IHE EUROPE
Integrating the Healthcare Enterprise

# Introduction to IHE profiles

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FORUM eZDROWIA

http://forumezdrowia.pl/en/

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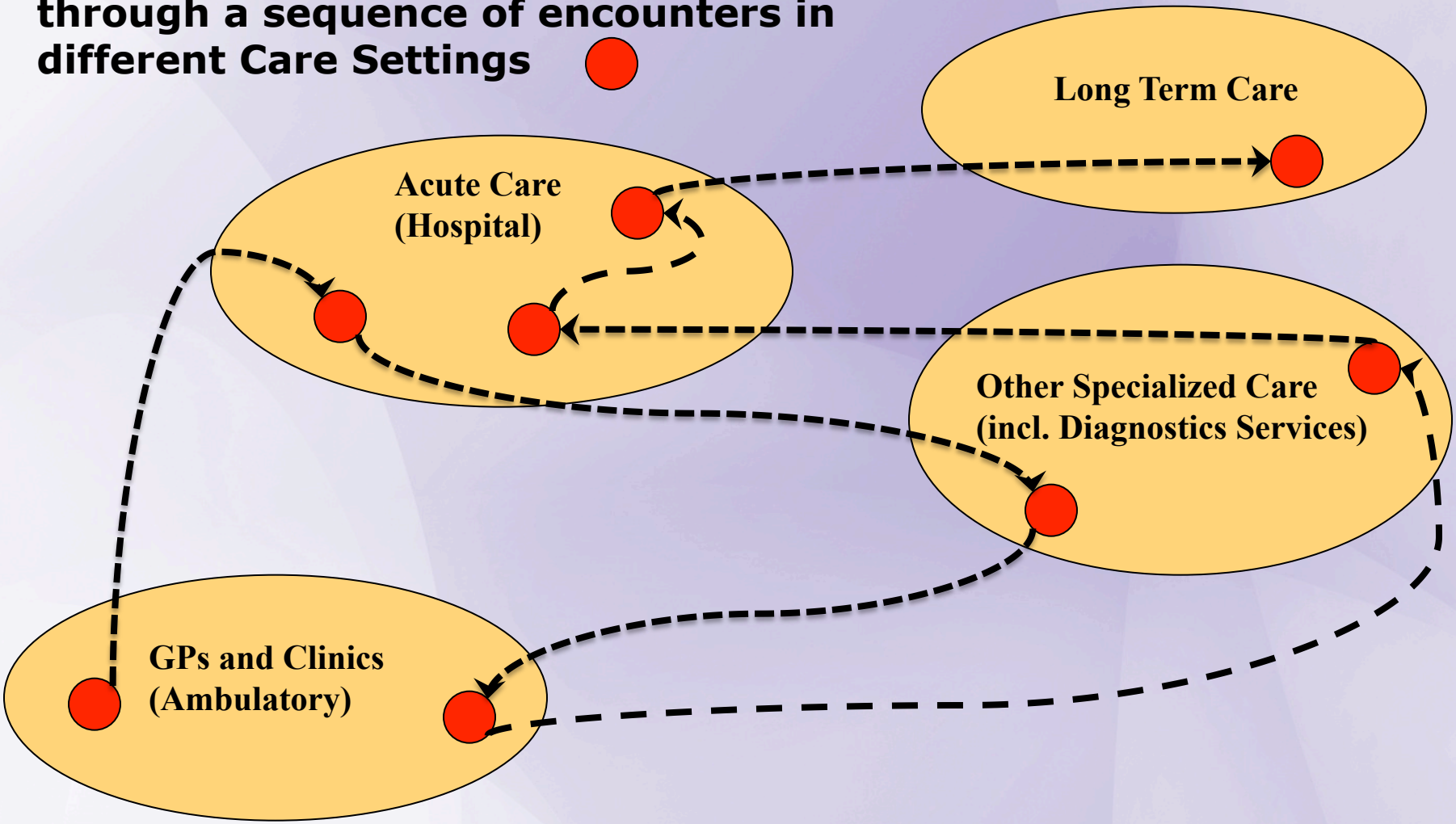
# Practical introduction on selected IHE Profiles

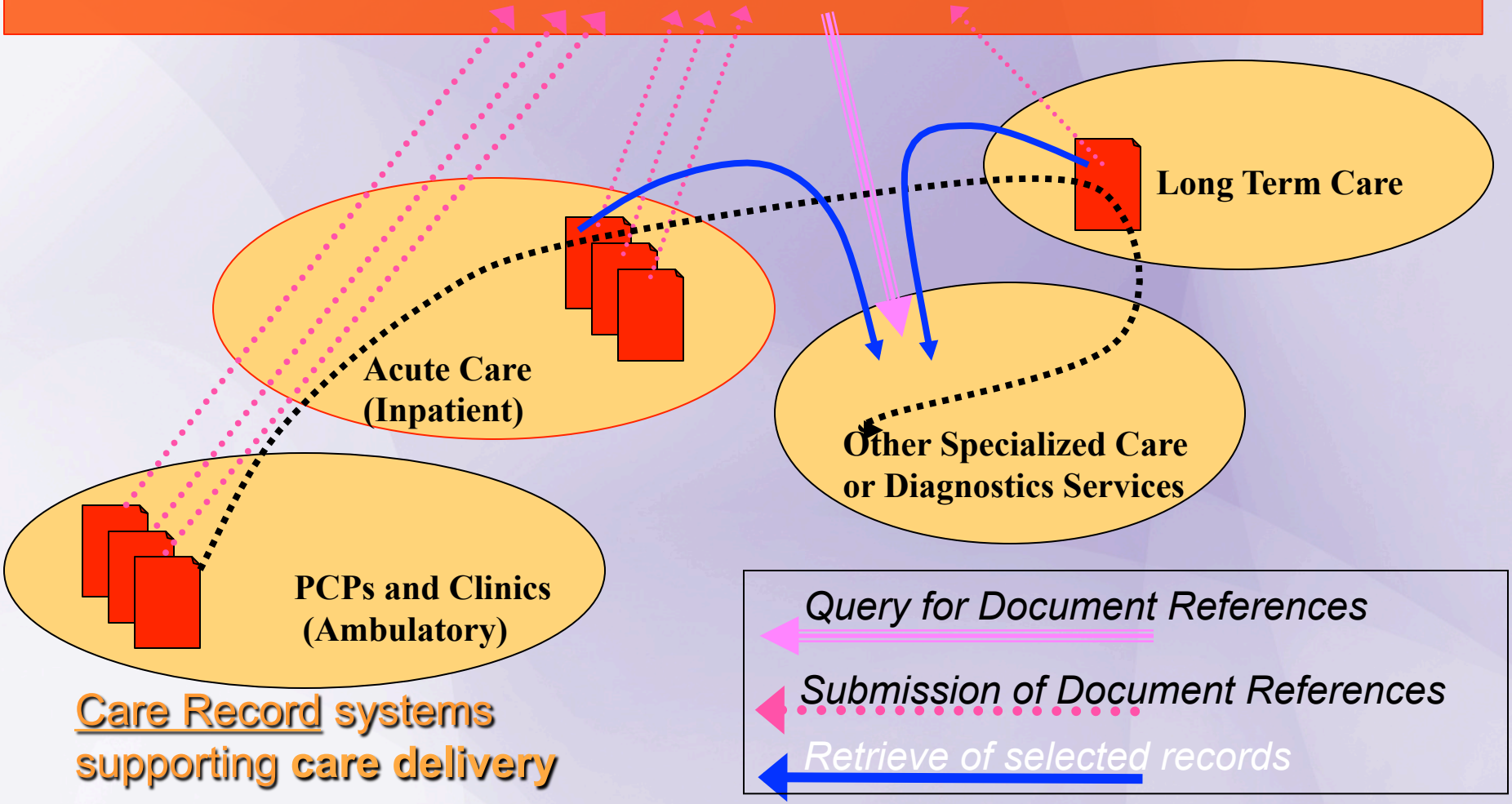
# Lets start from an example: Use Case Publish, share and access health records

**Care pathway: typically, a patient goes through a sequence of encounters in different Care Settings**



# Assembling and accessing health records

Document Index: Longitudinal Record as used **across-encounters**




Care Record systems supporting care delivery

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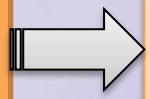
# XDS.b Profile

# Introduction

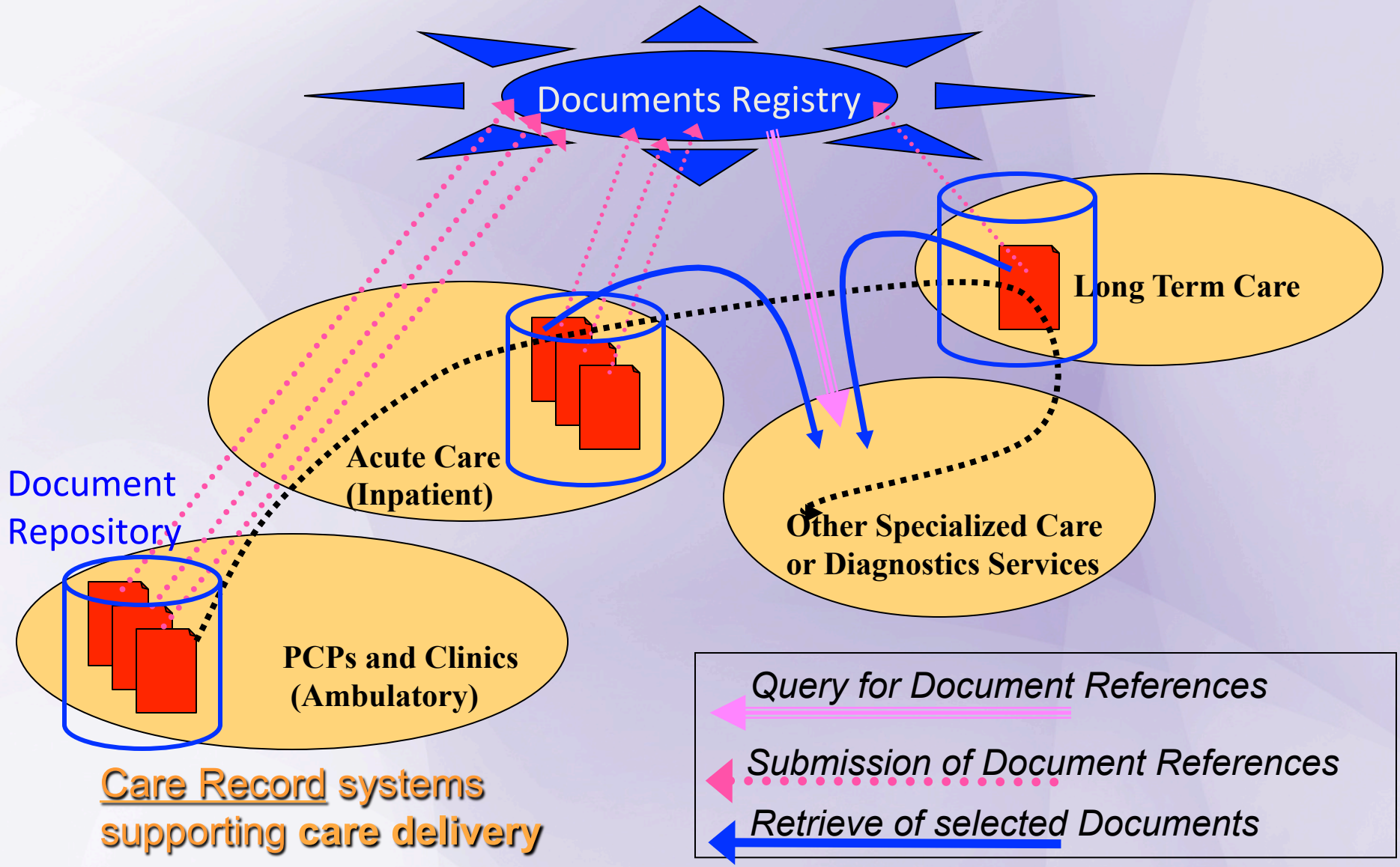
***Infrastructure (ITI)*** **For** ***Patient Care Coordination (PCC)***

- XDS (Cross Referencing Document Sharing)
- Patient Identifier Cross Referencing (PIX)
- Patient Identification Request (PDQ)
- Cross referencing Document Workflow (XDW)



Content profiles
+

# XDS Profile: Sharing Health Records at a large scale



**This was an example of an IHE profile….**

***Cross-Enterprise Document Sharing or XDS***

**Over the past 17 years, IHE has received hundreds of such "use cases" requests and responded with over 180 Profile Specifications**

# Use Cases

- Patient Care Summary (e.g. within a region)
  - Publishing of Care Summaries by providers
  - Access to patient's Care Summary in an emergency
- eReferral between primary and secondary care providers
- Sharing of radiology reports and images between facilities
- Sharing of laboratory reports by clinical laboratories with ordering physicians and other care providers
- ePharmacy between community pharmacy and ambulatory physicians

# Main Systems and Responsibilities

- A document **Repository** is responsible for storing documents in a transparent, secure, reliable and persistent manner and responding to document retrieval requests.
- A document **Registry** is responsible for storing information or metadata about those documents so that the documents of interest for the care of a patient may be easily found, selected and retrieved irrespective of the repository where they are actually stored.
- Any IT system (e.g. point of care) may act as a Document Sources or Document Consumers submitting documents for registration, or querying/retrieving relevant documents.

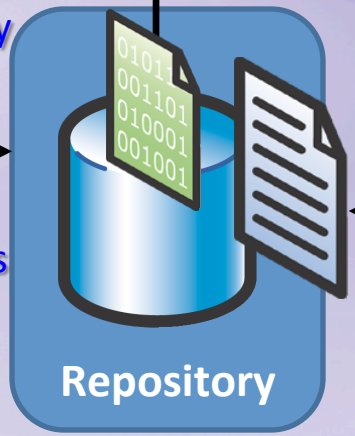
Notes:

- Analogous to a library (book repository) and catalog/index
- The Registry does not have access to the documents – an important separation from security and privacy perspective
- Multiple Repositories can be linked to one Registry

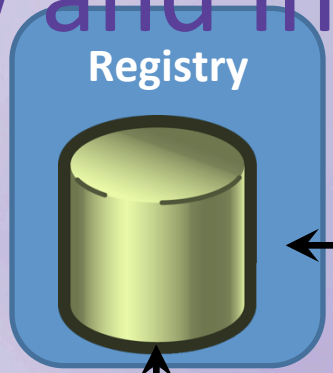
# XDS Flow and Interactions

XDS Document (Metadata):
- Class
- Patient Id
- Author
- Facility
- Date of Service
- …


1. Sources post document packages to the Repository



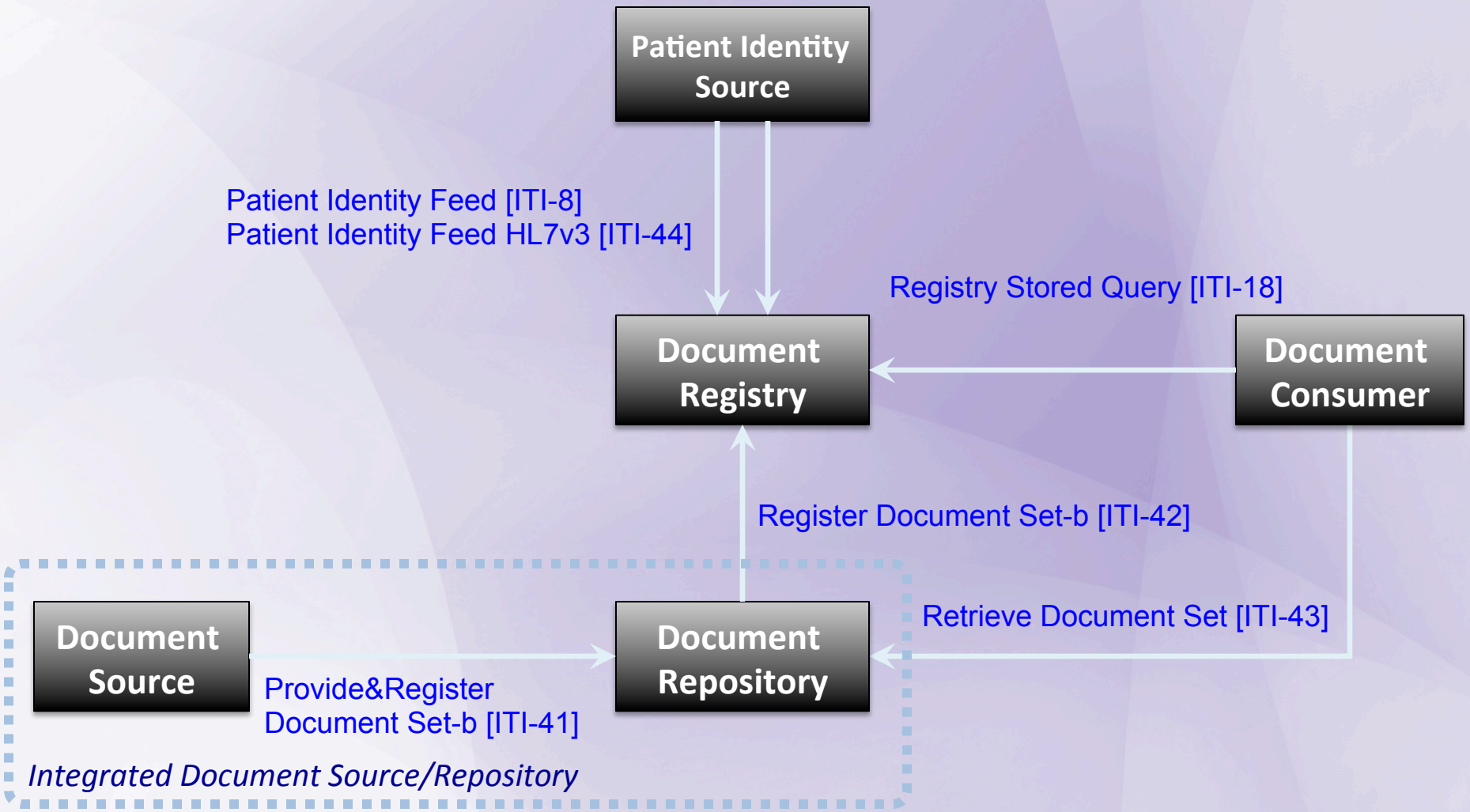

2. Repository registers the documents metadata and pointer with the Registry




3. Consumers search for documents with specific information


4. Consumers retrieve selected documents from Repository (-ies)

# XDS Transaction Diagram



# XDS Actors

- **Document Source** – producer and publisher of documents, responsible for sending documents and their metadata to a *Document Repository* actor
- **Document Repository** is responsible for both the persistent storage of these documents as well as for their registration with the appropriate *Document Registry*
- **Document Registry** maintains metadata about each registered document and a link to the Document in the *Repository* where it is stored. Responds to queries from *Document Consumer* actors about documents meeting specific criteria.
- **Document Consumer** queries a *Document Registry* for documents meeting certain criteria, and retrieves selected documents from one or more Document Repository actors
- **Patient Identity Source** provides unique identifier for each patient and maintaining a collection of identity traits. This facilitates the validation of patient identifiers by the *Registry Actor* in its interactions with other actors
- **Integrated Document Source/Repository** combines the functionality of the *Document Source* and *Document Repository* actors into a single actor that does not expose the *Provide and Register Document Set* transaction

# XDS Transactions (1)

- **Provide and Register Document Set** – For each document in the submitted set, the *Document Source Actor* provides both the documents as an opaque octet stream and the corresponding metadata to the *Document Repository*. The Document Repository is responsible to persistently store these documents, and to register them in the *Document Registry* using the *Register Documents* transaction.
- **Register Document Set** allows a *Document Repository Actor* to register one or more documents with a *Document Registry*, by supplying metadata about each document to be registered. This document metadata will be used to create an XDS Document Entry in the registry.

# XDS Transactions (2)

- **Patient Identity Feed** conveys the patient identifier and corroborating demographic data, in order to populate the *Document Registry* with patient identifiers that have been registered for the XDS Affinity Domain. (At least one of the options [ITI-8] or [ITI-44] must be supported.)
- **Registry Stored Query** is issued by the *Document Consumer Actor* to a *Document Registry*. It will return registry metadata containing a list of document entries found to meet the specified criteria including the locations and identifier of each corresponding document in one or more *Document Repositories*.
- **Retrieve Document Set** – initiated by a *Document Consumer*. The *Document Repository* shall return the document set that was specified by the Document Consumer.

# XDS Document Content Types

XDS profile is content agnostic – it can be used with a variety of document types, including:

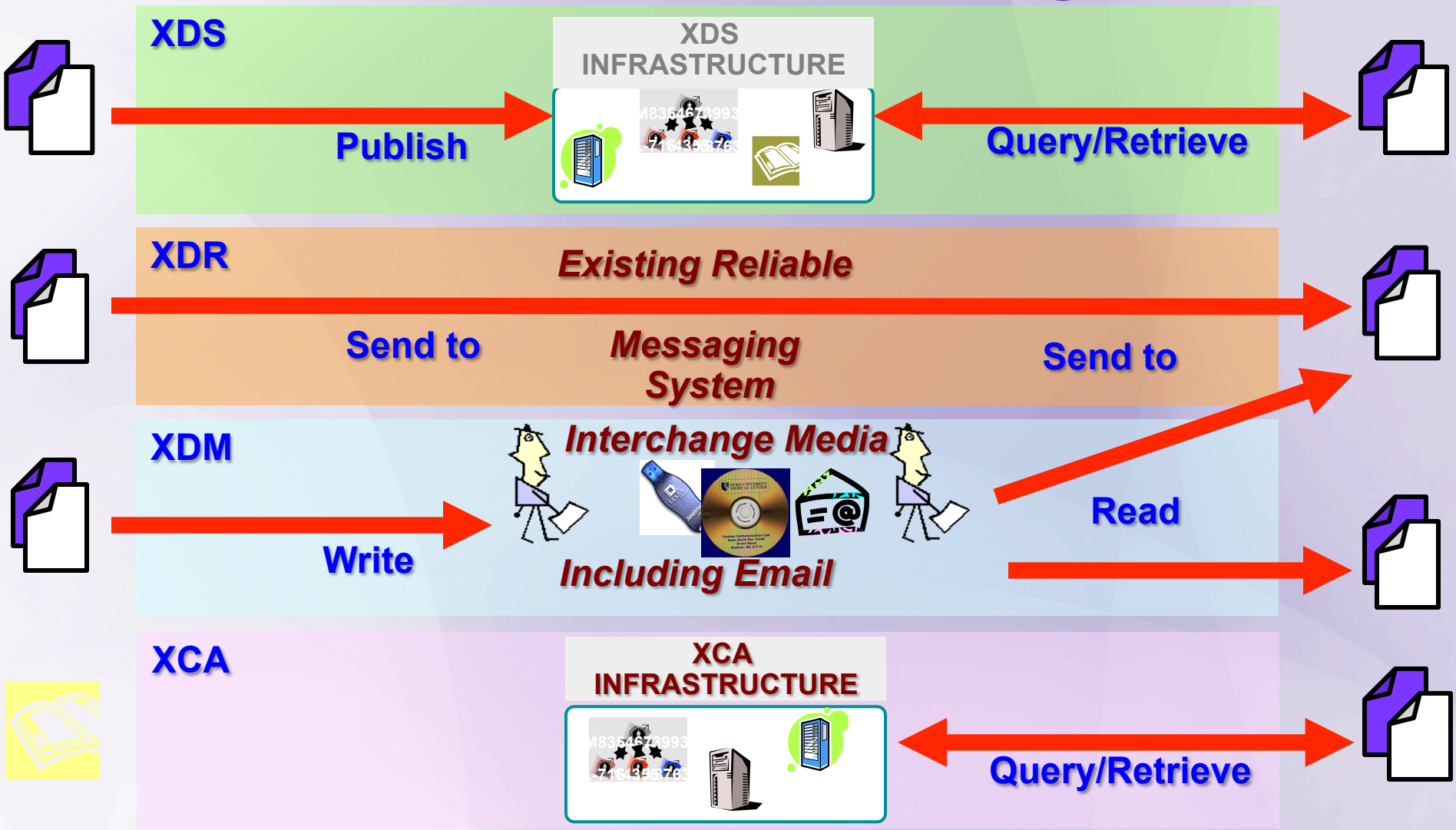
- XDS-SD: Scanned document, plain text or PDF/A, in HL7 CDA R2 format
- XDS-MS: Medical summary in HL7 CDA format
- XDS-I: Radiology report in plain text of PDF format, or reference to a collection of DICOM SOP Instances in a manifest document in the DICOM Key Object Selection format

Also supported are many other document content profiles specified by the IHE Patient Care Coordination, Laboratory, Cardiology, Pharmacy Technical Frameworks

Background material on IHE Profiles for regional and national health information exchange

See www.IHE.net and wiki.IHE.net

# Health document exchange Profiles



# Other profiles to be combined with XDS

- PIX: Patient Identifier Cross-referencing
  - managing multiple local Patient IDs per patient
  - look-up service for cross references
  - support for Master Patient Index (MPI)

- PDQ: Patient Demographics Query
  - find Patient ID based on name, birthdate, sex etc.

- XCPD: Cross-Community Patient Discovery
  - locate communities which hold a patient's relevant health data

# Patient Identity Cross-Referencing (PIX)

# What Problem is Being Solved?

Problem:

- The industry needs a standards-based method to provide distributed applications with a method to query a patient information server for a list of patients, based on user-defined search criteria, and retrieve a patient's demographic (and, optionally, visit or visit-related) information.

# PIX Introduction

- The PIX profile supports the cross-referencing of patient identifiers from multiple Patient Identifier Domains. These cross-referenced patient identifiers can then be used by "identity consumer" systems to correlate information about a single patient from sources that "know" the patient by different identifiers. This allows a clinician to have more complete view of the patient information.
- This integration profile does not define any specific enterprise policies or cross-referencing algorithms

# PIX Introduction

The Patient Identifier Cross-referencing Integration Profile (PIX) is targeted at healthcare enterprises of a broad range of sizes (hospital, a clinic, a physician office, etc.). It supports the cross-referencing of patient identifiers from multiple Patient Identifier Domains via the following interactions:

1. The transmission of patient identity information from an identity source to the Patient Identifier Cross-reference Manager.
2. The ability to access the list(s) of cross-referenced patient identifiers either via a query / response or via update notification.

# PIX Introduction

The Patient Identifier Cross Referencing Integration Profile supports two domains:

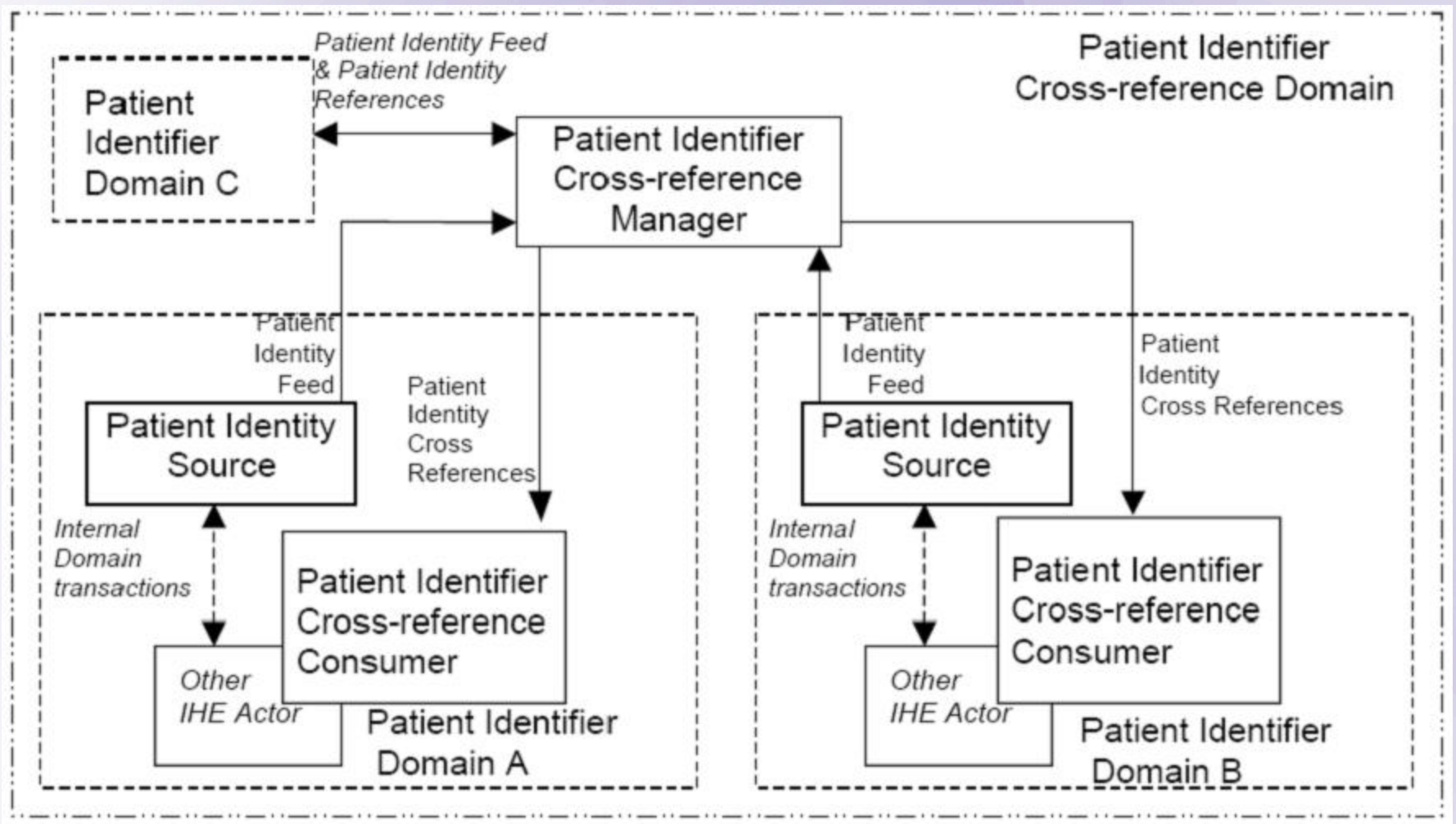
1. A Patient Identifier Domain is defined as a single system or a set of interconnected systems that all share a common identification scheme (an identifier and an assignment process to a patient) and issuing authority for patient identifiers.
2. The Patient Identifier Cross-reference Domain embodies the following assumptions about agreement within the group of individual Patient Identifier Domains:
   - They have agreed to a set of policies that describe how patient identities will be cross-referenced across participating domains;
   - They have agreed to a set of processes for administering these policies;
   - They have agreed to an administration authority for managing these processes and policies.

# PIX Use Case

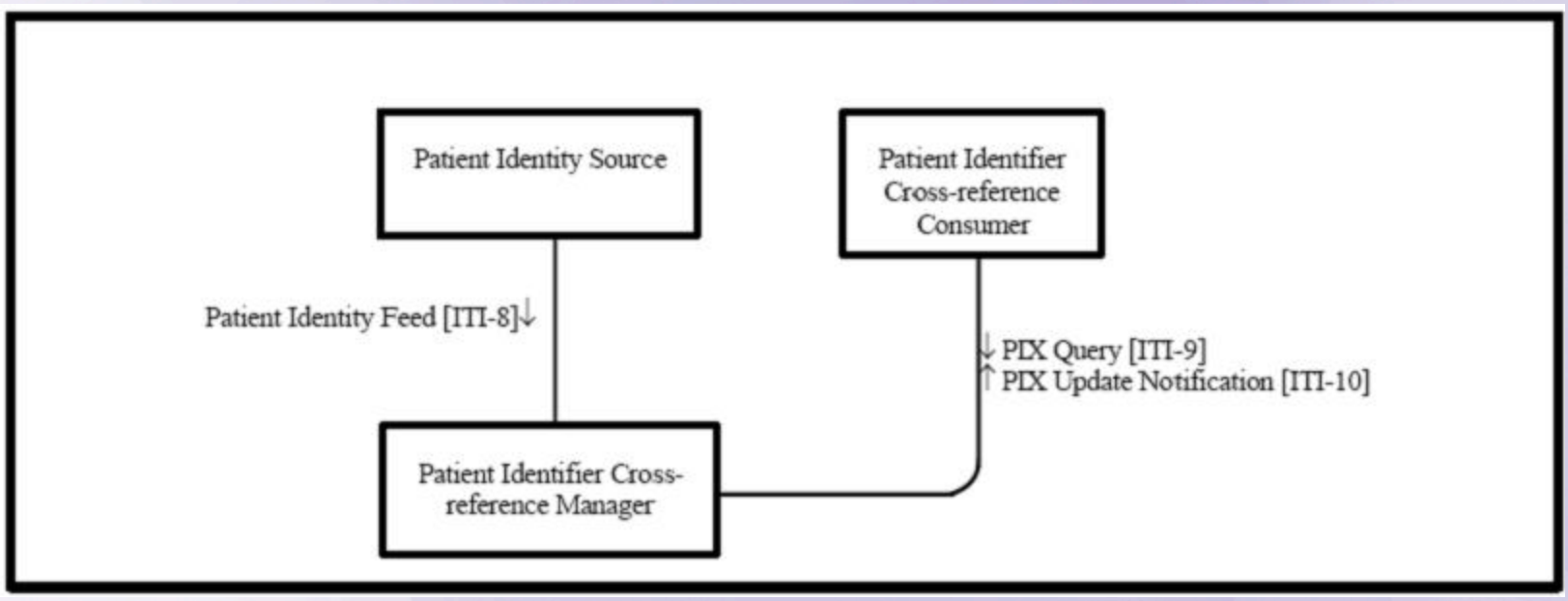
Multiple Identifier Domains within an Enterprise.

- Clinician seeks to monitor data across Intensive Care and hospital's laboratory system
- Essentially two different patient identifier domains
- Hospital ADT system (acts as the Patient Identity Source) provides Patient Identity Feed to the PIX Manager
- Intensive Care system would also send a PIX Feed to the PIX Manager
- Subsequently any authorized system could use the PIX Manager to determine alternate identifiers

# PIX Process Flow Diagram



# PIX Transaction Diagram



# PIX Actors

- Actors
  - **Patient Identity Source** – Provides notification to the Patient Identifier Cross-reference Manager and Document Registry for any patient identification related events including: creation, updates, merges, etc.
  - **Patient Identifier Cross-reference Consumer** – Uses patient identifiers provided by Patient Identity Source to ensure that XDS Documents metadata registered is associated with a known patient and updates patient identity in document metadata by tracking identity change operations (e.g., merge).
  - **Patient Identifier Cross-reference Manager** – Serves a well-defined set of Patient Identification Domains. Based on information provided in each Patient Identification Domain by a Patient Identification Source Actor, it manages the cross-referencing of patient identifiers across Patient Identification Domains.

# PIX Transactions and Options

- Transactions
  - **Patient Identity Feed [ITI-8]** – Communicates patient information, including corroborating demographic data, after a patient's identity is established, modified or merged or after the key corroborating demographic data has been modified.
  - **PIX Query [ITI-9]** – Request by the Patient Identifier Cross-reference Consumer Actor for a list of patient identifiers that correspond to a patient identifier known by the consumer.
  - **PIX Update Notification [ITI-10]** – The Patient Identifier Cross-reference Manager Actor provides notification of updates to patient identifier cross-reference associations to Patient Identifier Cross-reference Consumers that have registered their interest in receiving such notifications.
- Options
  - **PIX Update Notification**

# XDS "Family" of Integration Profiles

- CT: Consistent Time
  - synchronize all systems to common time
  - needed for audit trail, access rights etc.

- 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

# XDS Support Profiles

- XUA: Cross-enterprise User Assertion
  - user authentication in a distributed system
- HPD: Healthcare Provider Directory
  - Details of registered healthcare professionals
- XDW : Cross Enterprise Document Workflow
  - Handles sharing a workflow across different enterprises.

# XDS Support Profiles

- DSUB : Document Submission and Notification
  - Send notification that documents are available
- DSG : Digital Signature
  - Signing of documents in repository/registry

# 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, etc.

# XDS Content Profiles

- Content Profiles define document formats and XDS extensions for specific applications:
  - XDS-MS: Medical Summaries
  - XPHR: Exchange of Personal Health Record Content
  - PRE/DIS/PADV: Prescription/Dispensation/Advice
  - EDR: Emergency Department Referral
  - XDS-SD: Scanned Documents
  - XDS-Lab: Lab Reports
  - XDS-I: DICOM Images
  - …

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# XDW Profile

# XDW Introduction

The Cross-Enterprise Document Workflow (XDW) profile enables participants in a multi-organizational environment to manage and track the tasks related to patient-centric workflows as they coordinate their activities:

- No central controller
- No central scheduler
- Decisions are made by the “edges” (providers, doctors, nurses, etc)
- XDW coordinates these activities

# XDW Problem Statements

## Necessity:

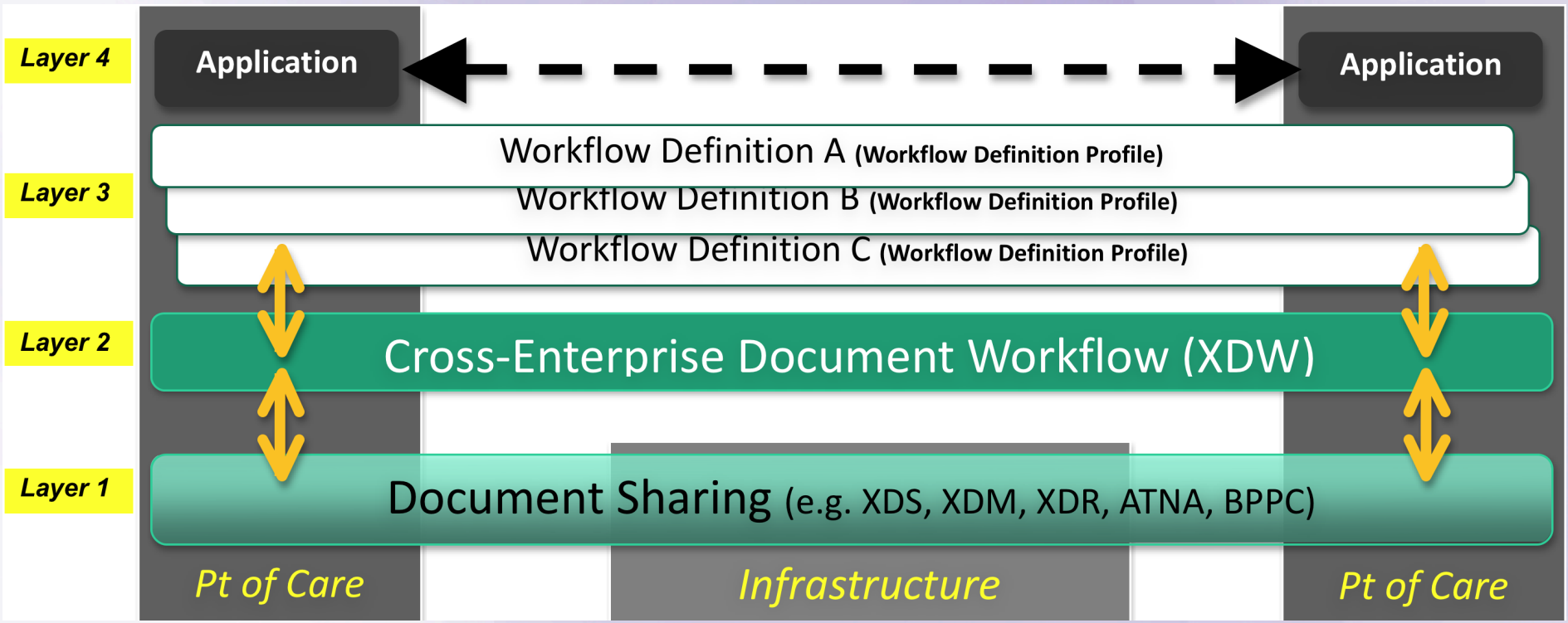
- Digitizing clinical processes (paperless) and enhancing care coordination is a focus across organization and boundaries such as many regional and national projects
- All expect to manage workflows beyond a single organization:
  - For example: eReferral workflows
  - Flexible solution for dynamic and adjustable workflow
  - Clinical, economic, social and organizational impact

# XDW Framework

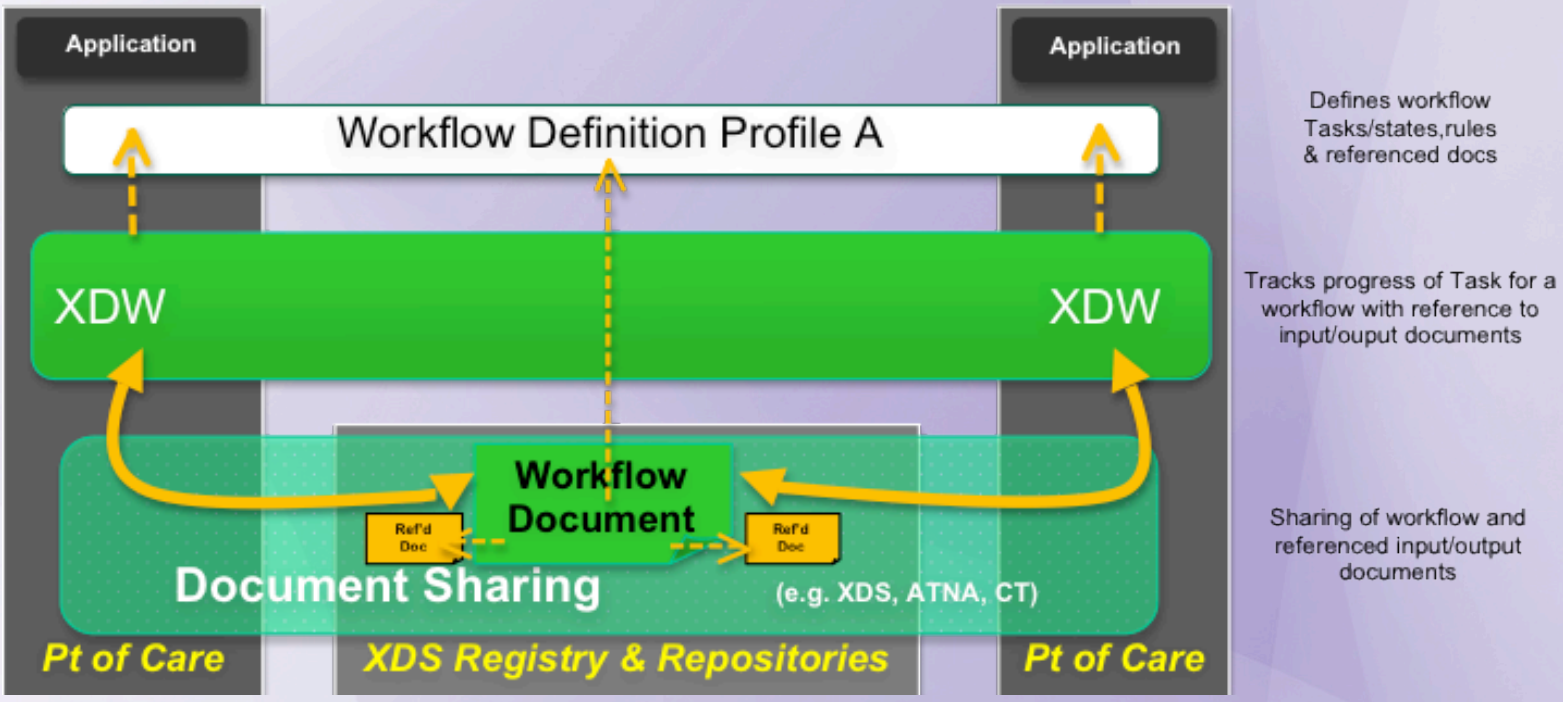
## Framework:

- XDW is a framework operating in an XDS context which supports the management of clinical processes
- XDW is a framework which is specialized by using Workflow Definition profiles to define specific clinical processes
- XDW increases workflow interoperability and enables the development of interoperable workflow management applications where workflow-specific customization is minimized
- XDW facilitates the integration of multi-organizational workflows which use a variety of existing workflow management systems within participating organizations (peer-to-peer)

# XDW Framework Diagram



# XDW Simple Case




## Workflow Document in XDW:

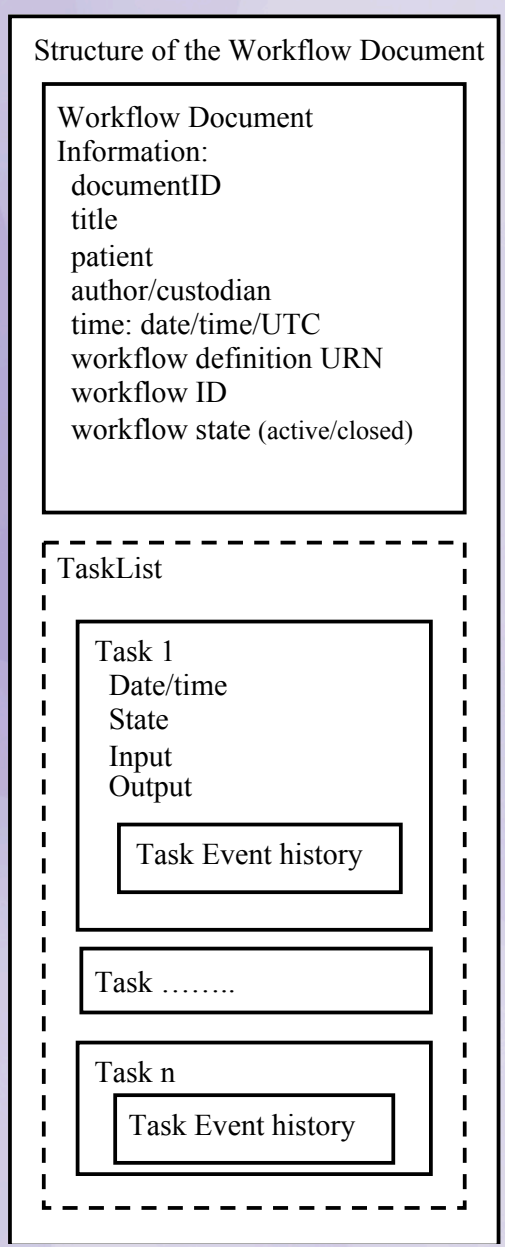
- Specified by XDW is generic across specific workflow content
- Manages workflow specific status with relationship to input/output documents
- Tracking the current/past steps of the workflow and engaged health care entities
- Workflow driven/enforced by the XDW actors, infrastructure provides transparency

# Structure of the step in the XDW Workflow Document

## Workflow Document Structure:

- **Overall workflow context**
- **Task level Information**

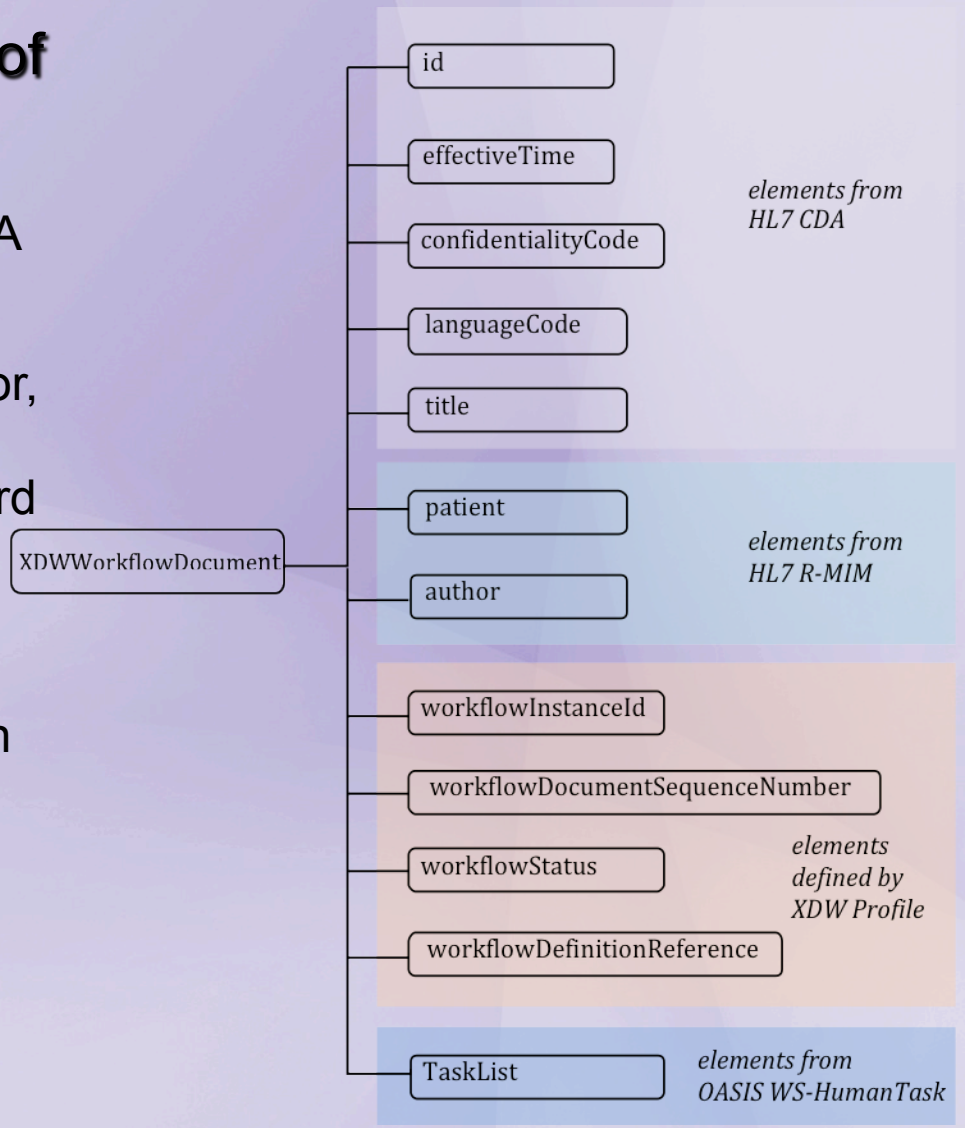
  **Task describes an activity that is planned or has been accomplished. Attributes of the task:**
  - Type
  - Owner
  - Current Status (created, in-progress, completed, etc.)
  - References to documents used for input or produced as output
  - The Task Event History tracks the past Task Events, up to the present state



# Structure of the Workflow Document

**It is possible divided the structure of the WD in 4 parts:**

- **Part 1**: elements derived from HL7 CDA standard
- **Part 2**: two elements, patient and author, defined in the XDWSchema with the structure derived from HL7 R-MIM standard
- **Part 3**: elements defined by IHE XDW Profile
- **Part 4**: the element <TaskList> in which is defined by elements derived from the OASIS WS-HumanTask standard.



# XDW Flow and Interactions

## in an XDS scenario

Content Creator

Content Consumer

XDS Infrastructure

Content Consumer

Content Updater

**1.** Sources post workflow document and referenced document to the XDS Infrastructure

2. Consumers search about patient's workflows

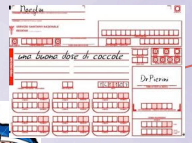
3. Consumers retrieve selected documents from the XDS Infrastructure

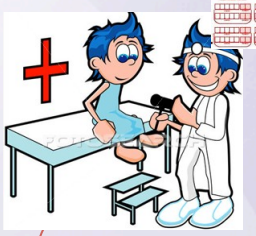
**4.** Sources update the workflow document and post possible new referenced documents

5. Consumers search about patient's workflows

6. Consumers retrieve selected documents from the XDS Infrastructure

# XDW Process Flow
## workflow definition

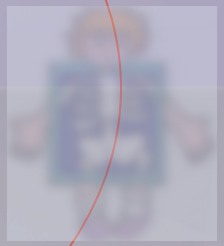




1-Visit and production of eReferral

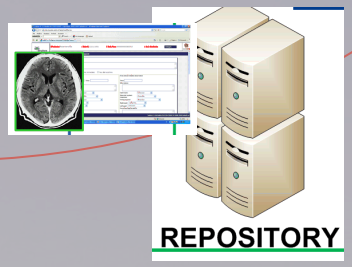
2- Admission of the patient

3- Start of the Consultation



5 – Possible notification to the GP

4 – End of the consultation and creation of the clinical report



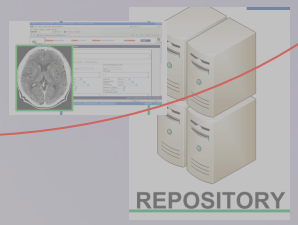

The workflow within the organization is encapsulated into a single XDW step

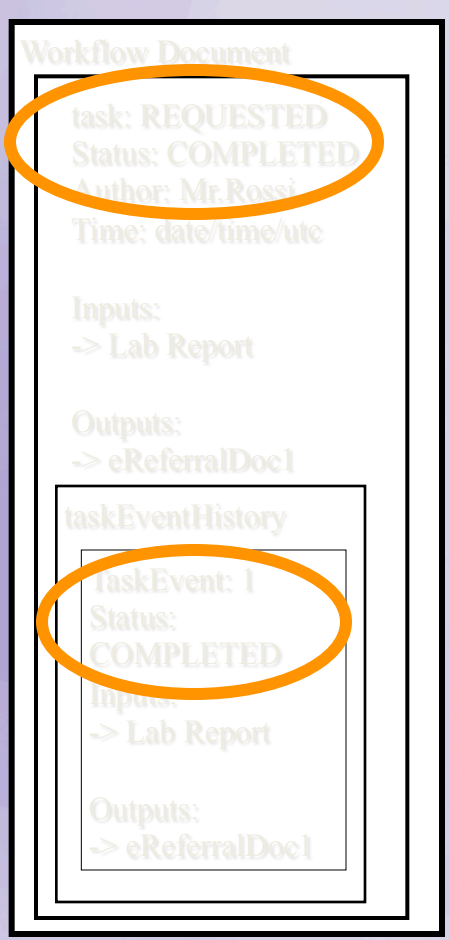
# XDW Process Flow
## first task of the process

**Task A: Requested**

***Status 1: Completed***

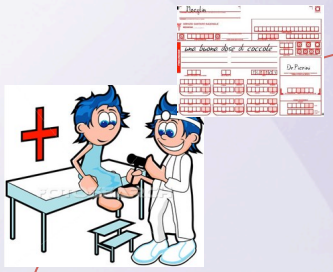
**1-Visit and production of eReferral**



# XDW Process Flow

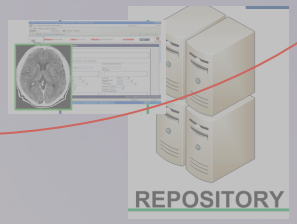
## second task of the process, first status



**2- Admission of the patient**

**Task B: Referred**

***Status 1: In Progress***




*The workflow within the organization is encapsulated into a single XDW step*

Workflow Document

REQUESTED

task: REFERRED
Status: INPROGRESS
Author: M.Brun
Time: date/time/utc

Inputs:
-> eReferralDoc1

Outputs:
->

taskEventHistory

TaskEvent: 1
Status: INPROGRESS

Inputs:
-> eReferralDoc1

Outputs:
->

# XDW Process Flow

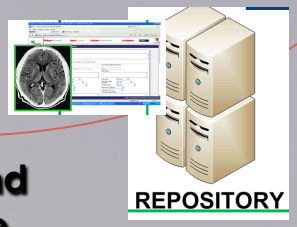
## second task of the process, second status

**Task B: Referred**

***Status 2: Completed***

**3- Start of the Consultation**

**5 – Possible notification to the GP**




**4 – End of the consultation and creation of the clinical report**

*The workflow within the organization is encapsulated into a single XDW step*

Workflow Document

REQUESTED

task: REFERRED
Status: COMPLETED
Author: Mr.Brum
Time: date/time/utc

Inputs:
-> eReferralDoc1

Outputs:
-> ClinicalRepDoc2

taskEventHistory

TaskEvent: 1

TaskEvent: 2
Status: COMPLETED

Inputs:
-> eReferralDoc1

Outputs:
-> ClinicalRepDoc3

# XDW profile and Workflow Definition profile

- Cross Enterprise Document Workflow is:
  - a framework to manage workflows
  - a platform upon which a wide range of specific workflows can be defined with minimal specification and implementation efforts
  - workflow independent
  - applicable on different document sharing infrastructures

- Workflow Definition Profile is:
  - the definition of a specific clinical process
  - a set of rules and task definition which characterize the process
  - the definition of the actors involved in the process and their roles

# Use Case: an example of eReferral workflow(2)

## Workflow Description

## XDW

*Evolution of shared Workflow Document*

# Selected Standards & Systems

- XDW Supplement introduces a new content framework profile for a workflow management document
  - OASIS Human Task for task structure and encoding
  - HL7 CDA for provider description
  - HL7 R-MIM for patient and author description
- No new transactions are introduced. Leverages existing ITI IHE Profiles:
  - XDS.b, DSUB, XDR, XDM, BPPC, ATNA
- No XDS Metadata extension, but specific rules about XDS Metadata content for the registry entry associated to the XDW Workflow Document

# XDW Security/Privacy

- XDW relies on the security controls in the underlining transport (e.g. XDS)
- In order to adhere to the principle of least privilege, organizations will want to prevent clinical documents from being replaced by other organizations while allowing XDW Workflow Documents to be replaced (exception based on classCode)
- When a Workflow Description Profile is created a risk assessment following the Security Cookbook may result in additional security considerations beyond those for the usual clinical report

# XDW references

- Trial Implementation status
- Primary Content
  - XDW Supplement
- Underlying technical framework content
  - ITI XDS.b profile

# XDW profile – Domain Activities

## XDW activity

- PCC Domain: creation of the “Workflow Definition Whitepaper”, in which it is defined the guide lines and the structure to write a Workflow Definition Profile

## Example of XDW Definition Profiles

- PCC Domain
  - XBeR-WD Cross Enterprise Basic eReferral Workflow Definition Profile
  - XTHM-WD Cross Enterprise TeleHomeMonitoring Workflow Definition Profile
  - XTB-WD Cross Enterprise Tumor Board Workflow Definition Profile
- Radiology Domain
  - XSM Cross Enterprise Screening Mammography Workflow Definition Profile (White Paper)

# IHE Profiles for organizing your project

- 1. Create the National/regional Infrastructure

| | | |
|---|---|---|
| **[ATNA ]**<br>Audit Trail and Node Authentication Basic security through (a) functional access controls, (b) defined security audit logging and (c) secure network communications | **[BPPC]**<br>Basic Patient Privacy Consents method for recording a patient's privacy consent acknowledgement to be used for enforcing basic privacy appropriate to the use. | **[XCA]**<br>Cross-Community Access allows to query and retrieve patient electronic health records held by other communities. |
| **[XDW]**<br>Cross Enterprise Workflow coordinates human and applications mediated workflows across multiple organizations. | **[XDS]**<br>Cross Enterprise Document Sharing share and discover electronic health record documents between healthcare enterprises, physician offices, clinics, acute care in-patient facilities and personal health records. | **[XDS-SD]**<br>Cross-enterprise Sharing of Scanned Documents enables electronic records to be made from legacy paper, film, and other unstructured electronic documents. |
| **[XUA]**<br>Cross-Enterprise User Assertion communicates claims about the identity of an authenticated principal (user, application, system...) across enterprise boundaries - Federated Identity. | **[EUA]**<br>Enterprise User Authentication enables single sign-on inside an enterprise by facilitating one name per user for participating devices and software. | **[PAM]**<br>Patient Administration Management establishes the continuity and integrity of patient data in and across acute care settings, as well as among ambulatory caregivers. |

***Listed Profiles are indicatives, please review IHE profiles at***

# IHE Profiles IHE Profiles for organizing your project

- 2. Restructure old systems (i.e LAB, RAD Profiles)

| | | |
|---|---|---|
| **[LTW]**<br>Laboratory Testing Workflow integrates ordering and performance of in-vitro diagnostic tests by a clinical laboratory inside a healthcare institution. | **[XD-LAB]**<br>Sharing Laboratory Reports describes the content (human and machine readable) of an electronic clinical laboratory report. | **[LBL]**<br>Laboratory Barcode Labeling integrates robotic specimen container labeling systems with sources of order-related labelling information. |
| **[SWF]**<br>Scheduled Workflow integrates ordering, scheduling, imaging acquisition, storage and viewing for Radiology exams. | **[MAMMO]**<br>Mammography Image specifies how Mammography images and evidence objects are created, exchanged, used and displayed. | **[BIR]**<br>Basic Image Review defines baseline features and user interface relevant to simple review of DICOM images. |
| **[XCA-I]**<br>Cross-Community Access for Imaging extends XCA to share images, diagnostic reports and related information across communities. | **[BRTO]**<br>Basic Radiation Therapy Objects integrate the flow of treatment planning data from CT to Dose Review for basic treatments | **[MS]**<br>Medical Summaries describes the content and format of Discharge Summaries and Referral Notes. |

***Listed Profiles are indicatives, please review IHE profiles at***
***http://wiki.ihe.net/index.php?title=Profiles***

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# IHE Profiles for organizing your project

- 3. See the future (ePrescription, mHealth, etc)

| | | |
|---|---|---|
| **[CMPD]**<br>Community Medication Prescription and Dispense integrates prescription, validation and dispensation of medication in the ambulatory sector. | **[PRE]**<br>Pharmacy Prescription Document records a prescription. | **[PADV]**<br>Pharmacy Pharmaceutical Advice Document records pharmaceutical advice in response to a prescription. |
| **[DIS]**<br>Pharmacy Dispense Document records the dispensation of medication to a patient. | **[HMW]**<br>Hospital Medication Workflow integrates prescription, validation, dispensation, distribution and administration of medication inside healthcare institutions. | **[PML]**<br>Pharmacy Medication List |
| **[MHD]**<br>Mobile access to Health Documents provides a RESTful interface to Document Sharing including XDS. | **[IUA]**<br>Internet User Authorization provides user authorization for RESTful interface. | **[DEC]**<br>Device Enterprise Communication transmits information from medical devices at the point of care to enterprise applications. |

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# *QUESTIONS ?*

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