

# Cloud Computing Services:

meeting more than demand spikes in FX

Whilst it may still be early days in the evolution and adoption of Cloud Computing technology by financial services firms and other institutions, the hype surrounding it may in five years time have dissipated to such an extent that market participants and end users regard Cloud technology as the norm. Roger Aitken investigates how the Cloud Computing model operates and in what ways the pooled resources of an enterprise Cloud design can assist with the delivery of FX trading applications.

Many organisations today appear stuck with legacy applications that are handcuffing them from investing in new technologies and applications to deliver competitive advantage, reduce costs and increase revenues. The scenario might be akin to a crash on the highway waiting to happen, which can only be avoided by investing in modernising applications and retiring older IT systems.

Highlighting the nature of problem, recent analysis undertaken by Forrester Research of 562 companies in North America and Europe has revealed that 55% of current IT budgets are dedicated to propping up systems and business processes that are between 10 to 20 years old. Clearly, this is a huge maintenance burden, which is where Cloud infrastructures can play a pivotal role going forward.

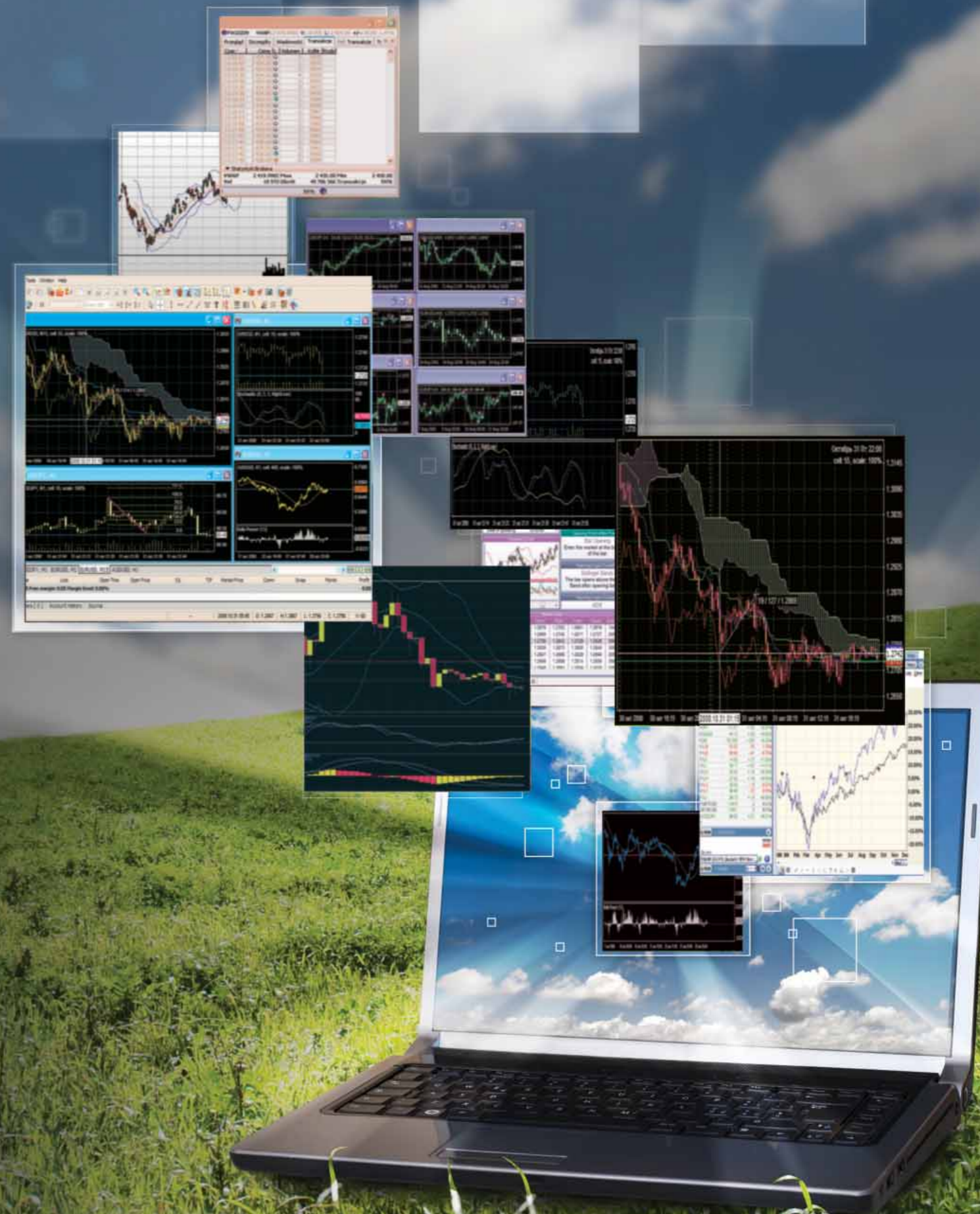
Change is obviously hard for many organisations, and many reasons are cited for why firms delay IT modernisation. However, as a Gartner paper warned ("Signs Indicate a Train Wreck is Coming Unless You Modernize IT"), an impending IT disaster might well be inevitable unless applications are overhauled. Consequently CIOs have been advised to "fund an IT modernisation/application overhaul program."

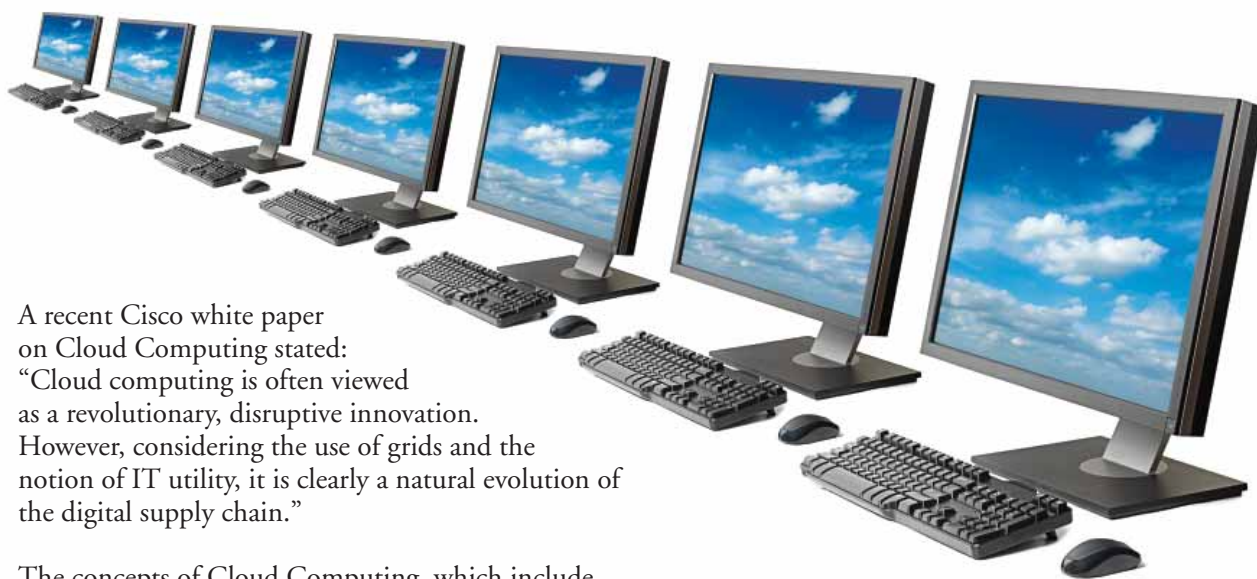
## Definitions

"Cloud computing as a term is very broad and means different things to different people," notes Rob Gagne, V-P of Engineering, Nexaweb Technologies in based in Burlington, Massachusetts, and the architect of the firm's FX Accelerator product.

He adds: "From a purely technical viewpoint, whether it is a private Cloud or public Cloud, what Cloud Computing in general allows one to do is leverage virtualisation technology, as well as some things that have been on top of virtualisation technology to run machines independent of hardware."

In terms of definitions, Wikipedia refers to Cloud Computing as: "Describing a new supplement, consumption, and delivery model for IT services based on the Internet, and it typically involves over-the-Internet provision of dynamically scalable and often virtualised resources. Frequently this takes the form of web-based tools or applications that users can access and use through a web browser as if it were a program installed locally on their own computer."





A recent Cisco white paper on Cloud Computing stated: “Cloud computing is often viewed as a revolutionary, disruptive innovation. However, considering the use of grids and the notion of IT utility, it is clearly a natural evolution of the digital supply chain.”

The concepts of Cloud Computing, which include networked infrastructure resources, available for a price and accessible over a standard interface, are fairly similar to preceding ones, with the main differentiator being that these resources are now supplied from outside the enterprise firewall. As a result the Cloud operating environment is more reliable, agile and efficient. Being abstracted, it can evolve as new technologies emerge.

Nexaweb, which has helped over 200 customers transform growth-limiting legacy applications into modern web-based Cloud Computing solutions that are securely accessible to anyone from anywhere at any time and help fuel expansion, views Cloud Computing as a “continuum of leverage, opportunity and benefit.”

Clients that Nexaweb work with are not using services from the likes of Amazon, but what they are doing is using additional technology in order to create new nodes. This means that they do not have to buy new computers, but just add new nodes as required.

### Well suited to FX

Harpal Sandhu, CEO, Integral Development Corp., which develops and operates FX Grid, a global Multi-sided Trading Facility (MTF) connecting active market participants with all major sources of FX liquidity, contends that while Cloud Computing has a lot to offer in any environment, it is especially “well suited” for FX markets. And, there are good reasons for this.

“FX trading at the outset is an expensive proposition due to the OTC nature of the market and there is no ‘one-size-fits-all’ solution,” Sandhu says. “So, in order to be an active market participant, one needs to provide both sides of the technology, the functionality an exchange would provide in equities, and the functionality of a broker or bank connecting with this exchange.”

On top that there is the sheer volume and volatility in the FX marketplace, which puts enormous strains on the underlying IT infrastructure. And, on a very basic level, Cloud Computing allows for a dramatically reduced cost structure because of the use of a shared IT infrastructure, shared support, and the standardisation that comes with it.

“Once in place, a Cloud-based FX trading application offers the added advantage to be very scalable,” he adds. “Last but not least, Cloud Computing allows for active market participants to only incur trading expenses when actually trading.”

### Private versus Public Clouds

Generally speaking, there are three primary services that are provided by the Cloud infrastructure, though each are interrelated. In terms of the enterprise Cloud design, the basic Cloud is comprised of pooled resources (compute, network, and disk) that are dynamically provisioned to meet the demands requested of it. Real-time and on-demand virtualisation technologies are used heavily for rapid deployment of resources to meet the demand.

At one end of the spectrum are Private Clouds enabled by virtualisation technologies such as Xen and VMware. Many organisations are opting for this approach to simply move applications to a more efficient IT infrastructure. Private Clouds dynamically provision computing resources on demand (by utilizing idle CPUs in the datacentre) to handle peak usage or to guarantee continuity of service in the case of server failures.

Public Cloud is enabled by vendors such as Amazon and Rackspace, all of which offer solutions that leverage their back-office infrastructure for storage and run-time.



Rob Gagne

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“Public Cloud is pay-as-you-go, but you do have to manage it yourself,” explains Nexaweb’s Gagne. “So, you’re getting the virtual equivalent of a datacentre, without having to pay for a datacentre. However, one still requires IT admin staff and the type of people that would run the datacentre for you. You just don’t need to make that upfront investment in the data centre.”

While with private Cloud an upfront investment is required, users do need to buy the hardware (although it allows hardware to be used much more efficiently). Dedicated or shared CPU and storage resources are hosted, operated and secured remotely. They are provisioned on-demand typically for a monthly usage fee that depends on the type of hardware provisioned and the usage level (e.g. bandwidth or CPU consumption). Companies utilising public Clouds do give up some control and flexibility (as they do not control the computing resources directly). That said, firms gain economic and speed advantages by not having to incur additional in-house data center overheads.

### Service models

At one end of the service spectrum is Platform as a

Service (PaaS) solutions which offer customised APIs and built-in libraries for quickly building tailored applications running on a public Cloud infrastructure. Then there is Software as a Service (SaaS) solutions, offering turn-key web-based applications on demand and finally there is Infrastructure as a Service (IaaS) applications.

“Software as a Service (SaaS) is a pay-as-you option go without any up front investment,” says Gagne. “Platform as a Service (PaaS) is also pay-as-you-go, where the upfront investment that one needs to make is your own software development effort, since the provider does not offer you with the full solution. You need to build on top of that.”

He adds: “What virtualisation allows you to do is to move things around over the course of a day or a week, so that your idle time is significantly far lower and therefore you can do more with less hardware.” In effect, it lowers the initial investment and allows firms to leverage it flexibly and efficiently.

Sandhu notes: “IaaS (Infrastructure as a Service) is offered by us because FX Grid is constantly integrating with new providers and venues and all of that integration is offered to customers on a provisioning basis at no additional cost.”

He adds: “PaaS (Platform as a Service) is offered when we [Integral] allow certain clients to develop their own algorithmic trading models and run them within the FX Grid (the Cloud). We also offer SaaS services for people who use the best execution facility we provide as a set of business services. They might use those for themselves or they might provision them for their clients’ usage.”

### Improving operational capabilities

Commenting on the benefits and the ways the pooled resources of an enterprise Cloud design can assist with the delivery of FX trading applications, Nexaweb’s Gagne says: “The main benefits these institutions are going to realise, is firstly leveraging the private Cloud and using that as a way of making better use of computing resources and providing more flexibility around peak times/peak usage and being able to react quickly to requiring more capacity.”

And, Cloud technology can certainly help avoid downtime. “One can literally take a running instance of your application and move it from one computer to the other using Cloud technology and not have to worry about losing downtime,” he says.

Essentially the same sort of technology that Amazon provides can be used and run in your own data centre. “And, that’s what a majority of banking customers are doing today,” says Gagne. “They are utilising that technology but not taking that additional step of selecting Amazon as a hosting provider. They are still keeping it within their own datacentre, but leveraging all the same type of technology.”

Stuart Grant, Sybase, EMEA Business Development Manager, Financial Services, Sybase, who labels Cloud Computing as being akin to “wolf in sheep’s clothing” says: “It’s starting to get into a cycle where the Cloud Computing capabilities could help organisations bring their front, middle and back office functions far more closely together than they ever have in the past, whilst at the same time improving the operational capabilities of the trading desks.”

He adds: “In this way these organisations can reduce the risk element by being able to monitor market to market missions, maximising the profitability and running their algorithms right next to the trading activities.”

Integral is certainly pushing the envelope of the benefits of Cloud services to its FX customers. According to Sandhu the provider “is unique in the degree to which brokers can take these Cloud services and build their own private exchanges on top of it.” Integral offers brokers the ability to define liquidity streams, business processes and risk management preferences on a customer-by-customer level.

A broker, for example, can fine-tune his offering so that a customer might receive a tight spread on one currency pair, but less tight ones on others. Sandhu claims: “This is truly a break from the traditional view of Cloud Computing that is focused on connectivity and delivering the same Cloud-based application to all users.” Integral also allows a user to customise and extend the functionality of FX Inside Professional with ease by providing an industry-standard Integrated Development Environment (IDE). Users can write their own programs (“Add-Ins”) in any Microsoft compatible programming language.

### Data management and analytics

From Sybase’s perspective, Grant says the vendor is coming at matters from the data management and analytics side of things and for the past decade has been focussing on “improving an organisation’s ability to report and perform on-demand analysis on any kind of data.”

He adds: “When one looks at the opportunities that

Cloud Computing provides it is perfectly in line with our strategy in that we’re now able to provide organisations with ‘One version of the Truth’ that enables them to act on that data in real time, regardless of whether or not that piece of data has just occurred, is static reference data or it was created 10 years ago.”

As a leading provider of software in that respect, Sybase also has the mobile capability as well “to mobilise that information out to handheld devices”. And, they are one of the few organisations that have those core components lined up for enterprise-class scale.

The most important business drivers for utilising Cloud Computing solutions in FX trading are according to Integral’s Sandhu “the ability to increase revenue and improve risk management practices”, whilst at the same time benefit from a dramatically reduced cost structure.

He adds: “Cloud computing allows companies to capitalize on revenue opportunities by quickly launching and expanding their private band FX

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trading system, with no up-front cost. They can improve their risk management procedures by exactly defining the market risk one wishes to retain, on a customer by customer level or basis.”

All this can be done on a dramatically reduced cost structure by taking advantage of a shared infrastructure with Cloud Computing solutions, paid for as you go.

“Among the most important advantages is that time to trade is reduced to weeks - from months or even years,” says Sandhu. “So, instead of spending time and money on re-inventing the wheel, a broker can take advantage of top-tier liquidity and industry-leading technology developed by a third-party technology provider.”

### Reducing complexity

Sybase's Grant notes: “The real opportunity for Cloud Computing is actually to improve the transparency of what is going on in many of these financial organisations by reducing a much of the complexity that has been in place. For example, we speak to a number of organisations who have the same data replicated 50, 100, or even 150 times in different offices around the world.”

So, not only should it benefit institutions' fundamental and underlying business, but it could go some way to appease regulators' concerns in terms of risk - credit risk, liquidity risk and counterparty risk.

### Benefits to FX firms

In term of the benefits that banks, FX brokers and trading firms are likely to see by utilising Cloud Computing solutions, in addition to things like optimised trader desktop environments, improved risk management, speedier disaster recovery, and more flexible control over non-strategic administration and data management applications, Integral's Sandhu regards the main benefit is really in increased flexibility.

As he frames it: “Fundamentally, it's about how a broker is able to automate exactly the way they are doing business today without having to make any compromises. Cloud computing allows brokers to organize and automate their existing business exactly the way they have it.”

Tim Haman, CEO, Fair Trading Technologies (FTT), which is based in the UK and has a development office in Sweden, says: “I believe that any financial institution, brokerage or bank that would like to go into Cloud Computing really needs to have their



Harpal Sandhu

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own private Cloud. Inside this private Cloud one can enable a public area where the traders and users can have their own servers and their own Window 7 workstations and trading terminals, which will then be remote controlled from wherever their client is.” FTT, developer of the T3 Execution bridge, uses Cloud Computing in its retail FX trading applications.

Haman says: “Everybody in the FX market is talking about the spread. The spread is a big marketing tool in terms of say a 1 or 0.5 pip spread. However, that is completely unimportant to the trader because it does not matter what type of spread they have. What matters is the latency when placing an FX order to reduce the slippage as much as possible.”

When FTT decided to use Cloud Computing technology they opted to use a VMware solution. “We have a rack of physical servers in Zurich and they are combined in one physical machine in a cluster. And, this high physical machine is divided into a number of virtual machines,” says Haman.

The MT server, bridge and MT demo machine resides in this Cloud of virtual machines. The transfer

time between the servers is in microseconds, rather than milliseconds. Offering a VPS solution (virtual private server), which your clients can connect to, it effectively means a latency saving for end users of between 0.5 and 1 second, Haman claims. This means if a trader puts in an order for a million in some currency pair and they save a second, it translates to a saving of a \$100 as the pip value is perhaps \$100 for that second. Haman says: “So, we're minimising the slippage in the order and saving money for the clients as well as making money on the volumes that the clients trading.”

As to whether the benefits of Cloud technology development outweigh the costs, Haman says: “The benefits are really the costs, the time savings and also a huge benefit of improved security because in the Cloud everything is redundant.”

He adds: “One is not depending on an Internet supplier or a single computer. If something crashes, which computers tend to do from time to time, you're instantly backed up with a secondary resource to our [FTT] private Cloud in Zurich. Thus, if any one or two of our three ISPs encounter a problem and the Internet goes down, clients still have a third way to remain operational. That means significant uptime. It can never be 100%, but close to 99.9%.”

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Tim Haman

There are also issues around improved risk management and security through having access to Cloud technology. If, for example, a trader places an order and they would like to get out of it, then were they to experience a problem with the Internet, pulling out might not be possible. “In a Cloud environment one has more security and greater redundancy, which will enable a trader to actually get out of the order,” Haman says.

### Deploying Cloud solutions

In terms of the building blocks required to deploy a Cloud Computing solution and what issues are involved in migrating legacy FX trading infrastructures to the Cloud, Sandhu says: “The foundation for us is a low latency FX Grid to make OTC trading possible. Then, one requires flexible best execution services to be deployed for an institution or the client of that institution.”

He further explains: “The service provider must be able to just configure the system to the client's satisfaction, i.e. turn on/off that other venue for price discovery, turn on/off that other venue for execution, report to that other CCP when the trade is done, add the trading costs to the spread before the trade is done, and charge a separate commission to my traders, etc.”

“Finally, robust and complete monitoring services are needed. So, to ascertain what happened, what is supposed to happen, and what did not actually happen.”

Cloud operators range from technology providers to (larger) banks and brokers. But this is not unlike the choices trading firms have had previously. “It should not come as a surprise that the logic is the same,” points out Sandhu. “Should a trading firm really go with a larger entity and risk all the inherent conflicts of interests? Or, would it not make more sense to partner with a neutral technology provider?”

On the levels of investment which are required to take advantage of Cloud Computing and what factors will influence this, Sandhu states: “Cloud computing requires little of the upfront capital and IT investments that are standard in the software-and-install-business-model,” says Sandhu. “The additional benefit of the Cloud Computing business model is that it offers the utmost elasticity to align business resources with business demands, even as they change frequently.”

David Gershon, CEO of SuperDerivatives, which operates an electronic FX options platform based on



Cloud Computing, says that the firm has been using Cloud technology and Cloud farms for over two years now, having switched over from around 400 old servers and a cost running to several million dollars. Everyday the firm makes millions of calculations - not just for trading - but for everything else the firm does. Clients can undertake real-time risk management, which is heavily dependent on Cloud technology.

SuperDerivatives has several Cloud farms whereby all their Clouds are connected. Gershon in Tel Aviv, says: "In my opinion there are certainly enough vendors on the market that can provide appropriate software. And, of course all the big companies like HP, IBM and Cisco provide excellent hardware for Cloud. The provider we selected gave us extremely robust tools to manage the site in remotely."

In terms of those costs, Gershon says: "It really depends. Firstly, of all it depends on the size of your organisation and how global you are. Secondly, it depends on how much of your hardware can be used for the Cloud or how much you need to trash."

### Competitive advantages

Commenting on some of the competitive advantages that could be derived for either institutional and retail FX providers from Cloud technology, FTT's Haman says: "First of all there is improved security since you do not have to manage a number of physical machines. One manages a number of virtual machines in the same management interface, thereby improving your security." As well as being able to easily keep track of who is permitted and who is not allowed to use the trading systems, it also improves uptime since everything is fully redundant.

He adds: "In the scenario where you have 10 physical servers and these are enabling 50 virtual machines.

And, if you have a critical virtual machine, you can easily have a copy of that virtual machine. Then, if something adverse happens it will switch over to the next machine in seconds. Therefore, a very increased uptime can be experienced because of the redundancy."

One can also achieve a significantly faster execution of orders, which saves many milliseconds since virtual machines share the same CPU and memory resources, with travel time between the virtual machines being extremely short. And, as Haman says it saves a huge amount of money by not having as many physical servers as before.

He explains: "When you're using Cloud technology you're really utilising maybe five virtual machines that are sharing these physical servers. You are getting a 1 to 5 ratio, and if you have 50 servers running as an FX broker, you can reduce that to 10 servers."

According to Haman just one installed standard server that runs for 24 hours a day for a full year (c.8,600hrs), would potentially consume c.£1,000 (c.\$1,500) in electricity alone. So, if one is able to reduce 50 machines to 10 machines, it's a massive saving in energy and makes it possible for brokers and banks to "market their green credentials."

SuperDerivatives' Gershon adds a cautionary note on the utilisation of Cloud services in FX, saying: "We also have to distinguish between where we are now and where we can be in the future. Let's talk about algorithmic FX trading, rather than discussing FX options where even more calculations are required."

He says: "If a market participant wants to apply an algorithm that uses correlation between currencies and other assets, which takes data and based on this makes trading decisions, then Cloud is the right solution



David Gershon

*"If people want to trade a large number of varied options and they don't wish to suffer from latency, then Cloud is the correct solution, which has become very necessary."*

because it will enable them to perform enormous numbers of calculations continually. It is essential to be as fast as possible and maximise performance to avoid extra latency."

### Impact on Algorithmic FX trading

For algorithmic trading Gershon asserts that Cloud Computing can be useful, but only for those extremely sophisticated market participants with a heavy need for calculations. "I'm not talking about simple algorithms, but rather the more complex algorithms that undertake huge numbers of calculations," says Gershon.

"It is difficult to know what each of your clients will do and how it will be spread out. By deploying Cloud you make sure that everyone gets the best performance possible."

Gershon states: "I don't think there is a critical need for Cloud Computing in spot FX right now, but I envisage this will change in the future. However, it is definitely a good fit for option trading as it can assist trading platform providers with the calculations. If people want to trade a large number of varied options

and they don't want to suffer from latency, then Cloud is the correct solution and is very necessary." For retail FX, Gershon does not fully believe Cloud is so critical since the spreads "are wide enough" and so for this constituency they may not be "sensitive enough".

In relation to what impact there might be to the future delivery and the evolution of FX algorithms from Cloud Computing, Integral's Sandhu believes that it will "dramatically" lower costs.

"That in turn will allow for more innovations in the markets, as more solution providers will find it economical to join in," he says. "Markets will be more connected and will provide increased transparency; pre- and post-trade, and at the moment of trade. More participants will use a PaaS to develop the innovative algorithms at considerably less costs. And, as markets change they will change the algorithms."

Turning to the prospects for the development of more effective Service Level Agreements (SLAs) with respect to Cloud Computing. Gershon says: "Once you outsource Cloud Computing you'll likely to get better and better SLAs. At the moment I think the average is not good enough (c.90%). But once the SLAs from the various providers improve there will be no reason why not to use them. The Cloud basically ensures latency and performance 99.99% all the time."

### Looking to the future

As to what the role Cloud Computing is likely to have in the FX space in the future, Nexaweb's Gagne says: "Certainly more and more companies will make use of it. It'll go from being a bit of a vague hype that it's right now with some very real benefits underneath it, to something that people don't even talk as much about because everyone is using it."

He adds "It will be rather like the way the web-based applications were five or six years ago. Everyone will be using it and nobody will be thinking about it anymore in the same way it's being considered right now as the next big thing."

And, he says that across SaaS, Paas, IaaS and the Public/Private Cloud continuum, everyone will eventually migrate to one of those. "One won't find people doing things the old fashioned way of setting up a server and running an application off of it. More banks will look at how they can make use of SaaS, so that they can stop essentially having to decide whether to undertake software development themselves or let someone else do it."