Flexible Medical Image Management Using Service-Oriented Architecture

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Digital Medical Imaging

- Image data volume is growing, it represents a large segment of the total data volume handled in Hospitals, Clinics, Health providers

- PACS (Picture Archiving and Communication System)
  - Introduced in the 1980s’
  - Support the management of Medical Images
  - Widespread in Hospitals
  - Typically support image management within a department

But …
- Integration with other systems is often not supported
- PACS upgrade is expensive and time consuming
More flexibility is needed when handling Medical Images

- **SOA – Service Oriented Architecture**
  - Holds the promise of increased flexibility in the face of changing business needs
  - For example: loose coupling among services enables smooth replacement/addition of services in an existing system

- **CMO – Content Management Offering**
  - A flexible platform for the management of Medical Images
CMO – architectural choices

- A set of fine-grained business services communicating through a Service Integration Bus (SIB) via JMS interface
- Three types of services:
  - System services
  - General-purpose services
  - Domain-specific services
- Stateless bus enables scalability
  - The bus processes messages from different services based only on the message content
  - Messages are encrypted and digitally signed
CMO – architectural choices (cont.)

- Web based administrative console
  - Monitors available CMO services
  - Supports web based hot configuration update

- No need for a separate management layer

- Service policy is a pre-defined set of values for the service parameters

- Service policy enables separation of concerns:
  - Business process logic
  - Technical details of process invocation
CMO domain-specific services support international standards

- IHE XDS-I: for exchanging Medical Images
- IHE PIX/PDQ: for resolving unique patient ID
- HL7 v2 and HL7 v3: for pre-fetch
- DICOM: for obtaining/routing Medical Images
- WADO: for providing Web access to DICOM persistent objects
- Access to Web Services
- LDAP: for user authentication
- XACML: for user authorization
- SNOMED-CT: for Medical Images annotations
Clinical Trial Sponsor: Medical Images management in a clinical trial

- The customer is a global pharma company sponsoring large-scale clinical trials that need to acquire, interpret, annotate and manage medical images
  - **DICOM In service** – handles the acquisition of Medical Images
  - **Authentication service** – verifies the identity of the hospital
  - **Transformation service** – removes identifying information
  - **SCORE service** – interfaces with SCORE system
The customer is one of the top 10 University Hospitals in the US
- It has several PACS systems distributed in different departments
- Goals: a) enable physicians access to all PACS images from the hospital’s EHR system; b) enable patients to access radiology images from the hospital’s patient portal

**WS access service** – gateway for requests coming from the Hospital’s EHR and Patient Portal

**Authentication service** – identifies the request origin

**Router service** – routes EHR requests to all PACS systems (physician policy), routes Patient Portal requests to Radiology PACS system (patient policy)

**DICOM Federation service** – interfaces with different PACS systems according to the defined policy
Discussion

- Management of Medical Images today is transitioning from the department level to the hospital/regional/national level
- This requires the integration of various systems
- Flexibility of Medical Imaging management becomes increasingly important
  - Support standards (IHE, DICOM, HL7, WS, ...)
  - Extensible architecture
Thanks!