Pharmaceuticals and The Cloud
How Cloud Computing is Changing the Way Pharmaceutical Companies Manage IT

Cloud Computing is rapidly changing the way companies across the globe manage their IT infrastructures, and the Pharmaceutical industry is no exception. While "The Cloud" is still growing, it already encompasses many transformative technologies for Pharmaceutical companies.

The challenge is to understand which technologies are ready today, which are just around the corner – and which are hype. This whitepaper will help you understand how to leverage Cloud Computing today to reduce IT costs and significantly improve efficiencies.

A Quick History of Cloud Computing

The easiest (and most entertaining) way to get an understanding of Cloud Computing is to review its origins.

It all started with the Berlin Airlifts
On June 27, 1948, in an attempt to push the west out of Berlin, the Soviets cut all surface traffic bound for Berlin traveling through Soviet Germany. A desperate Berlin, faced with starvation and in need of vital supplies, turned to the U.S., Great Britain and France for help. Wishing to avoid another war or a humiliating retreat, President Truman agreed to supply West Berlin by air.[1] This initiative, known as the Berlin Airlift, had the makings of a logistical nightmare. Literally millions of tons of supplies needed to be transported in hundreds of thousands of flights, and there was no time for red tape. People's lives were on the line and time was scarce.

The West looked to technology for the answer, developing a sophisticated electronic supply chain system which eventually led to Electronic Data Interchange (EDI) specifications and the Value Added Networks (VANs) used today by most large organizations. As explained later in this report, these B2B systems were some of the first Cloud Computing technologies, so, as poetic as it might sound, the fact is the Berlin Airlift took us right into the Cloud.

Forty years later, connectivity drastically increases
With the advent of the Internet, companies dramatically increased their interconnectivity. The introduction of common communication protocols, such as SMTP, FTP, and HTTP, led to Email, file transfers, and web browsers and fueled Internet adoption.

Realizing that software implementation, management and support could be simplified by implementing software in a single location and then making it available to users over the web, a number of software vendors started to create applications designed specifically to run on the web. The earliest web-based software vendors typically sold their applications to other companies to run in their datacenters. Later vendors began hosting and managing the applications themselves as ASPs (Application Service Providers). Buyers were drawn to ASPs because they eliminated the expensive hardware, software licenses and maintenance and support costs associated with traditional software. However, ASPs found the management of individual application customizations to be problematic and the ASP infrastructure lacked true multi-tenant architectures which made scalability a problem.[2] A whole new set of technologies had to be developed before most software providers could handle the volume, scale, and flexibility needed to profitably deliver this kind of web based computing.

Next comes Virtualization
As Email and web based application use grew, the volume of data processed in data centers increased exponentially. Companies suddenly needed load balancers, spam filters, massive amounts of storage, and lots of web server capacity for all of their Java and .NET applications. Peak load management became a huge issue as these companies had to scale their data centers to handle maximum loads – even when most of the time their systems only required a fraction of that capacity. The expense associated with managing these data centers grew dramatically.

The solution came in the form of virtualization tools from companies like VMWare. Virtualization enables companies to spread computer power across different applications that have varying capacity needs. Movement to virtual machine-based infrastructures (Java, PHP, Perl, .NET) allowed relatively common platforms to be virtualized quite easily. These solutions significantly simplified the management of the data center and reduced data center costs. They also enabled organizations to truly leverage new multi-core chip technologies.

Companies started using virtualization to their advantage in a number of ways. Initially they used it to run more applications in their data centers without increasing the number of servers. They also quickly realized it would allow them to scale their data centers more efficiently and make global availability and redundancy easier to manage.

At the same time, large internet-based software companies were struggling to overcome not only the multi-tenant architecture issues, but also the design and deployment of distributed global datacenters that could handle tremendous scale. Companies like Amazon and Google were handling not millions of transactions but billions. These companies began to use virtualization as a way to solve these distribution, scalability and multi-tenant problems.

Companies Benefit from HyperScalability and the Cloud Is Formed
The convergence of multi-tenant architectures, virtualization, huge bandwidth capabilities, and new software development technologies provided the hyper-scalability necessary to meet the extraordinary computing demands of the Internet. These mega-computing web-based companies (Google, Amazon and Salesforce.com are examples) are the parents of and largest players in what is now known as the Computing Cloud.

What, Exactly, is Cloud Computing?

Cloud Computing, is the hottest new buzz word out there - so new that the definition is still in flux. In its most basic form, Cloud Computing is a collection of IT solutions which provide resources over the Internet to users who need not have control over the technology infrastructure that supports them.[3]

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Cloud Computing is made up of four technology layers:

1. **Infrastructure as a Service (IaaS)**: *Services that deliver fundamental computing commodities – CPU cycles and storage*

   IaaS allows companies to directly offload portions of their datacenters into The Cloud.   Numerous companies, including very large vendors like Amazon.com and small companies such as GoGrid, provide this type of service. Most of the vendors selling virtual storage offer some form of API for integrating remote file and data storage into applications. These integration tools provide significant flexibility and scalability, but the integration is not as smooth as Network Attached Storage, for example. Vendors providing outsourced computing cycles let companies install their applications on servers in the Cloud. Users of these virtual CPU cycles install and manage their applications as they would with a remote data center, but the servers are managed by the vendor. Some IaaS vendors have extended this model. For example, GoGrid lets customers setup business rules and profiles that are used to customize their virtual environment according to their individual requirements. They also make it extremely easy to manage, monitor and deploy to their Cloud environment.

2. **Platform as a Service (PaaS)**: *Platforms that enable development in the Cloud*

   Like IaaS, PaaS also provides tools for deploying and managing IT applications. PaaS takes these tools one step further, providing an entire platform of online development applications rather than just a blank slate of CPU cycles and storage. They often include custom capabilities specific to the vendor. For instance, the Google AppEngine includes the BigFile API and the SalesForce.com platform (Force.com) provides significant CRM integration capabilities. PaaS tools also tend to scale virtual server use automatically based on the application's demand.

3. **Network as a Service (NaaS - Also called Integration as a Service)**: *Value Added Networks, Managed Services, and other applications that facilitate B2B information exchange*

   NaaS is one of the oldest outsourced technologies. A wide variety of B2B technologies fall into this category including:
   - Value Added Networks (VAN) such as EasyLink Services International's Electronic Data Interchange (EDI) VANs
   - Outsourced content delivery from companies like Ariba
   - OnDemand web services from companies like XIgnite
   - Hosted B2B data exchanges from companies like e2Open.

   These applications reduce the complexity of managing the movement, acquisition, distribution and transformation of data exchanged between businesses and their partners and customers.

4. <u>**Software as a Service (SaaS)**</u>: *Applications that sit on top of these other three technologies and deliver targeted functionality*

At the top of the Cloud technology stack are web based applications that deliver specific business functionality to businesses and consumers. There are thousands of SaaS applications on the market today and this number is growing rapidly. The functionality these applications provide includes everything from internet faxing (such as EasyLink's popular On-Demand Messaging) to survey tools and even disease management software. One of the most well-known SaaS applications is the Customer Relationship Management application called Salesforce.com. Another is Google's online spreadsheet, word processing and presentation tool called Google Docs. No matter what kind of functionality the application provides, all SaaS applications are 100% hosted and managed within the Cloud, and, like PaaS, SaaS applications completely hide the underlying infrastructure, platform and network.

Software as a Service

Integration as a Service

Platform as a Service

Infrastructure as a Service
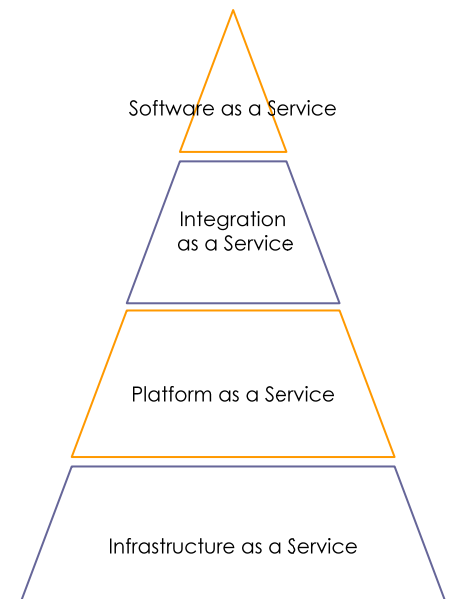
All four Cloud Computing layers share three common elements:
1. They are built on recent technological developments such as virtualization and multi-tenant architecture. This environment enables numerous customers to share the same computing power. This sharing of resources provides a number of significant benefits to the customers including substantially reduced operational costs.
2. They allow users to pay for their actual use of the technology instead of paying for a technology license or ownership of the technology.
3. They are accessed via the internet.

Cloud Computing is a major technological shift in our computing world. As described below, companies using it have seen tremendous benefits already. As this technological shift gains speed, companies that don't use it appropriately face great risks and those who do stand to profit considerably.
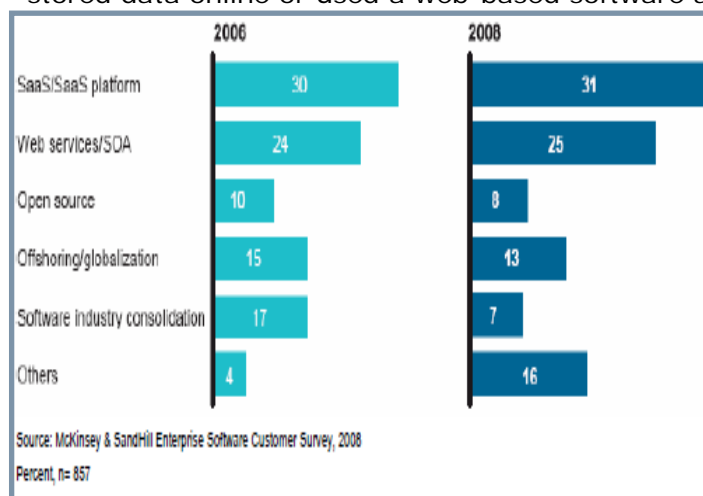
Chapter 3: Why Adopt Cloud Computing?

Cloud Computing leverages economies of scale to drive down the cost of deploying, managing, maintaining and servicing key IT resources. Currently consumers and small businesses use a greater percentage of Cloud technologies than enterprises, but large companies are starting to move more pieces of their IT to the Cloud as well.

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Consumers and small businesses prefer Cloud technologies because they tend to be very easy to use and their web based delivery makes Cloud applications easily accessible anywhere there is Internet connectivity. Most importantly, these users typically cannot afford the IT resources needed to manage even a small datacenter, so the only way they can get the computing power they need is through the Cloud.

Like consumers and small businesses, enterprises are turning to Cloud technologies because of their ease-of-use, anywhere-access, and cost savings. However, enterprises are not using the Cloud in place of their IT departments. Instead enterprises are outsourcing just the IT that cannot be leveraged for competitive advantage. Email Cloud services are a good example. Very few companies can leverage their expertise in managing Email applications to significantly increase their competitiveness. Therefore Email services are a key candidate for Cloud Computing.

The cloud is still in its infancy, but people are already using it extensively. A recent survey by the Pew Internet and American Life Project reported that 69% of all Internet users have stored data online or used a web-based software application. The global SaaS market was $6.3 billion in 2006 with the heaviest use in human resources, enterprise resource planning, and customer relationship management. A recent survey conducted by McKinsey and Company and Sandhill Enterprise Software, shows 30% of customers say SaaS is the most important trend impacting their business.[4]

	2006	2008
SaaS/SaaS platform	30	31
Web services/SOA	24	25
Open source	10	8
Offshoring/globalization	15	13
Software industry consolidation	17	7
Others	4	16

Source: McKinsey & SandHill Enterprise Software Customer Survey, 2008
Percent, n= 857

Each layer of the Cloud Computing stack lends itself to the outsourcing of different business processes. Each layer also has a core benefit. Some are financial benefits; others improve competitiveness and market flexibility.

Benefits of IaaS

By moving systems, servers, software and support to the Cloud, IaaS (Infrastructure as a Service) reduces capital expense and software licensing and labor costs. A particularly compelling example of how a company can benefit tremendously from IaaS is the outsourcing of computing power for new software testing.

For many companies, upgrading and implementing software is an extremely difficult and resource intensive process. The new software must be thoroughly tested before it can be released. For instance, imagine the capital cost and time associated with rolling out an upgrade to a sophisticated ERP application. Test machines, platform integration boxes, and production readiness machines are all needed for the rollout. Then, after the application is live, all of these machines are no longer needed. They might be repurposed for other uses, but often they sit dormant just waiting for the next upgrade.

Using IaaS, a company can create an entire virtual test platform, perform their upgrade tests, and then, when the cycle is over, release the virtual platform back into the Cloud. No new machines are purchased, no hardware is installed in the datacenter, and costs are only incurred for the actual processing and storage used during the test period. Better yet, when an identical platform is needed later on for the next upgrade, a deployment configuration that recreates the environment can be easily retrieved and run.

Benefits of PaaS

PaaS (Platform as a Service) solves another set of challenges for companies. While it does help cut costs, it is primarily designed to expedite software development and thus decrease time spent on software rollouts and time-to-market. Additionally, companies have used PaaS applications such as Google's BigFile and SalesForce.com's data management capabilities to create functionality that has resulted in real competitive advantages.

Benefits of NaaS

NaaS (Network as a Service) not only helps companies reduce capital expenses by eliminating hardware and software purchases, but also significantly reduces the operating expenses related to the management of B2B traffic.

Managing, monitoring and supporting network traffic is expensive. Network engineers are needed to manage firewalls, virtual private networks, TLS connectivity and an entire stack of communications and transport applications. NaaS vendors remove this complexity. Because they are solely focused on B2B technologies, these vendors have the domain expertise and common platforms needed for the smoothest B2B traffic flows possible. Plus, the highly competitive environment these vendors are in ensures they have extremely secure and reliable systems.

Benefits of SaaS

SaaS (Software as a Service) also reduces both capital and operating expenses and saves valuable IT manhours. Managing and maintaining software applications in-house takes network engineers, software developers, database experts, help-desk associates, and trainers. With SaaS there is no in-house software management or maintenance. All support, upgrade, and other software

"EasyLink has allowed our department to immediately communicate important information in a time frame we never thought possible."

Practice Manager, Leading Medical Research Institute

management work is performed by the SaaS vendor. Furthermore, because the SaaS vendor spreads his costs across numerous clients and allows companies to pay only for the actual use of the software, the cost of SaaS applications tends to be much lower than other kinds of software.

How Can Pharmaceutical Companies Start Using the Cloud to Their Advantage?

Moving into the Cloud should be a well thought out and carefully executed process. While there are definite economic advantages to using the Cloud, there are also risks. As mentioned previously Pharmaceutical companies should outsource processes and systems that do not generate significant competitive advantage. It comes down to this basic principle*: If managing a system or process in-house does not derive significant market advantage it should be managed for the lowest cost, and outsourcing usually results in the lowest cost.*

In addition to the non-industry specific examples of Cloud computing technologies already mentioned in this report, there are a number of processes specific to the world of pharmaceuticals that are a natural fit with the Cloud. Examples include:

- **Internet Faxing** - A number of prominent bio-pharma companies are turning to Fax SaaS solutions such as EasyLink's Desktop and Production Messaging. These solutions allow organizations to send and receive faxes exactly like e-mail, providing improved productivity, efficiency and secure, compliant, and auditable messaging. By utilizing this solution, businesses reduce paper, eliminate costly fax servers and machines, reduce errors and provide fax capabilities to employees even when they are out of the office. Furthermore, these solutions integrate with back-end systems, translating data into formatted files for delivery via fax, secure email, text message, or EDI.
- **E-Recall / Notify and Supply Chain Mgt.** – Supply chain tools, like RedPrairie's E^2e^{TM} solution, ensure expired or other red-flagged items are not shipped from your facilities. These SaaS tools automatically place items on hold across the entire supply network based on lot / product expiration dates or quality assurance alerts. These tools can also systematically notify all affected end customers. They allow pharma companies to trace products across supply chains using the latest technologies such as RFID. They also allow you to enforce customer-defined rules permitting or prohibiting lot mixing in storage locations, and they support multiple cascading lot, inventory, and location holds.
- **Data management and Performance Analytics** – A number of vendors offer SaaS tools for analyzing sales, inventory, service levels and supply chain data. These tools are especially important given the increasing number of Pharmaceutical manufacturers who pay distributors based on their performance. Pharma analytics

"I don't know any company that has significantly increased its market position by managing their fax infrastructure better than the competition. However, many have formed strong competitive advantages through IT outsourcing."

Tom Stallings,

CEO, EasyLink Services International

applications, such as ValueTrak by ValueCentric, LLC, aggregate and analyze large volumes of data using proprietary and customizable monitoring, reporting and scorecarding methodologies to help manufacturers optimize their supply chains and improve business decisions.

- **EDI Value Added Networks** – Many Pharmaceutical companies need to integrate data from their trading partners and suppliers directly into their ERP and financial applications. However the movement, connectivity management, data transformation and integration of this information are difficult. Increasingly Pharmaceutical companies are turning to EasyLink's EDI VAN to securely transfer B2B information from partners directly into their ERP and financial applications. EasyLink's EDI offerings also help Pharmaceutical companies increase EDI compliance of small suppliers through its Web Gateway application. This SaaS solution enables companies that do not have in-house EDI expertise or technology to comply with their Pharmaceutical clients' EDI requirements. The supplier simply logs on to a web application which walks them through the steps necessary to send the EDI data in the right format for the Pharmaceutical company with which it is doing business.

Conclusion

In conclusion, it is important to understand that we are at the beginning of a major technological shift with Cloud Computing. The inevitable result of a number of smaller-scale technology innovations dating all the way back to the Berlin airlifts, Cloud Computing is already having a profound effect on the way IT is managed in organizations around the globe. While the exact definition of this term is still being developed, there are clearly four types of Cloud services: Infrastructure as a Service, Platform as a Service, Integration or Network as a Service, and Software as a Service. Pharmaceutical companies, as well as organizations in other industries, are already using the Cloud to their advantage. As this technology continues to proliferate, companies that make effective use of it will enjoy major cost reductions and other significant advantages. Pharmaceutical companies should use these tools as replacements for outdated systems such as fax machines and servers and other old hardware. They should also consider these technologies as their various client-server application licenses come up for renewal.

"Cloud computing is the story of our lifetime. Eventually all devices will be on the network"[5]
Eric Schmidt, CEO of Google

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