ITAC – Enterprise Working Group Position Paper

Cloud Computing: Transforming the Government of Canada for the Digital Economy

Release Date: August 2015

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As Canada's national ICT business association, the Information Technology Association of Canada (ITAC) champions the development of a robust and sustainable digital economy in Canada. A vital connection between business and government, we provide our members with the advocacy, networking and professional development services that help them to thrive nationally and compete globally. A prominent advocate for the expansion of Canada's innovative capacity, ITAC encourages technology adoption to capitalize on productivity and performance opportunities across all sectors. A member-driven not-for-profit, ITAC has served as the authoritative national voice of the $150 billion ICT industry for 60 years. More than 33,500 Canadian ICT firms create and supply goods and services that contribute to a more productive, competitive, and innovative society. The ICT sector generates one million jobs directly and indirectly and invests $4.8 billion annually in R&D, more than any other private sector performer.

EXECUTIVE SUMMARY

In today's modern economy, organizations across all sectors are looking to capitalize on opportunities for revenue growth, cost effectiveness/efficiency, service enhancements and competitive advantage. To do so, they must speed up innovation, enhance agility and improve financial management through the use of technology—but not the same way it has been done over the last several decades.

The same can be said for governmental organizations.

As a result—and as part of the Government of Canada's plan to steer the public service into the digital age and reshape the way policy is made and services are delivered in Canada—Blueprint 2020 promotes the strategic adoption and use of cloud computing.

According to the National Institute of Standards and Technology (NIST), cloud computing is:

"...a model for enabling ubiquitous, convenient, on-demand network access to a shared pool of configurable computing resources (e.g., networks, servers, storage, applications and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction."

As we have seen from other governments worldwide, cloud computing offers enormous benefits. More and more, we learn that cloud strategies and cloud-based managed service delivery models are delivering optimal value for specific workloads, applications, and timely business process transformation. And those benefits continue to grow.

As the Government of Canada investigates computing options for faster development and cost savings, it is only a question of time before it is required to provide more agile, flexible and cost-reducing cloud computing services to its clients and partners.

The enterprise working group (EWG) of the Information Technology Association of Canada (ITAC) believes the Government of Canada is extremely well positioned to define its own cloud computing strategy by leveraging lessons learned from other governments.

To that end, this white paper makes the following seven recommendations to help the Government of Canada make the move to a cloud-enabled enterprise:

1. **Maintain alignment:** with all other transformation-related initiatives

2. **Develop a "Cloud First" policy:** mandate enterprise-wide adoption of cloud computing

3. **Determine how to balance public with private cloud deployment:** understand security requirements, classify data and balance cloud decisions/choices accordingly

4. **Create a "Public Cloud First" posture for application rationalization:** harness the benefits of public cloud by considering it before private cloud services

5. **Leverage existing security controls and accreditations:** look to existing solutions and frameworks for guidance and direction

6. **Build a cloud-enabled enterprise:** embrace cloud using a structured, well-developed, centralized approach

7. **Enable transformation:** move from traditional procurement initiatives to innovative partnerships

INTRODUCTION

To meet the evolving demands of digital government and constituents, the Canadian public sector is undergoing a major technological transformation. One such enterprise-wide initiative currently under consideration is the strategic adoption and use of "cloud computing."

Promoted within Blueprint 2020, cloud computing is rapidly becoming a critical foundational component and building block to the successful transformation of the public sector—both internally and externally, within and across all levels of government.

Governments such as the United States, United Kingdom, New Zealand and Australia have already implemented policies that offer unique sets of lessons learned on adoption, security, accreditation and acquisition models that have driven innovation and delivered improved policy outcomes, enhanced efficiencies, higher levels of service quality, greater agility, security, and improved levels of trust with citizens and business. As such, the Government of Canada has a unique opportunity to exploit enterprise-enabled cloud technology to help innovate and deliver enhanced public value—and reap similar benefits.

The Information Technology Association of Canada (ITAC) strongly supports the government's IT modernization agenda. To that end, ITAC has established an enterprise working group (EWG) of private-sector industry leaders and providers of cloud-based services. Together, the EWG developed this white paper as its contribution to the Government of Canada's development of a cloud strategy and implementation roadmap.

This white paper is structured to provide:

- A general understanding of cloud computing—including definitions, trends, key drivers, and its benefits;
- Lessons learned from other governmental cloud initiatives; and
- Recommendations of a future operating model that aligns with Blueprint 2020—including key steps required to successfully transform to cloud services.

UNDERSTANDING CLOUD COMPUTING

Definition

According to the National Institute of Standards and Technology (NIST), cloud computing is "a model for enabling ubiquitous, convenient, on-demand network access to a shared pool of configurable computing resources (e.g., networks, servers, storage, applications and services)

that can be rapidly provisioned and released with minimal management effort or service provider interaction."[1]

For a service to be considered "cloud," NIST sees the five following characteristics as essential:

1. ***On-demand self-service:*** the end user can sign up and receive services without long delays;
2. ***Broad network access:*** the end user can access the service via standard platforms including desktop, laptop and mobile;
3. ***Resource pooling:*** resources such as storage, processing, memory and network bandwidth are pooled across multiple customers;
4. ***Rapid elasticity:*** the system has the capacity to scale commensurate with demand; and
5. ***Measured service:*** resource usage is monitored, controlled, and metered on a pay-per-use basis.

Deployment models

There are four different ways to deploy cloud computing:[2]

Deployment Model	Type of Usage	Description	Cloud Owner/Manager
Private cloud	Exclusive	Built for and used by a single organization comprising multiple consumers (e.g., business units). Access is provided on an authorized basis.	The organization, a third party, or a combination of both
Public cloud	Open	Used by public small, medium and large enterprises; and general public. Access is provided on an authorized basis.	A business, academic or government organization, or some combination of them
Community cloud	Exclusive	A specific community of consumers from organizations that have shared concerns (e.g., mission, security requirements, policy, and compliance considerations)	One or more of the organizations in the community
Hybrid cloud	Open/Exclusive	Composition of two or more distinct cloud infrastructures (private and public). Sensitive data is maintained in the private cloud, with the processing/application running in a public cloud. Cloud infrastructures remain unique entities but are bound by standardized or proprietary technology that enables data and application portability.	Any combination of all owners/managers mentioned above

[1] http://csrc.nist.gov/publications/nistpubs/800-145/SP800-145.pdf
[2] http://csrc.nist.gov/publications/nistpubs/800-145/SP800-145.pdf

It is expected that the Government of Canada will adopt a hybrid model for cloud, which would entail a combination of legacy solutions, private cloud, and public cloud services.

A hybrid approach will provide government organizations with the ability to benefit from their own investments in cloud as well as already-established public cloud and rapidly evolving cloud services.

Cloud computing industry trends

To understand cloud's growing significance, consider the following statistics:

- Industry analyst firm International Data Corporation (IDC) predicts that the global cloud market will hit $118 billion in 2015 and crest at $200 billion by 2018.[3]

- Technology Business Review estimates that the private cloud market will grow by 35% this year, the public cloud will grow by 25%, and hybrid cloud will experience a 50% growth rate.[4]

- IDC forecasts that public cloud services spending will reach $127 billion in 2018, driven by factors including adoption of "Cloud First" strategies by IT vendors expanding their offerings and IT buyers implementing new solutions.[5]

Indeed, organizations in every sector are looking to capitalize on opportunities for revenue growth, cost effectiveness/efficiency, service enhancements and competitive advantage. To do this, they must speed up innovation, enhance agility and improve financial management through the use of technology—but not the same way it has been done over the last several decades.

According to Tiffani Bova, VP of Gartner Research, cloud computing has become the platform for the next transition, but "cloud is not the end state—it is where you should begin."[6]

Governments worldwide are clearly joining the movement toward adopting cloud computing practices and services in order to benefit from the economics, efficiencies and interoperability that cloud can enable. For example:

- The United States' Federal Cloud Computing Strategy[7] states that "By leveraging shared infrastructure and economics of scale, cloud computing presents a compelling model for Federal leadership. Organizations will be able to measure and pay for only the IT resources they consume, increase or decrease their usage to match requirements and budget constraints, and leverage the shared underlying capacity of IT resources via a network.

[3] http://www.computerworld.com/article/2860980/hybrid-cloud-adoption-set-for-a-big-boost-in-2015.html
[4] http://www.techradar.com/us/news/internet/cloud-services/cloud-trends-for-2015-hybrid-cloud-set-to-become-the-strategy-of-choice-1282298
[5] http://www.idc.com/getdoc.jsp?containerId=prUS25219014
[6] http://www.computerdealernews.com/?s=10+recommendations+for+cloud+partners
[7] https://www.whitehouse.gov/sites/default/files/omb/assets/egov_docs/federal-cloud-computing-strategy.pdf

Resources needed to support mission critical capabilities can be provisioned more rapidly and with minimal overhead and routine provider interaction."

- Provided data is adequately protected and cloud delivers value for money, the Australian government now requires agencies to adopt cloud services (also known as "Cloud First") for new ICT services and when replacing any existing ICT services.[8]

Key drivers

As we see worldwide organizational movement toward cloud computing, the Government of Canada should also be recognized for making significant strides in this direction:

- Blueprint 2020,[9] the government's own vision for creating a world-class public service equipped to serve Canada and Canadians now and into the future, has identified an urgent need to focus on innovative practices and networking, processes and empowerment, people management and technology—all seen as critical to help communication, collaboration, information sharing and service delivery. Blueprint 2020 advocates the strategic adoption and use of cloud computing.

- The new Central Innovation Hub,[10] promised in June 2013's Blueprint 2020 roadmap to modernize Canada's public service, encourages innovation among Canada's bureaucrats, and aligns to the 2020 vision, further demonstrating that governments are moving to more innovative approaches of doing business.

- In a 2014 speech to the Cloud Factory Conference, Treasury Board President Tony Clement recognized cloud computing as a way for federal government to maximize its IT investments, and invited input from industry experts on how to adopt and use cloud computing to achieve those savings.[11] Dave Adamson, Deputy CIO and Chief Information Officer for the Treasury Board Secretariat (TBS), was also present and reaching out to industry members for their expertise.

[8] http://www.finance.gov.au/sites/default/files/australian-government-cloud-computing-policy-3.pdf
[9] http://www.clerk.gc.ca/eng/feature.asp?pageId=350
[10] http://ottawacitizen.com/business/local-business/governments-new-innovation-hub-open-to-new-thinking
[11] http://news.gc.ca/web/article-en.do?nid=846049

- As two outcomes of the above-mentioned conference: TBS later held a one-day Industry Engagement Event[12] with more than 80 cloud service providers (CSPs) in attendance; and issued an RFI[13] in December 2014—serving as the catalyst for ITAC's members to provide an industry voice (outside of their own individual responses to the RFI) on how government should consume cloud services.

Benefits

The benefits realized by governments that adopt a cloud environment are numerous, including but not limited to:

- **Improved business engagement** across the organization by aligning IT to program and business objectives;

- **Cultural shift to higher value work** because there is no need to oversee procurement of IT commodities, or provision underlying infrastructure and systems; therefore, this evolves the role of IT as a "value creator" (i.e., from "IT delivery" to "service delivery");

- **Support sustainability measures** by more efficiently aligning resource capacity with actual demand and consumption, minimizing government waste by reducing excess computing capacity and power consumption;

- **Enhanced end-to-end service delivery** by making information more easily accessible, allowing for more nimble response times to citizens, businesses and stakeholders;

- **Innovate the public service** by tapping into private-sector innovation in the cloud computing arena, and identifying new opportunities for collaboration;

- **Better enabled to adopt and try new technologies** and services on a limited scale before deploying nationally;

- **Realized cost savings** by paying for only what is consumed (purchased "as-a-service"), thereby ensuring taxpayers' dollars are well spent;

- **Fuel an entrepreneurial culture** both inside and outside government, stimulating the economy and innovation ecosystem; and

- **Enhanced reputation** by promoting open government and fostering public engagement.

[12] https://buyandsell.gc.ca/cds/public/2014/11/26/284436b3876cd7214085e66ba827c9d4/cloud_industry_engagement_event_nov_13_2014_en.pdf
[13] https://buyandsell.gc.ca/procurement-data/tender-notice/PW-EEM-033-28881

RECOMMENDATIONS

The Enterprise Working Group is wholly supportive of the government's current initiatives toward cloud computing.

The following pages include seven critical building blocks that the Government of Canada should consider when adopting and implementing a cloud-enabled enterprise. Together, these recommended steps will help drive efficiencies and savings, and spur innovation, thereby executing on Blueprint 2020's core objective to improve the lives of Canadians by:

- making smart use of new technologies; and
- achieving the best possible outcomes with efficient, secure, interconnected and nimble processes, structures and systems.

1. Maintain alignment

The Government of Canada already has a significant number of transformation initiatives currently underway—all designed to innovate internal government and external client service delivery.

Given that a cloud strategy has yet to be solidified, it is imperative that the Government of Canada develop and execute all transformation initiatives in a manner that can align with cloud strategies once finalized.

2. Develop a "Cloud First" policy

According to the US General Services Administration, "Cloud First" refers to a mandatory policy that agencies must adopt—with benefits including maximizing capacity utilization, improved IT flexibility and responsiveness, and minimizing cost.[14] The United States has implemented this policy,[15] and similar policies have been adopted in the United Kingdom[16] and Australia.[17]

Unless a better alternative can be found that demonstrates better value for money, the Government of Canada should also establish a Cloud First policy, mandating departments to consider cloud-based services *before* purchasing new or replacing existing ICT services. Otherwise, departments and agencies will likely default to the status quo, possibly impeding large-scale IT modernization projects underway.

It should be noted that while several Western governments have adopted a Cloud First policy, they may vary widely on their approach to data sovereignty and data residency. In a

[14] http://www.gsa.gov/portal/content/190333
[15] http://www.dhs.gov/sites/default/files/publications/digital-strategy/federal-cloud-computing-strategy.pdf
[16] https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/266214/government-cloud-strategy_0.pdf
[17] http://www.finance.gov.au/sites/default/files/australian-government-cloud-computing-policy-3.pdf

world where data breaches are a common occurrence, the Government of Canada must, on behalf of Canadians, ensure it addresses these issues as it adopts cloud computing.

3. Determine how to balance public cloud with private cloud

As government cloud policies evolve worldwide, they all appear to share the same challenge: striking the right balance between public and private cloud today, and anticipating the level of balance required in the future.

Building large-scale private clouds can be cumbersome, bearing many hidden security, lifecycle management and additional maintenance costs.[18] Ultimately, the Hybrid Cloud model—one that encompasses both private and public cloud—can be the best and most cost-efficient option for government entities requiring the security of private clouds, but also the flexibility of public clouds.

At first glance, many governments believe all data they host is classified, thereby requiring a private cloud. In fact, much of the information that the Government of Canada has traditionally believed to be protected within the perimeter of its own networks can be shifted to the public cloud.

Through a data classification process in which data will be identified for cloud consumption or not, the Government of Canada can evaluate where and when public cloud services can be used, and where and when it is best to leverage a private cloud or hybrid cloud strategy.

As an example, in April 2014 the UK government reduced its data classifications from six to just three, with the intent of simplifying the protection of information and better suiting modern work practices (such as cloud computing).[19]

Assuming the Government of Canada adopts a hybrid cloud model, it will be critical to make this cloud approach known to internal decision makers and external suppliers—ensuring all parties are clear on which path they must follow.

According to IDC, over time, strong customer-partner relationships will open the door to innovative solutions, designed and balanced specifically for industries like government.[20]

4. Create a "Public Cloud First" posture for application rationalization

Unless data classification requirements dictate the need for a private, controlled data centre environment and/or the cost is less expensive, ITAC EWG encourages the Government of Canada to consider "Public Cloud First" strategy above all others (i.e., before private). This

[18] http://www.computerweekly.com/opinion/The-hidden-costs-of-a-private-cloud
[19] https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/251480/Government-Security-Classifications-April-2014.pdf
[20] http://www.channelnomics.com/channelnomics-us/news/2419075/idc-industry-specific-solutions-to-drive-public-cloud-computing

is also under the assumption that the cloud service provider (CSP) can meet Protected-B level (moderate) security requirements using a public cloud.

This follows cloud computing strategies akin to that of the US[21] and UK[22] governments.

Granted, some services will require delivery using private cloud, including the network infrastructure necessary for citizens to access these services. Government should therefore select service providers who have the ability to establish baselines and measure user experience.

5. Leverage existing security controls and accreditations

Security and accreditation of cloud service providers (CSPs) reflects the massive growth of cloud adoption in major enterprises and global government—and offer organizations worldwide guidance for evaluating vendors' respective abilities to manage different types of data.

Globally supported security standards such as ISO/IEC 27001 (Information Security Management)[23] and NIST 800-53 (Security and Privacy Controls for Federal Information Systems and Organizations)[24] are excellent starting points for evaluating cloud vendors and others as appropriate over time.

Instead of building its own, the Government of Canada may also wish to leverage existing approaches used by similar governments. The US Federal Risk and Authorization Management Program (also known as FedRAMP)[25] is one government-wide program that provides a standardized approach to security assessment, authorization, and continuous monitoring for cloud products and services. The Government of Canada may wish to develop a FedRAMP-like approach to accreditation, thereby ensuring all cloud suppliers are openly aware of Canadian government requirements.[26]

6. Build a cloud-enabled enterprise

Based on the experiences of the ITAC EWG and according to research data from leading industry analysts on IT trends, a "cloud-enabled enterprise" is the clear way forward. It can unify cloud services across multiple suppliers and delivery channels, and in the long term support as-needed acquisition requirements.

However, taking an ad-hoc approach to cloud adoption would result in a disjointed, fragmented service and data environment. As such, a structured approach to acquisition and consumption is absolutely critical—ensuring cloud adoption is not slowed down by

[21] http://www.gsa.gov/portal/content/190333
[22] https://www.gov.uk/government/news/government-adopts-cloud-first-policy-for-public-sector-it
[23] http://www.iso.org/iso/home/standards/management-standards/iso27001.htm
[24] http://csrc.nist.gov/publications/nistpubs/800-53-rev4/sp800-53r4_summary.pdf
[25] https://www.fedramp.gov/about-us/about
[26] It should be noted that accreditation in the United States is very costly, possibly excluding the majority of Cloud providers and limiting innovation. Therefore, FedRAMP should only be referred to as a starting point.

issues including integration complexities, disparate procurement processes and security concerns.

A coordinated facilitator approach can be achieved by creating a business unit or "marketplace" within the Government of Canada, which acts as an intermediary between cloud service providers (CSPs) and IT service consumers (partners, departments/agencies) adopting cloud services—ensuring commonalities and security across all government. Similar central agencies include the United States' Cloud Computing Services (CCS) Program Management Office[27] and the UK government's Digital Marketplace.[28]

The marketplace would efficiently manage risk while simultaneously maximizing value, and include characteristics such as:

- Bringing together buyers and sellers in an "App Store" environment with business- and industry-specific cloud offerings;
- Providing a comprehensive "marketplace" that encompasses the range of IT services and capabilities available to business owners including non-cloud, legacy, internal, and inter-agency solution capabilities;
- Providing a mechanism that provides a choice of Infrastructure-as-a-Service (IaaS), Platform-as-a-Service (PaaS), and Software-as-a-Service (SaaS) offerings and solutions that leverage industry standards;[29]
- Facilitating valuable competition among suppliers—allowing small and medium enterprises (SMEs/SMBs) to compete with larger vendors and create innovative solutions that are easy to use, install and deploy;
- Accelerating acquisition, provisioning, and availability of the newest technologies; and
- Finding new capabilities that coincide with expected future needs.

With a structured approach to cloud, effective governance and a well-developed change management model, all end users—whether internal government employees, citizens or public/private sector partners—can enjoy a seamless service experience.

7. Enable transformation

Transforming the Government of Canada into a cloud-enabled enterprise requires a complete understanding of key challenges, a well-defined strategy, and a roadmap to execute upon. Important consideration factors include the following:

[27] http://www.gsa.gov/portal/content/190333
[28] https://digitalmarketplace.blog.gov.uk
[29] For definitions of IaaS, PaaS and SaaS, see pages 2-3 of http://csrc.nist.gov/publications/nistpubs/800-145/SP800-145.pdf

- Changes need to be made to business, operational and IT delivery models and processes, governing IT and security policies and procurement processes. Additionally, government must look at its organizational change management model, to address potential issues regarding control and resistance to cloud adoption.

- The Government will need to adapt and reinvent its approach to service delivery, and transition from a traditional IT service provider. Implementing a cloud environment is about innovation—and therefore, cloud computing allows IT organizations within government to "gain a seat at the table" and drive new business initiatives. Rather than concentrate predominantly on operational initiatives, IT should focus on building an implementation strategy that optimizes the delivery of services through the most efficient and valuable delivery model. This requires very innovative partnering arrangements between government and industry and the use of cloud-based solutions to bring citizens together and drive what has been referred to as innovative collaborative entrepreneurship. We have only begun to scratch the surface related to cloud-based solutions and gain insight to the true program cost savings that cloud-enabled technologies can provide.

- Based on the collective experience of the EWG, it is suggested that the strategy and roadmap be implemented through a series of transformation projects that can be adapted to align with the Government of Canada's cloud direction and evolving and emerging cloud solutions and services. The roadmap should identify a series of achievable and manageable technical and organizational transformation projects, all providing their own ROI yet contributing towards the end-state.

In essence, a strategy must be in place that allows government to seamlessly migrate to cloud. This requires putting a flexible decision-making framework in place (like the one below), which can be built upon for years to come:

Select

- Identify which IT services to move, and when, based on cloud readiness, security, market availability and technology lifecycle

Provision

- Aggregate demand, ensure interoperability and integration with IT portfolio
- Contract effectively to ensure needs are met
- Realize value by repurposing or decommissioning legacy assets and redeploying freed resources

Manage

- Shift IT mindset from assets to services
- Build new skill sets as required
- Actively monitor SLAs to ensure compliance and continuous improvement
- Re-evaluate vendor and service models periodically to maximize benefits and minimize risks

CONCLUSION

Cloud computing is not a fad: it is here to stay, and its adoption continues to accelerate worldwide. As the Government of Canada investigates computing options for faster development and cost savings, it is only a question of time before it is required to provide more agile, flexible and cost-reducing cloud computing services to its clients and partners.

Therefore, the EWG believes the timing is ideal for the Government of Canada to adopt innovative public cloud technology and industry best practices to help integrate infrastructure and application services across service delivery models.

Cloud offers the Government of Canada an opportunity to:

- address many technical and budgetary challenges by better supporting enterprise and departmental applications, delivering platforms and infrastructure without ownership or capital investment; and
- help transform Government of Canada's service delivery model and provide rapid, innovative solutions to Canadians focused on policy outcomes.

As the Government of Canada has established a shared services provider, it must now enable cloud-based services that are highly responsive, flexible, secure, cost-efficient and which support the evergreening of IT environments that align with TBS direction and government business goals. The very nature of a cloud-enabled enterprise will foster an environment that continuously evolves as the industry, business and departmental and agency needs evolve and change.

The ITAC EWG welcomes the opportunity for further discussion on some of the insights, suggestions, and lessons learned from our industry members.