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Cloud decision toolkit

By Gillian Law
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Cloud computing might be the buzz word of the moment in all the IT press, but when it comes down to making the hard, detailed decisions about how and whether to use it, managers can be at a bit of a loss.

Is it actually the right decision to go to 'the cloud'? If so, how do you go about it – what systems are you going to move to the cloud, and how? Is your software cloud-ready or do will it need lots of work? And how much is it really going to cost you when it comes down to it?

A team at St Andrew's University has set about developing a toolkit to help answer those questions, and give IT managers a way to approach the problem.

"At present much ambiguity and uncertainty exists regarding the actual realisation of [the] promised benefits, as there is currently much hype, particularly around the cost savings of cloud computing, which are based on simplistic assumptions," says researcher Ali Khajeh-Hosseini in a paper[i] about the toolkit.

The aim, therefore, is to help managers work through all these issues and make the best possible decisions.

The most advanced area of the toolkit at the moment is a cost analysis tool, giving a clear picture of the costs that will be involved. Using the current pricing models of each of the main suppliers (currently Amazon Web Services, Microsoft Azure, FlexiScale, Rackspace, GoGrid, ReliaCloud, and Joyent), the team has developed tool where IT managers can enter their potential use scenario and see what the costs would be. Users create a graphical model of their system using a simple drag and drop user interface, indicating which cloud provider they would like to use for each node. This is currently done in Eclipse, but the team is working on an online version, which will be released on ShopForCloud.com within the next few months.

The tool then generates a detailed report showing how the cost of the system changes over time. The report also provides a breakdown of the costs that allows users to evaluate the architecture of their system and see how it might be adapted to better suit cloud use.

For a broader view than just the financial one, Khajeh-Hosseini has also put together a detailed spreadsheet listing the benefits and risks associated with cloud, to allow potential users to assess their own situations. The spreadsheet is available from ShopForCloud.com.

The toolkit is still in development, and will eventually include several tools: Cost analysis, the Benefits and Risks spreadsheet, Energy Consumption analysis, Stakeholder impact analysis and Responsibility modelling.

The Technology Suitability Analysis below was developed before the Benefits and Risks spreadsheet and works well as a first step – a set of questions to ascertain whether the cloud is the right direction for you:

1. Elasticity	Does your software architecture support scaling out? If not, will scaling up to a bigger server suffice?
2. Communications	Is the bandwidth within the cloud and between the cloud and other systems sufficient for your application? Is latency of data transfer to the cloud acceptable?
3. Processing	Is the CPU power of instances appropriate for your application at the

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	expected operating load? Do instances have enough memory for the application?
4. Access to hardware / bespoke hardware	Does your cloud provider provide the required access to hardware components or bespoke hardware?
5. Availability / dependability	Does your cloud provider provide an appropriate SLA? Are you able to create the appropriate availability by mixing geographical locations or service providers?
6. Security	Does your cloud service provider meet your security requirements? (e.g. requirements do they support multi-factor authentication or encrypted data transfer)
7. Data confidentiality and privacy	Does your cloud provider provide sufficient data confidentiality and privacy guarantees?
8. Regulatory requirements	Does your cloud provider comply with the required regulatory requirements of your organisation?

The Stakeholder Impact Analysis and Responsibility Modelling tools have been developed by researchers at St Andrews and are not specific to cloud, but are included within the toolkit because they allow users to analyse their cloud adoption decisions in more depth. The Energy Consumption Analysis is specific to private clouds, and is still under development. The Toolkit is still under development and a beta version, supporting cost estimation, will be available in early 2011 .

The tool testbed has been the systems at the School of Computer Science at St Andrews itself, to assess a possible move to the cloud. The School of Computer Science has around 60 members of staff and 340 undergraduate and postgraduate students. It provides email and web hosting, storage and network services, with a team of five system administrators. Some of the systems are interconnected with wider university systems.

Using the toolkit, the team did a review of the computing services to look at what might be migrated to the cloud. Some areas were marked as possible candidates – the school archives, for example, the Website and the WebApps service, which includes blogs, public wikis and software downloads.

Other areas were clearly unsuitable, such as the DNS Server, which controls the school network, the day-to-day network storage, which need low network latency, and other systems which need access to hardware or network infrastructure.

The school then looked to the cost modelling tool, using three models to cover the different options it was considering –purchasing physical servers, leasing the equivalent resources from the cloud, and using the elasticity of the cloud to buy what it needed, as it needed it.

The tool gives prices for various aspects of cloud: the cost of running a virtual machine for an hour, of storing 1GB of data for a month, input and output requests to and from storage, and the cost of transferring 1GB of data in and out of the cloud.

The proportional cost of the different options can be seen below – including some variations depending on how leasing costs vary in the elastic cloud market.

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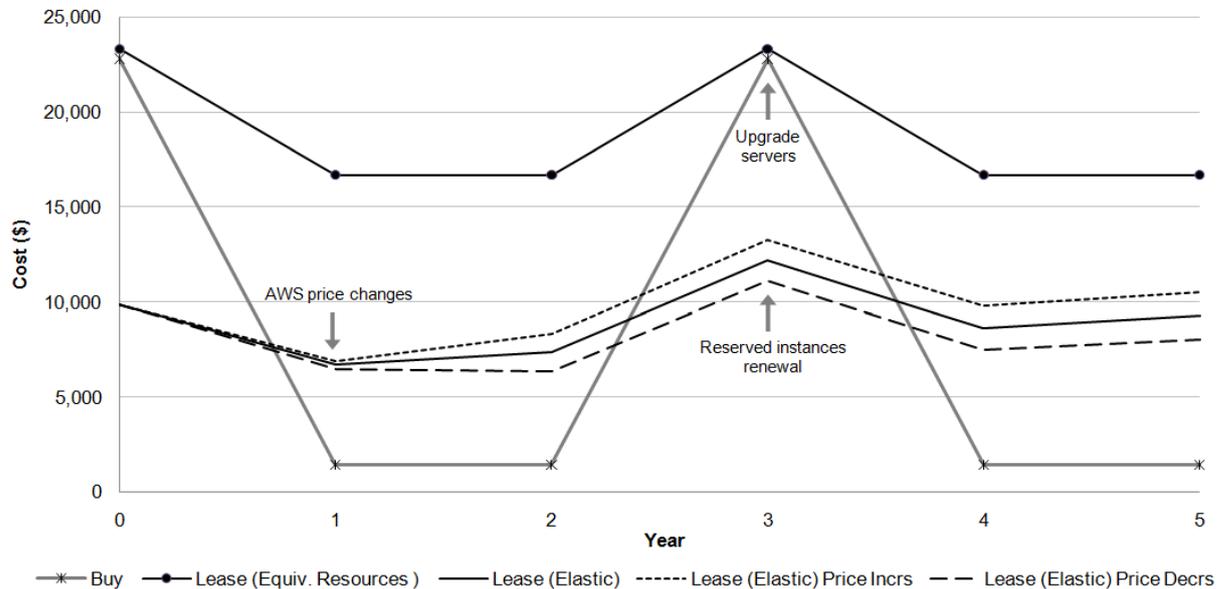
On working out the Net Present Value of each (NPV is a method of comparing options by taking incoming and outgoing cash flows and the potential other investment of capital into account), it was found that leasing the full requirement of servers and running them 24/7 for the five year period was the most expensive option by far, as one might expect.

However, perhaps surprisingly, the elastic option worked out slightly more expensive than purchasing the servers outright. Amazon may also change its pricing model over the course of the five years, making leasing either cheaper or more expensive – there is a bit of a gamble there for any company using it.

On top of the tool's results, the team also noted that the opportunity cost of buying the servers had to be taken into account – by choosing the elastic model and spending less up-front, management would be able to use the remaining capital in other areas.

Support costs are another issue– the support arrangements offered by suppliers need to be considered.

In the end, the final decision made by the school was to retain the status quo. This was more related to the Benefits and Risks spreadsheet than the Cost Analysis - given that the costs were broadly similar, it was the risks related to organisational change and system support that made the School decide to stay with its current set up.

Any organisation looking at cloud would be advised to do a similar analysis of its situation, of the costs and of the organisational factors involved before making a decision.

"It is easy to be seduced by the hype from cloud providers and the media about the possible savings from moving your systems to the cloud. Our tool lets you explore the reality of cloud migration and provides a basis for an objective analysis of the costs and risks in your company of moving to infrastructure as a service," says Prof. Ian Sommerville, who is leading the team.

[1] A. Khajeh-Hosseini, D. Greenwood, J. W. Smith & I. Sommerville. The Cloud Adoption Toolkit: Supporting Cloud Adoption Decisions in the Enterprise. To appear in Software: Practice and Experience. 2011.
Preview available from: http://arxiv.org/pdf/1008.1900v1