
Cloud Computing in Vermont State Government

Analysis of
Opportunities

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Introduction – Legislation passed during the 2009 session required that the

Legislative Director of Information Technology and the Commissioner of the Department of Information and Innovation (DII) to issue a request for proposals no later than July 1, 2009 to evaluate the viability of cloud computing and other virtualized infrastructure as it pertains to the use of e-mail, spreadsheets, word processing and calendars in the legislative, executive and judicial branches of government. (Section 19, Act No. 54 of 2009)

Because no funding was provided to conduct this study, DII incorporated the requirement into a request for proposal that was being prepared to hire a vendor to do an independent assessment the State of Vermont Information Technology posture. The goal of the assessment was to identify opportunities where the State of Vermont could improve the way Information Technology services are delivered within state government. That RFP was released in mid-July and DII engaged the services of TPI, Inc. to conduct the assessment. During the initial phase of the assessment, TPI looked at the Information Technology (IT) infrastructure, including server and system support, state networks, Desktop support and Mainframe operations. Both the infrastructure and desktop portions of the assessment included an analysis of Cloud computing opportunities. The final report was submitted by TPI in late December, 2009. The recommendations as provided by TPI are incorporated into this report. This report also incorporates research conducted by the CIO of the State of Vermont and his staff as well as the Director of Legislative Information Technology and his staff.

What is Cloud Computing? – Generally speaking, Cloud computing is another term for the outsourcing of certain computer infrastructure and related services that are provided on a subscription or per user basis. Cloud computing presents the opportunity for organizations to lower their cost of providing certain Information Technology (IT) services. It is currently one of the most talked about terms in the IT community; hardly a day goes by where some industry magazine or newsletter doesn't publish a paper or comment on the subject of Cloud Computing. A review of some of those sources indicates there is general agreement on both the opportunities and potential pitfalls which are outlined below.

The terms “software as a service”, “utility computing”, “platform as a service”, “web services in the cloud”, “storage as a service” and “public cloud” are all variations on the same theme. With Cloud computing, organizations can avoid most of the capital investment otherwise required for hardware, software and related services by instead contracting with another entity to provide those services. Payment generally consists of a one-time set up fee, after which costs are assessed based on a subscription or monthly fee and/or a user fee based on the amount of use. Accessing applications and data provided through a vendor typically require a user to have a reliable and fast access to the services by way of the Internet.

Cloud vendors experience economy of scale not usually available to single organizations through server virtualization, which means that instead of running one operating system and related applications on a single server, multiple operating systems and applications can be run on a

single server. A reduction in the number of servers required to operate various applications and systems is more cost effective than the older model of one application per server. With Cloud computing, an organization can scale up and down quickly based on actual demand. Cloud computing shifts the cost of providing IT services to the operational budgets of the organizations that use these solutions. The capital costs of the vendor to provide the required hardware, software and user interfaces are built into the usage fee charged to Cloud computing customers. The costs tend to be lower because the vendors maximize the services provided using the minimal number of hardware resources across a broader group of users.

Cloud vendors generally operate multiple data centers, in some cases both within and outside of the USA. This allows the vendors to maximize the use of their resources by transacting and storing data in any one or more locations. Because the data created by an organization may be moved in order to maximize the use of the vendor's resources, the exact location of an organization's data may be difficult to determine at any moment in time.

Organizations can also provide cloud-type services on their own servers to individuals within their own organizations. This is referred to as a "private cloud". Private cloud operations can allow organizations to take advantages of economies of scale while retaining control over data within the organization.

Like most IT innovations, Cloud computing is in a growing stage where opportunities are being maximized and challenges to that growth are being addressed. Most of the concerns with Cloud computing are related to security and privacy of critical data. Security concerns include protection of personal data, ensuring that transmission of personal data is encrypted, location of data at rest, the degree to which Cloud vendors are able to certify their data centers are secure, and compliance with various state and federal regulations. Privacy concerns include the protection of personal data like Social Security Numbers and health information. Other issues include the need to establish standards that enable organizations to more easily move their data from one Cloud computing vendor to another. The federal government is currently working with Cloud vendors and others to establish such standards.

The issues related to security and privacy of data are most critical to the State of Vermont, as they are with most organizations, because of the many different types of data that we manage on behalf of our citizens and as part of our day-to-day work.

Current Service Level and Scalability - Like many organizations the size of Vermont state government, it is fair to describe our information technology posture as being oriented towards Microsoft products. The three major Email operations, at DII, AHS and the Department of Public Safety all utilize some version of Microsoft Exchange, and over 80% of the servers in the state IT infrastructure use some version of Windows server technology. Microsoft Office is also the most commonly used business productivity software suite. (TPI, 2009). The Legislature also

operates an Email installation, on a different platform (Novell Groupwise) and the Attorney General's office operates a version of Exchange for their Email installation.

Implementing and managing Email installations require capital investments in hardware, software products that run in a server environment and the use of ancillary software to protect the networks and end users from malware and spam. There are also operational costs associated with managing the installation, including personnel costs and annual client access licenses for the various types of software required for each user. The cost of upgrading to each new release of the Email software, which generally happens on a three to four year cycle, is not insignificant and refreshing hardware on a 4 to 5 year cycle to help ensure optimal performance is also necessary. Generally speaking, software vendors will support the current release of their software and the previous version as well, but at some point in time it becomes necessary to invest in an upgrade, even if the organization skips a version in between time.

DII upgraded to Microsoft Exchange starting in 2007. At the time of the 2007 upgrade, DII also refreshed all of the hardware and designed the infrastructure to support all State of Vermont users, although the consolidation to a single common Email operation across state government is not complete. The 2007 upgrade resulted in a more robust and redundant Email platform that is very dependable; there have been no system wide outages attributable to the Email installation itself.

Physical and Virtual Data Security and Recovery – security and privacy are the most commonly identified concerns related to Cloud computing. While there are a variety of opinions expressed in the information technology literature, most IT security professionals would argue that there are too many open questions related to security in the Cloud to warrant a wholesale adoption of this new approach to information technology sourcing. While the security concerns have impeded the wholesale adoption of Cloud computing, there are still opportunities for organizations to utilize Cloud computing for their non-critical applications that do not include personal data.

For most organizations, the single biggest concern is how data is protected in a shared environment. (Accenture, 2009). As noted above, Cloud computing vendors achieve economy of scale using server virtualization. Cloud vendors may store data from different customers on the same server. In that type of environment, organizations worry that a compromise of some other entity's data, whether by malicious or other means, could result in a breach of their own data. State government collects and manages a great deal of personal data like Social Security Numbers and health information to name but two. The State has to take similar steps to protect that data as do Cloud vendors, but there is more control over the data because it resides in State controlled data centers.

Knowing where one's data is located raises other concerns. As noted above, in a pure Cloud computing environment, an organization's data may reside at any one or more data center (some

of which may be outside of the USA), and can be moved when it helps the vendor achieve the economy of scale they need to be cost competitive. In that environment, it can be difficult to obtain certification that an organization's data is being properly protected, because it can implicate multiple vendor sites. While vendors are willing to meet specific requirements of their customers, any requirement that affects the economy of scale that supports the Cloud computing model will likely also increase the cost of using the Cloud solution. It should also be noted that the State Archivist has strongly recommended that technical discussions of data security and recovery should take place in the larger context of records management planning.

The literature suggests that many organizations are adopting a "hybrid" Cloud approach. Under such an approach, mission critical and personal information like SSN's and health information is transacted and stored in a "private Cloud" or within data center(s) managed by the organization, while non-critical data is transacted and stored in the "public Cloud". A hybrid solution reduces security concerns but organizations may not realize the same cost savings.

Potential for Savings in Software Licensing and Hardware Investment – for comparative purposes, TPI priced one month of a typical medium sized server environment of cloud computing service from a large cloud computing service provider. The monthly service fee quoted for the medium sized environment would be \$1,662 per month. Comparing this to the State of Vermont's fully burdened cost for a standard server, which is \$605 per month, shows that cloud computing is significantly more expensive option to utilize. The TPI assessment noted one exception where short term needs for software development might warrant utilizing a Cloud solution instead of investing in servers and software infrastructure. (TPI, 2009).

Business requirements, including but not limited to encryption, archiving and E-Discovery tend to drive up the cost of Email operations, whether they are provided by a Cloud vendor or internally. According to the assessment conducted by TPI, the market range for an internally provided E-mail solution is from \$70 to \$190 per user per year. Because the State's average cost of \$126 per user per year for utility computing (which includes E-mail and file/print servers) is higher than the lowest cost typically found in the market, it may be an attractive alternative to consider. However, because the service offerings are relatively new on the market, TPI opined that the State should probably proceed with caution in this area. (TPI, 2009).

Forrester Research conducted a study that was reported in early 2009 in which they concluded that Cloud based email is always cheaper for mid-sized companies with fewer than 15,000 users. (Schadler, 2009). While the state fits within their definition of a mid-sized organization, that research is based on surveys and interviews with 53 private sector companies. There could be other factors related to the business needs of the State of Vermont that would cause a different conclusion to be reached.

Cloud desktop computing offerings like Google Apps are attractive because of the lower cost, but Accenture found that the current desktop application Clouds are still not mature enough in

terms of feature sets and service levels. (Accenture, 2009). Companies like Google and others are constantly innovating and over time will probably catch up with the needs of the majority of state users. On the other hand, commercially available office productivity suites, which may include software that will never be used by the average user, tends to be cost prohibitive to maintain at the current release version of the product.

Because the market for Cloud computing is changing so quickly, the logical time to consider changing Email platforms is when new versions of the existing platform have been released to the market for a few months, probably sometime in FY '11. By that time, presumably there will be other opportunities to consider, including those offered by Google, Microsoft, EDS, IBM and many other vendors. At that time, investigation of other options, including open source solutions like Open Office should also be conducted in preparation for the bid process.

Opportunities for Improved Systems Performance and Capacity – system performance in Cloud computing is dependent on the availability of a fast and reliable Internet connection; end users sitting at the end of a small pipe to the Internet will not be happy using a Cloud desktop solution if the transmission of data between desktop and application location is slow. While most of the State users are enjoying increased network capacity, there are still parts of the state that do not have broadband opportunities available. Likewise, a major outage at a Cloud vendor would impede state operations, and the cost of providing a disaster recovery backup in case of a Cloud vendor outage is probably cost prohibitive.

In terms of capacity, one of the key drivers to adoption of Cloud computing solutions is the ability to quickly scale up (and down) as needs change. As noted above, there are approximately 7500 employees who use a computer for their day to day work. If one assumes little to no growth in the workforce in the next five years, the need to quickly scale up capacity is probably not a driver in State government.

Specific Vendors and Relevant Vendor Policies – there are currently many vendors in this space. With so much segmentation in the market, the coming expected consolidation as less competitive options disappear from the market and no plans to conduct a procurement process in the next year or so, we found that it was premature to spend a lot of time assessing the current state of the vendor community and their relevant policies. As noted above, evaluation of vendor offerings should be driven by specific business requirements and decisions based on the best opportunity available at the time a bid process is conducted. Since there doesn't appear to be cost savings from migrating the State's server environment to a Cloud solution, the focus should probably be on identifying whether there are appropriate Cloud based desktop solution(s), including Email, for the State to consider. In any event, given the availability and attractiveness of open source solution like Open Office, we would not want to limit future procurements for office productivity software to only consider Cloud solutions.

Potential for Legal and Regulatory Obstacles – The legal implications of Cloud computing are outside the expertise of the authors of this report, but according to one expert, the legal community’s concerns are consistent with those expressed by the IT community as a whole and generally center on the issue of where the data is processed and stored (Navetta,2009). Most software license agreements expect the customer, in this case, the State of Vermont, to indemnify or otherwise limit their liability and there is no reason to think that would not be an issue with Cloud computing. The Executive branch does not have the legal authority to indemnify a vendor or shift the burden for liability from the vendor to the State. Even if a Cloud vendor were to drop the indemnification and limitation of liability issues, it would still be the responsibility of the State to ensure that the vendor was providing an adequate level of security of any data the vendor processes or stores, and that task is more complex if the data can exist anywhere. Telling a citizen that their Social Security Number was breached due to a vendor error wouldn’t make anyone feel better about a breach, and the State might still be obligated to disclose a breach, incurring costs associated with making the affected citizens whole. How a Cloud arrangement would work within the context of recently passed State law regarding breaches would have to be examined by the legal experts. Electronic E-Discovery is also complicated because it may be harder to manage and control data that is subject to a legal hold requirement as part of a law suit.

There are also requirements under federal laws like Gramm-Leach-Bliley, which is applicable to financial data, and HIPAA, which is applicable to health information, that would have to be addressed before adopting a Cloud solution.

Recommendations from the TPI Assessment – as already noted, the TPI assessment utilized data collected from the Executive and Legislative branches, leaving out only those small departments that do not have much of an installed user base. Their analysis looked at all types of servers currently in use.

For comparative purposes, TPI priced one month of a typical medium sized server environment of cloud computing service from a large cloud computing service provider. The monthly service fee quoted for the medium sized environment would be \$1,662 per month. Comparing this to the State of Vermont’s fully burdened cost for a standard server, which is \$605 per month, shows that cloud computing is significantly more expensive option to utilize. For very short term server requirements such as the need for a development server it may be attractive to utilize cloud particularly when development is needed quickly. In such cases, the State would need to make a decision based upon the realistic timeframes required to complete the application development work. When the time frames are stringent and short, the use of the environment would be effective. When the time frames are longer and enter the realm of long term support models, the cloud computing environment is most likely not cost efficient. (TPI, 2009)

TPI reached a somewhat different conclusion related to utilizing Cloud computing for the desktop, which would include Email and business productivity software:

The use of cloud computing as part of the State’s desktop environment may be an attractive solution considering that some of the larger cloud computing service providers offers their cloud e-mail and

desktop solutions for approximately \$50.00 per user per year. Considering that the mark to market range for an internally provided E-mail solution ranges from \$70 to \$190 per user per year, and with the State's average cost of \$126 per user per year for utility computing (which includes E-mail and file/print servers) there is a potential for additional savings in the desktop area. A cloud computing solution would not work for all employees in the State and because the cloud service offerings are relatively new on the market it is recommended that the State proceed with caution in this area. (TPI, 2009)

As already noted, an examination of all available options during the next procurement cycle makes the most sense.

Recommendations

While Cloud computing is not an ideal solution for all state government applications, it may be well suited for very small departments with limited or no IT support resources, and also for departments with large floating populations. A pilot study may be beneficial.

In their report, TPI recommended we consider two separate pilots.

The first pilot should be a larger agency, perhaps one that has a separate E-mail domain that could test the features of E-mail services and provide some analysis of reliability, assurance, innovation, technology, responsiveness, flexibility, and accessibility.

The second pilot should be a smaller agency that has a variety of support characteristics, i.e. central support and remote support that also could test the features of E-mail services and provide some analysis of reliability, assurance, innovation, technology, responsiveness, flexibility, and accessibility. (TPI, 2009).

For practical purposes, it doesn't seem feasible to conduct a test within a large agency due to the disruption it will cause to day to day operations. Identifying a smaller organization where a pilot can be conducted in a more controlled manner makes the most sense.

Conclusion

While at first blush Cloud computing seems like an attractive opportunity, it is clear from both the TPI Assessment and the analysis of information technology literature that the State should proceed with caution. In the rush to grab market share, IT vendors often put security issues on the backburner because security is both difficult and costly to implement and can slow product release to the open market. That seems to be the case with Cloud computing, where services have been available for a while but the broader issues of data security are only now being addressed. We expect that those issues will be resolved in the next couple of years. By that time, the State will need to make decisions about whether and the extent to which Cloud computing provides cost effective opportunities.

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