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Oklahoma Interoperability Grant

Web Services Suite
Roadmap

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1 EXECUTIVE SUMMARY

1.1 Purpose

To improve interoperability and integration across health and human services information technology systems, Oklahoma is building a roadmap that will integrate Service Oriented Architecture (SOA) and an Enterprise Service Bus (ESB). This paper focuses on a roadmap for the implementation of web services to support SOA/ESB. This will allow fully automated data exchanges, security, authorization, and service reusability for all services exchanged between the Oklahoma Department of Human Services (OKDHS), Oklahoma State Department of Health (OSDH), the Oklahoma Healthcare Authority (OHCA) and other initiatives.

Web services are software components that communicate using standards-based web technologies including Hypertext Type Protocol (HTTP) and eXtensible Markup language (XML)-based messaging. Web services are designed to be accessed by other applications and vary in complexity from simple operations to complex. Since they are based on open standards such as HTTP and XML-based protocols including Simple Object Access Protocol (SOAP) and Web Services Description Language (WSDL); web services are hardware, programming language, and operating system independent. This means that applications written in different programming languages and running on different platforms can seamlessly exchange data over intranets or the internet using web services.

1.1.1 Goals/Objectives

The major goals/objectives to be achieved with the implementation of the TO-BE system are summarized in Table 1.

Table 1: Goals/Objectives of the TO-BE System

Goal/Objective	Desired Outcome	Measurement	Impact
Standardization	Enterprise wide standards	Adopted by Inter/Intra Agencies and Programs	Improved efficiency
Reusability	Shared & reused data	Adopted as a model by other states	Reduction of development time
Reduce Data Redundancy	Data Consistency	Adopted by Inter/Intra Agencies and Programs	Improved data integrity and reduced errors
Governance	Policies and Procedures	Adopted by Inter/Intra Agencies and Programs	Conformance to standards
NHSIA Compliancy	Compliance with national Architecture Framework	Adopted by Inter/Intra Agencies and Programs	Achieve interoperability
Compliance to NIEM Framework	Compliance with national Architecture Framework	Adopted by Inter/Intra Agencies and Programs	Achieve data/service interoperability
Compliance to MITA	Compliance with National Architecture Framework	Adopted by Inter/Intra Agencies and Programs	Achieve interoperability

1.1.2 Project Outcomes

The proposed interoperability plan provides the maximum potential for mutual benefit and “reusability” by health and human services organizations in Oklahoma, enabled through the Project Outcomes listed in Table 2.

Table 2: Project Outcomes

Index	Project Outcome
O1	An outcome of this project and specifically this document will be a roadmap that will increase interoperability and lay the ground work for web services implementations. The Web Services Roadmap will integrate with the roadmap for SOA/ESB to allow fully automated data exchanges and service reusability for all services exchanged between OKDHS and OHCA and other initiatives.
O2	Another outcome of this project will provide a data roadmap that can be used by other states.
O3	A third outcome of this project is that it will provide the framework for the implementation of an Enterprise Master Person Index (eMPI) system.
O4	An additional project outcome will be Enterprise-Wide Data Definitions and Data Repository starting with eMPI focus; thus building groundwork for covering other areas.

1.2 Assumptions and Constraints

General assumptions considered for Interoperability are:

- The partnership is committed to the development of a roadmap for integration of SOA/ESB to allow fully automated data exchange and service reusability for all services exchanged between OKDHS and OHCA and other initiatives.
- The partnership is committed to the development of a model for the use of the National Information Exchange Model (NIEM) to enable a consistent exchange of data.
- The partnership is committed to the development of a plan that includes options to incorporate eligibility determinations through an online enrollment system for additional populations, and identification of opportunities for workflow improvement through the introduction of new web services or business processes that can apply heuristics (via automated rules engines).
- In collaboration with OHCA, the partnership is committed to the development of a design for an online/web based central access point which would facilitate automated alerting to remind members when their eligibility is about to expire as well as inform them of their eligibility status for various programs.
- The partnership is committed to the development of a plan to integrate information into an enterprise data warehouse tool for monitoring and performance tracking, which includes outcome measurements.
- The partnership is committed to focusing on programs that address those interactions between OKDHS, OHCA and OSDH, which is scoped as medical and Medicaid. This should further focus our current scope of eligibility and enrollment.

- The partnership is committed to building consensus on interoperability needs and solutions through an acceptable methodology and embraces a change management process overseen through a partnership governance model.
- The partnership will respect individual Lines of Business (LoB) authority and capability to allow and prevent access to business data in accordance to all appropriate federal and state requirements, federal and state standards, as well as industry standards.
- The partnership will include federal partners to assist with resolving identified federally mandated issues that may be identified as opportunities for improvement to a more efficient interoperability experience.
- The partnership and its federal partners will explore as part of its methodology working towards interoperability, existing and future best practices, and Information Technology (IT) solutions that provide more efficient interoperability.
- The partnership sees the opportunity to adopt an eMPI solution that will assist with a more efficient approach to identifying and sharing information regarding an individual, as well as avoiding potential duplications or errors.
- The partnership sees an opportunity to create through interoperability a roadmap for a coordinated process improvement and the IT solution as it relates to the enactment of House Bill 1304: Information Technology Consolidation and Coordination Act.

General constraints considered for Interoperability are:

- **Constraint:**
 - Federal funding streams earmarked to certain programs with attached restrictions and regulations create artificial silos and barriers to achieving interoperability across various human service organizations and programs. This barrier makes it difficult for certain organizations to “break out” of their current silos; although the Memorandum of Understanding (MOU) and Service Level Agreements (SLA) between organizations attempt to solve some of these issues, this barrier is ever present. As implementation of the National Human Services Interoperability Architecture (NHSIA) business viewpoint strives for interoperability through a functional point of view so must go the federal funding streams and associated restrictions and regulations if true interoperability is to be achieved.
 - Oklahoma has recently passed House Bill 1304, along with other house bills for consolidation on both the business operations and technical side of government. Some of the language of this Act is summarized below:
 - No state agency shall expend or encumber any funds for the purchase, lease, lease-purchase, lease with the option to purchase, rental or other procurement of any information technology assets without the prior written approval of the State Chief Information Officer (CIO).
 - No state agency shall initiate or implement an information technology planned project without the prior written approval of the State CIO.

- **Schedule Constraint:** Currently separate agencies, divisions and programs have different schedules for upgrading systems and infrastructure based on immediate needs, federal rules and available funding. Agencies are in different stages of the process.

- **Data Constraints:**
 - Currently OKDHS, OHCA, and OSDH each use their own intake for services and Master Person Index (MPI) process. This is a business data constraint because we collect different information in different ways for different purposes but need to share that information between when we have common customers.
 - OKDHS, OHCA and OSDH have requirements to have interagency data sharing agreements. This is a constraint because it takes on a lengthy path through business, legal and executive reviews and approvals.
 - OKDHS, OHCA, OSDH and our federal partners have similar or the same data but different data definitions.

- **Hardware Constraints:**
 - From a business perspective, any TO-BE required hardware must fit within SOA and enterprise architecture, and acquisition of any additional hardware is dependent on funding or financial constraints.
 - Oklahoma Office of Management and Enterprise Services – Information Services Division (OMES-ISD) hardware and software operating standards will be followed:
 - The architecture will follow all established OMES-ISD security and infrastructure standards, as well as industry best practices.
 - The architecture will conform to State of Oklahoma financial and economic best practices, allowing for a maximum return on investment in serving the citizens of Oklahoma.
 - The architecture will present a scalable infrastructure accommodating future growth and adhering to established governance policies.
 - The architecture will align with OKDHS business requirements and policies for delivering quality service and utility.

- **Software Constraints:**
 - Any TO-BE solution must fit within the approved SOA and enterprise architecture, and acquisition of any additional software is dependent on funding or financial constraint.
 - Our organizations do not use any common IT solution to share business data or processes, and each uses different custom software, programming languages and coding styles.

- Current software has been developed and approved based on program requirements mandated by federal or state standards based on their business needs.
- **Organizational Constraints:**
 - Resource acquisition and allocation may be a factor in implementing the interoperability plan. Policies and procedures may be too specific to share or reuse for purposes other than eligibility.
 - Each organizational unit uses their own data center and resources to manage and support the hardware and software that support the organizations business data and processes. In addition by having varying types of hardware and software requires different types of resources and skills sets to maintain them.
 - Business process changes that may be required to implement the interoperability plan will likely meet with some resistance from affected staff in each organization.
 - Funding streams often dictate specific guidelines, policies, systems, etc., and we may not be able to influence change with the respective federal agencies in the interim, we must be compliant with federal funding terms and conditions.
 - Some agencies may have some systems that are considered proprietary by a vendor.
 - Some policies and practices are based in state and federal law which govern accessibility to data.
- **Security Constraints:**
 - Compliance with Internal Revenue Service (IRS) Standards.
 - Compliance with Health Insurance Portability and Accountability Act (HIPAA)/ Health Information Technology for Economic and Clinical Health (HITECH) Act Standards.
 - Compliance with Family Educational Rights and Privacy Act.
 - Compliance with Social Security Accounts Standards.
 - Compliance with Information Security Standards.
 - Compliance with Federal and State Mandates for Accessibility.
 - Compliance with Program Requirements for Confidentiality.
 - Compliance with federal and state mandates, as well as IT standards for the creation, storage, reading and transfer of data.

1.2.1 Benefit to Other States

- This interoperability plan can be used by other states to implement enterprise interoperability measures.

- States under many federal programs are asked to share ideas and any custom applications that states build. States can also send staff here for an on-site visit to gain knowledge to avoid duplication of effort.
- Custom applications developed by government are public domain we should be willing to demonstrate and share with other states. In most instances, states interested in our systems often encounter some of the same constraints around change discussed in this document.
- Other states can benefit from lessons learned avoiding any difficulties we may encounter.
- Oklahoma has been in the forefront of this kind of effort through the utilization of enterprise architecture and their work with the MOSAIC project to identify an enterprise approach to the business process, as well as an enterprise IT solution to support the business decisions.

1.3 Breadth

The focus of this interoperability effort will include: state and federal programs that require eligibility determination: Supplemental Nutrition Assistance Program (SNAP), Temporary Assistance for Needy Families (TANF), Low-Income Home Energy Assistance Program (LIHEAP), Aid to the Aged, Blind and Disabled, and the child care subsidy. Other human services programs that will benefit from a new configuration of IT services include Child Welfare, Child Support Services, Aging Services Division (Medicaid funded long term care waiver) and Developmental Disabilities Services (Medicaid funded community based waivers). Other state agencies that are participating in the consortium include OHCA, Oklahoma Department of Mental Health and Substance Abuse Services and Oklahoma State Department of Health's program; Women, Infants and Children (WIC).

1.4 Human Services Program and Initiatives

OKDHS is undertaking a multi-year, multi-program, agency-wide effort to update its technology, streamline and improve its business practices, consolidate its information systems, and provide a secure, compliant web portal for OKDHS employees, clients and providers to conduct daily business...anytime, anywhere. OKDHS is pursuing a new enterprise software solution that is flexible and supports interoperability to allow internal and external stakeholder's access to the enterprise system and data, regardless of technology. OKDHS is seeking an enterprise software solution that will increase client use of self-service tools. The project will lead to a fully-functional, automated system that meets federal certification, compliance and mandates for child support, child welfare, and adult and family services and the associated titles and certifications needed for certification.

1.5 Information Technology Initiatives

OKDHS is working with state governance and leadership to procure the software, installation and configuration for an enterprise Human Services Application (HSA) to

support the core business functions and processes of OKDHS, as described for the enterprise system. Also, the OHCA is seeking to implement the technical aspects of the Affordable Care Act (ACA) for Oklahoma. Many aspects of the OHCA plan are consistent with the approach envisioned by the model. OHCA and OKDHS are working together on both of their initiatives to assure no duplication in funding or resources for similar projects using the Medicaid Information Technology Architecture (MITA) and National Human Services Interoperability Architecture (NHSIA) principles of re-usability. The proposed system will:

- Modernize existing system functionality to provide recipients a “golden standard” of customer care (i.e., a consistent look and feel across stakeholders and seamless customer service with consistent metrics to measure and continuously approve the customer experience).
- Significantly enhance the ability for providers to have prompt access to member eligibility and enrollment information to ensure that eligible individuals receive the health care benefits to which they are entitled and that providers are reimbursed promptly and efficiently.

An individual seeking health coverage in 2014 will be able to access information and assistance, and apply for health coverage, through multiple channels. All of these channels will connect with a standardized, web-based system to evaluate the individual’s eligibility for coverage through one of four programs:

- Qualified health plans through the Exchange (with or without Guidance for Exchange and Medicaid Information Technology (IT) Systems 4 Version 2.0 May, 2011/Centers for Medicare & Medicaid Services advance premium tax credits and cost-sharing reductions)
- Medicaid
- Children’s Health Insurance Program (CHIP)
- Basic Health Program, if established by the state

MITA ensures the availability of high-quality health care coverage to families and individuals who are achieved through a collaborative partnership between and within federal agencies and states responsible for implementation of the exchanges and the ACA’s Medicaid and CHIP provisions.

MITA envisions a streamlined, secure, and interactive customer experience that will maximize automation and real-time adjudication while protecting privacy and personally identifiable information. Individuals will answer a defined and limited set of questions to begin the process, supported by navigation tools and windows that open to provide or seek additional information based on individual preferences or answers. The application will allow an individual to accept or decline screening for financial assistance, and tailor the rest of the eligibility and enrollment process accordingly. The required verifications that will be necessary to validate the accuracy of information supplied by applicants will be managed in a standardized fashion, supported by a common, federally managed data services hub that will supply information regarding citizenship, immigration status,

and federal tax information. Tools for calculation of advance premium tax credits will also be provided. Business rules will be supplied that will allow for resolution of most discrepancies through automation, including explanations of discrepancies for the consumer, opportunities to correct information or explain discrepancies, and hierarchies to deal with conflicts based on source of information and extent and impact of conflicts on eligibility. Individuals will attest to the accuracy of the information they supply. The goal of MITA is to serve a high proportion of individuals seeking health coverage and financial support through this automated process.

1.6 Health Intersection

Currently Oklahoma has elected to not participate in the Federally Facilitated Marketplace (FFM). Oklahoma will defer to a Federally Facilitated Exchange (FFE).

The MITA and NHSIA frameworks were taken into consideration to achieve interoperability for eligibility services. NHSIA is aligned with MITA but is not as mature. Plans are to primarily work with the NHSIA framework since it's focused on Human Services (HS) with the understanding that MITA may supplement in areas where NHSIA is not as developed.

1.7 End Result

Best practices will be taken into consideration to achieve maximum efficiency with interoperability. The results of a cost benefit analysis and thorough assessment and gap analysis could be a factor that could bring a change to any proposed approach.

1.8 Background/Overview

Web services have become the preferred standards-based way to realize SOA. Web services are defined as a software system designed to support interoperable machine-to-machine interaction over a network as depicted in Figures 1 and 2 below.

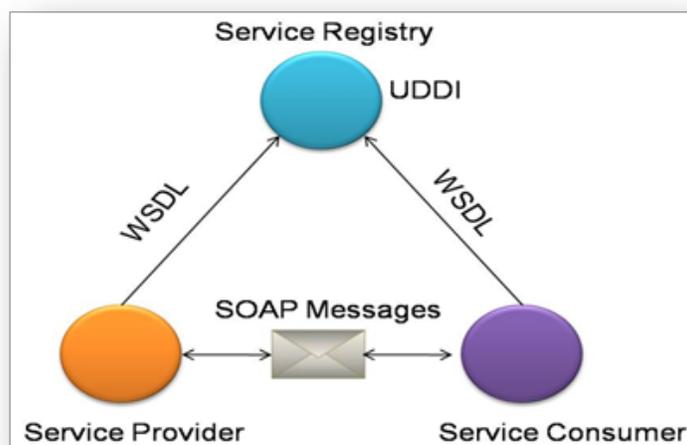


Figure 1: Basic SOA with Web Services

They provide a standard means of communication among different software applications, running on a variety of platforms and frameworks. Most enterprises, including OKDHS and other state agencies, have made significant investments in system resources and have accumulated enormous amounts of data over time. Systems are often developed to support a specific need or fulfill a certain function. As these systems mature it often becomes necessary to share information with other systems. Web services provide a layer of communication across the enterprise that is not dependent on the underlying technology. Web services have well-defined interfaces that can be dynamically discovered and each service is self-contained and performs a predetermined task. A composite service can be built from aggregates of other services.

Web service plays an important role when establishing or preparing for SOA. Web services are based on open standards such as:

- XML – A markup language that defines a set of rules for encoding documents in a format that is both human-readable and machine-readable
- SOAP – Used for invoking web services.
- WSDL – Used for describing the interface to a web service.
- Universal Description, Discovery, and Integration (UDDI) – A service registry for publishing information about web services.

These standards will be described later. The use of open standards enables interoperability between different vendor solutions. The existing solutions can be wrapped as web services and new services can be developed without the need to know who the consumer is. The consumer can consume any web service regardless of the platform on which it is running using the standard web protocols. This enables the just-in-time integration of the applications and allows the business to establish new partners on the fly. This makes web services technology the right candidate for creating SOA.

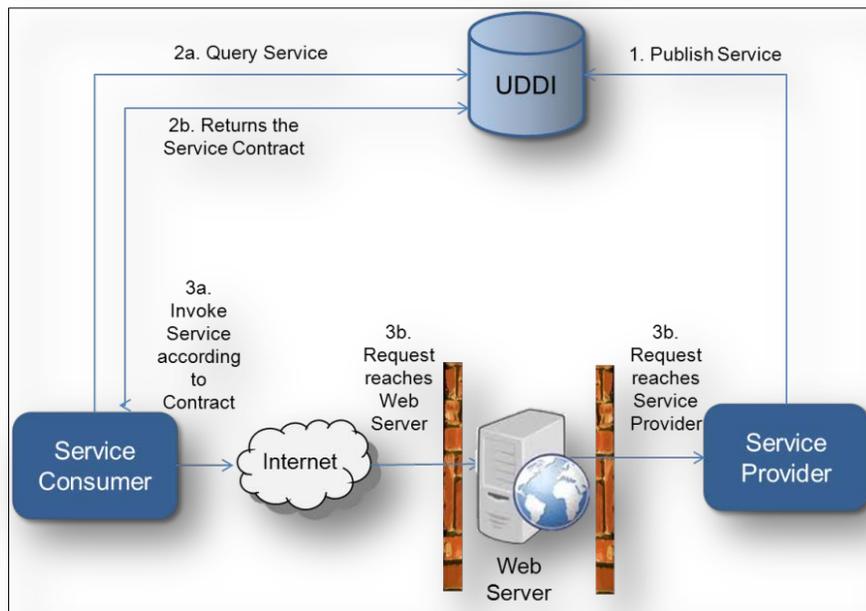


Figure 2: Web Services Overview

The integrity and confidentiality of a web service is essential in implementing SOA. Depending on the system, the message itself may require encryption or the message may be digitally signed to assure confidentiality. Tokens may also be attached to ascertain the sender's identity. These techniques, in association with higher-level SOA orchestration (execution) and choreography (interactions), provide a safe and secure environment for the enterprise.

1.8.1 Exploration Questions

This plan in conjunction with the plans covered under this grant will seek to explore and answer the following questions in Table 3.

Table 3: Exploration Questions/Answers

Index	Exploration Questions/Answers
Q1	What resources will be needed to integrate OKDHS human services programs into MITA Maturity Model (MITA Framework Version 3.0)/ NHSIA compliant architecture?
A1	Interoperability will be run as a project under the Oklahoma partnership direction and will require a project schedule, staffing plan, and adherence to the Project Management methodology and the symphony of methodologies deployed as best practices in the lifecycle development of the technology solution. Methodologies need to be captured in a common, agreed upon tool.
Q2	What technical and business architecture will be needed at OKDHS to integrate MITA? What is the security architecture that protects the interests of all state agencies?
A2	The Interoperability Business Architecture required will include AS-IS and TO-BE Business Node Connection Models, Conceptual Diagrams, detailed Business Process Modeling Notation (BPMN) mapping for the AS-IS and TO-BE for each of the identified processes for the scope of Interoperability.
Q3	What is needed among the health and human services agencies to develop and share eMPI?
A3	The TO-BE Interoperability Architecture will require a mitigation of the current federal and state business requirements driving the current business decisions, a building of consensus of ID information to be applied, consensus on a new eMPI framework, consensus on matching criteria logic, consensus on a historical data migration plan and the assistance of the Federal partners to position the local partners through mandates to remove any potential barriers for building this consensus. Once consensus is achieved, MOUs and SLAs should be approved.
Q4	What initiatives of the MOSAIC human services eligibility and case management system can be shared with OHCA initiatives under the ACA?
A4	For interoperability, the work that has been completed for MOSAIC; alignment of business requirements, models created, data harvested and resolved and IT solutions offer an opportunity to have a solid foundation to move forward with the roadmap presented here. The provided roadmap is intended to build upon this work and provide an Oklahoma solution.
Q5	What efficiencies can be gained by using SOA?
A5	Sharing and agility are the major values of SOA which provide efficiencies. Sharing provides leverage and reuse. Agility provides the capability to change more rapidly. SOA helps with silos by creating interoperability agreements that reconcile how systems talk to each other, the data formats they use, and the organizational barriers to cooperation.
Q6	How can governance be used to achieve the wide range of performance expectations?
A6	Interoperability provides an opportunity for developing a strong partnership between NHSIA and MITA partners through the utilization of a strong governance model, the governance will align performance expectations with their strategic plan. The recommended governance process will be the owner of strategic alignment of measures for the partnership.
Q7	How can Oklahoma improve overall state IT operating and cost efficiencies?
A7	Interoperability provides an opportunity to realize cost savings through IT by focusing resources for developing and implementing software and hardware not from an individual

Index	Exploration Questions/Answers
	program and service point of view, but rather from a shared functional point of view that crosses boundaries of siloes with something that meets at least 80% of the common needs to complete the function. Cost savings and operational cost from the IT and business perspective are realized through efficient business processing time, data sharing of information, development of IT solutions to support the process.
Q8	Explore how applying NIEM standards to our data can help facilitate a more efficient, timely and accurate exchange.
A8	An interoperability solution utilizing a NIEM Standard for our data collection will assist with developing consensus on standardized data elements to assist with the data exchanges that are required to support the overall process of serving the common customer/clients needs in a seamless approach, while reducing the required time needed for the common customer/client to access the delivery system's programs and services.

1.8.2 Options Considered

By all accounts, the web services approach to support SOA is made easier by the adoption of an ESB. This can be home grown or Commercial Off the Shelf (COTS). Research is underway on the ESB options available to the State of Oklahoma. Several open source ESBs were reviewed and compared including JBoss, Apache ServiceMix, and Mule. The comparison of these three open source ESBs can be found in Appendix F.

1.8.3 Options Impact and Goals

1.8.3.1 Improve service delivery for clients

The implementation of SOA and web services along with Master Data Management (MDM) technology supports the business needs across state agencies and benefits the client in several ways by:

- Reducing the amount of documentation families must submit to apply for multiple benefits.
- Reducing the time spent by families applying or retaining eligibility.
- Providing accurate, reusable and easily accessible services.
- Reducing errors by increasing efficiency and improving performance.
- Reducing customer dissatisfaction by supplying readily available information.

The eligibility determination is currently a mix of processes; there are manual and electronic processes for the various federal social service programs that are integrated only through custom interfaces with no exchange standards. No standard electronic application currently exists that can be used across multiple public assistance programs. An interoperable, reusable eligibility system will help bridge this gap. This improvement can be enabled by not only leveraging the evolving Oklahoma enterprise SOA framework, but also the governance strategy to facilitate proper design and execution of a prospective enterprise workflow. This use case also provides an opportunity to explore how additional efficiencies can be achieved to meet the ACA

Gold Standard User Experience, where clients are automatically referred to appropriate services.

Determining eligibility under Affordable Care Act – the ACA Gold Standard User Experience refers to an improved Eligibility System for customer satisfaction. As is stated in the “Guidance for Exchange and Medicaid Information Technology (IT) Systems” by Centers for Medicare and Medicaid Services (CMS), eligibility process should be a streamlined, secure, and interactive customer experience that will maximize automation and real-time adjudication while protecting privacy and personally identifiable information. Eligibility process should encapsulate the following functionalities:

- Individuals will answer a defined and limited set of questions to begin the process, supported by navigation tools and windows that open to provide or seek additional information based on individual preferences or answers.
- The application will allow an individual to accept or decline screening for financial assistance, and tailor the rest of the eligibility and enrollment process accordingly.
- The required verifications that will be necessary to validate the accuracy of information supplied by applicants will be managed in a standardized fashion, supported by a common, federally managed data services hub that will supply information regarding citizenship, immigration status, and federal tax information.
- Tools for calculation of advance premium tax credits will also be provided.
- Business rules will be supplied that will allow for resolution of most discrepancies through automation, including explanations of discrepancies for the consumer, opportunities to correct information or explain discrepancies, and hierarchies to deal with conflicts based on source of information and extent and impact of conflicts on eligibility.
- Individuals will attest to the accuracy of the information they supply.

The goal is to serve a high proportion of individuals seeking health coverage and financial support through this automated process.

1.8.3.2 Reduce error and improve program integrity

A critical challenge to realize an enterprise solution for the Eligibility Use Case is a common and accurate way of identifying clients, which is consistent across agencies. Oklahoma does not currently have a statewide eMPI; the addition of an eMPI will aid all agencies data steward functions when attempting to align persons across systems.

For example, currently, multiple identifiers exist for eligibility determination for, the Insure Oklahoma (IO) members, including a member ID (an OKDHS identifier) and an IO case ID (an Insure Oklahoma identifier). In the current workflow where manual reference checks are performed, the opportunity for errors increases. Through the development of an eMPI:

- Errors can be reduced

- Accuracy of eligibility determinations increased

Using the MDM, all eMPI focused data will be stored in one location, which will be maintained in a regular basis thus reducing the chance of pulling erroneous information. Information reported to or available in one program can be shared with other programs in support of program integrity efforts.

1.8.3.3 Improve administrative efficiency

Performance improvements can be realized through the development of business processes, enabled by SOA, which can automatically perform eligibility validation and cross-referencing, as web services are enabled across the enterprise. Through the SOA Roadmap, the development of business processes and the validation performed by web services to support these processes, administrative activities can be transformed to reduce redundancy of effort and streamline workflows.

1.9 Approach

The approach taken in this roadmap is to identify and document the current AS-IS efforts with web services and identify gaps that exist in developing and exposing web services in a TO-BE SOA environment for interoperability. A web services roadmap will provide OKDHS and its collaborating agencies with guidance and standards for implementing web services to allow for service reusability and identify a TO-BE web services model. Guidance and standards will be sought along the way from MITA, NHSIA, CMS, NIEM and the ACF HHS Interoperability Toolkit.

2 AS-IS WEB SERVICES

2.1 Overview

Web services are currently being developed and deployed by OKDHS, OSDH and OHCA. Each agency varies in their approach to web services. Most existing web services are internal with no public facing web services published yet.

2.2 OHCA Web Services

- The current system programming language is .NET.
- The primary system is custom-built with some COTS components (Oracle database, InRule Business Rules Engine, Initiate eMPI).
- Type of processing:
 - Batch and online
 - Transaction processing
- The basic application architecture is three-tier with SOAP services.
- The hardware platform that supports the current system is HPUX (Hewlett-Packard Unix) and Windows.
- The database platform that supports the current system is Oracle.
- The system user interface is browser based.

- The basic network architecture is Local Area Network (LAN), Wide Area Network (WAN), and internet.
- The contractor responsible for maintenance of the current system is HP Enterprise Services (HPES), the global business and technology services division of Hewlett Packard's HP Enterprise Business strategic business unit.

The current Oklahoma Online Enrollment system uses SOAP and XML transactions through direct interfaces. With the implementation of an ESB, additional web services will be developed and existing web services will be decoupled and services published for reuse.

OHCA has a public facing web service built as a Proof of Concept (POC) in preparation for the ACA to connect to the Federal Hub. It is set up to receive a “yes” or “no” response.

OHCA uses general standards and those that meet HIPAA guidelines and NIST 800-53 Recommended Security Controls for Federal Information Systems and IRS Publication 1075 for different WSDL and XML schemas.

OHCA has no centralized security team in place, and has requested security assistance as well as a security full time equivalent (FTE) as they have determined security governance will be a full-time job. Governance is being worked out.

OHCA is in the process of completing the System Security Plan (SSP) template for the ACA. Upon the completion of the SSP, OHCA will have security policies and procedures defined. Once completed, the SSP will be uploaded to the Collaborative Application Lifecycle Tool (CALT) site.

Identity Management and Directory Services is an ongoing project being led by OHCA, with an initial charter but is not yet agreed upon. The scope of the Identity Management and Directory Services project is currently focused on healthcare provider identity management. See Figure 3 for an example of identity management and directory services.

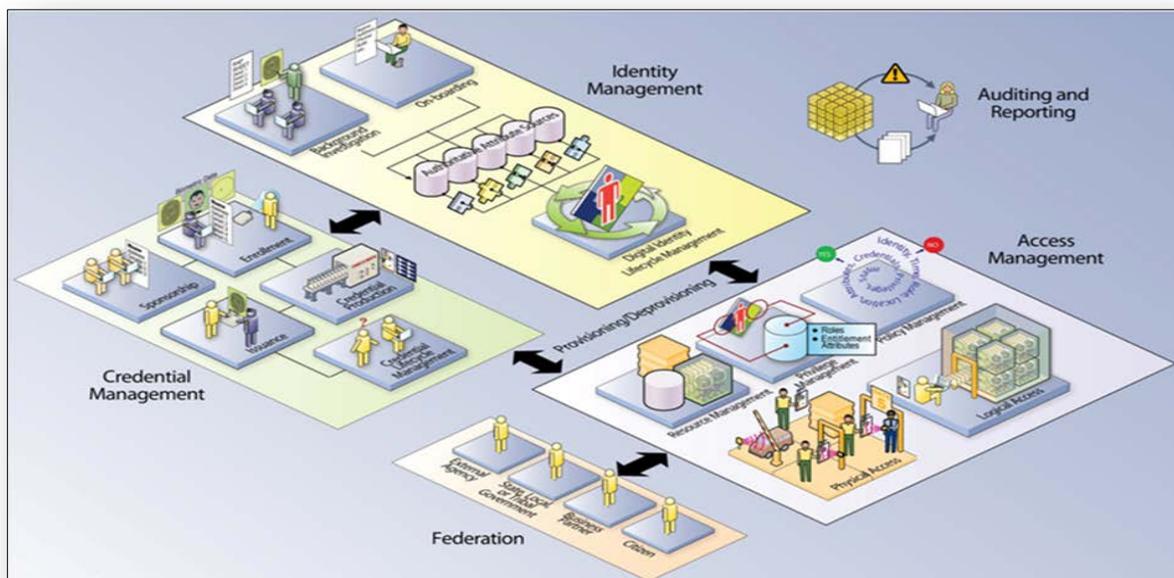


Figure 3: Identity Management and Directory Services

OHCA is in the process of installing and implementing an Oracle SOA Suite solution that includes an ESB and BPMN Workflow.

2.3 OSDH Web Services

OSDH uses Microsoft's Windows Communication Foundation (WCF) and .NET for web service development. Intermediate web services are developed and deployed to allow for separation of interface and processes. OSDH uses a more dynamic approach with WSDL by building classes at runtime versus development time. OSDH no longer accepts a Dynamic-Link Library (DLL) class.

OSDH secures web services through a variety of mechanisms, including certificates, active directory/username and password, and Secure Sockets Layer (SSL). HTTPS is used for all transmissions.

Most OSDH's web services use the convention `ApplicationName.Function()`, where `ApplicationName` would reference the application that the functionality comes from and `Function` would describe the action or method that the web service provides. They find this form more readable and descriptive.

OSDH has used Eclipse in the past but now uses Rhapsody Orion.

An example of a web service in use by OSDH includes an address verification web service used by the AIDS Drug Assistance Program (ADAP) and the HIV/STD Prevention System or XPEMS (Program Evaluation Monitoring System).

2.4 OKDHS Web Services

OKDHS uses .NET for web service development. Current web services are internal with no existing public facing web services. Basic web services standards have been defined for use at OKDHS.

The core web services specifications are: XML, SOAP, WSDL, and UDDI. These specifications constitute the basic building blocks of web services, but none of these web services standards address security issues.

A list of the AS-IS OKDHS Web Services can be found in Appendix A. Below is an excerpt of several OKDHS systems that include the use of web services:

- **Adult Protective Services (APS)** – This system is used by OKDHS APS specialists to manage and track reported allegations of abuse or neglect of older Oklahoma citizens. The system captures allegations, assessments, investigations, and remedial actions related to each allegation. Metrics are captured to allow OKDHS to manage case load and meet federal and state reporting requirements.

The APS division is responsible for managing the program that uses this application. This application is a custom developed .NET/Windows application suite consisting of web, reporting, and remote device components.

- **ELDERS** – This is a web-based system that provides the Aging Services Division a means for collecting and storing data regarding individuals who apply for and receive its services. The ELDERS Web Service provides updates from ELDERS to IMS.
- **Enterprise Worker Association (EWA)** – The EWA Web Services provide access to the EWA data so that developers needing to access this data for their application do not have to understand how to retrieve the data. The definition of many of the tables and how they are related to other tables in the database is complex, and the use of the EWA Web Services allows the developer to concentrate on developing their application rather than trying to understand how the EWA database is defined.
- **Family Support Services** – The Family Support Services Web Service provides a method to submit newborn registration information.
- **Oklahoma Employer/Employee Partnership for Insurance Coverage (OEPIC)** – This is a system that is the eligibility engine for the OHCA managed Insure Oklahoma system where applications are submitted on a public OHCA website. Applicant's information is collected for Insure Oklahoma coverage then sent to OKDHS for medical eligibility determination and client enumeration. This is performed by processes in the PS2 mainframe if certain conditions are met it is sent back to OHCA through the MMIS system and stored on the OKDHS side. OEPIC is a .NET/windows application suite consisting of a web application,

windows service, and web service. The web application portion is used by AFS personnel to maintain the insurance applications. The windows service component processes files received by File Transfer Protocol (FTP) from OHCA.

- **OKDHSLive** – OKDHSLive is a web-based social services screening, intake, and renewal system that enables applicants to pre-screen for food stamp benefits, child care, SoonerCare, TANF, and energy assistance benefits eligibility. It allows customers to apply for services online. It assists customers through the process for receiving services, reviewing ongoing eligibility, reviewing existing cases, and providing confirmation to customers that the application has been received.

OKDHSLive allows access 24 hours a day, seven days a week, 365 days a year (24/7/365) to position OKDHS for efficiency gains by improving data collection, increasing customer access, and reducing non-value added eligibility processing time.

OKDHSLive Web Services consist of a number of applications that retrieve information from the PS2 system on the IMS mainframe and submit information to PS2. There are also web services that IMS can call to perform updates in SQL server. There is a web service that is called to assign a worker to a case based on information in EWA.

3 GOVERNANCE

As discussed in the SOA Roadmap, to achieve interoperability for this and other cross-agency activities, a governance model for a SOA must be put in place to guide sharing at both the data and web services levels, and achieve a cross-organizational consensus and understanding at the workflow (i.e., business process) level. This project will codify and execute infrastructure/data governance, web service governance, and business process governance models to meet the needs of the enterprise.

3.1 Web Services Governance

Often the advantages of SOA and the use of Web Services are well understood by IT and business leaders yet organizations struggle to make them happen. One of the primary reasons has been that SOA and Web Services are viewed as technology solutions rather than as a management discipline. An effective web services strategy as well as any SOA strategy is more than just technology. It also requires an effective governance framework to make sure that:

- Organization is prepared to realize the strategy with the appropriate tools and training to be effective.
- Effective governance controls for decision-making, monitoring and accountability be instituted, and

- Technology standards and effective architectural guidance be made available to groups committed to interoperability and the web services strategy and SOA approach.

Governance is crucial. The importance of governance cannot be stressed enough.

3.1.1 Overall Current Governance Structure

Figure 4 below depicts the current governance structure of the agencies and business units involved in the scope of the interoperability effort.

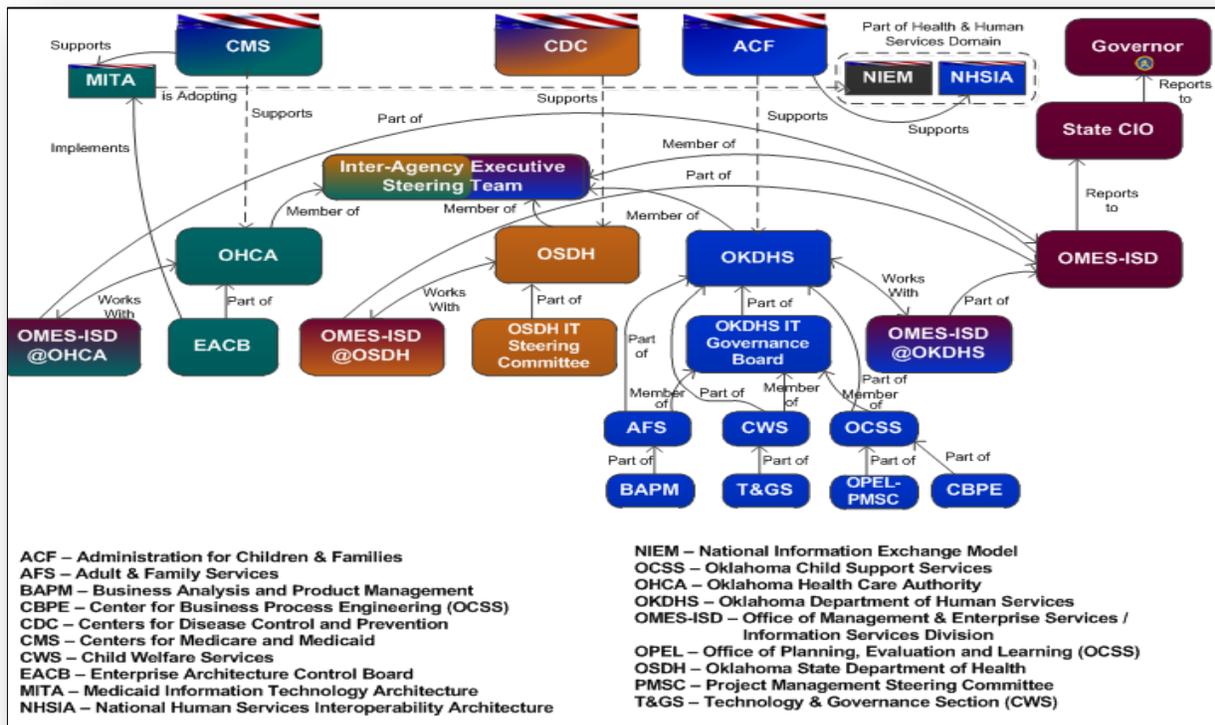


Figure 4: Current Governance Structure

3.1.1.1 Inter-Agency Executive Steering Team

The Inter-Agency Executive Steering Team (seen in Figure 4 and detailed in Figure 5 below) has been established to set the strategic vision and direction for the eligibility system project, including determination of project scope, selecting technology and system implementation alternatives including interagency and statewide collaborative strategies.

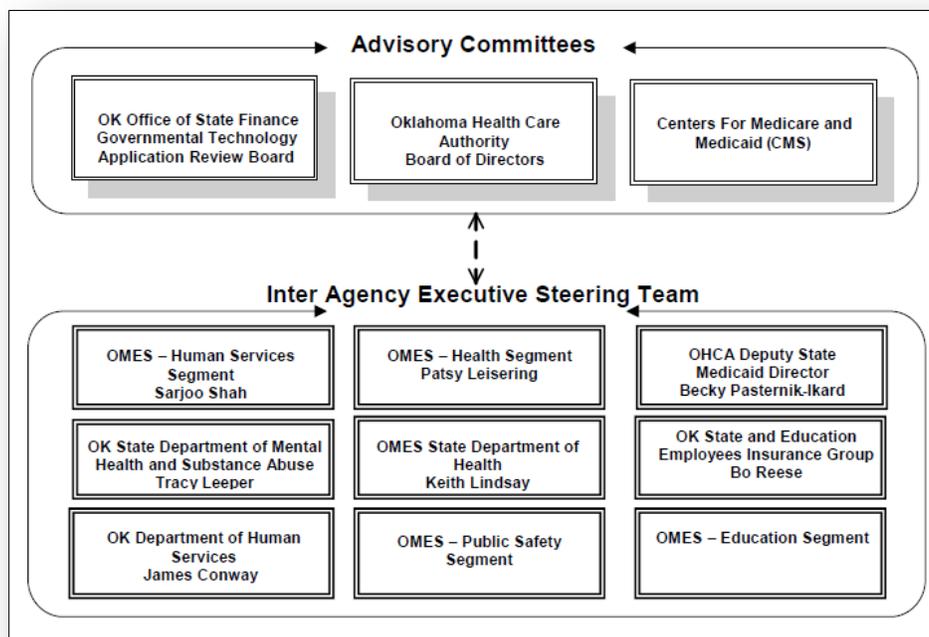


Figure 5: Inter-Agency Executive Steering Team

The momentum this executive steering team has generated for OHCA’s eligibility system determinations needs to continue with further interoperability efforts.

3.1.1.2 Health Information Infrastructure Advisory Board (HIIAB)

The Oklahoma Health Information Infrastructure Advisory Board (HIIAB) was created in 2009 by the State Legislature (SB 757). It authorized the formation of the HIIAB as an advisory board formed to advise and assist OHCA in developing strategy for the adoption and use of electronic medical records (EMR) and health information technologies that is consistent with emerging national standards and promotes interoperability of health information systems.

This advisory board will determine the governance structure and policies and procedures for the health information exchange, ensuring that the strategy and plan preserve the privacy and security of health information as required by state and federal law.

Member organizations of the Health Information Infrastructure Advisory Board are:

- 1) Oklahoma Health Care Authority
- 2) State Department of Health
- 3) Department of Mental Health and Substance Abuse Services
- 4) Department of Human Services
- 5) State and Education Employees Group Insurance Board
- 6) Insurance Department
- 7) Department of Corrections

5 WEB SERVICES REQUIREMENTS

An important part of web services strategy is to define web services requirements. In order to develop and deploy successful reusable web services we must establish, adhere to and follow:

- Governance
- Standards
- Security

5.1 Standards

XML-based technologies such as SOAP, XML Schema and WSDL provide standards to build interoperable web services

Table 4 outlines current generally accepted standards at a glance. For further details on each standard, please see Appendix B – TO-BE SOA Web Services Security Standards and Terminology.

Table 4: Current Generally Accepted Standards

Standard	Current Version	Future Version	Roadmap Status
Message Size	NA	NA	Max size < 5 megabyte, very low frequency
XML	1.0	NULL	Current/Suggested
WSDL	NA	2.0	Current/Suggested
SOAP	1.2	NULL	Current/Suggested
WS-I Basic Profile	1.0	1.2	Current/Suggested
HTTP	1.1	NULL	Current/Suggested
SSL	3.0	NULL	Current/Suggested
WS-Trust			Future
WS-Federation			Future
SAML		2.0	Future
WS-Security		1.1	Future
WS-Addressing		1.0	Future
WS-Policy		1.2	Future
WS-I Basic Security Profile		1.0	Future

5.2 Security Requirements

Web services security standards are depicted below in Figure 7.

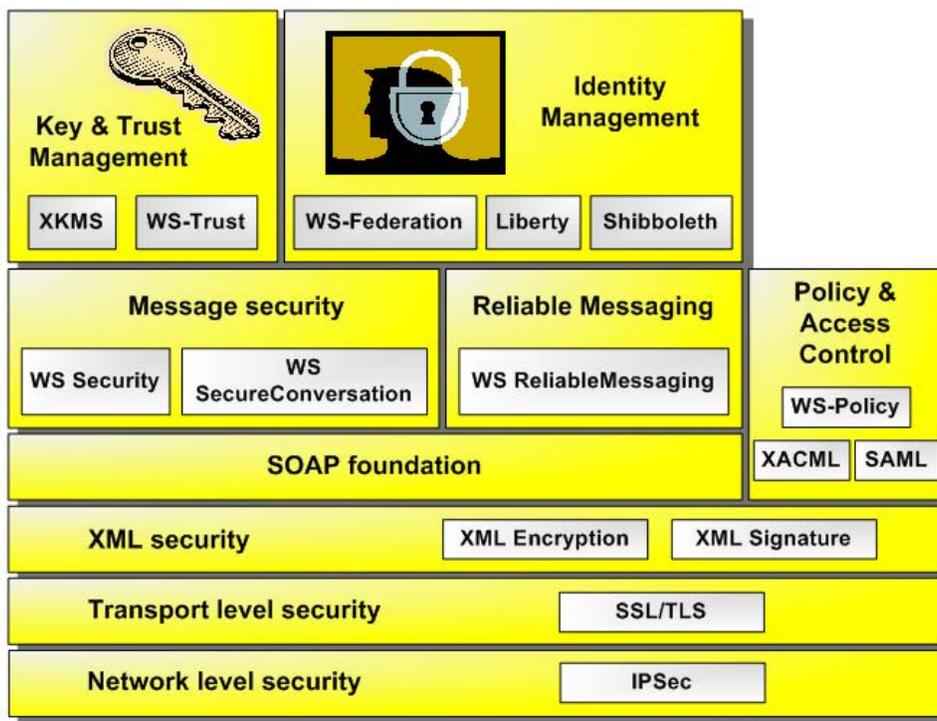


Figure 7: Web Services Security Standards

5.2.1 Security for Web Services and Windows Communication Foundation (WCF) Services

Web services and WCF services that are not for public consumption must take precautions that prevent unauthorized applications from calling them.

Any Web/WCF Service must have security to restrict access to authorized users and/or applications. The Enterprise Architecture Engineering Services (EAES)/Architecture & Design (A&D) unit will provide guidance on how to implement security for the OKDHS Web Services.

Interoperability inter-agency web services security should be defined by governance which is under development and being led by the Inter-Agency Executive Steering Team.

All OKDHS Web/WCF Services built to date have been required to reside on an internal web server. If they need to be accessed from the outside, they must be accessed by a web application that resides in the Demilitarized Zone (DMZ). If a need for a public-facing Web/WCF Service arises, it must be discussed with and approved by the EAES unit. EAES will collaborate with the appropriate project team members to plan for how this should be done in a secure manner.

SSL/Transport Layer Security (TLS) must be used on all web applications and Web/WCF Services that are transmitting secure data, whether internal or external.

Any other Web/WCF Service security methods must be approved by the EAES unit before use.

5.2.2 Security for Databases

Web applications or Web/WCF Services that access databases have the responsibility to verify that the person accessing the data has the authority to do what they are asking to do. The database will be accessed by the application using a proxy ID after the application has verified the request is authorized.

Databases that need to be accessed by web applications in the DMZ must reside inside the OKDHS network and be accessed by an internal Web or WCF Service that is called by the web application. In addition to the web application determining if the user has access, the internal Web/WCF Service will perform its own security to make sure the application calling is authorized to call it.

5.3 Exceptions

Exceptions to these standards must be approved by the EAES unit. Any dispute regarding an exception request should be escalated to an OMES-ISD Director. This standard applies to COTS products but exceptions for these will be evaluated on a case-by-case basis.

6 TO-BE SYSTEM

6.1 Overview

Web Services for the TO-BE system will be based on developing modular and reusable system components that are based on loosely coupled services and SOA design principles which follows NHSIA and MITA guidelines and meets the Seven Standards defined by CMS. The resulting system is based on a scalable, secure, SOA model with the ability to expose web services using standard Application Programming Interfaces (APIs) that can be used internal to the application or through an ESB to external applications if necessary. This will allow Oklahoma to use existing services. For information that is available in real time, information will be exchanged utilizing Web Services and sharing data in standard XML format.

6.2 Goals and Guidelines

The following are the overall design goals for Web Services for the TO-BE system:

- System architecture based on open standards
- Reusable services and system components
- Design that will allow maximum reusability (for other systems, agencies and states)

- Apply NHSIA and MITA 3.0
- SOA Services managed on an ESB
- Use of rules engine that follows standards and is a loosely coupled service that can support reuse
- Governance of web services included in SOA Governance
- Security for web services defined

6.3 Development Methods

- Agile Development
- Active and ongoing participation from stakeholders and Subject Matter Experts (SMEs) throughout the development phase

6.4 Architectural Strategies

The architectural strategies include:

- SOA that follows NHSIA and MITA 3.0 guidelines
- System architecture based on open standards
- Reusable services and system components
- Service orchestration managed by an ESB (See Figure 8)
- Shared services that allow for a high degree of reusability and platform independency
- Highly available and scalable architecture
- Compliance with security standards
- System architecture developed using Microsoft .NET Framework and Microsoft WCF

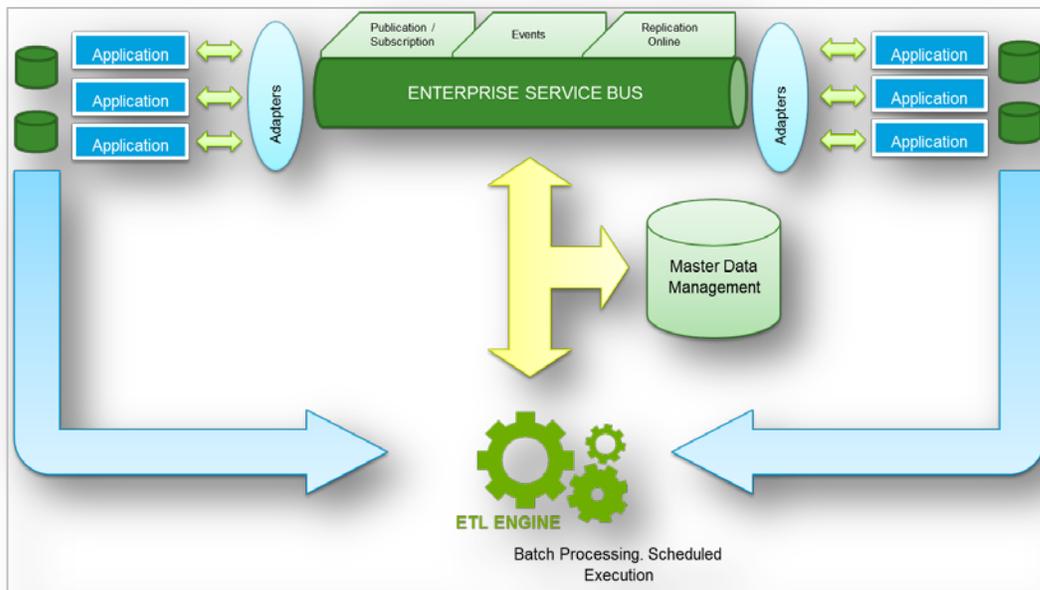


Figure 8: Enterprise Service Bus

6.5 Proposed System

The proposed system will have the capability for web-based, real-time eligibility determination including self-service features. It will have the capability to communicate through secure messaging.

The proposed system will include:

- Modularization and decoupling of business rules in the current Business Rules Engine (BRE).
- Decoupling of customer identification and authentication from eligibility services; state level eMPI to include security and identity management services; multiple agency eligibility will be identified for potential future expansion.
- Implementation of workflow and a business process modeling tool to document and further automate eligibility business processes and incorporate population expansion.
- Conducting Business Process Modeling and Business Process Reengineering (BPR).
- Inter-agency initiatives that align with CMS Seven Standards and conditions, MITA 3.0 and NHSIA interoperability and reuse principles.

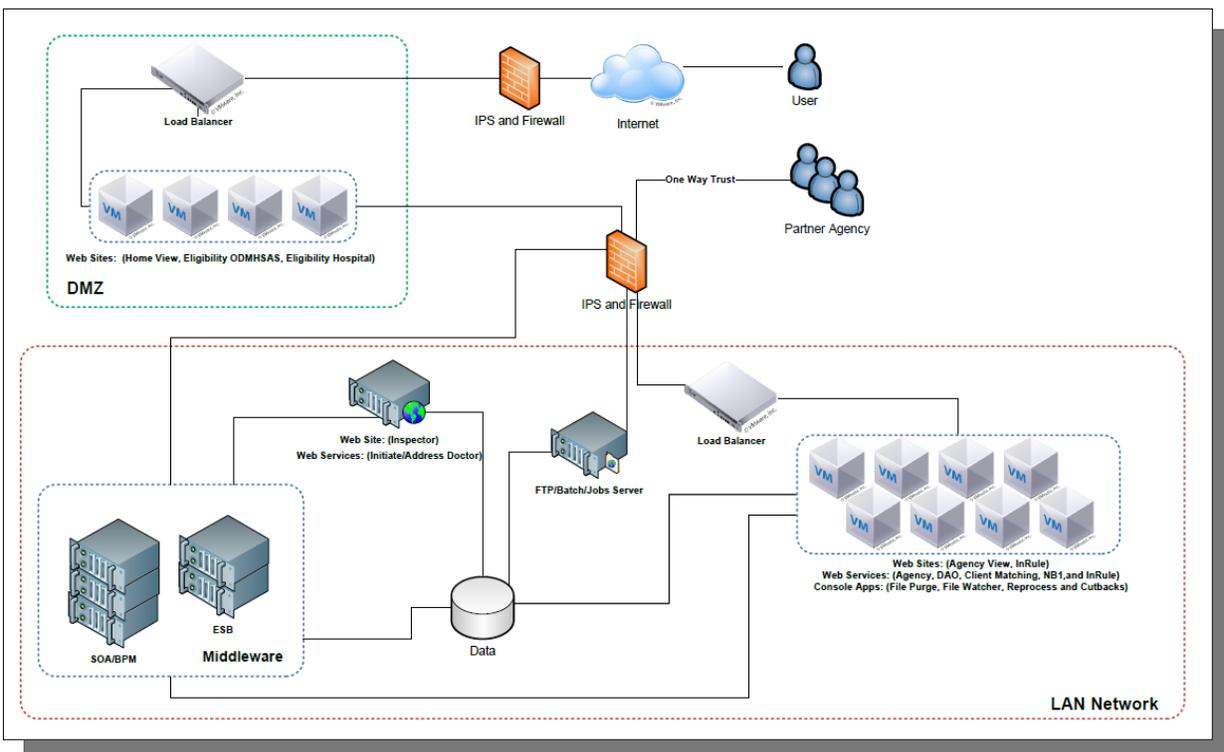


Figure 9: OHCA Eligibility System Infrastructure TO-BE

The planned OHCA Eligibility System Infrastructure is depicted in Figure 9 and includes an ESB.

As OKDHS and other agencies develop their SOA environments the opportunity for increased interoperability increases as shown in Figure 10.

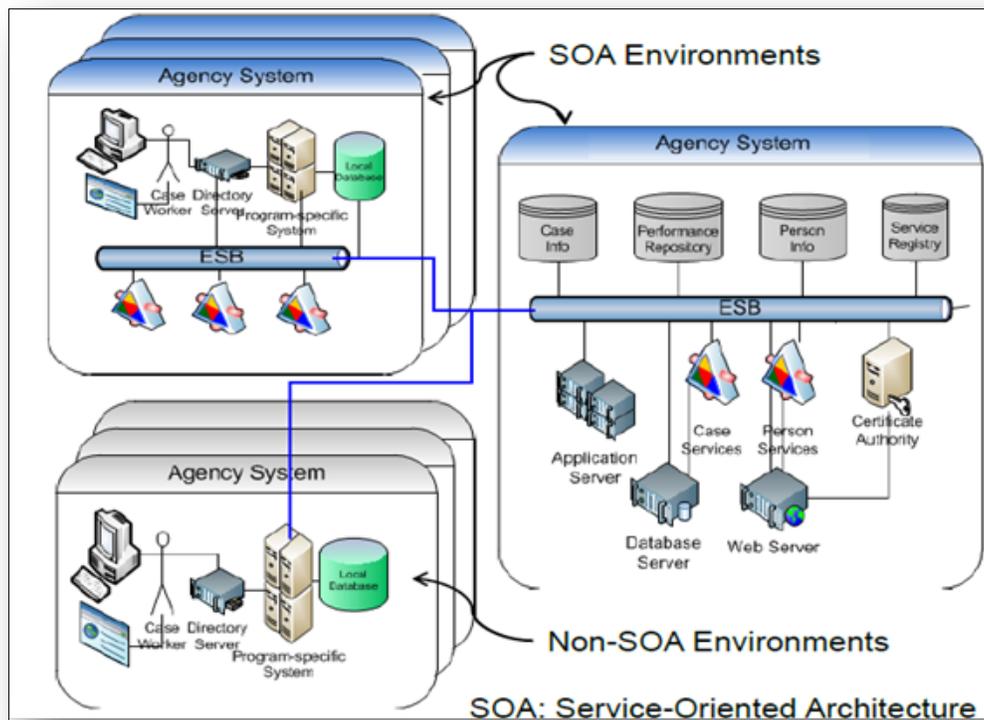


Figure 10: Proposed SOA Infrastructure

6.6 Interoperability Proof of Concept

The project team selected three specific interoperability opportunities to explore implementation of SOA/ESB, web services, NIEM, including COTS solutions. The following systems and processes were selected for analysis:

- OKDHSLive
- Citizenship Verification
- Online Enrollment (Medicaid Eligibility)

6.6.1 OKDHSLive Interoperability

6.6.1.1 Overview

The Adult and Family Services Division (AFS) of OKDHS provide many services for the population of Oklahoma. Three of these are: SNAP (Food Benefits), Child Care Assistance, and Medical Assistance. The computer system that supports AFS services is called PS2/FACS. PS2 is a mainframe IMS system that houses the data and has numerous online and batch IMS transactions that support the system. There is also

some data stored in DB2. FACS is a PowerBuilder front end to the PS2 system that allows workers in the county offices to enter information into the PS2 system.

This system was customized for use by AFS clients to allow them to enter information for renewals and recertification on their cases and for clients known to the system (have had a case with AFS) to apply for benefits through a web application. Soon AFS will make the application process available to clients not known to the system. This system is called OKDHSLive and it collects the information from a client (or a worker assisting a client) required for a review, recertification, or application. At a very high level the description of OKDHSLive is as follows:

- 1) Data is collected from a client or worker through a series of web screens.
- 2) The data collected is saved in a SQL Server database.
- 3) Windows services exist which look in the SQL Server database to see what has been submitted.
- 4) Data is sent from the SQL Server to various IMS transactions which update the appropriate information in the IMS and DB2 databases.
- 5) Depending on what data was updated, the case is automatically approved for renewal or recertification or sent to "Worker Review". Worker Review means that a worker needs to do something before the information can be approved. The reason for this could be something like documentation needs to be sent in, or something needs to be verified. In any case, once the information is sent to IMS, the case is handled by workers and the existing PS2/FACS system.

The OKDHSLive example presented in this document meets a need that AFS would like to have when the application process is made available to clients not known to the system. AFS would like to allow entities outside OKDHS that collect similar information to send us the information they collect so we can submit an application for SNAP, Medical, or Child Care. The two examples they want to start with are the Food Bank in Tulsa and the Community Action Center in Tulsa. This process could work for any service agency whether a state agency or not if we can define what we expect them to send us and in what format. These agencies would need to have some kind of agreement with OKDHS/AFS so we wouldn't let just anyone collect information without knowing about it. This would require some kind of security to be sure that we know who is sending the data.

If an agency sends data, then we would put the data in the SQL Server database and set it up so that it appears to be in submitted state so the backend windows services will send it to the PS2/FACS system for processing.

We thought this could be an interoperable process because there are other state agencies that take applications for the types of services that they support. If we build a statewide application that accepts this type of data, then the statewide application could send the information to any number of systems like OKDHSLive that are prepared to accept information from other agencies. We will need to think about how to format the data so that it can easily be changed as other applications are added that may have

somewhat different data requirements and still have no impact on the existing applications that are already in the process. This example is only for OKDHSLive because we do not have any requirements for other agencies. Online enrollment with OHCA will likely be another candidate for this process.

6.6.1.2 Business Processes

The owner of the data exchange will be OMES-ISD. The Business Process Diagrams is in Figure 11 below.

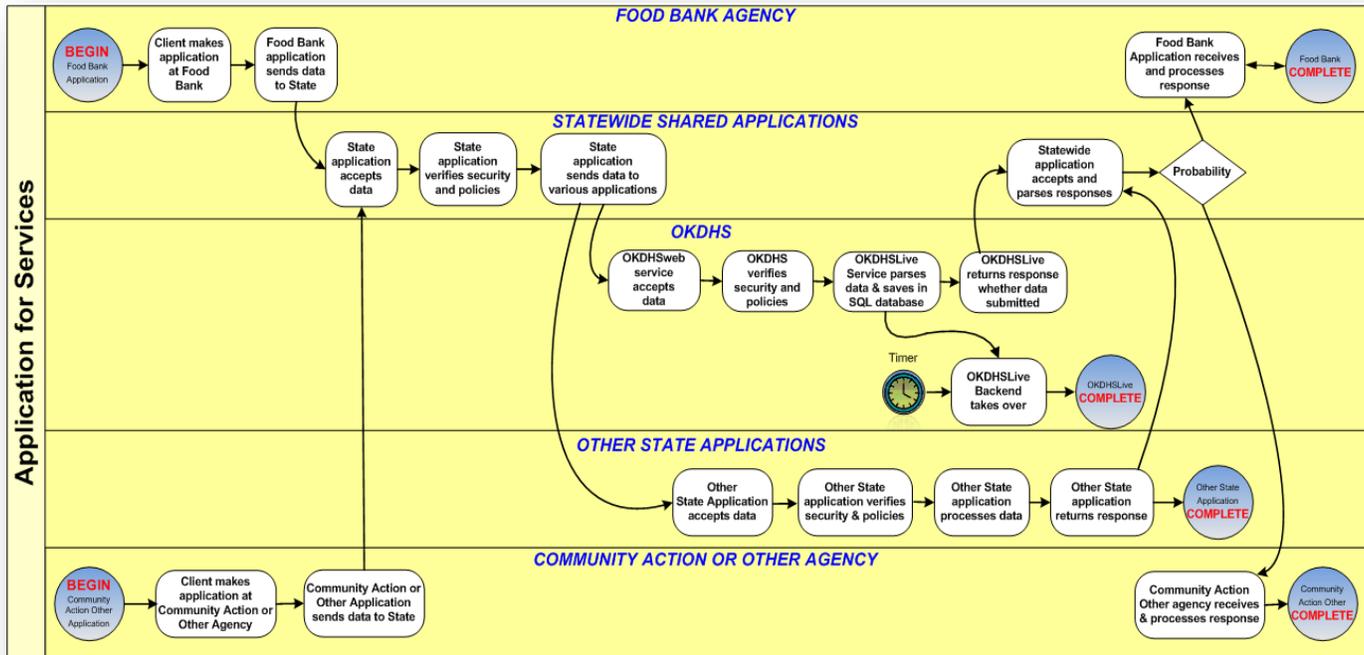


Figure 11: OKDHS Live Interoperability Business Process Diagram

6.6.1.3 Use Cases

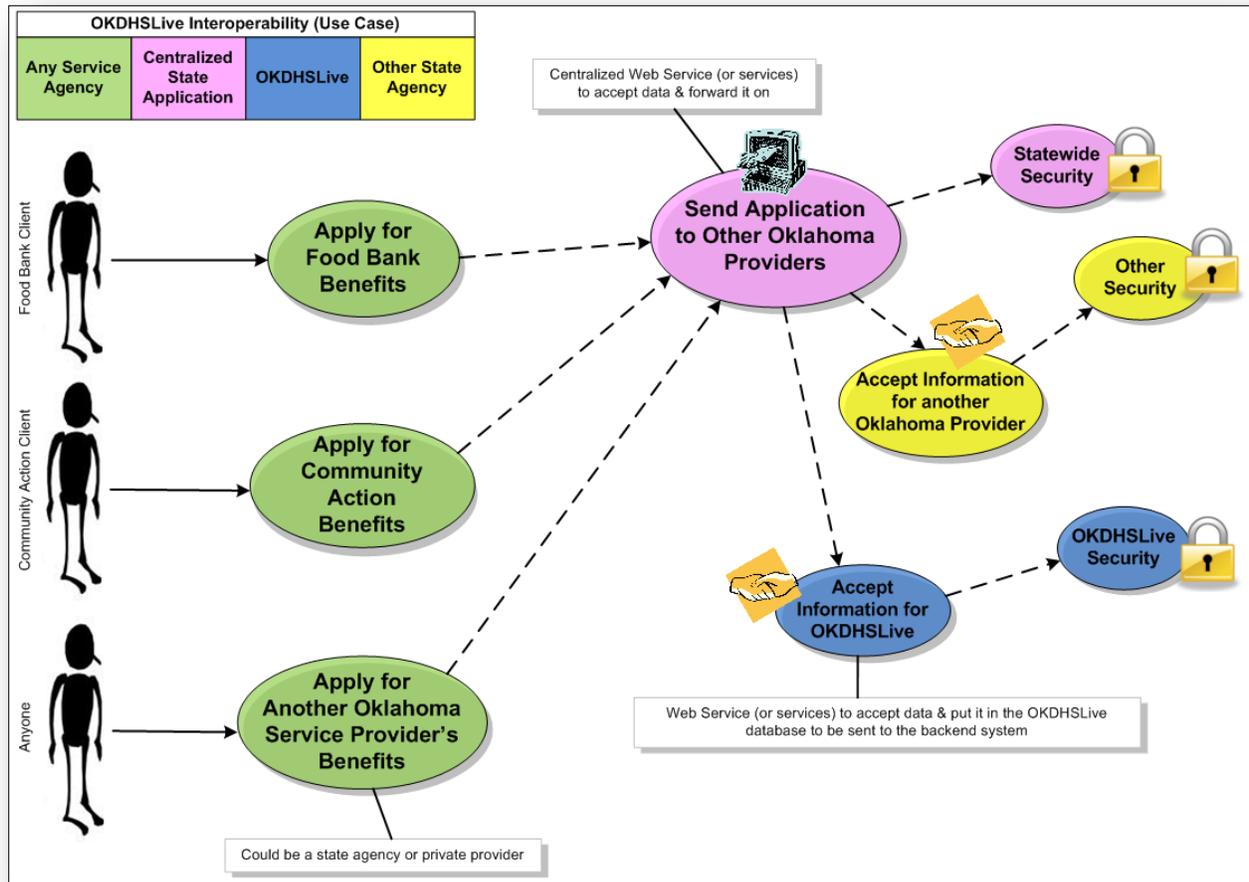


Figure 12: OKDHS Live Interoperability Use Case

Figure 12 is a Use Case Diagram of OKDHS Live Interoperability example. It can also be found in the NIEM Analysis paper, OKDHS Live Interoperability Information Exchange Package Documentation (IEPD) Main Document (Appendix B-1-5).

6.6.1.4 Requirements

- 1) Create a statewide web service to accept data from any agency whether internal or external to accept data for applications to receive services provided by Oklahoma state agencies.
 - a. The example given here is the food bank submitting data for OKDHS Live (a system that will allow users to apply for benefits offered by the AFS Unit of the Oklahoma Department of Human Services). The specific benefits in this example are food benefits, medical benefits, and child care benefits. Other AFS benefits may be added later.
 - b. This state wide application will accept the data and perform security checks to determine where the information came from and if that entity

- has an agreement with the state that allows them to send application data and perform any other security or policy requirement checks.
 - c. After verifying security and policies, it invokes all of the web services in the state that exist for accepting application information.
 - d. We will need to worry about other agencies data requirements as they are added because this document only addresses data needed by OKDHSLive.
 - e. A response is sent back to the caller with results such as security problems, success or failure of calling applications, responses from those applications, etc.
- 2) Create an OKDHSLive web service that will accept data from the statewide web service after the security has been verified.
- a. This web service will perform additional security checks to verify that the sender has an agreement with OKDHS and that other security requirements are met. (Can/should this be done at the state level?)
 - b. After verifying security and policies, the web service saves the data and generates necessary other data for the SQL Server database used by OKDHSLive. The data is stored in a manner expected by the OKDHSLive “backend”. (The details of this will be in the detail specifications for this web service.)
 - c. The web service will respond to the caller (the statewide application) with the results: whether a security problem exists, the data was successfully saved for OKDHSLive to process, or it wasn’t able to save the data.
 - d. We will need to determine how to handle the errors in case the data can’t be saved for some reason and how to recover, if possible.
 - e. After the SQL database is updated, the OKDHSLive “backend”, which is a series of windows services and web services, will notice that the data is there and submit it appropriately to the mainframe IMS system (PS2) for AFS. The application will most likely require an AFS worker to review it and contact the client for documentation and/or more information.
- 3) This looks like a good place for a messaging infrastructure or ESB, where applications interested in picking up data could just grab an application request and process it.
- 4) Security requirements and policies to be determined.
- 5) Implement NIEM as a standard for data exchanges.

6.6.1.5 Information Exchange

- 1) Any internal or external agency passes information to the statewide application web service:
 - a. Information required to authenticate/authorize and any other requirement to meet policy at the statewide level.
 - b. Application information for various services being requested.
- 2) Statewide application web service sends request to OKDHSLive web service:

- a. Information required to authenticate/authorize and any other requirement to meet policy at the OKDHS/AFS level. (Should this be at the state level?)
- b. Application information for various services being requested.
- 3) OKDHSLive sends reply back to statewide application web service:
 - a. Results
 - b. Error information, if any
- 4) Statewide application web service sends reply back to callers:
 - a. Results
 - b. Error information, if any

6.6.1.6 Web Services

The following operations take place for the statewide application web service.

- 1) Any internal or external agency:
 - a. Creates the request
 - b. Calls statewide application web service
 - c. Sends the request
- 2) Statewide Application Web Service:
 - a. Checks required parameters for valid access to web service
 - b. Grants/denies access to statewide application web service
 - c. Calls OKDHSLive and all other web services that accept applications
 - d. Sends information for the application
 - e. Receives answer from OKDHSLive and others that were called
 - f. Sends response to the calling agency
- 3) OKDHSLive:
 - a. Receives request from statewide application web service
 - b. Validates specific OKDHS/AFS security and policies
 - c. Grants/denies access to the OKDHSLive web service
 - d. Stores data in SQL database for processing by OKDHSLive "backend".
 - e. Sends response to statewide application web service

6.6.1.7 Sequence Diagram

The sequence diagram in Figure 13 shows the data transfer between the different entities involved in OKDHSLive Interoperability Web Service.

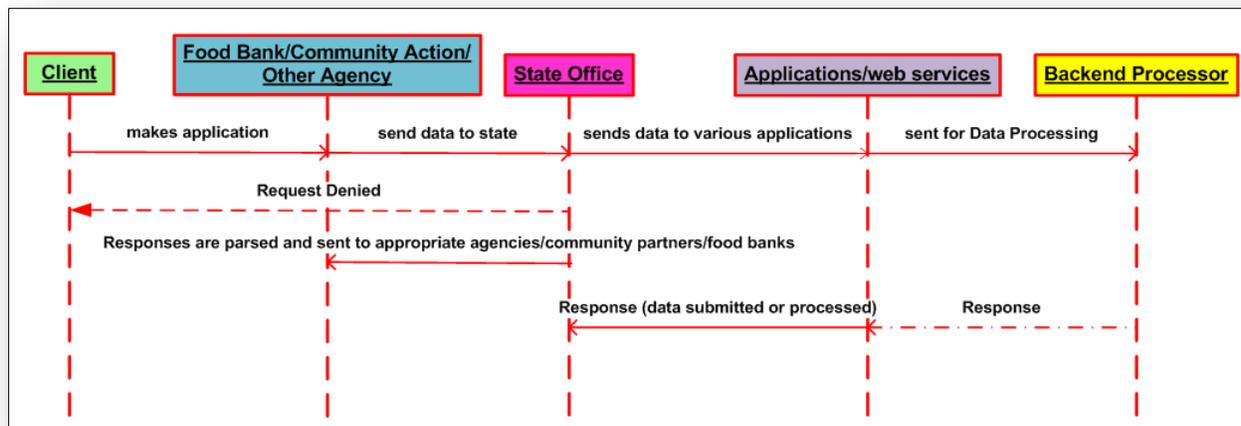


Figure 13: Sequence Diagram of OKDHS Live Interoperability Web Service

6.6.2 TO-BE Citizenship Verification Web Service

6.6.2.1 Overview

For OKDHS, a state or federal mandate requires an applicant for a particular benefit (e.g. Food Stamps) to prove they are a citizen. Currently, since Department of Human Services (DHS) has Federal Social Security Administration (SSA) and Supplemental Security Income (SSI) information, OKDHS uses the determination of the federal system to verify citizenship: that if a person is a citizen in the federal database, then the state would consider that person a citizen too. An initial automated search is performed on the federal data. If verified that a person was not a citizen on the federal database, for Medicaid, an additional check against OSDH data is done. If a person's citizenship is verified either on the federal side or with OSDH, the OKDHS database is updated with an appropriate flag. If no verification is found, a notice is sent to the applicant to provide proof of citizenship.

Currently, OHCA utilizes three methods to verify citizenship for their applicants. The primary method is the data match against the Social Security Administration-SOLQI service, this is a real-time verification. The second method is a manual data match against the Department of Homeland Security (DHS)-VIS system.

Finally, OHCA uses a daily batch process to exchange information with OSDH; the first batch job sends a request with all applicants who have declared to be born in Oklahoma and whose citizenship has not been verified through other means. The second batch job processes the verifications OSDH returns to OHCA.

The criteria and elements OHCA considers to create the request are:

- Member's citizenship must not be previously verified
- The member declared he/she was born in Oklahoma

- The member must be eligible for other program than Mental Health
- Only verified Social Security Numbers (SSNs) are included in the request

Once the request file is created, it is FTP transferred to OSDH for processing. The response file from OSDH then is processed by OHCA and the database is updated accordingly with the correspondent verifications.

OHCA maintains a life-time verification table where it keeps the citizenship verification records. Additionally, the document request for citizenship created when the application is submitted is keyed as met when someone's citizenship gets verified.

The release of the new Citizenship Verification Process for citizenship verification will allow the workers/clients to verify citizenship with OSDH real time so verification is instantaneous instead of delayed. It will also provide the flexibility to verify citizenship for any agency that has an agreement/contract signed to use the Citizenship Verification Web Service.

Considerations for the service (web service):

- Any agency can verify citizenship with either the federal side or OSDH
- If a two-step process is required, the agency will call the federal service first and Citizenship Verification Web Service after that
- Only designated Agencies (as specified in the contract/agreement) will be able to access the Citizenship Verification Web Service
- The output would be an indicator whether citizenship was verified/not verified
- The logic of whether to call just the Federal Web Service or OSDH Web Service or both web services for citizenship verification is handled by the application calling the web service (That would handle the cases for SNAP / TANF / Childcare / Medicaid taking different paths for citizenship verification for OKDHS)
- All processes dependent on the response from Citizenship Verification Web Service will be handled by the application

6.6.2.2 Business Processes

The owner of the Citizenship Verification Web Service (data exchange) will be OMES-ISD. The business process diagrams and sequence diagrams can be found in the Citizenship Verification IEPD Main Document (see Appendix B-1-4 of the NIEM Analysis paper).

6.6.2.3 Use Cases

Use cases can be found on the Citizenship Verification IEPD Main Document (Appendix B-1-4 of the NIEM Analysis paper).

6.6.2.4 Requirements

- 1) Citizenship verification with Federal
- 2) Citizenship verification with the OSDH
- 3) OHCA, Oklahoma Legislature Title 63 O.S.2011 § 5003. (Title 63 of the Oklahoma Statutes; "Medicaid" means the medical assistance program established in Title XIX of the federal Social Security Act and administered in Oklahoma by the OHCA.)
- 4) Real time citizenship data exchange
- 5) Implement NIEM as a standard for data exchanges
- 6) Security requirements to be determined

6.6.2.5 Web Services

An overview of the Citizenship Verification Web Service is depicted below in Figure 14. The detailed data elements that are exchanged for Citizenship Verification Web Services are detailed in the NIEM Analysis paper. The Citizenship Verification Web Service could reside on an ESB and called by other systems or applications with a need to verify citizenship.

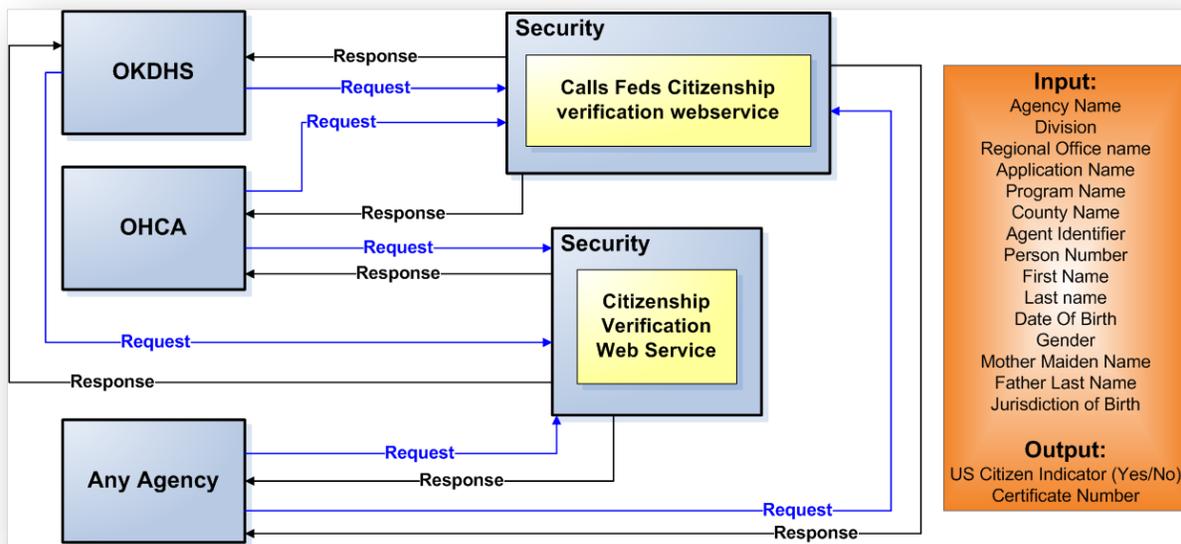


Figure 14: Citizenship Verification Web Service

Citizenship Verification Web Service details are given in Figure 15 below.

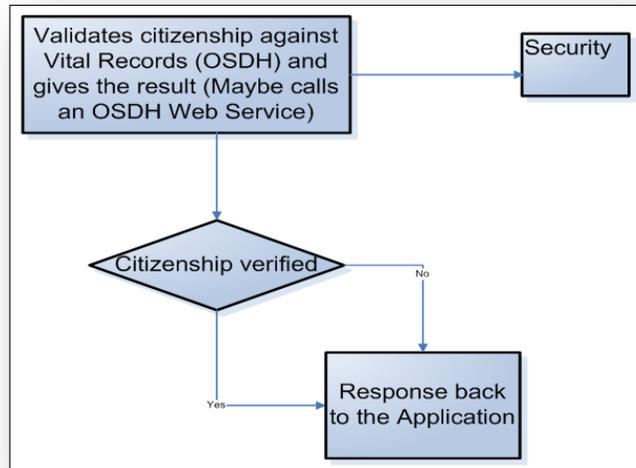


Figure 15: Details of Citizenship Verification Web Service with OSDH

6.6.2.6 Information Exchange

- Any agency passes information to Citizenship Verification Web Service for citizenship verification.
 - ✓ Information required for identity manager to authenticate/authorize (also includes information required by OSDH to identify/audit source information)
 - ✓ Information of the applicant whose citizenship is being verified
- Citizenship Verification Web Service sends request to OSDH
 - ✓ Agency/Agent Information
 - ✓ Information of the applicant whose citizenship is being verified
- OSDH sends reply back to Citizenship Verification Web Service
 - ✓ Indicator
 - ✓ Required Response Information (could be some information sent for auditing purposes by OSDH e.g. certificate number)

6.6.2.7 Exchange Content Model

Unified Modeling Language (UML) diagram for the exchange is given below in Figure 16.

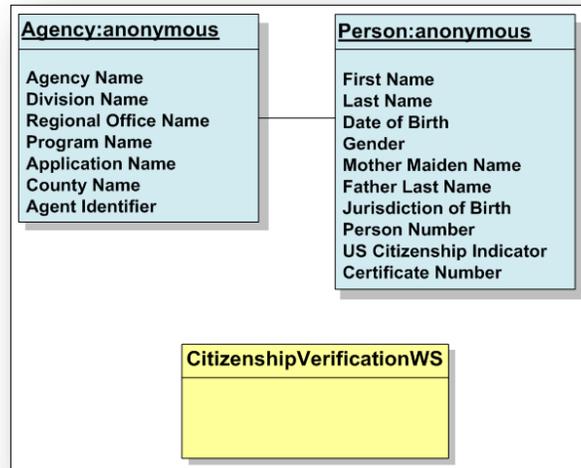


Figure 16: Draft UML Diagram

6.6.2.8 Mapping Document

Mapping Document is attached to the Citizenship Verification IEPD Main Document (Appendix B-1-4 of NIEM Analysis Paper).

6.6.2.9 XML Schemas

XML Schemas are attached to the Citizenship Verification IEPD Main Document (Appendix B-1-4 of NIEM Analysis Paper).

6.6.2.10 Functional Allocation

The following operations take place for Citizenship Verification with OSDH:

- Any agency:
 - ✓ Creates the request
 - ✓ Calls Citizenship Verification Web Service
 - ✓ Sends the request
- Security (statewide)
 - ✓ Checks required parameters for valid access to web service
 - ✓ Grants/denies access to Citizenship Verification Web Service
- Citizenship Verification Web Service
 - ✓ Calls OSDH Web Service
 - ✓ Sends request for citizenship verification
 - ✓ Receives answer from OSDH
 - ✓ Sends response to the agency
- OSDH
 - ✓ Receives request from Citizenship Verification Web Service
 - ✓ Validates records with Vital Records

- ✓ Updates the backend with the information received. This information might be used for audit purposes later.
- ✓ Sends response to Citizenship Verification Web Service

6.6.2.11 Sequence Diagram

The sequence diagram in Figure 17 below shows the data transfer between the different entities involved in Citizenship Verification Web Service.

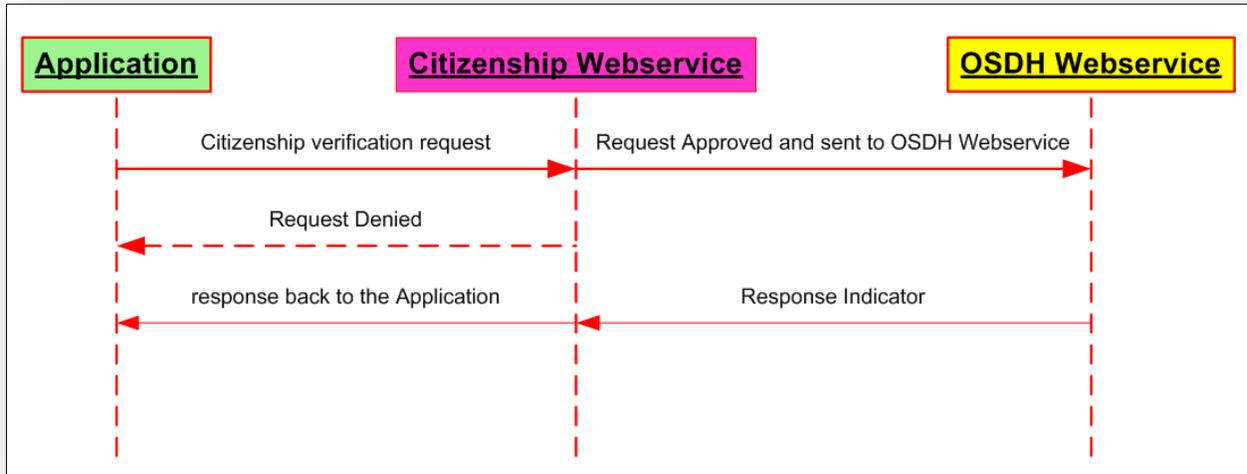


Figure 17: Sequence Diagram of Citizenship Verification Web Service

The security for this service needs to involve enterprise web services security standards applicable statewide that would ensure only designated agencies have access to the web service (authentication and authorization). It also needs to include an identity management that makes sure that only authorized agencies will be able to call the OSDH Web Service.

6.6.3 Online Enrollment SoonerCare Medicaid Eligibility Process

6.6.3.1 Overview

OHCA is the designated Oklahoma Medicaid agency. Applicant contacts OHCA or partner agency to apply for SoonerCare.

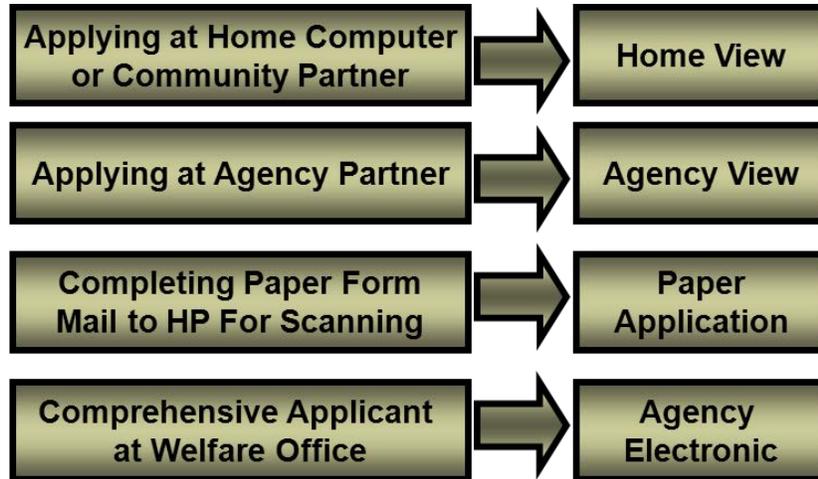


Figure 18: OHCA Application Methods

Applicant can use the following methods for application as listed below and shown in Figure 18 above.

- 1) Customer Log-in (Home View)
- 2) OKDHS-FACS (Interview Process)
- 3) OSDH (Interview Process)
- 4) Partner Agency (Agency View)
- 5) OHCA Helpdesk (Paper Application)
- 6) Oklahoma Child Support Services (OCSS) (Agency View – rarely)

OHCA certifies the case and information is sent from OHCA to OCSS in a batch file nightly. OSIS evaluates batch file builds referrals on appropriate OHCA cases. Information is displayed on RFLI for appropriate OCSS office or updated to OCSS case if existing FGN is found in OSIS.

- During information review process, OCSS staff either:
 - ✓ Builds OCSS case and cross references it to the OHCA case
 - ✓ Moves the referral to another OCSS office
 - ✓ Deletes the referral. This is accompanied by a change in the level of OCSS services listed on agency view to avoid the referral being received again.
- During update to OCSS existing case, OSIS updates information on an existing OCSS FGN. Examples are a change in case type or demographic updates.

OCSS nightly batch file to OHCA that could be Good Cause, Non-Cooperation or Case Status information.

Good Cause – If the referral indicated the applicant is requesting Good Cause for refusal to cooperate with OCSS, the OCSS staff member builds the case in OSIS with the pending good cause indicator. OSIS generates a letter to the applicant to inform him/her their request for Good Cause has been received and that they need to provide documentation in support of their request. If they do not respond, the case is marked as

the applicant intends to cooperate with OCSS. If they respond and provide appropriate documentation and OCSS determines Good Cause exists, the OCSS case is closed.

Non-Cooperation – If OCSS finds an applicant who is a parent is not cooperating with OCSS and their cooperation is necessary for OCSS to take the next step on a case, the OCSS case is marked as Non-Cooperation. This information is sent to OHCA in the nightly download. The OHCA system will review the information about the applicant to determine if they are in a protected mode (e.g. pregnant, etc). If not, the OHCA removes the benefits from the applicant. The benefits for the child remain active. If the applicant cooperated with OCSS, the cooperation code is updated and that information is sent to OHCA in the nightly download. If an applicant who has a code indicating Non-Cooperation applies for OHCA benefits, the OHCA system will not certify the individual. An edit indicating the applicant is not cooperating with OCSS is displayed.

Case Status Updates – Includes case status updates on payee cooperation status, Medicaid eligibility changes, and insurance coverage changes.

Case Closures – OCSS must pursue child support on cases where the family is receiving Medicaid assistance except for certain limited circumstances such as:

- Only the children are receiving Medicaid and the applicant has declined OCSS services
- Only the children are receiving Medicaid and the applicant is not cooperating when that person's cooperation is required for the next step on the case to the applicant cannot be located
- There is no deprivation for the child (intact family)
- The child is 'deemed eligible'
- Good Cause for refusal to cooperate has been determined

A weekly batch file for insurance is sent from OHCA to OCSS and from OCSS to OHCA. Insurance Information related to Medicaid recipients is exchanged. The information exchanged includes the carrier, type of coverage, coverage dates and policy holder information for each member. Logistics at both ends are in place to make decisions whether to update information at either end or not with the information.

Cash medical support collections are sent to OHCA on a monthly basis.

Collecting Cash Medical Support – Some child support orders require a parent to pay cash medical support in lieu of enrolling a child in insurance. When the family is receiving Medicaid, the cash medical support is assigned to the state of Oklahoma. Those amounts are forwarded to OHCA when collected by OCSS. These are sent as a monthly batch from one agency to the other.

6.6.3.2 Business Processes

The business process flows for Home View and Agency View are documented in Figures 19 and 20.

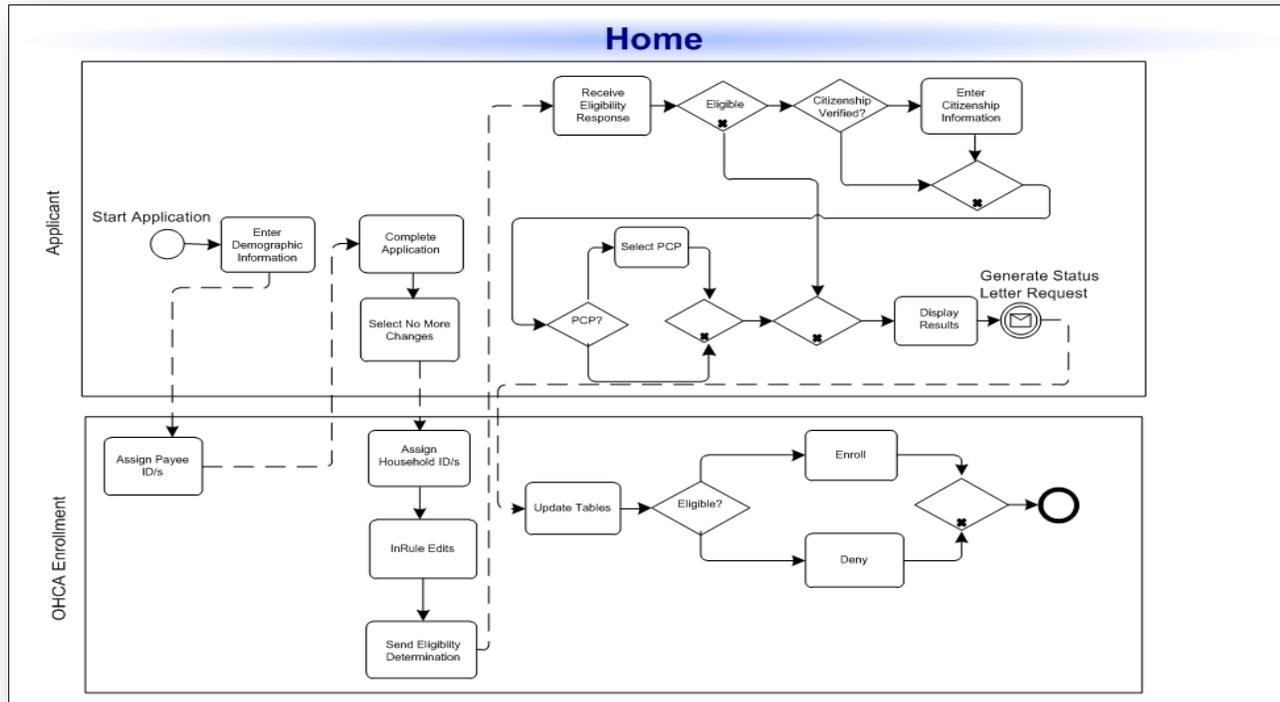


Figure 19: Home View Business Processes

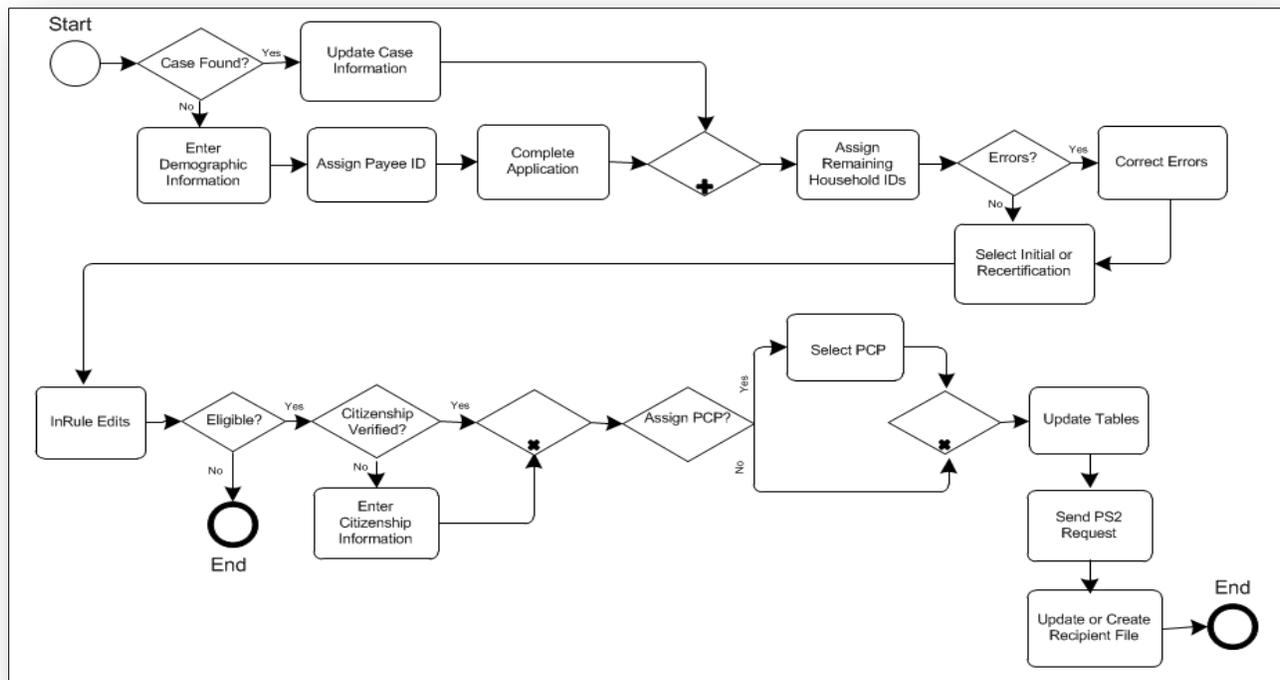


Figure 20: Agency View Business Process

6.6.3.3 Use Cases

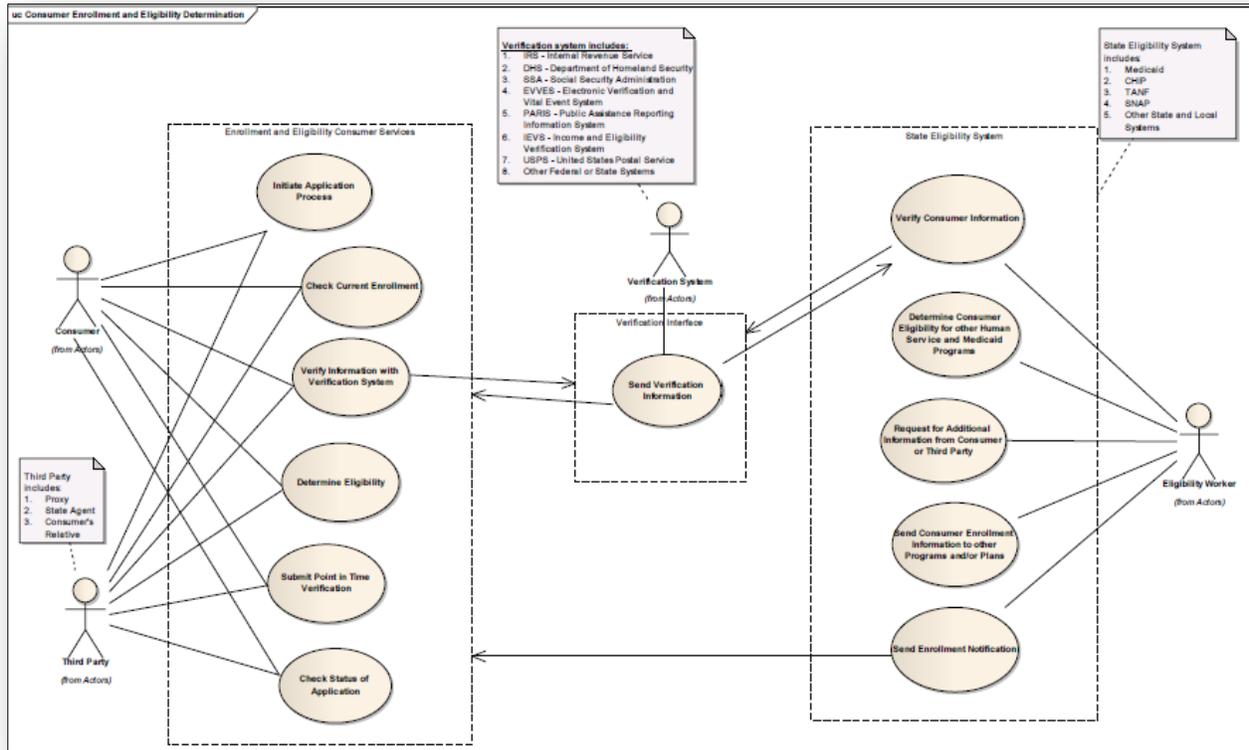


Figure 21: Example Eligibility Use Case

6.6.3.4 Requirements

- 1) Real time data exchange
- 2) Implementation of NIEM as a standard for data exchange
- 3) All family member information should include the parent of the children who is absent from the home

6.6.3.5 Web Services

See Appendix E – Eligibility Web Services.

6.6.3.6 Eligibility Functional Model

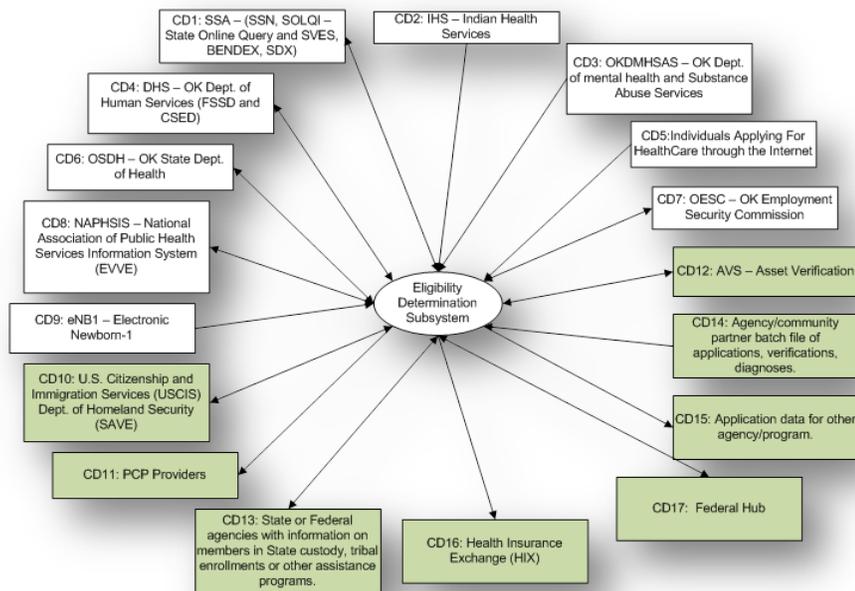


Figure 22: Eligibility Functional Model

6.6.3.7 Eligibility Reference Model

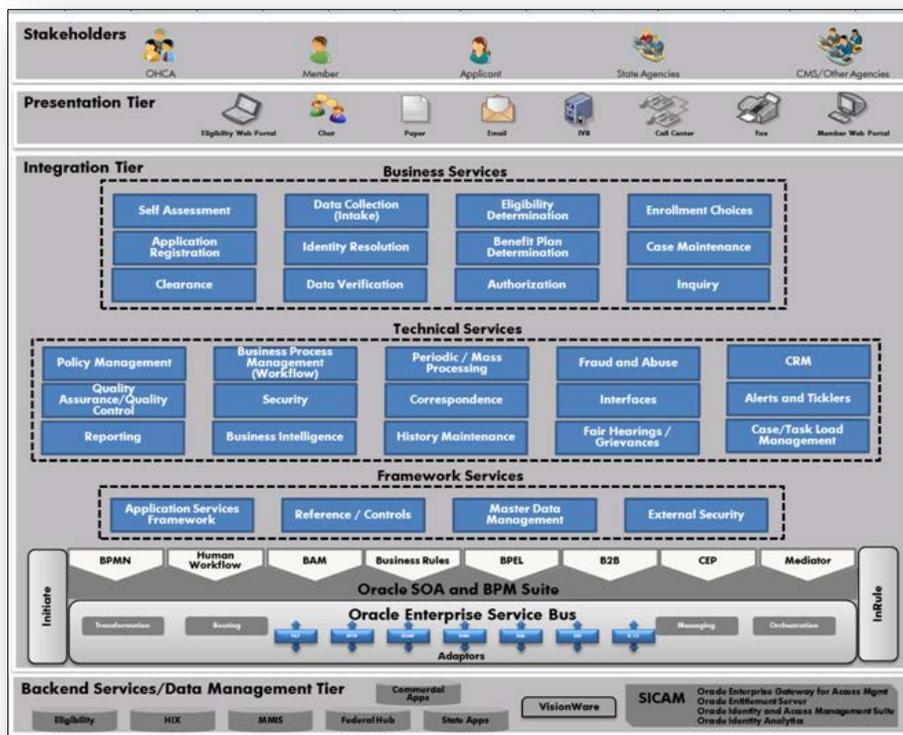


Figure 23: Eligibility Reference Model

6.6.3.8 Security and Integrity

SOAP messages enable the partner and the FFM, via the Hub, to send and receive data using services. The Hub, the FFM, and partner use two-way Secure Socket Layer (SSL)/Transport Layer Security (TLS) with client side certificates for SOAP-based services over the Internet.

The Team has not finalized the username and password authentication process. Required security standards for implementation of the Federal DSH Secure service between the FFM and the Hub, and the Hub and the partner agency, are as follows:

- Web Services Security (WS-Security) v1.1
- SOAP v1.2
- X.509
- A trusted Certificate Authority (CA) must sign the certificates
- Certificates must use 2048-bit keys
- Certificates must use Secure Hash Algorithm (SHA)-2 for the message digest. It can be any of the following strengths: 256, 384, or 512

Each request contains a WS-Security header.

6.6.3.9 Development Information

All transactional requests to the federal data services hub shall be performed via web services. These services shall be invoked by state IT systems via API or Web APIs that are accessed via secure HTTP and shall be executed on the system hosting the requested services. The CMS web services shall accept requests from trusted sources, perform the function based on the request, and return a response to the State system. CMS shall publish these web services in the CMS Service Catalog, which shall contain all services available to the states and the definitions of the standards that must be met to request the service and standard data format for the data provided when making the request and the data that shall be returned.

CMS is still determining the best mechanism for how batch and bulk data transactions will be designed and implemented. At this stage, CMS believes that there shall be a need to establish both web services and possibly alternate interfaces to meet batch and bulk data transaction requirements.

7 REFERENCED DOCUMENTS

7.1 Government Documents

In the event of conflict between these reference documents and contents of this document, contents of this document shall be considered a superseding requirement.

Implementation Advance Planning Document; Oklahoma Health Care Authority; Medicaid Eligibility System Project, Online Enrollment; November 21, 2011

Project Charter; State of Oklahoma; Eligibility and Enrollment System Project; Version 0.2; April 9, 2012

Project Management Plan; Oklahoma Health Care Authority; Version 1.2; April 12, 2012

Guidance for Exchange and Medicaid Information Technology (IT) Systems; Centers for Medicare & Medicaid Services; Version 2.0; May, 2011

Enhanced Funding Requirements: Seven Conditions and Standards; Centers for Medicare & Medicaid Services; Medicaid IT Supplement (MITS-11-01-v1.0); Version 1.0; April 2011

National Human Services Interoperability Architecture (NHSIA):
<http://www.acf.hhs.gov/nhsia-definition>

Medicaid Information Technology Architecture (MITA): <http://medicaid.gov/Medicaid-CHIP-Program-Information/By-Topics/Data-and-Systems/Medicaid-Information-Technology-architecture-MITA.html>

Collaborative Application Lifecycle Tool (CALT): <https://calt.cms.gov>

National Information Exchange Model (NIEM): <http://www.niem.gov>

Health Information Privacy and Accountability Act (HIPAA) – Security and Privacy Rules

Health Information Technology for Economic and Clinical Health (HITECH)

Internal Revenue Services (IRS) publication 1075 (“Safeguards for protecting Federal Tax Returns and Return Information”)

National Institute for Standards and Technology (NIST) Special Publication (SP) 800-53 rev 3 (“Recommended Security Controls for Federal Information Systems and Organizations”)

National Institute for Standards and Technology (NIST) Special Publication (SP) 800-95, (“Guide to Secure Web Services”)

Centers for Medicaid and Medicare Services (CMS) Harmonized Security and Privacy Framework

7.2 Non-Government Documents

Programming WCF Services, Juval Lowy; O’Reilly Media, Inc. 2007

Web Services Security Development and Architecture: Theoretical and Practical Issues; Carlos Gutiérrez and Mario Piattini; IGI Global. 2010

.NET 4 for Enterprise Architects and Developers; Sudhanshu Hate and Suchi Paharia; Auerbach Publications. 2012

Migrating Legacy Applications: Challenges in Service Oriented Architecture and Cloud Computing Environments; Anca Daniela Ionita, Marin Litoiu, Grace Lewis; IGI Global. 2013.

msdn.microsoft.com/en-us/library/ff648643.aspx

8 ACRONYMS

Acronym	Definition
A&D	Architecture & Design
ACA	Affordable Care Act
ACF	Administration for Children and Families
ADAP	AIDS Drug Assistance Program
ADFS	Active Directory Federation Services
AFS	Adult and Family Services
AIDS	Acquired Immunodeficiency Syndrome
API	Application Programming Interfaces
APS	Adult Protective Services
BPMN	Business Process Model Notation
BPR	Business Process Reengineering
BRE	Business Rules Engine
CA	Certificate Authority
CALT	Collaborative Application Lifecycle Tool
CHIP	Children's Health Insurance Program
CIO	Chief Information Officer
CMS	Medicare and Medicaid Services
COTS	Commercial Off the Shelf
DHS	Department of Homeland Security
DHS	Department of Human Services
DLL	Dynamic-Link Library
DMZ	Demilitarized Zone
EAES	Enterprise Architecture and Engineering Services
EMR	Electronic medical records
ESB	Enterprise Service Bus
EWA	Enterprise Worker Association
FFM	Federally Facilitated Marketplace
FTE	Full Time Equivalent
FTP	File Transfer Protocol
HHS	Health and Human Services
HIIAB	Health Information Infrastructure Advisory Board
HIPAA	Health Insurance Portability and Accountability Act
HITECH	Information Technology for Economic and Clinical Health

Acronym	Definition
HPES	Hewlett Packard Enterprise System
HS	Human Services
HSA	Human Services Application
HTTP	Hypertext Transfer Protocol
IEPD	Information Exchange Package Documentation
IO	Insure Oklahoma
IRS	Internal Revenue Service
IT	Information Technology
LAN	Local Area Network
LIHEAP	Low-Income Home Energy Assistance Program
MDM	Master Data Management
MITA	Medicaid Information Technology Architecture
MMIS	Medicaid Management Information System
MOU	Memorandum of Agreement
MPI	Master Person Index
NHSIA	National Human Services Interoperability Architecture
NIEM	National Information Exchange Model
NIST SP	National Institute of Standards and Technology Special Publication
OCSS	Oklahoma Child Support Services
OEPIK	Oklahoma Employee Partnership for Insurance Coverage
OHCA	Oklahoma Health Care Authority
OKDHS	Oklahoma Department of Human Services
OMES-ISD	Office of Management and Enterprise Services – Information Services Division
OSDH	Oklahoma State Department of Health
OSIS	Oklahoma Support Information System
PS2	A mainframe IMS system
SAML	Security Assertion Markup Language
SDOs	Standards Development Organizations
SB	State Bill
SHA	Secure Hash Algorithm
SLA	Service Level Agreements
SME	Subject Matter Expert
SOA	Service Oriented Architecture
SOAP	Simple Object Access Protocol
SSA	Social Security Administration
SSI	Supplemental Security Income
SSL	Secure Sockets Layer
SSN	Social Security Number
SSP	System Security Plan
TANF	Temporary Assistance for Needy Families
TLS	Transport Layer Security
UDDI	Universal Description Discovery and Integration
UML	Unified Modeling Language

Acronym	Definition
WAN	Wide Area Network
WCF	Windows Communication Foundation
WIC	Women, Infants and Children
WSDL	Web Services Description Language
WS-I	Web Services Interoperability
WS-I BP	Web Services Interoperability Basic Profile
WS-Trust	Web Services Trust
XML	eXtensible Markup Language
XSD	XML Schema Definition

APPENDIX A – AS-IS OKDHS Web Services

See attached Excel file: Appendix A – AS-IS OKDHS Web Services.xls

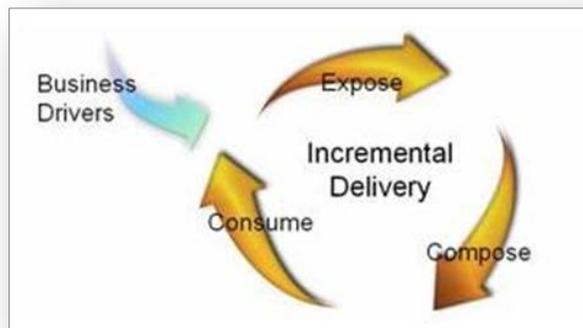
APPENDIX B – TO-BE SOA Web Services Security Standards and Terminology

1 OVERVIEW

The following sections outline the current or suggested standards as well as potential future standards as they relate to the Oklahoma Interoperability Grant Project and web services associated with Service Oriented Architecture (SOA) environments.

A Web Service is a standardized way of integrating Web-based applications using eXtensible Markup Language (XML), Simple Object Access Protocol (SOAP), Web Services Description Language (WSDL), and Universal Description, Discovery and Integration (UDDI) open standards over an Internet protocol backbone. XML is used to tag the data, SOAP is used to transfer the data, WSDL is used for describing the services available, and UDDI is used for listing what services are available. Essentially, Web Services allow different applications from different sources to communicate with each other without the use of time-consuming custom coding. Since all communication is in XML, Web Services are hardware, programming language, and operating system independent.

Services are commonly used to expose IT investments such as legacy platforms and line of business applications. Services can be assembled or “composed” into business processes, and made available for consumption by users, systems or other services. The process is an iterative one of creating (“exposing”) new services, aggregating (“composing”) these services into larger composite applications, and making the outputs available for consumption by the business user.



1.1 Purpose

The purpose of this document is to provide a detailed understanding and recommendation on using Web Services in an SOA environment. One of the key benefits of Web Services is interoperability, which allows different distributed Web Services to run on a variety of software platforms and hardware architectures. Interoperability is an important principle of SOA as well, and it can be achieved through the use of Web Services. SOA is an architectural framework

with a long history and Web Services are the preferred way to realize SOA. This document will outline the message, messaging and transport standards required to consume, operate and deploy a Web Service within the SOA environment.

1.2 Scope

This document covers only the standards for the anticipated SOA, and may not apply to other applications or web service standards.

1.3 Audience

The target audience for this document is developers, application architects and project teams wanting to understand the development requirements for participating in the SOA environment.

2 STANDARDS

This section covers the generally accepted standards for an SOA environment as well as the potential future standards. A description of each standard is given as well as examples and where possible a discussion of the future state of the standard.

2.1 Overview

The following table outlines current generally accepted standards at a glance. For further details on each standard, please see the associated sections below.

Standard	Current Version	Future Version	Roadmap Status
Message Size	NA	NA	Max size < 5 megabyte, very low frequency
XML	1.0	NULL	Current/Suggested
WSDL	NA	2.0	Current/Suggested
SOAP	1.2	NULL	Current/Suggested
WS-I Basic Profile	1.0	1.2	Current/Suggested
HTTP	1.1	NULL	Current/Suggested
SSL	3.0	NULL	Current/Suggested
WS-Trust			Future
WS-Federation			Future
SAML		2.0	Future
WS-Security		1.1	Future
WS-Addressing		1.0	Future
WS-Policy		1.2	Future
WS-I Basic Security Profile		1.0	Future

2.2 Current/Suggested Standards

The following are current or suggested standards for the development of web services within the SOA.

2.2.1 Message Size Limitations

Message size limitations may apply if an Enterprise Service Bus (ESB) product is implemented within the SOA that has message size restrictions that must be followed to support proper functions and avoid potential negative impact on throughput and dependability.

Example guidelines:

Average file size	< 1 Meg
Maximum Message Size	< 5 Meg (not to exceed a frequency of 1 message per hour)

If an ESB is implemented, any larger file size, frequency, or deviations may negatively impact the reliability of the ESB.

2.2.2 XML

The XML is a general-purpose markup language. It is classified as an extensible language because it allows its users to define their own tags. Its primary purpose is to facilitate the sharing of structured data across different information systems, particularly via the Internet. In short, XML was created to structure, store, and transport information.

Suggested SOA standard for XML is 1.0.

XML Example:

```
<?xml version="1.0" encoding="ISO-8859-1" ?>  
<note>  
  <to>Tove</to>  
  <from>Jani</from>  
  <heading>Reminder</heading>  
  <body>Don't forget me this weekend!</body>  
</note>
```

2.2.3 WSDL

The WSDL, pronounced 'wiz-dl' or spelled out, 'W-S-D-L' is an XML-based language that provides a model for describing Web services. WSDL describes a web service program with

procedure names, input/output parameters, the URL of the web service, and the enveloping mechanisms and transport to be used (i.e., SOAP over HTTP). Clients wishing to access a web service can read and interpret its WSDL file to learn about the location of the service and its available operations. In this way, the WSDL definition acts as the initial web service interface, providing clients with all the information they need to interact with the service in a standards-based way. Through the WSDL, a web services client learns where a service can be accessed, what operations the service performs, the communication protocols the service supports, and the correct format for sending messages to the service.

WSDL is often used in combination with SOAP and XML Schema to provide web services over the Internet. Any special data-types used are embedded in the WSDL file in the form of XML Schema. The client can then use SOAP to actually call one of the functions listed in the WSDL.

A WSDL file is an XML document that describes a web service using six main elements:

- **Port type** – Groups and describes the operations performed by the service through the defined interface.
- **Port** – Specifies an address for a binding, i.e., defines a communication port.
- **Message** – Describes the names and format of the messages supported by the service.
- **Types** – Defines the data types (as defined in an XML Schema) used by the service for sending messages between the client and server.
- **Binding** – Defines the communication protocols supported by the operations provided by the service.
- **Service** – Specifies the address (Uniform Resource Locator (URL)) for accessing the service.

The WSDL document that describes a web service acts as a contract between web service client and server. By adhering to this contract the service provider and consumer are able to exchange data in a standard way, regardless of the underlying platforms and applications on which they are operating.

Suggested SOA standard for WSDL is 1.1.

WSDL Example:

```
<?xml version="1.0"?>
<definitions name="StockQuote"

targetNamespace="http://example.com/stockquote.wsdl"
  xmlns:tns="http://example.com/stockquote.wsdl"
  xmlns:xsd="http://example.com/stockquote.xsd"
  xmlns:soap="http://schemas.xmlsoap.org/wsdl/soap/"
  xmlns="http://schemas.xmlsoap.org/wsdl/">
```

```
<types>
  <schema targetNamespace="http://example.com/stockquote.xsd"
    xmlns="http://www.w3.org/2000/10/XMLSchema">
    <element name="TradePriceRequest">
      <complexType>
        <all>
          <element name="tickerSymbol" type="string"/>
        </all>
      </complexType>
    </element>
    <element name="TradePrice">
      <complexType>
        <all>
          <element name="price" type="float"/>
        </all>
      </complexType>
    </element>
  </schema>
</types>

<message name="GetLastTradePriceInput">
  <part name="body" element="xsd1:TradePriceRequest"/>
</message>

<message name="GetLastTradePriceOutput">
  <part name="body" element="xsd1:TradePrice"/>
</message>

<portType name="StockQuotePortType">
  <operation name="GetLastTradePrice">
    <input message="tns:GetLastTradePriceInput"/>
    <output message="tns:GetLastTradePriceOutput"/>
  </operation>
</portType>

<binding name="StockQuoteSoapBinding" type="tns:StockQuotePortType">
  <soap:binding style="document"
transport="http://schemas.xmlsoap.org/soap/http"/>
  <operation name="GetLastTradePrice">
    <soap:operation soapAction="http://example.com/GetLastTradePrice"/>
    <input>
      <soap:body use="literal"/>
    </input>
    <output>
      <soap:body use="literal"/>
    </output>
  </operation>
</binding>

<service name="StockQuoteService">
  <documentation>My first service</documentation>
  <port name="StockQuotePort" binding="tns:StockQuoteBinding">
    <soap:address location="http://example.com/stockquote"/>
  </port>
</service>
```

</definitions>

2.2.4 SOAP

Simple Object Access Protocol (SOAP) was created to describe and/ or implement the rules for program-to-program communication over HTTP or HTTPS using XML. SOAP forms the foundation layer of the web services stack, providing a basic messaging framework which more abstract layers can build on. Web services use SOAP to send messages between a service and its client(s). Because HTTP is supported by all web servers and browsers, SOAP messages can be sent between applications regardless of their platform or programming language. This quality gives web services their characteristic interoperability.

SOAP messages are XML documents that contain some or all of the following elements:

- **Envelope** – Specifies that the XML document is a SOAP message; encloses the message itself.
- **Header** (optional) – Contains information relevant to the message, e.g., the date the message was sent, authentication data, etc.
- **Body** – Includes the message payload.
- **Fault** (optional) – Carries information about a client or server error within a SOAP message.

Data is sent between the client(s) and the web service using request and response SOAP messages, the format for which is specified in the WSDL definition. Because the client and server adhere to the WSDL contract when creating SOAP messages, the messages are guaranteed to be compatible.

The suggested version of SOAP recommended within the SOA environment is 1.2, although SOAP 1.1 is supported for backward compatibility.

It is important to note that this is recommended as the only accepted message format allowed in the SOA environment. *Custom XML schemas which fall outside of this standard will not be allowed. These schemas are seen as non-standard and require additional maintenance detracting from the value of a shared services environment.*

- Suggested SOA standard for SOAP is 1.2.
- Suggested SOA standard for SOAP encoding is *document-literal encoding*.
- It provides for easier interoperability between the different platforms and is in accordance with WS-I Basic Profile (official abbreviation is BP), a specification from the Web Services Interoperability industry consortium (WS-I), provides interoperability guidance for core web services specifications such as SOAP, WSDL, and Universal Description, Discovery and Integration (UDDI, pronounced Yu-di). The profile uses Web

Services Description Language (WSDL) to enable the description of services as sets of endpoints operating on messages.

SOAP Request Example:

```
POST /examples HTTP/1.1
User-Agent: Radio UserLand/7.0 (WinNT)
Host: localhost:81
Content-Type: text/xml; charset=utf-8
Content-length: 474
SOAPAction: "/examples"

<?xml version="1.0"?>
<SOAP-ENV:Envelope xmlns:SOAP-ENV=" http://www.w3.org/2003/05/soap-envelope/"
xmlns:xsd="http://www.w3.org/1999/XMLSchema"
xmlns:xsi="http://www.w3.org/1999/XMLSchema-instance">
  <SOAP-ENV:Body>
    <m:getStateName xmlns:m="http://www.soapware.org/">
      <statenum xsi:type="xsd:int">41</statenum>
    </m:getStateName>
  </SOAP-ENV:Body>
</SOAP-ENV:Envelope>
```

SOAP Response Example:

```
HTTP/1.1 200 OK
Connection: close
Content-Length: 499
Content-Type: text/xml; charset=utf-8
Date: Wed, 28 Mar 2001 05:05:04 GMT
Server: UserLand Frontier/7.0-WinNT

<?xml version="1.0"?>
<SOAP-ENV:Envelope xmlns:SOAP-ENV=" http://www.w3.org/2003/05/soap-envelope/"
xmlns:xsd="http://www.w3.org/1999/XMLSchema"
xmlns:xsi="http://www.w3.org/1999/XMLSchema-instance">
  <SOAP-ENV:Body>
    <m:getStateNameResponse xmlns:m="http://www.soapware.org/">
      <Result xsi:type="xsd:string">Oklahoma</Result>
    </m:getStateNameResponse>
  </SOAP-ENV:Body>
</SOAP-ENV:Envelope>
```

2.2.5 Mandated SOAP Header Elements

This section specifies mandated SOAP header elements based on best practices and industry standards that are appropriate for an SOA environment. The SOA mandates a number of custom SOAP header elements in addition to those found in the standard SOAP interface. These header elements help to identify the message in both inbound and outbound scenarios,

assist in logging and reporting, and provide additional security measures. The header elements will also provide a foundation for future policy and security additions.

- **SystemID** is the unique identify of the original calling system. This is used to identify the application which made the initial service request. This should be collected and provided by the calling system. It is provided to the end point service via the ESB and may be used for logging or further validation by the end point service.
- **UserID** is the actual account name of the end user requested the action on the original calling system. This should be collected and provided by the calling system. It is provided to the end point service via the ESB and may be used for logging or further validation by the end point service.
- **TransactionID** is created on the ESB. It is a unique ID used to identify a transaction, or set of transactions in scope. The transaction ID should always be provided by the calling system if known, the ESB will always check for the presence of a TransactionID in a message before assigning a new one. If a TransactionID is found, the ESB will use that ID for logging. The ID is comprised of the following:

YYYY	The current Year.
MM	The current Month.
DD	The current Day.
HH	The current Hour.
MM	The current Minute.
SS	The current Second.
MMM	The current Millisecond.
RRRR	Randomly generated 4 digit code.

Format = YYYYMMDDHHMMSSMMM:RRRR

Custom SOAP Header Example:

```
<soapenv:Header>
  <s3:HeaderRequest      xsi:schemaLocation="http://www.okdhs.org/DSD/SOAPHeader
HeaderRequest.xsd " xmlns:s3="http://www.okdhs.org/DSD/SOAPHeader">
    <s3:SystemID>100010101</s3:SystemID>
    <s3:UserID>CA\ul2345</s3:UserID>
    <s3:TransactionID>20130626081710910:3838</s3:TransactionID>
  </s3:HeaderRequest>
</soapenv:Header>
```

Custom SOAP Header Schema:

```
<?xml version="1.0" encoding="utf-8"?>
<s:schema xmlns:s="http://www.w3.org/2001/XMLSchema"
  xmlns:s3="http://www.okdhs.org/dsd-ws/2008/03/transinfo"
  attributeFormDefault="unqualified" elementFormDefault="qualified"
```

```
targetNamespace="http://www.okdhs.org/dsd-ws/2008/03/transinfo"  
xmlns="">  
<s:element name="HeaderRequest">  
  <s:complexType>  
    <s:sequence>  
      <s:element maxOccurs="1" minOccurs="0" name="SystemID"  
        type="s:string" />  
      <s:element maxOccurs="1" minOccurs="0" name="UserID"  
        type="s:string" />  
      <s:element maxOccurs="1" minOccurs="0"  
        name="TransactionID" type="s:string" />  
    </s:sequence>  
  </s:complexType>  
</s:element>  
</s:schema>
```

2.2.6 Web Services Interoperability (WS-I)

The Web Services Interoperability organization (WS-I) is an industry consortium chartered to promote interoperability across the stack of Web Services specifications. WS-I does not define standards for Web Services, rather it creates guidelines and tests for interoperability. It has recently become part of OASIS, Organization for the Advancement of Structured Information Standards, another standards body. WS-I was chartered to establish best practices for Web Services interoperability among selected groups of Web Services standards, across platforms, operating systems, and programming languages. WS-I comprises a diverse community of Web Services leaders from a wide range of companies and standards development organizations.

2.2.7 Web Services Interoperability Basic Profile (WS-I BP)

The WS-I Basic Profile (BP) is a specification from the Web Services Interoperability industry consortium (WS-I), provides interoperability guidance for core Web Services specifications such as SOAP, WSDL, and UDDI. The profile uses Web Services Description Language (WSDL) to enable the description of services as sets of endpoints operating on messages. The guidance provided by the BP is organized into four categories: messaging, service description, service publication and discovery, and security.

Suggested SOA standard for WS-I is 1.0.

2.2.8 HyperText Transfer Protocol (HTTP)

HyperText Transfer Protocol (HTTP) is the underlying protocol used by the Web. HTTP defines how messages are formatted and transmitted, and what actions Web servers and browsers should take in response to commands. Its original purpose was to provide a way to publish and retrieve HTML hypertext pages. Development of HTTP was coordinated by the W3C

(World Wide Web Consortium) and the IETF (Internet Engineering Task Force), culminating in the publication of a series of RFCs, most notably RFC 2616 (June 1999), which defines HTTP/1.1, the version of HTTP in common use today.

Suggested SOA standard for HTTP is 1.1.

2.2.9 Secure Sockets Layer (SSL)

SSL are cryptographic protocols that provide secure communications on the Internet for such things as web browsing, e-mail, internet faxing, instant messaging and other data transfers.

Suggested SOA standard for SSL is 3.0.

2.2.10 Universal Description Discovery and Integration (UDDI)

UDDI is a standard sponsored by OASIS (Organization for the Advancement of Structured Information Standards). Often described as the yellow pages of web services, UDDI is a specification for creating an XML-based registry that lists information about businesses and the web services they offer. UDDI provides businesses a uniform way of listing their services and discovering services offered by other organizations. Though implementations vary, UDDI often describes services using WSDL and communicates via SOAP messaging. Registering a web service in a UDDI registry is an optional step, and UDDI registries can be public or private (i.e. behind a firewall). To search for a web service, a developer can query a UDDI registry to obtain the WSDL for the service he/she wishes to utilize. Developers can also design their web services clients to receive automatic updates about any changes to a service from the UDDI registry.

3 FUTURE STANDARDS

The following outlines standards suggested on the road map for the SOA. It is important to note that not time lines are given for the adoption of these standards. New standards will be reviewed by the SOA Review Board and addressed as needed. Standards will only be certified and adopted when needed in an effort to limit confusion and the need for redesign of existing services.

3.1 WS-Addressing

SOAP messages sent through the HTTP(s) transport-protocol rely on the HTTP/TCP-IP to get messages to the right machine, but uses out-of-message information (i.e. SoapAction HTTP header) to figure out what to do with that message once it hits the destination machine. All of that out-of-message information is specific to HTTP. Therefore, to get rid of HTTP another place to put that out-of-message information must be found.

WS-Addressing is a standardized way of including the HTTP-specific data in the XML message itself. Instead of relying on the network-level transport to convey dispatch information, the message can now carry along its own dispatch metadata in a standardized SOAP header. The network-level transport is now only responsible for delivering that message to a dispatcher capable of reading that metadata. Once that message hits the dispatcher, the job of the network-level transport is done.

Suggested SOA standard for WS-Addressing is 1.0.

3.2 WS-Policy

WS-Policy provides a flexible and extensible grammar for expressing the capabilities, requirements, and general characteristics of entities in an XML web services-based system. WS-Policy defines a framework and a model for the expression of these properties as policies.

WS-Policy defines a policy to be a collection of policy alternatives, where each policy alternative is a collection of policy assertions. Some policy assertions specify traditional requirements and capabilities that will ultimately manifest on the wire (e.g., authentication scheme, transport protocol selection). Other policy assertions have no wire manifestation yet are critical to proper service selection and usage (e.g., privacy policy, Quality of Service (QoS) characteristics). WS-Policy provides a single policy grammar to allow both kinds of assertions to be reasoned about in a consistent manner.

WS-Policy does not specify how policies are discovered or attached to a web service. Other specifications are free to define technology-specific mechanisms for associating policy with various entities and resources. WS-PolicyAttachment defines such mechanisms, especially for associating policy with arbitrary XML elements, WSDL artifacts, and UDDI elements. Subsequent specifications will provide profiles on WS-Policy usage within other common web service technologies.

3.3 WS-Discovery

This specification defines a multicast discovery protocol to locate services. By default, probes are sent to a multicast group, and target services that match return a response directly to the requester. To scale to a large number of endpoints, the protocol defines the multicast suppression behavior if a discovery proxy is available on the network. To minimize the need for polling, target services that wish to be discovered send an announcement when they join and leave the network.

3.4 Web Services Security (WS-Security)

WS-Security is a communications protocol providing a means for applying security to web services. On April 19 2004 the WS-Security 1.0 standard was released by OASIS-Open. On February 17 2006 they released version 1.1.

The protocol contains specifications on how integrity and confidentiality can be enforced on web services messaging. The WSS protocol includes details on the use of Security Assertion Markup Language (SAML) and Kerberos and certificate formats such as X.509. WS-Security describes how to attach signature and encryption headers to SOAP messages. In addition, it describes how to attach security tokens, including binary security tokens such as X.509 certificates and Kerberos tickets, to messages.

WS-Security incorporates security features in the header of a SOAP message, working in the application layer to ensure end-to-end security.

3.5 Web Services Trust Language (WS-Trust)

WS-Trust is a web services (WS-*) specification and OASIS standard that provides extensions to WS-Security, specifically dealing with the issuing, renewing, and validating of security tokens, as well as with ways to establish, assess the presence of, and broker trust relationships between participants in a secure message exchange. <http://docs.oasis-open.org/ws-sx/ws-trust/>

3.6 WS-Federation

WS-Security, WS-Trust, and WS-SecurityPolicy provide a basic model for federation between Identity Providers and Relying Parties. These specifications define mechanisms for codifying claims (assertions) about a requestor as security tokens which can be used to protect and authorize web services requests in accordance with policy. WS-Federation extends this foundation by describing how the claim transformation model inherent in security token exchanges can enable richer trust relationships and advanced federation of services. This enables high value scenarios where authorized access to resources managed in one realm can be provided to security principals whose identities and attributes are managed in other realms.

WS-Federation includes mechanisms for brokering of identity, attribute discovery and retrieval, authentication and authorization claims between federation partners, and protecting the privacy of these claims across organizational boundaries. These mechanisms are defined as extensions to the Security Token Service (STS) model defined in WS-Trust. In addition WS-Federation defines a mapping of these mechanisms, and the WS-Trust token issuance messages, onto HTTP such that WS-Federation can be leveraged within web browser environments. The intention is to provide a common infrastructure for performing Federated Identity operations for both web services and browser-based applications. A common protocol provides economies with regard to development, testing, deployment and maintenance for vendors and customers alike.

3.7 Web Services Reliable Messaging (WS-ReliableMessaging)

Web Services Reliable Messaging (WS-ReliableMessaging) is a specification that allows SOAP messages to be delivered reliably between distributed applications in the presence of software component, system, or network failures.

3.8 WS-Reliability

WS-Reliability is a SOAP-based ([SOAP 1.1] and [SOAP 1.2 Part 1]) OASIS specification that fulfills reliable messaging requirements critical to some applications of web services. SOAP over HTTP is not sufficient when an application-level messaging protocol must also guarantee some level of reliability and security. This specification defines reliability in the context of current web services standards. This specification has been designed for use in combination with other complementary protocols and builds on previous experiences (e.g., ebXML Message Service).

3.9 WS-Coordination

This specification describes an extensible framework for providing protocols that coordinate the actions of distributed applications. Such coordination protocols are used to support a number of applications, including those that need to reach consistent agreement on the outcome of distributed activities.

The framework defined in this specification enables an application service to create a context needed to propagate an activity to other services and to register for coordination protocols. The framework enables existing transaction processing, workflow, and other systems for coordination to hide their proprietary protocols and to operate in a heterogeneous environment.

Additionally this specification describes a definition of the structure of context and the requirements for propagating context between cooperating services.

3.10 WS-Transaction

A web services specification developed by BEA Systems, International Business Machines Corporation (IBM), and Microsoft Corporation. The WS-Transaction specification describes coordination types that are used with the extensible coordination framework described in the WS-Coordination specification. It defines two coordination types: Atomic Transaction (AT) for individual operations and Business Activity (BA) for long running transactions. Developers can use either or both of these coordination types when building applications that require consistent agreement on the outcome of distributed activities.

3.11 WS-Eventing

This specification defines how Web Services Eventing (WS-Eventing) supports the simplest levels of web services interfaces for notification producers and consumers for a distributed event management system.

The WS-Eventing specification defines a baseline set of operations that allow web services to provide asynchronous notifications to interested parties. WS-Eventing defines the simplest level of web services interfaces for notification producers and notification consumers including standard message exchanges to be implemented by service providers that wish to act in these roles, along with operational requirements expected of them.

3.12 WS-Management

WS-Management is an open standard that defines a SOAP-based protocol for the management of servers, devices, applications and various Web services. The specification is based on DMTF open standards and Internet standards for Web services. WS-Management was originally developed by a coalition of vendors. The coalition started with AMD, Dell, Intel, Microsoft, Sun Microsystems and expanded to a total of 13 members before being subjugated in 2005 to the Distributed Management Task Force (DMTF) which is devoted to the development, unification and implementation of standards, initiatives and technologies for the Internet.

WS-Management provides a common way for systems to access and exchange management information across the IT infrastructure and was designed to meet four key requirements:

- 1) Constrain Web services protocols and formats so Web services can be implemented in management services with a small footprint, in both hardware and software.
- 2) Define minimum requirements for compliance without constraining richer implementations.
- 3) Ensure composability with other Web services specifications.
- 4) Minimize additional mechanism beyond the current Web service architecture.

Originally published in October 2004 by Advanced Micro Devices Inc. (AMD), Dell, Intel, Microsoft, and Sun, the WS-Management specification has been issued in two new major releases based upon interoperability testing. The co-authors now include DevicAMD, BMC Software Inc., Computer Associates (CA), Dell Inc., Fujitsu-Siemens Computers, Intel

Corporation, Microsoft Corp., NEC Corp., Novell Inc., Sun Microsystems Inc., Symantec Corp., and WBEM Solutions Inc.

WS-Management is designed to meet four key requirements: (1) "Constrain web services protocols and formats so web services can be implemented in management services with a small footprint, in both hardware and software; (2) Define minimum requirements for compliance without constraining richer implementations; (3) Ensure composability with other web services specifications; (4) Minimize additional mechanism beyond the current web service architecture."

3.13 SAML

SAML, developed by the Security Services Technical Committee of the OASIS, is an XML-based framework for communicating user authentication, entitlement, and attribute information. As its name suggests, SAML allows business entities to make assertions regarding the identity, attributes, and entitlements of a subject (an entity that is often a human user) to other entities, such as a partner company or another enterprise application. SAML is a flexible and extensible protocol designed to be used – and customized if necessary – by other standards. The Liberty Alliance, the Internet2 Shibboleth project, and the OASIS Web Services Security (WS-Security) committee have all adopted SAML as a technological underpinning for various purposes.

SAML V1.0 became an OASIS standard in November 2002. SAML V1.1 followed in September 2003 and has seen significant success, gaining momentum in financial services, higher education, government, and other industry segments. SAML has been broadly implemented by all major web access management vendors. SAML support also appears in major application server products and is commonly found among web services management and security vendors. SAML V2.0 builds on that success.

Many of these implementations have demonstrated successful interoperability at a series of events, the latest of which was held at the 2005 RSA Conference. The OASIS SAML Interoperability Lab, sponsored by the U.S. Government's General Services Administration (GSA), used three separate scenarios to demonstrate SAML-based interaction between a government or enterprise portal and sites from typical content or service providers.

SAML V2.0 unifies the building blocks of federated identity in SAML V1.1 with input from higher education's Shibboleth initiative and the Liberty Alliance's Identity Federation Framework. As such, SAML V2.0 is a critical step towards full convergence for federated identity standards.

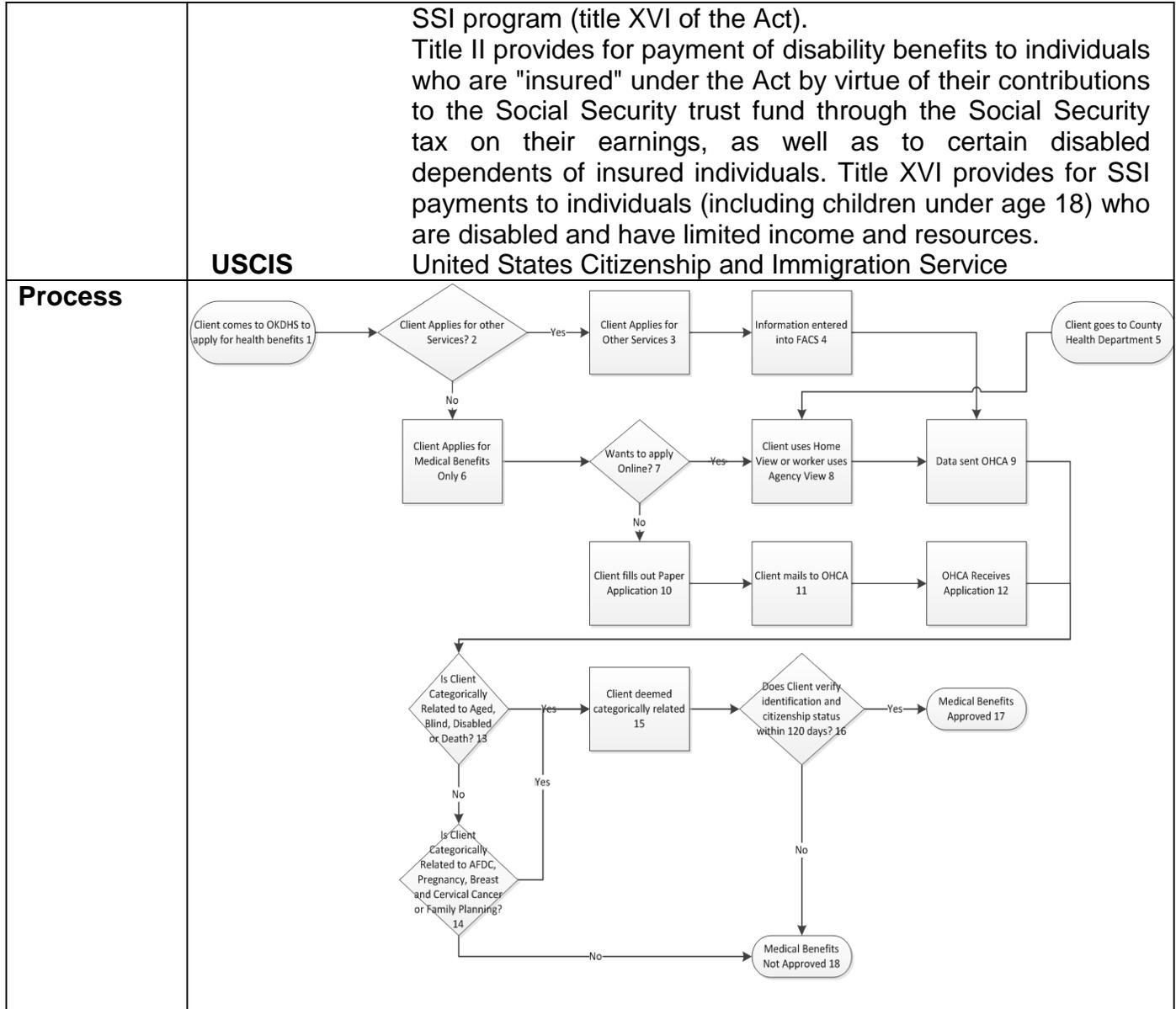
Through its support for the WS-Federation and SAML 2.0 protocols, Microsoft Active Directory Federation Services (AD FS) 2.0 provides claims-based, cross-domain web Single Sign-On (SSO) interoperability with non-Microsoft federation solutions.

4 REFERENCES AND RESOURCES

Resource Name	Version	Location
Web Services		http://www.webservices.org
Wikipedia (Standards and Definitions)		www.wikipedia.com
WS-I Basic Profile	1.0	http://www.ws-i.org/
WS-I Basic Security Profile	1.0	http://www.ws-i.org/
WS-Security	1.1	http://www.oasis-open.org/
XML	1.0	http://www.w3.org/TR/REC-xml/
WSDL	1.1	http://www.w3.org/TR/wsdl
SOAP	1.1	http://www.w3.org/TR/2000/NOTE-SOAP-20000508/
HTTP	1.1	http://www.w3.org/Protocols/
SSL	3.0	http://wp.netscape.com/eng/ssl3/
WS-Addressing	1.0	http://www.w3.org/Submission/ws-addressing/
WS-Trust	1.1	http://docs.oasis-open.org/ws-sx/ws-trust/200512
WS-Federation	1.0	http://www.oasis-open.org/
SAML	2.0	http://www.oasis-open.org/
WS-Privacy		http://www.oasis-open.org/
WS-Policy	1.2	http://www.oasis-open.org/
ebXML		http://ebxml.org
UDDI		
AD FS	2.0	http://technet.microsoft.com/en-us/library/adfs2
GFIPM		

APPENDIX C - OHCA & AFS Eligibility Workflow (Medicaid or SoonerCare)

Supersedes	None																																										
Process Owner	Oklahoma Health Care Authority (OHCA)																																										
Purpose	The purpose of this workflow is to describe eligibility intake, determine eligibility and perform case management.																																										
General	This workflow applies to how the AFS receives clients for medical benefits and OCHA approval.																																										
Definitions	<table border="1"> <thead> <tr> <th>Term</th> <th>Definition</th> </tr> </thead> <tbody> <tr> <td>AFDC</td> <td>Aid to Families with Dependent Children</td> </tr> <tr> <td>AFS</td> <td>Adult and Family Services</td> </tr> <tr> <td>BCC</td> <td>Breast and Cervical Cancer</td> </tr> <tr> <td>CDIB</td> <td>Certificate of Degree of Indian Blood or Certificate of Degree of Alaska Native Blood (both abbreviated CDIB)</td> </tr> <tr> <td>CMS</td> <td>Centers for Medicare & Medicaid Services</td> </tr> <tr> <td>FACS</td> <td>Family Assistance and Client Services</td> </tr> <tr> <td>FP</td> <td>Family Planning</td> </tr> <tr> <td>ID</td> <td>Identification</td> </tr> <tr> <td>LIHEAP</td> <td>Low Income Home Energy Assistance Program</td> </tr> <tr> <td>LOCEU</td> <td>Level of Care Evaluation Unit</td> </tr> <tr> <td>OHCA</td> <td>Oklahoma Health Care Authority</td> </tr> <tr> <td>OKDHS</td> <td>Oklahoma Department of Human Services</td> </tr> <tr> <td>SNAP</td> <td>Supplemental Nutrition Assistance Program</td> </tr> <tr> <td>SoonerCare</td> <td>SoonerCare (Oklahoma Medicaid) is a health coverage program jointly funded by federal and state government. This program helps pay some or all medical bills for many people who can't afford them. OHCA is the state agency that administers the program and determines financial eligibility for the program. (Note: Medicare is different from SoonerCare. Medicare is a federal health insurance program administered by CMS. Medicare provides coverage mostly to individuals age 65 or older and some people with disabilities.)</td> </tr> <tr> <td>SSA</td> <td>Social Security Administration</td> </tr> <tr> <td>SSI</td> <td>Supplemental Security Income</td> </tr> <tr> <td>SSP</td> <td>State Supplemental Payment</td> </tr> <tr> <td>TANF</td> <td>Temporary Assistance for Needy Families</td> </tr> <tr> <td>TEFRA</td> <td>Tax Equity and Financial Responsibility Act</td> </tr> <tr> <td>Title II and XVI</td> <td>The SSA administers two programs that provide benefits based on disability: the Social Security disability insurance program (Title II of the Social Security Act (the Act)) and the</td> </tr> </tbody> </table>	Term	Definition	AFDC	Aid to Families with Dependent Children	AFS	Adult and Family Services	BCC	Breast and Cervical Cancer	CDIB	Certificate of Degree of Indian Blood or Certificate of Degree of Alaska Native Blood (both abbreviated CDIB)	CMS	Centers for Medicare & Medicaid Services	FACS	Family Assistance and Client Services	FP	Family Planning	ID	Identification	LIHEAP	Low Income Home Energy Assistance Program	LOCEU	Level of Care Evaluation Unit	OHCA	Oklahoma Health Care Authority	OKDHS	Oklahoma Department of Human Services	SNAP	Supplemental Nutrition Assistance Program	SoonerCare	SoonerCare (Oklahoma Medicaid) is a health coverage program jointly funded by federal and state government. This program helps pay some or all medical bills for many people who can't afford them. OHCA is the state agency that administers the program and determines financial eligibility for the program. (Note: Medicare is different from SoonerCare. Medicare is a federal health insurance program administered by CMS. Medicare provides coverage mostly to individuals age 65 or older and some people with disabilities.)	SSA	Social Security Administration	SSI	Supplemental Security Income	SSP	State Supplemental Payment	TANF	Temporary Assistance for Needy Families	TEFRA	Tax Equity and Financial Responsibility Act	Title II and XVI	The SSA administers two programs that provide benefits based on disability: the Social Security disability insurance program (Title II of the Social Security Act (the Act)) and the
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Step	Action	Example	Information Received	Responsible Party
1	Client applies for Health Benefits	Jane applies for medical benefits at Garfield County OKDHS Family Services office	Customer demographics <ul style="list-style-type: none"> • Employment Information • Health Insurance • Income 	Adult and Family Services (AFS) ¹
2	Client interested in services other than medical benefits?	Jane wants to apply for any service she is eligible to receive; support specialist inquires about other assistance services, e.g. SNAP, TANF, Child Care, Title II, V and XVI programs, LIHEAP	If Yes, go to Step 3 If no, go to Step 6	AFS/Client
3	Client applies for other services	Jane provides information required to access other services options	• Customer demographics	AFS/Client
4	Staff enters client information into FACS ²	Support specialist enters Jane's information in FACS	• Customer demographics Go to Step 9	OKDHS AFS
5	Client goes to County Health Dept for medical benefits	Jane's 3 year old daughter is currently without health insurance and needs vaccinations	Go to Step 8	Client/OSDH
6	Client applies for medical benefits only	Jane confirms she is applying for medical benefits only	Go to Step 7	OKDHS/OHCA Client
7	Client wants to apply online? ²	After Jane hears about options to apply (e.g. online at home, at the office, or talk to case worker and case worker enters into FACS), Jane decides to apply online	Online Go to Step 8 Paper Go to Step 10	OHCA/OSDH Client
8	Client applies using Home View ²	Jane looks at all her online options	Go to Step 9	OHCA, OSDH
9	FACS sends data to OHCA	OKDHS sends Jane's information to OHCA to be evaluated for medical services	Go to Step 13	OKDHS/OHCA
10	Client fills out information on SoonerCare paper application ³	Jane fills out paper form because of no internet		Client
11	Client Mails SoonerCare Health Benefits application to OHCA	Jane mails application to appropriate address	Completed SC-1 Form	Client, OCHA
12	OCHA receives application ⁴	OCHA receives application; prepares to process the information		OCHA
13	Is Client categorically related to Aged, Blind, Disabled, TB, or Death? ⁷		If Yes, to any, go to Step 15 If No, go to Step 14	OKDHS

Step	Action	Example	Information Received	Responsible Party
	<ul style="list-style-type: none"> • Age Determination⁵ • Blindness Determination⁶ • Disabled⁸ • TB determination⁹ • Death?¹⁰ 	<p>Donald McCormack, (67), receives \$600 a month Social Security Retirement Benefits; his wife, Sandra (60) has no income; their total countable resources are \$1950 in a checking account</p> <p>Household consists of Lamont Sanford (39) and his father, Fred Sanford (60); Fred is blind and works part-time</p> <p>Angela Walcott, age 60, receives SSA disability of \$730 per month.</p> <p>Bill Meredith, a 30-year-old diagnosed with tuberculosis gives worker a note from his PCP stating he has an active case of TB</p> <p>Joan, diagnosed with Stage 5 lung cancer, applied for disability and while waiting for a decision was hospitalized and died.</p>	<ul style="list-style-type: none"> • Age 	
14	<p>Is Client categorically related to AFDC, Pregnancy, Breast / Cervical Cancer, or Family Planning?⁷</p> <ul style="list-style-type: none"> • AFDC (Aid to Families with Dependent Children) determination¹¹ 	<p>Heather Wayne (38) applies for health benefits for herself and her two children, Jim (9), and Elaine (12); Heather receives \$450 per month child support from the children's father and she works at a local child care center; her countable income from employment is \$1200 per month; her only resource is a savings account valued at \$250.</p> <p>Tim Olsen (35) and his pregnant wife, Glenna (33) have \$1800 in savings, and a vehicle valued at</p>	<p>If Yes to any, go to Step 15 If No, go to Step 18</p>	OHCA

Step	Action	Example	Information Received	Responsible Party
	<ul style="list-style-type: none"> • Pregnancy determination¹² • Abnormal screening for Breast and Cervical Cancer determination¹³ • Family Planning (FP) Program determination¹⁴ 	<p>\$23,000. Tim’s countable income is \$1500 per month</p> <p>Jane a single mom of two children and an income of \$1,200 per month was diagnosed with cervical cancer and is applying for medical benefits</p> <p>Mickey and Minnie have 3 children and want to seek out options on family planning services. Mickey makes \$1,100 a month; Minnie makes \$500 a month</p>	<ul style="list-style-type: none"> • Date of delivery • Number of children expected • Age • Insurance status 	
15	Client determined categorically related	Jane is “categorically related” and “categorically needy” and deemed eligible		OKDHS/OHCA
16	<p>Verify identity and citizenship status within 120 days?</p> <ul style="list-style-type: none"> • Identity 	Jane applied for medical services and is deemed eligible; she shows her driver’s license to prove	<p>If Yes to both identity and citizenship proof, go to Step 17</p> <p>If No, go to Step 18</p> <ul style="list-style-type: none"> • Driver’s License • School ID with picture • Day care or nursery record (minors only) • School record or report card (under 16 only) • Affidavit signed by a parent or guardian (under 16 only) • Government issued ID cards with photo or identifying information (State ID card) • Tribal government issued ID card (CDIB card) or other tribal 	OKDHS/OHCA Client

Step	Action	Example	Information Received	Responsible Party
	<ul style="list-style-type: none"> • Citizenship 	<p>Jane applied for medical services and is deemed eligible; she brings in her birth certificate to prove her citizenship</p>	<p>documents with photo or identifying information</p> <ul style="list-style-type: none"> • U.S. Military ID, U.S. Military Dependent ID or U.S. Military Draft Record • U.S. Coast Guard Merchant Mariner Card • U.S. Birth Certificate • Certificate or report of birth abroad issued by USCIS or the State Department • U.S. Citizen ID Card issued by USCIS • American Indian card issued by USCIS for the Kickapoo tribe • Final adoption decree • Evidence of Civil Service employment by U.S. Government before 6/1/1976 • Official military record of service showing U.S. place of birth (Form DD-214) • Extract of U.S. hospital birth record established at the time of birth, created at least five years before initial application date • Life, health, or other insurance record showing U.S. place of birth, created at least five years before initial application date • Census records showing U.S. place of birth • Nursing home records, medical records ,or other documents 	

Step	Action	Example	Information Received	Responsible Party
			showing U.S. place of birth, created at least five years before initial application date <ul style="list-style-type: none"> • Bureau of Indian Affairs tribal census records, Navajo and Seneca tribes only • Native-Americans- attestation of race, tribal membership cards or CDIB cards • Oklahoma Voter Registration Cards • Northern Mariana ID card from USCIS for naturalized citizens born before 11/4/1986 	
17	Client medical benefits approved	Jane applies for medical services and is deemed eligible and brings her identification and proves her citizenship status.		OKDHS/OHCA
18	Client medical benefits not approved	Jane applies for medical services and is deemed eligible but fails to show her identification or to prove citizenship status		OKDHS/OHCA

¹ OHCA has responsibility for administering the Medicaid or SoonerCare program. OHCA establishes the scope of the health benefits program in Oklahoma by establishing the program’s policies and procedures. OKDHS has responsibility for following the OHCA guidelines the in determining eligibility for individuals who are aged, blind, and disabled and for taking and submitting applications for anyone else who wants to apply for SoonerCare.

² The Online Enrollment system provides the following ways to enroll for health benefits:

- **Home View** (web access) - The Home View was designed for use by the general public and was built with the applicant in mind. It provides links to assist the client through the application process. Anyone with a computer and internet access can log onto the Home View of the online enrollment system by typing www.mySoonerCare.org into the address line of their internet browser.
- **Agency View** (OHCA community partners and other state agencies) - Clients who may not be able to apply from their homes have the option to apply from many community partner such as hospitals, tribal health facilities, OSDH offices, and OKDHS centers. Community partners have access to OHCA’s Agency View option. The Agency View allows these partners to help clients apply for benefits, make changes, view benefit status, and complete a review.
- **FACS** (OKDHS users) - FACS Clients who come to an OKDHS office to apply for health benefits *along with* other OKDHS programs such as SNAP and/or child care services will have their information entered into the FACS. No matter which input method is used (Home View, Agency View, or FACS), client information is sent directly to OHCA and an immediate approval or denial response is received.

³ Some clients do not have Internet access or may not be comfortable applying online. These clients will be able to use the OHCA SoonerCare Health Benefits paper application form (SC-1). It is important to make the client aware that each page of the form must be on a separate sheet of paper and the application must be mailed to OHCA. **OHCA will not accept faxed applications.**

⁴ The paper application date is the day the form is received by OHCA. The only exception to this will be if a person needs coverage for a medical service within the past 15 days and requested that verbally or in writing. Either the date an individual calls the office to request an application or the date a paper application is received in the county office can be considered the oral request date. You will need to write the words “Oral Request Date” and the date of request on the top of page 1 of the medical application form (SC-1). Be sure to write or stamp this information only in the white space between the page heading and OHCA’s logo. **If it is written anywhere else on the form, the request will not be honored.**

⁵ Aged means the individual is sixty-five (65) years of age or older. An individual meets the condition of categorical relationship for the entire month he or she turns 65. If the SSA has established this categorical relationship, you may accept it. If the individual is 65 years or older and has never applied for Social

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Security benefits, proceed with a determination of age and refer the client to the local Social Security office to make an application for benefits. Client must meet income and resource criteria and go through OKDHS for services.

⁶ Blindness means an individual has central visual acuity of 20/200 or less in the better eye with the use of a correcting lens. This basically means blindness can be defined as someone being able to see at 20 feet what people with normal sight can see at 200 feet, and that's with corrective lenses. When the SSA cannot make a decision regarding blindness for some reason other than the client's not being blind, it is possible to send Form ABCDM-16 (Authorization for Examination and Billing) as well as form ABCDM-80 (Report of Physician's Examination) to an ophthalmologist or optometrist for completion. When returned, you will forward them to the OHCA for a decision. Client must meet income and resource criteria and go through OKDHS for services.

⁷ The enrollment information is evaluated as soon as the client submits it and an eligibility determination is made almost instantly. This real-time process is done by the computer which relieves the worker of that responsibility.

⁸ Disability means a person is unable to engage in any substantial gainful activity by reason of any medically determinable physical or mental impairment which can be expected to result in death, or which has lasted (or can be expected to last) for a continuous period of not less than 12 months. Disability determinations from the Veteran's Administration, Workman's Compensation, and other sources are not considered valid for this category. Client must meet income and resource criteria and go through OKDHS for services.

⁹ If you encounter a client who has a diagnosis of tuberculosis (TB), you'll need to obtain verification of the active TB infection from a medical practitioner. Once obtained, the client is considered categorically related to disability. Client must meet income and resource criteria and go through OKDHS for services.

¹⁰ If a client dies while receiving a medical service or dies as a result of an illness for which he or she was hospitalized within two months after release from the hospital, categorical relationship is automatically established. The Title XIX application is certified retroactively if all other conditions of eligibility are established. Verification can be established by one of the following:

- **Services Prior to Disability Determination** -When there is a need for Medicaid coverage for months prior to SSA disability determination, you will request a disability determination from Level of Care Evaluation Unit (LOCEU).
- Death certificate
- Newspaper article
- SSA/SSI information
- Collateral information

¹¹ AFDC (Aid to Families with Dependent Children) continues to be a category in the health benefits program even though the program itself has ended and has been replaced with TANF. There are three groups of people affected by the AFDC category:

1. Children under 18 years of age*.
2. Adults who are 18 years of age (under 19)*.
3. Adults who are 19 years old or older and possess the specified degree of relationship to the minor child(ren) in their home.

*Every person under 19 in Oklahoma is automatically categorically related to AFDC.

An 18 year old is considered an adult in Oklahoma. Therefore, an 18 year old can be in their own medical case. However, they may remain in their parent's case if they will graduate high school prior to their 19th birthday. This can sometimes help the parent(s) receive health benefits. Consider what is most beneficial to the family in these circumstances. * See income level column 1 below to meet categorically needy standards.

¹² Pregnancy constitutes a categorical relationship. The OSDH and some tribal clinics will also process applications for pregnancy-related medical services. The expected date of delivery is needed, as well as how many children are expected. The number of children expected is important because the health benefits program counts the unborn child as a household member when determining eligibility of the pregnant woman. Client must meet income criteria.

A few years ago, OHCA began the **Soon-to-be-Sooners** program. This provides health coverage for pregnancy-related services *only* to non-qualified, undocumented and ineligible aliens who plan to remain in Oklahoma and deliver their babies. See income level column 1 below to meet categorically needy standards.

¹³ The 2000 Breast and Cervical Cancer (BCC) Prevention and Treatment Act gave States the option to make a categorical relationship for women who were screened for and found to be in need of treatment for one of these conditions. You will want to be sure clients are aware they may be eligible for coverage if they fall into this category. There is a special process involved to determine eligibility for this group of individuals. Any woman requesting information about coverage for or having been diagnosed with one of these diseases should be referred to **1-866-550-5585**. This phone number is specifically for the BCC program. It is not necessary to give the woman an application because applications are completed at the time of the abnormal screening. Client must meet income criteria.

¹⁴ All *uninsured men and women ages 19 and older* are categorically related to the Family Planning (FP) Program (SoonerPlan) The FP program permits Oklahoma to extend Medicaid eligibility to these individuals for family planning services. This program covers *family planning services only*. Adults with minor children who apply for this program will have to comply with the child support requirement if there's an absent parent. See income level column 1 below to meet categorically needy standards.

¹⁵ Everyone who requests health benefits **AND** is added for a medical benefit must provide verification of their identity. Identity must be verified within 120 days of benefits being approved.

¹⁶ People who receive health benefits are also required to verify their citizenship status. The only exceptions to this are individuals who receive Medicare or SSI, children in foster care, and deemed newborns through their first birthday. Citizenship status must be verified within 120 days of benefit approval. It is important to remember citizenship status is not the same thing as being a citizen. Certain eligible aliens can be approved for health benefits. Always check policy to determine if a non-U.S. citizen can qualify for services.

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2013 Income & Resource Levels*										
Family Size	SoonerCare Standard for Pregnant Women, Children, or Adults seeking family planning services ¹		SoonerCare Standard for Non-Disabled Adults with Children		SoonerCare Standard for Disabled not living in an institution ²		SoonerCare Standard for Individuals Approved for and Living in an Institution ³		Mental Health and Substance Abuse Services	
	Annual	Monthly	Annual	Monthly	Annual	Monthly	Annual	Monthly	Annual	Monthly
1	\$21,257	\$1,772	\$3,492	\$291	\$9,012	\$751	\$25,560	\$2,130	\$22,980	\$1,915
2	\$28,694	\$2,392	\$4,368	\$364	\$13,284	\$1,107			\$31,020	\$2,585
3	\$36,131	\$3,011	\$5,652	\$471					\$39,060	\$3,255
4	\$43,568	\$3,631	\$6,996	\$583					\$47,100	\$3,925
5	\$51,005	\$4,251	\$8,184	\$682					\$55,140	\$4,595
6	\$58,442	\$4,871	\$9,360	\$780					\$63,180	\$5,265
7	\$65,879	\$5,490	\$10,548	\$879					\$71,220	\$5,935
8	\$73,316	\$6,110	\$11,592	\$966					\$79,260	\$6,605
9 or more, for each additional person, add:	\$7,437	\$620							\$8,040	\$670
Online Enrollment Available?	Yes		Yes		No		No		Yes	

*Income and Resource Levels are subject to yearly adjustments. To view the official baseline (100%) federal poverty levels go to <http://aspe.hhs.gov/poverty/index.shtml>. Adult is defined as age 19 and over.

*Income must be reported as gross income before taxes or any other deduction. Gross income must be listed on the SoonerCare application for all household members over 18. Income includes:

- Earned income: money received from working, commonly referred to as salaries, wages, commissions, bonuses, or severance pay. It can be received from an employer or from working for yourself (self-employment).
- Unearned income: money received from other sources, such as Social Security, Veterans Benefits, unemployment compensation, worker's compensation, disability benefits, pensions, retirement, rent, dividends, interest, gifts, prizes, royalties, and child support.

To get further income disregards and resource information, you can go to <http://www.okdhs.org/programsandservices/health/med/docs/elig.htm>. You may also own a home, a car, and personal property and still qualify.

Resources are excluded in determining eligibility. Disabled income for family size of two is for qualifying individuals with an essential or non-qualifying spouse. Total income guidelines for a qualifying disabled couple are slightly higher, \$1,148 (\$574 for each).

Also includes ADvantage Waiver, non-eligible State Supplemental Payment (SSP) individuals who receive Home and Community-Based Waiver Services for the mentally retarded, patients 65 or older in a mental hospital, and children eligible for services through the Tax Equity and Financial Responsibility Act (TEFRA).

Responsibilities	<p>OKDHS has responsibility for following the guidelines set by the OHCA in determining eligibility for individuals who are aged, blind, and disabled and for taking and submitting applications for anyone else who wants to apply for SoonerCare.</p> <p>OHCA has responsibility for administering the Medicaid or SoonerCare program.</p>
Reference	<p>Procedures:</p> <ul style="list-style-type: none"> • <p>Forms:</p> <ul style="list-style-type: none"> • SC-1- SoonerCare Health Benefits Application <p>Other:</p> <ul style="list-style-type: none"> •

APPENDIX D - Women, Infants, and Children (WIC) Eligibility Workflow

Supersedes	None										
Process Owner	Oklahoma State Department of Health (OSDH)										
Purpose	The purpose of this workflow is to describe WIC eligibility.										
General	This workflow applies to how the OSDH receives clients for WIC benefits. Numbers in the process diagrams in the eligibility workflow correspond to the specific steps in the corresponding table that describes actions, examples, information received and responsible parties.										
Definitions	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr style="background-color: #e0e0e0;"> <th style="width: 30%;">Term</th> <th>Definition</th> </tr> </thead> <tbody> <tr> <td>OSDH</td> <td>Oklahoma State Department of Health</td> </tr> <tr> <td>SNAP</td> <td>Supplemental Nutrition Assistance Program</td> </tr> <tr> <td>TANF</td> <td>Temporary Assistance for Needy Families</td> </tr> <tr> <td>WIC</td> <td>Women, Infants, and Children</td> </tr> </tbody> </table>	Term	Definition	OSDH	Oklahoma State Department of Health	SNAP	Supplemental Nutrition Assistance Program	TANF	Temporary Assistance for Needy Families	WIC	Women, Infants, and Children
Term	Definition										
OSDH	Oklahoma State Department of Health										
SNAP	Supplemental Nutrition Assistance Program										
TANF	Temporary Assistance for Needy Families										
WIC	Women, Infants, and Children										
Process	<pre> graph TD Start([Client seeks WIC Services 1]) --> D1{Client is a woman who is pregnant, breastfeeding or recently given birth? 2} D1 -- Yes --> D5{Client lives in the State of Oklahoma? 5} D1 -- No --> D3{Client has an infant? (under 1 year old) 3} D3 -- Yes --> D5 D3 -- No --> D4{Client has a child under 5? 4} D4 -- Yes --> D5 D4 -- No --> D11([Client not Eligible for WIC Services 11]) D5 -- Yes --> D6{Client receives Medicaid, SNAP or TANF benefits? 6} D5 -- No --> D11 D6 -- Yes --> A8[Client goes to local WIC Agency 8] D6 -- No --> D7{Client meets the Income Program Limits? 7} D7 -- Yes --> A8 D7 -- No --> D11 A8 --> A9[Client shows Proof of Income, Identity and Residency 9] A9 --> D10([Client Eligible for WIC 10]) </pre>										

Step	Action	Example	Information Received	Responsible Party
1	Client seeks WIC Services	Mary wants help with nutrition in her home		Client
2	Client is a woman who is pregnant, breastfeeding or recently gave birth? ¹	Mary, is pregnant with her 3 rd child and breast-feeding her 2 nd child, seeks WIC services	Yes, Go to Step 5 No, Go to Step 3	Client
3	Client has an Infant? ¹	Mary has a 9 month old infant in her home	Yes, Go to Step 5 No, Go to Step 4	Client
4	Client has a child (children) under 5? ¹	Mary has a 3 year old child in her home	No, Go to Step 11	Client
5	Client lives in the State of Oklahoma?	Mary currently lives in Tulsa, OK	No, Go to Step 11	Client
6	Client receives Medicaid, SNAP or TANF benefits?	Mary currently receives SNAP benefits	Yes, Go to Step 8	Client
7	Client meets the Income Program Limits?	Mary has a house-hold size of 5 and household income is \$1,500 a month (see income guidelines chart ²)	No, Go to Step 11	WIC Worker
8	Client goes to local WIC agency?	Mary physically goes to the WIC agency in her region		Client
9	Client shows Proof of Income, Identity, and Residency	Mary shows her pay check stub, her utility bill, and children's birth certificates	<ul style="list-style-type: none"> • Pay Check Stub • Utility Bill • Children's Birth Certificates 	Client
10	Client eligible for WIC	Mary is approved for eligibility		WIC Worker
11	Client is not eligible for WIC services	Mary is not approved for WIC Services		WIC Worker

¹**Categorical Requirement^a**

The WIC Program is designed to serve certain categories of women, infants, and children. Therefore, the following individuals are considered categorically eligible for WIC:

- Women**
 - pregnant (during pregnancy and up to 6 weeks after the birth of an infant or the end of the pregnancy)
 - postpartum (up to six months after the birth of the infant or the end of the pregnancy)
 - breastfeeding (up to the infant's first birthday)
- Infants** (up to the infant's first birthday)
- Children** (up to the child's fifth birthday)

^a United States Department of Agriculture Food and Nutrition Service. 2012-11-20. Retrieved 2013-03-28. <http://www.fns.usda.gov/wic/howtoapply/eligibilityrequirements.htm>

² **WIC Income Eligibility Guidelines**
April 1, 2013 – June 30, 2014

Family Size	Annual Income	Monthly Income	Twice Monthly	Biweekly	Weekly Income
1	\$21,257	\$1,772	\$ 886	\$ 818	\$409
2	28,694	2,392	1,196	1,104	552
3	36,131	3,011	1,506	1,390	695
4	43,568	3,631	1,816	1,676	838
5	51,005	4,251	2,126	1,962	981
6	58,442	4,871	2,436	2,248	1,124
7	65,879	5,490	2,745	2,534	1,267
8	73,316	6,110	3,055	2,820	1,410
9	80,753	6,730	3,365	3,107	1,554
10	88,190	7,350	3,675	3,394	1,698
11	95,627	7,970	3,985	3,681	1,842
12	103,064	8,590	4,295	3,968	1,986
13	110,501	9,210	4,605	4,255	2,130
14	117,938	9,830	4,915	4,542	2,274
15	125,375	10,450	5,225	4,829	2,418
16	132,812	11,070	5,535	5,116	2,562
For each additional family member add: <?>	7,437	620	310	287	144

Responsibilities	OSDH is responsible for administering the WIC program.
Reference	<p>Procedures:</p> <ul style="list-style-type: none"> • <p>Forms:</p> <ul style="list-style-type: none"> • <p>Other:</p> <ul style="list-style-type: none"> •

APPENDIX E – Eligibility Web Services

Example Use Case

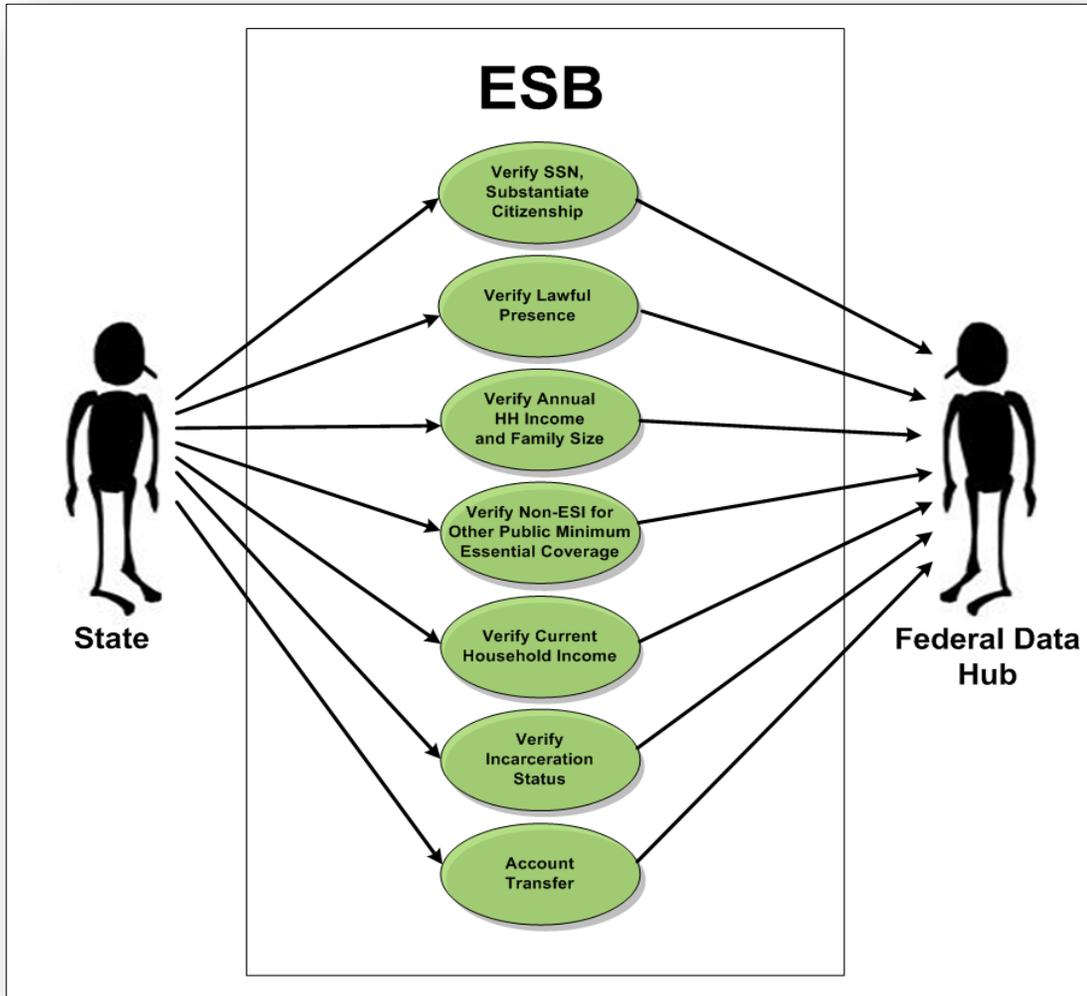


Figure E-1: Sample Eligibility Use Case

Eligibility Use Case

The following Use Case Diagram seen in Figure E-2 shows how eligibility might be implemented as a statewide service. Clients would only have to make one application for any number of services. This approach will be further defined in the near future how this breaks down into web services. Future details will include how eMPI can be incorporated.

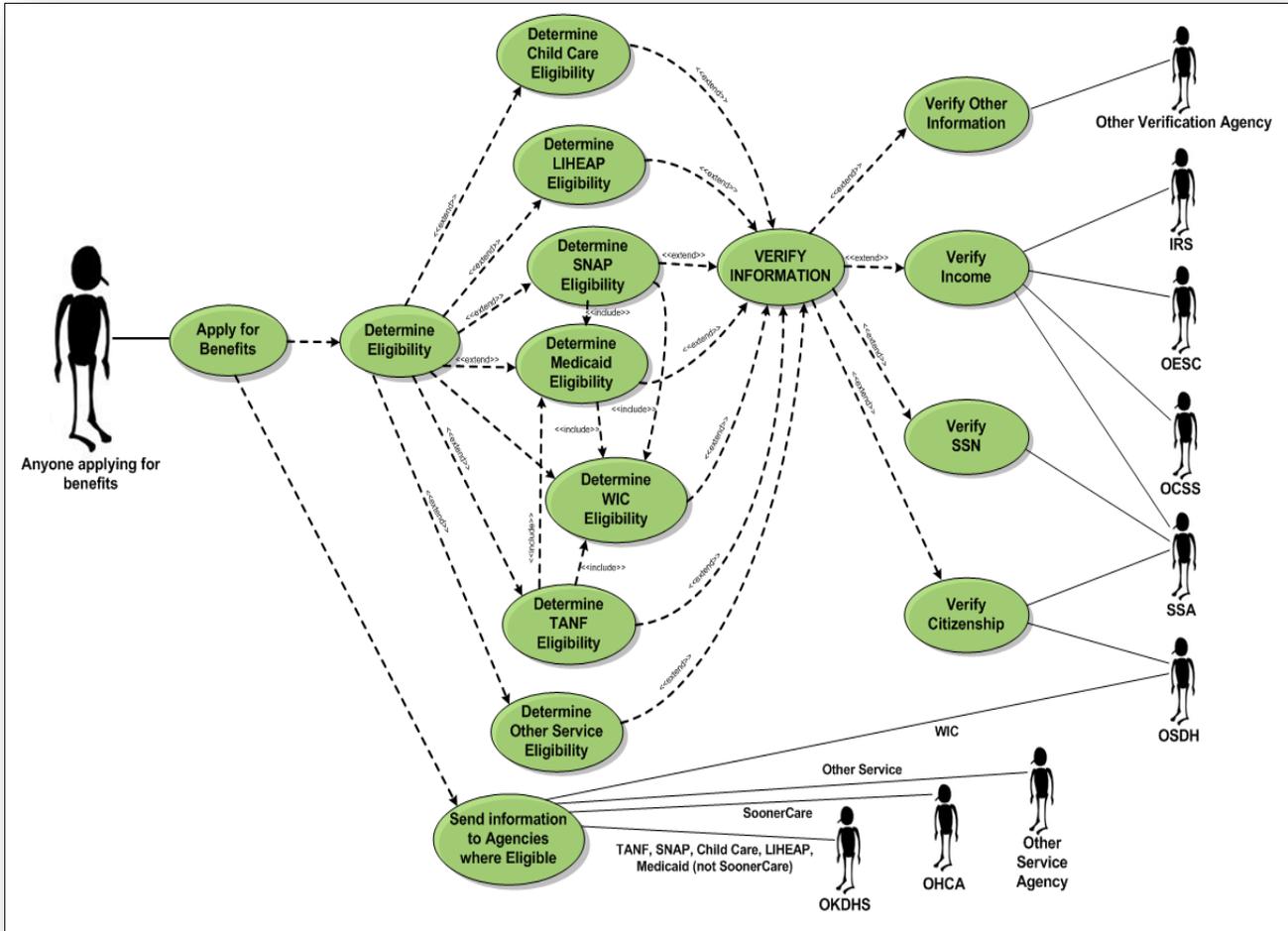


Figure E-224: Eligibility Use Case

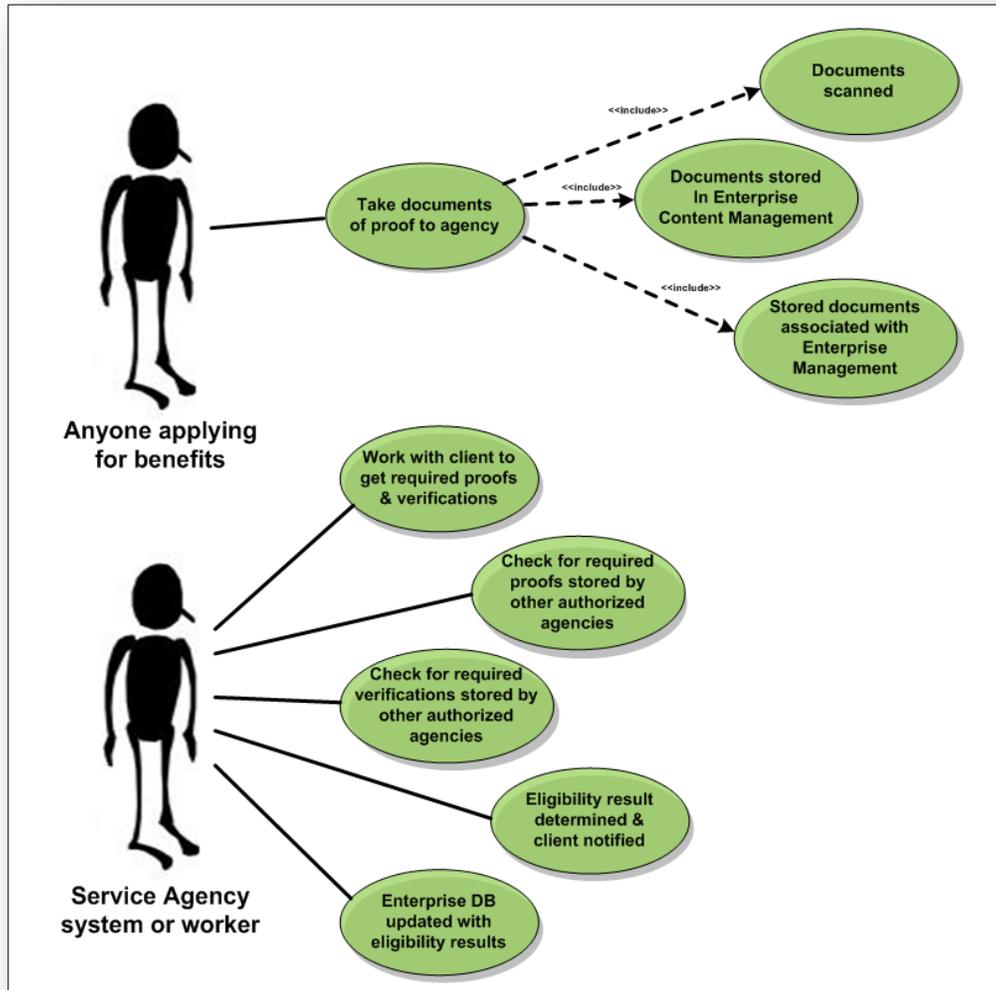


Figure E-3: Use Case for Eligibility Proof

The Use Case for Eligibility Proof is depicted in Figure E-3. This Use Case shows how documents needed to prove eligibility requirements might be implemented as a statewide service. Clients would only have to submit or provide documents of proof to one agency or state entity. They could be stored centrally to allow all agencies access. This approach will be further defined in the future and will require some type of Enterprise Content Management system.

APPENDIX F – Open Source ESBs (A Comparison of JBoss, Apache ServiceMix, and Mule)

1 INTRODUCTION

Enterprise Service Bus (ESB) is a software architecture model for distributed computing environments to design and implement the communication between interacting software.

This paper focuses on comparing three open ESBs — JBoss, Apache ServiceMix, and Mule — based on the following metrics:

- Memory footprint
- Enterprise Integration Pattern support
- Support for web services, message transformation, protocol mediation, content routing
- Support for message broker, governance registry, business process management, data services server, application server
- SOA governance capabilities
- Cloud integration platform offering (iPaaS)
- Cloud Connectors and legacy adapters
- Operating system support
- Database support
- IDE support
- Performance and scalability
- Security and identity management
- Content-based routing and intelligent routing

2 COMPARISON

Memory Footprint

Amount of hardware resources needed. It is designed to work efficiently on commodity hardware, virtual machines, and even developers’ laptops.

JBOSS ESB	<ul style="list-style-type: none"> • Relatively high, but supported with efficient tuning tools and procedures
Apache Service Mix (Fuse ESB)	<ul style="list-style-type: none"> • Small footprint : memory and disk, no application server required
Mule ESB	<ul style="list-style-type: none"> • Small footprint: memory and disk, no application server required

Enterprise Integration Pattern Support

Enterprise Integration Patterns (EIPs) define solutions that are generally accepted to recurring problems while designing and building messaging and integrating systems. They serve as a common language for teams to use when architecting solutions. Abiding to such standard practices makes an ESB solution easy and maintainable.

JBOSS ESB	<ul style="list-style-type: none"> Some of these patterns are implemented by JBoss ESB and are ready to use (out of the box), some are not yet
Apache Service Mix (Fuse ESB)	<ul style="list-style-type: none"> Rapid Prototyping with EIPs Fuse ESB includes Fuse Mediation Router®, which implements EIPs, as defined in Gregor Hohpe and Bobby Woolf’s book, through a dynamic scripting language or graphical editor/debugger.
Mule ESB	<ul style="list-style-type: none"> Mule implements most protocols and standards defined in EIP

Support for web services, message transformation, protocol mediation, content routing

Common ESB features are around support to Web services and messaging. These are functionalities, essential for any ESB.

JBOSS ESB	<ul style="list-style-type: none"> Web services — Yes Message transformation and content routing — Yes, based on EIP
Apache Service Mix (Fuse ESB)	<ul style="list-style-type: none"> Fuse Mediation Router — A powerful rule-based routing and process mediation engine. It can be deployed inside any container or be used stand-alone and works directly with any kind of transport or messaging model to rapidly integrate existing services
Mule ESB	<p>Mule is designed to facilitate the use of Web services in the following ways:</p> <ul style="list-style-type: none"> Web services can be hosted or consumed Transport decoupled from protocol, in other words, you can send/receive over Java Message Service (JMS), email, etc. JAX-WS (Java API for XML (eXtensible Markup Language) Web Services (JAX-WS) is a Java programming language API for creating web services) or Simple services Web services can be proxied or modified without much code They are also well suited for building RESTful applications. REST (Representational State Transfer) Supports message transformation, protocol mediation, and content routing

Support for message broker, governance registry, business process management, data services server, application server

ESBs are often packaged with other key SOA components, such as Message Brokers,

Governance Registry, Business Process Management (BPM), Data Services Server, and Application Server. This enables architects to adopt one cohesive technology stack. While they are beneficial to adopt as one single package providing easy maintenance, they also induce vendor dependency. Some ESBs, such as Mule, position themselves as vendor neutral, yet providing easy and effective integration.

<p>JBOSS ESB</p>	<ul style="list-style-type: none"> • Message Brokering: Tightly integrates with Apache JBoss Messaging to facilitate message brokering. • Governance Registry: JBoss does not come with a Universal Description, Discovery and Integration (UDDI) registry out of the box. • Business Process Management: jBPM is a flexible BPM Suite. • Data Services Server: Teiid is a component form of the query engine that is the heart of the JBoss Enterprise Data Services Platform (JBEDSP),. They are used by large commercial organizations, independent software vendors, and many federal agencies. • Application Server: Yes, Built on top of JBoss Application Server
<p>Apache Service Mix (Fuse ESB)</p>	<ul style="list-style-type: none"> • Message Brokering: Tightly integrates with Apache ActiveMQ to facilitate message brokering. • Governance Registry: Fuse ESB does not come with a UDDI registry out of the box. • BPM: Supported by JBoss BRMS. Expected to have exclusive tools and support in the immediate future. • Application Server: Fuse ESB is integrated with Apache Geronimo, JBoss, and Tomcat. Deployment via the Spring Framework is also supported.
<p>Mule ESB</p>	<ul style="list-style-type: none"> • Message Brokering: It employs a regular Enterprise Application integration approach to facilitate message brokering and integrates with most commonly used messaging interfaces, including ActiveMQ • Governance Registry: Does not support UDDI. Anypoint Service Registry provides governance registry support. • BPM: Mule interacts with many kinds of BPM systems. The Integrations are generally straightforward and readily available. Include native support to jBPM and also support Apache Activity. • Application Server: Unlike other ESB that are built on top of the Application Servers, Mule does not provide application server support. It integrates well with third-party application servers.

SOA governance capabilities

SOA involves several technologies packaged together and exposed to service consumers. Such nature of applications, coupled with diversity of service consumers induces a need for reliable governance capabilities. The governance capabilities are essential to ensure seamless integration and maintain control and scale the service offering.

JBOSS ESB	<ul style="list-style-type: none"> • The JBoss SOA-P product is a SOA stack and has SOA governance • Seamless, heterogeneous SOA Governance, Security and Management integration with JBoss Middleware infrastructure • Standards support for Governance automation (UDDIv3, WS-MEX)
Apache Service Mix (Fuse ESB)	<ul style="list-style-type: none"> • Relatively inadequate.
Mule ESB	<ul style="list-style-type: none"> • MuleSoft offers Anypoint Service Registry, as its governance platform to support the ESB. • The key features of the Anypoint service registry include: <ul style="list-style-type: none"> • Service repository: Serves as a centralized repository to manage services • Service Virtualizer: Helps implement version control on services by identifying current versions of the services • Policy Manager: Helps create, manage, and apply policies • Service Analytics: Help identify key analytics on service consumption in real time. • Contract Manager: Helps establishing and enforcing service-level contracts. • Anypoint service registry also provides security, reliability, and performance enhancing features.

Cloud integration platform offering (iPaaS)

Prior to the emergence of cloud computing, integration could be categorized as either internal or business to business (B2B). Internal integration requirements were serviced through an on-premises middleware platform and typically utilized a service bus to manage exchange of data between systems. B2B integration was serviced through Electronic Data Interchange (EDI) gateways or Value Added Network (VAN). The advent of Software as a Service (SaaS), sometimes referred to as "on-demand software" applications created a new kind of demand that was met through cloud-based integration. Since their emergence, many such services have also developed the capability to integrate legacy or on-premises applications, as well as function as EDI gateways.

Cloud connectors and legacy adapters

JBOSS ESB	<ul style="list-style-type: none"> No
Apache Service Mix (Fuse ESB)	<ul style="list-style-type: none"> No
Mule ESB	<ul style="list-style-type: none"> iPaaS is a platform for building and deploying integrations within the cloud and between the cloud and enterprise. With iPaaS, users can develop integration flows that connect applications residing in the cloud or on-premise and then deploy them without installing or managing any hardware or middleware. iPaaS as a potential platform for the buying, selling, and exchange of integration flows (both out-of-the-box and custom-built patterns) between users, service providers, and integration providers.

Cloud Connectors eliminate the need to understand the underlying Application Programming Interface (API) of each service. Connect your enterprise to a wide range of SaaS platforms, Open APIs, and social networks like Salesforce, Twitter, LinkedIn, and Twilio quickly and without difficulty.

JBOSS ESB	<ul style="list-style-type: none"> Yes
Apache Service Mix (Fuse ESB)	<ul style="list-style-type: none"> No
Mule ESB	<ul style="list-style-type: none"> MuleSoft’s integration platform powered by Anypoint™, provides instant API connectivity to hundreds of the most popular applications and services. With a library of repeatable integration solutions, you can rapidly create connectivity either on premise or in the cloud.

Operating system support

Open Source ESBs that support all operating systems may be beneficial for some deployments.

Software	Microsoft Windows					Mac OS X	Linux		IBM			HP-UX	Solaris	
	2000	XP	Vista	2003 Server	7-64 bit		Red Hat	SU SE	AIX	OS/390	I5/OS			z/OS
JBoss ESB	Yes	Yes	Yes	Yes		Yes	Yes	Yes	Yes			Yes	Yes	
Apache ServiceMix (Fuse ESB)	Yes	With SP2	Yes	Yes		Yes	Yes	Yes	Yes	No	No	No	Yes	Yes
Mule ESB	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes				Yes	Yes

Database support

Open Source ESBs that support all required databases will be easy to adapt.

Database	API		Sybase		Apache Derby	IBM				Firebird	Microsoft		My SQL	Oracle	Postare SQL
	ODBC	JDBC	ASA	ASE		DB2	DB2 for iSeries	Cloudspace	Informix		SQL Server	Azure SQL			
JBoss ESB	No	Yes		Yes	Yes	Yes	No	Yes	Yes	Yes	Yes		Yes	Yes	
Apache ServiceMix (Fuse ESB)		Yes	Yes		Yes	Yes					Yes		Yes	Yes	Yes
Mule ESB					Yes	Yes					Yes		Yes	Yes	Yes

IDE support

IDE should be able to easily integrate with an Open Source ESB. It should be easy to use and understand. Visual tool to create services. Not so configuration driven. Easy to download and start using it. Binding to a variety of protocols like Hypertext Type Protocol (HTTP), JMS, and File Transfer Protocol (FTP). It should be based on standards like XQuery (XML Query Language), Business Process Execution Language (BPEL), and XSLT (XSL Transformations).

JBoss ESB	<ul style="list-style-type: none"> • Key features: • Visual editing support for HTML and JSF (JSP and Facelets) pages, and JSF component libraries; merger of Hibernate Tools and Exadel ORM features; easy start, stop and debug of JBoss AS, Rules file editing, Rete View, and working memory debugging/inspection; jBPM workflow editing, and deployment, inspecting, invoking, developing and functional/load/compliance testing of Web services over HTTP; structured xml editor for the jboss-esb.xml file used in JBoss ESB; Smooks Tools; ESB project Wizard which creates a project that can be deployed as an .esb archive to a JBoss AS-based server with JBoss ESB installed; JMX Tools allows you to set up multiple JMX connections and provides view for exploring the JMX tree and execute operations directly from Eclipse; RichFaces Support, Code Assists, Web XML/JSP/XHTML Editors, CSS Style Editing, web.xml validation, Faceleted taglib in *taglib.xml is supported with XSD schema location; the optional integration with m2eclipse to provide Maven support for projects created by JBoss Tools and to some extent core WTP projects; a BPEL Editor based on the Eclipse BPEL project has been added to JBoss Tools; support of the Contexts and Dependency Injection annotations, and it works on any Eclipse Java project
Apache Service Mix (Fuse ESB)	<p>Key features:</p> <ul style="list-style-type: none"> • Graphical interface; integrated into Eclipse; imports existing routes; predefined

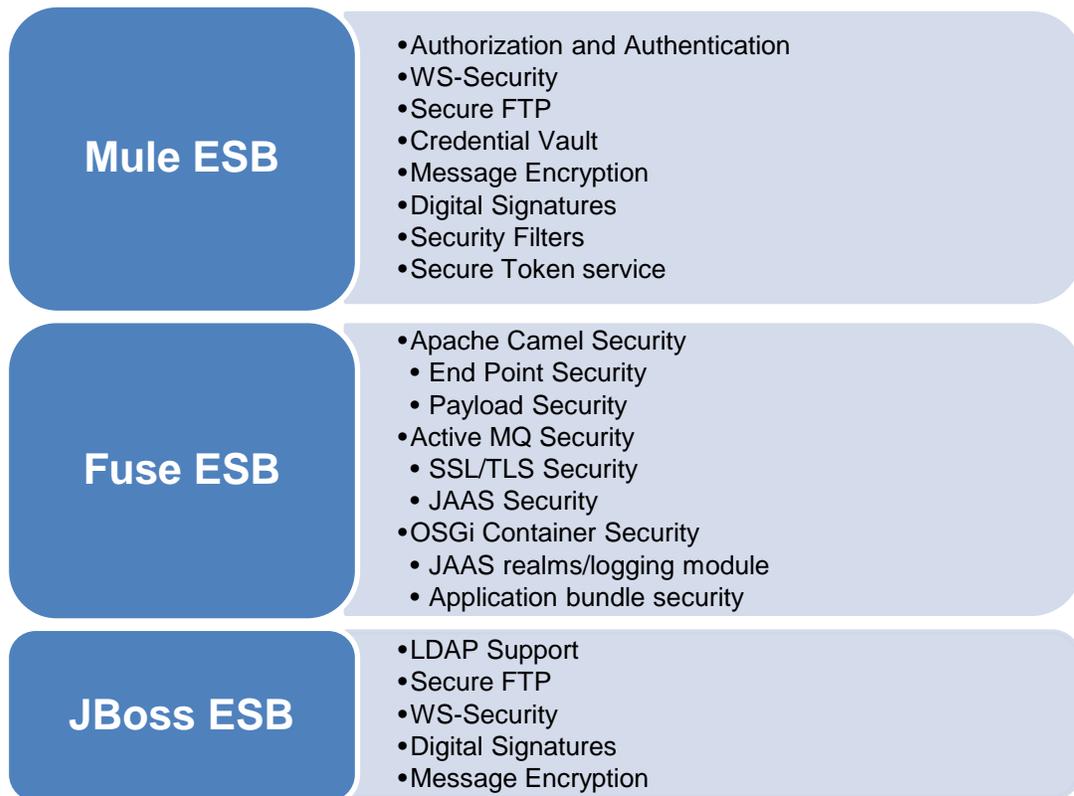
	building blocks; standard notation; <ul style="list-style-type: none"> JUnit test wizard; deployment flexibility; endpoint browsing; message drag and drop; JMX explorer; graphical viewer; route tracing
Mule ESB	<ul style="list-style-type: none"> Not well supported

Performance and scalability

High performing Enterprise Service is a necessary feature as most of the transactions on an ESB-based architecture are routed through the service bus. Not only is the Service Bus required to be high performing but also required to be scalable with changing capacities. All three products support both horizontal and vertical scaling.

Security and identity management

Securing applications at all layers/tiers is not optional, especially given the amount of data that is available nowadays and how it can be used to derive personally identifiable information. Any ESB used in an application stack has to be secure and should support secure protocols and methods to encrypt data. Detailed below is a list of security features supported by Mule ESB, Fuse ESB, and JBoss ESB.



Content-based routing and intelligent routing

Content-based routing is an Enterprise Integration Pattern that allows messages to be routed to the correct destination based on the content of the message being transmitted rather than a predefined destination. Since messages might differ in content and complexity, it is essential that an ESB would allow for easier content-based routing.

- Content-based routing on the JBoss ESB can use JBoss Drools or XPath
- FUSE Mediation, based on Apache Camel is used for content-based routing on Fuse ESB
- Mule uses XPATH, Groovy, and OGNL-based filters for content-based routing

Open source ESB comparison table

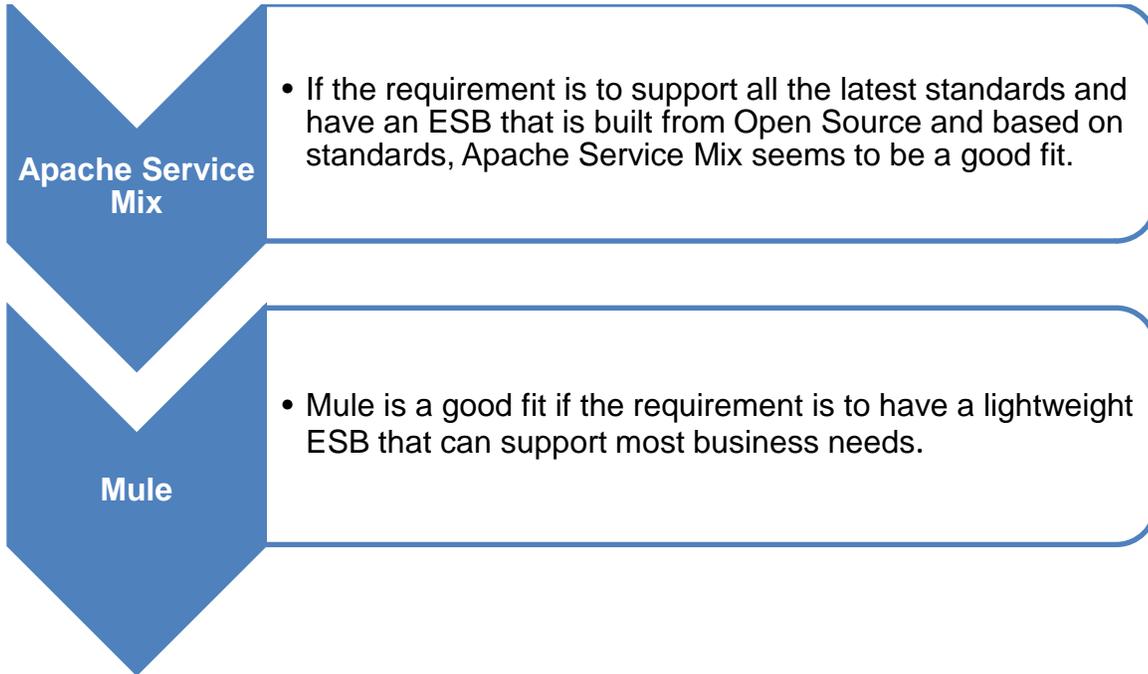
Detailed below is a comparison of Mule ESB, Fuse ESB, and JBoss ESB on several features that should be evaluated when selecting an ESB to be implemented in an Enterprise application.

Feature	Mule ESB	Fuse ESB	JBoss ESB
Supports EIPs	Yes	Yes	Yes
Delivers all required ESB features (i.e., Web services, message transformation, protocol mediation, content routing)	Yes	Yes	Yes
Offers a complete and cohesive SOA Platform (i.e., ESB, Message Broker, Governance Registry, Business Process Server, Data Services Server, Application Server)	No	No	Yes
SOA Governance	No	No	No
Graphical ESB Development Workbench	Yes	Yes	Yes
Based on a composable architecture	No	No	No
Cloud integration platform offering (iPaaS)	Yes	No	No
Cloud Connectors and Legacy Adapters	Yes	No	Yes
Performance	Moderate — High, Based on Deployment Architecture	Moderate — High, Based on Deployment Architecture	Moderate — High, Based on Deployment Architecture
Security and Identity Management	Limited	Limited	Limited
Open Business Model	Yes	Yes	No
Content-Based Routing and Intelligent Routing	Yes	Yes	Yes
JBI, OSGI, BPM, and BPEL Support	JBI — No OSGI — Limited BPM — Yes	JBI — Yes OSGI — Yes BPM — Yes	JBI — No OSGI — Yes BPM — Yes

Feature	Mule ESB	Fuse ESB	JBoss ESB
	BPEL — Yes	BPEL — Yes	BPEL — Yes
Hot Deployment Capabilities	Yes	Yes	Yes
Application Server Support	Yes	Yes — Not Advisable	Yes
Embeddable	Yes	Yes	Yes
Long-term cost of ownership	Low	Low	Low
Short-term cost for procurement	Low	Low	Low
Support from third-party vendors	Limited	Moderate	Limited
Management Console	Yes	Yes	Yes
Pluggable Architecture	Yes	Yes	Yes

Recommendation

Each of these ESBs has strengths and areas for improvement.



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