

# *IT Infrastructure: Profiles for Health Information Exchange*

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# Affinity Domain Profiles



## Categories of Profiles

Basic XDS

Cross Community

Point-to-Point

Notification

Patient ID Management

All focus on or support Document Sharing

## XDS is Cross-Enterprise Document Sharing

Cross-Enterprise – Elements can be owned by different organizations

Document Sharing – Elements of patient record organized as 'Documents'

XDS.a - Original

XDS.b – Updated technology

## XCA – Cross Community Access

XDM – Media Interchange (email, CD, etc.)

XDR – Reliable networking

## NAV – Notification of Document Availability

# Patient ID Management

PDQ – Patient Demographics Query

PIX – Patient Identifier Cross-Referencing

# What is a Document?

## Cross-Enterprise Document Sharing

### What is a Document?

Collection of bytes

Persistent/Unchangeable

Documented Format

# What We Will Not Discuss

Document Content Format  
Security

These are covered in other talks

XDS does not define content

- ...just like your PC filesystem does not define file types
- PDF, Word, Text, JPEG files are just collections of bytes. The file type is what links the file to an application.
- XDS Content Profiles define what the bytes mean

# XDS Content Profiles

- **Content Profiles define document formats and XDS extensions for specific applications:**
  - **XDS-MS: Medical Summaries**
  - **BPPC: Basic Patient Privacy Consents**
  - **XPHR: Exchange of Personal Health Record Content**
  - **PPHP: Pre-procedure History and Physical**
  - **EDR: Emergency Department Referral**
  - **XDS-SD: Scanned Documents**
  - **XDS-Lab: Lab Reports**
  - **XDS-I: DICOM Images**

# Security is still required

## – **ATNA: Audit Trail and Node Authentication**

- Basic security functions: centralized audit trail,  
authentication of systems (not users),  
optional encryption for transport connections
- Required by IHE for all XDS implementations

# What are we defining?

IHE Profiles are NOT an architecture

It is a collection of architectural  
components

To build into new or existing systems

To aid in integration



# XDS

Cross-enterprise  
Document Sharing



- **Big Picture**
- **Transactions and Actors**
- **Metadata**
- **How it integrates with PIX/PDQ**
- **Common configurations**

- Provide support for document-based patient EHR
- Support for document storage within existing products
- Provide support for indexing of patient documents
- Support query and retrieval of patient documents
- Scalable architecture

# XDS: Big Picture

- **Points of view**
- **EHR-CR : Care-delivery Record**
  - Patient information
  - Managed by a Care Delivery Organization
- **EHR-LR : Longitudinal Record**
  - Documents shared by EHR-CR(s)
  - Tracked by Registry
- **Clinical Affinity Domain :**
  - Group of healthcare enterprises (EHR-CR)
  - Common set of policies
  - Share a single registry
- **Archival**

# XDS: Big Picture

- **Foundation for Health IT Infrastructures:** Shared Electronic Health Record, in a community, region, etc.
- **Effective means to contribute and access:** clinical documents across health enterprises.
- **Scalable sharing of documents:** between private physicians, clinics, long term care, pharmacy, acute care with different clinical IT systems.
- **Easy access:** Care providers are offered means to query and retrieve clinical documents of interest.

# XDS: Big Picture

- **Distributed:** Each Care delivery organization “publishes” clinical information for others. Actual documents may remain in the source system.
- **Cross-Enterprise:** A Registry provides an index for published documents that can be queried!
- **Document Centric:** Published clinical data is organized into “clinical documents”. using agreed standard document types (HL7-CDA/CCD, PDF, DICOM, etc.)

# XDS: Big Picture

- **Document Content Neutral:** Document content is processed only by source and consumer systems. Infrastructure is generic.
- **Standardized Registry Attributes:** Documents are described by standardized set of attributes. Standardized queries supported by all vendors.

- Document Source
- Document Repository
- Document Registry
- Document Consumer

# Document Source

- Has document to store
- Creates description (metadata) for document
- Submits

# Document Repository

- Accepts document and metadata from Document Source
- Stores document
- Forwards metadata to Document Registry
- Later, reproduces document on request (allows retrieval)

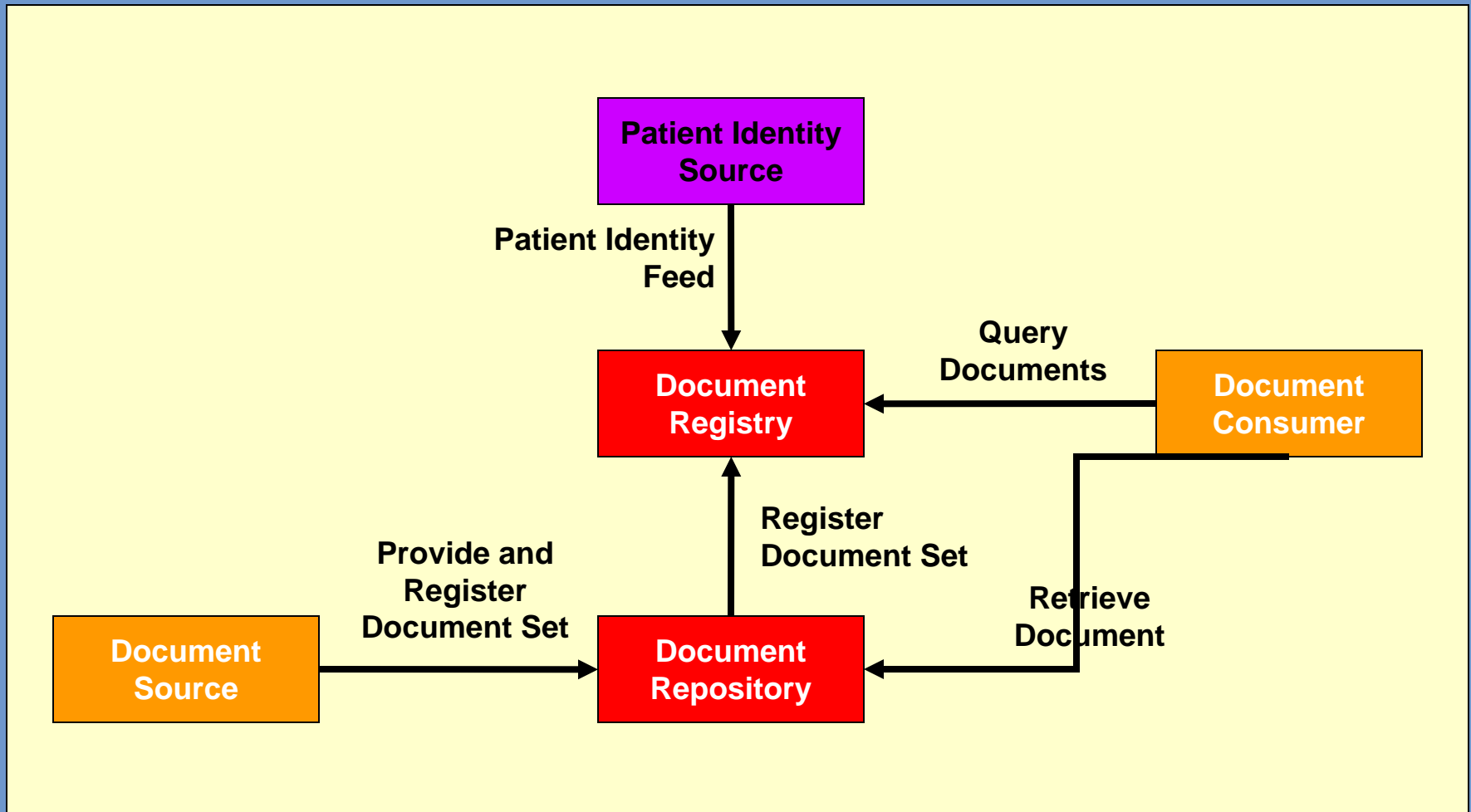
# Document Registry

- Accepts metadata from Repository
- Stored metadata
- Accepts queries about metadata
- Returns metadata matching queries

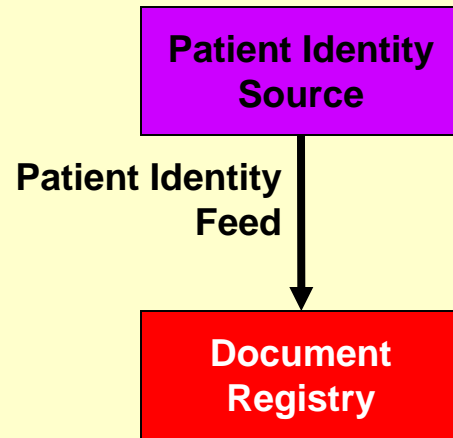
# Document Consumer

- **Generates queries to Registry**
- **Accepts metadata back from Registry**
- **Displays list of documents for user to choose from (probably)**
- **When user selects document from list, retrieves and displays document**

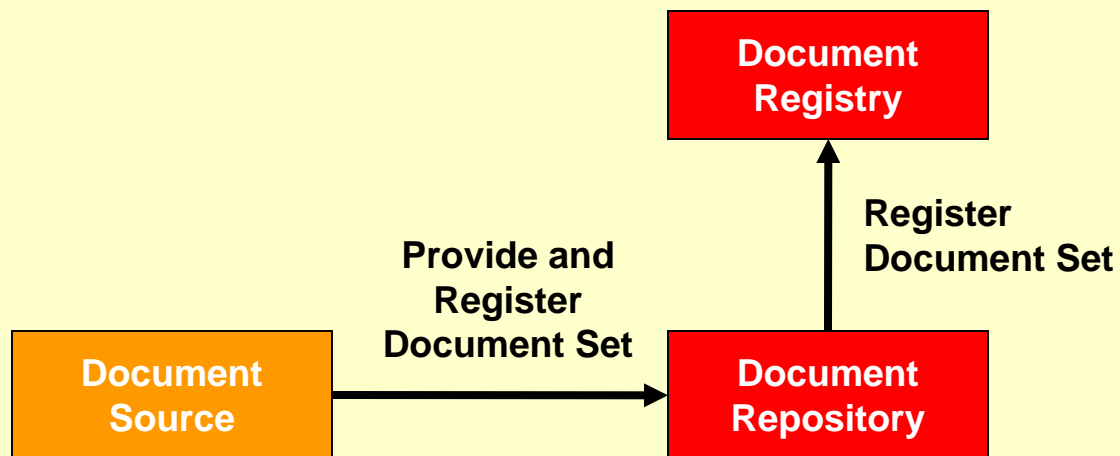
# XDS Transaction Diagram



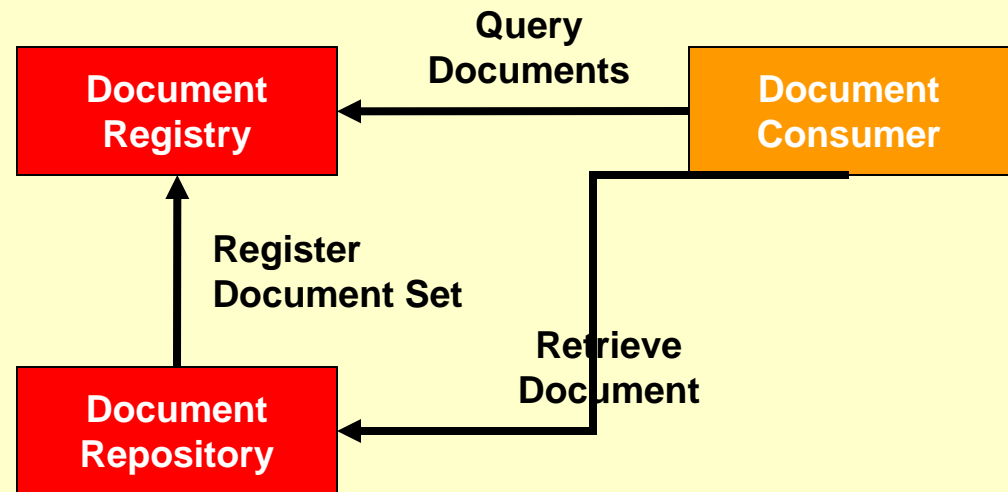
# Patient Registration



# Document Submission



# Query and Retrieve



- **Document Source**
  - Source of documents and metadata about documents
- **Document Repository**
  - Stores documents, requests indexing in Document Registry, supports retrieval
- **Document Registry**
  - Indexes documents, supports search
- **Patient Identity Source**
  - Feeds identity of known patients to Document Registry
- **Document Consumer**
  - Initiates search and retrieval for consumer of documents

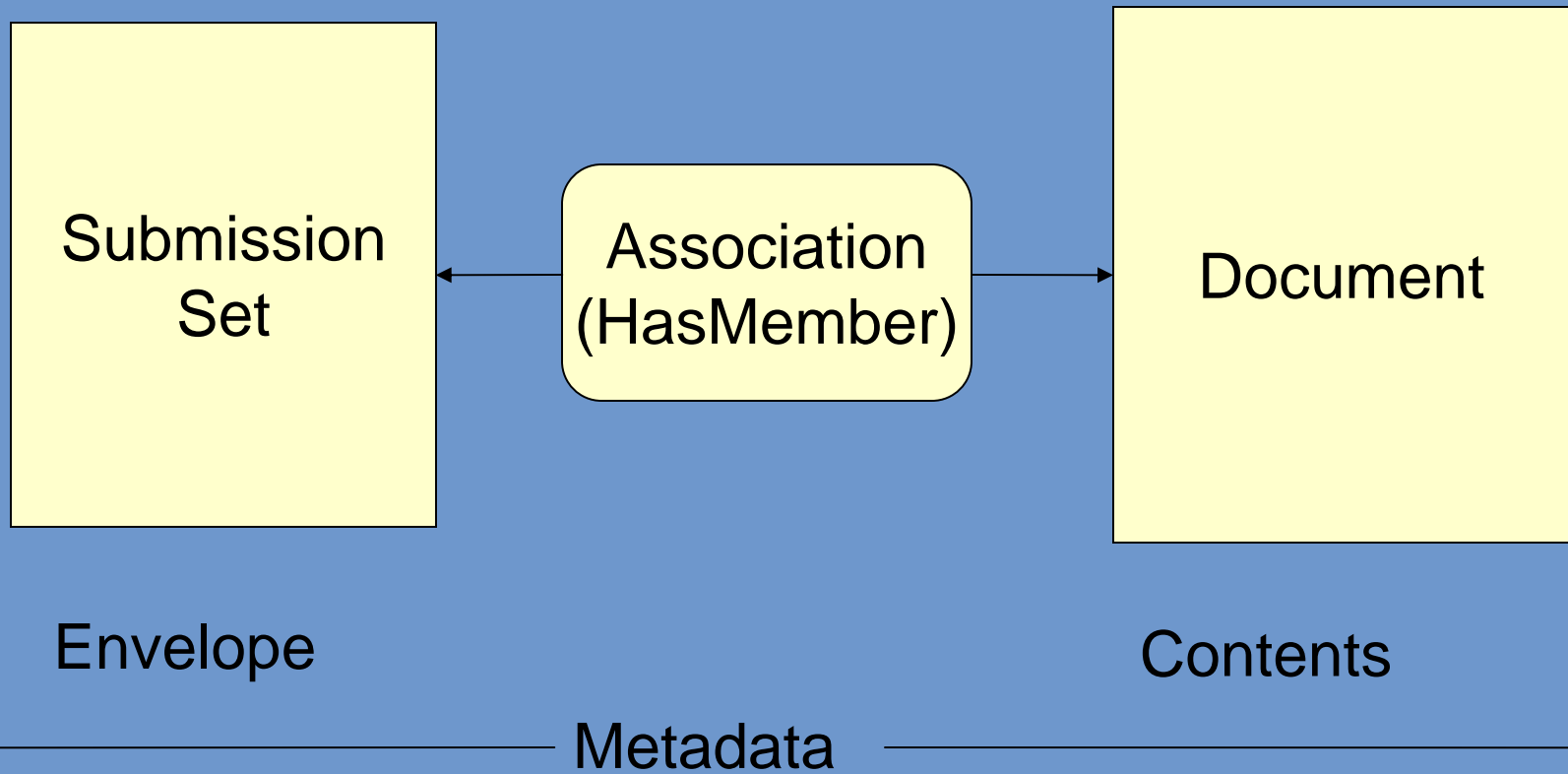
# Metadata Objects

- Metadata is data stored in the Registry
- Document - represents a real document
- Submission Set - included in all submissions to document the submitted “package”
- Folder - for grouping documents (directory metaphor)
- Association - Links other objects together

# Object Structure

- Each Metadata Object has internal structure
- ebRIM standard coding used (XML)

# Single Document Submission



# Submission Set Attributes

- **Author**
  - person, role, specialty, institution
- **Title, comments, submission time**
- **Availability Status**
  - Submitted or Approved
- **Coded elements**
  - contentType (type of clinical activity)
- **Identifiers**
  - Patient ID, Source ID, Unique ID, UUID

# Document Attributes

- **Author**
  - Person, role, specialty, institution
- **Legal Authenticator**
- **Title, comments, creation time, service start/stop time**
- **Availability Status**
  - Submitted, Approved, Deprecated
- **Identifiers**
  - Patient ID, Unique ID, UUID
- **Demographics**
  - Source Patient ID, Patient Demographics

# Document Attributes (cont)

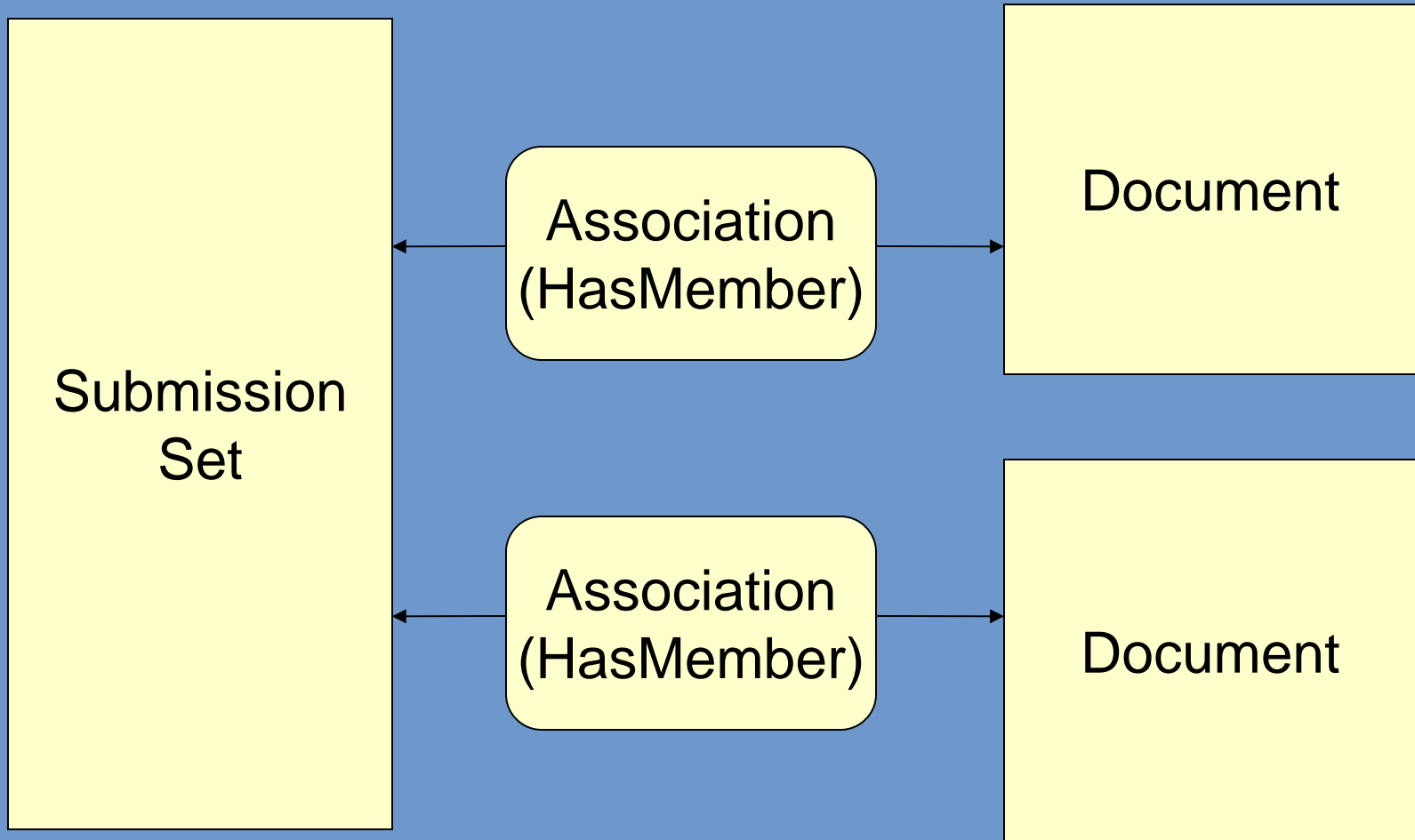
- **Coded Values**
  - **Kind of Document**
    - **Class Code** (general category)
    - **Type Code** (more detail)
  - **Event Code** (main clinical event)
  - **Healthcare Facility Type**
  - **Practice Setting Type**
  - **Confidentiality Code**
- **Technical Details**
  - **MIME Type**
  - **Format Code** (more detail)
  - **Size**
  - **Hash**
  - **URI**
  - **Language**

Document Metadata  
points to  
Document  
in Repository

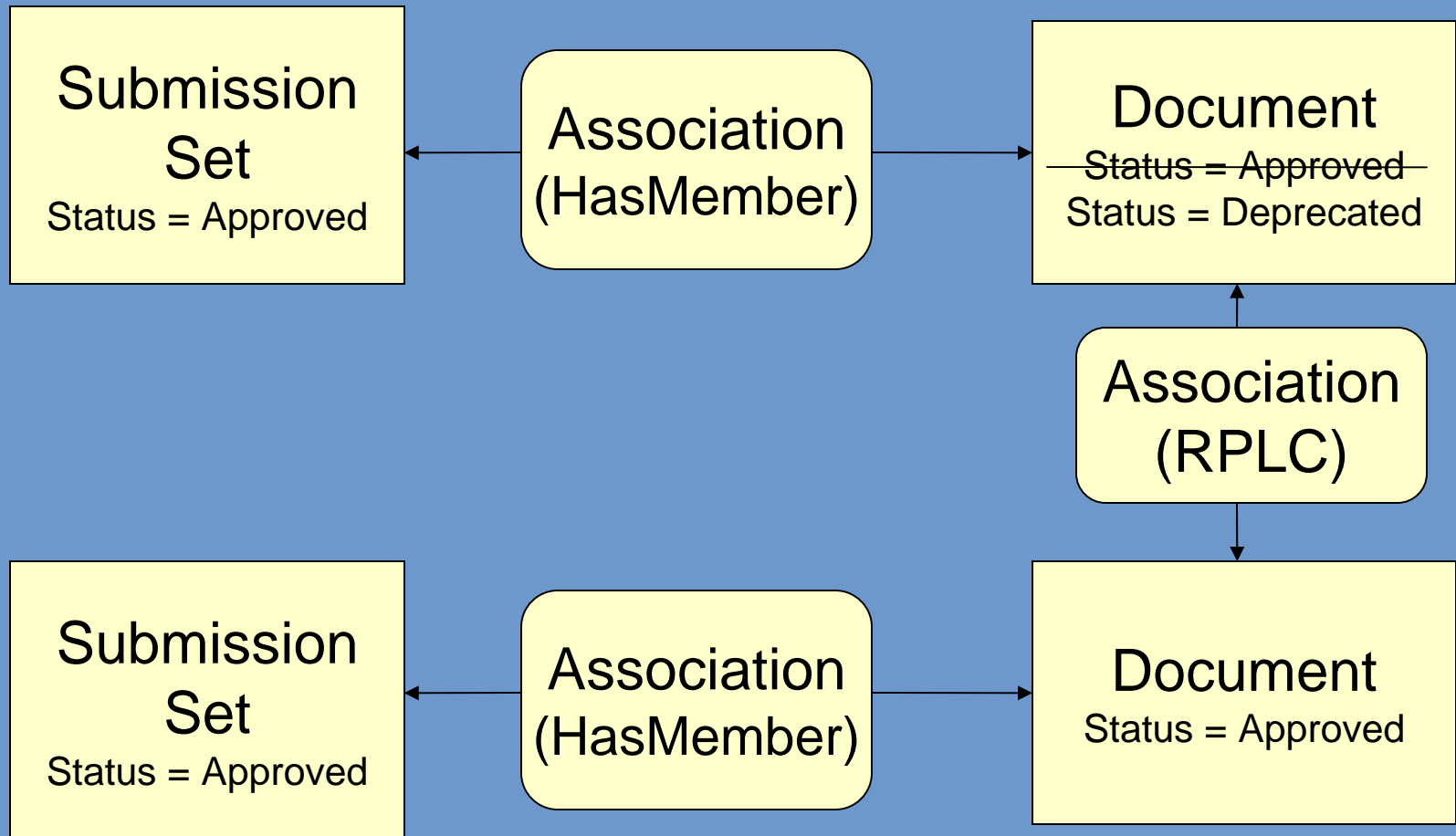
# Association Attributes

- **Type**
  - HasMember
  - RPLC (Replace)
  - APND (Appends)
  - XFRM (Transformation)
  - Signs
- **SubmissionSetStatus**
  - Original or Reference
- **Pointers**
  - sourceObject, targetObject

# Multiple Document Submission

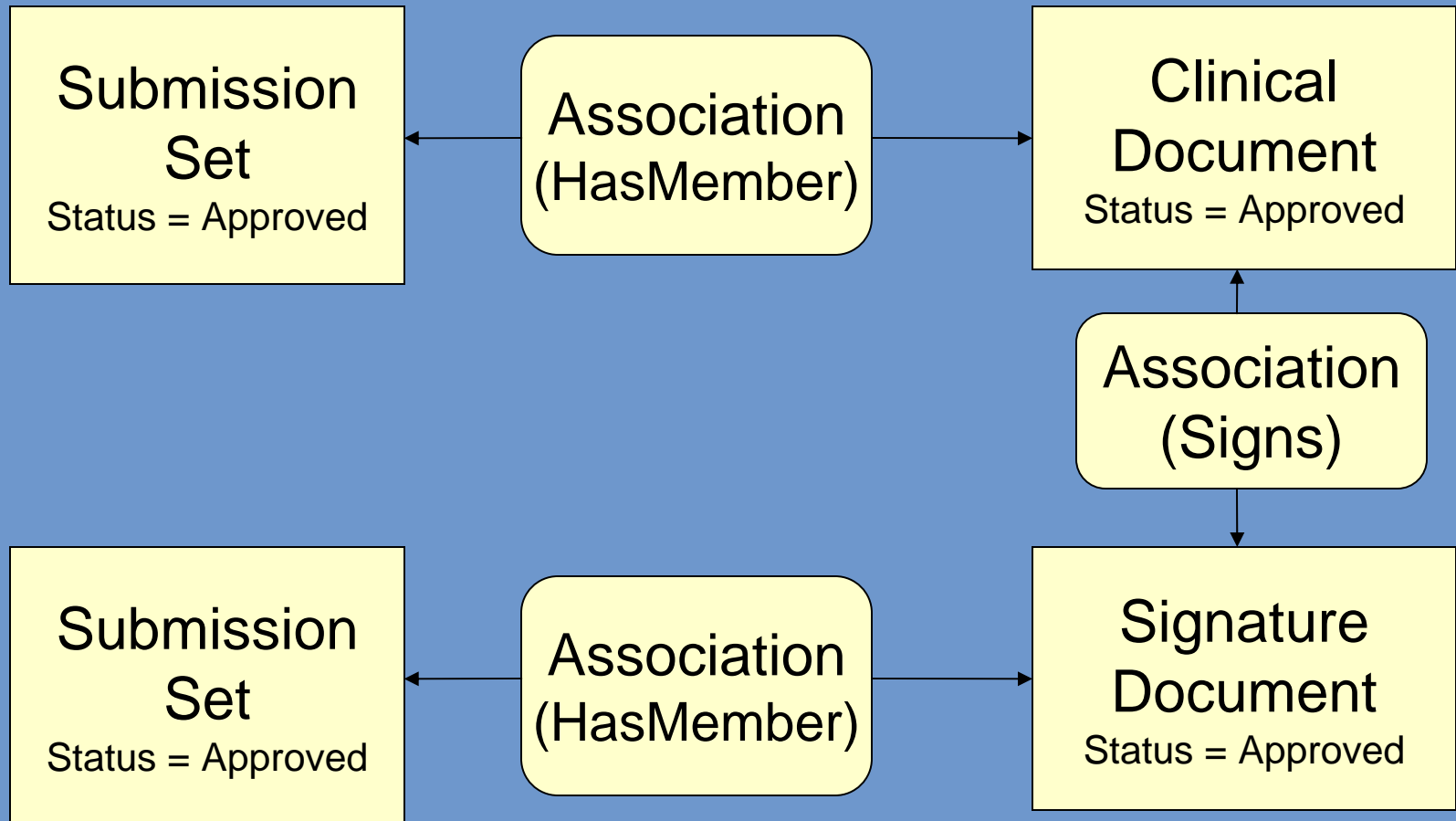


# Document Replacement

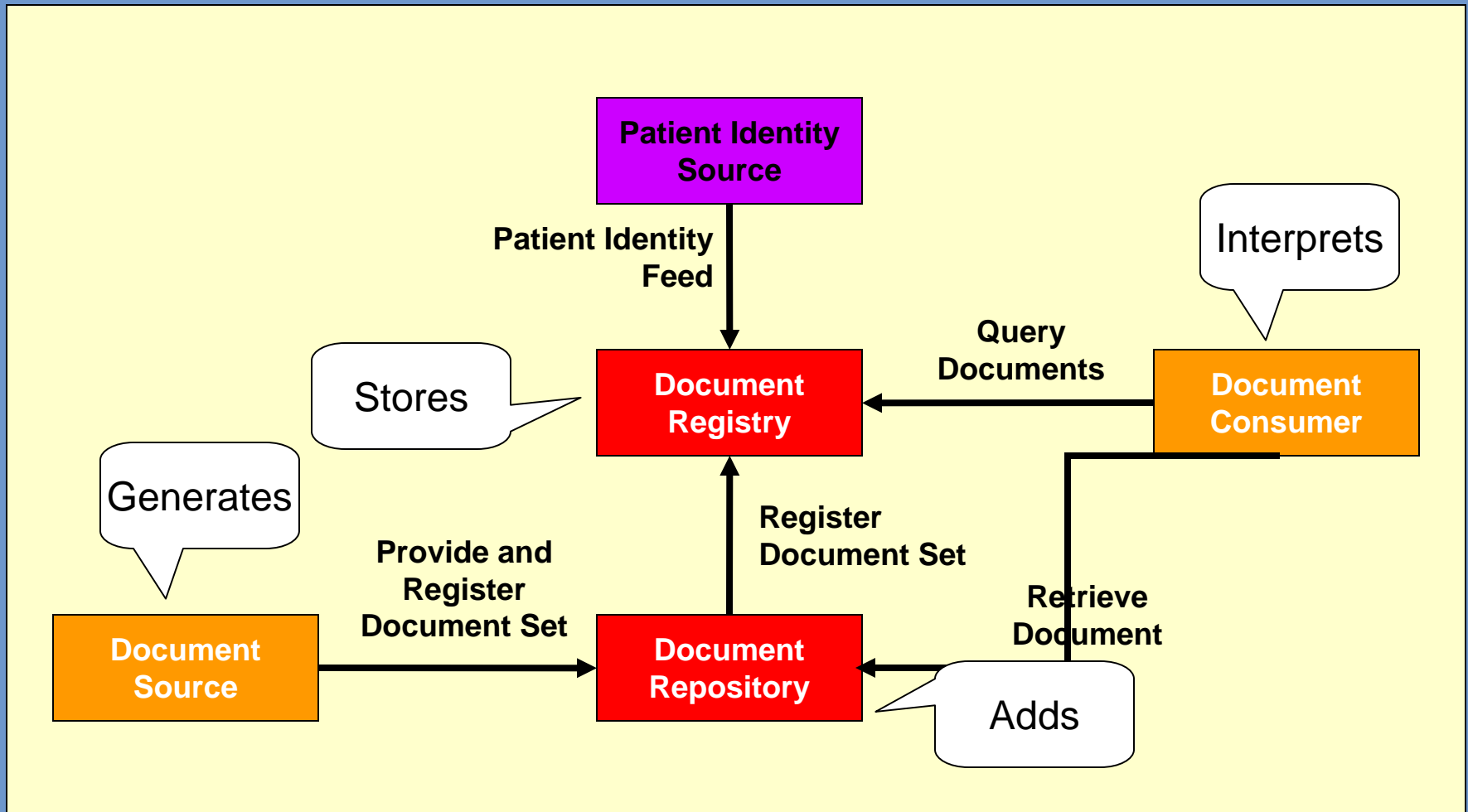


- **Clinical Document Stored in Repository**
  - Indexed in Registry
- **Digital Signature (Document) Stored in Repository**
  - Indexed in Registry
- **How is Signature “attached” to Clinical Document?**

# Digital Signature (DSG Profile)



# XDS Metadata handling



- Options center around Document Source actor
- Basic operations
- Submit single document
- Replace existing document
- Optional features
- Off-line mode
- Multi-document submission
- Document life-cycle management
  - Submit addendum or transformation of document
- Folder management
  - Create folder, add to folder

# Affinity Domain

- **Set of organizations/systems organized around a single Registry**
- **Common set of Codes**
- **Single Patient ID Domain**
- **Involves business and legal agreements**
- **Security model/agreements**



# XDS: Standards Used

## *Electronic Business Standards*

ebXML, SOAP ...

## *Internet Standards*

HTML, HTTP,  
ISO, PDF, JPEG ...

## *Healthcare Content Standards*

HL7 CDA, CEN EHRcom  
HL7, ASTM CCR  
DICOM ...

# XDS: Standards Used

- XDS Infrastructure Standards
- OASIS/ebXML
  - Registry Information Model v2.0
    - Basis of XDS Registry Information Model
  - Registry Services Specifications v2.0
    - Registry Services
  - Messaging Services Specifications v2.0
    - Offline protocols
- ISO/IEC 9075 Database Language SQL
  - Registry Query Language
- SOAP with Attachments
  - Protocol for communication with XDS Registries and Repositories
- SHA-1 [FIPS 180-1]
  - Document Hashes

# XDS: Standards Used

- **XDS Infrastructure Standards (cont)**
- **HL7 Version 2.3.1**
  - Messages for Patient Identity Management
- **HL7 Version 2.5**
  - Datatypes for XDS Registry Attribute values
- **HL7 CDA Release 1**
  - XDS Document concept definition
  - Source of XDS Document Entry Attributes
- **DICOM, ASTM CCR, HL7 CDA Release 2, CEN EHRcom**
  - Sources of XDS Document Entry Attributes

# XDS: Standards Used

- XDS Infrastructure Standards (cont)
- **HTTP**
  - Protocol for Retrieve Document
  - Online SOAP bindings
- **SMTP**
  - Offline ebMS bindings
- **IETF**
  - Language Identifiers
- **MIME**
  - Document Type codes
- **UTF-8**
  - Encoding of Registry Attributes

# XDS: Standards Used

Two “categories” of standards used

XDS Content

XDS Infrastructure

# XDS Content Profiles

- **Outside scope of XDS; layer on top of XDS**
- **Content Profiles**
  - Document use cases and translation of document content into registry metadata
  - Publishable separately
  - Generated (mostly) by other committees (PCC, Radiology, Lab etc)
- **Of concern only to Document Source and Document Consumer actors**
- **Base standards for Content Profiles include: HL7 CDA, DICOM, ASTM CCR**

# XDS

Query Catalog  
supported by Stored Query



- **Defines a collection of queries**
  - Name
  - Function/purpose they serve
  - Parameters they accept
- **Must be supported by all XDS Registries!**

- **Primary queries**
  - Based on Patient ID
- **Secondary queries**
  - Based on registry identifiers

- **FindDocuments**
  - Find documents for a patient
- **FindSubmissionSets**
  - Find submission sets for a patient
- **GetAll**
  - Get everything known about a patient
- Each have parameters to restrict documents 'found'

# Secondary Queries

- **GetDocuments**
  - Given the ids of the documents
- **GetFolders**
  - Given the ids of the folders
- **GetAssociations**
  - Related to a given document/folder/submission set

# Secondary Queries (cont)

- **GetDocumentsAndAssociations**
  - Combines GetDocuments and GetAssociations queries
- **GetSubmissionSets**
  - For a collection of documents and/or folders
- **GetSubmissionSetAndContents**
  - Given the id of the submission set, return its contents

# Secondary Queries (cont)

- **GetFolderAndContents**
  - Given the id of a folder return the folder and its contents
- **GetFoldersForDocument**
  - Given the id of a document return all folders that 'contain' the document
- **GetRelatedDocuments**
  - Given the id of a document return all documents that are related to the document through an association

## XDS.a

- Older standards
- Registry (ebRIM/ebRS 2.1)
- Web Services (SOAP w Attachments)
- Most transactions are WS
- HTTP Retrieve

## XDS.b

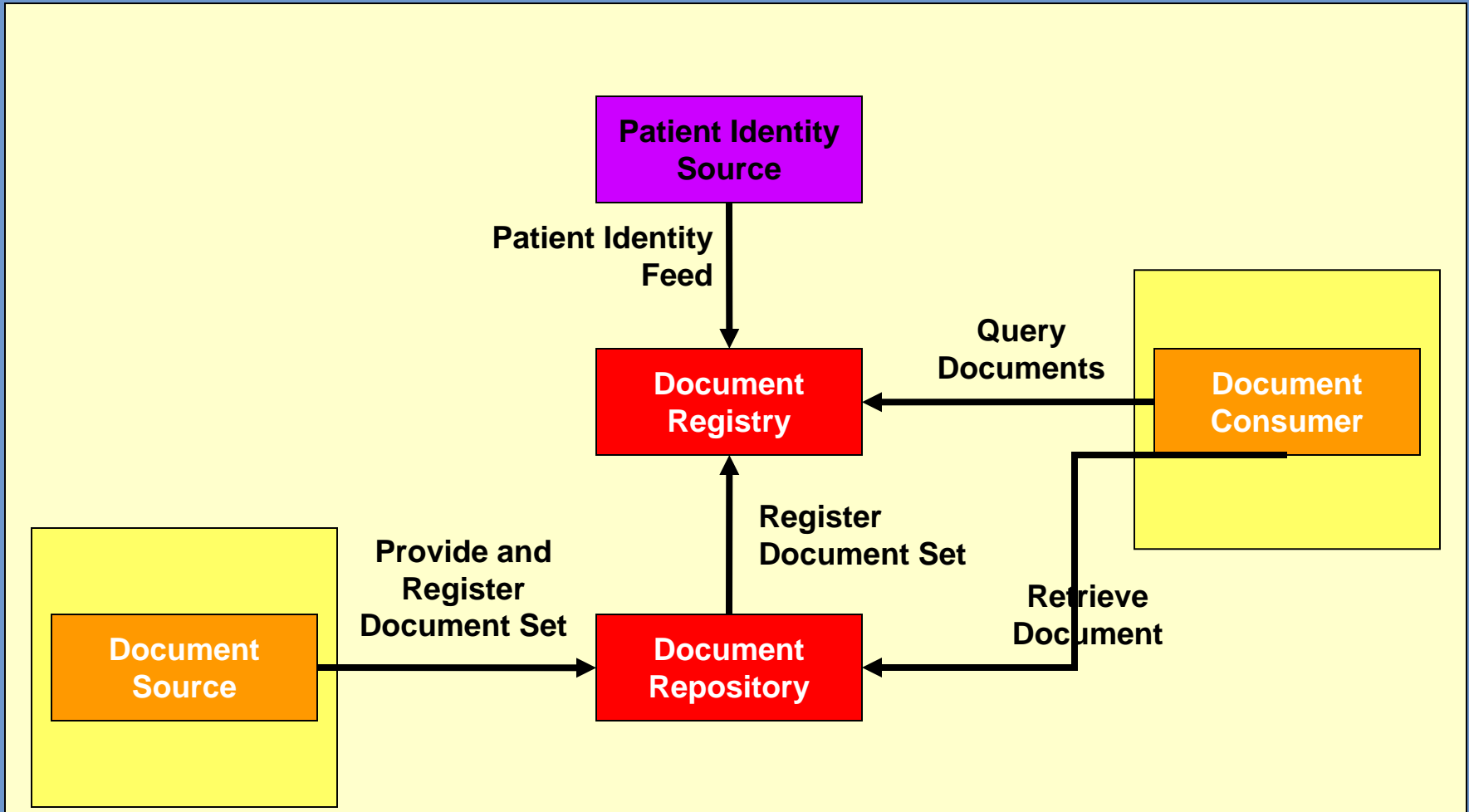
- Newer Standards
- Registry (ebRIM/ebRS 3.0)
- Web Services (Addressing, MTOM/XOP)
- All transactions are WS
- WS Retrieve

# XDS Configurations

Understanding how  
the actors work together



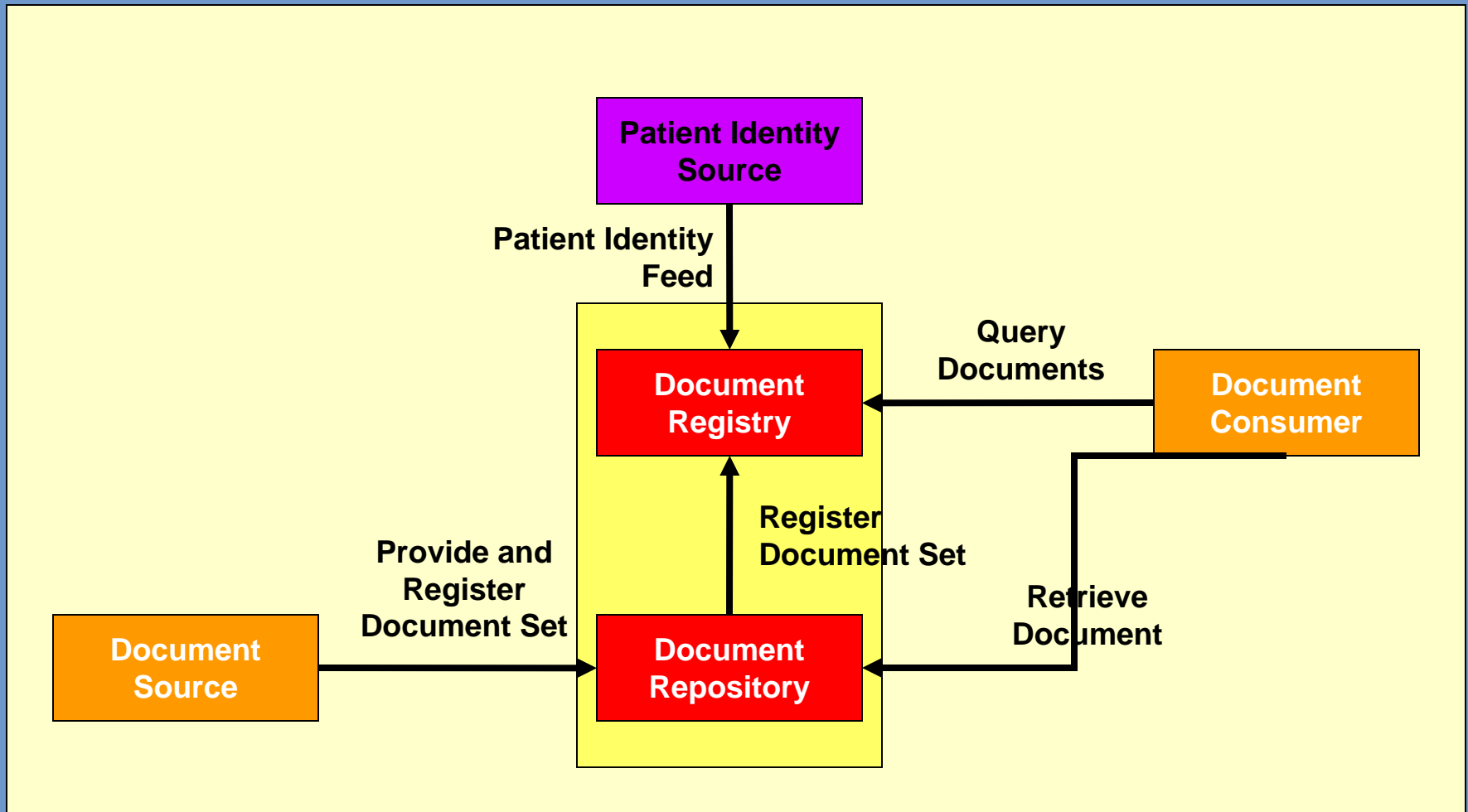
# XDS Transaction Diagram



# Source/Consumer Grouping

- A single 'workstation' that can submit and access content.

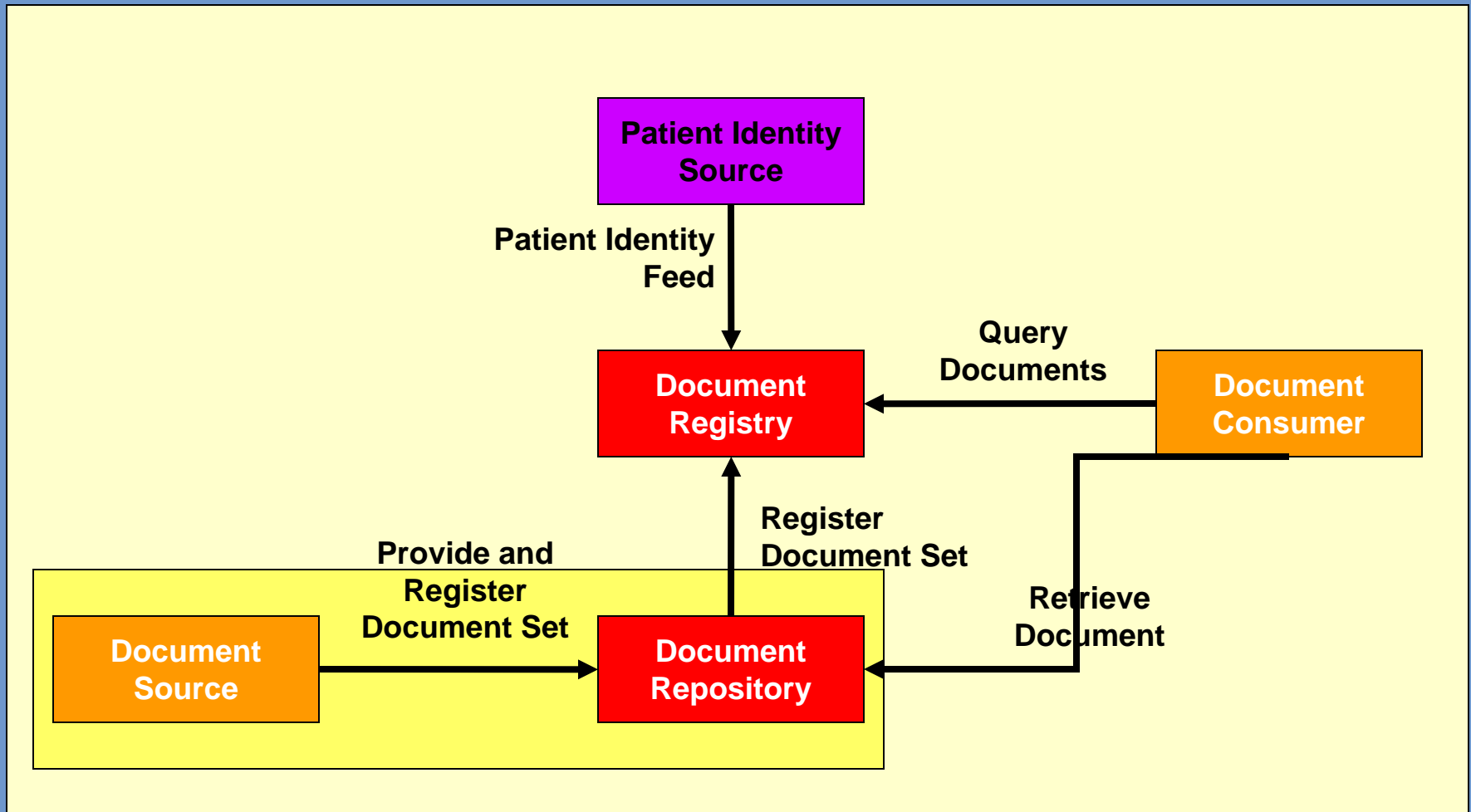
# XDS Transaction Diagram



# Registry/Repository Grouping

- Affinity Domain could offer a central Repository along with Registry to serve facilities that do not have local Repository.

# XDS Transaction Diagram



# Source/Repository Grouping

A source of documents could be an existing EHR which

- Registers documents in Registry
- Allows document retrieval via Retrieve Document transaction
- Stores information internally in non-document formats
- Must manage document persistence

# What is a Document?

- **Content/Documents have 3 formats:**
  - Storage
  - Transfer/interface
  - Display
- **XDS constrains the transfer/interface through Content Profiles**
  - Use of IHE published Content Profiles is a local choice. It is not required by XDS.
- **Transfer/interface formats are chosen locally by Affinity Domain**
- **IHE only makes recommendations**



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