Government of Canada

Service Oriented Architecture

Strategy

Statement of Direction

Chief Information Officer Branch

Enterprise Architecture and Standards Division

February 2006

Draft Version 0.8

Document History

Version	Date	Participant	Role	Comment
0.1	Dec. 22, 2005	Mike Giovinazzo	Author	Initial outline and draft content
0.2	Jan. 13, 2006	Wesley McGregor	Author	Refinements
0.3, 0.4	Jan. 24, 2006	Mike Giovinazzo	Reviewer	Condense; Address R. Bryson & Wesley McGregor Review, suggested concepts and Comments
0.5	Jan. 26, 2006	Richard Bryson	Editor	General editing
0.6	Jan. 31, 2006	Mike Giovinazzo, Wesley McGregor	Editors	General editing and refinement from R. Bryson
0.6A	Feb 1, 2006	Wesley McGregor	Editor	Minor style changes.
0.7	Feb 8, 2006	Gary Doucet	Review /Edit	Miscellaneous Edits
0.8	Feb 15, 2006	Wesley McGregor	Editor	Minor edits.

TBS RDIMS # 379490

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1.0   Forward

The Chief Information Officer Branch (CIOB) of the Treasury Board Secretariat is providing guidance on the adoption of Service Oriented Architecture for the Government of Canada (GC SOA). The goal of this guidance is to have departments adopt a common approach to the emerging standards and models of Service Oriented Architecture. SOA is a useful approach to GC program design, strategic business planning as well as systems design; it is not simply a technological advancement. It is also a means of achieving the GC goals for service modernization, horizontal service delivery and greater interoperability.

> SOA is a useful approach to GC program design, strategic **business planning** as well as systems design; it is not simply a technological advancement.

In this context "Service Orientation" is the planning and delivery of all services by formally componentizing each of the services and their subordinate services such that the overall collection of services work as a whole and supports a high level master-plan (or strategic design).

This document introduces the Service Oriented approach and the GC SOA reference model that provides all departments and agencies a statement of direction and orientation to help ensure a consistent adoption of SOA in support of a cohesive approach to service delivery across government.

The initial statement of direction is being presented in this document. Other, more specific guidance is provided though several additional companion guides.

The statement of direction for GC offers executives the advantage of seeing the longer-term government direction related to GC SOA as well as encouraging project initiatives and program designs to incorporate the concepts of Service Orientation wherever practical on a going forward basis. As a general principle, the Enterprise Architecture and Standards Division (EASD) seeks to promote strategies of evolution as opposed to revolution.

SOA goes to the foundation of all program design and clearly impacts the manner in which all systems and information technology is deployed. GC architecture domains like: Business, Information, Application, Technology, Security, Accessibility… will be influenced and guided by the GC SOA.

2.0   About this Document

2.1   Purpose

This document provides a statement of direction for a GC Service Oriented Architecture. The statement of direction consists of:

- An announcement of CIOB's intent to place a strong emphasis on service oriented architecture;
- An introduction to the concept of service orientation, its benefits and implications; and
- An outline of next steps planned by CIOB to provide specific guidance in the adoption of Service Oriented Architecture across the Government of Canada.

2.2   Audience

This document is intended for general management and architecture / designer audiences. As such, it does not examine the technical details or the specifics of the GC Service Oriented Architecture.

2.3 Scope

The scope of this document is the introduction of the basic concepts of Service Orientation and an initial statement of direction for the GC SOA.

2.4 Companion Documents

This is the first document of a collection. Other documents present specific guidance in discrete areas. Over time, these materials will evolve and offer additional supporting guidance where necessary.

3.0 What is the GC SOA?

3.1 Defining "Service Orientation"

The words "service" and "Service Orientation" are sometimes misunderstood. The noun "service" is defined in dictionaries as "The performance of work (a function) by one for another". Examples of services in a Government of Canada context are: providing a grant, delivering business start-up advice or some other tangible output deemed to be of value. This makes *service* a very important and reusable building block for planning and designing government programs that achieve desired outcomes.

Service-Orientation depicts the delivery of any valued output via a service from one party to another. It is based on the theory of the marketplace. If a service has value, then someone will consume it and if a service has a lot of value, then a lot of people will demand it. Extending the marketplace example, service orientation is a paradigm for organizing and utilizing distributed service delivery capabilities that might be under the control of different ownerships in a managed fashion such that an organization, such as the federal government, can act and behave as one.

Achieving Service-Orientation is primarily accomplished by taking monolithic business models, processes or computer systems and breaking them open to form a well-organized collection of individual parts. Individually each part can then be designed to offer value (a service) in a broader context. That is, each service can be used within different 'collections' reducing the need to build duplicate services.

3.2 Introducing the GC SOA

CIOB is working towards the ideal of having all departments consistently adopt a common approach to service oriented program design at the business level and support this with fully compatible and layered service oriented architecture in their implementations which include process definitions, service agreements, job descriptions and, of course, IT solutions. This consistency, then translates into dramatic improvements in service modernization yielding greater productivity and increased agility.

The GC Service Oriented Architecture (GC SOA) is a comprehensive reference model that guides the use and adoption of Service Oriented Architectures (SOA) across the Government of Canada. By the end of 2005 there was already a significant groundswell of support for SOA throughout the private sector and in many government departments. This document encourages this adoption trend and provides guidance needed to foster consistency in the use of the GC SOA enhancing the benefits of SOA across the federal government landscape.

The GC Service Oriented Architecture is as much a business innovation as it is a technological one. SOA offers proven and standardized ways to achieve business flexibility by facilitating collaboration and reuse of business services as well as supporting business with IT systems that are flexible and easy to integrate.

A well-managed SOA environment enables rapid response to changing business demands. It helps organizations increase the agility of their business processes, as well as strengthen their underlying IT infrastructure by better retaining and reusing existing assets.

Figure 1 introduces the three distinct GC SOA layers and the supporting business context. Each offers a different degree of interoperability and reuse. This GC SOA reference architecture should be used to guide the selection and evolution of all system components. Technical submissions will be reviewed for alignment with GC SOA, where practical.
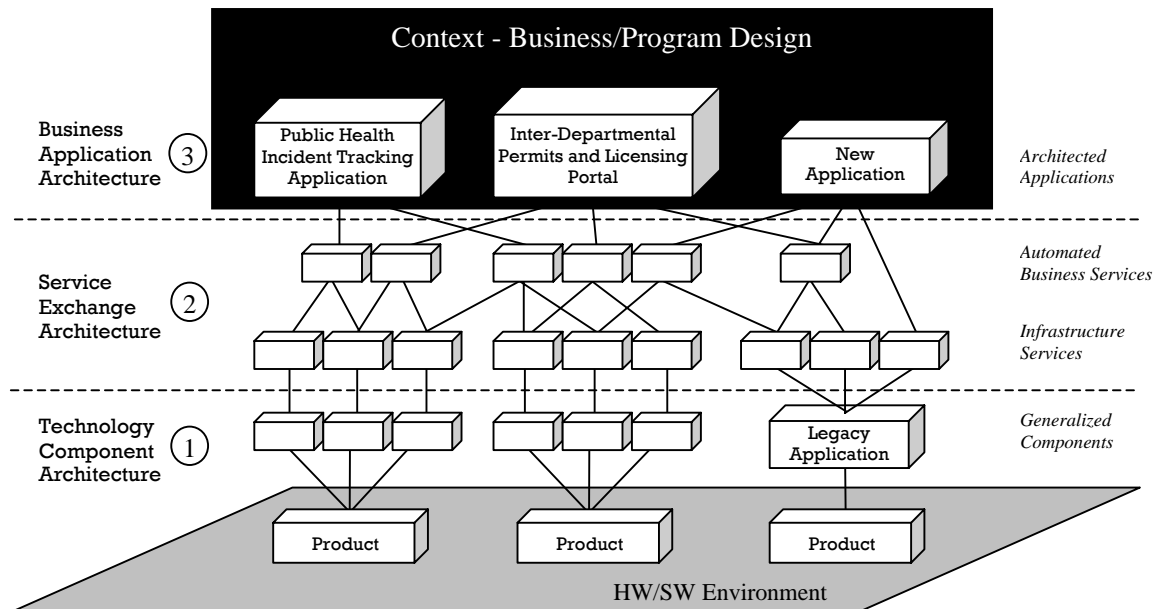

Figure 1   GC SOA Overview

The reference model consists of three distinct layers, which are used to organize components in alignment with the needs of the business. The three layers defined within the Layered Component Architecture are:

Layer 1 -   **Technology Component Architecture**

The Technology Component Architecture (TCA) contains vendor specific products, services and their supporting architectures and identifies the lowest level components that can be re-used across the GC "out-of-the-box".

Layer 2 -   **Service Exchange Architecture**

The middle layer supports the one-to-one mapping of a component offering to infrastructure services (*i-services*) and also the construction of services composed of other services (*composite services*).

Layer 3 -   **Business Application Architecture**

The top layer allows business owners to package a tailored selection of GC (and non-GC) services to be used in alignment and support of specific business requirements.

Context -   **Business & Program Design**

Sitting above the three layers is a formal approach to formulating business services using Business Architecture that dovetails closely with the Service Oriented Architecture's technical layers.

Common to all the layers in the GC SOA, readers will find:

- Each layer provides the necessary services for the layer above it
- Each layer is self-describing
- Each layer embodies a particular architectural concept

4.0   The Challenge and its Importance

4.1   The Issues

The Government of Canada is in the midst of a transformation on a scale never seen before. This transformation involves engaging the citizenry more fully while at the same time becoming more cost effective and efficient with the resources it currently has and consumes. As well, the citizens of Canada want to see their government as a seamless portfolio of services that reinforce one another and together combine to deliver the outcomes that meet their needs.

The federal government has placed a huge emphasis on horizontal service delivery and citizen centric service delivery. Linking together vital initiatives such as: Services Canada, the Service Transformation agenda, Horizontal Service Delivery, Common Administrative Services and IT Shared Services will depend on this coordinated and integrated approach to "Service Orientation".

These are clear directives being handed down as a by-product of key initiatives like Results for Canadians. It is now more imperative than ever to address the demand for consistency and interoperability across the government as more and more services require information from multiple sources.

Increased interoperability among all services will be critical. This cannot be achieved with the current collection of non-homogeneous products, tools and applications in the technology landscape. The implication is that large-scale changes will be needed to make this level of interdepartmental synergy possible.

With the amount of duplication and overlap federally and multi-jurisdictionally, coupled with the inherent complexity of many government programs, SOA can have a valuable streamlining effect.

To successfully achieve this service-oriented vision, there must be a consistent way of defining and implementing services across the federal government. A proven way to do this is, to create all services like a set of interoperable business components that can be flexibly mixed-and-matched to cost effectively achieve the desired outcomes and deliver on the many mandates of government. Service Oriented Architectures (SOA) makes it possible to deliver on this promise in a practical manner.

4.2   The Value of SOA

One of the key goals of a service-oriented design is to cut through the current information silos, promote interoperability and enable services to be delivered more effectively and uniformly. SOA adoption has the potential to erase the barriers that separate the business and technology sides of any organization, dramatically improving productivity, and increasing overall harmony and agility.

The heritage of SOA is admittedly one of technology; as such industry has consistently agreed that the value of SOA is found in its ability to:

- Facilitate the manageable growth of large scale enterprise systems;
- Provide a simple scalable paradigm for organizing large networks of systems that require interoperability;

- ▪ Minimize trust assumptions among providers and consumers to further promote greater business agility and autonomy; and still
- ▪ Integrate functionality across ownership boundaries.

Canada chooses the broadest interpretation of 'system' such that it encompasses all aspects of a business. The role of SOA in business planning is highlighted in section 4.3.

SOA certainly has traction in the IT field as evidenced by Gartner's prediction that "80% of software development projects will be based on SOA by 2008".

> 80% of software development projects will be based on SOA by 2008 … **Gartner**

Service orientation is not in itself a solution to domain problems but rather an organizing and delivery paradigm that enables one to get more value from both the use of capabilities which are locally "owned" and those under the control of others. It also enables one to express solutions in a way that makes it easier to modify or evolve them.

Service Oriented Architecture has the ability to extract, create and expose services from pre-existing or legacy applications. Broad swaths of companies have already put themselves on the path to SOA; this includes IBM, Microsoft, BEA Systems Inc., Oracle Corp. and SAP. Much like modern vendor products and their components, new applications can expose services in the same way. The impact to the monolithic and single purposed applications of the past is to increase their useful lifespan, maximize the government's return on investment and potentially reduce any immediate needs for obsolescence due to potential problems in interoperability and non-compliance.

The private sector and other governments have repeatedly demonstrated the benefits of SOA. The adoption of SOA in accordance with the GC SOA can greatly extend the reach and value of existing services, streamline processes, and generate measurable improvements in the efficiency and effectiveness of departments and their service delivery capabilities.

4.3 The role of the GC SOA

The GC SOA is a reference architecture, which includes a series of SOA concepts and models specifically tailored to the needs of the Canadian Federal government.

SOA is widely known in the information technology industry as a proven concept; and is widely accepted as a best practice for information and technological design. More recently, the concept has been extended to encompass business elements.

CIOB takes this latter perspective and views SOA as a valuable approach to organizing services in the business realm in addition to addressing the usual technological benefits. By broadening the scope of SOA to also encompass the business levels helps to ensure department can interoperate to deliver a more agile, effective and efficient government overall. The interconnected aspects of Information Technology (IT) systems delivery and information sharing are simply the downstream result of the service-oriented business transformation.

To achieve the best results, SOA must be used in a consistent fashion. The GC SOA reference model is quite precise in the use of specific layers and the need for GC-wide interfaces throughout the middle layer. These are GC specific extensions designed to ensure the greatest benefits from SOA in the federal landscape.

To this end CIOB is publishing the "*GC Service Oriented Architecture*" (GC SOA) to offer clear guidance in the use and adoption of SOA across the federal government. Using the GC SOA, the Government of Canada's services will be highly reusable and fully interoperable from the higher-level business concepts, to their supporting technical components. The result is greater efficiency, more consistency, minimal duplication and less overlap across the entire enterprise.

5.0 Putting Service Orientation into Perspective

5.1 Service Orientation in a Business Context

The CIOB already offers departments an element of guidance in the area of business design and promotes the GSRM, which provides a formal definition of a business "service". By looking at services in a consistent way it is possible to begin to bring together collections of related services in a more synergistic manner. Citizens can access the service they want without the need to understand the intricacies of the government bureaucracy. Overall efficiency can be improved when services can be shared for the benefit of all, rather then necessitating each department to reinvent the wheel locally.

Thus "service orientation" in this context is the planning and delivery of all services by formally componentizing each of the services and their subordinate services such that the overall collection of services work as a whole and supports a high level master-plan (or strategic design). Such an approach helps to ensure that individual services can interoperate and reinforce one another; have a minimum of redundancy and overlap; and are managed as self-contained units.

Service orientation must exist at all layers of an organization to be truly effective. It begins with the business layer but must subsequently be found in all the process and technology resource layers that support the business. See Annex A for an example of a service model supporting the business layer.

5.2 Service Orientation in a Technical Context

In the technical layers, service-orientation is straightforward. In fact the notion of service orientation evolved from the technical disciplines and benefits of Object Oriented Design. SOA extends these benefits and treats services as freestanding units that can be invoked between disparate applications – so that the same function can be used by many applications, no matter what their technology platform.

SOA doesn't standardize how individual processes work, or how different applications function, or how different programming languages in different machines work. It is a standardization of their interfaces.

Linking the technology back to the business, we see that hardware and software assets are key concepts. They are resources to be used by business processes and become the key building blocks from which new services are designed and built. The technology is not the service; its use delivers services. Take for example the business owner who does not wish to invest in ever increasing amounts of specialized firewalls and e-mail management software. The business owner's goal is to have access to a reliable service that ensures e-mail is delivered promptly, without "spam" or viruses, regardless of the provider.

5.3 Relationship to Other Initiatives

The emphasis on service orientation is synergistic with a number of other TBS directives and is consistent with the TBS policy renewal process. In some ways service orientation is not new, but brings together a number of initiatives and programs that have been underway for some time. For instance the push towards service modernization and horizontal service delivery has been underway for some time. Their success requires a clear understanding of how the many services

delivered to Canadians impact one another and add-up to the desired Results for Canadians. The formality that GC SOA brings to service orientation augments these efforts.

Similarly previous work on Business Architecture and the evolution of a common language was a precursor to the business context-setting elements of the GC Service Oriented Architecture. This business architecture work is being linked to the annual planning processes of the GC including the PAA(Program Activity Architecture) in support of the need for greater accountability and visibility across programs. These efforts are complementary with the service orientation direction and emphasizes the collaborative delivery of services coming from new partnerships and their service agreements.

In the technical realm, numerous departments have already begun adopting many of the tenants of service orientation and are exploring the industry methods promoted in the SOA literature. Departments are also acquiring new tools and products that bring with them elements of an SOA approach/capability. These technically focused initiatives are already underway and will benefit from further guidance and support from the GC SOA.

6.0   Rationale and Implications

The rationale for providing this forward guidance on SOA is to allow departments to orient their thinking and activities in such a manner as to ease the transition to a truly holistic Service Oriented approach to doing business and implementing systems via a GC Service Oriented Architecture. The transformation will not be immediate but there are clear imperatives that must be met and this guidance is the starting point in a series of communiqués and documents that will offer increasing level of detail in various facets of the move towards a Service Oriented government.

While it is clear there are great advantages to be attained by moving to a service orientation, it is also true that the impacts are quite far reaching and affect business design as well as many technology and system investments. The specifics of these impacts and the details of addressing them will be covered in more detail in the individual supporting documents as part of the GC SOA rollout (topics such as the business, technology and infrastructure guides along with their various appendices).

This section highlights some of the major implications envisioned so far so that the reader can better appreciate the magnitude of this undertaking and better relate to the subject matter from their own perspective. The implications are broken into several sections. These sections also reflect the breakdown of the subject in a manner similar to the detail guides and thus provide insights where additional information on a given subject might be found. The implications occur at three levels: Business, Infrastructure & Support, and Technical.

> **Business Implications** include changes to government program design and the manner in which they invoke shared services through service level agreements along with the impacts to start-up costs, service sustainability and privacy; plus associated changes to existing operational procedures especially during the transition.

> **Infrastructure & Support Implications** include the need for new policies & standards that cover the responsibilities of service ownership, the needs for service registration and discovery, the approach to implementing an accessible service mediation function and the impacts to autonomy and accountability of our stewardship processes. The introduction of the GC Service Oriented Architecture will also give rise to a new GC SOA oversight infrastructure and the need to support community development.

> **Technical Implications** include areas such as authentication, authorization and identification with respect to service invocation. Selection of vendor products

will now be scrutinized more closely with an eye not just towards satisfying the immediate application requirements, but how well does a particular product blend into a standardized interoperable service-oriented environment. Also, as legacy systems are upgraded, key elements of their functionality can be exposed extending their life and value.

7.0   Next Steps

In publishing the GC SOA and related materials, CIOB is providing guidance on the adoption of Service Oriented Architecture.   The goal is to have all departments adopt a common approach to service oriented program design at the business level and to support this with a fully compatible and layered service oriented architecture for their supporting IT solutions.

At this time, it is recognized that many other initiatives and priorities are already underway and it is not CIOB's intent to impede that momentum. This initial statement of direction offers departments the advantage of seeing a longer-term course of action and should permit them to incorporate the concepts of Service Orientation wherever practical now and in the future.

This Strategic Direction is the first in a collection of related supporting materials that will prescribe additional guidance in discrete areas. Over time, these materials will evolve into more specific standards and will offer additional supporting guidance where necessary. Materials such as:

- A set of SOA adoption principles;
- Promotion of a consistent Business Architecture discipline;
- The GC SOA reference model; and
- Standards & infrastructure related to SOA life-cycle management.

7.1   SOA Guiding Principles

The GC SOA Principles are key. They provide:

- Overall guidance for individual decision making events;
- A well articulated rational for behaviour; and
- Logical consistency for design across multiple business areas.

By adhering to these principles, greater consistency can be achieved even when specific standards and guidelines are lacking, or when special situations arise that seem to require interpretation or judgment. Departments are therefore asked to keep these principles in mind when planning, defining, implementing or changing business services or any of their supporting processes or technical components. Not surprisingly, these same principles will be used by the central agency stewardship function to guide them when examining submissions to determine how well these principles have been respected.

7.2   Business Architecture Disciplines

In the area of Business Architecture, specific disciplines and a common language have already begun to evolve and have been articulated with tools such as the GSRM and BTEP. The GC SOA reinforces this formality and encourages departments to use the CIOB supported Business Architecture methods to guide the planning and design of programs and services. These will be described, within the context of GC SOA and promulgated as a way of consistently expressing their services. This will extend to service descriptions as they are designed and developed in the Service Canada Service Registry, the Program Activity Architecture (PAA) and similar departmental performance reports.

7.3   GC SOA reference model

Beyond the business layer, specific technical guidance will be provided in the form of detailed reference architectures for SOA in the context of the federal government. The GC SOA defines a uniform approach to layering computer applications and their components to enhance interoperability and reuse. The initial guide will be a GC SOA primer intended to introduce the topic to general audiences. It will be followed with detailed guides for practitioners responsible for the implementation of IT system components.

7.4   Standards & Infrastructure

Supporting the GC SOA reference architecture will be a list of specific standards and guidelines. These will likely evolve over time but for selected areas of focus the standards will be available in the relatively near future. To foster partnering across jurisdictions as well as with the private sector, these standards will primarily be industry standards as opposed to unique federal standards. The initial set of standards will cover key areas such as registering new services, how to discover reusable services, service mediation, service negotiation and other interoperability issues. Some of the standards will also address business issues (such as the use and creation of service level agreements) rather than focus only on technical concerns.

8.0   Summary and Additional Reading

This document provides an overall appreciation of the importance of service orientation and the need for consistent adoption and use of SOA across the federal government. The strategic direction and guidance is for departments to adopt SOA in the design of their programs, services and IT systems, as appropriate and wherever possible.

In summary, the SOA adoption principles, business design guidance and GC SOA reference model should be used to guide the evolution of design for business and systems. This in turn will result in a consistent adoption of the SOA discipline, leading to an improved agility and an increased capability to delivery on the promises of service modernization, horizontal service delivery and ultimately Results for Canadians.

The documents outlined below, already under development, will soon offer additional guidance in the technical, business, governance and infrastructure areas. The reader is encouraged to further their understanding of the GC SOA by consulting the following documents relevant to their needs and interests when available:

- GC SOA Overarching Principles
- GC SOA Primer
- GC SOA Business Design Guide
- GC SOA Reference Architecture Guide
- GC SOA Business Application Architecture Guide
- GC SOA Service Exchange Architecture Guide
- GC SOA Technical Component Architecture Guide

9.0   Annex A – Example GC Service Model

The following diagram illustrates at a high-level the constituent parts of a service within the Service Exchange and Technical Components architecture layers.
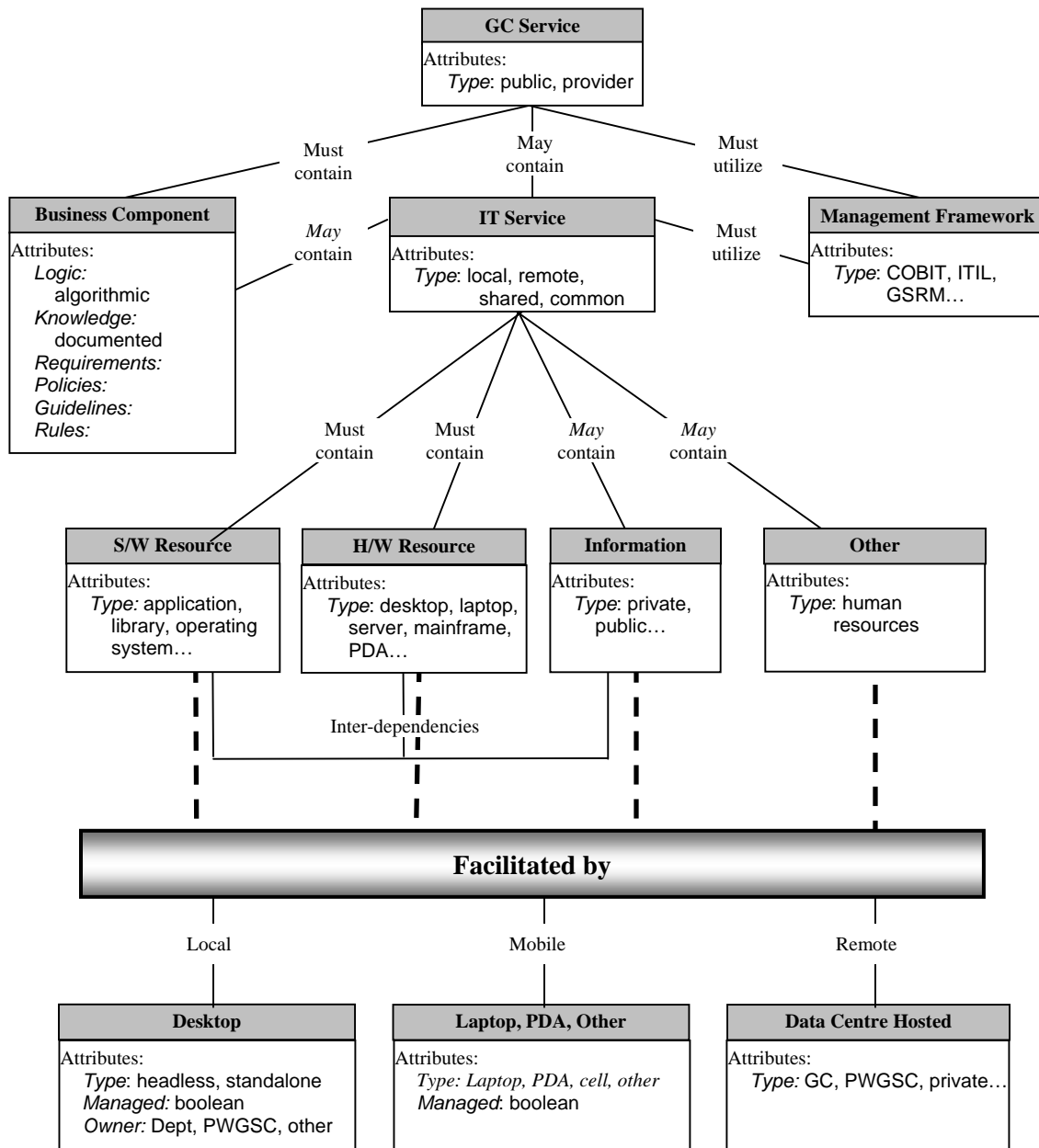
Figure 2   Modeled Representation of a Service

Infrastructure and higher order business services can both be decomposed into these components comprising a service. The key point to note is that a Government of Canada (GC) public facing service (also known as a Program) with components residing in the Business Application Architecture layer could use a GC business service that has a reference architecture built upon this model.