



**Cross-Enterprise Collaboration to Manage
Patient Care Across Health Networks via XDS & FHIR**

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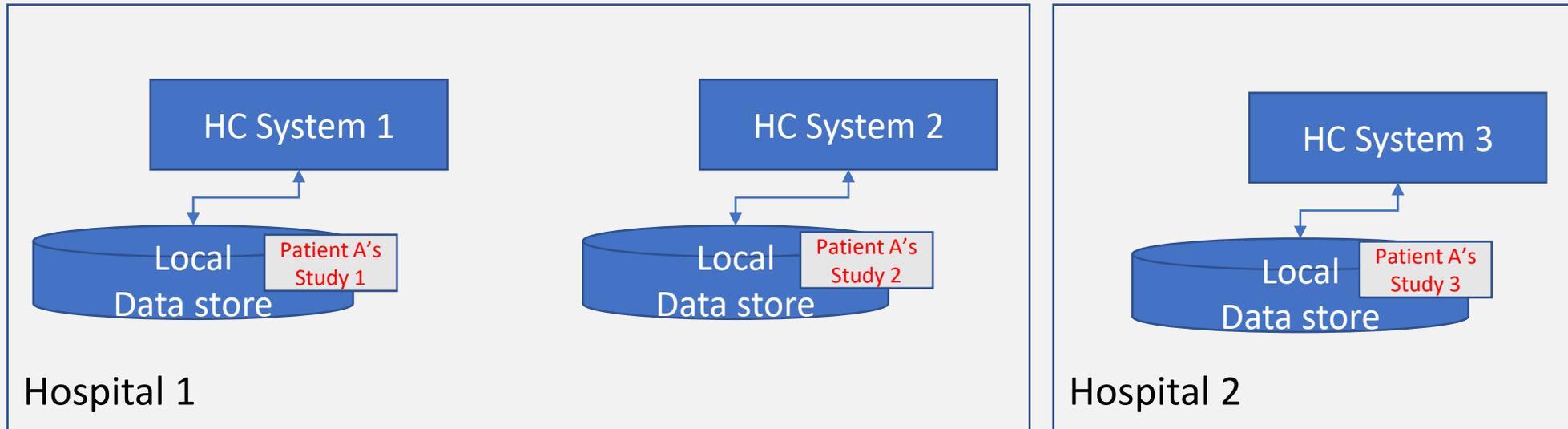
Who am I?

- Pradeep Bangalore
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- Working with Royal Philips
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Introduction

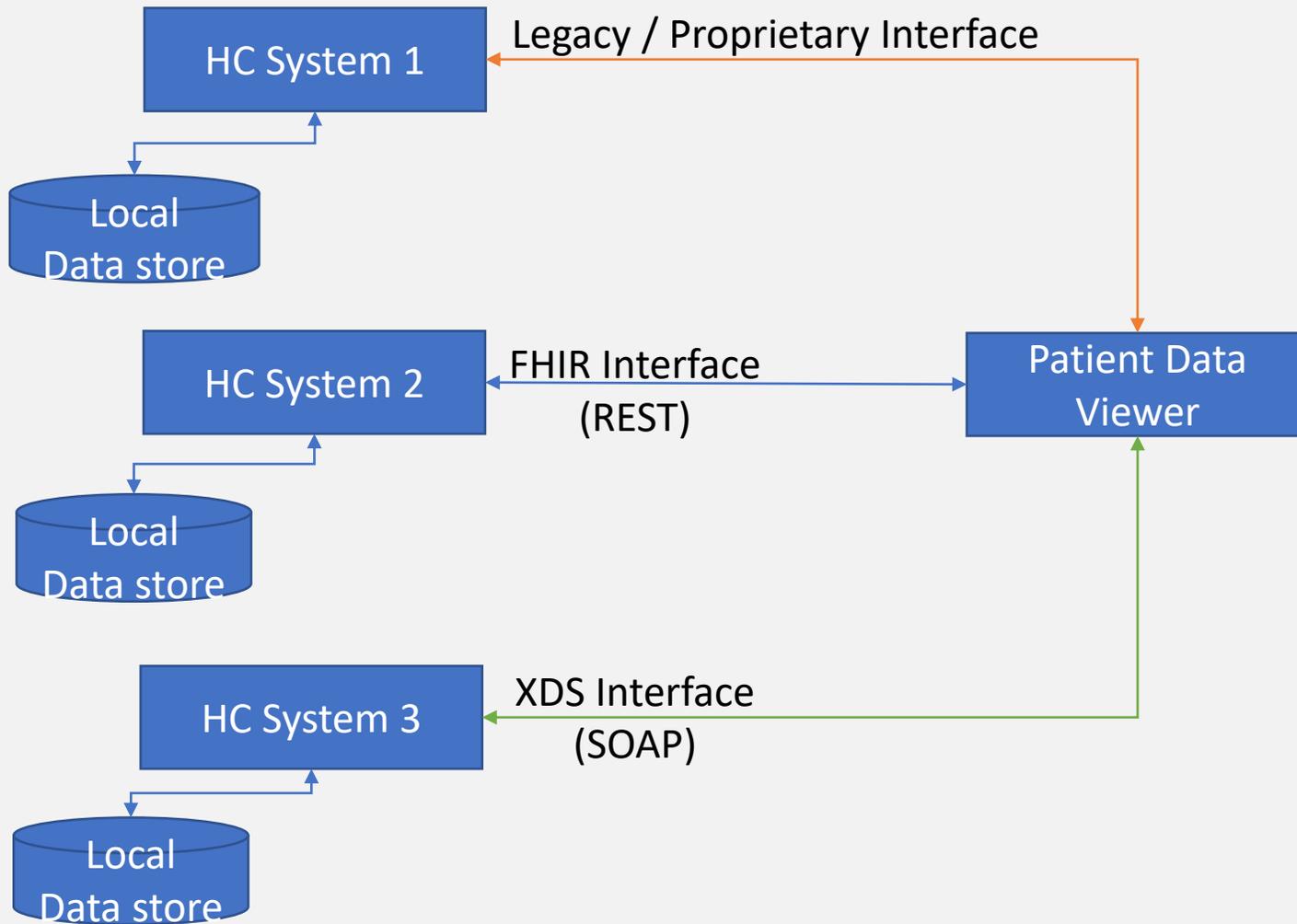
- **Cross-Enterprise Collaboration to manage Patient Care across Health Networks:** Patient data (in the form of Healthcare documents) is scattered across various Healthcare systems in a Healthcare environment. It will be very helpful to get a complete longitudinal view of such scattered Patient Health data. We require some form of Cross Enterprise collaboration. This is the topic of the current session.



Some terminology

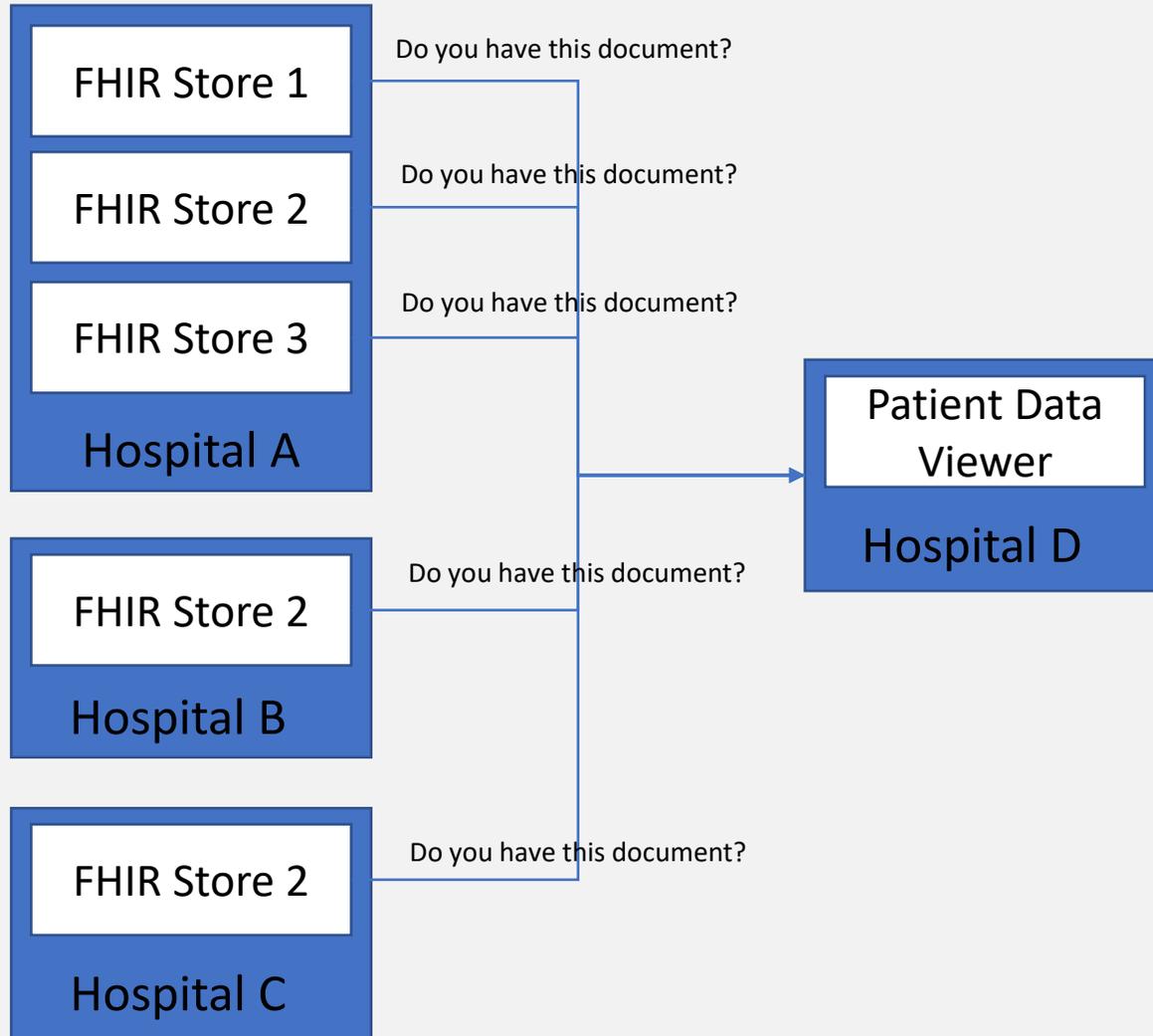
- **IHE (Integrating the Healthcare Enterprise)** is an initiative by the Healthcare industry to improve the way in which the computer systems in the Healthcare domain share information.
- **IHE profiles** define a common interaction language that can be used in specific clinical workflows.
- **Cross-Enterprise Document Sharing (XDS)** is an interoperability profile that facilitates the registration, distribution and access across health enterprises of patient electronic health records (**documents**).
- **On-Demand Documents** are documents assembled by the On-Demand document sources at the time of request. This allows for the latest version of clinical data to be assembled and provided at the time of the request

Missing Common Language



- Different Healthcare systems / Modalities have different interfaces
- A system that requires communication with all of these systems/ modalities shall need to be able to speak all of these languages (FHIR, XDS, Proprietary protocols, etc.) over communication protocols like SOAP and REST

Where is my document?



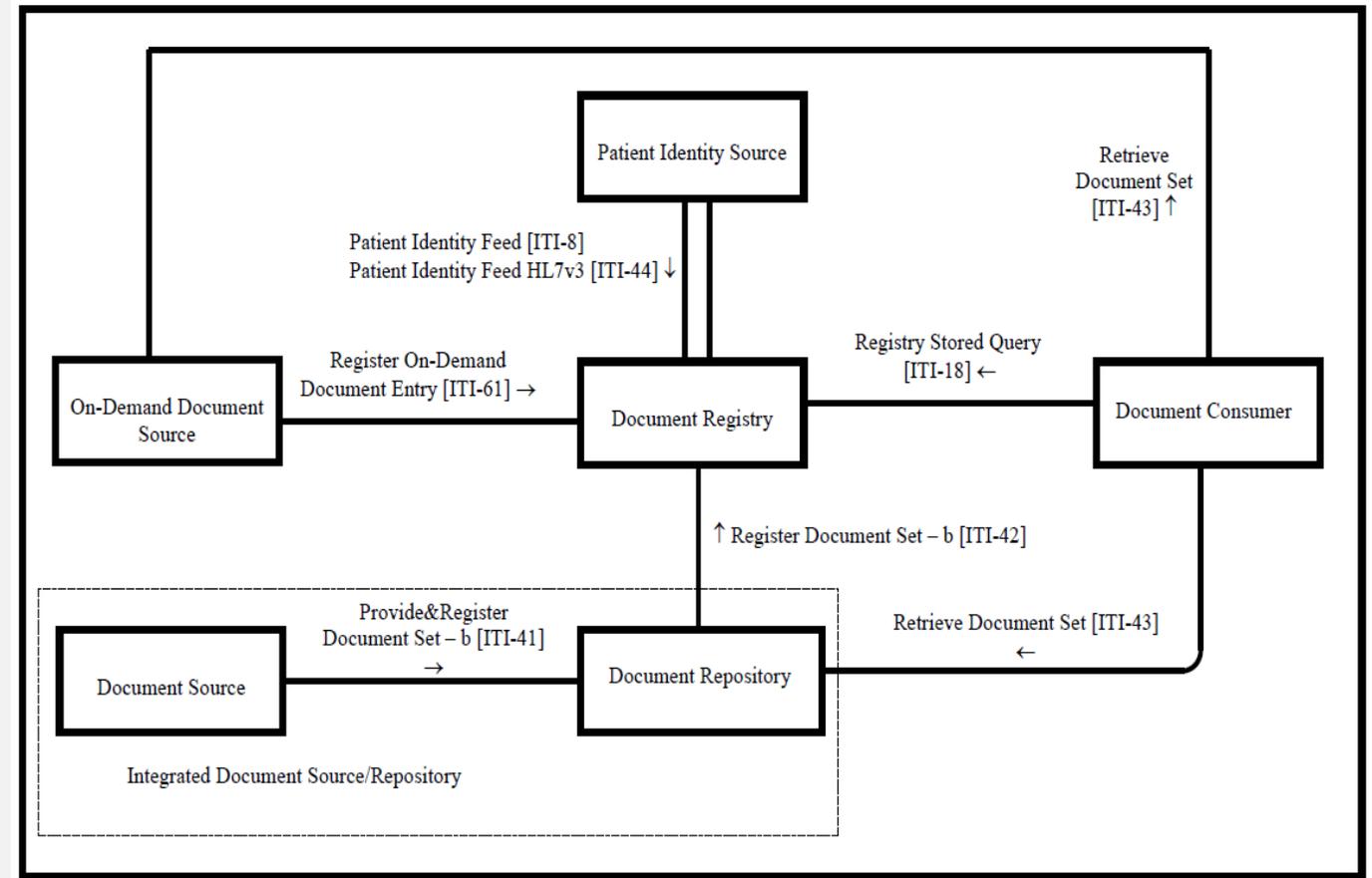
- If Healthcare operatives / systems need to find a specific document of a patient, in a networked hospital setup, they have no FHIR standard way of determining which FHIR store contains the data, i.e., no FHIR way of performing Document Discovery

Session Scope

- The scope of this session is to talk about our learnings on using IHE On-Demand Document (XDS.b) profile for federating **XDS Registries** and **FHIR Data Stores**.
 - We shall look at how we can enable an automated workflow that enables On-Demand document discovery using XDS registries.
 - We shall see the workflow on how we can retrieve an On-Demand document (a FHIR document) from a FHIR store

Typical actors in the in the XDS integration workflow

- **Document Registry** – Stores metadata about the documents (including where they are stored)
- **Document Repository** – Stores the documents and shall share the same upon valid requests
- **Document Source** – Produces documents and updates the information about the same in the Registry
- **Document Consumer** – Queries for the documents meeting certain criteria
- **On-Demand Document Source** - Produces On-Demand Documents and updates the information about the same in the Registry.



XDS and FHIR

- XDS is a widely adopted data sharing mechanism in Healthcare. It can help in discovering where the document is located as well.
- FHIR Servers can act as the Document Repositories
- A central XDS server acts as the Document Registry
- What is missing in the current landscape:
 - A mechanism for automatically updating metadata about FHIR Documents into the Document Registry.
 - A bridging entity that can speak to FHIR servers using REST and to XDS Document Registry using SOAP (that also allows for reuse of the existing XDS infrastructure)
 - A workflow that can provide the latest version of the required FHIR documents at the time of request (instead of fetching and storing documents in batches periodically)

Some assumptions before continuing

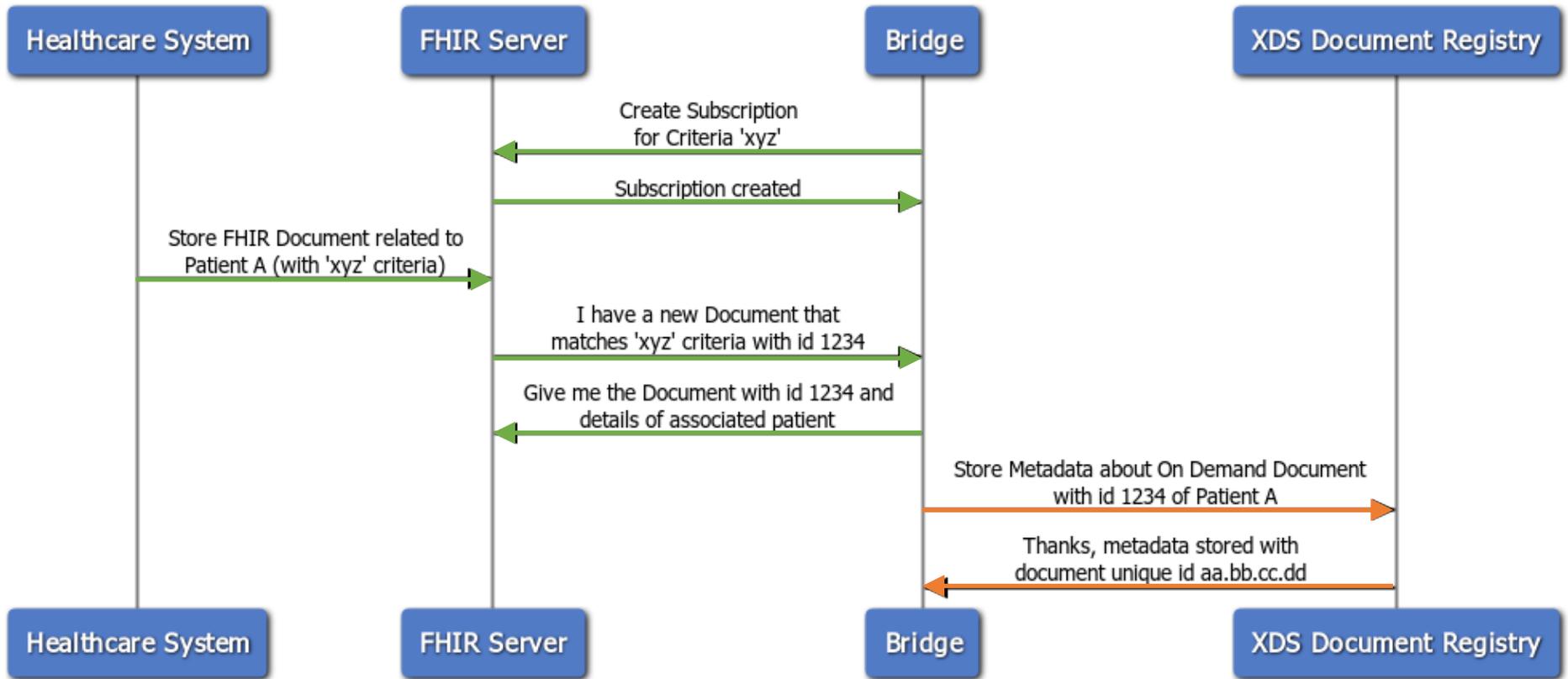
- All the actors in the integration workflow can communicate with each other
- All the actors in the integration workflow have the appropriate Authorization and Authentication permissions to access the resources
- The documents being shared meet all the required criteria (such as validity, authenticity, etc.)
- Deployment models of the services are irrelevant to this discussion

XDS and FHIR Integration – Bridging both worlds

- FHIR servers support the consumers to create subscriptions based on specific search criteria.
- Once resources matching these criteria are registered in the FHIR servers, they notify the registered subscribers

XDS and FHIR Integration – Registering documents

Automated Registration of XDS On Demand Documents



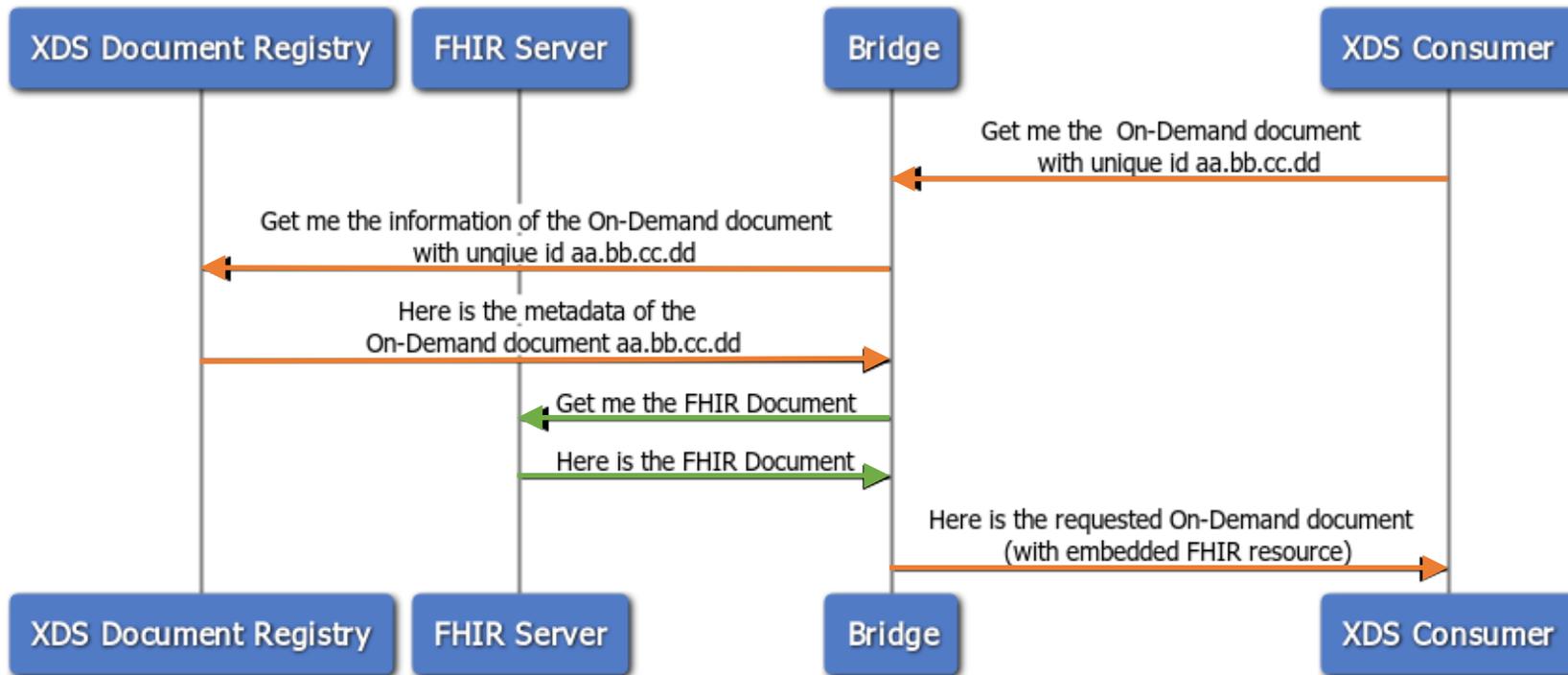
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Key

- XDS workflow
- FHIR workflow

XDS and FHIR Integration – Retrieving documents

Retrieve Document workflow



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Key

- XDS workflow
- FHIR workflow

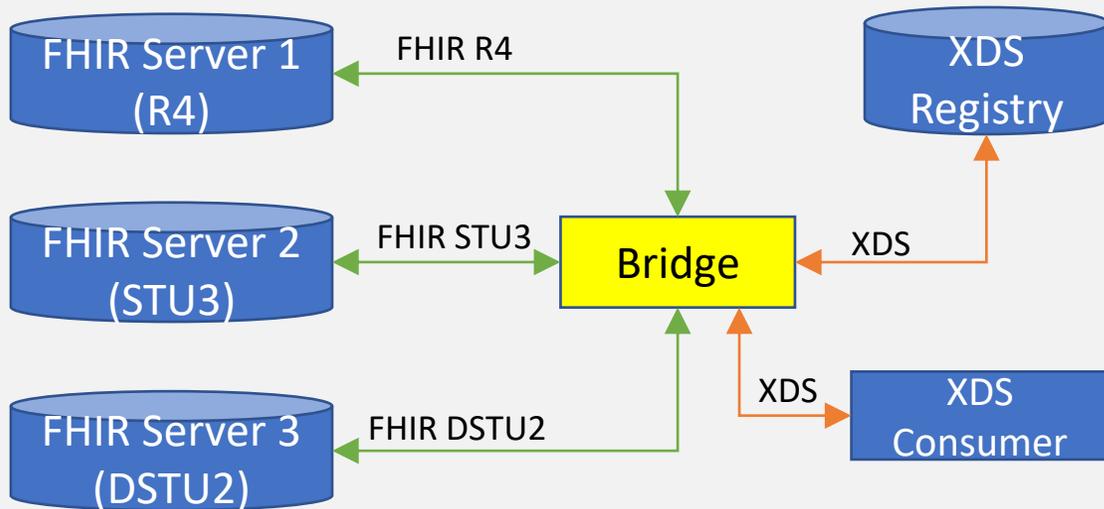
Patient Identity Resolution

- The different Healthcare systems participating in the integration workflow might have different conventions of naming the patients. Thus, if one system refers to John Doe with an identifier John_Doe_12345, the other system might refer to the same John Doe as Doe.John.12345. Thus, when these systems are participating in an integrated workflow, we need to have a standard way of identifying the patients.
- For this, we can make use of the Mobile Patient Identifier Cross Referencing (**PIXm**) Integration Profile or any other suitable Patient Identity Management system. Such systems allow us to uniquely identify the patient with multiple systems using different conventions. Similarly, FHIR servers can provide appropriate **\$match** operation support

MHD (Mobile access to Health Documents)

- The Mobile access to Health Documents (MHD) Profile defines one standardized interface to health documents for use by mobile devices so that deployment of mobile applications is more consistent and reusable.
- The Mobile Health Documents (MHD) profile provides a more simpler API to an existing XDS system.
- The MHD profile doesn't support all of the XDS workflows. Hence, based on the existing XDS infrastructure and the use cases, we can pick either the previously discussed approach or have a MHD based implementation

Challenges faced



- Though XDS is a stable interface, multiple Healthcare systems might be using different FHIR versions. The Bridge needs to be able to talk to data stores with different FHIR versions.
- The XDS Consumer shall also need to understand different FHIR versions to be able to consume the Healthcare documents appropriately
- The multiple hops / translations occurring in the workflow shall induce some latency.

Conclusion

- With the integration of the IHE XDS profile and the FHIR servers, we can liberate data that is isolated in various silos.
- This integration provides a standardized way of data sharing and federation. This ensures that all the Healthcare systems actively participate in creating the information about the journey of a patient at the various stages in a hospital environment
- Making use of the FHIR subscriptions and XDS On-Demand documents we ensure that we always have the metadata about the available FHIR documents in the XDS Registry and we can fetch the latest versions of these FHIR documents on demand

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Q&A

