Section 1: Project Information	
Title	COBOL to Cloud: Transparent, Real-Time Change Detection and Data Exchange From On-Premises Legacy Mainframe System to Software as a Service
Category	Emerging and Innovative Technologies
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State	Washington
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Completion Date	May 23, 2015

Section 2: Executive Summary

Washington State policy leaders are keen on leveraging cost and process efficiencies of new technologies and Cloud platforms: Governor's Order 13-04 outlined strategic state government improvement priorities, and Senate Bill 5931 directed the Washington State Department of Enterprise Services (Enterprise Services) to identify and implement efficient and cost-effective measures to reach the state's goals. Subsequent legislation created a project for the centralization of time, leave and attendance for the state's 65,000 employees, which was an invitation to innovate: A data integration layer would allow for transparent, <u>real-time</u> data change detection, transformation, and data exchange between state systems, including a COBOL mainframe application, to Software as a Service (SaaS).

Business requirements for the project included: Mitigating the need for costly and unreliable point-to-point interfaces; gaining efficiency among manual business processes supporting a legacy world; and improving data consistency and workflows.

The project to centralize Washington state employee timekeeping functions was launched in fall 2013. The policy environment resulted in a significant IT opportunity: A window for the state to invest in a modern SaaS offering. Within the broader effort, data managers launched a critical two-phased data integration project that would leverage an emerging product to integrate COBOL and SAP systems with the new SaaS. Building on existing capabilities the state anticipated a yield of compounding efficiencies with the advent of <u>real-time</u> data exchange between on-premises systems as well as the Cloud.

Phase 1 production, a state-based integration layer, was completed November 2014 and provided new efficiencies including real-time data integration from a 25-year-old COBOL mainframe financial system to a Windows-based SAP payroll system. This resulted in immediate workflow efficiency, and unprecedented data availability among most of the state's 120 agencies, boards and commissions. Phase 2 production, secure connection of the integration layer to the new timekeeping SaaS, completed May, 2015.

The project aligned with two NASCIO 2015 Top 10 Priorities: 1) Cloud Services: Via the integration layer the state can now easily engage Cloud-based applications without incurring the expense and time to make significant changes to on-premises mainframe systems; and 2) Strategic IT Planning: The integration layer leverages an emerging technology to synchronize data between: a) Windows-based proprietary SAP software on premise; b) a COBOL mainframe financial system on-premises; and c) a modern Cloud-based SaaS – all in real-time. This Cloud-friendly data combination has positioned Washington state government for further use of Cloud solutions while preserving its investment in legacy systems of record.

The topic of this nomination is the two-phased data integration project that achieved state policy goals, honored business requirements, aligned with NASCIO priorities, and integrated the aging mainframe financial system to the Cloud.

Section 3: Description of the Business Problem and Solution

The problem

1) As in other states, the exchange of mainframe financial data with other enterprise or agency systems became synonymous with delay and a plethora of manual processes which were accepted as normal. The exchange of financial data usually occurs at night rather than during business hours when the information is needed.

Exchanges in this manner resulted in inefficiency, measured in days, across payroll and finance offices within virtually all of the state's 120 agencies, boards, and commissions and meant employees were required to pick up and attempt to complete work threads, checking to see if the data exchange had completed. The need to revisit a task rather than it being "once and done" also introduced frequent human errors.

2) The SaaS platform requires financial system data elements in real-time, a function well beyond the capability of the state's 25-year-old mainframe system. Data integration with divergent legacy business systems across the spectrum of agencies is also required.

Problem summary: Inefficient and expensive data delays for the business, and aging, divergent legacy systems across the state that hold data required for SaaS functionality.

The Solution – An Integration Layer

Data managers selected and configured a new set of integration products that would provide the best and most promising features to posture the state for the future:

> **Instantaneous Synchronization**
> COBOL + SAP + SQL Data Feeds
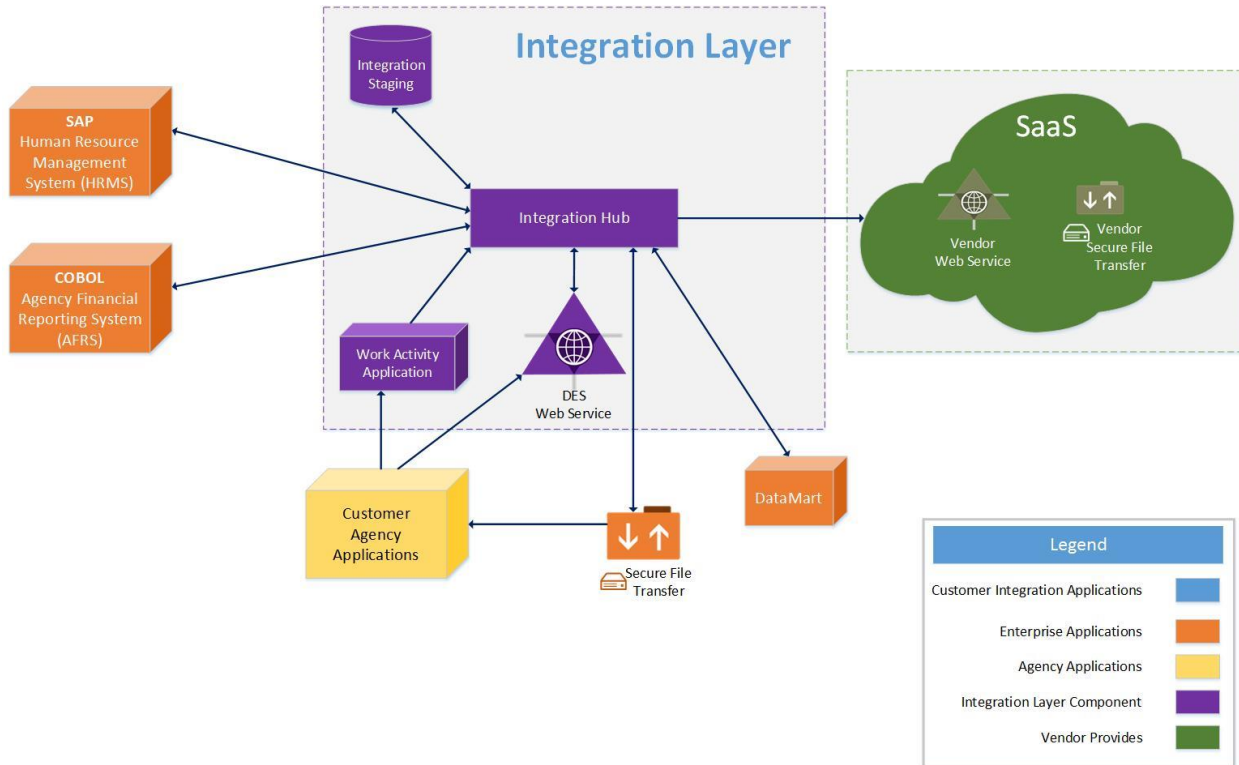> Transformed and Published for Consumption
> = Cloud-Friendly Legacy Data

The solution yields almost instantaneous synchronization between a variety of enterprise systems including a COBOL application, and in-flight data transformation and integration. Other features include flexible and efficient data publishing options for consumption by any variety of both legacy and contemporary application platforms. The integration layer provides all or a subset of data either immediately, on a scheduled basis, or on demand. It can also accept data in a variety of formats and translate to other data formats for each data consumer's requirements such as comma separated values, XML, Web Services, secure file transfer, etc.

Publishing options include: batch, request/reply, and/or publish and subscribe.

The state provided its own project management resources, and followed the PMBOK approach to a charter, governance, a work breakdown structure, as well as issue and risk management. A third-party security review of the architectural plan for compliance

with State OCIO policy was conducted and the plan was issued a successful pass. An as-built integration architecture document was created to document the solution.

High-Level Integration Overview

Enterprise Services' integration layer provides both batch and real-time data exchanges between divergent data sources within the timekeeping landscape. These data exchanges are commonly referred to as interfaces. Additionally, the integration layer provides web service end points for exchanging data.

The data integration interface architecture employs two different concepts to integrate data between enterprise systems and SaaS applications: Integration patterns and re-usability. The integration patterns concept provides the methods used to migrate data between application systems, whereas the re-usability concept promotes building a component once and leveraging that component for multiple interfaces.

By following these two architectural concepts for building data integration interfaces, Enterprise Services has:
• Made it possible for interface flexibility, providing choices for the appropriate integration pattern(s) based on interface requirements;
• Minimized the cost of building and maintaining interfaces by re-using existing components from the integration product vendor, or extracting data when possible; and
• Jumpstarted the delivery of future interfaces by leveraging what will already have been built or data extracts already in place.

To move data from the COBOL-based Agency Financial Reporting System (AFRS) data into the SAP-based payroll system (HRMS), both batch and real-time interfaces are used. A data integration hub (DIH) supports the transit of AFRS data into HRMS real-time, and a hub component is used to support batch interfaces from AFRS to HRMS.

A hub architecture provides a major IT support efficiency. Data sources are decoupled from destinations, enabling applications to publish once but effortlessly support one-to-many consuming applications.

The real-time interface uses a change data capture (CDC) strategy to identify COBOL-based finance codes as they change. Once CDC identifies a new or changed finance code, a DIH process is notified and the changed or inserted AFRS codes are imported into HRMS using a real-time publication / subscription pattern. Providing real-time updates to HRMS for new or changed AFRS codes is functionality that agency customers have been asking for since 2006.

Significantly, the integration layer is implemented without any change to COBOL program logic. Change detection and data exchange are transparent to the legacy system.

The integration layer also provides a staging location for housing enterprise application data in preparation for transit to the SaaS platform.

The DIH then completes transformation of data and depending on the data set uses secure file transfer (SFT) and Web Services.

The work was done in two phases. Phase 1 was implemented ahead of schedule and on budget in November, 2014. The effect and benefit to nearly every state agency payroll and human resources office was immediate. For the first time, there was a real-time exchange of data measured in seconds rather than days between the mainframe and the more recent SAP payroll system.

At the time of Phase 1 implementation, Enterprise Services launched an awareness campaign to state HR and payroll offices promoting the effort's success and availability of business information in real-time. The message was simple: "No more waiting."

Phase 2 – the completion of the SaaS production landscape – occurred May, 2015, providing secure connectivity from the integration layer, with encryption on-the-fly, to the SaaS platform.
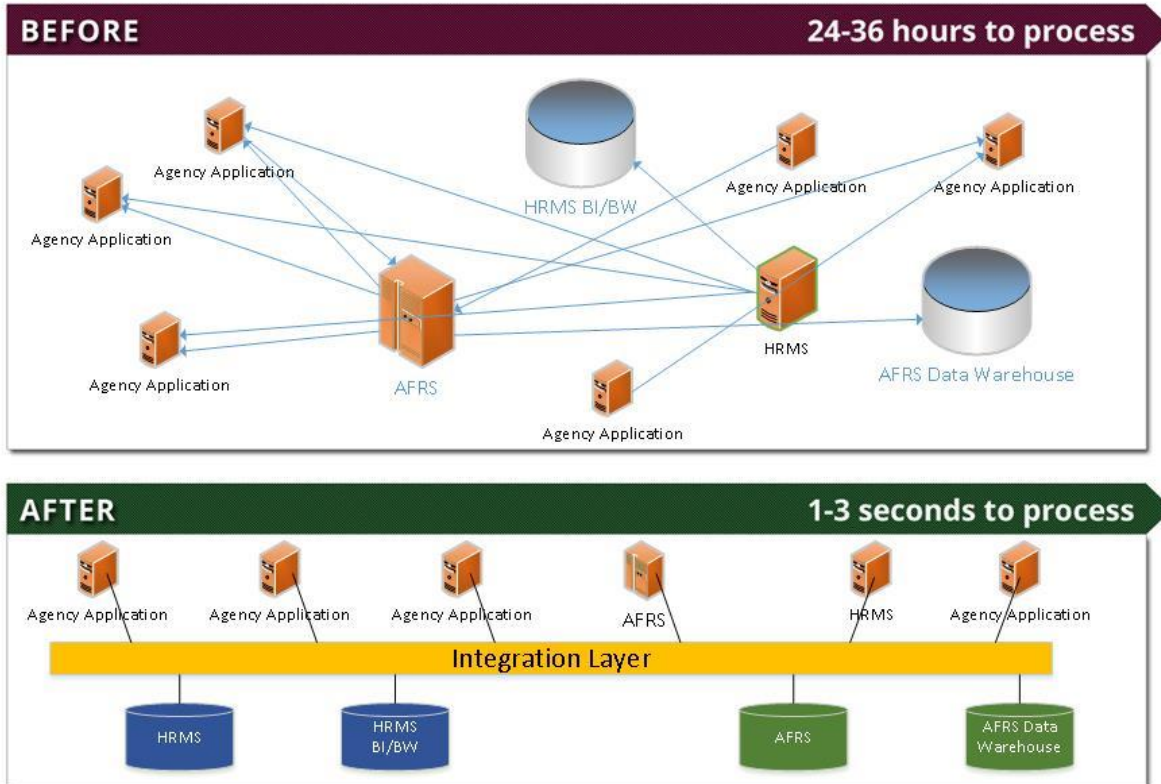
The integration layer project achieved the original business requirements of mitigating the need for costly, unreliable point-to-point application interfaces; speeding up manual business processes that had previously relied on a one- to three-day turnaround time on business data and frequently caused human error across virtually all agencies, boards, and commissions; and improving data consistency and workflows.

Section 4: Significance to the Improvements of the Operation of Government

As part of the Phase 1 production implementation, the new Integration Services capability reduced a data exchange that used to take days down to seconds, benefitting virtually all of the state's agencies, boards, and commissions.

"Life is fast-paced in the HR world and having timely access to information necessary to do your job is essential. Taking a process that once meant waiting 1-2 days for data and compressing it into a matter of seconds is invaluable".
– Denise Flatt, Former OFM State Human Resources

The integration technology project has given the Washington state government the ability to effectively utilize Cloud-based applications such as the SaaS centralized timekeeping solution. Exchanging legacy system data with the Cloud was done without incurring the expense and time to make significant changes to the state's existing payroll system or needing costly third-party SAP BASIS programming. Similarly, the solution avoided the need for expensive COBOL programming for the financial system. The service is an enabler for strategic IT planning, and provides an essential method to synchronize data between aging mainframe systems and Windows-based software.

Enterprise Services' Integration Services supports these top policy and technology issues: Security; Consolidation/Optimization; and Budget & Cost Control.

Integration Services capabilities are policy-driven to invoke the highest level of security appropriate for the data being transmitted. External data transmissions are encrypted.

The "publish and subscribe" model allows budget and cost control. Once data is being provided to one trading partner, the same data can easily be provided to another partner agency. The state can now serve-up data in a totally different format for the data consumer such as providing a flat file for one agency and web services for another.

The integration layer immediately postured Enterprise Services to provide Integration as a Service (IaaS). This implementation vastly improves time-to-value capabilities for moving enterprise functions to the Cloud. And with the integration hub the time required to design application access strategies will be reduced.

Overall, the integration hub represents an investment in innovation that will provide long-term return by reducing technical debt with an IT architecture that costs less to maintain and operate while providing a powerful, new method of reaching the Cloud.

Section 5: Benefits of the Project

Immediate, tangible benefits are provided to Enterprise Services, other state agencies, enterprise application developers, and business users of multiple applications:
• A technical capability was created that will allow Washington state government to utilize Cloud-based solutions in ways that were not possible before. Rather than purchasing monolithic systems that span multiple business areas, the new capability allows the state to integrate data between enterprise and individual agency systems of record and multiple Cloud services in real-time.
• The timekeeping system is the first Cloud-based system to benefit from this capability. Washington state was able to acquire the services of a best-of-breed solution which incorporates existing systems of record, including a COBOL-based financial system in real-time at the data persistence level and without any change to program logic.
• As Enterprise Services expands the customer base for this service, the centralized integration approach provides efficiencies by establishing one point of issue resolution.
• New state projects have begun to leverage the cost-savings of IaaS. For example, a recent estimate for development, testing, and interface release from the SAP team was 198.5 hours. The IaaS team, from start to finish, completed this effort in 36 hours.
• Development staff utilize IaaS data sources rather than building one-off data interfaces. Applications receive consistent, accurate data from the system of record.
• Utilizing the new tools Enterprise Services is able to achieve faster time-to-value for data exchange functionality.
• Cost-savings are achieved when creating integration solutions with the AFRS mainframe financial system, by avoiding the need for mainframe developers to write new data interface programs, resulting in less complex testing. Mainframe operational cost is reduced. Data quality, morale, and administrative overhead have all benefited.
• IaaS provides another tangible, significant benefit from both a support and customer data quality perspective: Do validation once, at publication, and remove redundant and inconsistent data validation processes, including expensive manual steps. Consuming applications no longer need to build additional data-validation processes to certify data before loading – data has already been certified as clean, complete, enriched, and accurate.