

Spatial Cloud Computing (SC2)

White Paper

A New Paradigm for Geographic Information Services

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Updated: August 2012



Leverage geography in the “cloud”... Spatial Cloud Computing (SC2)

Building from Cloud Computing

Cloud Computing is often equated with the concept of a utility, in which an organization can “plug-in” to this virtual computing environment and use the computing resources available on an as-required basis. In a similar way that the electrical utility enabled factories to stop having to produce their own electricity at the turn of the 20th century, today’s IT-dependent business is getting a boost from cloud computing services.

With cloud computing, the applications you use are there when you need them, and wherever you need them – you just need a connection to the Internet. Further, you don’t have the expense or need to buy/lease, manage, and maintain your own IT infrastructure and software licenses.

Cloud computing is used in the context of three, often overlapping, delivery models:

- **SaaS**, or “software as a service” is software that is deployed over the Internet and made available on a subscription basis to users. Salesforce.com or Google Calendar are two of many examples.
- **PaaS**, or “platform as a service”, which is the delivery of a computing platform and solution stack as a service. Microsoft’s HealthVault is a PaaS, designed to support the development and deployment of health applications and services.
- **IaaS**, or “infrastructure as a service” is the provision of scalable IT and network resources and compute capacity on the Internet. Amazon’s Elastic Computing is a good example.

The value of the Cloud Computing industry is expected to reach \$100 Billion in four years (Merrill Lynch). An April 2010 survey by Gartner Inc. revealed that 95% of the organizations interviewed intend to maintain or grow their use of SaaS. So it’s easy to understand why the big IT vendors like Microsoft, Google, and Amazon have ramped up cloud computing solutions.

Cloud computing is becoming a very attractive option to organizations looking to drive their IT costs down and expand their services because:

Rapid Deployment: With nothing to buy, set up and implement, there is a lot of time saved getting started.

Dependability / Redundancy: Cloud computing offers cost effective solutions that are dependable, and reliable. Cloud vendors deliver best of class solutions based on industry best practices.

Flexibility / Scalability: Cloud computing solutions give clients the ability to choose the IT resources they need in a way that can grow over time or instantaneously as needs change.

Levelled Playing Field – Democratization: Small corporations / organizations now have the same capabilities for computing and information access, as larger ones. The size of the organization is no longer an issue.

Meets Client Expectations for Innovation and Options: Users no longer have any adherence or loyalty to traditional technologies or approaches. Users will embrace cloud computing if it provides the needed functionality at the right price.

Security. Often the primary concern of a client is whether or not their systems will be secure in the cloud. Cloud computing providers recognize that security is paramount and focus a lot of attention on ensuring security.

Identity Management and Access Control: Cloud computing solutions provide advanced solutions for access control and identity management measures that ensure users and uses of the data are legitimate.

Two references with more information about Cloud Computing:

- Wikipedia: http://en.wikipedia.org/wiki/Cloud_computing
- Salesforce.com video on YouTube: http://www.youtube.com/watch?v=ae_DKNwK_ms

Spatial Cloud Computing (SC2)

Spatial Cloud Computing (SC2) adds **geography** to the cloud computing paradigm.

SC2 provides dynamically scalable geographic information technology, spatial data, and geo-applications as a web service.

SC2 is on-demand *geo*-intelligence for corporate information resources; enabling geography to be used without a massive investment in specialized geo-data, people, and software typically required in an “enterprise GIS” implementation.

GIS = Geographic Information System.

Definition: A GIS is any system that captures, stores, analyzes, manages, and presents data that are linked to location. (Source = Wikipedia).

Some SC2 offerings may also incorporate base and thematic spatial data. Spatial data – represented as map layers in a GIS – are required for a GIS, and are what provide the location reference to the business/thematic data.

Why is “geography” important? Put simply, **80-90% of all business data** has a geographic component, such as an address, an area reference like a sales district, or a map coordinate. Consider:

- Maps are **intuitive**. They can **communicate** with clarity and build understanding.
- Geography is a powerful way to **integrate** disparate business data. Especially data that would otherwise have *no* other connection. Mapped locations become the access points for all related business data and systems, providing a unified view of an organization's information resources.
- Making data "location aware" enables spatial **patterns and relationships** to be instantly visible. Words and numbers cannot easily describe what is readily apparent on a map.

By leveraging this geo-intelligence you are able to better capitalize on your information investment, and build new knowledge from the information.

To quote "Why 'Where' Matters" by Dr. Bob Ryerson and Dr. Stan Aronoff, "*To early man, geospatial knowledge was a matter of life and death*". Geography mattered a lot in prehistory! There's good reason why it should matter today as well. In this information age, we are only recently becoming easily able to incorporate "where" in our core business applications and decision-making – and those that do are realizing tremendous economic and strategic advantage.

The Benefits of Spatial Cloud Computing (SC2)

Spatial cloud computing builds on the benefits of cloud computing and on the advantages of leveraging the geographic component in your data. If we look at these benefits based on a traditional "Enterprise GIS" approach in which everything needs to be done in-house, some key benefits are clearly identifiable:

Lower Cost:

Because the geo-technology infrastructure, the services and the data are provided; there is no large initial investment in time and cost, or ongoing maintenance. This is important because the cost of an enterprise geographic information system can be quite significant from a variety of factors including software licensing, applications development, data management, and IT infrastructure. Cost is a primary reason why many organizations don't have GIS solutions. With spatial cloud computing, *that barrier to entry disappears*.

Spatial Data:

With the advent of services like Google Maps and Bing, base spatial data are now available as an affordable foundation in an SC2 service.

Users likely need other thematic spatial data, and will have their own asset/thematic mapping to overlay on top of this base. Often the user asset mapping data can be quickly generated from the business data or can be acquired from other sources. For example, a map layer of client locations can be quickly created by geo-coding the address details.

The need to manage spatial data in a GIS – both from a cost and complexity perspective – has been a key reason why most business applications and therefore organizations don't incorporate geography in their systems and decision-making. The SC2 integration of foundation data and geocoding services helps remove the barrier, because it is easy to do and inexpensive.

People Capacity:

Implementing a traditional enterprise GIS in an organization requires people with specialized skills. By providing the GIS functionality and data as a web service, SC2 eliminates the need for in-house GIS capability. And for organizations with in-house GIS, SC2 frees them up from responding to basic mapping requests, and lets them deal with more complex and specialized tasks and services – such as cartography, spatial data maintenance, and spatial analysis.

The State of Spatial Cloud Computing

Several companies are providing spatial cloud computing solutions in one form or another. Sometimes the focus is on data, while with others it is core technologies, or with custom applications.

Google Maps jump started in a significant way the use of the web to provide map-based access to information. Their open, free or low cost approach and huge spatial database opened the doors for web developers of all stripes to start using mapping in their web applications and services.

Other companies like GISCloud.com and SpatialStream.com are looking at the opportunity from a more traditional GIS perspective and creating web-based solutions that do GIS functions – like spatial analysis and data management. Staying with these two examples, GIS Cloud provides an online GIS SaaS solution; while SpatialStream provides a GIS API and services to enable easy development of GIS applications.

Traditional GIS companies are getting on board too. ESRI's ArcGIS Online (and now ArcGIS.com) has been providing web-based map services and spatial data for several years. Their cloud service in partnership with Amazon EC2 – essentially enables clients in the United States to deploy preconfigured ArcGIS Server and enterprise geodatabase machine images in the Amazon cloud infrastructure. ESRI deploys two SaaS applications: ArcLogistics – a cloud application for creating optimized routes for multiple vehicles; and Business Analyst Online – providing businesses tools for understanding client and demographic data. And, their partnerships with Bing, Microsoft (Silverlight), Amazon EC2, and the new development APIs make it reasonable to assume we'll be seeing spatial cloud services springing up from a variety of developers and companies.

Our own SC2-GeoPortal is described below.

Future Cloudy and Bright:

Security: Security remains a concern, particularly among governments and large institutions holding sensitive or personal data. Our approach at SKE is to provide the cloud service / applications, but enable the organization to keep the data hosted behind the firewall. But only time will change attitudes toward the security and perception of threat.

Jurisdiction: The cloud – being mostly in the Internet – is loosely governed by rules that don't necessarily span jurisdictional boundaries. So, clients are wary about exactly "where" their data are being stored and the service is provided.

LinkedIn:

The spatial cloud computing landscape will continue to change rapidly. In fact, this white paper is almost certainly dated already!

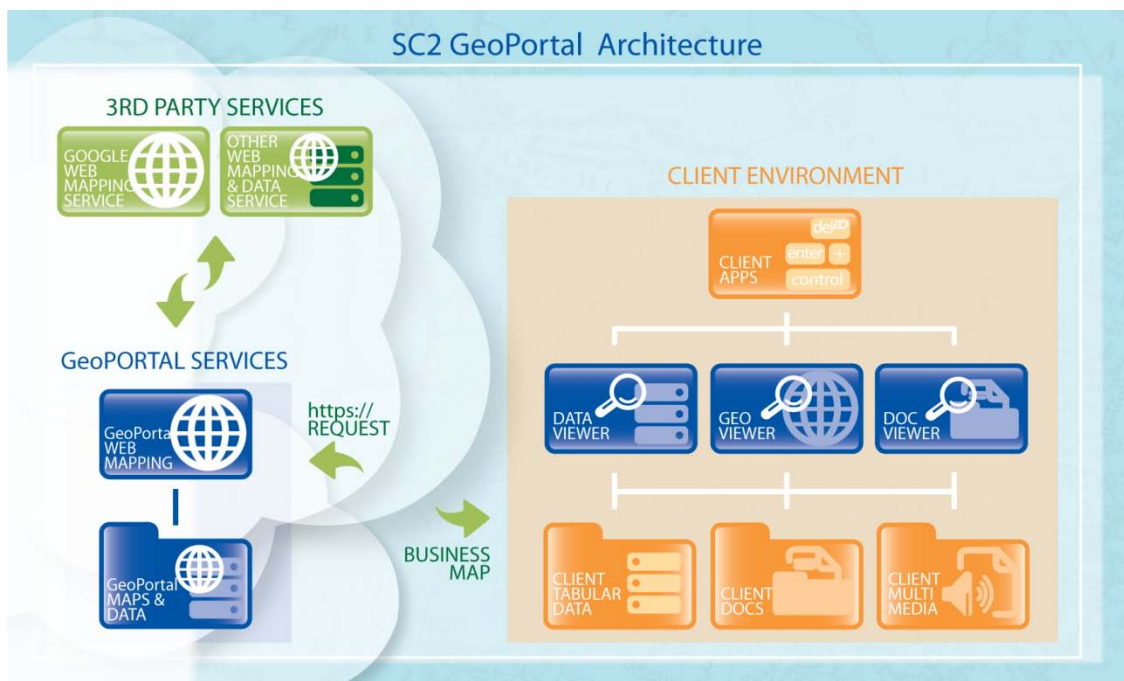
Since we can't keep the white paper current with the latest ideas and innovations, there is a Spatial Cloud Computing group on LinkedIn at which members are encouraged to participate in discussions and introduce new topics of their own. Please visit: <http://www.linkedin.com/groups?gid=1839124>.

SKE's Direction – SC2-Geoportal

At SKE, we have pioneered technologies and services in spatial cloud computing by creating the “SC2-GeoPortal” solution. SC2-GeoPortal makes it easy for organizations to add the “G” (geography) to their “IS” (information systems) and get integrated access to the data in their systems, reports, and other web services. It is a geo-intelligent platform consisting of software, services, and spatial data that provides our clients the ability to map-enable their business systems and data.

SC2-GeoPortal uses Google maps and imagery as the geographic base upon which we add the organization’s key map layers – such as branch / store / asset / client locations; zones of interest; administrative areas; natural boundaries; and so on. With these maps, we connect the business information systems – so that each user has access to everything all in the same place.

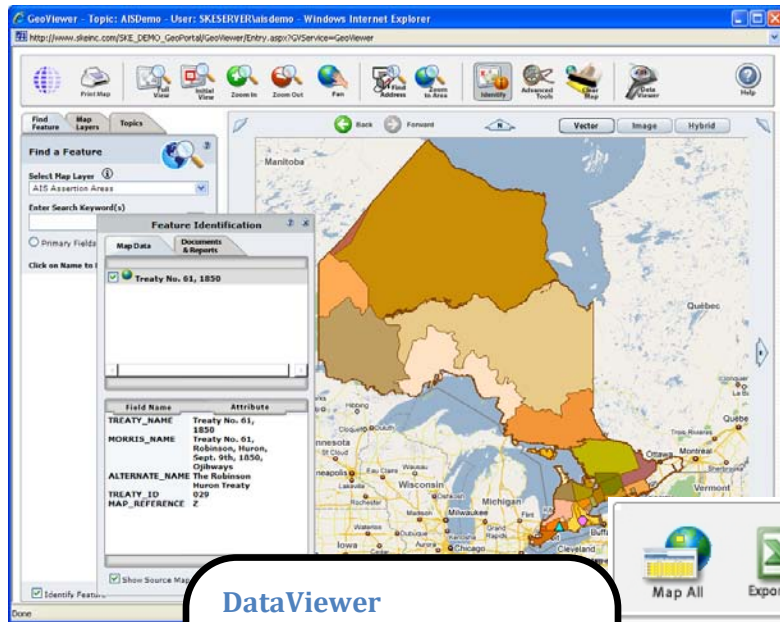
The following diagram illustrates a “distributed architecture”. The spatial data are hosted in the cloud, while the client’s business data stay behind their firewall. The spatial data, other web services, and the client’s data and information *dynamically integrate* through SC2-GeoPortal’s client tools.



Another available option reflects the “traditional” cloud approach, in which the client’s business systems and data are also hosted in the cloud and simply accessed by the client through the GeoPortal tools.

SC2-GeoPortal Tools

SC2-GeoPortal consists of ready-to-use web tools, all accessed in a web browser with no plug-ins. The client tools include GeoViewer, DataViewer and DocumentViewer.



GeoViewer

A map-based information search and access tool that enables the user to visualize their data on the map and access related business information.

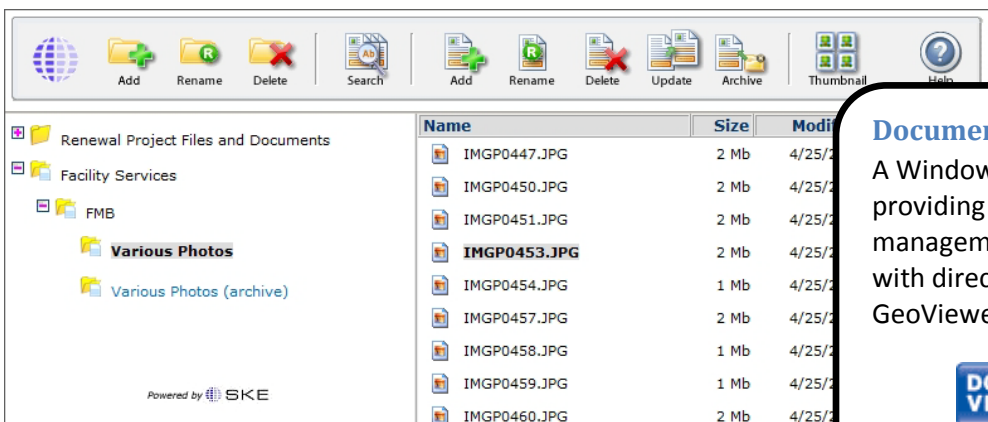


DataViewer

A data query and reporting tool with a variety of features and functions that maps the results in GeoViewer, and links to other related information.



	Community_Name	Alternate_Name	Reserve_Name	FN_Modern_C
	Kee-Way-Win		Kee Way Win Indian Settlement	325
	Ojibway Nation of Saugeen	Ojibways of Savant Lake	Ojibway Nation of Saugeen	258
	Ojibway Nation of Saugeen	Ojibways of Saugeen	Ojibway Nation of Saugeen	258
	Ojibway Nation of Saugeen	Saugeen	Ojibway Nation of Saugeen	258
	Wawakapewin	Long Dog	Wawakapewin	234



DocumentViewer

A Windows Explorer-like tool providing a secure content management environment with direct links from GeoViewer and DataViewer.



About SKE

SKE is an information solutions company whose business focus is on creating systems and solutions that make it easy to publish and access information.

With our SC2-GeoPortal, clients improve their access to information, lower their IT costs, and can significantly enhance the sharing of information within their office, with partners, and around the world.

By leveraging our SC2-GeoPortal services, we provide clients:

- Rapid deployment and delivery – often in weeks, not months or years.
- Enterprise geographic information systems in the cloud.
- Access to all SC2-GeoPortal components as a cloud computing service – meaning no license or IT costs.
- Development of, or enhancements to, business systems to leverage spatial cloud computing.
- Secure hosting of client spatial and business data.
- Dedicated technical support.

SC2-GeoPortal is suitable to support policy development, program delivery, and client service in virtually all government, private sector, and non-profit sector organizations.

Some of our key spatial cloud computing implementations:

- **Infrastructure Ontario:** The Ontario GeoPortal (www.ontariogeoport.com). A service of the Ontario Realty Corporation for the province of Ontario and its municipalities.
- **Ministry of Aboriginal Affairs:** The Aboriginal Consultation Information System (ACIS) and Aboriginal Information Service (AIS). Enabling the sharing of key information among Ontario ministries about aboriginal communities and specific details about consultations and assertions.
- **Ministry of the Attorney General:** The Facilities Management Information System (FMIS) enabling the management and maintenance of the provinces courthouses.
- **Infrastructure Ontario:** IO Customer Portal enabling the sharing and management of facility information from Ontario Realty Corporation with all Ontario ministries.
- **Public Works and Government Services Canada:** PHAI Collaboration Portal with a number of applications and tools to permit the management and sharing of data and information in support of the partners' research and remediation work.
- **Public Works and Government Services Canada:** PWGSC Engineering Customer Portal supporting Ontario engineers in the management of structure facility information.
- **Real Property Transformation Group:** RPTG Customer Portal enabling federal government departments to manage information associated with the management of laboratories across the country.

Join the "Spatial Cloud Computing" group on LinkedIn.com
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