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# **VA Enterprise Design Patterns:**

## **2. Enterprise Architecture**

### **2.5 Enterprise SOA Design Pattern**

**Office of Technology Strategies (TS)  
Architecture, Strategy, and Design (ASD)  
Office of Information and Technology (OI&T)**

**Version 1.0**

**Date Issued: October 20, 2015**

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**APPROVAL COORDINATION**

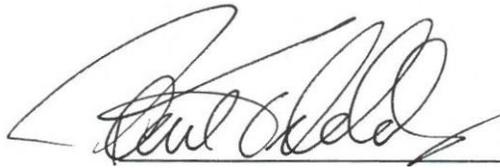
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## REVISION HISTORY

Version	Date	Organization	Notes
0.1	4/30/15	ASD TS	Initial Draft
0.3	6/1/15	ASD TS	Updated draft to include additional research from working sessions (e.g., benefits and memorials use cases), and to adjudicate feedback from stakeholders. Also removed content from previous VistA Evolution Design Pattern and aligned content with ESS strategy and SOA design guidance.
0.5	6/19/15	ASD TS	Updated draft for 6/16 working session to include research on ESS use cases and to adjudicate feedback from previous working sessions (6/2 and 6/10) and ESS Architecture working group (6/8).
0.7	8/10/15	ASD TS	Additional edits taking into account feedback from Public Forum.

## REVISION HISTORY APPROVALS

Version	Date	Approver	Role
0.1	4/30/15	Joseph Brooks	ASD TS Design Pattern Government Lead
0.3	6/1/15	Joseph Brooks	ASD TS Design Pattern Government Lead
0.5	6/19/15	Joseph Brooks	ASD TS Design Pattern Government Lead
0.7	8/10/15	Joseph Brooks	ASD TS Design Pattern Government Lead

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## **1.0 INTRODUCTION**

Service-oriented Architecture (SOA) is an architectural approach to simplify enterprise IT by standardizing how systems communicate and by breaking larger, monolithic systems into a set of reusable business services. SOA provides a uniform means to offer, discover, interact with, and use capabilities to produce desired effects consistent with measurable preconditions and expectations. VA plans to deploy Enterprise Shared Services (ESS) that enable all applications to consume SOA-based resources across VA and external partners consistently.

### **1.1 Business Need**

Substantial VA IT investments have focused on consolidating IT infrastructure and exposing legacy resources as reusable SOA services to enhance interoperability, improve security, and reduce operational costs. This document establishes an official enterprise direction for VA's migration to a SOA environment using ESS and common IT infrastructure platforms. ESS will help VA achieve the following goals:

- Advance organizational interoperability and agility through the reuse, interoperability, and governance of services across internal and external organizational and program boundaries.
- Promote the standardization, reuse, interoperability, and composition of the best available capabilities developed under the auspices of any system to meet business and mission requirements.

Projects deploying solutions that use ESS will help VA resolve recurring challenges to improving and evolving information security, advancing agile interoperability and information sharing, and reducing the total lifecycle cost of IT per the VA Enterprise Technology Strategic Plan (ETSP) and the Enterprise Design Patterns Directive (VA Directive 6551).

### **1.2 Approach**

The Enterprise SOA Design Pattern aligns with VA's overall IT strategy for supporting "any device, anywhere, anytime" for VA patients, customers, staff and partners through enterprise services. This document provides an overarching guideline for the ESS Strategy and Roadmap maintained by ASD Product Engineering, and it supports an enterprise-wide directive for ESS integration. The ESS roadmap involves achieving enterprise-wide agreement on architecture and governance approaches, and identifying candidate ESS that align to strategic business capabilities characterized in the VA EA and in ASD Product Planning Documents (PPD). This roadmap also includes plans for SOA infrastructure services over the next three fiscal years to

support expanded ESS provisioning, management, and consumption. A summary of the approach for adopting ESS in VA for interoperable data sharing is as follows:

- Phase 1: Establish Governance:
  - Establish the ESS Center of Excellence (CoE).
  - Gain agreement on governance approaches for ESS across all lines of business.
- Phase 2: Establish Standards:
  - Establish project-level service design guidelines for ESS architecture, development, and support.
  - Publish ESS implementation guidance and disseminate to project teams.
- Phase 3: ESS Execution:
  - Deploy SOA infrastructure capabilities to support current and projected ESS.
  - Architect, deploy, and sustain ESS in accordance with VA business needs intake and analysis, and PPDs.
  - Support migration of legacy systems to ESS available through VA's SOA infrastructure.
- Phase 4: Continual Improvement:
  - Update governance processes, standards, and service design guidelines to account for lessons learned.
  - Evaluate the current and future state of SOA infrastructure and develop a roadmap for evolving the SOA infrastructure to accommodate emerging technologies.

This approach establishes a framework for mandated ESS following the latest industry standards. Appendix E contains the current list of mandated ESS supporting high-level use cases documented in Section 4. Platform-specific implementation guidance for ESS is beyond scope (see Appendix A), but is available by ASD Product Engineering.

## **2.0 CURRENT CAPABILITIES AND LIMITATIONS**

### **2.1 Current Capabilities**

VA agreed to the SOA environment for all healthcare applications that shared data with VistA in November 2013. Since then, the product lines that constitute VistA Evolution adopted several SOA services to use modern web services instead of point-to-point connections to legacy business logic (per the VistA Evolution Product Roadmap). This migration includes the Enterprise Messaging Infrastructure (eMI), which is the official SOA infrastructure backbone capability for ESS. VA has established an ESS CoE to serve as an advisory body for adopting ESS across lines of business going beyond healthcare. This organization is establishing governance processes and service design guidelines available on the ESS website. Governance processes and service design guidelines constitute an “implementation” of the SOA to which VA is migrating.

The ESS CoE has crafted an ESS strategy, which provides a long-term guideline for identifying and provisioning the ESS required to develop solutions useful to the enterprise. As such, part of identifying ESS is to consider how a service contributes to solutions, either as business services providing business solutions or as infrastructure services from which business services are composed. Using ESS in accordance with this Enterprise SOA Design Pattern will help projects meet the criteria for Enterprise Capabilities in Section 2.6 of the VA ETA Compliance Criteria: “VA solutions shall utilize enterprise-wide standards, services, and approaches to deliver seamless capabilities to Veterans, facilitate IT consolidations through reuse, and simplify the use of Veteran functions.”

## **2.2 Limitations**

VA’s adoption of ESS to achieve an enterprise SOA is still a work in progress. The ESS CoE will continue to work with stakeholders across VA to achieve a shared vision for ESS and a migration to an enterprise SOA environment. “Local” SOA is still prevalent in many parts of VA (e.g., Veterans Benefits Management System), and the ESS CoE will provide the official SOA governance structure and advisory board to standardize SOA capability implementation. The current SOA infrastructure for ESS was based on a decision to reuse existing IT investments from the Integrated Electronic Health Record initiative, and future activities will look at the evolution of this infrastructure to accommodate emerging technologies captured in the ETSP.

## **3.1 FUTURE CAPABILITIES**

The future state for enterprise SOA consists of the following aspects addressing the approach in Section 1.2, which include continual improvement to account for lessons learned and changing business needs:

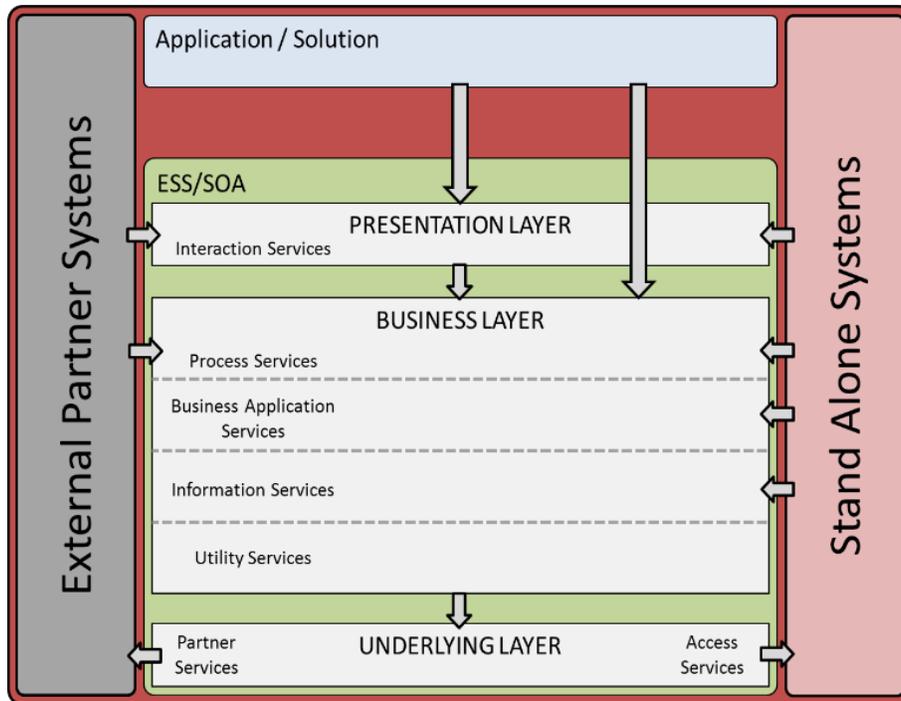
- A standard set of governance processes for ESS across all lines of business (Phase 1)
- Completed service design guidelines for ESS architecture, development, and support (Phase 2)
- Fully operational SOA infrastructure capabilities to support current and projected ESS, with a roadmap for SOA infrastructure evolution (Phase 3)
- Registry of ESS in accordance with VA business needs intake and analysis, and alignment of business needs to strategic goals (Phase 3)

The ESS website and the eMI reference in Appendix D contain information on how to integrate with the eMI. The supporting Enterprise Design Patterns provide additional details on enterprise capabilities and constraints for middleware platforms like eMI.

ESS require adherence to the following SOA design principles agreed to by the ESS CoE:

- **Encapsulation:** Advocates exposing a discreet system capability as an autonomous IT asset (that is, a service) that can be used by any application that requires the capability
- **Separation of Concerns:** Advocates separating different aspect of software system so that each aspect can be developed independently and maintained autonomously
- **Loose Coupling:** Advocates reducing dependencies between system components and making all remaining dependencies explicit
- **Business Traceability:** Advocates using well-defined heuristics to maintain the “line of sight” from business requirements to the system capabilities that support them

All VA application solutions use a layered architectural framework consistent with the above design principles. This means that applications will not access physical data stores directly, but will use abstracted information services that encapsulate the data stores and enable virtual data access. ESS aligns to specific service types and layers in the following figure depicting a platform-independent architecture framework:



**Figure 1: Layered SOA Capabilities Framework for ESS**

The Open Group's SOA Reference Architecture<sup>1</sup> guides the categorization of ESS and is used to inform ESS architecture guidance and governance processes for Phases 1 and 2. The ESS CoE will use the following categories to describe service functionality:

- **Interaction:** Client-centric services (e.g., portal services) tied to organizational roles and solution applications.
- **Process:** Business processes services (e.g., workflows) are tied to an organization's way of doing business.
- **Business Application:** Stand-alone services that provide a discreet, business-related capability specific to a narrow set of service domains. Likely has a single business owner.
- **Information:** Services (e.g., data access services, data federation services) that provide information related to business entities; broadly used across processes and less specific than process services.

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<sup>1</sup> The Open Group, SOA Reference Architecture, ISBN: 1-937218-01-0, November 2011

- **Utility:** Stand-alone services that provide a discreet, business-related capability used across a wide range of service domains; normally has broad cross-section of stakeholders.
- **Access:** Services (e.g., adapters) that provide access to legacy systems and whose service interfaces are tightly coupled to the legacy system interface.
- **Partner:** Services capturing interoperability with partners, isolating VA from changes.

The Service Layering and Service Categorization Guideline (published on the ESS website) provides detailed implementation guidance on each abstraction layer and service category that informs solution architecture development. Future versions of this document will include links to these guidelines and additional details on the architecture modeling activities.

### 3.1 Alignment to TRM

All projects require approved technologies and standards located in the VA Technical Reference Model (TRM) to comply with the guidance provided in this document. The following technology categories specific to the use cases described in Section 4 include:

**Table 1: Enterprise SOA Categories and Approved Technologies**

Tool Category	Example Approved Standards
Integration Software	Enterprise Service Bus, Service Registry, Messaging-Oriented Middleware, SOA Governance, Device Integration
Data Integration	Data at Rest, Data in Motion (Common Message Terminology and Semantics), Database Replication and Clustering (e.g., Extract, Transform, Load)

The Enterprise SOA Design Pattern serves as a gateway to other Enterprise Design Patterns that refer to applicable ESS, as discussed in Appendix E. Each Enterprise Design Pattern contains a reference to applicable TRM categories. This information will help projects guide their technology selection and plan for future technologies. All projects leveraging enterprise SOA capabilities to achieve interoperability objectives will:

- Adhere to the profile of information exchange standards (REST for new service interfaces and SOAP for legacy interfaces) outlined in the ESS Message Exchange Guide (posted on ESS website).
- Use only approved standards profiles documented in the TRM. Standards not included in the TRM require a waiver that is approved only by the Deputy CIO of ASD.

- For healthcare information exchange, comply with the standards profile enforced by the Interagency Program Office (IPO) and described in the IPO Information Interoperability Technical Package (IT2P) and DoD/VA Health Standards Profile (HSP).

#### **4.1 USE CASES**

The following sections describe a generic use case involving an application consuming ESS through an enterprise-wide SOA infrastructure. This analysis includes references to Enterprise Design Patterns posted on the ASD TS public-facing website (Reference 2 in Appendix D). Each use case contains the following attributes agreed to by the ESS CoE:

- Pre-Conditions
  - Define starting point for service use
- Inputs
  - Configure the interaction with the service
- Behaviors
  - For satisfied preconditions, use inputs and leads to specified outputs and post-conditions
- Outputs
  - Deliver immediate feedback
- Post Conditions
  - Define the end state when service interaction is complete

#### **4.1 Healthcare ESS Interaction**

The following use case refers to a generic service interaction involving Department of Defense (DoD), VA, or other external partner (e.g., Walgreens) consumers with the goal of retrieving healthcare information (e.g., official patient records, prescription information, patient-generated data), subject to appropriate security and privacy restrictions.

1. Pre-Conditions
  - Requestor authenticated to an application through security services platform (currently provided by IAM services).
  - Example VA applications (portals, web applications, mobile applications, kiosks)
    - Enterprise Health Management Platform (eHMP) Clinical Presentation Experience (CPE) application
    - Veterans Point of Service (VPS) application
    - Mobile Patient-generated Data (PGD) (Data Access Services) application
    - External non-VA client (e.g., DoD healthcare application)
2. Inputs
  - VA user invokes a service request to access VA healthcare information

- This may occur through a mobile application in accordance with the Mobile Architecture Design Pattern. Appendix D Reference 2 includes the public-facing website that contains this Enterprise Design Pattern.
- IAM services authenticate the service consumer and support access control decisions per the Privacy and Security Design Patterns.

### 3. Behaviors

- External service consumers use an External Gateway (aka SOA Gateway Service) capability to access services.
  - The External Gateway refers to the eHealth Exchange for commercial consumers like Walgreens.
  - DoD consumers leverage services as outlined in the VistA Evolution Interoperability Plan. Currently, DoD consumers may also use the eHealth Exchange if they do not use the Bi-directional Health Information Exchange (BHIE) DoD Adaptor (per the eHMP architecture). In the long-term, the Defense Health Management Systems Modernization (DHMSM) data services will continue to leverage these services.
- Request goes to service provider.
  - The Enterprise Messaging Infrastructure (eMI) provides integration middleware for a service provider that is part of the VistA Evolution program.
  - Invalid service requests will produce error messages to user through exception handling, and failed attempts are to be logged in accordance with Privacy and Security Design Patterns.
- Service providers exposed through service proxies and service entries.
  - Service interfaces are to be defined in accordance with the ESS Message Exchange Guide.
  - Enterprise service registry needed to document the services.
- Service provider processes request through a “wrapper” data access service (per the Hybrid Data Access Design Pattern) and prepares response in accordance with requestor’s expectations.
- Response from VistA instances generated through data federation platforms (currently VistA Service Assembler).

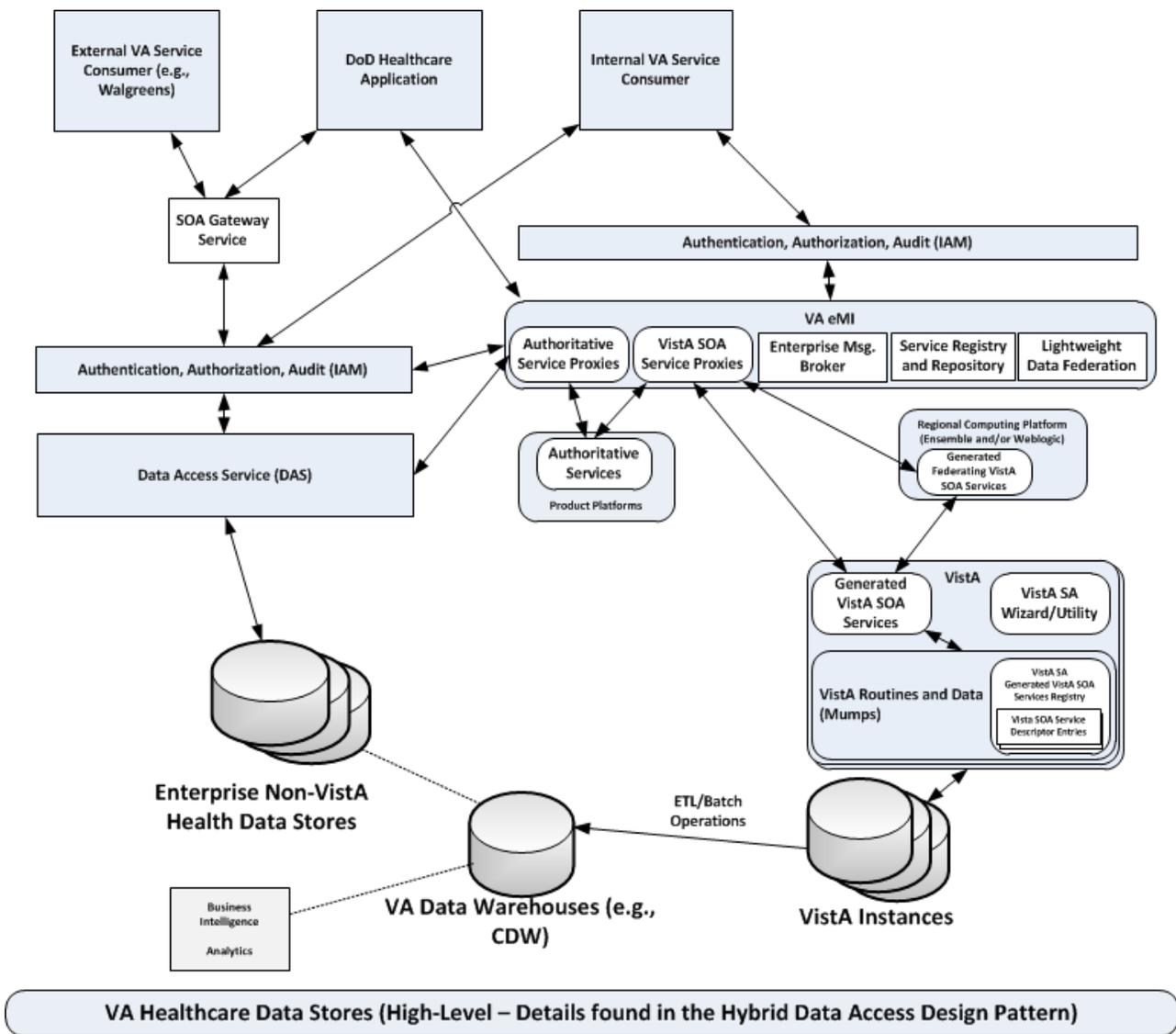
### 4. Outputs

- Response routed back to requestor.

### 5. Post Conditions

- Requestor obtains application response based on initial expectations.
- A data warehouse capability (e.g., the Corporate Data Warehouse) collects data from authoritative data stores for business intelligence and analytics purposes. VistA will continue to provide batch feeds to the data warehouses, as indicated by the solid arrow.

The following figure provides an architectural blueprint for the use case:



**Figure 2: High-level Context Diagram for Healthcare ESS Interaction**

#### 4.2 Benefits, Memorials, and Corporate ESS Interaction

The following use case refers to a generic interaction between an internal or external service consumer and a VA application, allowing the consumer to retrieve benefits information (including memorials information).

##### 1. Pre-Conditions

- Requestor authenticated to an application through security services platform and authorized to access information. Currently these are provided by IAM services.
  - Please consult Privacy and Security Design Patterns for detailed architectural guidance on these capabilities.

- Example VA applications (portals, web applications, mobile applications, kiosks)
  - Enterprise Veterans Self-Service (eBenefits)
  - National Gravesite Locator (NGL) application
  - MyHealthVet (MHV)
  - VRM Customer Relationship Management (CRM) client
- 2. Inputs
  - VA user sends in a service request to access VA healthcare information
    - This may occur through a mobile application in accordance with the Mobile Architecture Design Pattern, leveraging a user interaction capability per the User Interaction Capabilities Design Pattern.
    - IAM services authenticate the service consumer and support access control decisions per the Privacy and Security Design Patterns.
- 3. Behaviors
  - External service consumers use an External Gateway capability to access enterprise services.
    - The External Gateway in this context may refer to a web server proxy located in a perimeter network.
  - Service request goes to service provider.
    - Invalid service requests will produce error messages to users through exception handling, and failed attempts are logged in accordance with the Privacy and Security Design Pattern.
    - Service request may either be brokered or go directly to the service provider (details found in implementation guidance).
  - Service providers exposed through service proxies and service entries.
    - Service interfaces are to be defined in accordance with the ESS Message Exchange Guide.
    - Enterprise service registry needed to document the services.
    - Service expose authoritative data sources in accordance with the Hybrid Data Access Design Pattern.
  - Service provider processes request and prepares response in accordance with requestor's expectations. Example services include:
    - Data Access Service (DAS)
    - Authoritative Information Services per the Hybrid Data Access Design Pattern (exposes authoritative data sources including Veterans Benefits Management System (VBMS))
  - Information Services equate to a VA Data Layer (as discussed in the Hybrid Data Access Design Pattern) – may include VBMS, Chapter 33, Customer Relationship (CRM), DAS, Corporate Email, Gravesite Location data (BOSS Enterprise)
    - Offline data imported into the VA Data Warehouses
    - Details on VA Administration data concerns provided in the Hybrid Data Access Design Pattern

4. Outputs

- Response routed back to requestor.

5. Post Conditions

- Requestor obtains application response based on initial expectations.
- A data warehouse capability (e.g., the Corporate Data Warehouse) collects data from authoritative data stores for business intelligence and analytics purposes.

More information about Benefits, Memorials, and Corporate ESS considerations may be found in segment-level architectural models under development by ASD Product Engineering (PE). The following figure provides a visual representation of the use case:

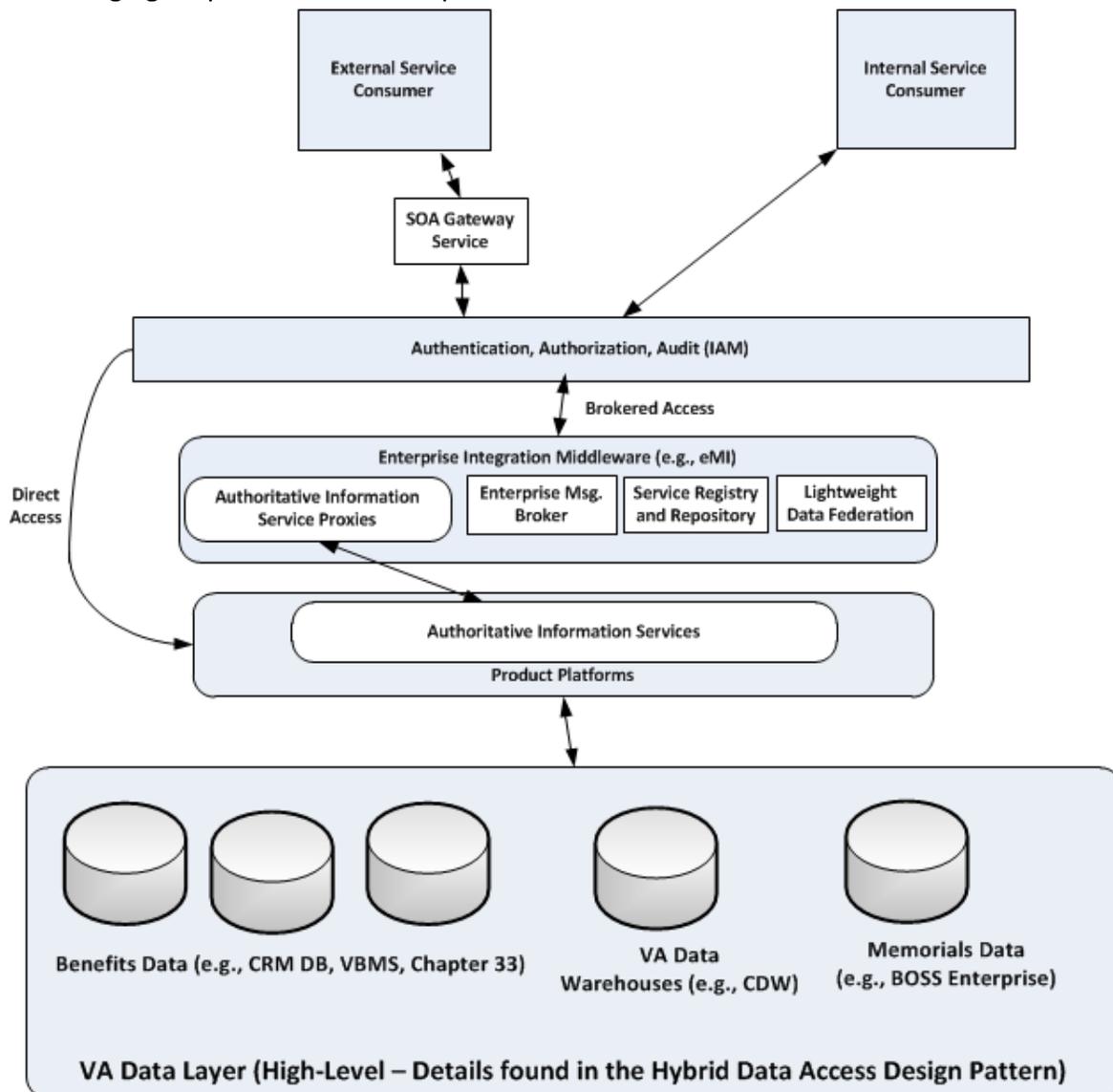


Figure 3: High-level Context Diagram for Benefits ESS Interaction

## **Appendix A.DOCUMENT SCOPE**

### **Scope**

This document represents a formal update of the initial Enterprise Design Pattern (“SOA Design Patterns for VistA Evolution”) approved in July 2014, and it takes into account lessons learned from implementation of the document since its approval. It identifies the consensus set of enterprise SOA capabilities that not only apply to VistA Evolution, but apply to VBA and NCA as well. This document covers:

- Enterprise Design Patterns that will guide all projects in establishing solution architectures
- Enterprise capabilities currently provided by ESS
- Consensus set of SOA design principles for ESS
- Alignment of SOA capabilities to the Technical Reference Model (TRM)

The following content is beyond scope:

- Project-specific implementation guidance for how to integrate with ESS
- SOA governance processes established by the ESS Center of Excellence
- Product Planning Documents (PPD) maintained by ASD Product and Platform Management (PPM)

### **Document Development and Maintenance**

This document was developed collaboratively with internal stakeholders from across the Department and included participation from VA’s Office of Information and Technology (OI&T), Product Development (PD), Office of Information Security (OIS), Architecture, Strategy and Design (ASD), and Service Delivery and Engineering (SDE). Extensive input and participation was also received from Administration representatives. In addition, the development effort included engagements with industry experts to review, provide input, and comment on the draft document. This document contains a revision history and revision approval logs to track all changes. Updates will be coordinated with the Government lead for this document, which will also facilitate stakeholder coordination and subsequent re-approval depending on the significance of the change.

## Appendix B. DEFINITIONS

Key Term	Definition
Enterprise Shared Service	A SOA service that is visible across the enterprise and can be accessed by users across the enterprise, subject to appropriate security and privacy restrictions.
Service	A mechanism to enable access to one or more capabilities, where the access is provided using a prescribed interface and is exercised consistent with constraints and policies as specified by the service description.
Service Oriented Architecture	A paradigm for organizing and utilizing distributed capabilities that may be under the control of different ownership domains. It provides a uniform means to offer, discover, interact with and use capabilities to produce desired effects.

## Appendix C. ACRONYMS

Acronym	Description
AA&A	Authentication, Authorization, and Audit
APM	Application Performance Monitoring
ASD	Architecture, Strategy and Design
CIO	Chief Information Officer
CoE	Center of Excellence
COTS	Commercial Off-the-Shelf
eMI	Enterprise Messaging Infrastructure
ESS	Enterprise Shared Services
ETA	Enterprise Technical Architecture
ETSP	Enterprise Technology Strategic Plan
HDA	Hybrid Data Access
IAM	Identity and Access Management
NPE	Non-Person Entity
PMAS	Project Management Accountability System
PPD	Product Planning Document
QoS	Quality of Service
REST	Representational State Transfer
TCO	Total Cost of Ownership
TRM	Technical Reference Model
VistA	Veterans Health Information Systems and Technology Architecture
VRM	Veterans Relationship Management

## Appendix D. REFERENCES, STANDARDS, AND POLICIES

This Enterprise Design Pattern is aligned to the following VA OI&T references and standards applicable to all new applications being developed in the VA, and are aligned to the VA ETA:

#	Issuing Agency	Applicable Reference/Standard	Purpose
1	VA OIS	VA 6500 Handbook	Directive from the OI&T OIS for establishment of an information security program in the VA, which applies to all applications that leverage ESS.  <a href="http://www1.va.gov/vapubs/">http://www1.va.gov/vapubs/</a>
2	VA ASD	VA Enterprise Design Patterns, Office of Technology Strategies	Provides references to the use of enterprise capabilities as part of the integration with SOA support infrastructure services, per VA Directive 6551.  <a href="http://www.techstrategies.oit.va.gov/docs_design_patterns.asp">http://www.techstrategies.oit.va.gov/docs_design_patterns.asp</a>
3	VA ASD	VA Enterprise Design Patterns supporting references	<ol style="list-style-type: none"> <li>Enterprise Design Pattern SharePoint Site: <a href="https://vaww.portal2.va.gov/sites/asd/TechStrat/edp/Design%20Pattern%20Library/Forms/AllItems.aspx">https://vaww.portal2.va.gov/sites/asd/TechStrat/edp/Design%20Pattern%20Library/Forms/AllItems.aspx</a></li> <li>Enterprise Design Pattern OMB Max Site: <a href="https://max.omb.gov/community/display/VAExternal/Enterprise+Design+Patterns">https://max.omb.gov/community/display/VAExternal/Enterprise+Design+Patterns</a></li> </ol>
4	VA ASD	ESS Website	Provides the overarching strategy for developing, deploying, and managing ESS throughout the VA. ESS guidelines for provide the consensus set of standards service design and consumption by enterprise solutions:  <a href="http://vaww.ea.oit.va.gov/enterprise-shared-services-service-oriented-architecture/">http://vaww.ea.oit.va.gov/enterprise-shared-services-service-oriented-architecture/</a>
5	VA OI&T PD	eMI	<a href="http://go.va.gov/emi">http://go.va.gov/emi</a>
6	VA OI&T PD	eMI Integration Guidance	The eMI Integration guidance is intended for individuals or organizations seeking to utilize eMI

#	Issuing Agency	Applicable Reference/Standard	Purpose
			<p>services by requesting, onboarding, and consuming eMI services. The guide also provides set of guidelines and recommendations to develop and use Services and other messaging solutions within SOA framework. Integrating with the eMI aids in the assurance of compliance with the VA Technical Reference Model (TRM) as the eMI leverages only approved technologies outlined in the TRM.</p> <p><a href="http://vawww.oed.portal.va.gov/communities/VAeMI/eMI%20Documents/eMI%20Integration%20Guideline%20Overview.pdf">http://vawww.oed.portal.va.gov/communities/VAeMI/eMI%20Documents/eMI%20Integration%20Guideline%20Overview.pdf</a></p>
7	VA ASD	Full range of technologies provided by the TRM	<a href="http://www.va.gov/TRM/ReportVACategoryMapping.asp">http://www.va.gov/TRM/ReportVACategoryMapping.asp</a>
8	VA ASD	Enterprise Technology Strategic Plan (ETSP)	<a href="http://www.techstrategies.oit.va.gov/docs_ent_tech_strat_plan.asp">http://www.techstrategies.oit.va.gov/docs_ent_tech_strat_plan.asp</a>
9	VA ASD	Approved Set of ESS	<a href="https://vaausemihswgdev1.aac.va.gov/ServiceRegistryDashboard/">https://vaausemihswgdev1.aac.va.gov/ServiceRegistryDashboard/</a>

## Appendix E. ENTERPRISE SHARED SERVICES (ESS)

This Enterprise Design Pattern mandates the following ESS:

Project	Service	Description
CDW	VA Corporate Data Warehouse	Organizes Clinical data into logical data domain, e.g. pharmacy, lab chemistry, etc.
eMI	Enterprise Message Broker	Enables message exchanges between VA systems and services messaging engine supported by a security gateway and sophisticated routing services
eMI	Service Registry/Repository	A service registry is established as a central part of the surrounding infrastructure and is used by service owners and designers to register services and capabilities that are in development or currently existing.
eMI	VistA SA Generated VistA SOA Service Registry	The WSRR Registry populated with services generated using the VSA.
eMI	VistA SOA Service Descriptor Entries	Descriptions of services generated using the VSA entered into the WSRR.
IAM	MVI	
IAM	eSig	The functionality enabling the use of electronic or digital signatures within an application
IAM	SAC	SAC will enable an application to authorize and control access down to the transaction, field or object levels if needed
IAM	Directory Services	Directory Services efficiently stores and manages user information and provides a comprehensive view of predefined authoritative

Project	Service	Description
		data managed by IAM for all users across the VA enterprise
IAM	IP	Identity Proofing is the step in the IAM process where an end-user initially establishes their identity with a registration agent or authority
IAM	CSP	Credentialing, for the purpose of logging on to an IT system, consists of the procedures used to issue a token to a user in such a way that the token can be relied upon to represent the user in electronic transactions
IAM	SSOe	Allows a user that is authenticated at a federated CSP (IdP) to seamless access integrated applications
IAM	SSOi	Allow a user to sign on once to an application, using PIV or AD username/password, then allow the User to access other integrated applications using the sign on credentials originally submitted
IAM	CAR	The service allows VA visibility into an application's level of compliance with VA IAM and information security policies and mandates alignment with federated identity operations described in the FICAM Roadmap and Guidance
IAM	Provisioning	Provisioning is the process of associating an identity with one or more accounts and assigning privileges on IT systems
Legacy VistA	VistA Instances	An installed copy of the VistA software at a particular location
VistA Exchange	Data Federation	VistA Exchange will provide 'native federation' of all appropriate longitudinal health record data.

Project	Service	Description
VLER DAS	DAS	VLER Gateway - Authentication, Authorization, Audit & Access Control, Many aggregators, transformers, splitters, routers, etc.
VLER DAS	eCRUD Wrapper	Provides designated common enterprise services, including enterprise Create/Read/Update/Delete (CRUD) services for enterprise data stores
VLER DAS	Persistence as a Service	The VLER Data Access Services (DAS) is responsible for transfer of structured and non-structured storage of VLER data between internal and external Consumers and Producers
VLER eHealth Exchange	External Gateway	The eHealth Exchange Service's (formerly the NHIN) technology and standards provide a secure, nationwide, interoperable health information infrastructure that connects providers, consumers and others involved in supporting health and health care
VSA	Generated VistA SOA Services	Services that enable an application to use Legacy VistA Business Capabilities
VSA	Generated Federating VistA SOA Services	Services that retrieve information across multiple VistA instances.
VSA	Provisioning	<ul style="list-style-type: none"> <li>o Add a New User from Provisioning to VistA</li> <li>o Update a user (identity) from Provisioning to VistA</li> <li>o Provision/DeProvision user from VistA</li> <li>o Communicate user changes from VistA back to Provisioning</li> </ul>
VSA	VistA SA Wizard / Utility	Developer's tool used to generate services that enable an application to use Legacy VistA Business Capabilities

Project	Service	Description
VSA	VistA SOA Service Proxies	Software written to make VistA accessible to services and applications that do not use the MUMPS language directly.

The following table briefly highlights a recurring technical problem and a mapping to published Enterprise Design Patterns (Appendix D Reference 2). The related guidance includes ESS service design guidelines and other references including VA Handbook 6500.

**Summary of Recurring Problems and Mapping to Design Patterns and Related Guidance**

Recurring ESS Problems	Enterprise Design Pattern	Related Guidance
<ol style="list-style-type: none"> <li>1. Information sensitivity</li> <li>2. Identity propagation</li> <li>3. Access control and auditing</li> <li>4. Non-person entities (NPE)</li> <li>5. Mobile security</li> </ol>	Authentication, Authorization, and Audit (AA&A)	ESS Security Model; VA Handbook 6500; ESS Exception Handling Guide
<ol style="list-style-type: none"> <li>1. Establishing ITIL processes, including Asset Management</li> <li>2. Vulnerability scanning and removal of unauthorized software</li> <li>3. Establishing an enterprise Configuration Management Database</li> </ol>	IT Service Management (ITSM)	Federal Information System Controls Audit Manual (FISCAM), Enterprise Management Framework
<ol style="list-style-type: none"> <li>1. Virtual data access using authoritative information services</li> <li>2. Future-state implementation of a VA “data lake” for authoritative data sources</li> </ol>	Hybrid Data Access	VA Data Architecture (CDM, ELDM, etc.); Authoritative Data Sources
<ol style="list-style-type: none"> <li>1. Enterprise mobility strategy and infrastructure platforms</li> <li>2. Mobile application governance</li> <li>3. Bring Your Own Device (BYOD)</li> <li>4. Veteran-facing and staff-facing apps</li> </ol>	Mobile Architecture	Mobile Application Reference Architecture (MARA), Federal CIO Mobile Security Reference Architecture

Recurring ESS Problems	Enterprise Design Pattern	Related Guidance
<ol style="list-style-type: none"> <li>1. Tracking application performance using enterprise-wide system monitoring</li> <li>2. Establishment of key performance indicators early in the project lifecycle</li> </ol>	End-to-End APM	ESS service monitoring guidance, including high availability and disaster recovery
<ol style="list-style-type: none"> <li>1. Use of enterprise middleware capabilities for both asynchronous and synchronous messaging</li> </ol>	Enterprise Message Exchange	ESS Message Exchange Guide
<ol style="list-style-type: none"> <li>1. Design of application User Interface and User Interaction Capabilities</li> <li>2. Need for consistent set of portals and application development frameworks</li> </ol>	UI Capabilities	VA ETA SOA Layer Implementation Guide, Section 2
<ol style="list-style-type: none"> <li>1. Flexibility and elasticity of devices, services, and staffing</li> <li>2. Enterprise cloud broker</li> <li>3. Cloud-native development and operations</li> </ol>	Cloud Computing and Infrastructure (TBD at this time)	VA Directive 6517