Service Oriented Architecture (SOA)
Overview of iEHR Platform Deployment Activities

Status briefing dated: May 1st, 2013
by Dr. Patrick Pearcy, Ph.D.
Overview

- Service Oriented Architecture (SOA) Suite Informational Brief
  - Mission, Scope and Objectives
  - Schedule
  - Approach
  - What does this mean for DoD/MHS and Service Operations?

“The enterprise service bus serves as “the heart of the iEHR” and is a messaging platform that allows the data and the applications to communicate with each other.”

—Honorable Roger Baker, VA Assistant Secretary for Information and Technology

“I would add that the fundamental agreement that we made -- probably two years ago…. taking a service-oriented approach, again, data-driven, the utilization -- for those of you who live in the technology space -- of an enterprise service bus that enables us to, I'll just say, move data to the places that it needs to be, again, in a standard way…. So I think all those things are -- it’s important to reiterate that the approach we're taking really remains fundamentally consistent.”

—Ms. Beth McGrath, DoD Deputy Chief Management Officer
Mission, Scope, Objectives
Delivery of Seamless Health Care and Benefits

VA/DoD Disparate Healthcare Systems

Integrated Electronic HealthCare Record (iEHR)

- Integration of EHR systems will enhance care continuity as military personnel transition from DoD to VA healthcare and between VA healthcare facilities.
- Securing data exchange between Healthcare Stakeholders: Location-independence, trusted content delivered over a TBD “portal”
- Interoperable infrastructure will create a foundation for future VA/DoD initiatives in medical record, pharmacy and other health support systems.

- Network-centric: IT infrastructure layer enhances service delivery & security
- Network Awareness: Product/Service registration & Service Administration process enables “SmartRouting”, enhances network to deliver the “right data, right users”
- Building Consumer-centric information sharing model: Content producers “provide-to-cloud” ONCE & users “consume-from-cloud”, MANY TIMES enabling content re-use with no code modifications at source

Incomplete Information Sharing
- Lack of Agility to Adapt to Dynamic Situations
- Costs to Deploy New Interfaces and Applications is too High
- Timely Access to Common Data is Lacking
- Lacks Tools to Support Performance Based Operation
- Costly point to point communications
- Difficult to discover relevant records

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Note: DoD and VA functionality depicted within this slide is “Notional” and representational only
iEHR “To Be” Architecture: Enterprise Service Bus

Scope of Capability

- The goal of this project is to acquire and implement a Commercial-Off-The-Shelf (COTS) product that provides Service Oriented Architecture (SOA) enabling capabilities. An integral component of this SOA Suite is an Enterprise Service Bus (ESB). The IBM WebSphere Message Broker was selected as the core product.

- The SOA Suite will be used by the Department of Defense (DoD) and Department of Veterans Affairs (VA) to facilitate the delivery and use of services by both Departments in support of the integrated health record. It provides the ‘transport’ for the messages both between and among the DoD Military Health System (MHS), the VA Electronic Health Records (EHR) and associated information management systems in a standards based, secure and reliable manner.

- The SOA Suite facilitates the development of business process-based common services, promotes system interoperability (internal and external), provides enterprise application integration and improves existing application integration.

- The SOA Suite Team is responsible for the design, build, configure, and test the SOA Suite in support of the iEHR requirements for iEHR Platform deployment. The Team is also responsible for deployment and sustainment of the software solution within the DoD and VA enterprise, sandboxes, and Development & Test Environment (DTE).

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The SOA Suite Team is responsible for:

- The design, build, configure, and testing of the SOA Suite in support of the iEHR requirements for iEHR Platform deployment. The Team is also responsible for deployment of the software solution within the DoD and VA enterprise, sandboxes, and Development & Test Environment (DTE).
- Providing information assurance (IA) design, documentation and configuration of the SOA Suite components so that an authority to operate (ATO) is achieved prior to iEHR Platform deployment.
- Integration support to include software development kits (SDKs) and integration support for developed services. Additionally, responsible for the promotion (i.e., connection to) of applications (services) to the ESB that are developed by various teams/vendors/suppliers after a SOA certification process.
- SOA Suite Team responsible for sustainment of the solution to include Tier 3 help desk services, capacity planning and management, system updates and migration, and break-fix support.
- Working with government test work-streams, and to provide the environment for system integration testing of SOA Suite components to include development integration testing, Government led testing, and reporting of results.
- Provide training and training materials (plan, instructor guides, student briefing/manuals) to SOA Suite system administrators, database administrators, help desk support, and service developers/integrators/testers.

The SOA Suite Team is currently focused on the iEHR platform deployment.
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SOA Scope

The SOA Suite will provide a set of infrastructure components enabling the development, deployment and management of SOA services in support of a logical SOA infrastructure. DoD/VA have identified 376 requirements, highly desirable or desirable features that the SOA Suite must meet. In addition, there are 15 capabilities that the SOA Suite must provide:

- **Option 1** - Initial capabilities rolled out as SOA Suite is implemented:
  - Messaging
  - Performance Monitoring
  - Service Registry/Discovery
  - Data/Messaging Transformation
  - Security
  - Rules Engine
  - Quality of Service
  - SOA Governance

- **Option 2** - Additional capabilities implemented to enterprise as SOA matures:
  - Orchestration
  - Mediation
  - Process Monitoring
  - Choreography
  - Protocol Conversions
  - Business Process Management
  - Business Activity Monitoring
SOA Suite Sandboxes

The SOA Suite Program maintains two Sandboxes to allow VA/DoD product developers and other approved users an opportunity to develop trial integrations with the SOA Suite. The Government Sandbox is in the Pacific-Joint Information Technology Center (P-JITC) in Maui, HI, and the Contractor or “Commercial” Sandbox is in Harris facilities in Melbourne, FL.
Sandbox Access Queue (as of 05/01/2013)

**MLB Contractor Sandbox**

- **CBX1**
  - Deloitte IPO Governance IPO Support
  - POC: Daniel LeGare (Stratitia) 321-549-0220

- **CBX2**
  - SystemsMadeSimple
  - POC: Peter Arrubla (Harris) 321-914-1430

- **CBX3**
  - SRA, DRC, BGS, VRM, CPS, SAIC
  - POC: Daniel LeGare (Stratitia) 321-549-0220

**P-JITC Government Sandbox**

- **GBX1**
  - IBO
  - Technology Refresh

- **GBX2**
  - Deploy April 1-15. TAPS
  - Technology Refresh

- **GBX3**
  - Deploy April 12-26. OSEHRA
  - Technology Refresh

Note: Sandbox access requires six (6) business days for access approvals and to schedule sandbox access. On-boarding will take 3-7 business days depending on how many users request access and resources availability at the sandbox.
Sandbox Status (Projects) (As of 05/01/2013)

- **CBX1 (On Board)**: Internal SOA/ESB projects. (1) Deloitte, (2) IPO Governance, (3) IPO Support (7 users); will be migrating to GBX3 in May
- **CBX2 (On Board)**: (1) Systems Made Simple (SMS) Awarded iEHR Systems Integration contract October 2012. iEHR Project Members have returned paperwork, Accounts and VM’s configured (18 Team Members). 3 Additional SMS members on-boarded
- **CBX3 (On Board)** (3 projects): (1) Complete Professional Services – CPS. (2) Veterans Relationship Management (VRM) team being lead out of the Product Engineering Group. VRM objectives to (a) provide Call Centers and develop web services. (b) VRM will be developing demographics and contact information services – enterprise-wide. (3) Benefits Gateway Services (BGS) team being directed out ASD. (a) Independently evaluating ESB/SOA and R/R and XML Gateway solutions. (b) BGS product developers desire to learn and test drive the WebSphere Service Registry and Repository (WSRR), WMB, Layer 7 and Repository in the sandbox. (c) BGS is pivotal for Benefits transformation
- **GBX1 (On Board)**: iEHR Business Process Optimization (iBO). (a) Research Initiative for iEHR Business Process Optimization (iBO), Legacy Migrations, Service Oriented Architecture (SOA) / Enterprise Service Bus (ESB), Transition Activity Processes. (b) Research and recommend the optimal approach, feasible schedule and dependencies for the government on deployment strategies to implement the new architecture of services/applications in a virtual SOA environment. (c) Demonstrate the performance metrics of embedded messaging services within a hierarchy of data or logic calls from a higher level or external ESB/CSB. (28 Team Members)
- **GBX2 (April 2013)**: MHS Transition Application Plan Support (TAPS). MHS TAPS is a research project that will examine how to (a) carefully extract and expose the core elements of CHCS and (b) migrate both data and business logic with the least impact on continued functionality and operation of the current CHCS environment during the transition toward the new architectural vision of the iEHR (15 Team Members)
- **GBX3 (May 2013)**: OSEHRA. OSEHRA Director of Architecture Peter Li is initial client user submitted for P-JITC access. OSEHRA is a testing and certification organization interested in testing VistA, CHCS and ALHTA Healthcare applications and interfaces via the SOA Suite in Government sandbox. Will be off-boarding in May
Epic User Story High-Level Capability for – Messaging

- As an IT Services Provider, I need to manage standards-based data messaging to enable iEHR sharing and flexibility between the DoD or VA networks, so that I will enable joint common services of clinical providers and administration services.

Notional, pending architectural direction from IPO.
Epic User Story High-Level Capability for – Data Transformation

- As an Application Developer, I need to have tools that support common messaging standards and HL7 data transformation, to maintain interoperability and business needs flexibility between the MHS and VA systems, at regional and local levels.
Objectives

- SOA Suite (DoD/VA) contract award: January 13th. 2012
- SOA Suite (DoD/VA) contract re-award: March 20th 2012
- Milestones:
  - April 19th. / 30 Days After Contract Award (DACA) : Contractor Sandbox Established
  - June 29th. / 100 DACA : Interim Report, Exercise Option 1
  - July 30th. / 60 DACA : Government Sandbox Established at JITC
  - Sept 17th. / 180 DACA : Final Post-Demonstration and Evaluation Report
  - Mar 17th. / 365 DACA : Implement SOA Suite at DoD sites located at Hampton Roads and San Antonio; iEHR Platform Deployment (Formerly Known as Initial Operating Capability (IOC))
  - Sept 19th. / 545 DACA : Continue implementation of SOA Suite at VA sites located at Hampton Roads and San Antonio; bring all sites up to production ready status.
- Continue the enterprise deployment at Regional, and Local DoD/VA facilities; Full Operational Capability (FOC)
Schedule

After less than one year (on-time and within budget), the SOA Suite project team has completed the design, testing, engineering demonstration (i.e. Proof of concept), security certification and accreditation and is in the process of deploying the solution for use!
SOA Suite 5 Year High-Level Events

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SOA Suite Active Timeline

- **Site Registration @ 1st 3 sites**
- **Deployment Checkout @ 1st 3 sites**
- **VA ATO**
- **DECC SATX installed**
- **DECC SATX production ready**
- **HVAMC & STVHCS installed**
- **HVAMC & STVHCS production ready**
- **Option commence**
- **SOA Suite Overview Webinar materials ready**
- **Helpdesk Support ILT materials ready**
- **Developer and Tester ILT materials ready**
- **Integrator ILT materials ready**
- **Access to MHS HD**
- **System maintenance ready for checkout**
- **SD ready for checkout**
- **Ops Switchover**
- **VA NSD Service Development Complete**
- **Capacity mgmt/sys mon ready for checkout**

**Legend:**
- = Open action
- = Complete action
= Date has changed in the last week

**Last updated:** 04/30/13
Near Term Option 1 Critical Path

Explanations:
1. Expect 60 day acquisition cycle started on 04/22/13 by funding approval.
2. The process to get these sites installed is still being defined by the VA; the schedule shown here is based on what happened for the DOD sites and is subject to change.

Option 1 Platform Deployment 03/15/13

Last updated: 04/20/13
Approach
**Current Conceptual Architecture – Local to Regional Communications**

**Layer 7**
- Having local Layer 7 gateways allows for policy enforcement of local servers without having to route to the region.
- Layer 7 SSG provides encryption for Web services
- Regional Layer 7 SSG provides authorization and access control for regional services
- Local Layer 7 SSG provides authorization and access control for local services

**Mirth**
- Having it locally enables message queuing (caching) at facilities in low/no-communication scenarios.
- Local traffic can stay local instead of traversing the network to be routed by the regional SOA Suite. This reduces WAN traffic.
- Transformations and other tasks can be performed locally to offload work from the regions.
- It can filter invalid (e.g. error checking etc..) messages before they reach the region.

Note: DoD and VA functionality depicted within this slide is “Notional” and representational only
Architecture – OV-1 iEHR Platform Deployment for March 15th DoD Sites

Note: DoD and VA functionality depicted within this slide is “Notional” and representational only.

[Diagram of DOA MAAG Site: NMC Portsmouth and DOA MAAG Site: MESA San Antonio]

- **DoD MAAG Site: NMC Portsmouth**
  - Math + 0.0.7 Cluster of 5 VM servers, 4 VCPUs, 3 GB VRAM.
  - Load Balancer: Private, LB1, 500G, 100GVRAM.

- **DoD MAAG Site: MESA San Antonio**
  - Math + 0.0.7 Cluster of 5 VM servers, 4 VCPUs, 3 GB VRAM.
  - Load Balancer: Private, LB1, 500G, 100GVRAM.

[Diagram of DISA Montgomery (MGM)]

- **Domain: Health.Mil**
  - IBM WebSphere Application Server 7.0.0.1.1 (2 servers, 4 VCPUs, 16 GB VRAM).
  - IBM WebSphere Business Manager V7.0.0.1.1 (2 servers, 4 VCPUs, 16 GB VRAM).
  - IBM WebSphere Portal Server Advanced V7.0.0.1.1 (2 VM servers, 4 VCPUs, 32 GB VRAM).

[Diagram of MHS NIPRNET / VPN Cloud]

- VLAN ID = 100 (TRA)
  - Subnet: 192.168.1.0/24 (120 sites)

- VLAN ID = 200 (TRA)
  - Subnet: 192.168.2.0/24 (120 sites)

- VLAN ID = 300 (TRA)
  - Subnet: 192.168.3.0/24 (120 sites)

Note: If requirement for Layer 2 extension, then VLAN IDs need to be unique per location.

System outlined in box above should be VMware Clustered on separate physical blades and RAID 9+0 and SAN capable of 74,000 IOPS for 99.999% availability and performance support to be possible.
Architecture – OV-1 iEHR Platform Deployment for Post-March 15th VA Sites (Notional)
Where should SOA Suite nodes be deployed?

- Goal is to maximize the user experience
  - User perception of response time <0.75ms 95% of the time (near instantaneous)
  - Unforeseen remote EMR response within 30 seconds

- This is accomplished by minimizing latency between the SOA Suite node and services performing as data producers and consumers (e.g. services and applications)

- SOA Suite region nodes should be deployed where producer/consumer services are concentrated (e.g. AITC)

- Initial threshold is 30 milliseconds for round-trip communications between the SOA Suite node and producer/consumer services. Metrics collected after initial deployment may alter this threshold

- Initial plan is to deploy SOA Suite Region nodes at DoD and VA regional data centers to align with concentration of producer/consumer services
Notional User Transaction

Total Transaction Latency: .961 seconds

To be validated:
1. Portal processing time
2. DMDC look up time
3. CHCS retrieve time
4. Network Latency

Validated:
1. Local ESB processing time
2. Regional ESB processing time

*Please see next slide for explanation of communication flows
### Notional Transaction with Latency Budget

#### Total Transaction Time (Lookup)

- **Initiate lookup request:**
  - 125ms: Portal processing for lookup
  - 30ms: Network portal to local ESB
  - <1ms: Local ESB processing
  - 30ms: Network local to regional
  - <1ms: Regional ESB processing
  - 45ms: Network regional to DMDC
  - 125ms: DMDC processing
  - 45ms: Network DMDC to regional
  - <1ms: Regional ESB processing
  - 30ms: Network regional to local
  - <1ms: Local ESB processing
  - 30ms: Network local to portal

- **Lookup request complete:** 464ms

#### Total Transaction Time (Retrieve)

- **Initiate retrieve request:**
  - 125ms: Portal processing for retrieve
  - 30ms: Network portal to local ESB
  - <1ms: Local ESB processing
  - 30ms: Network local ESB to CHCS
  - 125ms: CHCS processing request
  - 30ms: Network CHCS to local ESB
  - <1ms: Local ESB processing
  - 30ms: Network local ESB to portal
  - 125ms: Portal processing for display

- **Retrieve request complete:** 497ms

**Total Transaction Retrieve/Refresh:** 961ms
System External Interfaces
SOA Network Connectivity Using MHSi and National Federated Gateway (NFG)

Description: Utilize the MHSi for communications between the DoD sites and DISA DECC. Utilize the NIPRNet Federated Gateway (NFG) when it becomes available in April 2013 for VA site connectivity to DISA DECC. When MED-COI becomes available, transition SOA/ESB to that infrastructure.

Activities Underway
The IPO Network and Security Work Group is responsible for implementing this transition state solution to support the SOA deployment in advance of the Med-COI target state. This includes a separate DISA service request and other appropriate actions. Additionally, they are responsible for identifying and coordinating additional infrastructure needs and connectivity (e.g., switches, firewalls, network protection).
End State: Use Med-COI
What Does This Mean For The Sites?
SOA Suite Local & Regionalization

Regional Node
- Bulk of the SOA Suite Components “Live” here
- Connectivity from Local Site to Primary & Secondary Region
- Virtualized Infrastructure from DISA
- Virtualized Infrastructure from VA Data Centers (for FOC)

Local Node
- Local ESB at DoD local sites provided by the Virtualized Infrastructure from AVHE (DoD)
- Small “footprint” (3 U) needed at non-regionalized VA local sites

No Impact to the End User. Minimal impact to the site.

Ready to Support DoD and VA to include:
- Accelerate the Federation of VA & DoD Clinical Health Data Status
- HDD Mapping to VA Corporate Data Warehouse
- Logically Federate Data VA Corporate Data Warehouse with Clinical Data Repository (DoD)
- Federation of Real-Time Data
- Patient access to Blue Button – Phase I
- Clinician Access to Federated Data
SOA Suite Artifacts

(as of Feb 15, 2013)

✓ Application Development Security Checklist
✓ Certification and Accreditation (C&A) Boundary Device Matrix
✓ C&A Boundary Diagram
✓ C&A Plan
✓ Concept of Operations (CONOPS)
✓ Configuration Management Compliance Plan
✓ Contingency and Business Continuity Plan
✓ Contingency Operations Plan (COP)
✓ Demonstration Plan (Including Demonstration RTM)
✓ Demonstration Report
✓ DIACAP Implementation Plan
✓ DIACAP Plan of Action and Milestones
✓ DIACAP Scorecard
✓ DIACAP Security Posture Questionnaire
✓ Executive VM Dashboard Report
✓ Final SOA Suite Sandbox Platform Requirements
✓ Government-Furnished Equipment (GFE) List
✓ Implementation Strategy (IS)
✓ Information System Core
✓ Information System Security Test Plan and Evaluation Report (STP&ER)
✓ Interface Control Document (ICD)
✓ Incident Response Plan
✓ Information Assurance Controls Validation Report
✓ Integrated Deployment Schedule
✓ Integrated Master Schedule (IMS)
✓ Integration Specification
✓ Meeting Minutes
  ✓ SOA Suite IPT
  ✓ Integrated Baseline Reviews
  ✓ In-Progress Reviews
  ✓ Weekly Sprint Reviews
✓ Ports, Protocols, and Services

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SOA Suite Artifacts (Cont’d) (as of Feb 15, 2013)

- Program Management Accountability System Documentation
  - Preliminary CDR (and associated approval)
  - iEHR Acquisition Documentation Review Worksheet
  - SOA Suite PMAS readiness checklist (3/15/2012)
  - SOA Suite Project Start EDM (3/15/2012)
  - SOA Suite – Outcome Statement (signed)
  - Suite – Project Charter (signed)
  - SOA Suite – BRD (signed)
  - IPT Charter (signed)
  - PMAS Approval Presentation (3/14/2012)
  - Near-term Critical Path
- Quality Control Plan (QCP)
- Release Package
- Security Education, Awareness, and Training
- Security Management Plan
- Security Test Plan
- Site Survey Report

- System Design Document (SDD)
- System Requirements Specification (SRS)
- SOA Suite Demonstration Installation and Configuration Plan
- SOA Suite Operations and Maintenance Plan
- SOA Suite Sandbox (Contractor Facility)
- Task Order Management Plan (TOMP)
- Test Plan and Procedures (TPP)
- Training Program Plan
- Vendor Monthly Performance Reports with supporting Subcontractor Performance reports
- Work Breakdown Structure (WBS) with Dictionary

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Questions?