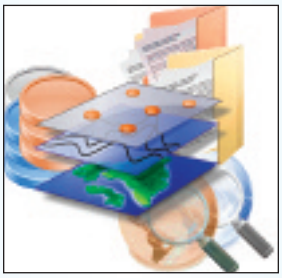
Spatial Cloud Computing (SC2) – Revisited
Enterprise GIS as a Service

By Hugh Williams and Darko Poletto, O.L.I.P.

Two years ago, this magazine ran an article[1] authored by us that discussed cloud computing and how geographic information services and spatial data could be provided in the "cloud" as a service. We call this "Spatial Cloud Computing". Today, the spatial cloud computing concepts have become a viable option for many organizations looking to map-enable their data and/or improve their overall business intelligence and information access capabilities.



To recap, Spatial Cloud Computing (SC2) is the array of services associated with the online provision of:

a) computing, network, and security infrastructure;
b) applications; and,
c) spatial data.

The benefits associated with SC2 are like any map-based solution:

- the ability to better visualize and understand information through geographic relationships; and,
- the ability to more easily find, access, and integrate information.

Plus, the benefits associated with *cloud computing*:

- Lower overall costs to implement a solution and operate it;
- Faster implementation;
- More opportunity for innovation; and,
- Higher reliability.

The 2009 article also highlighted how SC2 could significantly expand the overall market for GIS, because something that had been expensive and time consuming to implement could now be done more quickly, with less expertise, and with fewer risks. This also means almost any organization can take advantage of the use of maps and the inherent benefits associated with this.

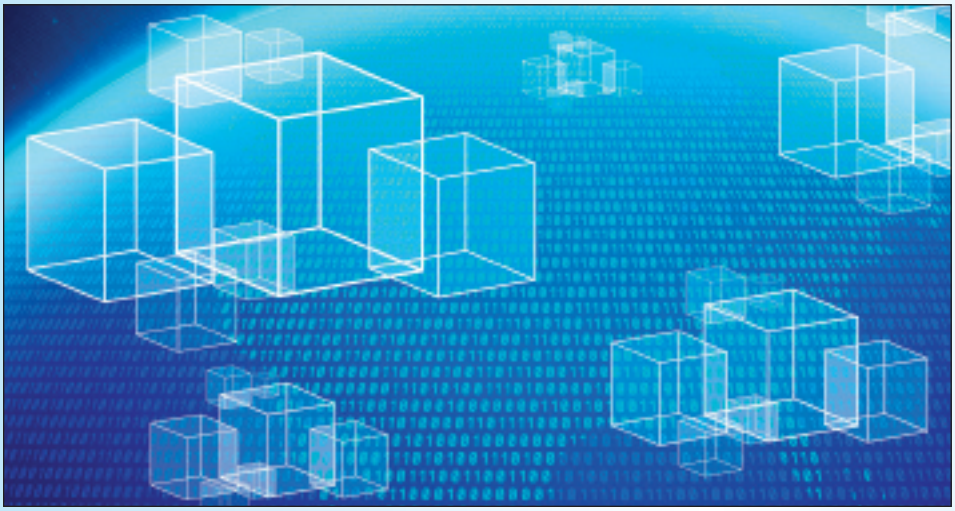
In the intervening two years, the landscape for the use, acceptance and understanding of map-based applications has changed significantly. In fact, the appearance of spatial data and services within online applications is becoming so common that the whole distinction of "GIS" and map-based capabilities as being a separate or unique technology is being lost. GIS is becoming "mainstream" in both the IT sector and among the broad user community.

Our Ontario Experience

In November 2010 we launched a hosted cloud solution within the Ontario Government for 1300 users in several ministries and agencies.

Implementing this solution meant we needed to de-couple the services, data, and infrastructure that already existed at the primary client location; and, re-establish the data and services in a secure, hosted environment outside the client's firewall. The implementation went off smoothly without any service disruptions. The solution has over 1600 named user accounts, using business solutions dealing with real property management, facilities management, asset management, land use, aboriginal consultation, emergency management, mining title verification, and customer service management. The aboriginal consultation solution is also available to all Ontario government staff on the government's Intranet, and will soon be available to the public with an Internet-facing site to be launched this summer.

This solution recently won the 2011 "Best Public Sector GIS" gold award from URISA-OC.



The whole process has taught us a lot about working in the cloud and delivering on those "promises" of the cloud that the clients expect. We believe that the movement towards cloud-based GIS

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applications, data, and technology services will grow rapidly over the next several years. And although you probably won't see this on Letterman any time soon, here's our "Top 10" list "Why..."

Top 10 List - Why GIS Will Succeed in the Cloud

Reason 1. Maps Make Business Information Better

Those of us in GIS have long understood that maps can help communicate and build understanding of business information. Maps are also a natural platform for analysis and they help us integrate information – because they provide a common spatial reference.

So, given the choice of using maps or not in support of business information access, integration and intelligence (if cost / usability are not an issue) then it makes sense to adopt GIS capabilities within a business system solution.

Reason 2. No More Maintenance

With cloud-based applications there's no longer any software maintenance and licensing. Not only are costs kept in check, but the migration of one version to the next, and the installations on multiple machines throughout an organization are a thing of the past.

In the cloud, applications are updated and maintained as part of the service subscription. And, since everyone's using a web browser or a common mobile device – the application changes for everyone at the same time, and usually in incremental stages.

Reason 3. Data

This could be reasons 3 to 10! Google and Bing each provide a base that is for the most part current and well maintained; and a programming interface that makes these data available. Hundreds of data providers are on board with their own data services and interfaces. What used to be the most difficult and costly aspect of a GIS, is now, in many cases, easily accessible.

So, for surveyors, who produce some important and valuable spatial data, this is a great example of what is possible, and reason to explore opportunities.

Reason 4. Lower Costs and Faster to Deploy

Many of the aspects that made a GIS expensive to implement in the past are dealt with through spatial cloud computing, such as: the initial upfront software; the hosting of the web server; training; and specialized development requirements.

From a software / data perspective, cloud providers offer multiple solutions with varying levels of functionality. The applications in the cloud don't necessarily have all the functionality specifically required for each business solution, but they do offer commonly-required capabilities to make them worthwhile. For example, our SC2-GeoPortal solution has basic "GIS" capabilities, but its strength and focus is on making it easy to access and integrate data.

From a hardware / infrastructure perspective, cloud providers offer immediate access and scalability. Building a similar or custom infrastructure environment takes a lot more time and effort.

Reason 5. User Expectation

Your cell phone likely has GPS built in it and you use applications on it that support location awareness. In other words, GIS is everywhere now. So, business users increasingly expect their applications to have maps to support data input and reporting. If yours doesn't, they'll find one that does. It's a challenge to meet ever changing needs, but also an opportunity.

Reason 6. The "Pie" is Bigger

Ten years ago any GIS software vendor could describe their market as a few key sectors / industries: local/provincial/federal government; utilities; resource industry; and large businesses. The market *today* is anyone conducting business with a browser or cell phone. Most clients do not need the functionality of a large GIS system offered by the traditional software vendors, and certainly do not want to pay the cost. They want functionality that is easily delivered through the cloud for multiple uses and users in virtually any market.

A corollary to that – the traditional GIS markets are also making the pie bigger, because GIS is being liberated from the specialists and being put into the hands of program and policy and frontline service. And, this is NOT a threat to GIS professionals. What it typically means is that they are freed up to dedicate resources to areas that matter more – such as more advanced spatial analysis, creation of cartographic products, and data maintenance.

Reason 7. The Term "GIS" is No Longer Required

Just as there is a huge new market, spatial applications are being developed by non-GIS companies. The gory technical details have been abstracted and therefore made more straightforward to deal with, the data are available, and the application development interfaces and standards are published and understood. So, instead of a few dozen companies developing spatial solutions, there are literally thousands around the world, which means that there is significantly more innovation and more choices for the consumer.

Reason 8. Security

Developing, testing, and implementing appropriate security can be expensive and time consuming and it requires expertise. Therefore, this has been a barrier to organizations that want to get on the web with their information, especially for governments that need to protect specific types of data. However, cloud application providers offer security within their solutions.

Some security concerns do need to be addressed. With our SC2-GeoPortal solution, we have done the following:

a) **Hosting Sensitive Data**. Some clients will never feel comfortable having sensitive data hosted outside their "firewall". In architecting the SC2-GeoPortal solution we enable clients to keep data hosted on their servers, while still using the GeoPortal services and 3rd party data that we host. While some applications require the data to be hosted in the cloud, this "hybrid cloud" or "distributed model" solution gives clients an alternative option. Other solutions are adopting

similar approaches.

b) **Data in Canada**. Because of international law and jurisdiction, our Canadian clients often need assurance that their data will physically reside on servers in Canada.

c) **User Access**. All user access is done over a secure encrypted channel. As well there are a number of other layers of security to ensure that the user is properly authenticated, that all requests are coming from valid users, and that each user's account dictates what functionality they have and what data they are able to "see".

d) **Reliability and Threat Tested**. It's vital that the solution have enough redundancy and fail-over capability that it stays running even if one or more components fail. The solution must also be hardened to withstand hacking and denial of service type threats.

Reason 9. The Spatial Cloud Computing Community

One advantage of today's connected world is that new trends and concepts can be discussed, challenged, and refuted in blogs, forums and other open online services. LinkedIn©, for example, has a few independent discussion groups that focus on GIS and cloud solutions. One group that we helped start – Spatial Cloud Computing – continues to attract new members from around the world. Ideas are varied and the subjects deal with everything from applications, to infrastructure, to the spatial data. For everyone, the focus is on how to do it, and how to do it right. So mistakes made by someone are less likely to be repeated, while more collaboration and sharing is leading to more informed decision-making and new ideas.

Reason 10. Money

Billions of dollars are being invested by the technology sector putting the cloud infrastructure in place. Billions more are being spent developing solutions. If the financial picture is telling us anything, the cloud is here and growing.

[1] Ontario Professional Surveyor, Vol.52, No.3, Summer 2009, pg. 11.

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If you are interested in finding out more, please contact us or join the Spatial Cloud Computing discussion group on the "LinkedIn" web site (www.linkedin.com).