The State Of Wyoming is committed to leveraging the power of the Internet to serve its citizens. To this end it is involved in several E-Business initiatives to improve service delivery. These initiatives originated with the State of Wyoming Online Government Commission (OGC), an entity created on July 1, 1999, by an act of the Wyoming Legislature to provide for the conduct of state government business electronically. The OGC includes the State’s top five elected officials.

The State Of Wyoming EPortal was the first initiative from the OGC focused on leveraging the Internet to better serve citizens. In 2000, the State Of Wyoming embarked on a design and development effort to prove the concept of an Internet services portal for constituents, in conjunction with an infrastructure of common functions referred to as the Common Services architecture. In June of 2002, the proof of concept prototype was completed, including one pilot system that utilized the Common Services architecture. The Common Services architecture now operates successfully, supporting over a dozen applications.

Some of the key benefits we’ve seen with the adoption of the Common Services architecture include:

- Dramatic reduction in development time and costs for state agencies
- Leveraging existing technologies and infrastructures to control IT spending
- Ease of integration for both new and existing web-based service delivery systems
- Consistent look and feel, access, and authentication to services for constituents.

The architecture allows applications to access twelve common services using industry standard SOAP/XML protocols and Secure Socket Layer (SSL) connections. A three-tier architecture is utilized, consisting of a presentation layer, business logic and Common Services layer, and a data layer. The software architecture is built on the MS .Net Framework version 1.1.

Advantages provided to state government operations include the following:

- Standardization of architecture using SOAP/XML and the .Net framework;
- Better management of IT spending by leveraging Common Services available to all agencies;
- Stronger application and data integration through user profile management, common data elements to reduce redundancy, and streamlined security administration;
- Reduced development time;
- Reduced deployment time;
- Increased consistency for system users.

The Common Services architecture was developed using both state and contract personnel at a cost of approximately $250,000. Subsequent development efforts have used the Common Services, realizing as much as 80% savings in development hours. An additional ten application developments are planned in the near term using the Common Services, adding to the return on investment.
PROJECT DESCRIPTION

BACKGROUND

Formal efforts by the State of Wyoming to address electronic government began with the creation of the Online Government Commission (OGC), by act of the Wyoming Legislature in 1999. In 2000, the OGC launched the design and development of an EPortal to improve service delivery to citizens. This initiative had two key components:

- Better utilization of the Internet to provide easy access to information and services for constituents.
- The creation of a set of core common services that could be leveraged by the state agencies to avoid the redundant creation of common functions in each service delivery application that was developed.

The Department of Administration and Information - Information Technology Division was tasked with developing this proof of concept in collaboration with an independent consulting firm. This effort included the development of an infrastructure of common functions referred to as the Common Services architecture. Early design and development was based on the Microsoft DNA architecture, however with the arrival of .NET on the horizon a decision was made to adopt the leading edge technology and base our architecture on .NET web services. This proved to be a key strategic decision and positioned the project to create a much more robust and powerful solution than would have been possible with the DNA platform.

In June of 2002, the proof of concept prototype was completed, including one pilot system that utilized the Common Services architecture. At this point the Information Technology Division spent several months evaluating the resulting architecture, and refining several aspects of that architecture to improve stability, performance, scalability, and ease of integration.

Today, the Common Services architecture has been in full production for seventeen months and supports over a dozen systems for both public service delivery and state internal systems. The architecture has proven to be scalable, easy to use, benefiting both state agencies and constituents.

COMMON SERVICES ARCHITECTURE

The Common Services architecture provides the core set of common features utilized in online service delivery systems. The basic concept was to allow state agencies to focus on their specific business processes and business logic, and leverage existing services for common functions. The common services architecture resides in a secure scalable server environment and provides any state system both agency-hosted or those that reside within the Information Technology Division EPortal server environment, access to web services on a 24/7 basis.

The Common Services architecture is based on the Microsoft .NET framework, and utilizes .NET web services to provide reusable services to applications. These services include:

- User Authentication
- User Profile Management (adds, deletes, and updates of core information: name, address, shipping address, business relationships etc.)
- Business Profile Management (adds, deletes, and updates of core information: business name, address, shipping address, business members etc.)
With the deployment of these common services as .NET web services, state agencies wishing to leverage the functionality simply access them using industry standard SOAP/XML protocols via a Secure Socket Layer (SSL) connection. This results in minimal coding effort to access those services as opposed to developing them as stand-alone functionality in each system, and ease of integration for new and existing systems.

The architecture is a basic three-tiered architecture:

**TECHNICAL INFRASTRUCTURE - HARDWARE AND SOFTWARE**

**Hardware:** The server infrastructure uses Dell PowerEdge server technology with load balancing on web servers, and clustering on database servers. There are a total of 13 servers that provide Internet (Public Access) web servers and public data database servers, Intranet (state internal) web servers and database servers, and internal dedicated secure (encrypted data) database servers. This is augmented with a Dell-EMC fiber-based SAN solution.

**Tier 1:** Tier one is the presentation layer, utilizing four Dell PowerEdge servers in a load-balanced configuration for the presentation of web pages to the public (Internet). There are two Dell PowerEdge servers in a load-balanced configuration for the presentation of web pages to internal state users (Intranet).
**Tier 2:** Tier two is the business logic and Common Services layer. This is also the layer at which secure user authentication processing is taking place. A pair of Dell PowerEdge four-processor servers running in a load balanced configuration provides access to all .NET web services that support both specific business logic for applications, and the core Common Services infrastructure. All communications to this layer utilize SSL encryption for the communications.

**Tier 3:** Tier three is the data layer. There is a single Dell PowerEdge server that resides in the DMZ that provides public (non-critical, non-confidential) data. A pair of Dell PowerEdge servers running as a SQL Cluster provides access to the core Common Services data (user profiles, encrypted user credentials, message logs etc.). An additional pair of Dell PowerEdge servers running as a SQL Cluster provides secure data storage for state internal applications.

**Software:** The software architecture is Microsoft Windows 2003 operating system, Microsoft Internet Information Server (IIS), Microsoft .NET Framework version 1.1, and the IDE is Visual Studio .NET. The database server is Microsoft SQL Server 2000. All core Common Services are custom developed .NET web services.

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**SIGNIFICANCE TO THE IMPROVEMENT OF STATE GOVERNMENT OPERATIONS**

**STANDARDIZATION**

The Common Services architecture standardized on SOAP/XML interfaces using the Microsoft .NET 1.1 framework. This allows us to maximize the skill sets within the Information Technology Division by focusing on a single core technology and making that technology available to state agencies using an accepted industry standard. This architecture was also chosen due to its strategic alignment with the direction of enterprise web and application architecture standards. As state agencies move their systems into alignment with enterprise standards, the Common Services architecture will already be poised to respond to increased utilization and integration requirements.

**MANAGE IT SPENDING**

With the increased focus on reducing and controlling IT spending within state government, agencies need to find ways to collaborate and leverage existing technologies and infrastructures to meet their goals. The Common Services architecture allows state agencies to approach projects with the knowledge that key core functionality already exists within a scalable robust architecture. When developing a system in support of their mission critical business functions, they can focus the utilization of IT funds on development of business-specific functionality as opposed to individually developing common functionality such as user authentication, user management, etc. This results in more efficient utilization of IT funds, and better management of expenditures on IT projects.

**DATA AND APPLICATION INTEGRATION**

The use of a core set of common functions for the creation and management of users of state systems provides a central location for user information. The user profile management services available in the Common Services architecture provides any systems utilizing the architecture with a single source point of information about that user for their business needs. Common data elements such as name, mailing address, shipping address, email address, phone number, etc. are centrally located, and managed by the end user. Updates to that user's information are immediately available to any agency system utilizing the architecture. This avoids redundant data being stored in multiple systems, and discrepancies in that data from system to system.
With the user account and authentication functionality, the user creates one account with one set of secure credentials that can access multiple agency systems. When the user creates the account, they can request access to specific systems (for example Low Income Energy Assistance, or Workers Compensation and Safety information). The administrator of a system grants or denies access via a web based administration tool. From the end users perspective, once granted access they are able to seamlessly move between systems, regardless of what agency or department is involved, without having to re-authenticate each time a new system is accessed.

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**BENEFITS TO AGENCIES AND CONSTITUENTS**

### REDUCED DEVELOPMENT COSTS

The Common Services architecture provides those core components that are common across most software systems. The net result of reusing this architecture is that the cost of developing a solution is reduced significantly because the core framework already exists. While there is an effort required to utilize the common services architecture, it is far less than building those components from the ground up with each application (See Return On Investment).

### REDUCED TIME TO DEPLOYMENT

As with the reduced development costs, the time to build and deploy are also reduced. Development time can be reduced by several hundred hours per project (depending on the scope and complexity of the system) given core common functionality has already been developed and is simply leveraged.

### CONSISTENCY FOR END USERS

End users are provided a single point of access to online state systems, utilizing a single user ID and password. They can move seamlessly between systems through a consistent user interface without having to re-authenticate or remember multiple account credentials. This provides a higher degree of consistency and ease of use for the public and business communities.

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**RETURN ON INVESTMENT**

The Common Services architecture was one component of the State Of Wyoming EPortal project. Looking at just the Common Services architecture, the cost to design, build, test, and deploy the Common Services architecture was performed by six developers (three state IT staff, three contract staff), at a cost of approximately $250,000.00 over the course of six months.

The return on the initial investment is realized as new applications utilize the Common Services, rather than develop the redundant functionality in each application. Savings estimates are based on development hours saved, using a blended average rate of $65.00 per hour for current internal staff and contract staff. The five examples listed below are a sample of the twelve systems currently in production. Other results varied depending on the size, complexity, and scope of the system leveraging the Common Services architecture.
EXAMPLES OF COST SAVINGS IN DEVELOPMENT

The example projects below have utilized the Common Services architecture during development. The statistics reported are from the project managers of the specific projects.

**Department Of Revenue – eLiquor Online Ordering (Public)**

<table>
<thead>
<tr>
<th>Common Services Utilized</th>
<th>Estimated Effort Without Common Services</th>
<th>Actual Effort With Common Services</th>
</tr>
</thead>
<tbody>
<tr>
<td>Authentication, Profile Management, Catalog, Shopping Cart, Check-out, Messaging</td>
<td>600 hours $51,000.00</td>
<td>100 hours $8,500.00</td>
</tr>
</tbody>
</table>

**Department Of Administration & Information – Employment Application System (Public)**

<table>
<thead>
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<th>Actual Effort With Common Services</th>
</tr>
</thead>
<tbody>
<tr>
<td>Authentication Profile Management Messaging</td>
<td>300 hours $19,500.00</td>
<td>50 hours $4,250.00</td>
</tr>
</tbody>
</table>

**Department Of Administration & Information – Human Resource Management System (State internal)**

<table>
<thead>
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<th>Estimated Effort Without Common Services</th>
<th>Actual Effort With Common Services</th>
</tr>
</thead>
<tbody>
<tr>
<td>Authentication Profile Management Messaging</td>
<td>300 hours $25,500.00</td>
<td>50 hours $4,250.00</td>
</tr>
</tbody>
</table>

**Department Of Administration & Information – Financial Reporting System (State internal)**

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</tr>
</thead>
<tbody>
<tr>
<td>Authentication Profile Management Messaging</td>
<td>300 hours $25,500.00</td>
<td>50 hours $4,250.00</td>
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</table>

**Fire Prevention & Electrical Safety – Inspection Information System (State & Public)**

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</tr>
</thead>
<tbody>
<tr>
<td>Authentication Profile Management Messaging</td>
<td>300 hours $25,500.00</td>
<td>50 hours $4,250.00</td>
</tr>
</tbody>
</table>

Over the next two years, the Information Technology Division estimates at least ten new systems coming on board utilizing the Common Services architecture (additional professional license renewals on the web for various boards and commissions, crime victim’s compensation system for the Attorney General’s office, ePermitting for the Coal Bed Methane industry, and ePermitting for
building permits). These would yield a cost savings for those applications of approximately $195,000.00.