HL7® FHIR® DevDays

JUNE | 2023

XDS on FHIR®

Gregorio Canal (Consorzio Arsenàl.IT)

HL7 FHIR DevDays 2023 | Hybrid Edition, Amsterdam | June 6–9, 2023 | @HL7 | @FirelyTeam | #fhirdevdays | www.devdays.com

ORGANIZED BY

Who am I?

- Gregorio Canal
- Standardization Area Team Leader
- Consorzio Arsenàl.IT

What does Arsenàl.IT?

Veneto Region's consortium of:

- 9 Local Health Authorities
- 2 Hospital Trust
- 1 Institute of Oncology

We support them in the digital transition

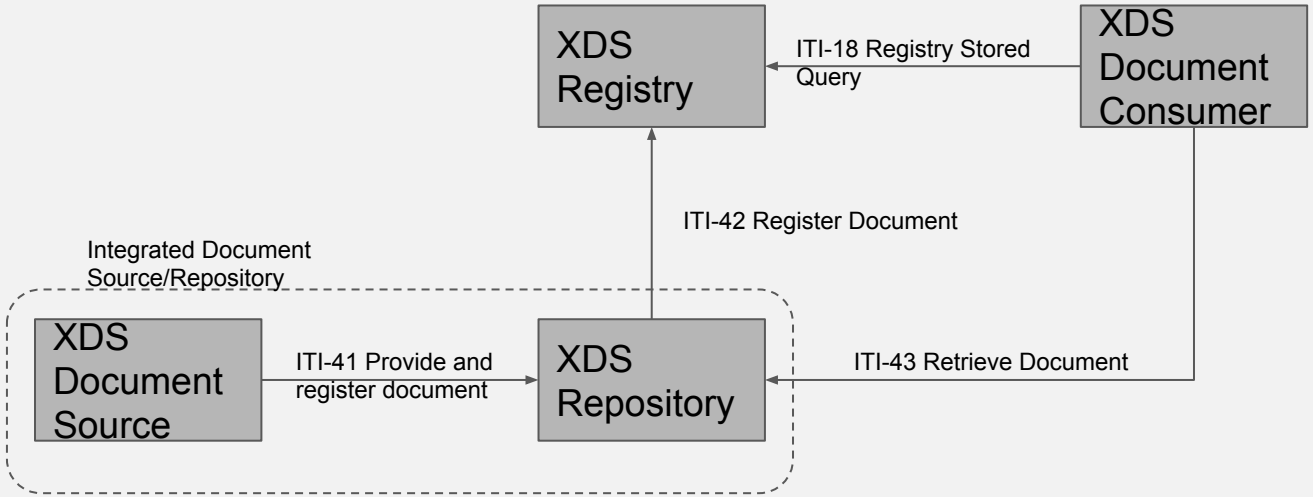
Source: https://www.smettintempo.it/107_5/mappa-ambulatori.ashx

Learning Objectives

- Document Sharing – as a given
- FHIR® access to Documents
  - MHD –> XDS on FHIR®
  - Support profiles: IUA, PDQm, PIXm, etc
- Decomposed into Elements/Resources
  - mXDE + QEDm
  - Using Provenance – to get back to source documents

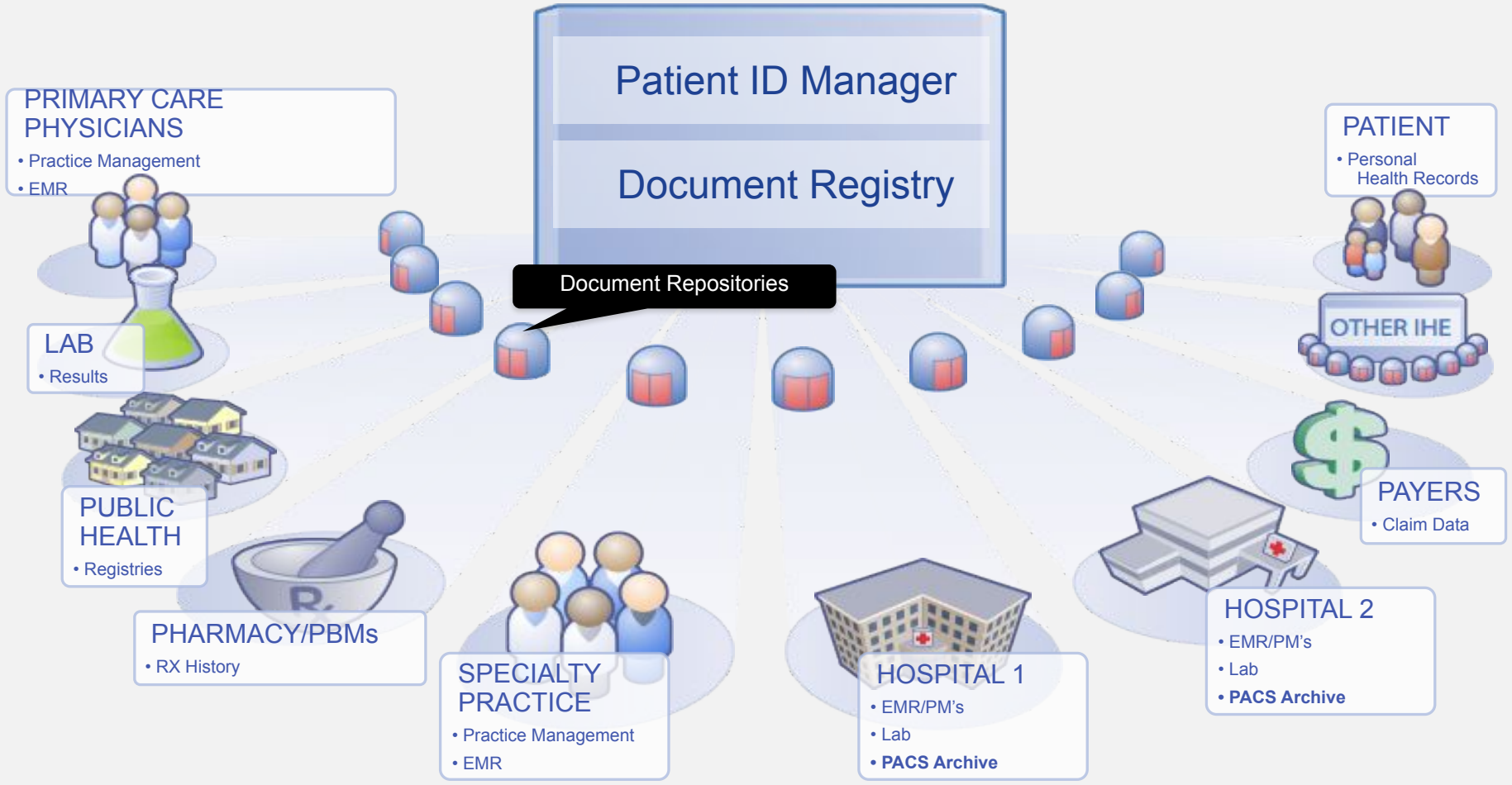
XDS – Document Sharing

- **Document Sharing Registry (XDS)**
  - Based on W3C standards
  - ebRegistry
  - SOAP
  - SAML
- **Patient Identity Management (PIX, PDQ)**
  - Based on HL7 v2 or v3
- **Supports Centralized or Distributed Repository**
- **User / Organization Federation**
  - Certificate Authority trust domain
  - SAML assertions



IHE Standards-based HIE (XDS)

Key Components



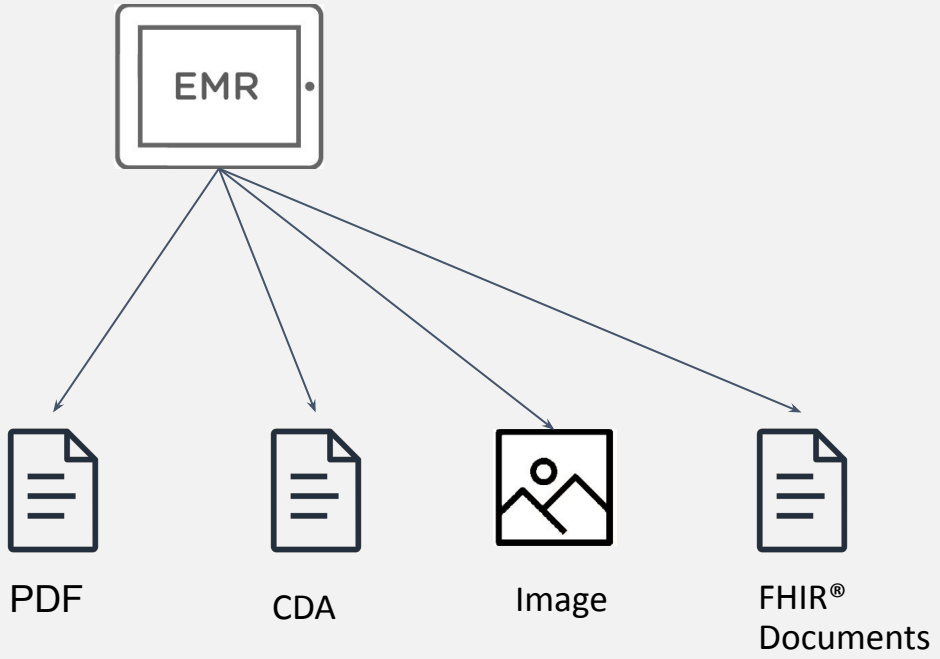
Source: https://ihe.net

Principles of a Document

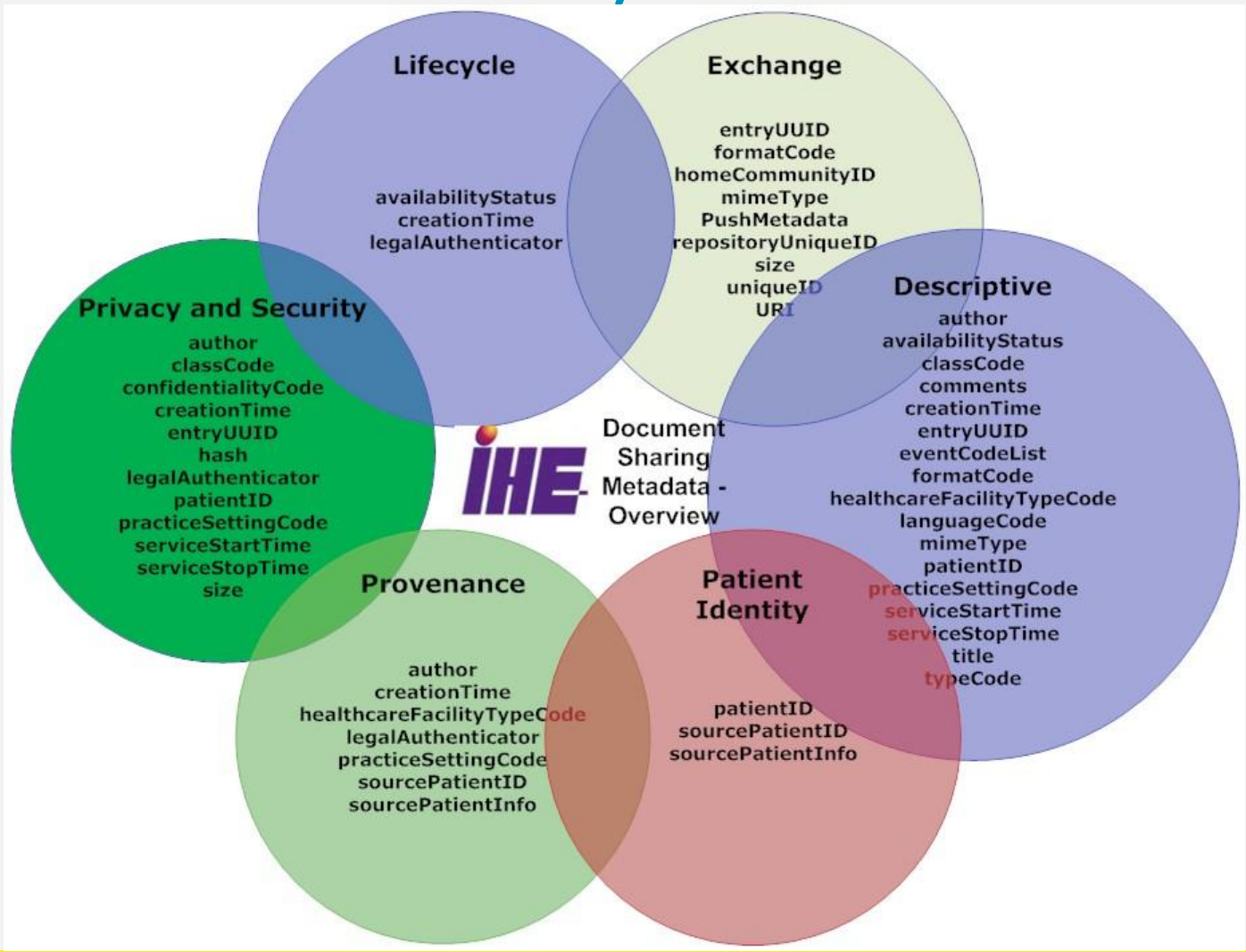
- **Persistence** – A Document continues to exist in an unaltered state, for a time period defined by local and regulatory requirements. Note documents outlive the servers (and often the syntax), on which they are created.
- **Stewardship** –A document is maintained over its lifetime by a custodian, either an organization or a person entrusted with its care.
- **Potential** for authentication - A clinical document is an assemblage of information that is intended to be legally authenticated.
- **Context** - A clinical document establishes the default context for its contents.
- **Wholeness** - A document is a whole unit of information. Parts of the document may be created or edited separately, or may also be authenticated or legally authenticated, but the entire document is still to be treated as a whole unit.
- **Human readability** – a document is human readable.

Various formats and encodings

- XDS/XCA are content agnostic
- Metadata enable discovery
- CDA, C-CDA, C32, etc
- FHIR® Documents
- DICOM Documents
- PDF/Text
- Graphics (JPEG, MPEG, TIFF…)
- Special (On-Demand, Delayed)



Metadata – enables discovery



Source: https://ihe.net

XDS Data Models

3 types of objects supported by XDS:

- **SubmissionSet:** metadata describing a collection of Folders, DocumentEntries, and Associations submitted together.
- **Folder:** metadata describing a collection of related DocumentEntries.
- **DocumentEntry:** metadata describing a Document.

2 types of **Association:**

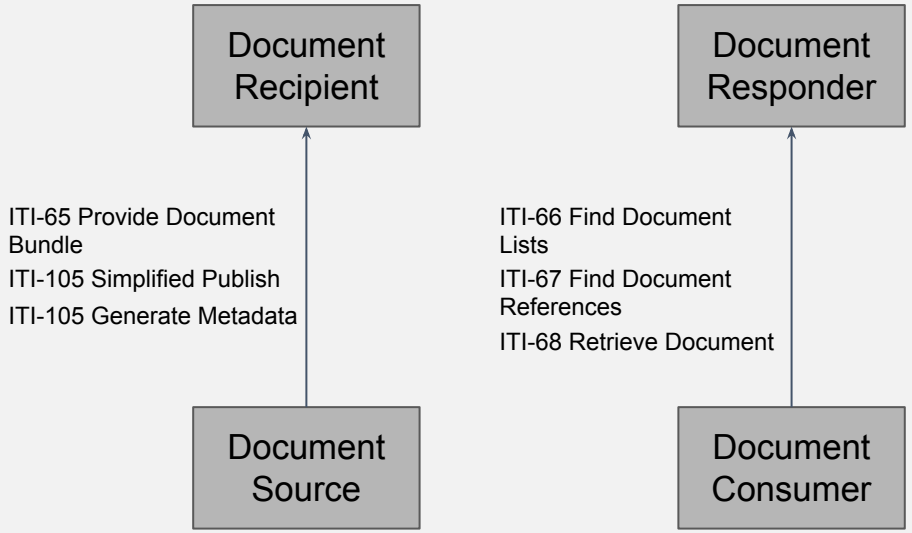
- **HasMember:** represents membership of an object in a collection.
- **Relationship:** represents a relationship(Replace, Transform, Append, Signs, etc) between two Documents (represented by DocumentEntries).

Mobile access to Health Documents (MHD)

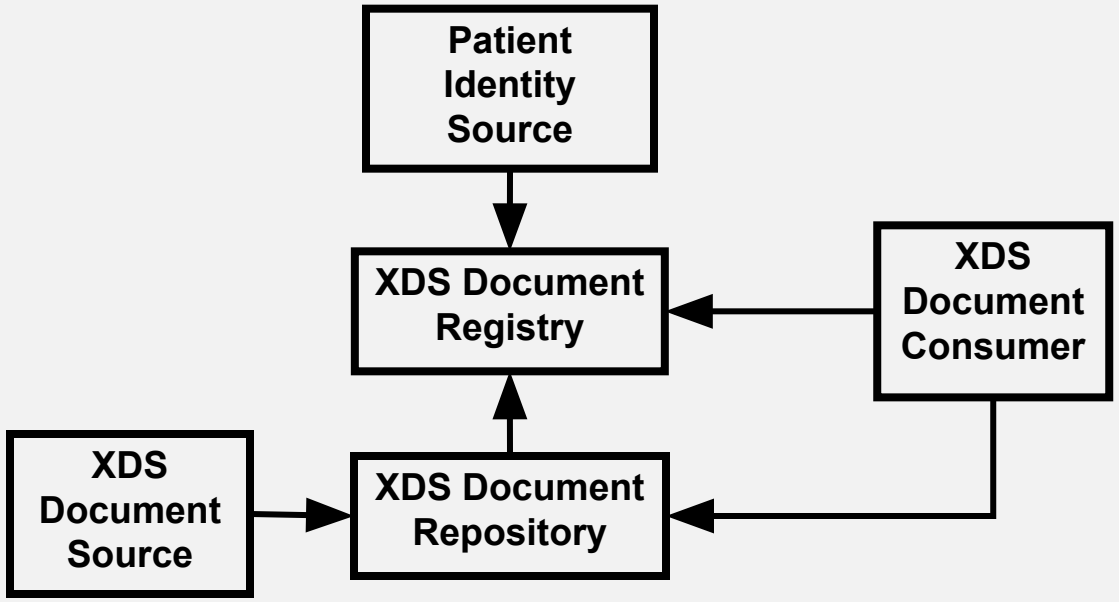
Provide FHIR® based methods of publishing and accessing Document Sharing

- Enable publication of Documents by Apps
- Enable Discovery of available documents by Apps
- Retrieval of the Document content
- XDS on FHIR®

- Details https://profiles.ihe.net/ITI/MHD/index.html



MHD as API to XDS



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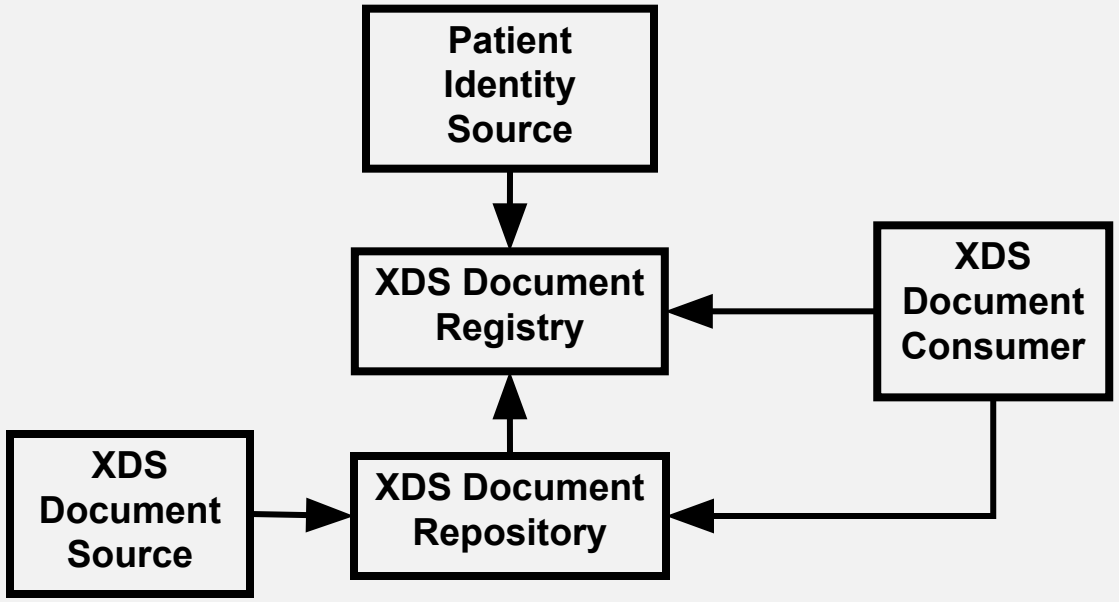

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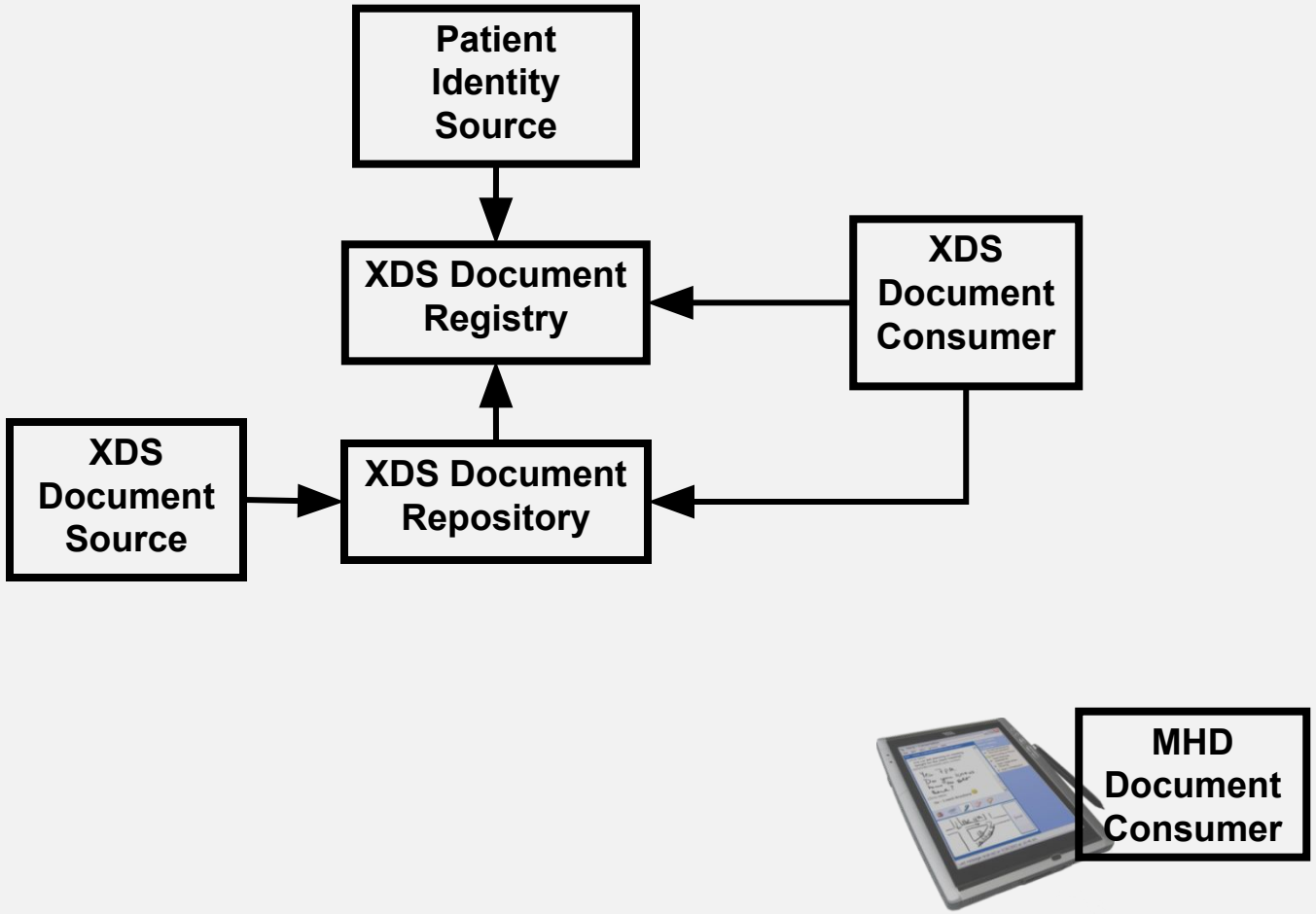

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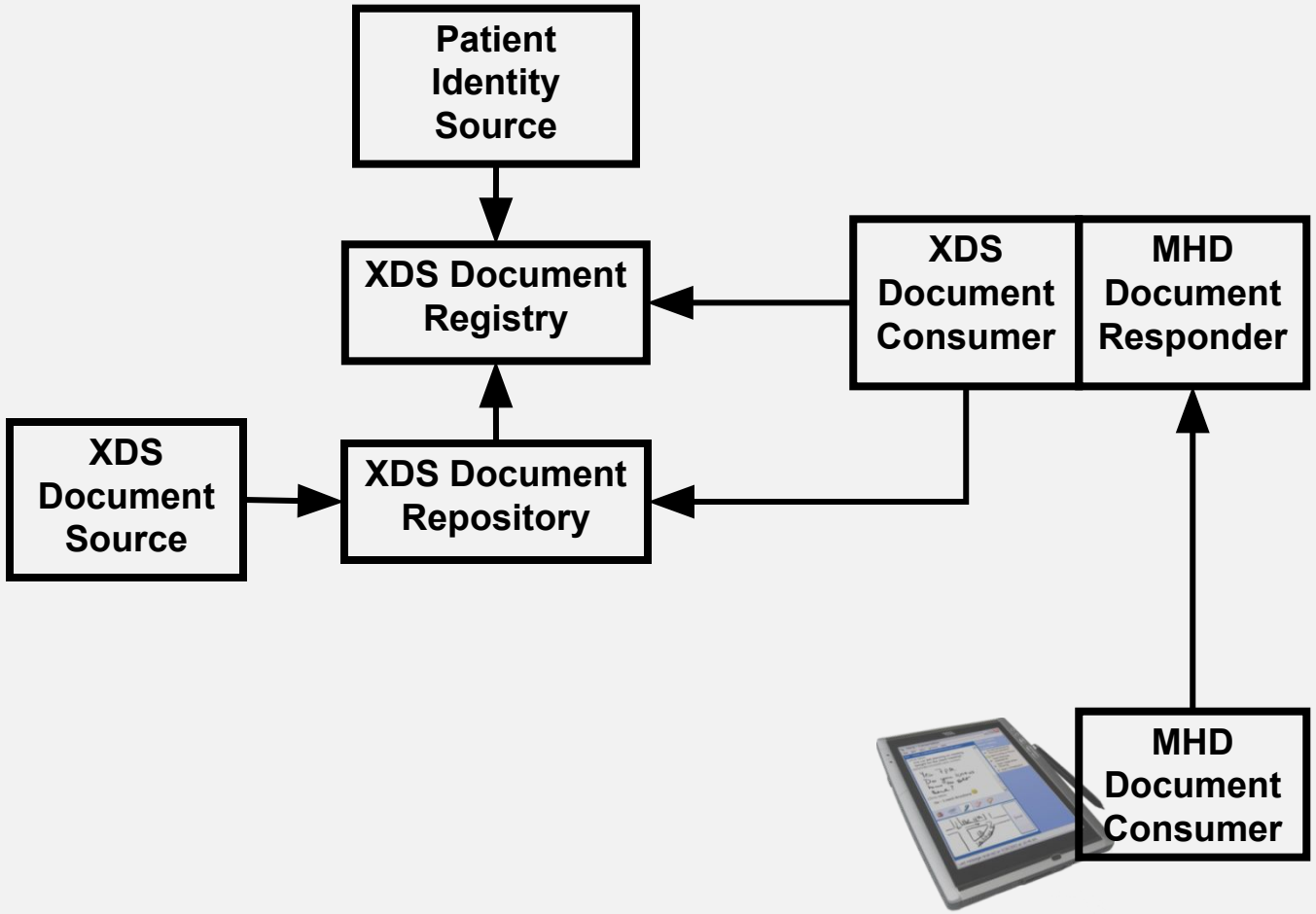

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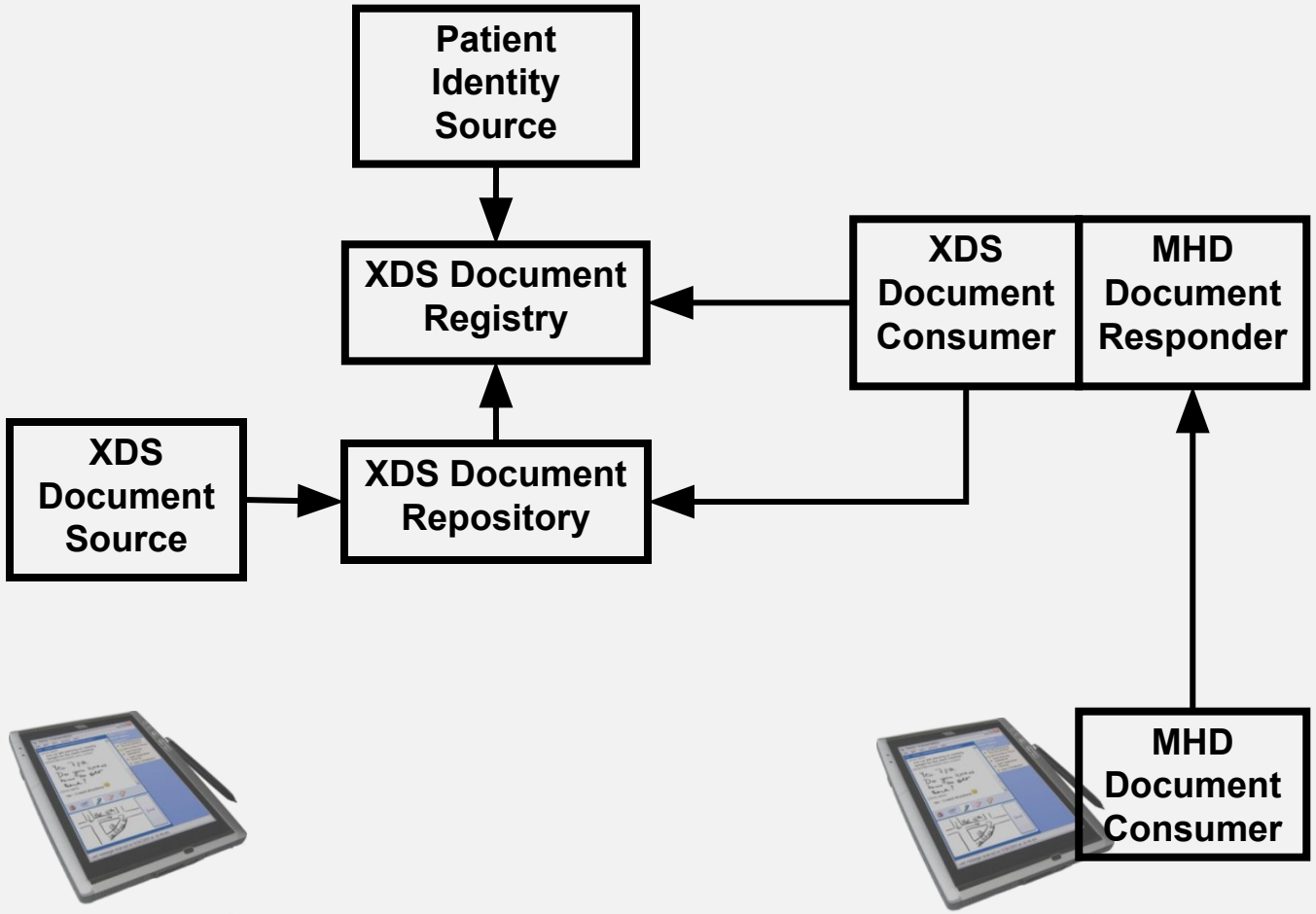

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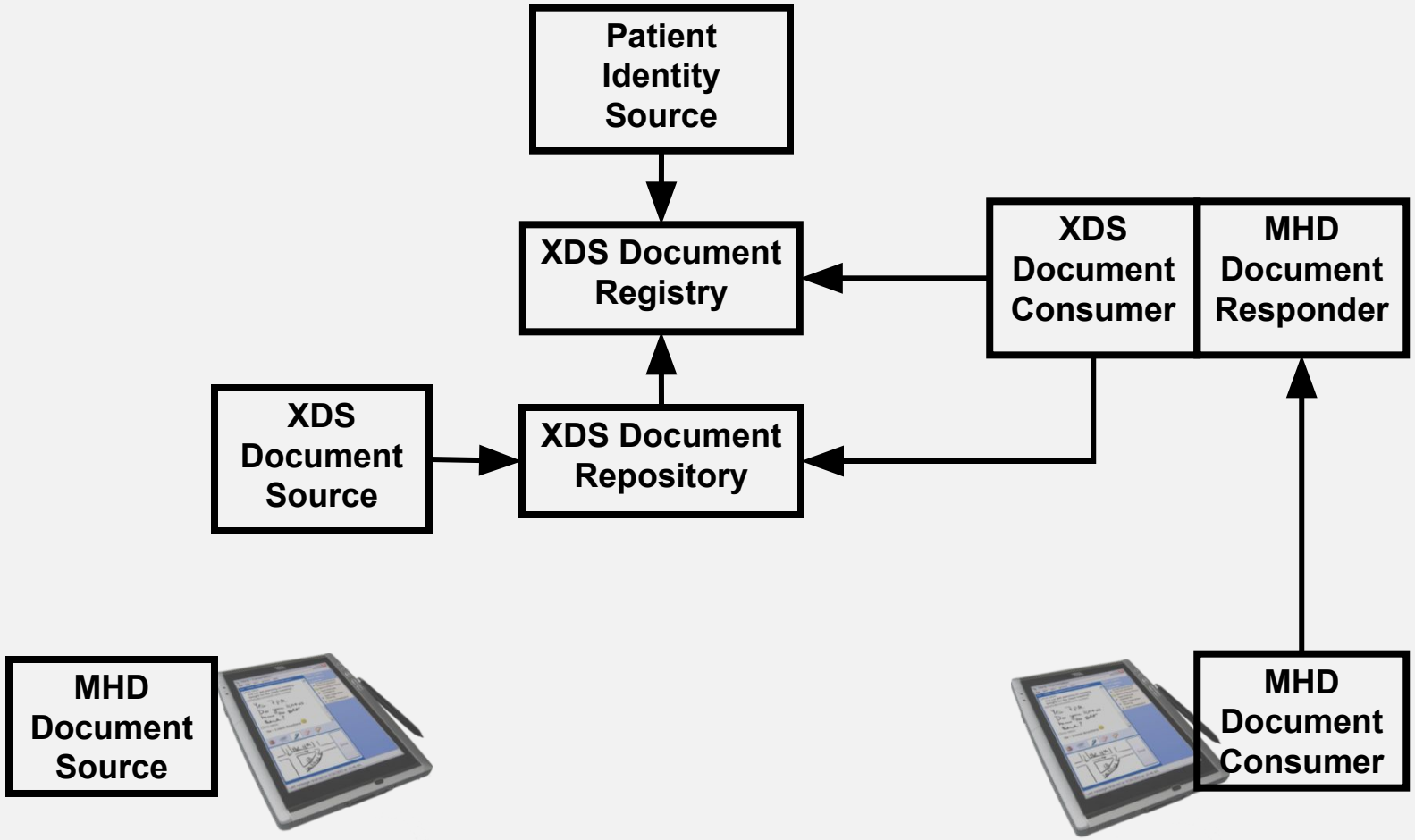

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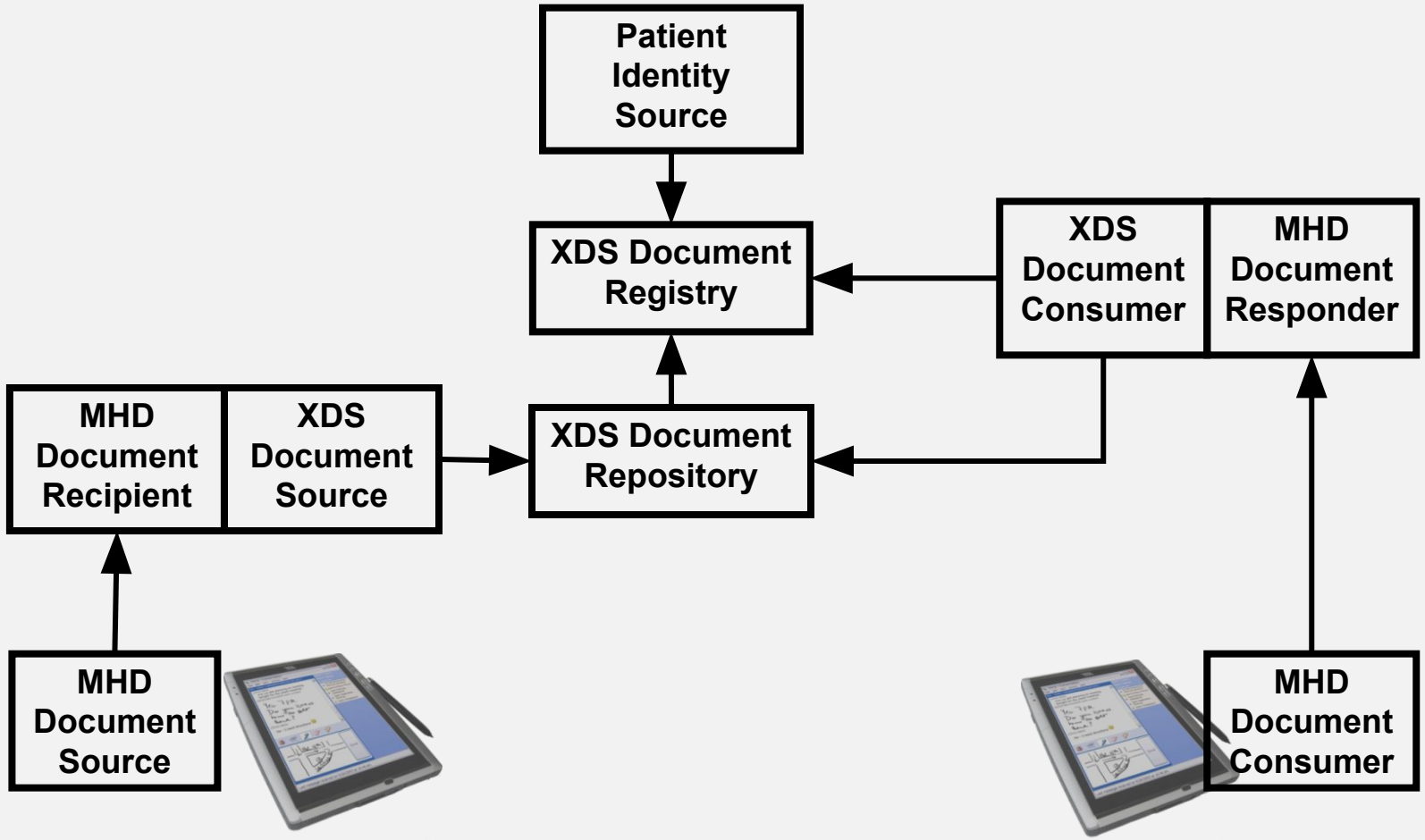

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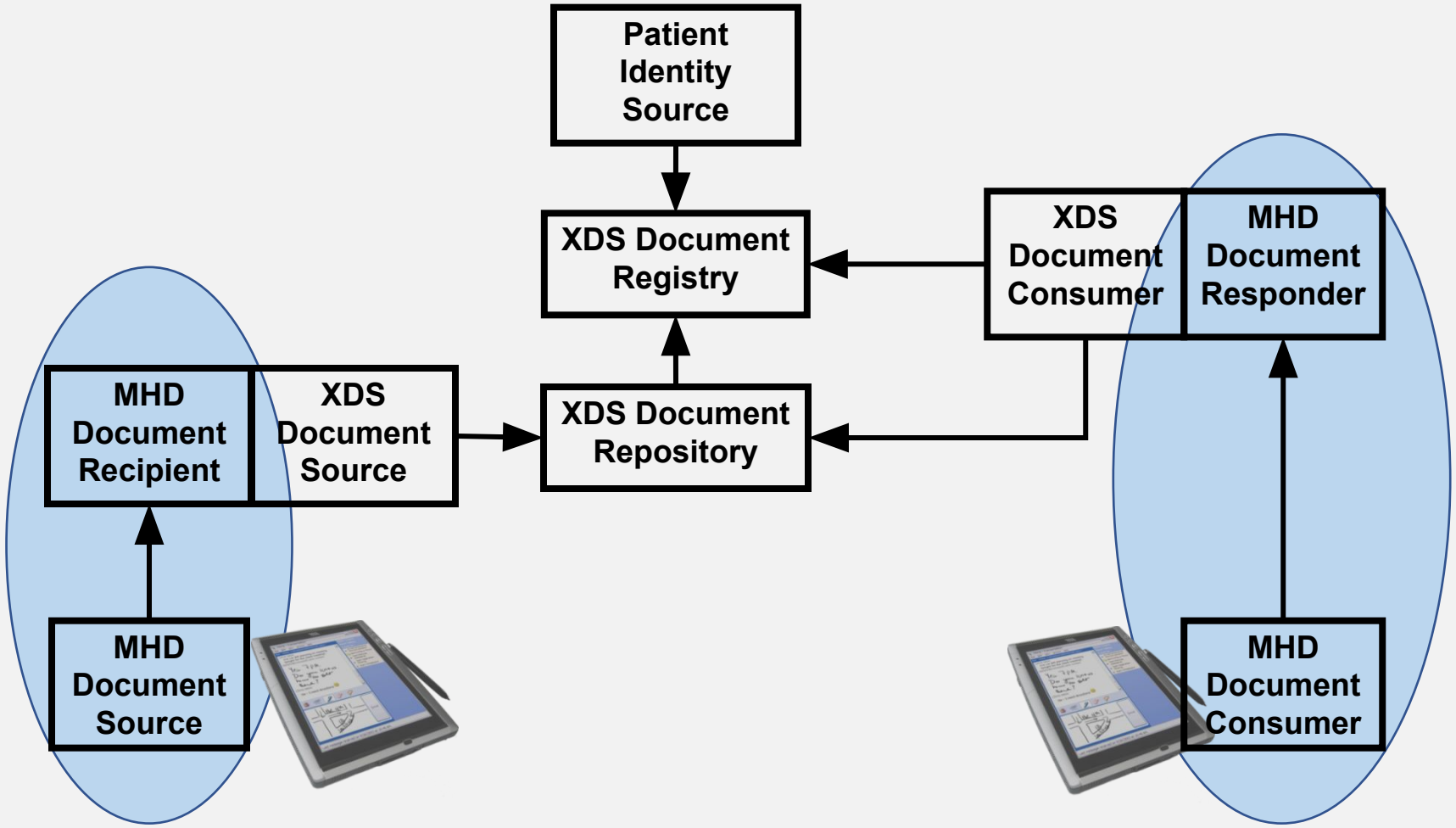
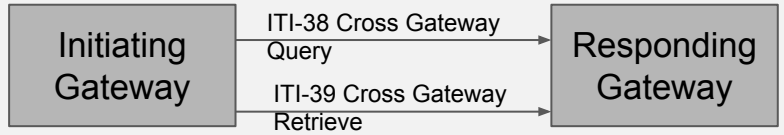


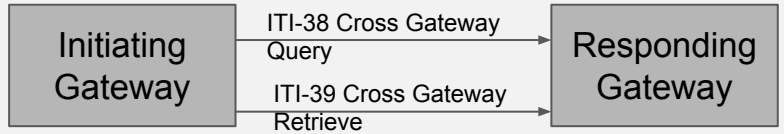
XCA– Cross-Community Access

- **Cross Community Access (XCA)**
  - Based on W3C standards
  - ebRegistry
  - SOAP
  - SAML
- **Patient Identity Management (PIX, PDQ)**
  - Based on HL7 v2 or v3
- **Discovering and Retrieving from another community**



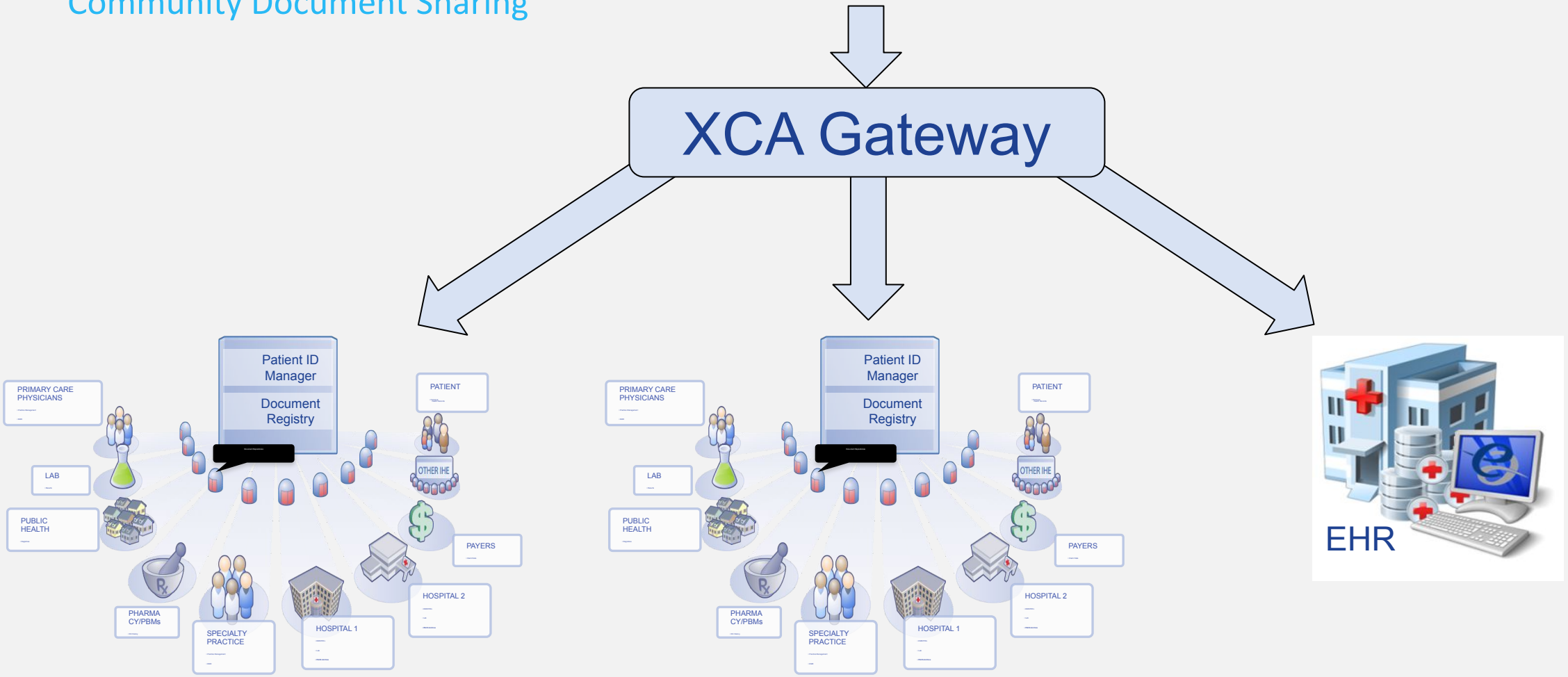
What is Community?

- **Coupling of facilities/enterprises** that have agreed to work together **using a common set of policies for** the purpose of **sharing clinical information** via an established mechanism
- Facilities/enterprises may host **any type of healthcare application** such as EHR, PHR, etc
- A community is **identifiable by a globally unique id** called the **homeCommunityId**
- Communities **may be XDS Affinity Domains** which define document sharing using the XDS Profile **or any other** communities, no matter what their **internal sharing structure**.



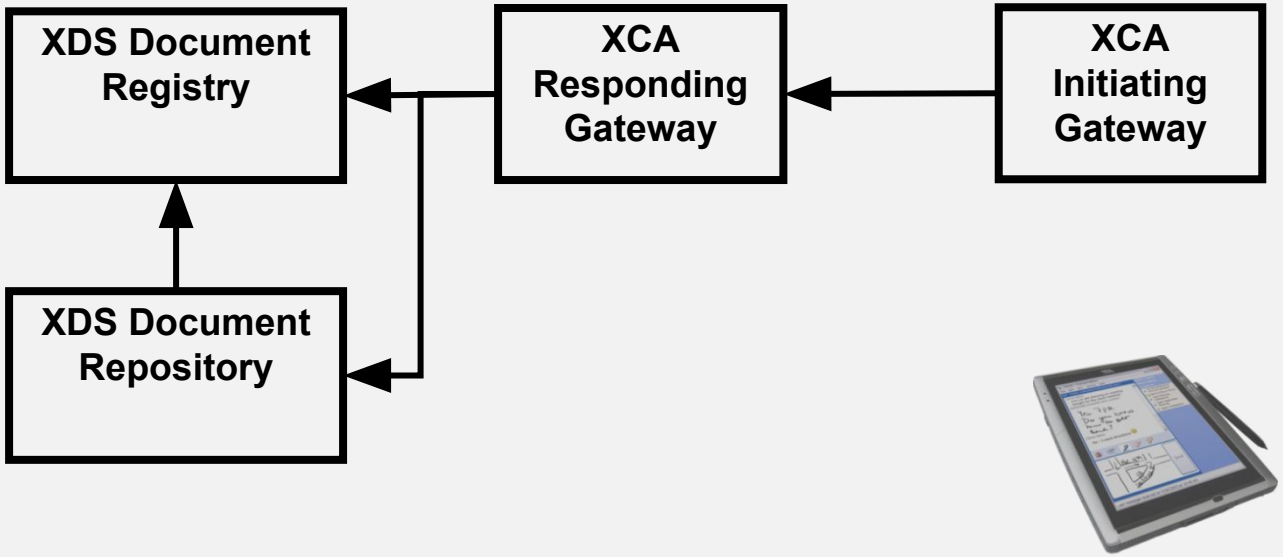
IHE Standards-based HIE (XCA)

Community Document Sharing



Source: https://ihe.net

MHD as API to XCA



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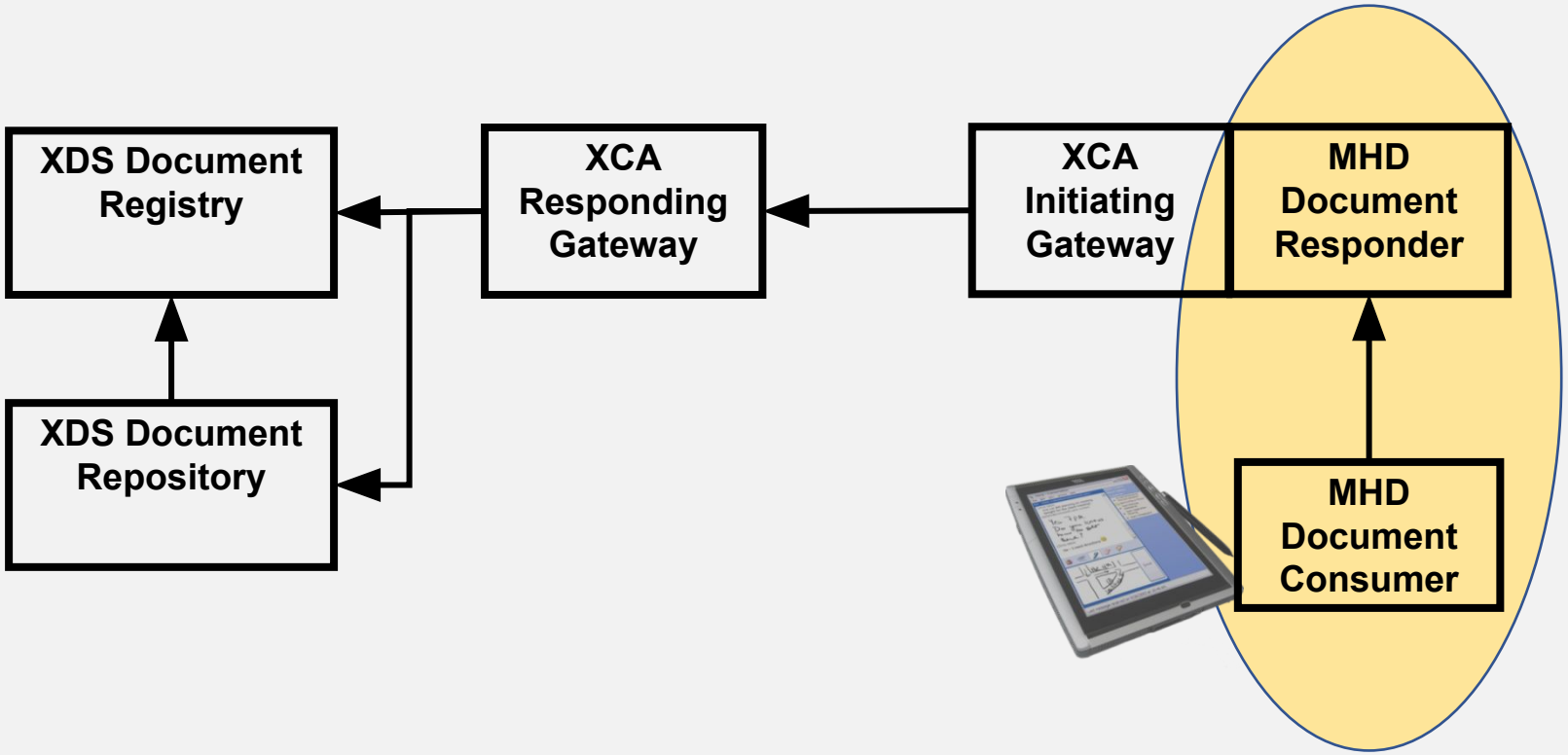
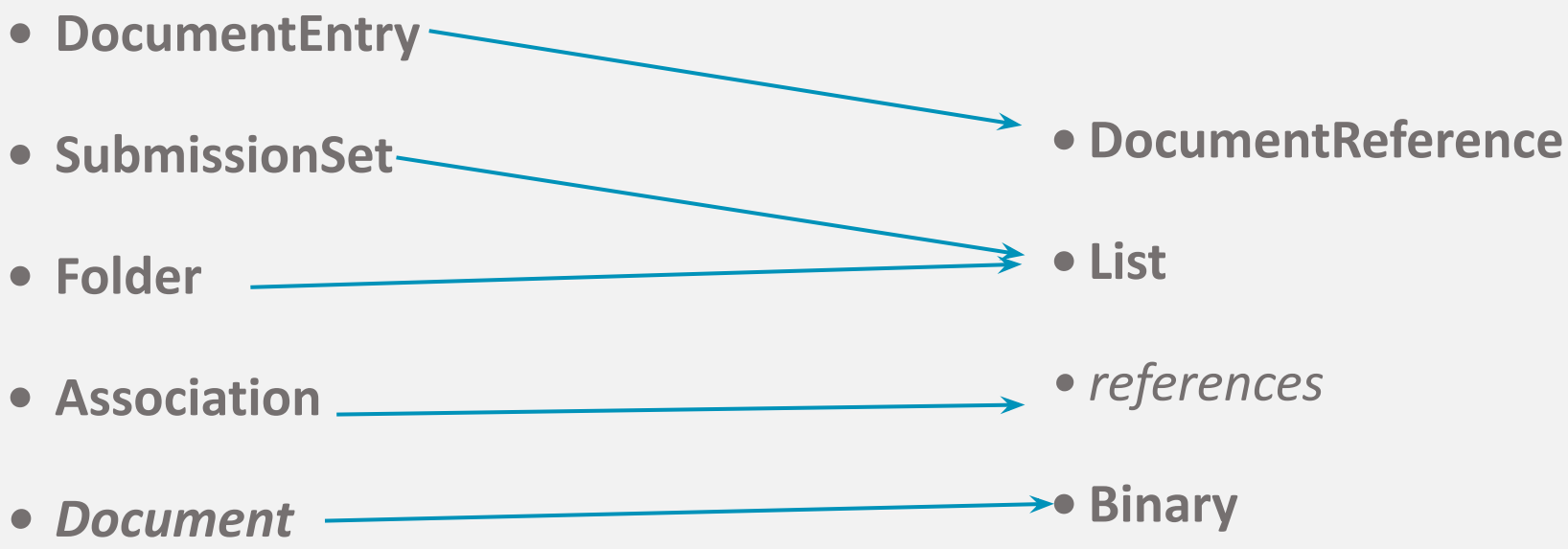


XDS to FHIR: Profiles Mapping

XDS's support profile	FHIR equivalent	Description	FHIR reference
PDQ v2 v3	PDQm	patient demographics discovery	https://profiles.ihe.net/ITI/PDQm/index.html
PIX v2 v3	PIXm	patient identifiers discovery	https://profiles.ihe.net/ITI/PIXm/index.html
XUA	IUA	handling of authentications protocols	https://profiles.ihe.net/ITI/IUA/index.html
ATNA	BALP, RESTful query and feed to ATNA	handling of secure HTTP protocols and events auditing	https://profiles.ihe.net/ITI/BALP/index.html https://www.ihe.net/uploadedFiles/Documents/ITI/IHE_ITI_Suppl_RESTful-ATNA.pdf
DSUB	DSUB for mobile (currently ongoing)	Handling of document subscription and notifications	http://build.fhir.org/ig/IHE/ITI.DSUBm/branches/master/index.html 

XDS to FHIR: Object Mapping



ITI-65 Provide Document Bundle Transaction (Publication request)

- Publish
  - Used mostly with XDS Reg/Rep to publish new documents, or replace old documents with new
- Push
  - Used to send documents

Bundle (Create Transaction)

- List (SubmissionSet)
- DocumentReference
  - Binary
- DocumentReference
  - Binary
- DocumentReference
  - Binary
- List (Folder)
- *Patient*

ITI-66 & ITI-67 Query *Transactions – simply normal FHIR® queries*

DocumentReference (*DocumentEntry*)

- Patient – required parameter
- classCode, practiceSetting, timeframe, etc

List (*SubmissionSet / Folder*)

- Patient – required parameter
- classCode, practiceSetting, timeframe, recipient, etc

Documents are not optimal for FHIR® clients

MHD eliminates the need to understand SOAP and ebXML . It does enable API use of JSON or simple XML.

But Document format not changed

- They are various formats (PDF, DICOM, CDA, etc)
  - CDA XML is not simple XML
- Apps tend to want summary without duplicates

Yet

- Apps will eventually need to know the integrity and authenticity of the data
- Apps may need to reference the source
- Many CDA today are just EHR data dumps – a Current Medical Summary
- FHIR® provides nice sized chunks

Note: MHD Retrieve Document could support service that converts the original document to FHIR®-Document

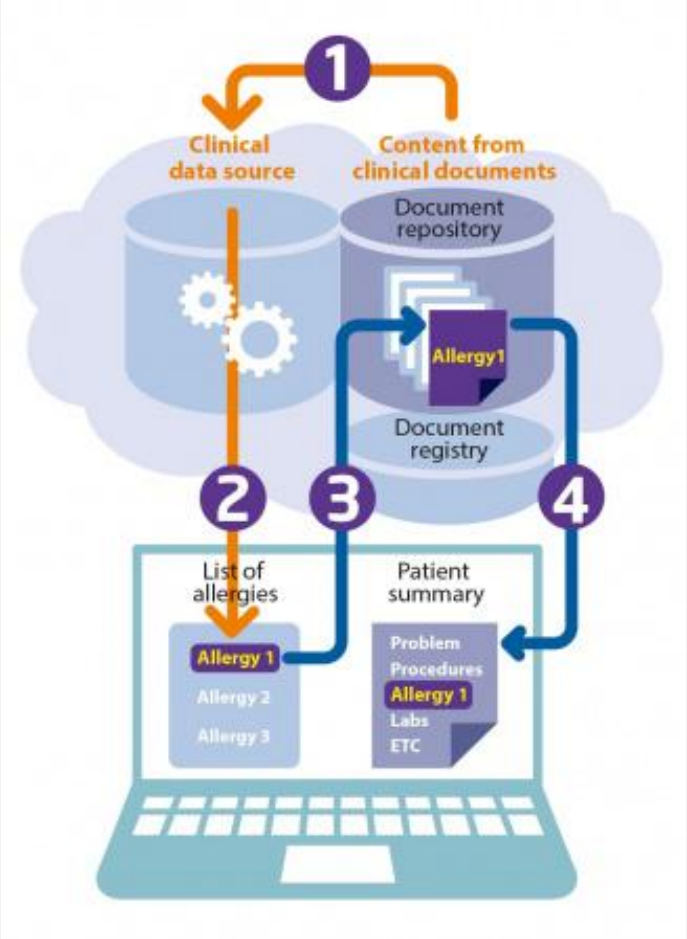
Query for Existing Data for Mobile (QEDm)

- Supports queries for clinical data elements (e.g., observations, allergies, etc.) by making the information widely available to other systems within and across enterprises
- Aimed at class of systems that are resource- and platform-constrained (e.g., tablets, smartphones, and embedded devices including home-health devices)

- Observation,
- AllergyIntolerance,
- Condition,
- DiagnosticReport,
- Medication,
- MedicationStatement,
- MedicationRequest,
- Immunization,
- Procedure,
- Encounter,
- Provenance,
- OperationOutcome,
- Bundle

Mobile Cross-Enterprise Document Data Element Extraction (mXDE)

- Provides means to access data elements extracted from shared structured documents
- Enables the deployment of health data exchange infrastructures where fine-grained access to health data coexists and complements the sharing of coarse-grained documents and the fine-grained data elements they contain

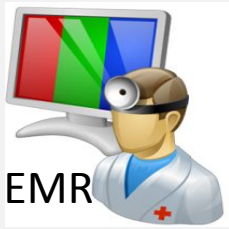


Source: https://ihe.net

Shared Documents (XDS)

Med Summary

Episode 2/7/1989



Discharge Summary 1/2/2002

Etc…

Resources

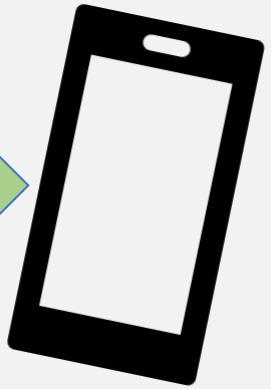
Observation
- Obs 1
- Obs 2
- Obs 3

Medication
- Med 1
- Med 2
- Med 3

Allergy
- Al 1
- Al 2
- Al 3

Immunization
- Imm 1
- Imm 2
- Imm 3

Provenance
- Prov 1
- Prov 2
- Prov 3



FHIR®

Source: https://ihe.net

Using Provenance

- Determine how often the issue is referenced (1 document vs all)
- Determine who has published the issue
- Pull the metadata -- DocumentReference
- Pull the Document
- Model for Provenance
  - One Provenance for each Document
  - Where a data Resource came from many documents, it will have many Provenance.target pointing at it
  - **Provenance.target** □ 1..* Resources (the resources that came from this document)
  - **Provenance.recorded** □ when the decomposition happened (might inform cache)
  - **Provenance.policy ==** “urn:ihe:pcc:qedm:2017:document-provenance-policy”
  - **Provenance.agent** □ the software “ASEMBLER” that decomposed this document into these target Resources
  - **Provenance.entity** □ the DocumentReference representing this document

Experiment

- IHE-Connectathon tools
  - http://wiki.ihe.net/index.php/IHE_Test_Tool_Information
- Published conformance resources
  - https://profiles.ihe.net/ITI/MHD/artifacts.html

Bonus Things not in the IHE Profiles

When using MHD, one could retrieve the Binary (Document) and get a better format than was published.

- MHD Document Responder
  - **MUST** be able to return the Binary in the format given in the DocumentReference
  - **May** support negotiate to 'better' for the client format

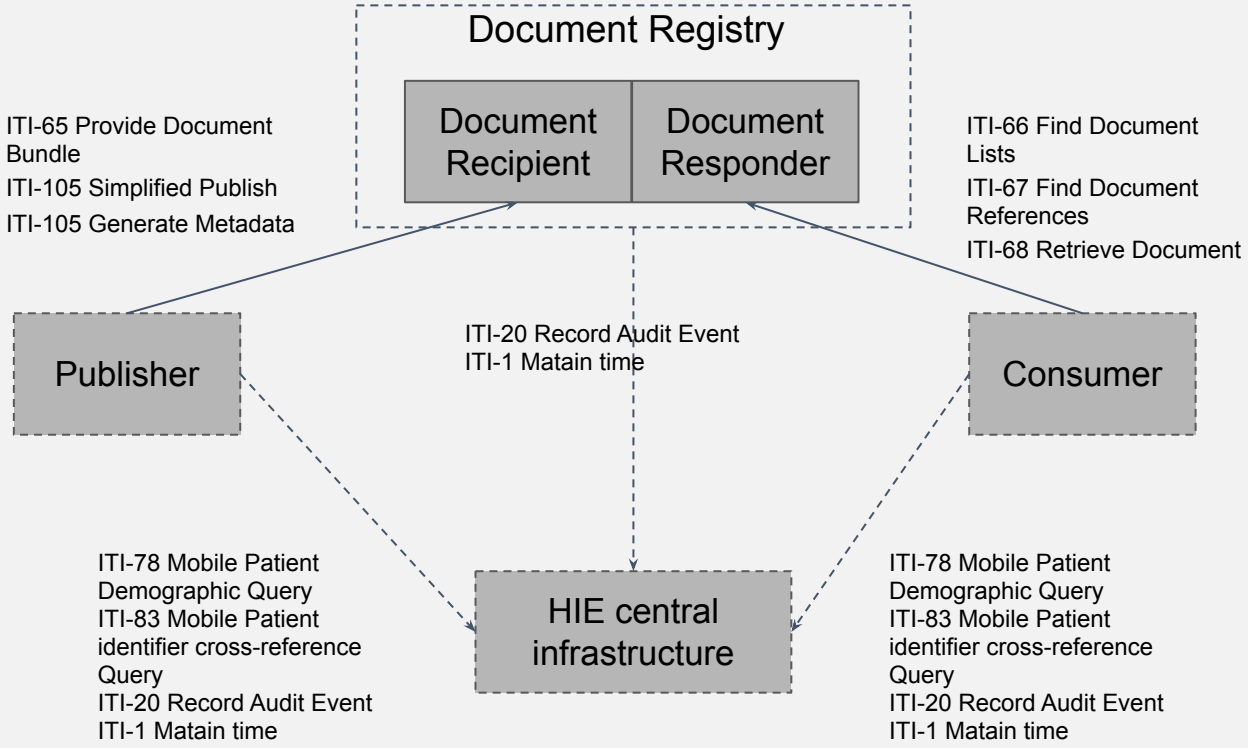
Example when the document is in C-CDA, the C-CDA on FHIR transforms could be used to automatic conversion to FHIR Document http://hl7.org/fhir/us/ccda/history.html

Example when the Document Consumer would prefer a human rendering, the Document Responder could apply a stylesheet and return PDF rendering

Bonus Track- Mobile Health Document Sharing (MHDS)

- 100% FHIR infrastructure
- **Document Registry**
  - MHD transactions
  - Persistence and lifecycle management
- Patient Identity Management
- Authorization - OAuth
- Audit Record Repository

Details: https://profiles.ihe.net/ITI/MHDS/index.html



What did you learn?

- Insights on XDS and XCA
- MHD (XDS on FHIR)
  - Document Metadata Query
  - Publication of Documents
- mXDE & QEDm
  - Get Decomposed Resources
  - Get Provenance, so that get source Document
- Bonus: MHDS

Contact

- During DevDays, you can find / reach me here:
  - Via Whova App – Speaker's Gallery
  - email: gcanal@consorzioarsenal.it

Q&A

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