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## Department of Health and Human Services



Centers for Medicare & Medicaid Services

# Exchange Reference Architecture: Foundation Guidance

Draft

Version 0.99

March 16, 2011

## Foreword

The *Exchange Reference Architecture: Foundation Guidance*, Version 1.0, provides the business architecture, information architecture, and technical architecture for the health insurance Exchanges. This Foundation document provides an overview and description of the approaches to defining the architectures; additional supplements will be released that contain the details of each architectural component.

The Centers for Medicare & Medicaid Services (CMS) has reviewed and accepted this Architecture Framework as a foundational component of CMS' Enterprise Architecture in accordance with the CMS Information Technology (IT) governance process.

The CMS Deputy Chief Information Officer leads the development of this Architecture with the support of all components of the IT staff and contractors.

This document is intended to provide information initially for grantees. It does not constitute official guidance or policy and is subject to change in the future.

Any changes to the Exchange Architecture must be approved by the CMS Deputy Chief Information Officer.

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Henry Chao  
Deputy Chief Information Officer  
Centers for Medicare & Medicaid Services

Date

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## Record of Changes

Number	Date	Reference	A=Add, M=Modify, D=Delete	Description of Change	CR #
1	January 14, 2011	All		Initial Working Draft, v 0.5 for formal comment	NA
2	February 1, 2011	All	M	Incorporation of formal comments from CMS, draft v. 0.7	NA
3	February 15, 2011	All	M	Incorporation of formal comments from CMS, draft v. 0.94	NA
4	March 3, 2011	All	M	Accommodates review comments from IRS and CMS stakeholders	NA
5	March 10, 2011	All	M	Accommodates review comments from IRS stakeholders	NA
6	March 16, 2011	All	M	Accommodates review comments from CCIIO stakeholders	NA

CR: Change Request

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# 1. Introduction

The Patient Protection and Affordable Care Act of 2010<sup>1</sup> (hereafter simply the “Affordable Care Act”) provides for each state to have a health insurance Exchange. An Exchange is an organized marketplace to help consumers and small businesses buy health insurance in a way that permits easy comparison of available plan options based on price, benefits and services, and quality. Consumers seeking health care coverage will be able to go the health insurance Exchanges to obtain comprehensive information on coverage options currently available and make informed health insurance choices. By pooling consumers, reducing transaction costs, and increasing transparency, Exchanges create more efficient and competitive health insurance markets for individuals and small employers.

The Department of Health and Human Services (HHS) and the Centers for Medicare & Medicaid Services (CMS) are responsible for providing guidance and oversight for the Exchanges. This responsibility includes defining business, information, and technical guidance that will create a common baseline and a set of standards for health insurance Exchange implementation activities. CMS will focus this guidance on the key tradeoffs and technology choices necessary to create interoperable and coordinated Exchange services between the federal government and the states.

## 1.1 Purpose and Scope

The *Exchange Reference Architecture: Foundation Guidance* document provides a high-level view of the business architecture, information architecture, and technical reference architecture of the Exchange, and describes the approaches to defining core components for the Exchanges.

CMS will update this document with further refinement of the stakeholder relationships, key transactions, and technical standards. The approaches described here will be used by the collaborative partnership team members to identify and capture the necessary details and direction to define and implement Exchanges.

## 1.2 Vision for the Exchange Reference Architecture

CMS is developing Exchange Reference Architecture (ERA) guidance to provide a standard business, information, and technical reference architecture (TRA) for Exchange processing environments (hereafter called “Exchange Environments”), and also to establish a technical baseline for the relationships and transactions between Exchanges and the CMS technical environments.

This *Exchange Reference Architecture: Foundation Guidance* document is CMS’ first publication of ERA guidance; in the near future, CMS expects to expand and deepen each component of the ERA through Business Architecture, Information Architecture, and Technical

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<sup>1</sup> Public Law 111–148, Patient Protection and Affordable Care Act, March 23, 2010, 124 Stat. 119,  
<http://www.gpo.gov/fdsys/pkg/PLAW-111publ148/content-detail.html>  
[http://www.healthreform.gov/health\\_reform\\_and\\_hhs.html](http://www.healthreform.gov/health_reform_and_hhs.html)

Architecture supplements. CMS guidance is based on best information technology (IT) practices; ongoing feedback from states, vendors, and other stakeholders; lessons learned from early IT development projects and innovation work; and further development and evolution of standards.

CMS will promote and facilitate a highly collaborative atmosphere where the best and most efficient solutions will emerge from the efforts of states, private sector vendors, business partners, and governmental projects funded at both the state and federal levels. Although each state may take different approaches to implement the Exchange, CMS desires that states and their contractors will leverage the ERA for future system builds.

The Exchange Reference Architecture is intended to:

- Define the business architecture, business process models, and business services for the key functions necessary to realizing the Exchanges
- Provide information architecture decisions, including conceptual data models, data element definitions for business services, and data security guidance to drive commonality to the greatest extent possible
- Provide clear technical definitions, requirements, and standards for the Exchange Environments, technical interfaces between Exchanges Environments, and future application designs to ensure a secure operating environment
- Greatly increase state awareness of critical security and privacy definitions and standards for handling Personally Identifiable Information (PII), Protected Health Information (PHI), and Federal Tax Information (FTI) data
- Provide federal partners a clear understanding of the CMS Exchange Reference Architecture
- Provide Exchange contractors with technical guidance and requirements applicable to any Exchange system
- Communicate the CMS Exchange Reference Architecture approach.

The ERA will evolve through collaborative efforts involving CMS, the Internal Revenue Service (IRS); the states; and federal and state contractors who will be implementing Exchanges. CMS will accomplish its vision and applicable legislative mandates through this collaborative partnership.

### 1.3 Exchange Reference Architecture Documentation Framework

This document establishes the authoritative baseline and guides the development of additional, more specific architecture and implementation documentation for all business functionality and environments. Figure 1 provides the overall framework for the evolution of the CMS ERA documentation.

As depicted at the bottom of Figure 1, this document provides the foundation of CMS' Exchange Reference Architecture documentation. The future supplements addressing the Business Architecture, Information Architecture, and Technical Reference Architecture will build increasingly more specific layers of detail and definition of the business, information, and technical services that operate within all of the Exchange Environments. This document and its associated supplements represent best practices and guidance on architecture principles, technologies, and standards for the business process, data exchange, solution interoperability, and operational requirements of health insurance exchanges.

The CMS ERA Documentation Framework establishes a clear, direct, and auditable linkage between all documentation of the CMS Exchange Reference Architecture and its implementation. Each supplement will focus on a particular business, information, or technical topic that is critical to the overall Exchange Reference Architecture. This separation between the supplements allows the evolution and update of individual supplements to respond to technical improvements and guidance that occur over the life of the Exchanges.

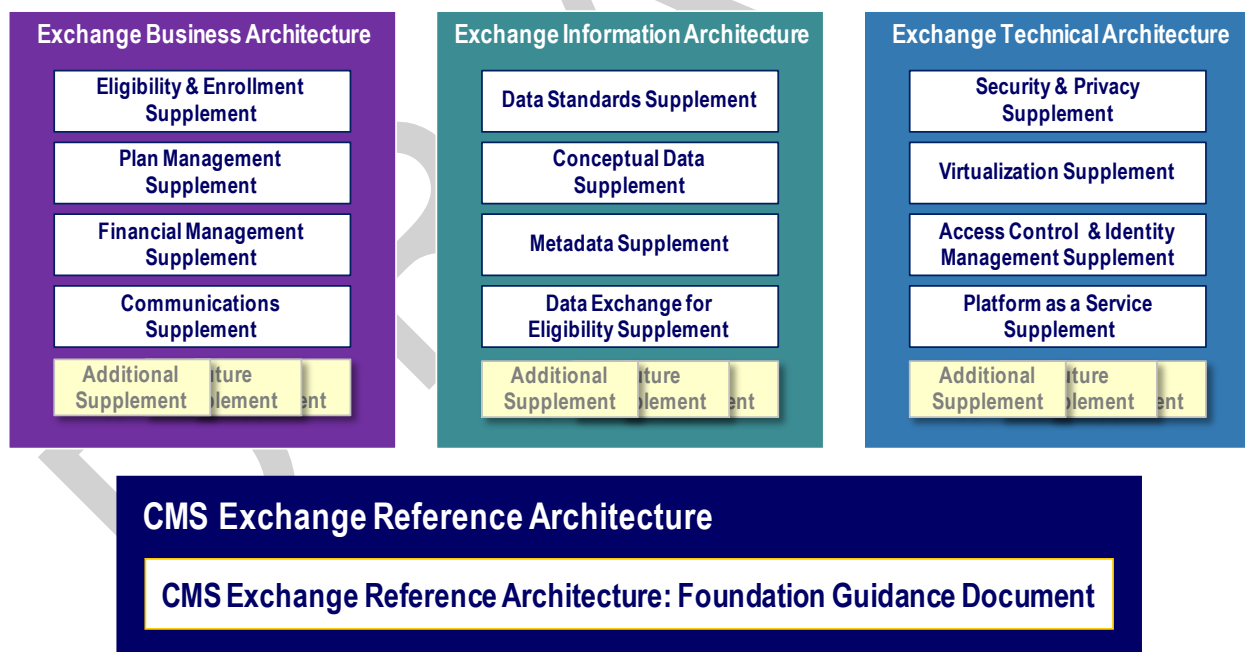


Figure 1. CMS Exchange Reference Architecture Documentation Framework



CMS intends this document for use by Exchange stakeholders. CMS will publish future supplements on specific solutions (e.g., Eligibility & Enrollment business processes and Virtualization). The initial set of CMS Exchange Reference Architecture supplements includes:

- *Eligibility & Enrollment Blueprint – Exchange Business Architecture Supplement*, draft, March 2011
- *Plan Management Blueprint – Exchange Business Architecture Supplement*, draft, March 2011
- *Collaborative Environment and Life Cycle Governance – Exchange Reference Architecture Supplement*, draft, March 2011
- *Harmonized Security and Privacy Framework – Exchange TRA Supplement*, draft, March 2011.

## 1.4 Alignment of Medicaid IT Architecture and the ERA

This document establishes the definition for the CMS Exchange Reference Architecture, identifying key Exchange architectural themes to be explored and defined in future Exchange supplements. The Exchange Reference Architecture's framework of Business Architecture, Information Architecture, and Technical Reference Architecture, and the methods for architecture definition, align with and complement the Medicaid Information Technology Architecture (MITA) framework. CMS intends to maintain the alignment between the Exchange Reference Architecture and MITA as the respective architectures evolve. CMS recognizes that Medicaid and Exchanges will share certain technology components and capabilities, and hence there is a need for shared governance, architecture, and business requirements and expectations.

## 1.5 Alignment of the Exchange IT Guidance Document and the ERA

The *Guidance for Exchange and Medicaid IT Systems* document establishes a framework and approach for developing IT systems, and provides the fundamental principles for future Exchanges and Medicaid IT Systems. The detailed business, information, and technical guidance provided in this *Exchange Reference Architecture: Foundation Guidance* document and the corresponding supplements will align with the *Guidance for Exchange and Medicaid IT Systems*.

## 1.6 Intended Audience

The distribution of this document is available to all states, other federal agencies, and supporting contractors.

## 1.7 Document Organization

This document is organized as follows:

Section		Purpose
Section 2:	Exchange Overview	Provides an Exchange context defining the key stakeholders and their relationships in Exchange services.
Section 3:	Exchange Reference Architecture Overview	Provides an overview of the Exchange Reference Architecture, and describes the relationship between the Business, Information, and Technical Architecture sections.
Section 4:	Business Architecture	Provides an overview of the Exchange business process modeling and service definition activity.
Section 5:	Information Architecture	Provides an overview of the Information requirements, data exchange element definitions, and transfer mechanisms.
Section 6:	Technical Architecture	Provides a description of the physical architecture for infrastructure, platform, and application services.
Acronyms		Defines the acronyms used in this document
List of References		Presents the references used in the preparation of this document.

## 2. Exchange Overview

The Exchanges will carry out a number of functions required by the Affordable Care Act, including certifying qualified health plans, administering advanced premium tax credits and cost-sharing reductions, and providing an easy-to-use web site so individuals can determine eligibility and enroll in health coverage. The Exchanges will facilitate all people having a choice for quality, affordable health insurance even if a job loss, job switch, move, or illness occurs. The new law also provides tax credits to help more Americans pay for insurance. Exchanges will make purchasing health insurance easier and more understandable—and a consumer-friendly IT infrastructure will be critical to how well the Exchanges succeed.

CMS is dedicated to implementing many of the provisions of the legislation that address private health insurance, and to working with the states on Exchanges. CMS appreciates that states are in varying stages of development in establishing an Exchange.

The Exchange will share and gather information across the enterprise as appropriate, and will streamline the process for the Consumer. Ultimately, the Exchange will present the Consumer with the best information to make an informed choice regarding health insurance options. At a high level, each Exchange will support six key business areas: Eligibility & Enrollment, Plan Management, Financial Management, Customer Service, Communications, and Oversight. Section 4 presents a more detailed discussion of each of these business areas.

The six business areas are part of an overall Exchange Business Architecture that will provide a high-level view of the key business processes and services an Exchange must support. The Exchange Business Architecture identifies business processes and services performed by the Exchange as well as those performed by the Data Services Hub (hereafter simply the “Hub”). The Hub will provide a centralized approach to accessing and sharing information across federal agencies to support the Exchange. The Business Architecture supplements will provide the states a common baseline for the processes and support necessary for each business area.

The Hub will streamline and simplify information flows between states and federal agencies to support Exchange operations. The Hub provides an opportunity for federal agencies and states to collaborate in defining Service-Oriented Architecture (SOA) services to support the data exchange requirements needed by all Exchanges. The Hub will provide a single interface to the states that supports the verification of information as well as the exchange of information with all of the federal partners as deemed appropriate.

Beyond the SOA services defined by the Hub, each state will be responsible for identifying and defining the additional services required to support the Exchange. Table 1 presents, at a high level, the core functions an Exchange must provide.

**Table 1. Core Functions of an Exchange**

Core Functions Supported by an Exchange	
Certification/Recertification/Decertification of Qualified Health Plans	Enrollment process
Customer Service through multiple channels (call center, email, mail, etc.)	Application and notices

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Core Functions Supported by an Exchange	
Exchange website	Individual Responsibility Exemption determinations
Plan quality rating	Premium tax credit and cost-sharing reduction administration
Navigator program	Outreach and education
Premium calculator	Free Choice Vouchers
Eligibility determinations for Exchange participation, premium tax credits, and cost-sharing reductions	Risk adjustment and transitional reinsurance
Seamless eligibility and enrollment process with Medicaid and other state health subsidy programs	SHOP Exchange-specific functions

An opportunity exists for states to leverage existing architectural components and services used by other programs (Medicaid, CHIP, etc.), to collaborate with one another to build and share reusable components, and to leverage new federal services (such as the advanced premium tax credit calculator).

### 3. Exchange Reference Architecture Framework Overview

This *Exchange Reference Architecture: Foundation Guidance* provides a mechanism for defining the key business, information, and technical areas that will evolve as the Exchange functionality is built. This document describes the context and relationships between the governance, business, information, and technical areas for the Exchange. The supplements to the ERA define the specific requirements for each component of the Exchange to ensure and drive common understanding, standardization, and implementation.

The Exchange Reference Architecture supports five critical objectives that enable the Center's health care mission: (1) secure the Exchange Environments, (2) support integration between Exchange Environments, (3) facilitate a Service-Oriented Architecture that provides access to required business services, (4) build an enterprise technical architecture that anticipates and responds to the mission and business needs of the states and the federal government, respectively, and (5) provide appropriate and sufficient disaster recovery capability.

#### 3.1 Exchange Reference Architecture Framework

Figure 2 shows a high-level view of the key aspects of the Exchange Reference Architecture Framework. Process activities at the highest or Framework level, such as Governance, Exchange Life Cycle, and a Collaborative Application Life Cycle Management (ALM) Environment, are important mechanisms for managing the evolution of the Exchanges. One of the initial ERA supplements will begin to address these processes.

The three architecture areas—Business Architecture, Information Architecture, and Technical Reference Architecture—are described in Sections 4, 5, and 6; the detailed requirements for each area will be defined in future supplements.

##### Business Architecture

The Business Architecture partitions the Exchange business requirements into six key business areas: Eligibility & Enrollment, Plan Management, Financial Management, Customer Service, Communications, and Oversight. The Business Architecture provides the context for the definition of the Information and Technical area components and ensures clear traceability between each area. Each business area is functionally decomposed into business processes supported by business process models. A set of business services will be derived from the business process models, and these services will satisfy the Exchange's high-level functional requirements. The Exchanges will implement the business services through IT components.

##### Information Architecture

The Information Architecture defines the mechanisms for exchanging information between Exchange stakeholders, and for such other functions as information/data management, business intelligence analytical processing, reporting, etc. Each of the key Information Architecture topics will be addressed in future supplements. The primary focus of the information exchange mechanisms is the interface between the Exchanges and the Data Services Hub. The mechanisms and definitions for this interface will make clear to the states what information is

needed by the federal agencies in the Hub, and the information returned to the Exchanges as a result of federal functional processing; for example, the information needed for income verification, immigration status verification, and incarceration status verification, and the information returned following federal processing. The information provided and consumed by each business service is part of the definitions, data models, and standards included in the Information Architecture supplements.

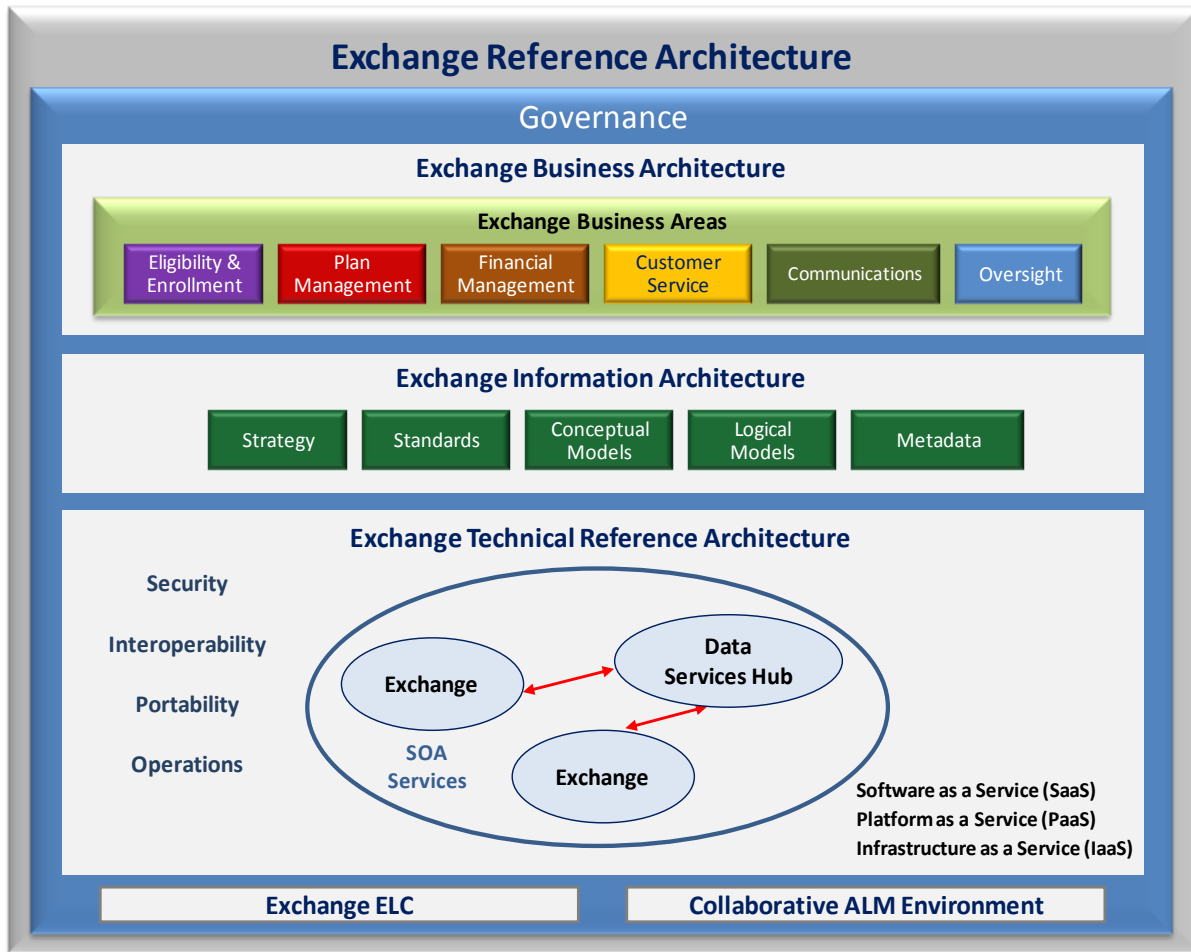


Figure 2. Exchange Reference Architecture Framework

## Technical Reference Architecture

Finally, the business service implementation requirements and the information exchange requirements are supported by a Technical Reference Architecture that embodies the security, interoperability, portability, and operational requirements of the business services. The recent publication by the Federal CIO, *25 Point Implementation Plan to Reform Federal Information Technology Management*, reinforces the shift to a “cloud first” policy for federal IT developments. CMS intends to support a managed services implementation for the federally hosted Exchange Environment. In addition, the TRA supplements will contain guidance defining the use of managed services-based technical environments for Exchange Environments.

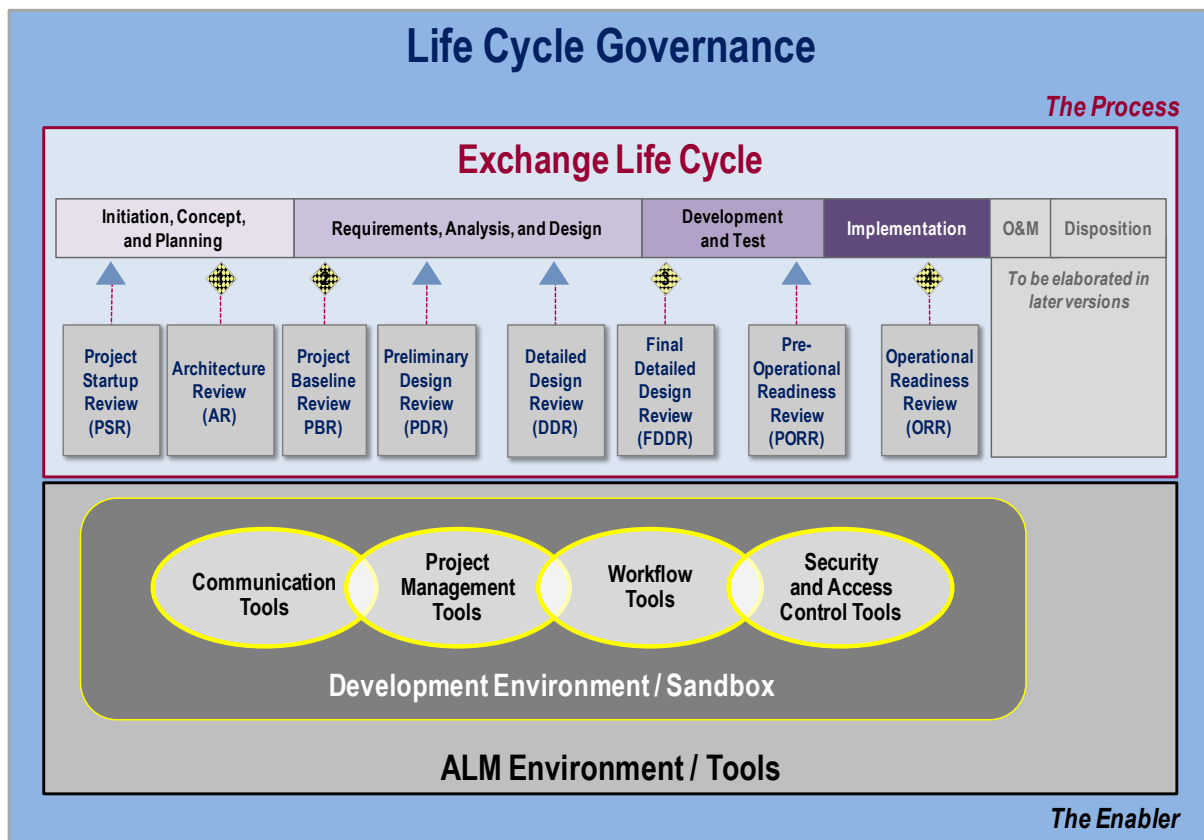
## 3.2 Exchange Life Cycle Governance

In an effort to coordinate and ensure optimal execution of investments supporting the Affordable Care Act, CMS will coordinate Exchange investments and their associated projects. By applying CMS governance for Exchange development, CMS intends to optimize investments, facilitate expediency and best practices, and establish effective federal and state collaboration and sharing.

CMS is the agent of implementation for a shared governance model, providing seamless oversight to the Medicaid and Exchange programs. CMS is in the process of refining the governance mechanisms to assist and enable the states with their Medicaid and Exchange IT development efforts. CMS governance bodies and responsible parties related to Medicaid and Exchange solutions will be identified and communicated in future supplements. As part of the overall governance approach, CMS is proposing life cycle governance around the development, implementation, and maintenance of Exchange solutions. The primary purpose of CMS' life cycle governance is to provide the mechanisms and tools to:

- Help prioritize and advance projects quickly and in a coordinated fashion
- Promote learning, sharing, and reuse
- Enable managed performance and accountability
- Exercise standards and best practices
- Leverage existing solutions, and create common and seamless services where appropriate
- Provide a framework with common synchronization points across multiple projects
- Offer flexibility to encourage the use of agile systems development methodology.

Given these objectives, CMS is proposing the use of a streamlined Exchange Life Cycle (ELC) model as well as a collaborative ALM environment. As shown in Figure 3, CMS life cycle governance is responsible for effective oversight and coordination of the two key components of Exchange Development: the *process*—the ELC—and the *enabler*—the collaborative ALM environment. Subsections 3.2.1 and 3.2.2, respectively, provide high-level descriptions of the ELC and ALM components, respectively.



**Figure 3. CMS Life Cycle Governance and Correlation between the ELC Process and the Collaborative ALM Environment**

As CMS matures the Exchange development governance model, CMS will provide more detail in future communications regarding specific governance bodies and related functions.

### 3.2.1 Exchange Life Cycle Model

Given the need to respond quickly to health reform requirements, CMS is proposing the use of a tailored life cycle process for Exchange system development. The Exchange Life Cycle collapses the project phases and aligns reviews, artifacts, and deliverables to the needs of the Exchange. A key aspect of the Exchange Life Cycle is the opportunity to tailor the specific reviews, artifacts, and deliverables further to match Exchange systems development activities.

The Exchange Life Cycle is a framework to communicate the expectations and key synchronization points across the project life cycle through artifacts and stage gate reviews. Various organizations will be involved in developing the Exchange IT solutions. Toward those ends, the Exchange Life Cycle accommodates all forms of systems development methodologies. CMS encourages the use of agile systems development methodology, and will accommodate agile processes in the stage gate reviews as appropriate.

Figure 4 shows the proposed Exchange Life Cycle at a high level (phases and reviews only). Reviews and deliverables are suggested within each phase, and are addressed in full detail in the *Collaborative Environment and Life Cycle Governance – ERA Supplement*. In addition to the



artifacts identified, each review will include activities to help the states achieve certification for an Exchange. The certification process will take into account the Affordable Care Act legislation, regulations, and specific capabilities, functionalities, and systems identified in the Establishment Grant and other related communications to the states for establishing an Exchange. This process will maximize chances of acquiring certification at the end of the project to enable operation of an Exchange.

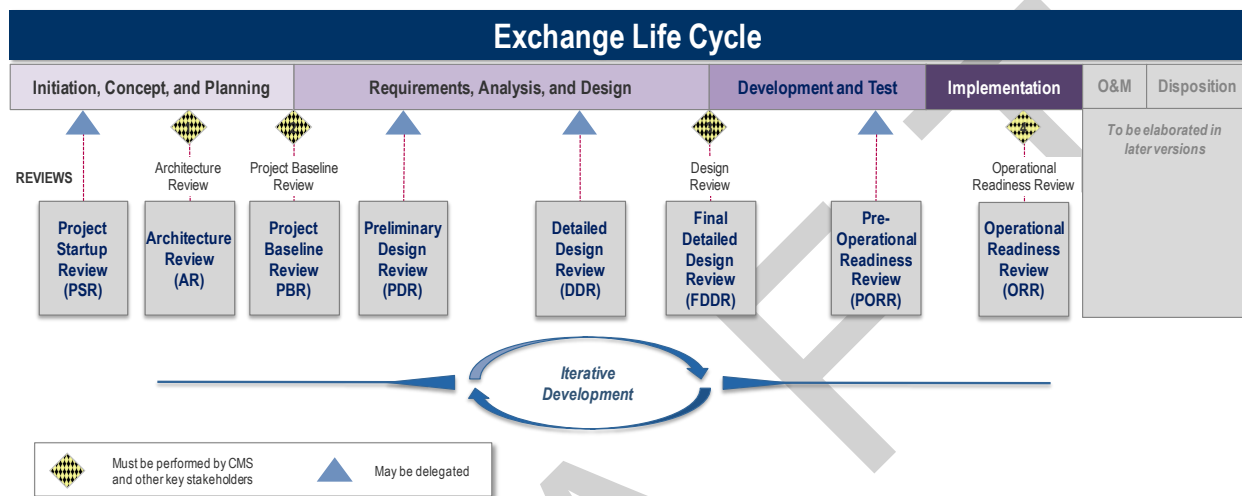


Figure 4. Proposed Exchange Life Cycle

The Exchange Life Cycle aligns with the standard CMS ILC (CMS Integrated IT Investment & System Life Cycle Framework) and HHS EPLC (Enterprise Performance Life Cycle) processes. The CMS ILC<sup>2</sup> and HHS EPLC<sup>3</sup> web sites provide the details for the process, phases, and deliverables for the respective models. The ELC offers a consistent framework to help guide project managers, business owners, IT Governance, critical partners, and other stakeholders through the project life cycle. Future supplements will provide further details specific to the ELC and certification process.

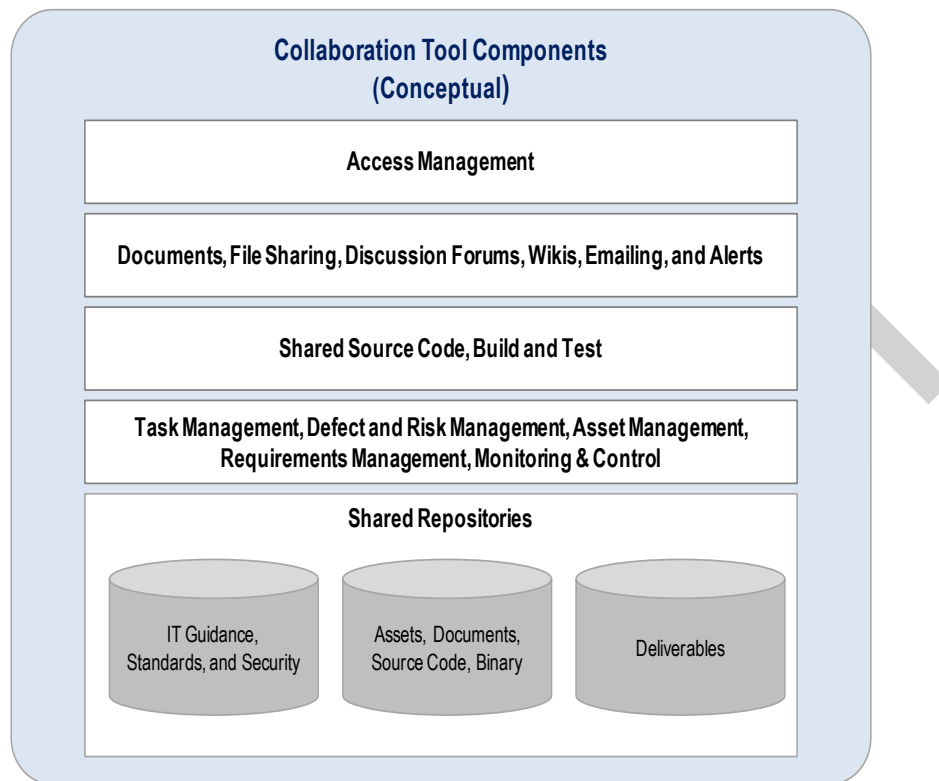
### 3.2.2 Collaborative Application Life Cycle Management Environment

A key to successful development for large complex systems is an ALM environment that enables collaboration and reduces risks. A collaborative ALM environment provides critical insight into the Exchange Life Cycle to maximize cooperation between federal and state stakeholders. CMS will provide a collaborative ALM environment that supports communication, software design and development, testing, issue tracking, document management, task assignment, project reporting, etc. Figure 5 shows the conceptual components of such an ALM environment. An ALM environment that can host multiple stakeholders (federal and state) allows the information

<sup>2</sup> See CMS ILC at <http://www.cms.hhs.gov/ILCPhases/>

<sup>3</sup> Detail regarding HHS EPLC phases, deliverables, and reviews can be found at <http://www.hhs.gov/CCIIO/eplc/>

sharing and asset reusability that is fundamental to a successful and efficient health insurance Exchange.



**Figure 5. Collaborative ALM Environment Concept (Example)**

The CMS Collaborative ALM Environment is addressed in full detail in the *Collaborative Environment and Life Cycle Governance – ERA Supplement*.

## 4. Business Architecture

The Exchange Business Architecture provides business process models and business service definitions for the key functions necessary to realize an Exchange. This section describes the approach for identifying the business goals and generating detailed business processes and services for each of the core business areas.

Table 2 presents the key business areas and the key processes for each.

**Table 2. Key Processes for Core Business Areas**

Business Area	Key Business Processes
Eligibility & Enrollment	<ul style="list-style-type: none"><li>• Employer enrollment in a SHOP Exchange</li><li>• Individual enrollment in a QHP; determination of eligibility for advance premium tax credits, cost-sharing reductions, and other applicable state health subsidy programs</li></ul>
Plan Management	<ul style="list-style-type: none"><li>• Plan certification, recertification, and decertification</li><li>• Plan monitoring and review</li><li>• Plan rating</li></ul>
Financial Management	<ul style="list-style-type: none"><li>• Plan assessment, reinsurance, risk adjustment, and risk corridors</li><li>• Reconciliation of reductions in enrollee out-of-pocket costs</li><li>• Determination of issuer credits</li></ul>
Customer Service	<ul style="list-style-type: none"><li>• Manage responses to information requests and requests for service</li><li>• Efficient distribution/management of requests across phone, web, paper, and face-to-face</li></ul>
Communications	<ul style="list-style-type: none"><li>• Communications and outreach strategies; content and messaging</li><li>• Measurement/reporting of communication effectiveness</li></ul>
Oversight	<ul style="list-style-type: none"><li>• Federal oversight of Exchange operations</li><li>• Exchange oversight of management and operations</li></ul>

There are certainly other processes and considerable detail behind each of the listed processes. Future Exchange Business Architecture supplements will contain the detailed business process and service descriptions, along with the flow of processing necessary to implement them.

### 4.1 Goals and Approach

CMS is participating in a collaborative business analysis effort to generate business blueprints that describe the goals for Exchanges and an operational view of Exchanges. CMS will use these business blueprints to communicate Exchange operations to stakeholders; eventually, the blueprints will provide the basis for system design and development activities. A blueprint consists of detailed definitions of business processes, business services, and supporting data necessary to support the implementation of the services for each of the Exchange business areas. Blueprints provide a foundation for beginning detailed requirements as well as data and technical standards definition activities. The initial business blueprint development focuses on the Eligibility & Enrollment, Plan Management, and Financial Management business areas.

The Affordable Care Act legislation represents the primary documented input into the Blueprint effort. Figure 6 illustrates the major inputs to the Business Blueprint and outputs from the Blueprint.

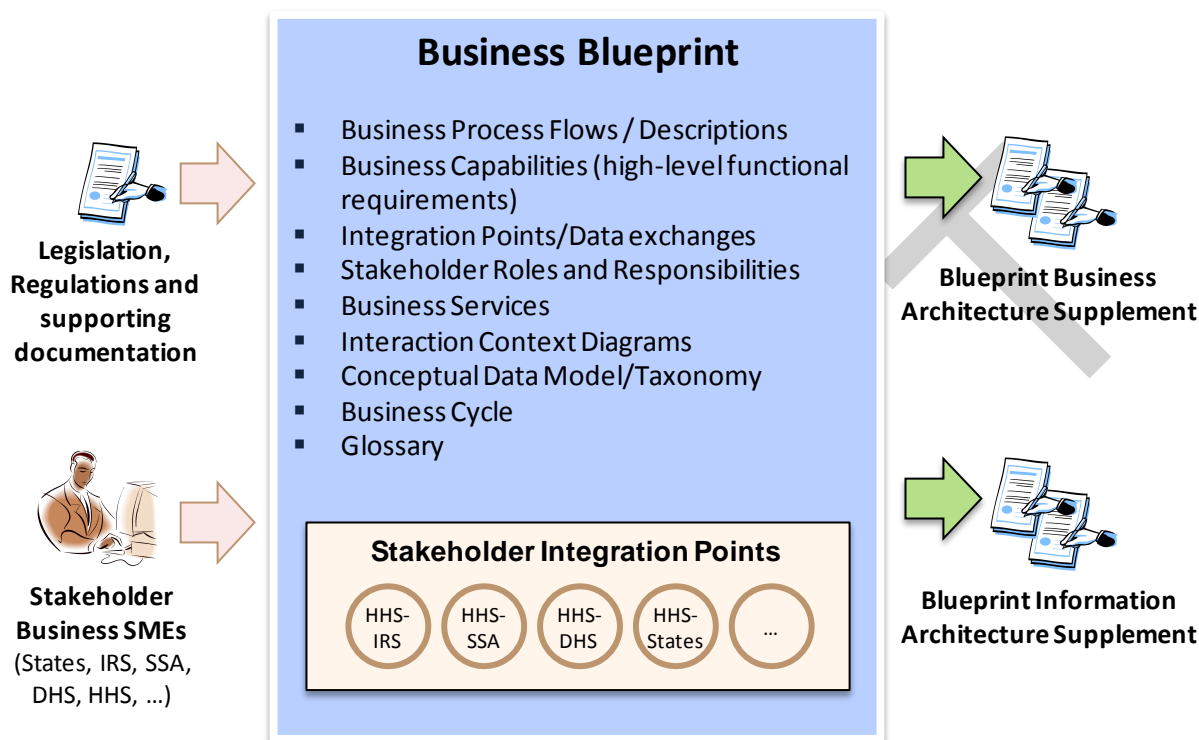


Figure 6. Business Architecture Blueprint Process

The Business Blueprint communicates Exchange operations through process models illustrating the interactions and information exchanges among functional activities and stakeholders (e.g., states, federal agencies, insurers, and employers) performing those activities. These depictions provide the foundation for understanding Exchange business functions, capabilities, and information needs to support those functions and capabilities. The process models also provide the foundation for understanding stakeholder relationships and information exchanges to facilitate coordination and agreement among stakeholders concerning their respective roles, responsibilities, and information exchange needs.

The Blueprint Business Architecture Supplement and Blueprint Information Architecture Supplement are intended to facilitate discussions with states, to establish a shared understanding of the major business functions, processes, and services to be implemented by Exchanges. The initial Blueprint Supplement version is a work in progress that CMS will revise periodically to reflect improved understanding of the needs and functions, processes, and services to be implemented by Exchanges.

To date, CMS has produced the initial draft of the Blueprint Supplement for Eligibility & Enrollment, and for Plan Management. The initial draft of the Information Architecture and the other Exchange functional areas are in process and will be released as supplements in the future.

The business process models comprise the process flows and associated metadata for describing aspects of the models, including functional descriptions of the process flows, activities, and associated capabilities. These descriptions include high-level business needs that will form the basis of requirements. The Business Process Hierarchy was derived through identification of higher-level Exchange business processes represented in the process models. The Business Services were derived through analysis of the stakeholder interactions and activities represented in the process models.

CMS relies on the Business Blueprints as its primary vehicle for developing the Business Architecture viewpoints conveyed in this Foundation architecture. The future Exchange Business Architecture supplements will present them in detail.

## 4.2 Exchange Business Processes and Services

To better understand the approach used to identify the business processes and services required to support the Exchange Environments, this subsection steps through a typical example. Since the Business Blueprints are a work in progress, the figures provided in this subsection represent example information, and are not intended to convey latest information found in the Blueprint Supplements. Figure 7 shows the starting point using the MITA for comparison. At the top level are the six business areas: Eligibility & Enrollment, Plan Management, Financial Management, Customer Service, Communications, and Oversight.

As shown in Figure 7, the definition of business processes required to support the Exchange occurs at the next level down. For example, within the Eligibility & Enrollment business area, 11 business processes were identified through the Blueprint efforts (excluding the Small Business Health Option Program). The figure shows three of the 11 business processes.

Continuing with Eligibility & Enrollment and selecting the Verify Individual Eligibility Information business process as an example, the next level down defines the business services required to support this specific business process.

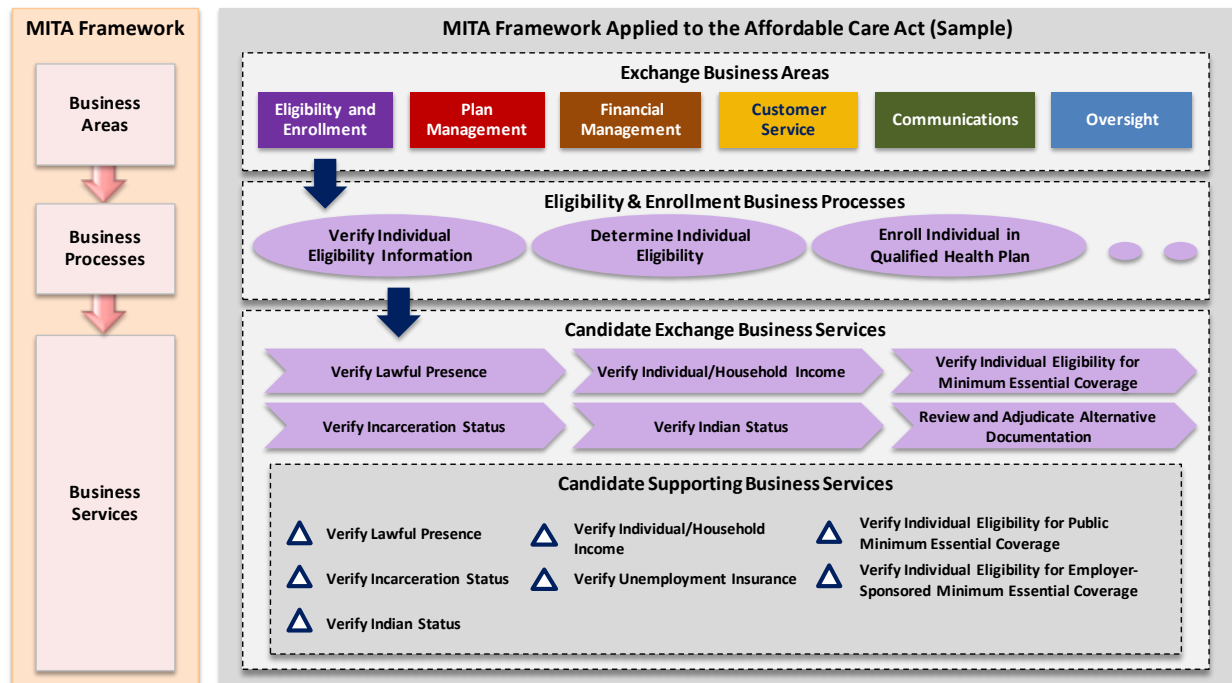


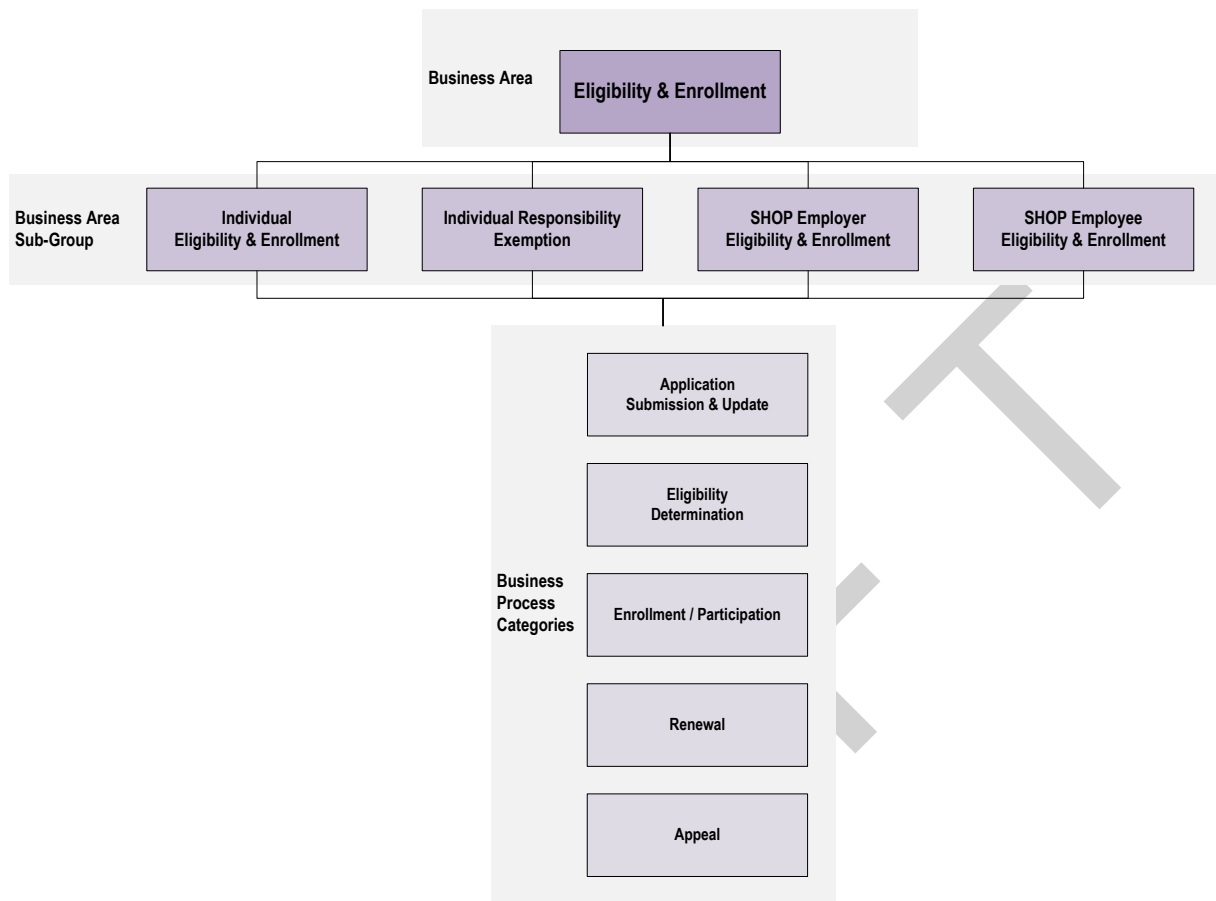
Figure 7. Business Architecture Approach (Example)

As presently envisioned, the Data Services Hub would perform at least six candidate business services. The business process owners may define additional candidate business services. Many business services will be reusable across business processes and business areas.

Figure 8 depicts an example hierarchical relationship between a business area (Eligibility & Enrollment), its Business Area Sub-Groups, and related business processes to support a particular Business Area Sub-Group.

As shown in Figure 8, the Eligibility & Enrollment business area has defined four Business Area Sub-Groups:

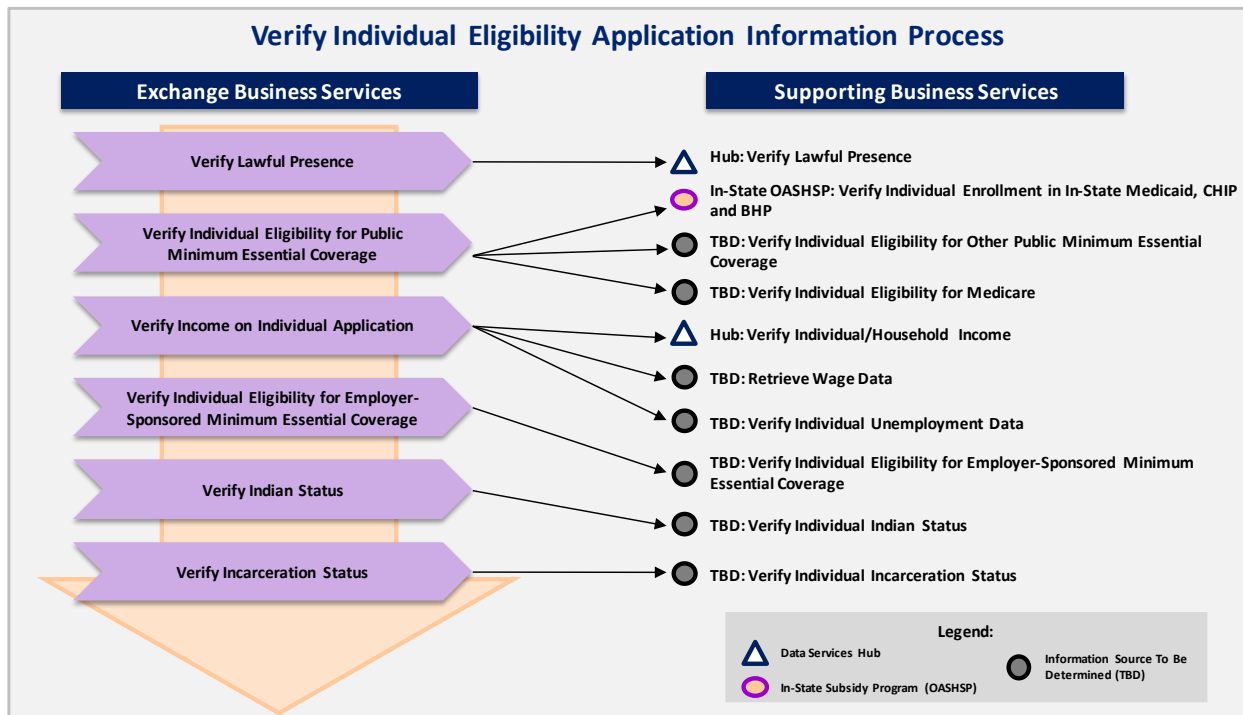
1. Individual Eligibility & Enrollment
2. Individual Responsibility Exemption
3. Small Business Health Option (SHOP) Employer Eligibility & Enrollment
4. SHOP Employee Eligibility & Enrollment



**Figure 8. Business Area Decomposition (Example)**

The business processes that support Individual Eligibility & Enrollment can be further decomposed into several business services. Figure 9 illustrates an example for individual eligibility, correlating some of the Exchange business services with their respective “service owner.” In this example, the service owners include the Data Services Hub, In-State Subsidy Program, Verification Entity, or Third-Party Data Source.

Service owners do not necessarily own the data, but instead are responsible for creating and managing the service that gathers or shares the data from the authoritative source.



**Figure 9. Business Service Decomposition (Example)**

The Exchange Business Architecture supplements will provide the business process and business service details for each business area. These supplements will clarify where candidate business services may be shared to support multiple business processes as the Business Architecture is further defined across all areas and processes.

CMS will develop and release a Business Architecture supplement for each of the six core business areas. The initial release will be the Eligibility & Enrollment Business Architecture supplement.



## 5. Information Architecture

The Exchange Information Architecture provides information architecture decisions, including conceptual information models, information element definitions for business services, and information security guidance to drive commonality to the greatest extent possible.

This section describes, at a high level, key concepts in the Information Architecture. The initial focus is on the types of transactions necessary to transmit between Exchanges and their data elements, and on the transmission mechanisms that may be necessary to support existing data formats, such as ANSI-X12, and new formats, such as the National Information Exchange Model (NIEM). Future Information Architecture supplements will contain further details on these concepts as well as other Exchange information resources.

### 5.1 Information Element Definitions

For each business service defined in the Business Architecture that requires information exchange, an information element definition will be generated and included in the Exchange Information Architecture supplements.

The information elements are determined by reviewing Affordable Care Act requirements and the input requirements of the source processing site. Table 3 shows an example information element definition for two eligibility business services supported by the Hub.

**Table 3. Example for Eligibility Services: Information Element Definition**

Business Service	Service Owner	Data Input	Data Output	Business Logic Summary	Data Source(s)	Data Exchange Standards
Verify Lawful Presence	HHS	Exchange Account information identifying individual, including SSN and DHS ID (if applicable), and attestation of lawful presence.	Individual's lawful presence status.	In response to a request from an Exchange, HHS notifies the Exchange whether the records of DHS or SSA substantiate an individual's citizenship, status as a national, or lawful presence.	SSA – maintains citizenship records. DHS – maintains lawful presence and citizenship.	SSA SOLQ (proprietary) interface definition  DHS SAVE (proprietary) interface definition
Verify Individual/ Household Income	HHS	Exchange Account information identifying individual and taxpayer identification number.	Household size, household MAGI, and supporting information.	In response to a request from an Exchange, HHS obtains information from an individual's tax return regarding household MAGI from the IRS. This utilizes the supporting services from IRS that will calculate the individual's MAGI based on his/her tax return.	IRS – authoritative source for household size and household MAGI on tax return,	

## 5.2 Information Exchange

Information exchange transmission requirements will establish standard formats, transfer protocols, currency of data requirements, and the frequency of transmissions. Adherence to the requirements will provide more consistent and reliable information exchange, enabling interoperability between the Exchanges and the Hub. Authoritative data will be received from multiple sources; the owner of the authoritative data establishes the standards for that data.

States may be dependent on existing information output formats that do not match with the guidance in the CMS Exchange Reference Architecture supplements. Each non-compatible information format will require an interim translation step to convert the data to the compatible formats; customarily, the states would be responsible for this translation. To the greatest extent possible, states should provide a plan for transitioning to the information standards at the earliest possible time.

The National Information Exchange Model is a candidate standard. NIEM supports enterprise-wide information exchange standards and processes. The standards promote a common understanding among federal agencies, states, and other stakeholders of the definitions and formats for each information element. NIEM is built as an eXtensible Markup Language (XML) data model specific to the organizations and information at hand.

CMS is working toward a NIEM definition sufficient to match the Information Architecture requirements as they evolve.

## 6. Technical Reference Architecture

The Exchange Technical Reference Architecture provides clear technical definitions, requirements, and standards for the Exchange Environments, for the technical interfaces between Exchange Environments, and for future application designs to ensure a secure operating environment.

This section describes initial, key technical concepts for establishing an Exchange Technical Reference Architecture. Future supplements will contain details on these concepts and additional relevant technical topics to assure a common understanding of the technical foundation components.

The major drivers to developing the Exchange Technical Reference Architecture are as follows:

- Provide a standardized, secure computing environment for Exchange and Hub systems and services
- Enable efficient and secure interaction with the Exchange Environments by providing standard interfaces for entities that access Exchange and Hub applications, services, and data
- Provide the necessary control to implement policy and requirements changes so CMS can comply with statutes and regulations on a timely basis, and to ensure the operational flexibility to handle processing reconfigurations, e.g., for workload distributions and balancing.

This section addresses the Data Center Infrastructure, including the Exchange and Hub Zoned Architecture, Managed Services Computing, Security and Privacy Services, Data Exchange Services, and Web Application Services.

### 6.1 Data Center Infrastructure

#### 6.1.1 Zoned Architecture

The architecture for the Exchange Environments is characterized as a “multi-zone” architecture with each zone separated by sufficient security components to support application systems and data security, as shown in Figure 10. The first or outermost zone—the “Presentation Zone”—supports web servers and can include strictly public data. In addition, data exchange interfaces will usually come through the Presentation Zone to assure adequate security control over the other zones.

The second or middle zone—the “Application Zone”—supports business logic and technology service components for the business services defined in the Business Architecture. As shown in Figure 10, the business process logic, supported by business service logic, and the specific technology components necessary to implement the business services, reside in the Application Zone.

The third or innermost zone—the “Data Zone”—contains the database servers used by the business services.

A Management Zone provides security, monitoring, and management in support of all other Zones via appropriate security components. The Management Zone may be separated into functional areas to better define the management interfaces and control points to the multi-zone operational environments. Additional network segments support specialized network services such as Public Key Infrastructure (PKI), Domain Name Services (DNS), etc.

The CMS Exchange Reference Architecture supports unified interfaces with both internal and external users, as well as an operational approach to the business services developed and implemented by and/or for the Exchanges and Hub. Various applications hosted in the Exchange Environments will be able to access data, where and when appropriate, in the data warehouse/data marts and a variety of operational databases located within the Exchange Environments through the Data Zone.

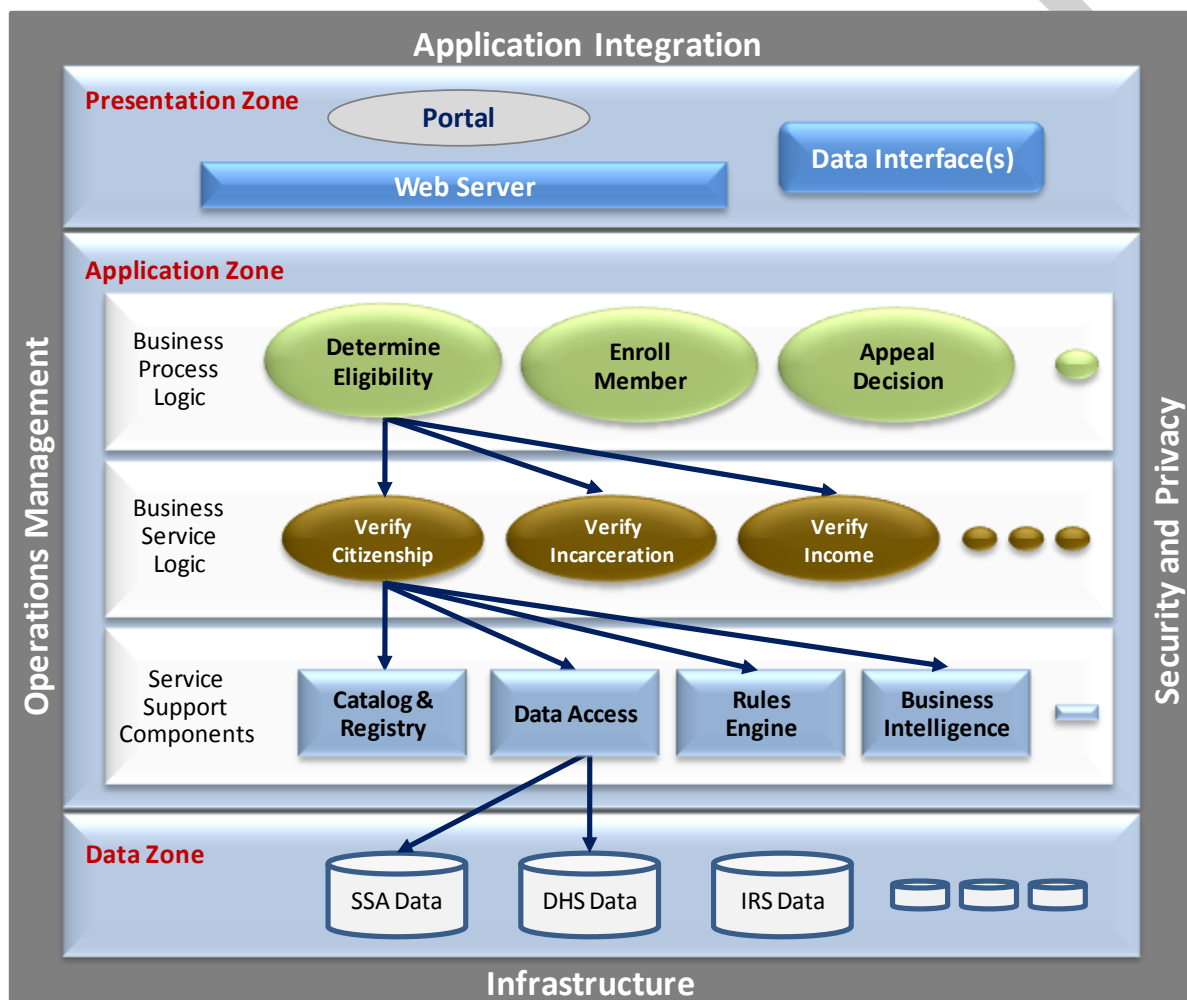


Figure 10. Exchange Technical Reference Architecture

Overarching considerations include the definition of the Infrastructure components and the specific configuration of the security components; security and privacy oversight of the critical Exchange data—whether PII, PHI, FTI, or other more public data types; Exchange application

integration support through well-defined interfaces and services; and coordinated operations management to assure reliability and continuity of operations. Each of these overarching considerations will be the topic of future Exchange TRA supplements

### 6.1.2 Managed Services Computing

The recent publication by the Federal CIO, *25 Point Implementation Plan to Reform Federal Information Technology Management*, emphasizes the shift to a “cloud first” policy for federal IT developments. As a result, government agencies are adopting cloud computing; however, the security of the cloud remains a key open issue. There are evolving cloud security approaches, such as the Federal Risk and Authorization Management Program (FedRAMP) that will eventually identify standard baselines for defining cloud security. NIST clearly defines Public, Community, and Private clouds<sup>4</sup>. In this sequence of cloud models, each subsequent type allows stricter security and architecture definition and control by the implementing organization. *Public clouds* generally use the public Internet for access and information exchange, use servers and data storage devices that are shared between customers, and leave security definition, implementation, and management up to each customer. *Private clouds* are generally built to the customer’s specification, including definition of the security infrastructure, variety in vendor devices, and dedicated servers and storage.

Best practices by an Exchange stakeholder are to evaluate the system and data classification for the Exchange, determine the level of risk the stakeholder will manage, and define an appropriate managed services model that will support the implementation of a multi-zone architecture and a secure infrastructure.

CMS intends to support a managed services implementation for the Exchange Environments. In addition, future Exchange TRA supplements will provide guidance for the use of managed services-based technical environments for Exchange Environments.

## 6.2 Security and Privacy Services

A complex array of requirements governs federal and state IT security and privacy today. Federal agencies and their contractors are bound by the Federal Information Security Management Act (FISMA) to develop, document, and implement agency-wide programs to provide security for their information and information systems. Both federal and state agencies are required to adhere to the Health Insurance Portability and Accountability Act of 1996 (HIPAA) and the Health Information Technology for Economic and Clinical Health Act of 2009 (HITECH) when handling PHI. These federal agencies and, in some instances, their contractors, are also subject to the Privacy Act of 1974, which places limitations on the collection, disclosure, and use of certain personal information, including PHI. In addition, any party authorized to access FTI provided from the IRS is subject to the data safeguard requirements of 26 U.S.C. Section 6103, and related provisions.

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<sup>4</sup> See <http://csrc.nist.gov/groups/SNS/cloud-computing/>

One of the initial supplements will be the *Harmonized Security and Privacy Framework – Exchange TRA Supplement*. The goal of this supplement is to communicate the federal guidance and requirements for sharing Exchange data in order to enable effective Exchange security and privacy implementation and operation by the states, while allowing the federal government to fulfill its security and privacy obligations.

## 6.3 Data Exchange Services

Data exchange, data management, and the effective collaboration of the Exchanges depend on a coordinated set of services that define and oversee Exchange data. Subsection 5.2, Information Architecture, presents a brief discussion of some key considerations in information exchange. In addition, data encryption, both for at-rest and in-transit data, and data exchange service implementation requirements are examples of other relevant technical topics that will be covered by future Exchange TRA supplements.

## 6.4 Application Web Services

The technology of Web services can expose reusable internal business services to external business partners. Web services allow applications to interact dynamically behind the scenes with other applications using open standards that include XML, Simple Open Access Protocol (SOAP), and Representational Transfer State (REST). This behind-the-scenes interaction usually involves server-to-server communications that provide the requesting application access to data and functionality from the requested application. The ability to loosely couple distributed computing services with partners enables new business models. The advantage of Web services is that it provides agility by enabling rapid interfacing of partner IT systems in response to new business requirements.

Each of these service areas and infrastructure topic areas will be covered more fully in future Exchange TRA supplements.

## Acronyms

<b>ALM</b>	Application Life Cycle Management
<b>ANSI</b>	American National Standards Institute
<b>CCIO</b>	Center for Consumer Information and Insurance Oversight
<b>CHIP</b>	Children's Health Insurance Program
<b>CIO</b>	Chief Information Officer
<b>CMS</b>	Centers for Medicare & Medicaid Services
<b>ConOps</b>	Concept of Operations
<b>DCIO</b>	Deputy Chief Information Officer
<b>DHS</b>	Department of Homeland Security
<b>DNS</b>	Domain Name Services
<b>DoD</b>	Department of Defense
<b>DOL</b>	Department of Labor
<b>E&amp;E</b>	Eligibility & Enrollment
<b>ELC</b>	Exchange Life Cycle
<b>EPLC</b>	Enterprise Performance Lifecycle
<b>ERA</b>	Exchange Reference Architecture
<b>ESI</b>	Employer- Sponsored Insurance
<b>FMS</b>	U.S. Treasury Financial Management Service
<b>FTI</b>	Federal Tax Information
<b>HHS</b>	U.S. Department of Health and Human Services
<b>ILC</b>	Investment Life Cycle (CMS Integrated IT Investment & System Life Cycle Framework)
<b>IRS</b>	Internal Revenue Service
<b>IT</b>	Information Technology
<b>MITA</b>	Medicaid Information Technology Architecture
<b>NIST</b>	National Institute of Standards and Technology
<b>OASHSP</b>	Other Applicable State Health Subsidy Programs
<b>OMB</b>	Office of Management and Budget
<b>PHI</b>	Protected Health Information

<b>PII</b>	Personally Identifiable Information
<b>PKI</b>	Public Key Infrastructure
<b>QHP</b>	Qualified Health Plans
<b>REST</b>	Representational Transfer State
<b>SHOP</b>	Small Business Health Options Program
<b>SOA</b>	Service-Oriented Architecture
<b>SOAP</b>	Simple Open Access Protocol
<b>SSA</b>	Social Security Administration
<b>TRA</b>	Technical Reference Architecture
<b>TRB</b>	Technical Review Board
<b>UI</b>	Unemployment Insurance
<b>VA</b>	U.S. Department of Veterans Affairs
<b>XML</b>	eXtensible Markup Language



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