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E-Government Infrastructure for Canada's Government On-Line Initiative

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Summary: This paper will describe briefly the decisions taken by the federal government of Canada to design and develop a common electronic infrastructure for the use of all federal departments and agencies in their efforts to bring government services on-line. Beginning with the background to the Government On-Line initiative, the concepts of the "Federated Infrastructure Model" and of "Strategic Infrastructure" are outlined briefly. The purpose, architecture and design of a major component of the common infrastructure known as "The Secure Channel" is then described, with illustrations of how that portion of the common infrastructure will be used to facilitate informational and transactional services for citizens and business. The paper concludes with a look at the "Smart Communities" program, which is designed to encourage transition to the "digital economy" and encourage innovative use of ICTs in support of local community development.

I Canada's "Government On-Line" Initiative:

Every government project or program begins with a concept or proposal for new initiatives that will further the policies and objectives of the Government of the day, and the political party or parties that make up that government. So it is with the many projects and programs now being implemented around the world to make information and services available to citizens on-line.

In Canada's case, the federal government, in outlining its legislative program and policy priorities at the opening of the 1999 session of the Canadian Parliament, expressed the intention that "---The government will become a model user of information technology and the Internet." It also indicated that "---our goal is to become known around the world as the government most connected to its citizens, with Canadians able to access all government information and services on-line at the time and place of their choosing."

This decision to make services more easily available on-line is related in part to the easy acceptance in Canada of new technologies introduced into the marketplace, including the extensive penetration of the internet and related ICTs into the homes and workplaces of average citizens. Canada has amongst the world's lowest telecommunications costs, including for local and long distance phone service, and by the late 1990s over half the population had internet access at either home or place of work. Over the past several years, a number of government programs have helped Canada to become one of the most "connected" countries in the world. "SchoolNet" and "Community Access", as part of the "Connecting Canadians" strategy, have ensured that virtually every Canadian school has access to the internet, and hundreds of community centres and libraries provide opportunities for people not already connected at home to access the internet at no cost. High speed, or "broadband" service was also becoming increasingly popular.

Canadians were telling their elected officials that getting government information and services on-line was important to them. They made it clear that they considered an “On-line government” to be synonymous with a “smart government”; one which understood the wishes and aspirations of its citizens for improved access to government services. Citizens were making it known that they expected their governments to use the internet as a service improvement opportunity, and not just as an opportunity to cut costs and close physical offices.

The federal government of Canada responded by recognizing that getting government services on line should be given a high priority and, in October 1999, made the program another “pillar” of the overall “connecting Canadians” strategy. Studies within the public service indicated that, to succeed, on-line services must be accessible to all, of direct benefit to the citizen, easy to use and organized in a manner which reflects citizen needs rather than government organization. The services must be private and secure, and should be shaped and constantly adjusted on the basis of citizen testing and feedback.

Of central importance is the conclusion that Government ON-Line, or “GOL” must be a service improvement initiative, aimed at expanding and improving services provided to Canadians through the use of the internet as an additional delivery channel. However, GOL also provides an opportunity for cross-channel program delivery integration, and the very act of redesigning services for delivery on-line promotes managers to consider opportunities for service transformation ---- providing more integrated approaches to delivery across several different government services, and redesigning services to enhance efficiency and effectiveness.

Overall management responsibility for the Government On-Line program has been assigned to the Treasury Board Secretariat. The Secretariat recommends and provides advice to the Treasury Board on policies, directives, regulations, and program expenditure proposals with respect to the management of the government's financial, human, and material resources. Its responsibilities for the general management of the government affect initiatives, issues and activities that cut across all policy sectors managed by 22 operating departments and some 100 other organizational entities. The

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Secretariat is also responsible for the comptroller function of government. Within the Treasury Board Secretariat is the office of the Chief Information Officer for the federal government, which serves as the management and coordination office for the overall GOL effort. A senior level committee of department heads provides general oversight and project approval. Interlocking committees of senior officials manage the cross department collaboration essential to providing effective on-line services.

The Government on-line initiative has five major components:

- On line delivery of a critical mass of key client services,
- Common infrastructure to support interoperability, service integration, cross channel integration, and reduce overall costs,
- Policy frameworks and standards that promote citizen trust, ease of use and accessibility,
- Client driven service improvement and communications, and
- A concerted effort towards human resource development to ensure the right skills are available for electronic and other service delivery.

Canada is now moving quickly to improve its early efforts at offering information and advice on-line, and the Canadian public seems to be comfortable with the approach being taken. 52% of Canadians with internet access have visited a Government of Canada web site within the last three months, with 73% indicating their satisfaction with the services' overall quality. In a recent survey, 77% of Canadians also indicated their belief that the internet will improve the manner in which they

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receive services from the federal government. “Take-up” of services offered has been rapid, in

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keeping with the rapid expansion of internet usage within the population. A recent survey

indicated that internet penetration has now reached approximately 73% between home and place of employment, with broadband access now estimated at 48% of those with internet connections at home. Canadians spend more time on the net than citizens of any other country, at an estimated 9.1 [iv] hours a week.

As indicated, development and deployment of a common infrastructure is one of the five major components making up the Government of Canada's Government On-Line Initiative, and the major aspects of this infrastructure are outlined in this paper.

II The Strategic Infrastructure Initiative:

Simply put, the "strategic infrastructure" supporting Canada's Government On-Line initiative consists of a framework of key policies and technical standards and the technology infrastructure required to facilitate the provision of client centric, "whole of government", private and secure on-line services for citizens and business.

The decision to adopt a "strategic infrastructure" model was taken after review of the current ICT environments of Canadian federal institutions. Often, these have grown up over time and are not well integrated, making it difficult and costly to inter-operate and provide seamless service to the citizen. And for those small or medium departments not already managing significant ICT facilities, it was clear that it would be an onerous and costly process if each department had to create its own electronic service delivery environment. This is particularly true in the case of major undertakings such as creation of a major PKI "Certificate Authority" to support government service delivery.

The Treasury Board Secretariat acts as the overall GOL program coordinator, and therefore is considered to be the "requirements owner" for definition of the elements of the common infrastructure. The Government Telecommunications and Informatics Services Branch of the Department of Public Works and Government Services provides and operates the main elements of the infrastructure through contractual arrangements with a private sector consortium. Project architecture, design, build and testing is carried out by an integrated team of government staff and the workforce of the main contractors.

In developing this strategic infrastructure, Canada has adopted what has become known as the "federated infrastructure model", consisting of three levels of ICT infrastructure and services. At the first level of this model is the common base layer of technologies and services being centrally developed and managed for the use of all departments. Each department and agency will be required to use these base services, which are also to be centrally funded, and are centrally provided and managed by the Government Telecommunications and Informatics Services organization. However, at the next level, they are still free to work together in groups of several departments or agencies with similar needs to develop further infrastructure that may be required to meet particular needs not addressed by the common infrastructure. At the single department level, organizations can still provide specific elements of technical infrastructure unique to their own situation and service delivery needs. At both the second (multi department or agencies) and third (single department or agency) levels, what they are not permitted to do is to duplicate any element of the base common infrastructure, even if their own project budgets might permit this in some cases.

Five groups of technologies are considered to be elements of the Strategic infrastructure for GOL. [v] These are;

- Architecture and planning services to give effect to the "federated architecture" approach,
- Security and authentication services, including a public key infrastructure providing digital certificates and signatures, authentication, authorization and non repudiation services,
- Directory services, providing a common authoritative source of information on services, businesses, officials delivering or managing government programs, digital encryption keys, and government

phone contacts or addresses.

-Network services providing TCP-IP based connectivity at multiple points of presence across the country, connecting citizens and businesses through private sector Internet Service Providers, and interconnecting all federal departments and agencies and their services,

-Messaging services, providing the capability to send message traffic at varying levels of security (as required) between officials of various departments, and between departments and the general public,

-Application integration services, allowing the public to connect to multiple programs and services of the government, and for those services to interconnect with the appropriate "back office systems" necessary for transaction completion.

III The Secure Channel Project:

At the centre of the strategic infrastructure is a system of hardware, middleware, network connectivity and security technologies usually referred to as "The Secure Channel". Secure Channel and its subsystems will enhance the ability of citizens and businesses to deal with government as a single entity, facilitate smooth access to on-line services by reducing back-office integration complexity, and protect citizen privacy through the use of public key infrastructure and digital certificates.

From the perspective of the Canadian public, they will be able to access government information and services in a more seamless fashion, from anywhere in the country (or internationally,) and from multiple devices including PCs, Kiosks, telephones, and handheld devices. Transactions spanning several departments will be possible without the need to know where to find components of a service within a department. Digital certificates will allow a reasonable level of identity assurance, and transactions will be logged to ensure a permanent record is maintained.

From the perspective of departmental officials, Secure Channel will obviate the need for each department to invest in costly infrastructure to support delivery of their services, allowing them to concentrate on the design and construction of the on-line services to support their particular programs. In addition, through the use of a central "broker" architecture, Secure Channel will also remove the need for departments to rebuild many of their back-office financial and data base systems to support on-line delivery. This is particularly important since the Canadian government has not yet adopted a single software application for departmental financial, human resource, inventory, or data base systems, with the result that there are a significant number of different system in use within departments. Secure Channel will put in place the necessary set of application interfaces to allow itself to communicate with each department, and then present a common front to external users.

The underlying network component of Secure Channel is a high speed IP based, enterprise level, virtual private network (VPNE) using multiple protocol label switching technology (MPLS). The network will be interconnected to the public internet at several points across Canada, depending on traffic demands. (Points of Presence or POPs) Network security is provided through the usual firewall systems, complemented by network and host based intrusion detection. The Secure Channel Network (SCNet) will also interconnect all departments and agencies, facilitating information and message exchange between officials of these organizations, and connecting officials to the public internet from their desktop. In this regard, SCNet will be replacing an existing IP protocol based network "GENet" currently in service for these purposes

The principal means of ensuring citizen or business authentication when necessary for transactions, as well as for the protection of citizen privacy, is through the creation of a single Public Key Infrastructure (PKI) Certificate Authority (CA) based on the "Truepass" product from Entrust. The service allows for remote, on-line, registration using shared secrets, or when appropriate the use of face-to-face identification by government officials at widely dispersed offices, as a prelude to on-line registration. The decision has been taken to employ anonymous certificates in light of the privacy difficulties that would be created by issuance of named certificates. Considerable effort has been put into designing the overall CA service, to be known as "ePass", to be as "user friendly" as possible, so

that citizens are not required to understand any of the considerable complexities of PKI in order to register and confidently use the system. Focus group testing and citizen surveys have been used in order to ensure a comfortable user experience.

Directory services are provided through a series of components referred to as the “Federated Infrastructure National Directory Service” (FINDS), with the core directory system based on the X.500 protocol, being supplied by the British firm NEXXOR. . This protocol is also employed for the creation of the specialized directory required to support the public keys associated with the PKI CA service. A series of “border directories” are being developed in order to allow individual departments to connect their directory based information to the master FINDS directory without the need to significantly alter their existing directory systems. As many of these existing directories are not in the X.500 format, FINDS must also act as a “meta directory” to allow interaction between dissimilar domains. Existing directories of public officials and of Canadian businesses are expected to be made available through FINDS as well.

The main Secure Channel broker is based on the IBM Websphere product in common use in many eCommerce applications, with some enhancements in areas such as double envelope date/time stamping and non-repudiation. The broker software will include a series of application interfaces (APIs) allowing connection to the back-office systems of various user departments, and will also act as a “workflow director” to route action requests between various departments or service providers. Thus, multi department transactions that would have previously required a user to jump between various government web sites (assuming they even knew which sites to go to,) will now be possible in a manner which appears to present multi department transactions as if the citizen or business was dealing with a “virtual department” created solely for the purpose of a specific function. Session management will be facilitated as well, and the broker will access the central PKI CA services for those transactions requiring authentication and authorization. Central services such as common financial settlement with the government, secure “drop box” for document delivery, and handicapped access support will also be provided through the Secure Channel broker.

Of particular note is the manner in which the architecture of the Secure Channel broker has been implemented so as to enhance and protect citizen privacy. This is a matter of considerable concern

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within Canada, with everyone from the federal Privacy Commissioner to ad hoc public interest groups having expressed concerns that, in the drive for efficient service delivery, the government may create large, centralized, data bases of personal information that could be abused in various ways by the State or by unscrupulous individuals. To avoid these dangers, the Secure Channel broker is designed so as to place within each department a subset of the required Secure Channel broker functionality, such that when a citizen carries out any transaction with a government department the data involved in that transaction will remain within the departmental “silo”. No central store of personal information is created in the process of using the systems, and Canadian federal law substantially limits the extent of information sharing that is permitted between departments or agencies, whether in electronic format or more conventional media such as paper.

IV The Secure Channel Procurement Process:

When developing the concepts of “Strategic Infrastructure and the “Secure Channel” it became apparent that a project of this scale and complexity, and this close to the leading edge of the technologies could only be implemented by a consortium of companies assembled for this purpose. Given the rapid evolution of the technologies involved, it was also felt that a significant degree of flexibility would be required, so that the vendor and the Government of Canada would be able to make adjustments as the work proceeded. For the same reasons, there was a strong desire to allow the private sector the widest possible latitude in development of the system and service. And recognizing that there would also be a need to constantly upgrade and refresh the systems, it was felt that the government should look to the private sector to operate much of the necessary infrastructure after initial development. These priorities led the government to adopt a modified procurement strategy designed to support the Government On-Line objectives and achieve an operational system

within a reasonable time frame. A draft Request for Proposals (RFP) was developed and circulated twice, seeking industry input and advice as to whether the RFP as structured would produce the desired results.

When issued, the RFP documents included the usual contractual requirements, but focused the attention of potential vendors on a “vision statement” which outlined what government officials felt was needed for the Secure Channel system, and invited bidders to either confirm the vision, or to offer their own technical proposals to achieve similar ends. Several responses were received, which were then graded on not only the compliance with basic technical requirements and standards, but on response to the vision paper, and experience in implementing similar systems for others. After a detailed negotiations phase, a design / build contract was signed which provided for frequent “off ramps” should problems develop with the quality of the work, its cost or timeliness, or should the government and vendor not be able to agree on the way ahead. The successful consortium is “Team BCE”, headed by one of Canada’s largest telecommunications service providers, Bell Nexxia, and supported by a “who’s who” of Canadian and international technology firms.

In the spirit of partnership with the vendor, a joint project office has been established to which both the successful consortium’s member companies have assigned project staff. A project governance methodology has been adopted which directly involves the vendor in weekly joint management meetings, and ensures ongoing alignment between the vendor team and the government’s strategic direction.

V The Secure Channel “Pathfinder” Projects:

In order to ensure that the Secure Channel infrastructure is actually going to provide “real world” benefits for both government departments and citizens, a set of “pathfinder projects” has been chosen which will present “real life” applications from departments of the government, with real business requirements that must be delivered in an on-line environment. Building the Secure Channel system to accommodate these real world needs will ensure alignment of the technology solutions and the service requirements.

Included in these “pathfinder projects” is the first of the applications which will use the full PKI Certificate service; the ability to change on-line the official address in your tax records with the Canada Customs and Revenue Agency. Already operational using a simple password system, the change of address system will be converted to digital certificates for authentication later this summer. It is expected that this service will be followed by bringing on-line the applications for employment insurance benefits, when the Human Resources Development Department implements its system, using the digital certificates this fall.

This is expected to be followed on-line by the system which employers use to record with the federal government the hirings and departures of every employee. This is critical information needed for calculation of various benefit programs associated with employment time for individuals, including employment insurance and the eligibility for Canada Pension Plan benefits. Completing the multi part forms for the current Record of Employment system is considered by small business owners to be one of the most onerous and irritating requirements of the federal government, and putting the system on-line will allow for much easier capture of the information.

Another of the applications currently in development will allow those owing money to the government for various tax purposes, or for the purchase of a good or service, to pay directly on-line, using not only standard credit cards such as Visa or Mastercard, (which several departments and agencies already use,) but also employing direct account transfers from the citizen’s or business’s account to the government accounts. (Approximately 65% of all federal government financial transactions are already carried out electronically.)

The Canadian Citizenship and Immigration department is currently developing a system to allow for

on-line query of the status of immigration requests by either representatives of the applicant, or the applicant himself / herself from overseas, via the internet. And certain routine aspects of passport applications and renewals will be put on line, using the digital certificate services for user authentication.

As the main purchasing agent for the federal government, the Department of Public Works and Government Services spends billions every year to purchase through competitive processes the many goods and services a major government organization needs in order to do its work. Companies wishing to bid on government contracts can already obtain all of the necessary information electronically, but this system now under development will provide a complete end to end, "Electronic Supply Chain" which is expected to allow considerable savings in the case of procurement of routine goods.

While the above referenced set of applications has been selected so as to provide real world services which will operate over the Secure Channel system, many other applications are currently in development in addition to these examples. These range from patent and trademarks applications on-line, to on-line applications for veteran benefits or farm support programs. From a government bookstore where you can obtain every publication from every department, to a businessman being able to review his entire tax account on-line. From access to Canadian cultural and historical information, to applying for educational financial support. These will join numerous federal services already provided electronically, including on-line auctions of radio spectrum, filing of annual personal tax returns electronically, the ability to search government archives on-line, or simply being able to obtain up to the minute weather forecasts through your wireless PDA. Each of these is a step towards the vision outlined by the Government of Canada in 1999.

VI Canada's Smart Communities Program:

While this paper is largely concerned with the technical infrastructure being built to support Canada's federal Government On-Line initiative, it must be remembered that there are also other levels of government within Canada which have also embarked on extensive programs to bring their services to Canadian citizens and business on-line. At the provincial level, virtually each of the ten provinces and three territories of Canada is already providing services electronically, and several have established formal programs and targets much like that of the federal government.

At the level of municipal government, many cities are also active in the area of on-line services, and the federal government is supporting a number of these through its "Smart Communities Program". The program encourages community groups and institutions to work together to define a vision of how ICTs can best be used to aid in the development of the city, its economy and culture in new and innovative ways.

Twelve "Smart Community" demonstration projects have begun, supported by three different programs. The first of these is the provision of a toolkit and skills development program organized by the federal government to support smart community efforts across Canada. Secondly, there is a Resource Exchange program to assist communities to build their smart community with the help of on line resources provided and managed by the government. And for those not directly receiving federal funding support, there is also a program intended to build momentum by recognizing their achievements.

The twelve demonstration projects are scattered across Canada, and range from urban environments such as Vancouver and Ottawa, to rural initiatives in Alberta and along the isolated Labrador coast, to native communities scattered across the northern prairies, and even includes one in the Western Arctic capital of Yellowknife. The objective of the program is to assist communities in developing sustainable smart communities strategies, while creating learning opportunities for participants, and providing new business opportunities for local companies engaged in the development of information and communication technology applications.

VII Conclusion:

In this paper we have seen some of the background behind the Government of Canada's decision to launch the Government On-Line initiative in the fall of 1999, after a series of other programs and initiatives aimed at assisting and encouraging Canadian citizens and business leaders to "get on-line" and participate in the knowledge economy. Collectively, these programs and initiatives are often referred to as "The Connecting Canadians Strategy". While many nations have begun similar initiatives, officials within the Canadian government realized that the present ICT infrastructure of most government departments and agencies had developed largely in a "stove pipe" environment which would make it difficult to easily connect citizens to services in different parts of the federal government. This led to the creation of the "Federated Infrastructure Model" and a decision to develop a common set of basic facilities and services that would be centrally funded and managed, and then used by all departments to facilitate their on-line service delivery plans. The principal elements of the "Strategic Infrastructure Initiative" were outlined briefly, and the main component, known as the "Secure Channel" is described. However, infrastructure in the absence of on-line applications or services is of little use. Real life applications are therefore being used as a series of "Pathfinder Projects" to ensure alignment between the "Secure Channel" system and the real needs of departments developing on-line services. Finally, reference is made to the work underway at other government levels within Canada, with a brief outline of one program designed to create "Smart Communities" at the local level.

The main elements of Canada's Government On-Line initiative have been to focus on service improvement, and ensure a citizen centric approach in the provision and organization of on-line services, while protecting citizen privacy. Much of the architecture and design behind the common infrastructure described herein is aimed at meeting these objectives. Given that Canada has, for the second consecutive year, been named by the Accenture Consulting group's world wide survey as number one in e-Government, it appears that this approach is the correct one. And judging from the rapidly climbing usage of Canadian Government web sites and services, and the high satisfaction levels expressed by users, Canadians also appear to support this approach to providing on-line service delivery.

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[i] Mandate & Responsibilities statement – Treasury Board Secretariat Web site, at www.tbs-cts.gc.ca

[ii] Canada Information Office survey - Spring of 2001.

[iii] Ipsos-Reid public survey released April 2002.

[iv] Canada Information Office survey – Spring of 2001.

[v] Presentation by M. d'Auray, CIO –Treasury Board Secretariat, Technology in Government Week, Oct 2001.

[vi] See the speeches of the Privacy Commissioner of Canada, at www.privcom.gc.ca/speech/sp-d_e.asp