare.
- **Enterprise-grade IaaS** – Infrastructure as a Service provided on the basis that customers sign contracts and arrange service agreements with cloud providers. Typically associated with greater levels of security and guaranteed by SLAs.
- **Freemium** – A business model that provides products/services free of charge while charging a premium for additional features.
- **Hypervisor** – The most common form of hardware virtualisation which allows multiple operating systems to run concurrently on a single server.
- **HaaS** – Hardware as a service; see IaaS.
- **IaaS** – Infrastructure as a Service: raw hardware resources such as storage, computing, security or network capacity delivered on demand and priced consumptively. The consumer of this resource does not need to understand the technical details of the hardware elements being delivered as part of the service.
- **IPaaS** – Integration Platform as a Service.
- **ISP** – Internet Service Provider: an organization that provides companies or private individuals with access to the internet.
- **ISV** – Independent Software Vendor: A company specializing in making or selling software. ISVs can be dedicated to a particular activity or company, or can sell generic products to mass markets.
- **IXP** – Internet Exchange Point: a physical infrastructure point through which internet service providers exchange internet traffic between their networks.
- **M2M** – Machine to Machine: technologies that allow both wireless and wired systems to communicate with other devices. A device captures an event which is relayed through a network to an application that translates it into meaningful information.
- **Managed Services** – the practice of outsourcing day-to-day IT management responsibilities. This can include being to a cloud provider or a basic hosting/colocation provider.
- **Middleware** – Middleware is computer software that provides services to software applications beyond those available from the operating system. It therefore sits in between the two layers.
- **Multi-tenancy** – The principle in software architecture where a single instance of a piece of software runs on a server, but multiple clients can access and use it simultaneously. The partition between the different versions of the application which the clients see is virtual rather than actual.

- **Non-linear** – Content that is received on demand as opposed to linear, broadcast content.
- **Outage** – Refers to periods when a system is unavailable. Can also be described as **downtime**.
- **PaaS** – Platform as a Service: a software platform including infrastructure elements such as database, middleware, messaging, security, development tools and a presentation layer that are used by corporate customers or ISVs to develop custom applications.
- **Private cloud** – IT resources that are delivered to the internal customers of a single corporate entity.
- **Public cloud** – when cloud computing services are made available in a pay-as-you-go manner to the general public.
- **PUE** – Power Usage Effectiveness: a measure of the efficiency of a datacentre, specifically the ratio of total facility power to the power used by IT equipment.
- **Runtime** – Runtime is the time during which a program is running.
- **SaaS** – Software as a Service: the provision of software applications to consumers over the internet. The broadest definition encompasses any on-demand software, including those that run software locally but control use via remote software licensing.
- **Software Defined Networking (SDN)** – a networking architecture which separates the control plane from the data plane in network switches and routers. Under SDN, the control plane is implemented in software in servers separate from the network equipment and the data plane is implemented in commodity network equipment.
- **Thin client** – A computer or computer program that depends on another computer (its server) to fulfil its computational roles. Compare with a 'fat client' which is self-standing and able to take on these roles by itself. Thin clients can occur as components of a broader infrastructure, where thin clients share a single server.
- **Unified communications (UC)** – The integration of real-time communication services (such as instant messaging, video conferencing and data sharing) with non-real-time communications (such as email, voicemail and SMS) in a single suite of products with a unified user interface.
- **Utility computing** – The provision of IT services in the style of a utility such as water or electricity. This includes consumptive pricing, as well as elasticity of usage in terms of both variability and flexibility.
- **Virtualisation** – the creation of a virtual version of a service, such as a hardware platform, operating system, storage device or network resources.
- **Web-grade IaaS** – Infrastructure as a Service provided as a low-end, generic storage and compute service. It is typically charged on a monthly basis, and different levels of computing power can be specified dependent on requirements.

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## Companies Section

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# US & European Telecom operators

## AT&T

### Introduction to cloud offering

AT&T offers access to cloud computing and cloud storage over its network on an on-demand basis. AT&T differentiates itself with its pay-as-you-go offering that allows customers to turn the service on or off as necessary, which should help customers drive cost efficiencies. Customers have the ability to increase or decrease their spending on cloud services as needed very quickly, and AT&T offers 99.999% availability and enterprise-class security.

### What cloud services does it offer?

AT&T has several cloud offerings, including: 1) AT&T Synaptic Compute as a Service with VMware vCloud Datacenter Service is a pay-as-you-go cloud computing solution that lets customers access virtualized servers in the cloud to quickly turn compute capacity up when needed and down when requirements change; 2) AT&T Synaptic Storage as a Service provides cloud-based virtual data storage with on-demand scalability, pay-as-you go pricing and the enterprise-class security of the AT&T network; 3) AT&T's Software-as-a-Service (SaaS) helps customers deliver applications over the Internet, and TopLineISV includes hosting and hardware, as well as a consultative team of experts focused on customer's software; 4) AT&T Platform as a Service is a development environment to build and launch custom applications quickly, run them reliably and manage them easily across the full application lifecycle; and 5) AT&T Virtual Desktop Service moves the desktop environment to the AT&T cloud that runs on a remote centralized platform within a state-of-the art AT&T Internet Data Center.

### What is the potential to differentiate?

AT&T differentiates its cloud offering by offering network resident clouds and highlighting AT&T's global network reach, localized clouds that improve latency and access, interoperability amongst AT&T's public cloud and customers' private clouds, as well as its 99.999% availability and focus on security of customers' data.

### What share of revenue does cloud computing comprise?

Cloud represents a very small but growing portion of AT&T's total revenue, as a component of Strategic Services which makes up around 5% of total revenue.

### What is its future potential in the cloud space?

We believe AT&T is very well positioned to leverage its infrastructure scale to enable enterprise customers to consolidate their cloud services contracts and save money on bundled cloud services. We estimate AT&T's strategic services revenue, which includes cloud computing revenue, represents around 8% of AT&T's 2012E total revenue and will continue to grow robustly at a CAGR of 10% between 2012 and 2015 and represent ~6% of 2015E consolidated revenue or ~22% of AT&T Business Solutions revenue. We believe the company could consider acquisitions to bolster either its scale in the arena, or its distribution capabilities.

### Winner or loser?

Net-winner over time, as we believe that AT&T is well positioned to benefit from the cloud from a combination of selling bandwidth, colocation, and managed services.

## BT

### Winner or loser?

BT has an extensive range of cloud products supported by its Global Services division with SME offerings included. The company sees attractive profit opportunities in cloud services and specialist applications including supply chain management, and collaboration. It is less enthused by the margin potential of basic commodity IaaS but recognizes the need to be involved in the category. We see some risk of it spreading itself too thin with its initiatives but the scale of BT's corporate operations compared with the size of the group and its market readiness make it an interesting stock to watch as cloud continues to develop in Europe.

### Overview of BT's cloud offering

BT's portfolio of cloud services includes enterprise-grade infrastructure and the provision of enterprise software. BT has a cloud strategy based on three key concepts. Firstly, it offers an IaaS – BT Compute, and when combined with BT Connect makes a cloud delivery system ecosystem (this includes divisions such as BT iNet); secondly, its core cloud services portfolio provides business services including unified communications, **CRM**, and **security applications**; and thirdly, it **is targeting particular industry verticals**.

### What specific cloud services does BT offer?

BT's IaaS business model is firmly in the enterprise-grade camp. Management sees the global hubs model that underpins the Amazon or Google web-grade offering as being scale-dependent, and recognises BT's own limitations in using this to match enterprise customer needs at acceptable margins. Instead, BT is looking to take advantage of its existing assets: 1) relationships with business customers, 2) network intelligence and 3) specialist applications such as low latency services provided to financial services customers via BT Radianz.

The BT Compute offer is an IaaS model; BT argues the hybrid cloud is the clear winning solution for enterprise cloud. BT can provision network, security, storage and compute both at a private and public level along with integration of IT services. A specific issue the BT Compute approach addresses is enabling the right balance for an IT department using different delivery options.

**BT's competitive advantage in the cloud: customer relationships and network intelligence**

**BT's cloud services portfolio includes: BT Contact, BT One and BT Assure**

BT's core cloud services portfolio includes three divisions. Importantly, BT is not selling pure-play SaaS, but instead is acting as the enabler and adding value around it, selling the networking, service structure and data centre capacity that supports SaaS and partnering with specific SaaS providers. BT argues that its cloud operations are able to 'grow by osmosis', as clients commission increased capacity based on the company's strong service track record.

**BT argues that its cloud operations are able to 'grow by osmosis'**

Firstly, **BT Contact** provides a fully hosted cloud customer contact centre. For £80 per month and per sales agent, clients can hire the platform, allowing agents to work flexibly. For example, GSK Nutritional Healthcare adopted a Next-Generation Call Centre (NGCC) service and cites flexibility as the key advantage in that it is able to direct inbound calls to a number of different locations. According to information provided by the company, BT Contact can cope with a 300% increase in network load at peak times and flex upwards to accommodate it. Management also states that a 30% reduction in call centre costs can be achieved compared with a traditional arrangement.

**BT's third area of focus is targeting specific industry verticals with niche products, commanding a margin premium**

Secondly, **BT One** offers unified communications (UC) as a service. This provides a single point-of-access for all communications including voice, web and video conferencing, instant messaging, voicemail, email and SMS. It is based on Cisco's Unified Communications and Collaboration technology as well as drawing from other vendors. What differentiates it from other UC offerings is the cloud component - it is provided on a utility pricing basis - and the packaging with other network elements of the solution.

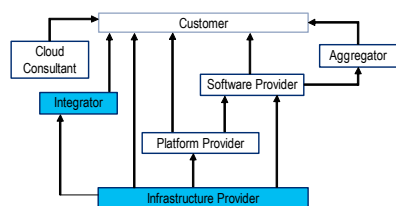
Thirdly, **BT Assure** specializes in security services. It provides scalable protection including managed firewalls, threat monitoring, web security and message scanning.

BT targets specific industry verticals on a case-by-case basis. One example includes BT's partnership with some of the world's largest pharmaceutical companies, whose drug development speed is critical for top-line growth due to the timing of patent expirations. By designing a **community cloud**, BT's unified communications offering is customized to allow pharmaceutical companies to work together on non-competitive research, thereby reducing time to market.

#### **What is the margin potential of BT's cloud computing portfolio?**

BT remains cautious on the margin potential of basic commodity IaaS. Management sees the greatest margin potential in the service features that can be layered on top of the infrastructure. SaaS provision and customized applications targeting specific industries in particular have higher margin potential.

Figure 57. Colt in the Cloud Value Network



Source: Citi Research

## Colt

### Winner or loser?

Colt's repositioning, targeting a close to pure-play role in the cloud, is showing increasing success. We see the name as likely to deliver improving growth and margins and representing an interesting take-out play with a well developed and differentiated position in a rare growth category in the sector.

### Introduction to Colt's cloud offering

Over the last two years, Colt has undergone a process of considerable restructuring, rebranding itself as an 'information delivery platform' and resisting being pigeonholed into any of the traditional business models that characterise its industry. The company is continuing to move away from its former voice-centric business towards increased focus on managed services and the cloud in particular. Non-voice now represents 64% of revenue, up from 50% in 2007. This transformation is reflected in the organisational structure, going from a country model to a more centralised model with rationalised resources.

**Cloud-centric networking and data centre assets** form the basic infrastructure that underpins Colt's cloud offering. Colt operates 19 data centres across Europe, with an additional one between Amsterdam and Brussels under construction. 28,000 square metres of hosting space is currently available, with capabilities for expansion into another 20,000 square metres. Each data centre links into Colt's Ethernet and IP networks and includes a 24x7 dedicated security operations centre. These data centre assets were acquired for €114 mn of net investment over the last five years. The cloud centric network allows customers to move workloads and data between locations such that, as customers increase or decrease their compute requirements, the network flexes to accommodate this. Colt has developed and deployed a cloud service platform which is enhanced by partnerships with cloud industry leaders including **VMware**, **Cisco** and **EMC**.

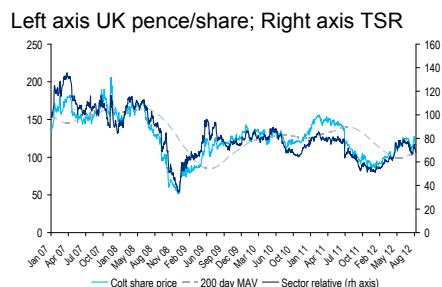
### What specific cloud services does Colt offer?

Colt markets its cloud services under the **Colt Enterprise Service (CES)** business division. At the basic level, the division is able to offer commissioning of virtualised hardware, equivalent to an offering like Amazon Web Services. This is low-margin and relatively undifferentiated.

However, Colt also provides dedicated and private hosting in addition to the public cloud and will soon be able to provision all these options from a single point-of-access. In doing so, it is outsourcing not just IT infrastructure, but effectively the company's entire IT department including all hardware, networking and service components. This allows it to target enterprise customers in particular. Importantly, what distinguishes Colt's offering is the ability to provide automation and orchestration layers:

- **Automation** refers to the ability to scale up and down automatically, without the customer having to do any manual commissioning. Colt is currently able to do this with virtualised hardware and will soon be doing it with network as well.

Figure 58. Colt Stock Has Recovered Robustly Since Early 2012.

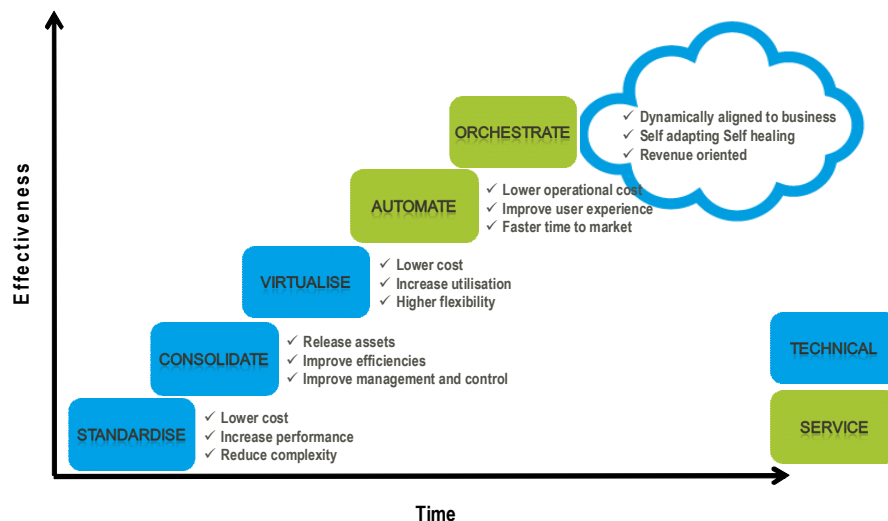


Source: Datastream

- **Orchestration** allows customers to see and manage their entire infrastructure assets simultaneously. This allows clients to allocate different applications and storage between off-site public clouds, off-site private clouds and on-site servers

depending on how mission-critical these are. In this sense Colt is able to marginalise the cloud integrator role that is being adopted by some IT Service companies.

Figure 59. Colt's Cloud Services Architecture



Source: Company Reports

These two elements are usually fulfilled by internal IT departments, but increasingly they will be taken on by the IT managed service provider, and Colt claims to be leading the way in this area. The company argues that, even with these benefits, it is able to provide IaaS at a 25% discount to the price of equivalent do-it-yourself infrastructure.

Colt's preference is not just to sell racks, because it can generate increased margins by selling a managed service in the same data centre space.

#### What share of group revenues is derived from cloud?

Colt Enterprise Services comprised 39% of group revenues in 2011. Within CES, the revenue mix is split 19% IT Services, 19% Voice and Unified Communications and 62% Network Services. The core of this business is classified as IT Services, though cloud operations span all three components. Colt has grown its managed services revenue at a CAGR of 11.6% between 2007 and 2011.



**T-Systems aims to deliver scalable infrastructure, platforms and applications over its network**

## Deutsche Telekom

### What cloud services does Deutsche Telekom offer?

Deutsche Telekom's cloud strategy centres around its T-Systems Dynamic Net-Centric Sourcing business, which aims to deliver a fully end-to-end provision of utility computing for enterprises. This means delivering scalable infrastructure, platforms and applications over its network.

T-Systems has seven years of expertise in Cloud Computing, having first offered SAP business applications to customers in 2005. It now splits its offerings between application and infrastructure services, all integrated within its IT services portfolio.

### Application Services

- The company's core cloud business is the virtualisation of SAP systems. These applications are standardized and offer a high level of reliability, security and availability.
- DT has established partnerships with Microsoft, Oracle, EMC<sup>2</sup> and VMware.
- It targets a number of industry verticals, including eHealth, cloud media distribution, energy metering services and cloud vehicle diagnostics.

### Infrastructure Services

- T-Systems operates 90 data centre buildings worldwide, at 58 locations with a total floor space of 123,000 square feet.
- In 2010, the business launched an IaaS service for corporate customers, which allowed businesses to commission infrastructure using a T-Systems online portal.
- It specialises in hosted private cloud and in bringing cloud into outsourcing deals.

To support these offerings, T-Systems provides cloud consulting, integration and migration services and cloud-based security. The purpose of these is to assess what can be migrated into the cloud and how, so that a strategy can be developed and targeted services provisioned.

### What is Deutsche Telekom's potential to differentiate?

The key to Deutsche Telekom's strategy appears to be the completeness of its offering and the extent to which it is integrated into a single portfolio. Its range of services, experience and strong customer base points to a defensible position within cloud in Europe. The offering appears to be a successful implementation of all stages of our telecoms cloud development path, including both well developed infrastructure and moving forwards into complex SaaS enablement.

### What is its future potential in the cloud space?

Management believes that cloud computing will become the greatest driver of growth for IT services in Europe and its focus for 2012 and 2013 has been to migrate increasingly complex applications into the cloud. It already delivers SAP and email by the cloud, and now is working towards moving legacy and non-standard applications such as mobile HR systems available by this method as well.

## France Telecom

### What cloud services does FT offer?

France Telecom offers cloud computing solutions for both professional customers (called Cloud Pro for SOHO) and consumers. At an international level, Orange Business Services has 3 datacentres in Frankfurt, Singapore and Atlanta on top of several datacentres in France, Poland, Romania. FT is building a new “mega-datacenter” in Val-de-Reuil in France of 10 megawatts with a 1.3x power efficiency ratio.

FT offers a suite of solutions including web hosting, disaster recovery as well as managed solutions. FT can also manage external applications like SAP for its customers.

### What is FT's potential to differentiate?

**FT focuses on tailore-made solutions, higher-end, combining private and hybrid cloud services solutions**

FT focuses on tailor-made solutions combining private and hybrid cloud services solutions. FT can offer different levels of SLAs: more standardised on the networking side and on a case-by-case basis on the customer services side (answering time can vary depending on the contract); reliability can be charged at a premium. FT does not compete on price where pure cloud players such as Amazon, Google or Rackspace have price leadership. FT also provides disaster recovery solutions owing to its extensive network coverage. A certain level of performance can be guaranteed.

It is interesting to note that large companies tend to request that their data be stored locally, which FT can provide in most cases owing to its global presence. Most large corporates tend to have a preference for tailor-made solutions rather than pure cloud services as provided by Amazon and Google, with a few notable exceptions of large corporates that have decided to use the basic cloud services for specific applications (email) albeit not on a generalized basis. At the high end of the market, FT's main competition comes from HP, IBM, Atos, T-Systems, Verizon-Terremark and NTT.

### What share of revenue does cloud computing comprise?

**FT is targeting €500m of revenues from the cloud by 2015, up from €50m in 2010**

As part of its Conquests 2015 plan, FT is targeting €500m of revenues from the cloud by 2015, up from €50m in 2010. Strong growth in cloud computing, which is growing faster than the software and IT services market, should allow easier penetration of IT Services for newcomers, especially network operators that can articulate network and IT cloud services such as FT.

### What is its future potential in the cloud space?

**Owing to its economies of scale, FT can provide cost savings of potentially 15-20% of total IT costs to businesses moving to the cloud**

FT emphasizes its network capability and connectivity to provide end-to-end delivery solutions to CIOs. Owing to its economies of scale, FT can provide cost savings of potentially 15-20% of total IT costs to businesses moving to the cloud. The availability of a pay-per-use solution is also one of the key attractions of the cloud.

## KPN

### Introduction to KPN's cloud offering

KPN's extensive expertise in both network connectivity and system integration is a competitive advantage in providing cloud services

KPN is focusing on the cloud aggregator business model. The rationale behind this is recognizing that KPN sees itself as one of the few telecoms who have extensive expertise in both **network connectivity and system integration**. This expertise allows KPN to manage a large SaaS enablement platform with strong partnerships with cloud vendors in IaaS, PaaS and SaaS services. This cloud aggregator offering is still very much in its early stages and will be commercially launched in late September 2012, although it has already been implemented by a number of pilot customers. It complements a number of existing cloud services which KPN offers, including email exchange, unified communications, and workspace.

### What specific cloud services does KPN offer?

Cloud Services Aggregation enables KPN to bundle KPN and third party services

Companies look for prebuilt "service" business solutions instead of fragmented IT services. KPN responded with a new cloud go-to-market and partner ecosystem to create the right customer experience bundle. KPN has deeply invested over the past years in developing cloud-based services that evolve from current areas of focus on the workspace to delivering services that bridge the traditional IT services and the cloud services environment. **Cloud Services Aggregation** provides a means for cross and up sell and new and compelling offerings within both the corporate and the midmarket segments. Services Aggregation enables KPN to logically bundle top of the bill KPN and third party services. KPN has partnered with a number of SaaS enablement businesses which automate the billing, provisioning, and identity management of SaaS services, including **LuxCloud**, **NordicEdge** and **Jamcracker**.

KPN provides the ability for the IT department to set up a single-sign-on password that gives users access to a range of SaaS products. In general, cloud software vendors do not take much responsibility for provisioning, authentication and enterprise-friendly access. KPN looks to resolve this with a complete set of services including on-boarding, maintenance, authentication and reporting. In order to reach an economic scale, KPN is standardizing its products to an extent by developing a modular infrastructure to change components as technology changes. This, management argues, will generate a flexible environment for customers, allowing them to integrate their existing IT infrastructure with KPN's cloud aggregation platform. According to a study conducted by Forrester research, KPN represents one of the most advanced examples of cloud brokerage.

KPN's argues hybrid cloud will be a key part of future corporate demand for cloud services

KPN also owns significant **datacentre assets** in the Netherlands and has access across central Europe via their partner eco system. KPN had 25k m<sup>2</sup> of housing services capacity and c. 13k servers at the end of 2Q12. These form the foundation of its private cloud, hosting, and colocation businesses. Management sees the hybrid cloud as the future, and is managing a flexible environment for customers to move into the cloud including the provision of enterprise IaaS and SaaS, supported by its consultancy business.

### What share of revenue does cloud computing comprise?

KPN's movement to cloud brokerage aims at offsetting the cannibalization of corporate market revenues towards cloud

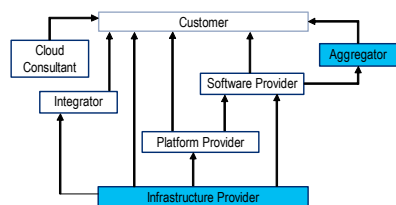
KPN expects some cannibalisation of its existing corporate market revenue streams by the movement towards the cloud. Its movement into cloud brokerage is intended to offset this and accommodate a smooth transition, so we should not expect large incremental revenues shift to cloud businesses, at least in the short term.

As for the total share of revenue, KPN's cloud aggregator business is confidential so no information is yet available on this.

## Portugal Telecom

### Winner or Loser?

Figure 60. PT in the Cloud Value Network



Source: Citi Research

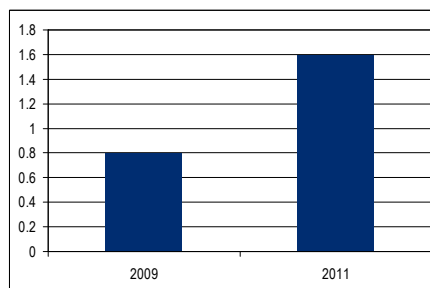
We view PT as a potential winner in the European cloud space, and a good play on cloud services. Being one of the most advanced European telecom operators in rolling out FttH and 4G, we view PT's network quality as a strong differentiator in cloud. By being able to offer converged connectivity solutions and bundling this with high value added cloud services in a cost effective way, PT is already starting to build domestic market share for enterprise cloud services. Management seems confident about the market reaction to PT's cloud products and there is strong demand for SaaS in Portugal from public administrations, the financial industry and SMEs. We view a potential recovery in the macro-economic environment as an incremental positive for PT as it will accelerate the take-up of consumer cloud applications and increase PT's share of the customer wallet.

### Overview of Portugal Telecom's cloud offering

Portugal Telecom has invested heavily in fibre and 4G, with the intention of providing a very high speed network which, in addition to enhancing the customer experience, will also remove the risk of an access bottleneck to its cloud services. PT intends to act as cloud aggregator and is selling a portfolio of cloud services to corporations through **SmartCloudPT**, hosting applications from partnerships with SAP, Microsoft and other smaller vendors. The company is targeting potential future partnerships with Oracle, Fujitsu and HP.

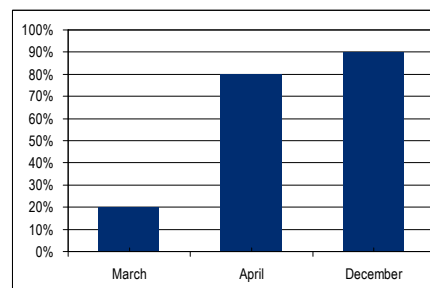
PT is positioned as a cloud aggregator

Figure 61. Fibre Homes Passed (Millions)



Source: Portugal Telecom, Citi Research

Figure 62. Pop. Penetration of 4G Network



Source: Portugal Telecom, Citi Research

### What specific cloud services does PT offer?

PT now operates five data centres spread over Portugal and currently controls 4,000 square metres of data centre space. It is in the process of building a four-block facility in **Covilha** in central Portugal, which will be one of the largest data centres in Europe with approximately 45,000 square meters of server space. This data centre enjoys advantages in location and altitude by ensuring both equidistant positioning between the Lisbon and Porto networks and energy efficiency: 1.2x power efficiency ratio due to its relatively cool location on the back of high altitude. The company has committed to the first of the four blocks, of which significant usage will be dedicated to PT's own cloud. In this regard, PT hopes to move >50% of its IT infrastructure to the cloud by the end of 2012, and argues this has the potential to lower its own IT expenditure by 30-50%. PT anticipates the own migration to cloud to be a useful case study for potential cloud customers in the corporate world.

PT's client base is growing, and the company is targeting both large corporations and SMEs. For its larger customers, PT is able to bundle security offerings and is now moving to serve other clients including hospitals and a large digital company. The number of registered corporate customers rose 89% to 1,100 between 1H11 and 1H12, with cloud being a strong driver behind the incremental market share.

**Figure 63. PT's Planned Data Centre in Covilha**



Source: Portugal Telecom

### **What is PT's long-term potential in the cloud space?**

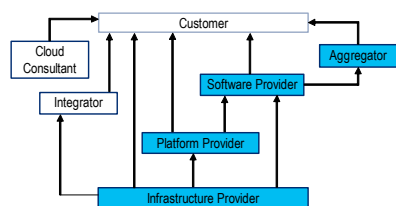
PT management emphasizes the ambition to leverage connectivity assets by delivering a 'smart network' which can directly relate the service provided to the application requirements of the end-user. The location of the data centres complements this, by enabling the delivery of a high-quality level of service to anywhere in the country. Management argues that having a single large data centre is preferable to having many smaller ones, due both to economies of scale and to the specific case of Portugal being a small country where increased latency effects are less significant. Although management remains confident in the reliability of the in-house data-centre based cloud service, we would highlight the danger of outages that may result from such concentration.

In Consumer, PT expects to migrate the set-top box technology and intelligence to the cloud. In addition to enabling ARPU-enhancing 'entertainment' cloud-offers, this is an interesting cost reduction opportunity for the company as it reduces the level of maintenance capex required and SACs given better churn trends on a more sticky customer base.

### **What share of group revenues is derived from cloud?**

In the short run, PT expects its cloud revenues to contribute towards stabilizing total revenues rather than making them grow in absolute terms by offsetting some of the pressure on their traditional revenues streams caused by macro headwinds. Once these conditions subside, PT expects cloud to form an interesting additional revenue stream. In 2011 and 1H12, PT's total cloud revenues were >€5.5mn from c.100 new customer deals.

Figure 64. Telefónica in the Cloud Value Network



Source: Citi Research

## Telefónica

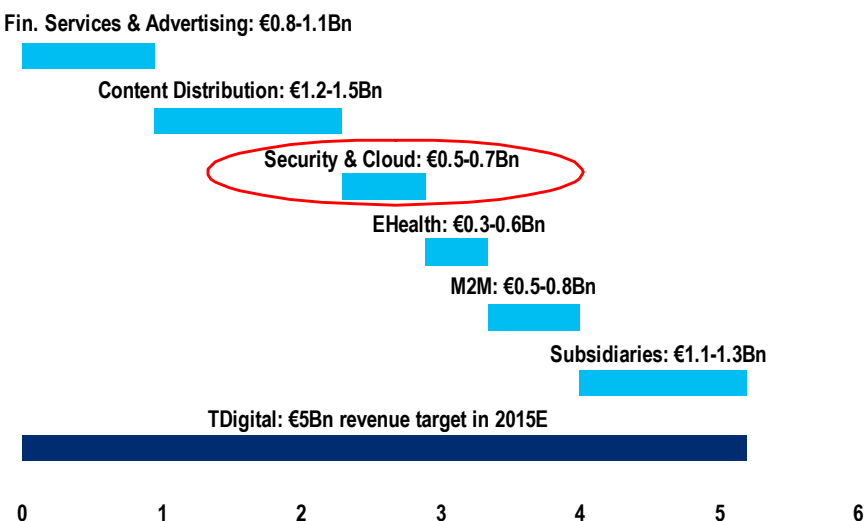
### Introduction to TEF's cloud offering

Telefónica aims to provide end-to-end levels of service to its customers. It offers integrated SaaS to large corporates (Global Cloud Computing services for multinationals) and SMBs but it focuses specifically on IaaS with its **"Instant Servers"** product launched in August 2012 in Spain. The product targets enterprises that offer digital services, with a focus on the business activity rather than the size of the company: mobile applications, on-line gaming, PaaS/SaaS platforms, e-commerce websites are given as potential users for this service.

**Telefónica Digital's expectations for cloud:** At its London investor day in July, TEF management did not devote a significant amount of time to the cloud opportunity, perhaps signaling this will not be a key focus for the operator over the next three to five years. The revenue opportunity for cloud and security services combined is estimated at €0.5-0.7bn. This remains a small fraction of the €5bn total revenue target for TDigital.

Figure 65. Telefónica Digital 2015 Revenue Guidance (€bn)

Revenues from security and cloud services expected to reach between €0.5-0.7bn (combined)



Source: TDigital Investor Day Presentation, July 2012

### What cloud services does Telefónica offer?

Instant Servers, provided by Acens (Telefónica's Cloud hosting company), offers access to virtual servers charged on a monthly basis, based on consumption of: RAM, CPU, storage and Internet connection. This product is based on Joyent technology, a San Francisco SaaS company in which TEF took a strategic stake in January 2012. In addition to the virtual servers, the product provides licences to the operating systems and other software that is used within the virtual servers; client portal; Cloud API access and technical support. There is a general SLA (service level agreement) through which TEF commits to a server availability of 99.9% and query response times of <30 min for "very critical" issues and <2h for "important" issues. If the commitments are not met the customer is offered a reduction on their monthly bill.

### What is TEF's potential to differentiate?

In an on-line interview, Moises Navarro (Director Strategy & Services, Global Cloud Services, Telefónica Digital) highlights a **"very reliable environment"** as being a key differentiator for Telefónica in the cloud. According to him, reliability, performance of the service, confidence and trust are the key selling points for TEF's cloud services and the reason why they are charged at a premium vs. basic IaaS products. Similarly, in the Global Cloud Computing on-line presentation, TEF highlights its solutions as being **"physically secure and redundant, with contingency solutions operated and maintained 24x7, [...] with local customer care and support"**.

### What share of TEF's revenues does cloud computing comprise?

Telefónica does not disclose a specific figure for cloud revenues. However, TDigital generated €2.4bn of revenues in 2011, 3.8% of total group revenues. If we assume Cloud & Security was c. 10% of TDigital revenues (in-line with the 2015 forecast), this would be c. €240m, so roughly 0.5% of 2011 group revenues.

### What is the long-term potential in the cloud space?

We argue Telefónica benefits from customer recognition through its global established brands and scale. Furthermore, the creation of TDigital could enable a more agile approach to cloud services in a market that is moving fast. By partnering with system integrators, outsourcers, IT service providers and other telcos TEF is aiming to 'fill the gaps' in areas where there is no expertise available in-house. We see this as the right approach on the path to rapidly gaining market share in an area where we argue scale will become increasingly important. Our key concern is around cost efficiency. Telefónica has a relatively good track-record in managing costs, but the need to provide 'customized' SLAs in a move to differentiate away from traditional cloud services and the multiplication of third-party partnerships could imply a significant cost rise, which would make TEF's cloud revenues less attractive from a profitability perspective.

## TeliaSonera

### What cloud services does TeliaSonera offer?

The aim of the company's cloud strategy is to take advantage of its integrated network, long-term customer relationship in the Nordic markets and ability to provide strong security solutions. This means predominantly targeting the corporate market.

TeliaSonera formulated its cloud strategy three years ago and aims to provide all three IaaS, SaaS and PaaS cloud products:

- **IaaS** – TeliaSonera sells managed data centre hosting both directly and through its subsidiary Cygate.
- **SaaS** – the company resells basic software applications including Office 365 and Cisco's WebEx web conferencing.
- **PaaS** – here TeliaSonera has a platform in place and may look to develop further.

TeliaSonera finds the cloud requirements vary considerably between market segments. In the public sector, a hybrid cloud is usually required. On the private side, larger companies have a preference for private clouds given the desire for IT infrastructure to be located nearby, preferably in the home country for regulation and security requirements.

Management observes that TeliaSonera's CIO clients are under increasing pressure to come closer to the business needs of the company and that their budgets are under increasing scrutiny. The biggest question they face is related to efficiency, and cloud solutions are usually commissioned to fulfil these needs.

### What is TeliaSonera's potential to differentiate?

Based on our call with Telia's B2B sales and strategy management, we note two main areas where TeliaSonera can differentiate competitively:

- In the enterprise space, the Telia and Sonera brand names are very strong. Since there is a focus on reliability when it comes to business critical operations, this provides the company with a strong position in the target Nordic market.
- An integrated, reliable and high-quality mobile and fixed network gives it a platform for cloud provisioning.
- Collaboration services offered by TeliaSonera in partnership with Cisco are close to the core telecom competencies and leverage on the network capabilities hence this is a high-growth area.

### What share of revenues is derived from cloud?

Telia does not disclose the revenues on its cloud computing services. However, management notes that some revenues cannibalize legacy areas, especially those associated with IaaS offerings replacing CPE (Customer Premises Equipment) offered: for example, network switching that would move from in-house to cloud. On the other hand, the cloud meeting and businesses conferencing services are a source of incremental revenues, as these take money away from companies' travel budgets. Finally, the company is seeing more growth than cannibalisation overall.



Profitability: Telia argues margins vary between different components of the cloud business. It is seeing margins just below the traditional telecom operations on the data centre side (Cygate). For its intelligent networking business, margins are lower and more in-line with traditional IT services at around 20% (this business is much more people-intensive).

#### **What is its future potential in the cloud space?**

Telecom Cloud services for the business sector will be worth about SEK 10 billion by the end of 2012, according to TeliaSonera and Cisco's estimates. Vendor licenses are not included in the scope but video-conferencing and meeting services as well as intelligent network solutions are.

Telia has been surprised by the lack of competition from the likes of Amazon and Google in its home markets. Management argues this is due primarily to clients' preference for local data storage and focus on security. This is to some extent reassuring, indicating Telia does not see the requirement to compete aggressively on price for now. In our view, this plays in Telia's favour, allowing the incumbent to protect its position as the market leader in enterprise cloud in Sweden.

## Verizon

### Introduction to Verizon's cloud offering

Verizon, through its 2011 acquisition of Terremark, has become a leading provider of cloud services offering a comprehensive portfolio of services, including Infrastructure as a Service ("IaaS") and managed hosting services, across a global platform. With a leading reputation for security combined with global data center infrastructure and an MPLS backbone, Verizon is well positioned to target the largest enterprise and government accounts to realize their cloud strategies.

### What cloud services does it offer?

Verizon offers several cloud services, including: 1) Enterprise Cloud Services; 2) CloudSwitch, which allows clients to bridge their data centers with Verizon's cloud computing services; 3) Colocation (carrier neutral and carrier specific); 4) Managed Hosting, 5) IT Professional Services; 6) Application Services, and 7) Data Center Services. The company is also launching its Video Digital Media Services, which will be a cloud-based content delivery network (CDN) that creates the capability of offering mass customizable content to meet the specific requirements of many devices. The first major customer will be Verizon's joint venture with Coinstar to offer an over-the-top video solution.

### What is its potential to differentiate?

Verizon has the ability to offer consolidated cloud services to enterprise accounts by leveraging its global partnerships, wireless and wired networks and leading reputation for security provisioning, which remains a key concern for corporate decision makers in choosing to migrate services to the cloud. The Terremark acquisition also brought in the US Government as a meaningful cloud customer.

### What share of revenue does cloud computing comprise?

Verizon's Strategic Services (cloud computing and managed hosting services) represent 7% of 2012E consolidated revenue or 10% of 2012E proportionate revenue (excluding Vodafone's 45% equity stake in Verizon Wireless).

### What is its future potential in the cloud space?

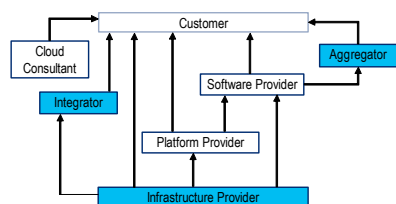
We believe Verizon is very well positioned to leverage its infrastructure scale to enable enterprise customers to consolidate their cloud services contracts and save money on bundled cloud services. We estimate Verizon's cloud computing revenues will continue to grow robustly.

### Winner or loser?

Net-winner over time, as we believe Verizon is well positioned to benefit from the cloud from a combination of selling bandwidth, colocation, and managed services.

## Vodafone

**Figure 66. Vodafone in the Cloud Value Network**



Source: Citi Research

**Vodafone's acquisition of CWW is likely to be central to its cloud strategy**

### Introduction to Vodafone's cloud offering

Vodafone's current cloud offerings are limited to the low end of the market via its ONE Net offering and its basic provisioning of Office 365 in Europe. We expect the acquisition of C&W Worldwide to significantly increase Vodafone's commitment to hosting and its related services and indeed believe that the acquisition was partly motivated by that ambition. C&W Worldwide will move Vodafone into more advanced cloud and hosting markets, providing enterprise cloud and managed hosting under the umbrella of Vodafone Global Enterprise. We expect Vodafone to elaborate on this at its Enterprise Day on 27 September.

### What cloud services does it offer?

CWW offers a range of hosting products including co-location, server and website hosting, storage and security. As of the beginning of 2011, CWW had 205,000 square feet of datacentre space. Their enterprise hosting clients currently include Ryanair and Aviva.

In the year ending March 2012, CWW's revenue from hosting and applications was £284 million, representing 13.6% of its total revenue, with 11.7% growth on the previous year. This generated a gross profit of £206 million at a margin of 70%. The expansion is attributed to increased sales and a £20 million project with £17 million of gross revenue, helping to offset a general fall in enterprise revenues. It forecasts hosting markets to continue to grow at 10% to 12% per annum. The hosting revenue is split approximately one-quarter to co-location solutions and three-quarters to managed hosting.

During its 2011/12 financial year, CWW added 4,000 square feet of data centre space at its existing datacentre in Swindon, and plans future expansion at both its Leeds and Swindon facilities. In January 2012, CWW concluded an agreement with Infinity for a 15-year leasehold deal on a 4.3MW data centre facility in the South East of England, which will represent a further 25% expansion in CWW's hosting capacity.

## Pure-Play US Wireline Carriers

### Introduction to cloud offering

Telecom carriers, especially the wireline pure-play providers, should benefit from Cloud services by providing one or more of the following services: 1) bandwidth; 2) facilities (i.e. data center colocation); and 3) managed computing (such as IAAS, PAAS, SAAS, etc.). We expect cloud offerings from the telco providers to evolve over time as most should benefit from increasing demand in bandwidth, while some should benefit by offering and/or introducing new facility and managed computing services over time.

### What cloud services does it offer?

CenturyLink, via its 2011 acquisition of Savvis, provides colocation and managed hosting services, and VMware-based IaaS operates through its data center infrastructure in the US, Europe, Canada and Asia. Cogent is likely to stay a pure-play provider of bandwidth and offer a limited set of facility services. TW Telecom sells bandwidth for public and private clouds and offers some facilities for data center colocation, while leaving managed services to partners, such as Amazon Web Services, and others that have scale to provide cloud-based services. Level 3 is likely to benefit from the growing demand for bandwidth and facilities, and could evolve into offering more cloud-based services over time. Windstream is offering all three services through a series of acquisitions. Cbeyond recently announced its new 2.0 strategy to offer a bundle of fiber-based broadband bandwidth combined with managed hosting and cloud-based services to small- and mid-sized business customers within its current footprint.

### What is the potential to differentiate?

We believe Cogent can differentiate as the low-cost provider of bandwidth that customers can use to connect their centralized computing infrastructure in the cloud with their private locations and across the public Internet. We like TW Telecom's strategy to focus on where it can provide service and scale as points of differentiation. We believe CenturyLink will continue to build on its integrated model of providing bandwidth, facilities, and managed computing by pursuing additional acquisitions that can extend metro-fiber connectivity to more customers and to improve its distribution scale by expanding the salesforce and number of customer relationships.

### What share of revenue does cloud computing comprise?

Cloud-related revenue for data center facilities or managed computing services represents roughly 6% of CenturyLink's total revenue and 3.5% of Cbeyond's total revenue. Carriers have not disclosed bandwidth-related revenue that is derived from the cloud, although Cogent generates roughly half of its revenue from the net-centric segment that originates mostly from third-party data centers.

### **What is its future potential in the cloud space?**

We believe companies will continue to evolve their strategies and experiment with the potential for offering managed computing services on a local basis, which can offer proximity and specialization as alternatives to the scale models of Rackspace, Amazon Web Services, and others. We believe most telcos aspire to be more than bandwidth providers, while we believe the provisioning of bandwidth services and data centers, to some extent, are the products in which these pure-play wireline telcos have historically offered the best returns.

### **Winner or loser?**

Presently, we believe Cogent as a pure-play bandwidth provider and TW Telecom as a full-service telecom service provider are likely to be long-term beneficiaries from cloud-based services. CenturyLink can emerge as a winner in the sector, but we believe the company needs to garner more scale in offering metro-fiber services in order to be a net-winner in the category, and expect more acquisitions from the company, as a result, to further boost its efforts.

# Datacentre Players

## Equinix

### Introduction to cloud offering

Equinix is a leading provider of network-neutral colocation, interconnection, and managed services to a variety of enterprises, content companies, system integrators, and telecom network service providers across its global footprint. The company operates Internet Business Exchange (IBX) data centers in the Americas, Europe, and Asia-Pacific.

### What cloud services does it offer?

Data centers are an integral part of the infrastructure for the cloud and Equinix has the ability to host public and private cloud networks and network provider nodes for cloud providers, as well as assisting companies with deployment of secure service nodes necessary for connecting to public cloud networks.

### What is its potential to differentiate?

Equinix differentiates itself by focusing on its global footprint and network density. Platform Equinix focuses on the speedy deployment, globalization and scale. Equinix also delivers reliability, security and high-quality service.

### What share of revenue does cloud computing comprise?

The cloud and managed service segment for Equinix is now the largest revenue segment at around 24% of its service revenue, although private cloud deployments could be incorporated into other revenue segment definitions.

### What is its future potential in the cloud space?

The opportunity for Equinix to create an ecosystem of Cloud Computing nodes is an emerging theme that we believe is encouraging for the company's role in the deployment of cloud-based services over time.

### Winner or loser?

We believe that Equinix can be a net winner from cloud services based on: 1) breadth of network diversity creates an advantage for Equinix to host public and private cloud networks and network provider nodes for larger cloud providers, such as Amazon and Rackspace; 2) rising demand for computing services is consuming the power efficiencies facilitated by virtualization and cloud deployments that we believe reduces cannibalization risk for data center colocation revenue; 3) Companies looking to connect to public cloud networks can leverage Equinix facilities to deploy a secure service node.

## Interxion

### Introduction to cloud offering

Interxion provides carrier-neutral colocation services across a large footprint throughout Europe. Interxion offers space, power, cooling and security allowing customers to store and operate their computing, network, storage and IT infrastructure. Interxion offers additional services, such as network monitoring, remote monitoring of customer equipment, systems management, engineering support services, cross connects, data backup and storage.

### What cloud services does it offer?

Interxion's data center portfolio across Europe offer communities of cloud service providers called Cloud Hubs. Interxion also offers Cloud Test Labs, where customers can test their applications and platforms in real operating environments.

### What is its potential to differentiate?

Interxion differentiates itself through its Cloud Hubs that offer an array of hosters, infrastructure providers, hyper scale platforms, software providers and networks. Each Cloud Hub allows customers to house and develop cloud services in a secure and reliable manner, with multi-layered security and power with built-in redundancy to support high-density computing.

### What share of revenue does cloud computing comprise?

Roughly 18% of revenue is derived from managed services, which we believe is the segment that would include Cloud-based services, although private cloud-deployments could also be within other vertical segments.

### What is its future potential in the cloud space?

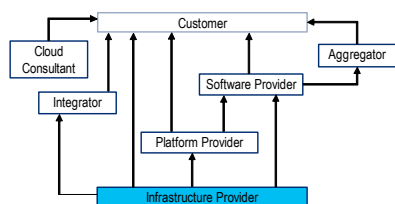
We believe the visibility for demand for data center colocation, managed service, and cloud-based service models remains fragmented given a substantial portion of demand will come from enterprise customers moving infrastructures from internal resources and office buildings to centralized facilities over time. Currently, a majority of revenue growth for Interxion (similar to its competitors) comes from existing customers, which positively reflects the growing demand for centralized facilities to host a variety of computing and connectivity needs.

### Winner or loser?

The data center market in Europe continues to experience strong demand for colocation services driven by growth in Internet traffic, applications requiring low-latency connectivity (such as electronic trading), and an increasing amount of outsourcing and centralization of computing resources. We believe these trends should help to increase the demand for both space and power for data center colocation, either through direct deployments or through the purchase of managed and cloud-based services. We believe Interxion is well positioned to be a net beneficiary from the growth of cloud computing in Europe.

## Telecity

Figure 67. Telecity in the Cloud Value Network



Source: Citi Research

### Winner or loser?

We view Telecity and its peers as potential winners from increased cloud adoption with increased data traffic set to drive more take up of space. Further, latency is set to be a key issue for cloud offerings and we view highly connected data centres with 250+ telcos and ISPs as not only addressing this issue but also offering cloud providers many opportunities for distribution of content. Further, we continue to believe Telecity remains a potential take-out target (historically telcos have been the acquirers, with NTT buying Telehouse and Verizon buying Terremark).

### What specific cloud services does Telecity offer?

Telecity's primary focus is the provision of colocation space to IT service clients who offer cloud-related services either by connecting through Telecity's data centres or for the smaller players from servers hosted within their data centres.

The company also has a direct connection to Amazon Web Services' data centre in Dublin. Telecity's hosting clients can connect by a private fibre connection back into Amazon's data centre in Dublin and by doing so access applications hosted by Amazon quicker than via traditional means. For customers, this offers cheap access to web-grade cloud infrastructure for non-critical activities while their critical IT remains on Telecity's secure Docklands data centre.

Finally, it also offers an Infrastructure-as-a-Service solution (Dynamic Data Centre which provides an enterprise-grade IaaS product).

### What is Telecity's ability to differentiate?

We see many similarities between Telecity and its other peers such as Interxion and Equinix. That said, in Europe the link to Amazon Web Services relationship is a key differentiator. Other than that, the major differences are in the way space is sold (Telecity typically prices locally vs. Interxion and Equinix on a European basis) and geographical footprint (e.g. Telecity is particularly strong in London, where it has some high-quality assets in London Docklands) compared with Equinix which is global and Interxion which is in more smaller markets in Europe. These businesses along with Telehouse (owned by NTT) are able to differentiate themselves from newer entrants on connectivity as well as capacity (>250+ ISPs/telcos in some cases).

### What share of group revenues is derived from cloud?

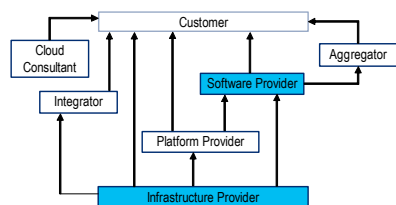
Looking at where Telecity derived its top 100 customer contract wins in 2011 and 2010, it can be seen that these came from a wide range of sectors, with the cloud arguably showing the biggest change (+16% in 2011 vs. +8% in 2010).

### What is Telecity's future potential in the cloud space?

We continue to see good potential for Telecity from the cloud with it continuing to benefit from increased demands for capacity from cloud providers. The company should also benefit from evolving technology trends such as video streaming and the increase in connected devices. Finally, we would expect the company to remain focused on building and operating data centres rather than see its margins diluted by moving into a more hybrid services offer.



Figure 68. United Internet in the Cloud Value Network



Source: Citi Research

## United Internet

### Winner or loser?

United Internet is, in our view, a good example of a company moving from a traditional commoditized web-hosting business towards more value added cloud services. With its DIY product it targets a niche market of small local businesses. By focusing on the intuitive user experience via the content provided and security of the data storage, United Internet has a good competitive advantage which we believe could be successfully monetized as the company gains scale over the next few years. Our concern is the cost of distribution direct to business owners and the risk of competition as this becomes a more established field. The gross margin is very high on the DIY product; however, EBITDA margins are currently depressed by significant marketing spend.

### Introduction to United Internet's cloud offering

United Internet's traditional webhosting business could be considered a basic IaaS product. This access to cloud servers offers very little differentiation and as such is priced competitively: indeed United Internet is positioned as the 'budget hoster'. UDTI has 4.6m classic web hosting customers with around €7 ARPU.

With the 1&1 **do-it-yourself homepage**, the company offers the content and applications needed for small businesses to build a customized website with minimal IT knowledge and relatively quickly (could take as little as 15 minutes). UTDI currently has c.320k DIY website customers with c.€13 ARPU.

### What is UTDI's potential to differentiate?

Like most of the telecom operators, United Internet effectively combines a basic IaaS product with SaaS enablement, but its approach differs in two important ways:

- It targets exclusively small businesses (up to 30 employees), freelancers and home users, providing a way in which customers with little or no website can develop an internet presence without having a significant sunk cost upfront. UTDI's ambition is to become a market leader within this niche.
- Unlike its competitors – Strato (owned by DT), Web.com and GoDaddy –the DIY website product is able to generate sophisticated websites, including navigation and ready to go content.

### What share of UTI's revenues does cloud computing comprise?

In 2011 UDTI's EBITDA breakdown is 47% Access (DSL and mobile) and 53% Applications. Applications revenue of €726m (vs group €2.1bn) can be broken down as roughly €360m classic webhosting, €15m DIY, €90m paid e-mail accounts, €110 advertising on portals and free e-mail accounts, €127m Sedo holding (domain wholesale and affiliate marketing), c.€30 domain resellers (InternetX, Fasthost). Growth is being driven by geographical expansion in classic webhosting and the launch of the cloud service DIY website.

DIY customers were 190k end 2011 and are guided to grow by 200-300k net adds in 2012; at 450k customers, DIY would generate €70m of revenue on an annual basis. UTDI is also adding on additional services such as an online office to its paid and free e-mail service.

**What is its future potential in the cloud space?**

United Internet intends to build upon its current DIY product to include more extensive SaaS enablement. The company remains focused on SMEs for which the addressable base in the current footprint is c. 15mn. Going forward, the company sees DIY as one of its main growth engines.

## Technology & IT Services

### Accenture

**Accenture recognises that most clients will have a hybrid environment**

Accenture also has been investing in cloud technologies for several years now, even though it does not face quite the challenge that IBM faced in terms of data centre outsourcing revenues, because it has a different revenue mix.

One of the cornerstones of Accenture's cloud offering is the realisation that most of its clients are likely to have a hybrid environment with co-existing public and private cloud functionality. It takes advantage of the inherent implied complexity of this outcome.

Specific offerings include (i) Strategy and Planning (ii) Third-party SaaS implementations (iii) Cloud application and Platform management (iv) Software solutions – essentially Accenture has "cloud-ised" its extensive portfolio of software solutions (v) Business Process Utilities for the Media, Telecom and Retail industries.

## Amazon

### Introduction to Amazon's cloud offering

**Amazon's cloud offering is centered around its Web Services Division**

Amazon launched its Web Services offerings in a beta mode in 2002 to a small group of internal customers. These initial offerings were largely modularized programs developed to help scale Amazon's Technology infrastructure for its core Retail business. About four years later, in 2006, Amazon began offering IT infrastructure services to businesses in the form of Amazon Web services – now commonly known as cloud computing.

**AWS provides almost all services on a pay-as-you-go basis**

AWS falls under providing remote infrastructure services (IaaS) as well as Platforms as a Service (PaaS). Almost all web services are priced on a subscription mode – pay-as-you-go with minimal upfront expenses or long-term commitments. AMZN's most popular Web Service, Amazon Elastic Cloud Computer or EC2, has revolutionized the market for hosting services with granular, by-the-hour pricing. It also has a CDN service coupled with its S3 storage service.

### What cloud services does it offer?

Amazon offers a wide variety of products and services categorized across five broad buckets – Compute & Networking, Storage & CDN, Database, App Services, and Deployment & Management. Within these categories, we'd highlight following key products offered by Amazon:

- **Compute & Networking:** Amazon Elastic Compute Cloud (Amazon EC2) is a web service that provides resizable compute capacity in the cloud. It is designed to make web-scale computing easier for developers; Networking Services include Route 53 (a domain name service) and Virtual Private Cloud.
- **Storage & CDN:** Amazon Simple Storage Service (Amazon S3) is a web services interface that can be used to store and retrieve data, at any time, from anywhere on the web; Amazon CloudFront is a web service that makes it easy to distribute content with low latency via a global network of edge locations.
- **Database:** Amazon Relational Database Service (Amazon RDS) is a web service that allows users to set up, operate, and scale a relational database in the cloud using capabilities of MySQL, Oracle or Microsoft SQL Server database engine; Other Database services include DynamoDB and ElastiCache
- **App Services** – Includes several services such as Search, Workflow management, Email, and Notifications.
- **Deployment & Management** – Includes several services such as Remote management, Identity & Access management, and Resource monitoring.

### What is its potential to differentiate?

**AWS is the market leader, and will continue to differentiate based on value proposition**

We believe the recession accelerated cloud adoption as cost savings became a primary focus area for most enterprise customers. AWS has been a leader in the 'pay-as-you-go / pay-as-you-grow' pricing strategy for storage, computing, and network resources. We believe Amazon's core Retail business value proposition pillars (viz. Price, Service, and Selection) translate to its Cloud Computing business quite seamlessly. Moreover, Amazon has a potential to differentiate its Cloud Computing business based on value proposition which is Low Cost, provides Instant Elasticity, Open & Flexible, and Secure.

We have attended several user conferences hosted by Amazon over the past couple of years, and we think the following anecdotes summarize how Amazon can continue to succeed within this space: **(i)** SlingMedia, an online video company, highlighted an example with the cost savings for hosting and streaming videos. For instance, the cost for 1,000 15- minute videos went from \$142,800 (fully loaded capex & run costs) to \$9.52 on AWS; **(ii)** Amazon's vision is to help users build "Websites that sleep at night" to save money Amazon has introduced "auto scaling" resources – adding or deleting a server depending upon Website traffic – without any human intervention; **(iii)** AWS has hundreds of thousands of registered customers in over 190 countries with its geographical footprint including two datacenters in US, and one each in EU, Singapore, and Tokyo plus 10 Edge locations in US, 5 in EU, and 3 in APAC; **(iv)** At the end of 2011, more than 500B objects were stored in Amazon's S3 database, growing at over 300% Y/Y. **(v)** Each day AWS adds the equivalent server capacity to power Amazon when it was a global, \$2.76B company (~ in 2000).

#### What share of revenue does cloud computing comprise?

**We believe AWS revenues contribute a 'mid single digits' percentage of total 2012E revenues**

While Amazon hasn't disclosed precise revenue and profitability metrics for AWS, we believe AWS revenues would contribute a 'mid single digits' (or approx 4% to 6%) percentage of Amazon's 2012E revenues – so, approx \$2B to \$2.5B in revenue contribution in 2012. However, given the relatively high gross margin nature of AWS revs, we believe, AWS should contribute about 'mid teens' (or approx 14% to 17%) of Amazon's gross profits in 2012E. Please refer to our Amazon report titled "Updating The Long Thesis" published on March 17<sup>th</sup>, 2012 for further details.

#### What is its future potential in the cloud space?

**We think AWS will continue to contribute a growing proportion to overall Amazon's top line as well as bottom line**

Amazon management believes that its Cloud Computing business can grow as large as its Retail business over the next 10 years. Furthermore, Amazon.com – the world's largest retail website – now runs on AWS systems. We believe AWS accounts for about 10-15% of Amazon's gross profits and we think Amazon is currently operating this segment on a break-even bottom-line basis. Given the large market opportunity and leading market share, we think AWS will continue to contribute a growing proportion to overall Amazon's top line as well as bottom line.

While lower costs, reliability, and scalability are factors that prompt websites to switch to the cloud, we believe that security and compliance remain key inhibitors. Amazon has taken steps toward robust physical and virtual security of its data centers, and the next steps outlined in terms of SOX, HIPAA, Sarbanes Oxley Type II Audit compliance, and advanced encryption should help assuage security concerns as enterprises become more comfortable with storing internal data on Amazon's network.

#### Winner or loser?

**Yes, a winner ...** We believe Amazon's Cloud Computing offering is very differentiated (despite being a fairly commoditized product) due to the following reasons: **(i)** AWS helps customers replace up-front capital expense with low variable cost; **(ii)** Economies of scale and efficiency gains allow Amazon to continually lower prices. Amazon has lowered the prices on its core AWS products 20 times since the launch in 2006; **(iii)** Multiple pricing models allow AWS customers to optimize costs for both variable and stable workloads. AWS offers a premium security spec at non-premium prices. **(iv)** Cloud computing drives down IT labor costs both up-front and on an on-going basis; **(v)** AWS allows customer workloads to be highly available for

a fraction of the cost of self-hosting; and (vi) With AWS, customers save more money as their business scales in size and requirements.

## AtoS

European Leadership in private cloud infrastructure forms the cornerstone of AtoS's cloud strategy.

AtoS views the emergence of cloud as an opportunity for the firm and has outlined its ambitions to become the 'European leader in cloud'. In our view, this is a natural extension of the firm's present positioning as the 'largest European outsourcer'. In particular, European leadership in private cloud infrastructure forms the cornerstone of AtoS' cloud strategy and the firm is investing in building energy-efficient data center capabilities. At the same time, during a recent roadshow with us in London, top management indicated that AtoS's value proposition very much lies in being a one-stop-shop for the larger stack (IaaS, PaaS and SaaS) (please see [AtoS: Takeaways from London NDR](#)).

AtoS sees additional value in the cloud with JV's Canopy and Yunano.

In addition, the firm's go-to-market strategy has been characterized by its ability to form partnerships including Yunano (JV with Chinese ERP vendor Yonyou, formerly called UFIDA) and more importantly – Canopy (JV with EMC and VMWare – see [AtoS: Canopy in the Clouds](#)).

### Service line highlights

- **Managed Services** – In 2011, slightly less than one-fifth of AtoS' Managed Services (MS) ~€4bn revenues came from cloud and infrastructure services. In particular, the contribution from 'cloud' to the MS top line was €200m+ and AtoS has revealed its ambition to grow this revenue stream to €1bn by 2015. The firm hopes to achieve this target by focusing on private cloud for large enterprises or communities, partnering in R&D with PaaS and SaaS players, and internally establishing a start-up approach with dedicated resources from pre-sales to delivery.
- **System Integration** – AtoS' cloud-based System Integration (SI) offerings include Cloud transformation journey (start the transformational journey into the cloud), TAM on the Cloud (rational tool set on-demand for its customers), SAP BI OnDemand (cloud-based analytics offering), Dynamic PLM services (PLM Teamcenter on a dynamic cloud infrastructure) and Azure development (Azure-based software development on the cloud).
- **HTTS & SB** – Although it is still early days, we believe that AtoS is also aiming to leverage its HTTS & SB expertise to develop Business Process as a Service (BPaaS) solutions.

## Capgemini

We believe that cloud innovations have led to a transformation of Capgemini's Service lines. Within Capgemini, cloud seems to be perceived more as a 'ubiquitous design principle' resulting in a cross discipline approach rather than creation of a separate dedicated unit.

### Service line highlights

**Capgemini's Cloud offerings come under Consulting, Infrastructure, Application and BPO.**

- Capgemini Consulting – Capgemini's consulting arm provides cloud-related services such as digital transformation, customer value prototyping and cloud road mapping. An example of digital transformation is the creation of a centralized digital service center as a shared service model for Spanish media conglomerate PRISA.
- Infrastructure – While Capgemini's solutions span most of the cloud stack, the firm has chosen to adopt an asset-light approach, and therefore is not directly investing in hardware but instead opts to resell the storage from strategic alliance partner EMC via its 'storage-as-a-service' offering. The key infra services from a cloud perspective include service aggregation (which leverages infra and partner asset base on a global basis across hybrid clouds thereby serving as an enabler for Capgemini group cloud offerings) and service orchestration / Capgemini RightCloud (aimed at large enterprises that want to combine cloud-based services).
- Application – Application Services include among others: SaaS development, SaaS integration, and SaaS orchestration. In particular, we highlight Capgemini's 'Immediate' platform - a cloud-based social CRM offering in collaboration with partners including Salesforce.com (SFDC). Traction for the SFDC solution has been encouraging, with wins including Burberry and Telefonica.
- BPO – Finally on the BPO side, too, the cloud is shaping the delivery model, for example leading to emergence of on-demand procurement solutions.

**Capgemini's strategic partners in the cloud include EMC2, SAP, HP, IBM, MSFT and ORCL.**

## Computer Sciences (CSC)

CSC's core business has a significant level of data centre outsourcing work as well as a concentration of public sector revenues, so its worth looking at the pertinent offerings in this case.

CSC has a core cloud strategy offering, of course. Beyond this, it offers (i) Cloud Infrastructure and Managed Hosting Offering – this includes a private cloud offering; a desktop outsourcing offering based on VMWare; Identity and Access management solutions and Managed Hosting and SAP-based services. (ii) Cloud Productivity and Collaboration Solutions – essentially cloud-based e-mail and telepresence solutions (iii) Cloud Application Enablement and Testing.

## IBM

Executing on its cloud initiatives is an important element of IBM's 2015 roadmap that it has outlined to investors. IBM expects these cloud initiatives to contribute ~\$7 billion of revenue over that time period. Note, however, that there is ~\$4 billion of revenue cannibalization envisioned in the plan and so the net contribution from the cloud is ~\$3 billion.

IBM's branded cloud offering is called IBM SmartCloud and it incorporates: (i) A set of basic services (IBM SmartCloud Foundation) that include architecture design for private and hybrid clouds, provisioning, monitoring, integration and security. Its integrated hardware/software offering, PureSystems, can be a part of this solution as well; (ii) SmartCloud IaaS, PaaS and managed backup storage services; and (iii) SmartCloud SaaS Solutions. Obviously, there is a set of consulting offerings as well, which include cloud strategy and design, development and testing, integration with other existing systems and advice on security and privacy issues.

IaaS: This is essentially supported by six data centres and, as stated on its website, IBM can guarantee 99.9% uptime and embedded security and isolation features.

PaaS: IBM's platform-as-a-service offering enables users to deploy and migrate applications to both public and private clouds. IBM markets this as a way to retain a level of customization that moving to SaaS applications does not provide.

SaaS: IBM can help a client build custom-SaaS applications that can be made available throughout the client's enterprise on an as-needed basis. Beyond custom-SaaS applications, specific SaaS functionality that IBM has built for its broader client base includes sourcing, procurement and online commerce capabilities (using its Sterling Commerce acquisition); marketing optimization, web analytics and demand generation capability (using its Unica and CoreMetrics acquisitions); and enterprise-grade file sharing and other collaborative / social capabilities. There are also industry-specific solutions available as a part of its BPM practice.



## SAP

**SAP's offerings are focused on four lines of business: 1) People, 2) Money, 3) Customer and 4) Supplier solutions**

### Overview of SAP's cloud offering

SAP has created a separate division with ~5,000 staff to deliver cloud services and generates revenues from 20 or more cloud applications such as Business ByDesign, Sales OnDemand, Travel OnDemand and SuccessFactors BizX Suite. SAP's HANA can support a cloud infrastructure and brings together information and cloud. Since the close of SAP's acquisition of SuccessFactors in Feb 2012, SAP's cloud-based solutions are focused on four lines of business to manage people, money, customers and suppliers, which are to be offered by integrating into the ERP business software.

### SAP will mostly participate in cloud through SaaS

SAP has a significant base of software applications revenue, with the overwhelming majority of this revenue coming from its core ERP business. This software runs at the heart of many of the largest companies in the world and is mission-critical to their operations. As a result, we do not expect demand for these core applications products to be meaningfully impacted by cloud trends, nor do we expect SAP to look to migrate this technology to a cloud-based architecture. SAP does have a lighter-weight "Business by Design" offering in the ERP space for mid-market companies. In this segment of the market, with simpler requirements and faster deployment times, SAP has been aggressively marketing its capabilities.

At the same time, SAP participates in the 'edge' applications market, a segment that tends to be less mission-critical and evolves more quickly. These areas include CRM, sourcing, payroll, travel and expense, HR (especially outside of the system of record). In these areas, we have seen SAP move aggressively with organic development and acquisitions. The 2011 acquisition of SuccessFactors is one such example. In May 2012 SAP announced the acquisition of Ariba, a buyer-seller collaboration network, for \$4.3 billion; this is intended to complement SAP's B2B and on-premise solutions. The Ariba acquisition is expected to close at end-4Q12.

In addition to its SaaS offerings, SAP has two platforms that it makes available for custom application development (PaaS). The Core PaaS is utilized for transactional applications and is ideal for transactional line of business on-demand solutions (e.g. SAP Sales OnDemand, Sap Travel OnDemand, SAP Store), while the Edge PaaS is based on Java and is utilized for utility applications (e.g. SAP Business Suite). SAP's PaaS apps are built on on-demand (SaaS) apps with transactional as well as collaborative and analytical capabilities.

Following the acquisitions of SuccessFactors and Ariba and combining this with existing offerings, SAP will likely be a substantial player in the cloud, mostly around SaaS. In 2011, cloud revenues contributed about €100 million (1% of total) to SAP's total revenues, and we expect that, with the acquisition of SuccessFactors, SAP will be able to generate over €300 million in cloud revenues during 2012. SAP estimates that the cloud will be able to contribute ~€2 billion in revenues by 2015.

Overall, SAP has taken an aggressive stance in cloud computing, which we think combines the right balance between strategy and acquisitions (SuccessFactors and Ariba). We believe that its multiple service offerings, along with complementary offerings such as Mobility solutions and SAP HANA, further strengthen its position. Though the cloud computing space is rapidly becoming crowded, we believe SAP is well positioned for growth in ERP within the cloud space with its strategic acquisitions and complementary offerings.

## Companies Mentioned Under Our Coverage

Figure 69. Companies mentioned under our coverage, priced at 3 Sep 2012

Name	RIC	Current Price	Rating
Accenture Ltd	ACN.N	61.60	Buy
Amazon.com	AMZN.O	248.3	Buy
AT&T Inc	T.N	36.64	Buy
ATOS	ATOS.PA	47.64	Buy
BMC Software, Inc.	BMC.O	41.40	Neutral
BT Group PLC	BT.L	2.23	Neutral
CA Inc.	CA.O	26.03	Neutral
Capgemini SA	CAPP.PA	30.00	Buy
CenturyLink	CTL.N	42.26	Buy H
CheckPoint Software Technol	CHKP.O	46.09	Buy
Cisco Systems Inc.	CSCO.O	19.08	Buy
Citrix Systems, Inc.	CTXS.O	77.69	Buy
Cogent Comms Group Inc	CCOI.O	19.60	Neutral
Colt Group SA	COLT.L	1.18	Buy
Computer Sciences Corp	CSC.N	32.21	Neutral H
Deutsche Telekom AG	DTEGn.DE	9.53	Buy
Equinix Inc	EQIX.O	197.65	Neutral
France Telecom	FTE.PA	11.15	Sell
Interxion Holding NV	INXN.N	19.09	Buy
Intuit Inc.	INTU.O	58.54	Buy
Jive Software, Inc.	JIVE.O	15.09	Neutral H
Level 3 Communications Inc	LVLTK	21.55	Neutral
Microsoft Corp.	MSFT.O	30.82	Buy
ServiceNow, Inc.	NOW.N	31.10	Buy
Oracle Corporation	ORCL.O	31.65	Buy
Palo Alto Networks, Inc.	PANW.N	64.38	Neutral H
Portugal Telecom	PTC.LS	3.91	Buy
Red Hat, Inc.	RHT.N	56.04	Buy
salesforce.com, inc.	CRM.N	145.18	Buy
SAP AG	SAPG.DE	53.03	Buy
Symantec Corp.	SYMC.O	17.83	Buy
Telecity Group Plc	TCY.L	8.71	Buy
Telefonica SA	TEF.MC	10.16	Neutral
TeliaSonera AB	TLSN.ST	46.04	Buy
TW Telecom	TWTC.O	25.15	Buy
United Internet AG	UTDI.DE	16.18	Neutral
Verizon Communications Inc	VZ.N	42.94	Neutral
VMware, Inc.	VMW.N	89.04	Sell
Vodafone Group PLC	VOD.L	1.83	Buy
Websense, Inc.	WBSN.O	15.38	Neutral
Web.com Inc	WWW.O	16.65	Buy

Source: Powered by dataCentral

## Notes

## Appendix A-1

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