Slide 1

Networking and Health Information Exchange

Unit 8
Enterprise Architecture Models

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Slide 2

Objectives

- Explain the significance of Service Oriented Architecture in networking and health information exchange networks
- Explain the value of an Enterprise Architecture in networking and health information exchange networks
- Describe key elements of various service oriented architecture platforms and infrastructure options
- Explain regional healthcare networks – policy and implementation strategies
- Explain the concept of a Nationwide Healthcare Information network

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Slide 3

Who Needs Interoperability?

EnterpriseA   EnterpriseB

● Services

Two or more groups interested in collaborating and sharing healthcare / life sciences data / information using computer systems and electronic interchange
- No assumption of any scale
  - Nations
  - Enterprises
  - Individuals
- No assumption of what is being exchanged, how it is exchanged, or why

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Slide 4

Service Oriented Architecture (SOA)

- SOA is an automation of common services.
- Ensures functional consistency across applications.
- Minimizes duplication across applications; reuse
- Messages can be either payloads in or infrastructure beneath services
- Is an accepted industry best practice.
- Many key products use SOA but do not expose interfaces.

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Slide 5

What is SOA?

- Flexible set of design principles used during the phases of system development and integration.
- SOA based architecture provides a loosely-integrated suite of services are reusable. These services function similarly to subroutines in computer programs.
- SOA becomes more important with the availability of web services.

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Slide 6

Defining SOA

- SOA interface is defined in terms of protocols and functionality.
- SOA separates functions into distinct services, accessible over a network in order to permit users to combine and reuse them in different applications.
- Data is passed in a well-defined format.
- SOA service is self-contained; makes no calls out of its service package.

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Slide 7

Understanding Services

- Services
  - perform specific tasks
  - have a well-defined interface
  - May use different implementation languages
- XML is commonly used for interfacing with SOA services.
- SOA contrasts with API approach; provides flexibility; modules can be updated or even exchanged simply

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Slide 8

SOA

- Supports
  - Integration of diverse classes of information
  - Distribution across a distributed heterogeneous research and care community
- Enables
  - Coordination of functionality between inter-enterprise information systems
  - Collaborative data processing and work flow execution
- Services
  - Can be implemented standalone fashion
  - Rapid creation of composite applications

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Slide 9

Services

- XML is typically used to structure data that is wrapped in a nearly exhaustive description-container.
- Web Services Description Language (WSDL) describes the services.
- Simple Object Application Protocol (SOAP) describes the communication protocols.

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Slide 10

Usage

- SOA permits developers to string together large chunks of functionality to build applications.
- Building an application is like taking a set of blocks, each representing a service, and stringing them together to create the application.

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Slide 11

Value Component

- SOA relies on service-orientation as its fundamental design-principle.
- A simple interface can abstract away the underlying complexity.
- Users can access independent services without knowledge of the service's platform implementation.

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Slide 12

What SOA Buys

- Can use any MPI without re-integrating
- Can painlessly integrate data from new clinical systems into a patient's health summary
- Heterogeneous systems can be accessed consistently from your installed application base
- Standards support ability to redeploy or distribute hardware and software without breaking things

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Slide 13

Requirements to Use SOA

- Interoperability between different systems as the basis for integration between applications on different platforms through a communication protocol. Messages are used across channels for communication and transfer of data.
- Create a federation of resources. Data flow is established and maintained to a federated database allowing new functionality developed to reference a common business format for each data element.

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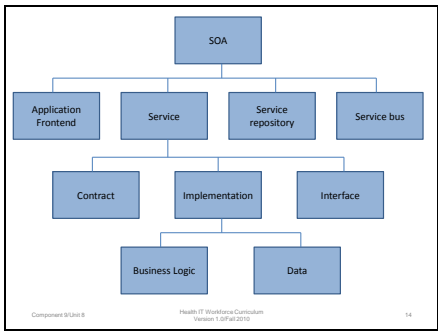
Slide 15

Guiding Principles

- Service encapsulation
- Service loose coupling
- Service contract
- Service abstraction
- Service usability
- Service composability
- Service autonomy
- Service optimization
- Service discoverability
- Service relevance

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Slide 16

Service Contract

- Header
  - Name of service
  - Version
  - Owner
  - Responsibility assignment
  - Type (presentation, process, business, data, integration)

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Slide 17

Service Contract

- Functional
  - What the service accomplishes
  - Service operations
  - How to invoke service (SOAP, event triggers)

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Slide 18

Services Contract

- Non-Functional
  - Security constraints
  - Quality of service
  - Translational
  - Service level agreement
  - Semantics
  - Process

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Slide 19

Service Contracts

At their simplest, contracts simply bind together technology to fulfill business processes.

Slide 20

Behavioral Framework
Differences Between Services, Documents, and Messages

Specification	Services	Documents	Messages
Analysis (Blueprint Conformance)	Application Role, Business Interactions, Trigger Events, Message Types are common to all Interoperability Paradigms		
Conceptual Design (Platform-Independent Conformance)	Can support multiple systems playing multiple roles exhibiting multiple behaviors. Loose Coupling between Interaction Logic, Roles, and Participations	Coarse operational behavior (previously implicit), Interfaces bound to Operational purpose of document (GetHandP ( ))	Generally considered to be point to point or hub and spoke. One participant per role, very coarse explicit operational behavior (Send (), Do ()). Focus on message structure.
Implementable Design (Platform-Specific Conformance)	Requires scalable infrastructure (rules engines, orchestration engines, service advertising and discovery patterns, WS-*), message granularity varies to support operations.	End points are information- focused, operations are atomic (few pre- and post-conditions to message events)	Supported by many Messaging engines and platforms. Highly scalable implementation and deployment pattern.

Slide 21

Enterprise Architecture (EA)

The intersection of HL7, MDA, Distributed Systems Architecture, SOA, and CSI provide a goal, the artifacts, portions of a methodology, and the framework for defining robust, durable business-oriented constructs that provide extensibility, reuse, and governance.

Slide 22

EA Specification Pattern from the 5 Viewpoints

Enterprise View: concerned with the purpose, scope and policies governing the activities of the specified system within the organization of which it is a part	Why?
Information View: concerned with the kinds of information handled by the system and constraints on the use and interpretation of that information;	What?
Computational View: concerned with the functional decomposition of the system into a set of objects that interact at interfaces – enabling system distribution;	How?
Engineering View: concerned with the infrastructure required to, and distribution of, the computing resources defined in the Computational View.	Where?
Technology View: concerned with the choice of technology to support system distribution	True?

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The Specification Constraint Pattern

Specification		Information Viewpoint		Engineering Viewpoint
Reference	Reference Artifacts, Models, Patterns, and Templates from HL7			
Analysis	Conformance Assertions that are Computationally Independent, Conceptual, Business Oriented			
Conceptual Design	Conformance Assertions that are Logically consistent, computable, verifiable			
Implementable Design	Conformance Assertions that are directly implementable, often related directly to a platform or technology			

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Slide 24

The HL7 Specification Stack

				Conformance Level
EHR-FM, Clinical Statements	BRIDG, LS DAM, HL7 ADTs	EHR-FM	-	Domain
Business Context, Reference Context	Project-oriented DIM	Dynamic Blueprint, Functional Profile(s)	N/A	Blueprint
Business Governance	CIM, LIM	Dynamic Model, Interface Specification	N/A	Logical
N/A	Transforms, Schema	Orchestration, Interface Realization	Execution Context, Specification Bindings, Deployment Model	Platform

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Slide 25

SOA vs. Web Services

	SOA	Web Services
Is a technology platform	No	Yes
Is a transport protocol	No	Yes
Primary ownership is business line owned	Yes	No
Affects workflow and business processes	Yes	No
Enables business and IT transformation	Yes	Yes
Is an industry standard	No	Yes

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Services Oriented Architecture

- We are seeing SOA appear in the design of loosely connected inter-organization HIT networks as the desired way to interconnect widely distributed systems.
- SOA is particularly attractive when no one organization owns/controls all of the applications and platforms.

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HL7 Services-Aware Enterprise Architecture Framework (SAEAF)

- Interoperability Framework for Enterprise Architecture
- Uses v3/RIM artifacts and expertise
- Supports measurable, testable conformance and compliance
- Provides directly implementable solutions

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SAEAF

- Services:
  - This is about "services enabling" HL7's Standards
- Aware:
  - This is about making our standards "aware" of both services and an Enterprise Architecture
- Enterprise Architecture:
  - When adopted and imbedded in our development methodologies, SAEAF becomes our Enterprise Architecture
- Framework:
  - This is a "framework" in which we will "place" our standards so that we can see how they relate to each other and they relate to other standards and becomes part of our users' Integration Architectures.

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Slide 29

Core Components

- Information Framework
- Behavioral Framework
- Enterprise Conformance and Compliance Framework
- Governance Framework
- Implementation Guide

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Slide 30

What Is Being Specified?

- Standards are being developed for:
  - Entity Identification (to manage and maintain identities within and across domains, localities, or products)
  - Record Location & Retrieval (to discover, retrieve, and update records in distributed environments)
  - Decision Support Services (to support evaluation processes such as clinical decision support)
  - Terminology Service (to retrieve, maintain, and navigate [clinical] terminologies and ontologies)

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Slide 31

Where Would Specifications Be Used?

- Inter-Enterprise (such as National Health Information Network, Regional Health Information Organizations)
  - By functionally specifying behavior, roles between applications and products are clarified, and the technologies supporting them can be profiled and sharpened
- Intra-Enterprise
  - Standardization on functionality allows for better integration of off-the-shelf and custom development environments, and promotes more of a "plug and play" environment
- Intra-Product
  - Facilitates vendors ability to integrate third-party value-add components and speed design phase with higher confidence
- Custom-Implementation
  - Affords organizations wishing to custom-develop the opportunity to later integrate off-the-shelf

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Services In Particular Are

- More coarsely granulated than messages are more readily traceable to business/clinical capabilities/requirements
- Specifications for a service are of the form:
  Functional Profile (collection of operations offered by a service) + Semantic Profile (static semantics utilized by operations in FP) + Conformance Profile (testable (automated or human) conformance standards against which an implementation may make pair-wise conformance assertions)
- Combination of these two points above provide a foundation for both intra- and inter-enterprise durable services interfaces.

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How Is SOA Different From Messaging?

- A common practice in healthcare, just not yet in healthcare IT
- Many key products use them but do not expose interfaces
- Ensures functional consistency across applications
- Accepted industry best practice
- Furthers authoritative sources of data
- Minimizes duplication across applications, provides reuse
- Messages can be either payloads in or infrastructure beneath services
- Service-oriented architecture provides the framework for automation of common services
- Still, SOA has to be done well. It is cheaper and easier than ever to create badly designed applications and spaghetti integration
- Fits well with Open Source

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Healthcare Service Specification Project (HSSP)

- Effort to create common "service interface specifications" tractable within Health IT
- Joint standards development project by HL7 and OMG
- Objectives:
  - To create useful, useable healthcare standards that address functions, semantics and technologies
  - To complement existing work and leverage existing standards
  - To focus on practical needs and not perfection
  - To capitalize on industry talent through community participation

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Slide 35

SAIF

S = services
A = aware
I = Interoperability
F = Framework

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