CLOUD COMPUTING FOR THE FINANCIAL SERVICES INDUSTRY

Author: Abhinav Garg
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CLOUD COMPUTING FOR FINANCIAL SERVICES

EXECUTIVE SUMMARY

Cloud Computing is the buzzword in technology circles today. It is sometimes compared with the virtualization of computing power, applications and storage, thought of as a model to deploy pay-as-you-go web services or perceived to be similar to grid computing. Cloud computing shares characteristics with all of these technology paradigms, yet it has more to offer.

The purpose of this document is to provide a point of view on how cloud computing is applicable to the financial services industry and to provide an approach for adoption by a financial services firm. We start by introducing cloud computing and its characteristics. Then we outline the common challenges that different financial services firms have faced while implementing cloud computing.

We also discuss the factors that make cloud computing an attractive option for a financial services firm, substantiate the advantages of cloud computing by providing some examples of adoption by financial services firms, and provide our perspective on the ideal types of financial services systems that should be moved to a cloud. Finally, we suggest a cloud computing readiness approach, which can be adopted by firms to make sound decisions around their approach to—and readiness for—cloud computing.

WHAT IS CLOUD COMPUTING?

The U.S National Institute of Standards and Technology (NIST) defines cloud computing as “a pay-per-use model for enabling available, convenient, on-demand network access to a shared pool of configurable computing resources [e.g., network, servers, storage, applications, and services] that can be rapidly provisioned and released with minimal management effort or service provider interaction. This cloud model promotes availability and is comprised of five key characteristics, three delivery models and four deployment models.” In other words, cloud computing is a potent combination of a public utility, such as electricity or telephone, and autonomic computing. Like a public utility, it has elasticity for scaling up or down, is accessed through pooled computing resources using a multi-tenant model and can be metered and billed only for the usage. And like autonomic computing, it’s a self-managing system of distributed computing resources, adapting to unpredictable changes while hiding intrinsic complexity from users. Cloud Computing can be delivered through such delivery models as:
Software as a Service (SaaS)
• Google Docs—A suite of products that allows you to create different types of documents, work on them in real time with other people and store them, along with other files, online.
• Salesforce.com—A cloud-based Customer Relationship Management (CRM) platform that can be used by a firm to connect with customers and employees.

Platform as a Service (PaaS)
• Microsoft Azure—A platform cloud that helps developers build, host and scale applications through Microsoft datacenters.
• Google App Engine—A platform cloud that enables developers to build and host web applications on the same systems that power Google applications.

Infrastructure as a Service (IaaS)
• Amazon EC2—An infrastructure cloud web service that provides resizable compute, storage and network capacity on the cloud.
• Rackspace—An infrastructure organization that enables public, private and hybrid cloud hosting.
• NYSE Euronext CMCP—Infrastructure cloud services offering aimed at NYSE Euronext’s financial services customers.

Business Process as a Service (BPaaS)
• ADP Employease—An Online business process services for HR, benefits administration and outsourcing.
• AMEX Concur—An online business process that connects travel suppliers and mobile solutions from around the world to provide advanced travel and expense functionality.

Data as a Service (DaaS)
• Google Public Data—A public data service that makes large datasets easy to explore, visualize and communicate.
• Xignite Capital Markets Data—A platform that

The above cloud services can be delivered through deployment models, such as:

• Public Cloud—A public cloud is available over the internet to everyone. The cloud provider manages and owns everything from operations and facilities to computing resources. Popular public clouds are Amazon EC2, Google App Engine and Microsoft Azure.

• Private Cloud—A private cloud is available only to trusted users of an organization or group. Everything in a private cloud can be managed either by the organization or the cloud provider.

• Community Cloud—A community cloud is accessible to the members of a larger community comprised of different organizations or groups, and where partner organizations and the cloud provider co-manage everything from operations to facilities.

• Hybrid Cloud—A hybrid cloud is a mix of multiple public and private clouds and it addresses the challenges of a pure public or private cloud environment.
CHARACTERISTICS OF CLOUD COMPUTING

The key characteristics of cloud computing include the following:

- **On-demand self-service**— Unilateral provisioning of such computing resources as server time, storage or network bandwidth, without requiring human interaction with service providers.

- **Ubiquitous network access**— Access to systems regardless of user location or device (PC, mobile phone, tablet, etc.).

- **Resource pooling**— Multi-tenancy that enables sharing of pooled resources and costs across a number of users, with different physical and virtual resources dynamically assigned and reassigned according to user demand.

- **Rapid elasticity**— Quick scale up or scale down of resources through elastic provisioning or the release of capabilities in near real time.

- **Pay per use**— Capabilities that are charged using a metered, fee-for-service or advertising-based billing model to promote optimization of resource use. One pays only for the time when the resource is used.

KEY CHALLENGES

Cloud computing comes with its share of challenges, in terms of security, data privacy, compliance, availability, lack of standards, etc. These challenges are highlighted more in a regulated and security-sensitive environment, such as financial services.
The challenges impact financial services firms in the following ways:

- Firms are apprehensive about their data being compromised on a public cloud or the monetization of their customer data by cloud vendors. For example, traders in a firm would be extremely wary of placing their proprietary trading strategies in a cloud, fearing that a competitor on the same cloud might gain access to them. Similarly, portfolio managers and risk analysts are apprehensive about the asset allocation or benchmark rebalancing strategies of a firm. Since financial services firms operate in a highly regulated environment, any loss of customer data or any of the above scenarios could have reputational implications and lead to a barrage of lawsuits from customers.

- IT managers are also worried about availability of applications deployed on a cloud. Cloud computing vendors generally provide services on standard terms, which tend to be for the benefit of vendors, including limited warranties. Imagine a scenario in which a cloud provider deletes a customer’s data or takes down a customer’s application for days or weeks for breach of contract, such as non-payment. It would create many problems for a firm. And cloud outages, like the one at Amazon, further compound the fear of non-availability.

- Vendor lock-in is another concern. Most cloud providers provide access to their resources through proprietary APIs, web interfaces or command line tools. If a firm wants to shift to a different cloud vendor, there would be high cost involved to switch to new interfaces, which might actually negate the advantages of using the cloud in the first place.

MARKET OPPORTUNITY AND CONSIDERATION FACTORS

A 2010 IDG survey revealed that:

- 6% of CIOs polled felt that cost reduction across the board was a critical business priority for the future

- 62% felt that optimizing resources and key business processes was going to be a priority

- 67% saw improving the marketing time for products and services as critical in the coming years

A financial services firm that heavily relies on IT enabled services can benefit from cloud computing, despite the objections mentioned above. Perceived cost savings, ease of scaling-in and scaling-out, faster time-to-market for deploying systems, virtualization of enterprise-wide data as a service, enterprise technology standardization, and the ability to access data and applications on the move are all critical consideration factors that can drive financial services firms to adopt cloud computing.
**Cost Savings:** Business agility is determined by the cost an organization incurs. There are a few on-demand, self-service-based, and perceptually inexpensive public cloud computing solutions, that have served as a wake-up call for IT departments. Low-cost price plans marketed by public cloud vendors have encouraged IT departments to become more familiar with exact costs, resource allocation models and the variety of cloud models, including public, private and hybrid. For example, Firm58’s SaaS billing solution automates fee management, commissions and payouts for trading firms, broker and dealers, which helps those firms free up resources that can be leveraged for more strategic initiatives. Billing is a non-core process for financial services firms, and outsourcing it to a less expensive third-party allows them to channel their funds into core technology-based functions. Imagine achieving cost benefits by moving one of those core technology-based processes to a cloud, like NASDAQ did for its Market Replay application. It’s a rich client application, which provides NASDAQ-validated replay and analysis of stock market activity. Using Amazon Simple Storage Service (S3) to restore all historical data, the application is an inexpensive and extremely scalable storage solution for NASDAQ, which generates gigabytes of trading data every day.

**Scalability:** In addition to cost savings, NASDAQ, with billions of text files for countless number of users, also benefited from increased data scalability without sacrificing performance. If well designed cloud solutions enable firms to meet user demands and scale quickly, dynamic provisioning of computing resources, whether it is CPUs, memory or IP addresses, will save business users and IT professionals from engineering the systems for peak loads. To stay compliant with today’s regulations around risk management processes, financial services firms need multiple times the computing power for risk modeling than they did before the financial crisis of 2008-09. And that’s why firms are looking at cloud-based grid solutions. Normally, to run these risk simulations and calculate analytics indicators, computing power is heavily required only at certain times of a day, leaving resources idle for the rest of the time. If shared computing resources could be made available to such processes based on when they are run and the data load, it could lead to
instances of almost zero unutilized computing power. Firms can tackle the challenges of security and data privacy by creating a hybrid cloud where sensitive data can reside on a private cloud and computing power can be available on a public cloud. These private and public clouds can be combined in a virtual private network to create a single scalable hybrid cloud.

**Time to market:** With cloud computing, time to market can be reduced from months to weeks or days, depending on the size of a firm. A self-service based, on-demand and real-time monitored cloud helps by:
- Eliminating procurement delays for computing hardware and software
- Expediting computing power for when existing applications need to handle peak loads
- Eliminating the upfront capital and time investment for procuring hardware for proof of concept work or rapid application development

**Data Virtualization:** Virtualization of data is not a new concept. In fact, extraction, transformation and loading (ETL)-based business intelligence systems have been around for a while. Data virtualization is the integration of data from multiple and disparate sources across the enterprise or external sources for the on-demand consumption by a wide range of applications in a virtualized manner. The Dodd-Frank Act mandates a 360° view of risk and performance across all asset classes and portfolios within a firm, enforces more compliance and regulatory reporting for financial services firms, and warrants a way to value positions and calculate variation margins for OTC derivatives collateral posting. These mandates require firms to have a data virtualization strategy in place, which can be used to provide a single source of reference data, such as security master data, single view of positions and holdings, book and counterparty data, etc. Also, risk and analytics calculations rely on many different types and sources of data, including relational, semi-structured XML, dimensional and the new Big Data types. Leveraging large volumes of data from such sources makes query performance a critical success factor. Energy firms can also benefit from data virtualization because they require energy data from smart meters. When that data is combined with historical data from other commercial sources, it can enable those firms to identify user energy consumption patterns and forecast for the future accordingly. Combining such disparate data from public and private domains is a challenge. Therefore, accessing that data from a single virtual source would drive scores of data consolidation and mash ups within energy firms.

**Enterprise Technology Standardization:** Oftentimes, there is a lack of standardization in terms of technology and architecture approaches used by different groups within a firm. The solutions might be similar in nature, but application environments, with individual components and configurations, are considerably different. Standardizing these technology and architecture approaches would reduce duplication of effort. Additionally, different units of cloud computing infrastructure, such as virtual machine images, architecture patterns and templates, would allow teams to create standardized environments. A cloud would also enforce development lifecycle standardization across different teams—once they start accessing it through the same interfaces.

**Mobility:** Many of today’s business users want to access risk and analytics reports, performance attribution metrics and trading summaries while they are on the move. They see the advantages of accessing their emails on their smart phones and tablets, anywhere and anytime. Likewise, they want similar interfaces for financial services-specific applications. And since a cloud enables users to access systems and infrastructure using a web browser or customized clients regardless of location and time, development of such interfaces has started taking shape. Some financial services players have ventured into this area by developing iPhone, Android and iPad interfaces for their account management applications, CRM tools and data research and reporting applications.
CURRENT ADOPTION

Cloud computing has caused more debate than many other recent technological advancements. Regardless, there has been a tremendous rise in its adoption by financial services firms over the last couple of years. Some prominent examples include:

**NYSE Euronext Capital Markets Community Platform:**
Recently, NYSE Euronext launched a PaaS community cloud service for the financial services industry, aimed at brokers, dealers, hedge funds, and other market makers. The platform has been set up to host customer applications and services, such as electronic trading, market data analysis, algorithmic testing and regulatory reporting.
The infrastructure consists mainly of storage and virtualization tools from EMC and VMware, running on Xeon-powered blade servers.

**NASDAQ OMX Data on-demand:** This SaaS cloud service, built with the support of Xignite, provides easy and flexible access to massive amounts of historical level 1 tick data. It’s a web application that allows users to purchase data online and access it using an application programming interface (API) or as plain text files.

**CME Clearport OTC Data on-demand:** This on-demand SaaS web service is also built on top of the Xignite platform and offers access to end-of-day OTC settlement, volume and open interest data to support markets available through CME Clearport®.

**I-Banks using cloud for risk analysis and non-core processes:** Now a part of Bank of America, Merrill Lynch used IBM iDataPlex servers as part of an IaaS strategy to build and evaluate risk analysis programs. The servers turn many separate computers into a pool of shared resources, i.e., a cloud. Morgan Stanley uses PaaS cloud vendor Force.com for its recruiting applications and has extensive cloud penetration in analytics and strategy.

**Gridglo real-time energy apps:** The startup, Gridglo, is developing SaaS services to sell energy information to utilities. It is mining energy consumption data from smart meters and combining it with data from other sources, such as real estate, weather and demographic data, to provide tools for energy forecasting, demand response analytics and energy credit scoring for categorizing different types of consumers, along with a financial risk energy tool.

**Microsoft Azure DataMarket for the Energy Industry:**
Microsoft DataMarket SaaS cloud services enable the discovery, exploration and consumption of data from trusted public domains and commercial data sources, such as demographics, health, location-based services, real estate, weather, transportation, navigation, etc. It also includes visualizations and analytics to enable insight from that data. All this data can be incorporated into software applications for any device through a common API. Different players in the energy industry are using this platform to create energy forecasting and analytics applications.
WHAT’S AHEAD?

There are countless opportunities for financial services firms to leverage the benefits of cloud computing by migrating a variety of applications to the cloud. Non-core applications and such business processes as recruiting, billing and organization-wide travel management can—and should—easily move to the cloud. A number of infrastructure operations, such as data center management, data storage and disaster recovery, should also move to a cloud after a thorough evaluation of different vendors offerings and based on the flexibility of cloud vendors in documenting contracts. Although very few firms are currently using cloud computing for their core applications, different hosting architectures provided by IaaS cloud providers and new avenues in the community and hybrid cloud space, will drive more firms to move their core applications to the cloud. In fact, core solutions, such as batch processes running throughout the day, analytics and reporting applications, are perfect candidates. A few scenarios that would be ideal for a cloud deployment include:

**Risk analytics calculation:** Applications that calculate such analytics as cost of trade, current value, yields, Greeks, etc., at the level of a single security, position or portfolio are perfect candidates for a grid-based cloud. A cloud-based grid service can easily scale up or scale down depending on the data load. What’s more, the applications can be seamlessly deployed on multiple grid nodes, reducing maintenance overhead. Also, since such applications only run for specific durations, dedicated hardware leads to unutilized CPU cycles, which can be optimized by a grid-based cloud. The whole solution can be implemented on a private cloud where existing computing power can be virtualized and made available as an on-demand service.

**Performance attribution:** Performance attribution provides a framework for examining the relative performance of a fund versus its benchmark. It is a methodology that quantifies the success or added value of an investment strategy. Attribution allows investment managers to identify the factors of the investment process that contributed (positively or negatively) to the performance levels highlighted by performance measurement. Hence, these data-intensive processes need access to a huge amount of historical data for correctly calculating metrics. Performance attribution or benchmark rebalancing applications run at specific times of a day, like the analytics calculation processes. As such, these are ideal candidates to be deployed on a cloud, able to optimize the usage of available computing power and the scale-in and scale-out benefits of an existing grid.

**Trade matching and reconciliation:** A trade matching process gets trade data from multiple brokers and counterparties and then reconciles it. This process is prone to high volumes during times of peak trading. The solution is to create a hybrid cloud where the reconciliation process can run on a public cloud for scalability and the data can reside on dedicated database servers in a private cloud. The data from multiple brokers and counterparties can be pushed to the public cloud, which can then be streamed to the private cloud. This can also help avoid creating separate connectivity to new partners and maintaining all those connections simultaneously.

**Reference data virtualization:** Various types of reference data, such as security master data, positions data, holdings and book data, broker and counterparty data, etc., reside in multiple kinds of data sources. These data sources can be internal databases, file systems or external feeds. When an application needs to access data from many sources, it can be a challenge to devise strategies that connect those data sources and consolidate and aggregate the data within the application for specific needs. The recommended solution is to build a data virtualization layer that seamlessly federates these different data sources and provides different ways to access the single virtual data source. The layer should be flexible enough to mash up different streams of data according to the requirements of a particular application. Similar to the reference data virtualization layer, a transactional or operational data virtualization layer can be created to support risk management, financial analysis and compliance reporting. The goal is to make all data available through centralized data services.
Cloud computing has caused more debate than many other recent technological advancements. Regardless, there has been a tremendous rise in its adoption by financial services firms over the last couple of years. Some prominent examples include:

**SAPIENT CLOUD READINESS APPROACH**

Developing a successful cloud strategy starts with a thorough evaluation of current business processes and applications and identifying those that can be moved to a cloud. The processes and applications should be evaluated using a balanced scorecard. The identified processes typically show characteristics similar to the applications documented in the section above. The balanced scorecard uses parameters, such as privacy requirements when the information is stored on a cloud, peak load hours, architecture constraints and such legal requirements as the physical location of hardware, which will decide applicable legal jurisdiction and laws of country, etc.

**Phase I—Evaluate**
Developing a successful cloud strategy starts with a thorough evaluation of current business processes and applications and identifying those that can be moved to a cloud. The processes and applications should be evaluated using a balanced scorecard. The identified processes typically show characteristics similar to the applications documented in the section above. The balanced scorecard uses parameters, such as privacy requirements when the information is stored on a cloud, peak load hours, architecture constraints and such legal requirements as the physical location of hardware, which will decide applicable legal jurisdiction and laws of country, etc.

**Phase II—Prototype**
In the Prototype phase, particular processes are selected and the type of deployment model, including public, private or a hybrid cloud, is decided. Plus, strategies for storing data with different security requirements and complexities are developed. Some of the key decisions focus on where the most sensitive data should be located and how less-sensitive data will be processed. This phase also includes the evaluation of cloud vendors based on data and architectural parameters. Proper assessment of cloud vendors with respect to their focus on security, data confidentiality and availability are completed. Choosing the right vendor involves understanding what each one can offer and how their offerings align with the firm’s requirements.

**Phase III—Implement**
Once the deployment model is decided and cloud vendors are chosen, the implementation phase begins. In this phase, applications are deployed on cloud. Several factors are kept in mind during this phase, including migration and cutover planning, as well as the adoption and operational management of the new process.

**Phase IV—Measure**
Finally, an organization should spend considerable time measuring the ROI achieved and fine-tuning the adoption process. In this phase, ROI is measured considering the objectives and feedback is collected from end users. The output of this phase is fed back into the evaluation process to fine-tune the next roll-out.
CONCLUSION

Continued growth of cloud computing within the financial services industry will require vendors and firms to overcome its challenges together. The NYSE Euronext community cloud paves the way for these types of collaborative ventures in the future, where multiple firms will have a proportionate stake. And in the areas where data secrecy is more important than collaboration, hybrid clouds with the appropriate allocation of data and applications are recommended.

Cloud Computing is a promising paradigm for delivering computing utilities as services. Just as personal computers and servers shook up the world of mainframes and minicomputers, or as smartphones and tablets revolutionized the mobile commerce industry, cloud computing is bringing similar far-reaching changes to the licensing and provisioning of infrastructure and to methodologies for application development, deployment and delivery. Some firms have already realized the benefits of cloud computing, which include scalability, cost savings and time to market. Firms that are still looking to leverage the cloud should begin by moving non-revenue generating and non-core systems to the cloud. And, they should consider developing a comprehensive cloud strategy to move core applications to the cloud.

Since major shifts in technology can take years to make an impact, the migration of core financial services applications to the cloud might take some time. Using Sapient’s Cloud Readiness Approach, financial services firms can meet the technical challenges of cloud computing and build a comprehensive and effective cloud strategy.
WEB REFERENCES

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About Sapient Global Markets
Sapient Global Markets, a division of Sapient® (NASDAQ: SAPE), is a leading provider of services to today’s evolving financial and commodity markets. We provide a full range of capabilities to help our clients grow and enhance their businesses, create robust and transparent infrastructure, manage operating costs, and foster innovation throughout their organizations. We offer services across Advisory, Analytics, Technology, and Process, as well as unique methodologies in program management, technology development, and process outsourcing. Sapient Global Markets operates in key financial and commodity centers worldwide, including Boston, Chicago, Houston, New York, Calgary, Toronto, London, Amsterdam, Düsseldorf, Geneva, Munich, Zurich, and Singapore, as well as in large technology development and operations outsourcing centers in Bangalore, Delhi, and Noida, India.

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