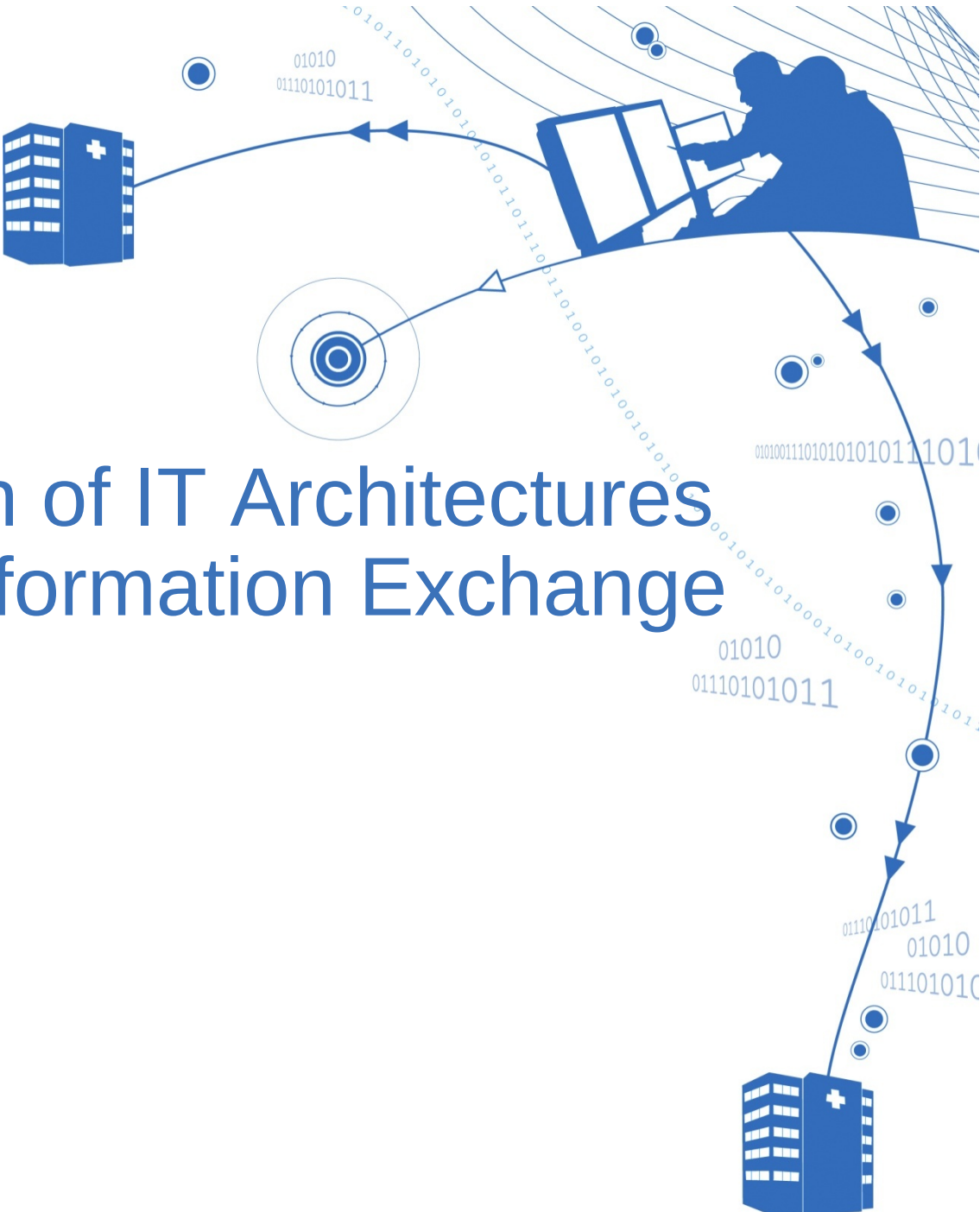




Standardization of IT Architectures and Imaging Information Exchange

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GE Healthcare



Outline

1. Set the stage: Key info exchange use cases
2. Positioning the standards and profiles
3. Maturity and Implementation readiness



Towards connected imaging

**Optimize clinical staff
productivity and
enable informed
decision making**

Physician access to prior
& ordered report/images

**Enable on-line imaging
orders**

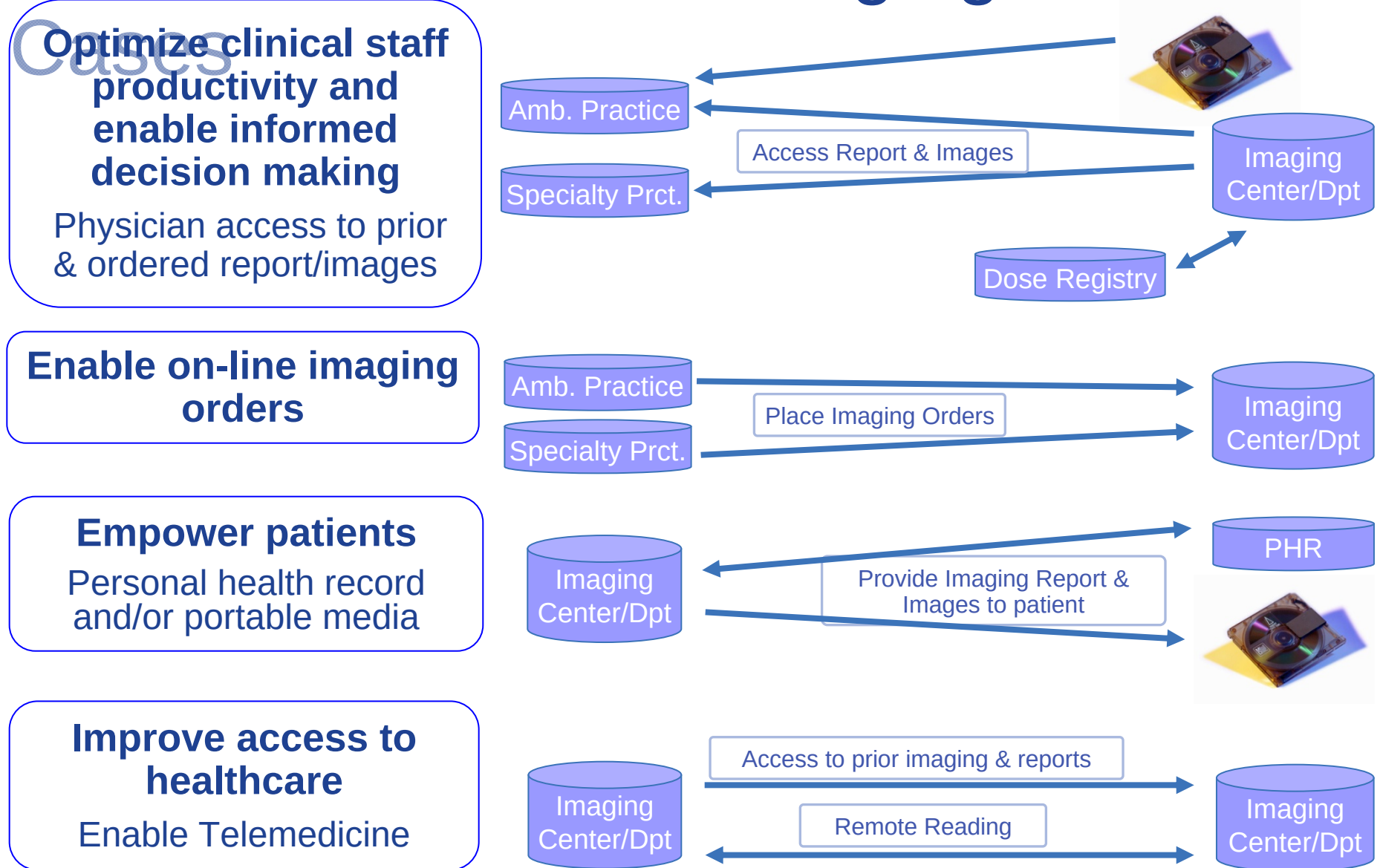
Empower patients

Personal health record
and/or portable media

**Improve access to
healthcare**

Enable Telemedicine

Towards connected imaging: Use



Note: Intra hospital imaging interoperability (EMR/RIS/PACS integration) out of MU s

Connected Imaging: Use Cases

Optimize clinical staff productivity and enable Informed decision making

Physician access to prior & ordered report/images



Today:

Imaging centers and imaging departments return imaging results either:

- Paper/film
- On portable media (CD/DVD) carried by the patient or sent by mail
- Referring physician imaging portal (for heavy referral as inconsistent display)
- Limited use of network transfers: DICOM e-mail used for dental imaging

➔ **Portable media interoperability with IHE PDI profile based on DICOM**

Display from media – launch on media DICOM viewer

Use a DICOM readers on DICOM objects (open source or not)

Millions of IHE PDI media interchanged every year

Connected Imaging: Use Cases

Optimize clinical staff productivity and enable Informed decision making

Physician access to prior & ordered report/images



Next step: Three sub-use cases:

1. Access to prior reports and/or images (avoid duplicates, informed orders)
2. Send results (report only with image links for viewing from source portal)
3. Send reports and DICOM images (key for specialist, e.g. orthopedist, dentist)

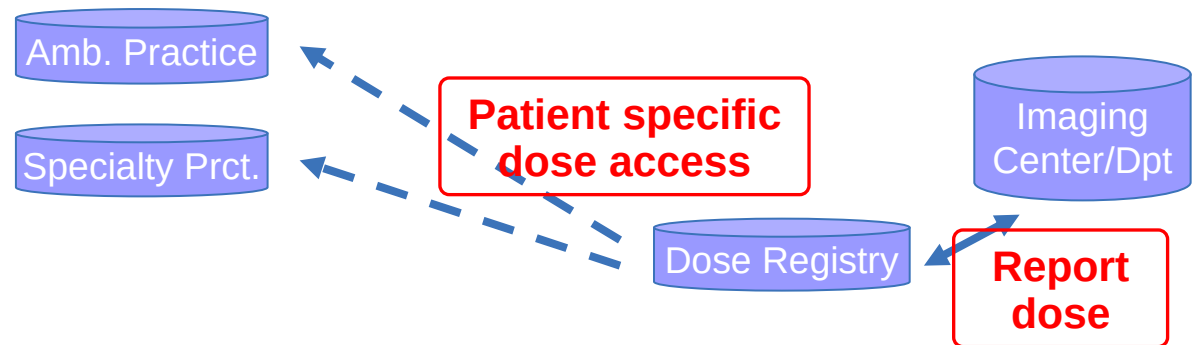
→ Access to prior (1) requires HIE/NHIN/PHR: specified by IHE XDS/XCA plus XDS-I profiles (based on WS+OASIS ebRS plus DICOM)

→ Send results with links (2) or (3): XDM e-mail or XDR, plus XDS-SD (PDF) including links to images (DICOM WADO to pull either JPEG or DICOM images)

Connected Imaging: Use Cases

Optimize clinical staff productivity and enable Informed decision making

Physician access to prior & ordered report/images

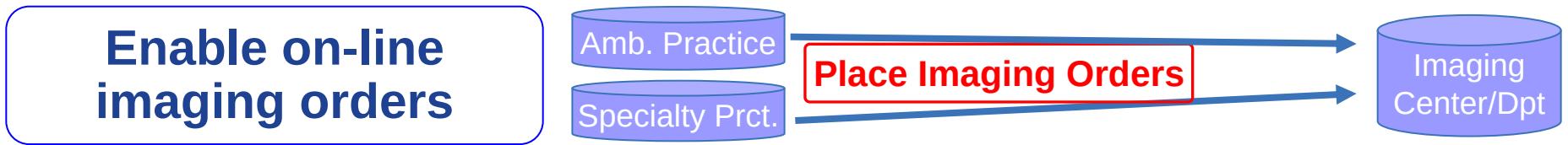


Fourth sub-use cases: Imaging department dose tracking and *non-patient specific* dose reporting

Note: For the update and access to a *patient specific dose* record, standards and profiles have not yet been developed

➔ Non patient specific dose reporting to a dose registry: IHE REM Profile (based on DICOM Dose SR)

Connected Imaging: Use Cases

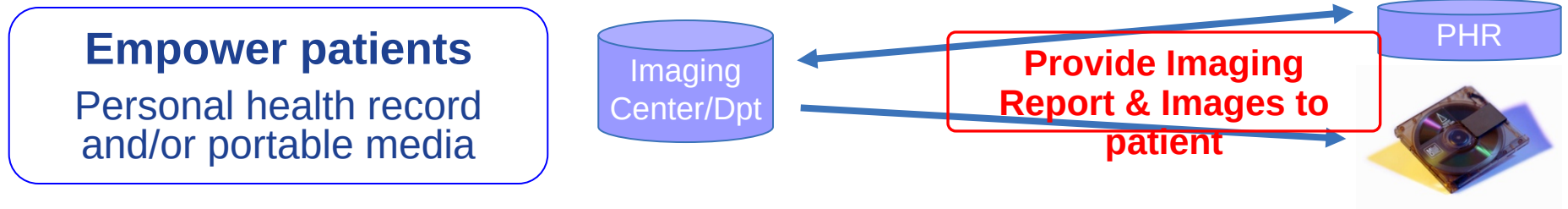


Ambulatory practice issues and tracks progress of electronic order to a remote Imaging Center/Imaging Department

Note: Challenge is routing of the order to the desired imaging facility
Ordering clinical decision support is part of the previous use case

➔ Place Order Transaction: IHE Scheduled Workflow Profile (based on HL7 V2.x)

Connected Imaging: Use Cases



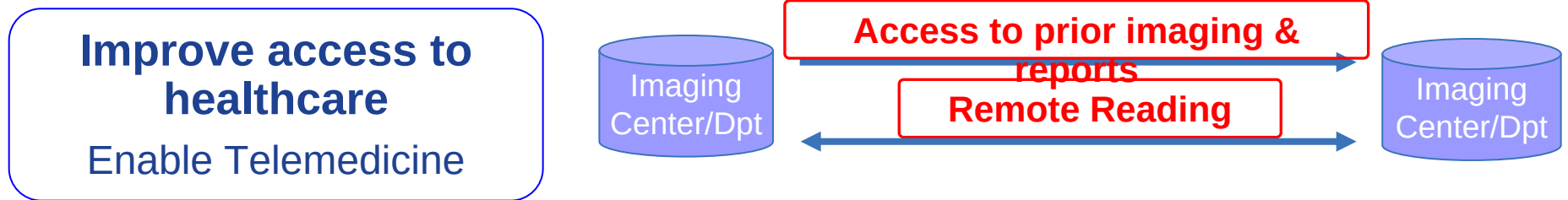
Two sub-cases:

1. Provide imaging information on portable media
2. Provide imaging information by network export (report and/or images)

→ Portable media interoperability with IHE PDI profile based on DICOM

→ Network export: specified by IHE XDS/XDR plus XDS-I profiles (based on WS+OASIS ebRS and DICOM)

Connected Imaging: Use Cases



Cross-imaging centers/departments network access:

1. Access to prior reports and images (avoid duplicates and informed imaging)
2. Provide remote reading service

→ Access to prior (1) requires HIE/NHIN: specified by IHE XDS/XCA plus XDS-I profiles

Note: remote reading service standards have not been profiled yet

From Base Standards to Plug and

Play
Base Standards are critical but can be “customized” and “combined” in incompatible ways

Profiling Base Standards for specific use cases widely recognized as essential

IHE and Continua are two globally recognized profilers

Many national/regional projects rely on “Profiles” to guide implementers: accelerate adoption, reduce risks and costs. Leverage test tools/process

Delivers consistency among eHealth projects



A deeper dive into key standards & implementation guides/profiles:

- DICOM
- IHE PDI
- IHE XDS/XCA
- IHE XDS-I
- IHE XDM/XDR
- IHE REM
- Structured Radiology Reports

Key Standards/Profiles: DICOM

DICOM standardizes image content since 1993, with widespread world-wide use since 1995.

DICOM covers much more than radiology:

cardiology, dentistry, endoscopy, mammography, ophthalmology, orthopedics, pathology, pediatrics, radiation therapy, surgery, (even veterinary)

Even JPEG/MPEG images are supported (consistent header: patient, clinical context, image characteristics)

DICOM covers much more than images:

waveforms (e.g. ECGs), intra-departmental workflows, image computer analysis results (structured), oncology treatment plans

DICOM conformance can be made highly specific

Key Standards/Profiles: IHE PDI

Based on DICOM Media Interchange (CD, DVD, USB media)

Portable Data for Imaging (PDI) refines critical elements (implementation guide/specification):

- Trace defective media back to creating system
- How to support (DICOM viewer) application launch
- Provide a pure web browser view of media (HTML overview and JPEG)
- Restrictions allowed (e.g. permissible compression schemes)

IHE also provides compatibility testing tools and process

AMA, ACR and RSNA support use of IHE PDI

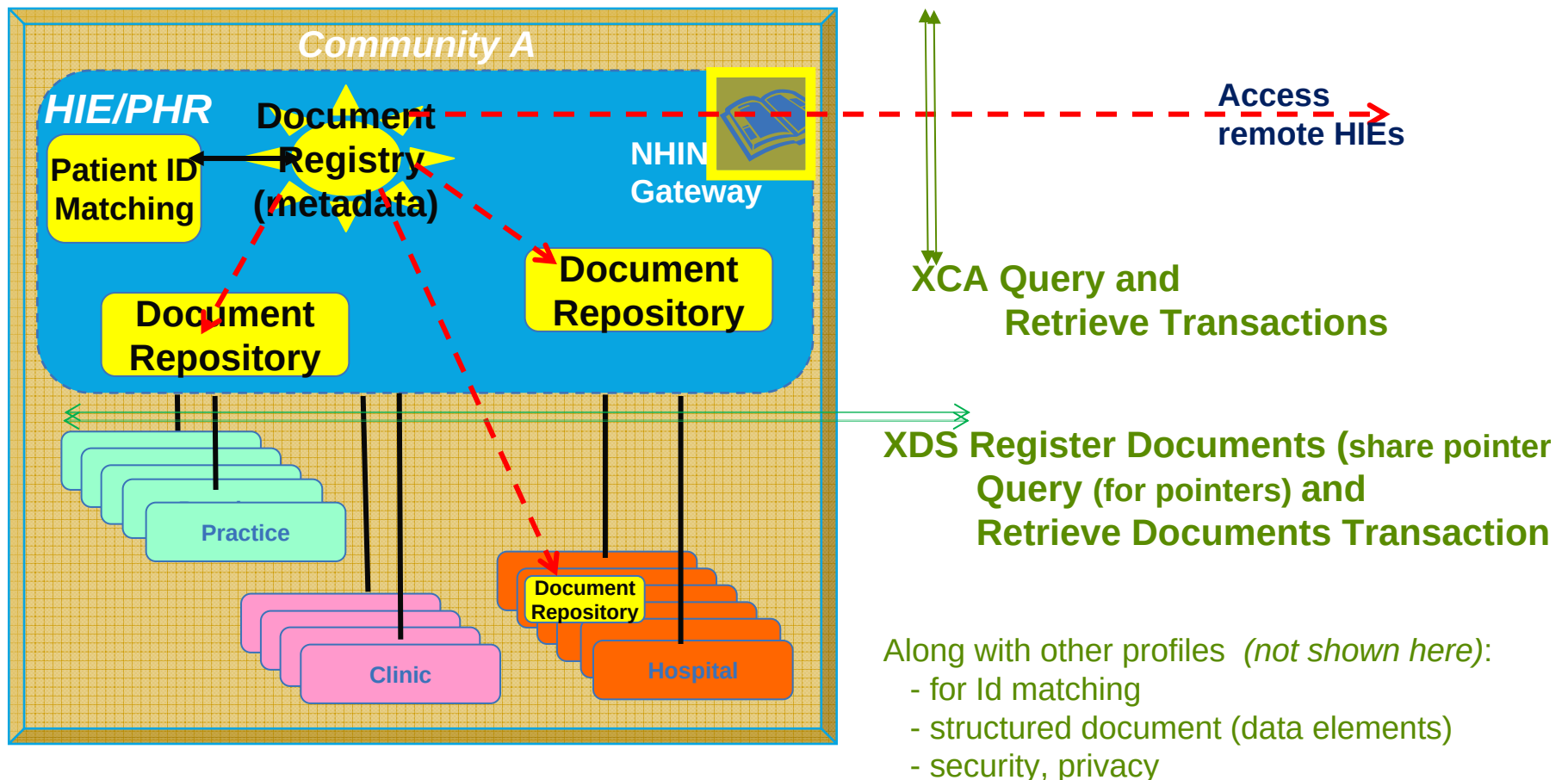
Beyond imaging: IHE PDI is a subset of IHE XDM (allows inclusion of clinical summaries, various IHE content profiles)

Key Standards/Profiles: IHE XDS,

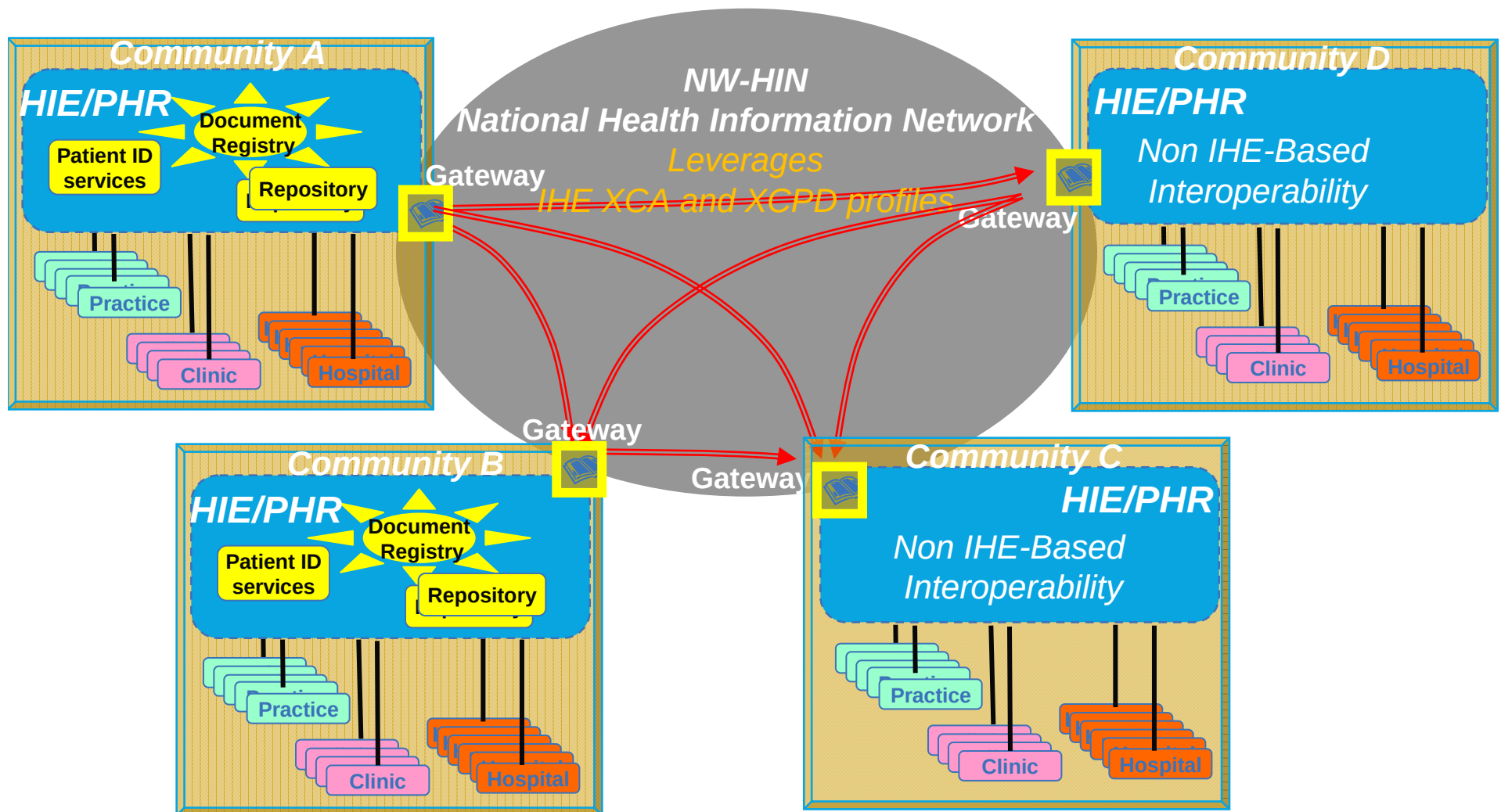
~~XDS~~: Cross-enterprise Document Sharing Profile

XCA: Cross-enterprise Community Access Profile

→ *Enable health information content neutral infrastructures*



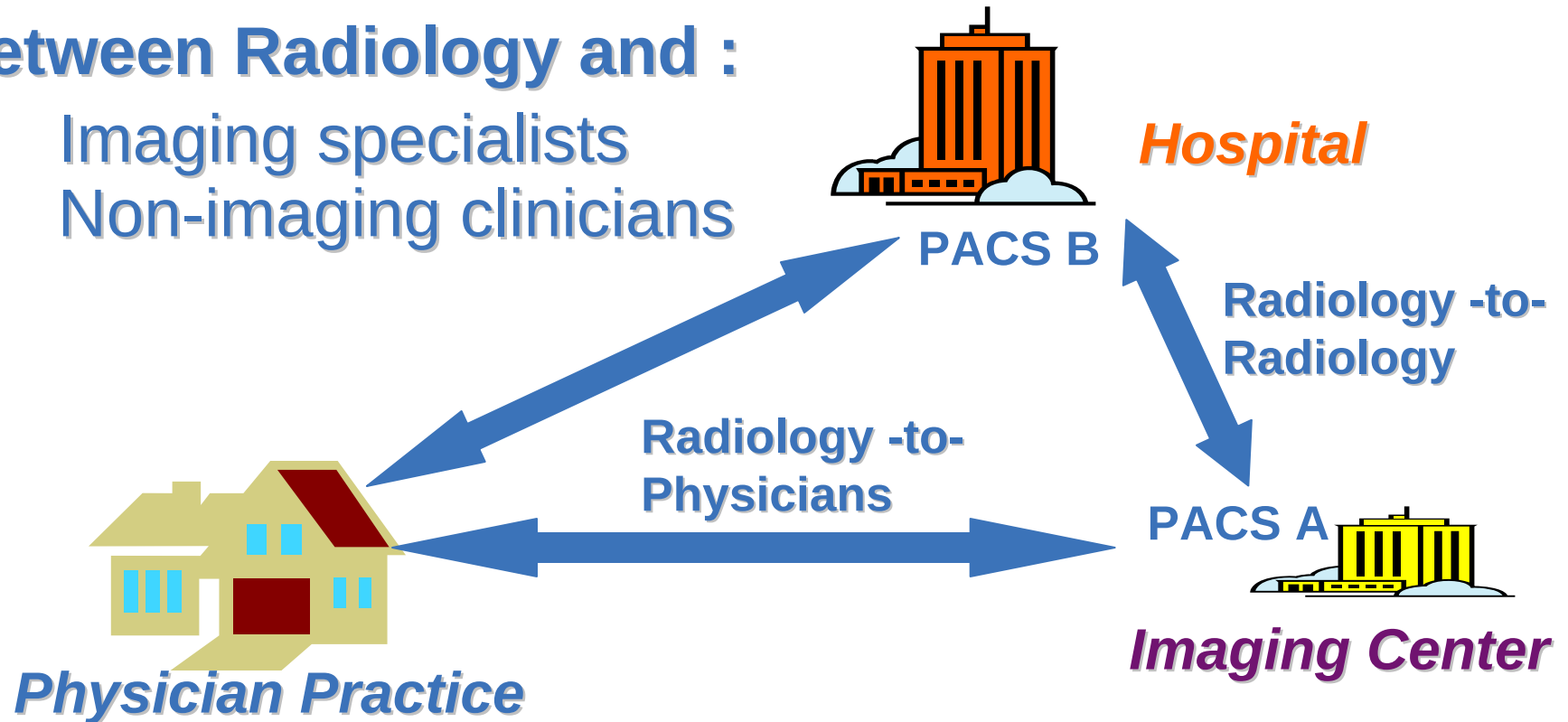
NW-HIN AND HIES - Information sharing within communities and across regional boundaries



Use of a shared XDS infrastructure to access Imaging Reports and Images (XDS-I)

Between Radiology and :

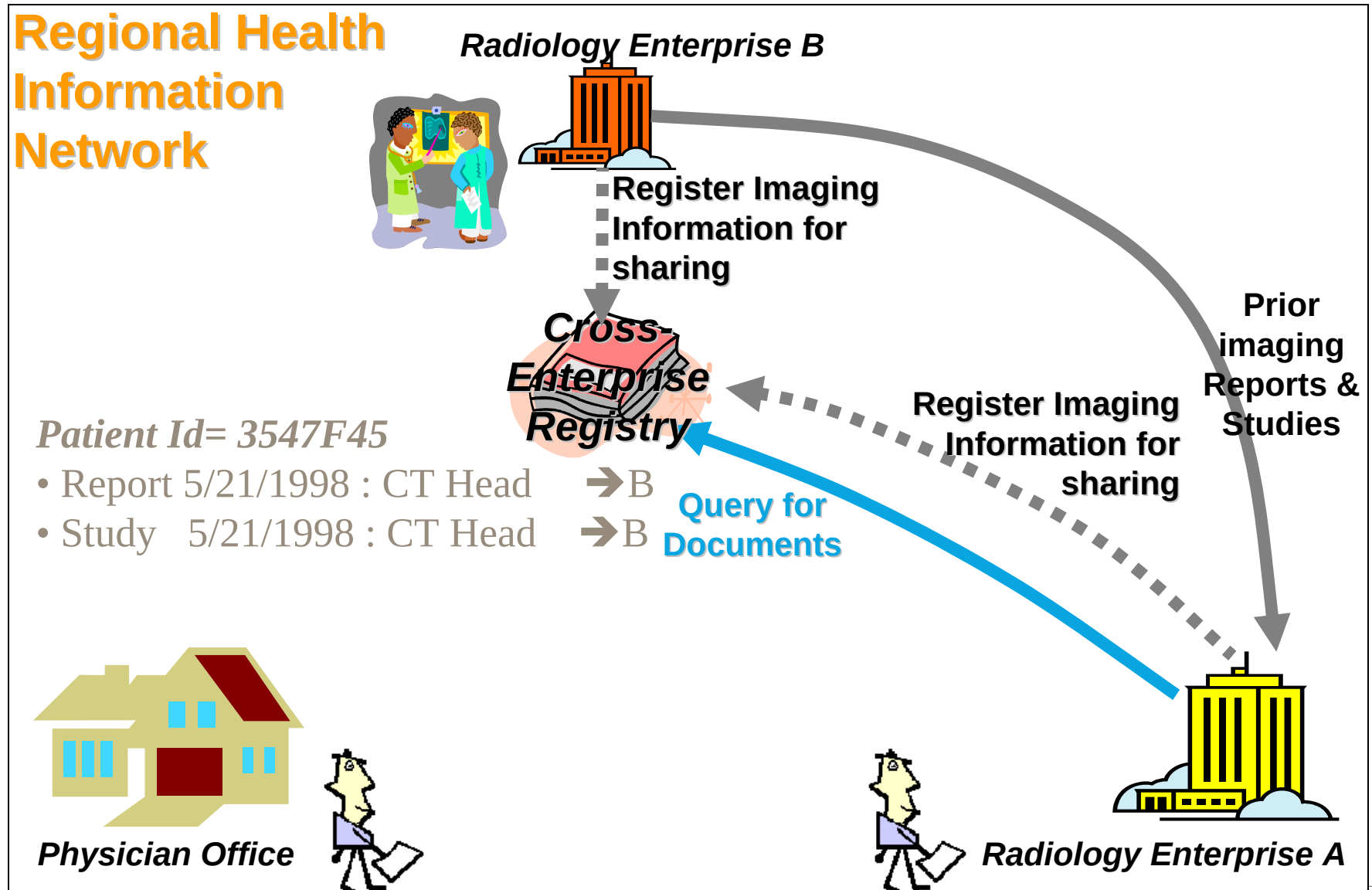
- Imaging specialists
- Non-imaging clinicians



Same XDS Infrastructure (Registry and Repositories) for medical summaries and imaging information !

Physicians and Systems within a Regional Health Network - Routine Imaging Referral

Regional Health Information Network



Physicians and Systems within a Regional Health Network - Routine Imaging Referral

Regional Health Information Network

Radiology Enterprise B



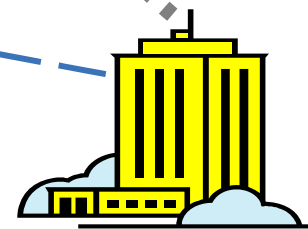
Cross-Enterprise Registry

Register Imaging Information for sharing



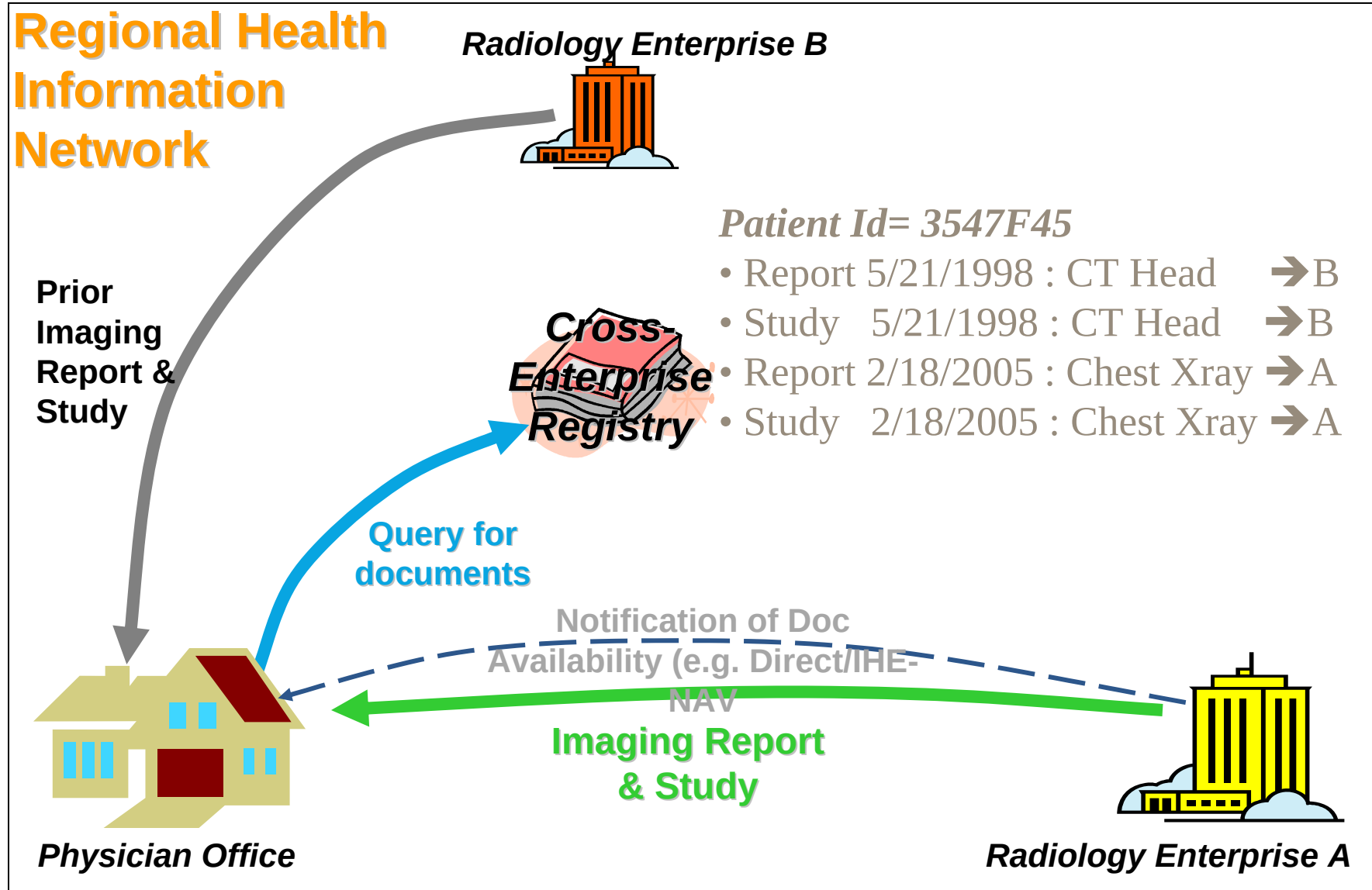
Physician Office

Notification of Doc Availability



Radiology Enterprise A

Physicians and Systems within a Regional Health Network for a Routine Imaging Referral



Key Standards/Profiles: IHE XDS-I

Profile specifying “Imaging content information” to be shared/accessed by IHE-XDS & XCA.

Content includes for:

- Images: DICOM Objects
- Reports: textual or PDF (including links - portable with WADO)

XDS & XDS-I deployed and in operations in several projects around the world (Netherlands, Japan, China, Austria, Canada, etc.)

Key Standards/Profiles: IHE

XDM/XDR

XDM: Cross-Enterprise Document Media Interchange of any sets of documents (structured, unstructured, images) content:

- On media (CD, DVD, USB keys)
- Via e-mail Secured S-MIME attachment:
 - identical to the DIRECT Project specification
 - Requires the XDS meta-data tagging

XDR: Directed document interchange via Web Service transport (include the XDS Metadata tagging)

Key Standards/Profiles: DICOM

WADO

DICOM WADO: Web Access to DICOM Objects

WADO specifies a way to remotely access to objects from a server by a browser application

It specifies: a URL format (Restful) to identify:

- Request image (Unique ID) and Study (Unique Id),
- Expected format (DICOM, JPEG)
- Basic image presentation (matrix size, window width/level, etc)

DICOM in process to specify a Web Services (SOAP) version of WADO

Key Standards/Profiles: IHE REM

IHE Radiation Exposure Monitoring (REM) based on DICOM Dose Structured Report. Covers:

- Intra enterprise: flow of Study level aggregated Dose from Acquisition Modality to PACS and Dose Info Consumer
- External enterprise reporting: from Dose Reporter to Dose Register (patient specific or patient identified)

Note: Access to aggregated patient specific dose is not covered

IHE REM is widespread only on new acquisition modalities but in early enterprise deployment

Key Standards/Profiles: Structured Imaging Reports

Radiology Reports are currently text. Common exchange formats are:

- HL7 V2.x
- ASCII/UTF-8 Text
- PDF (sometimes with a CDA header-XDS-SD)

Work is underway in DICOM and IHE for introducing structure and coding (HL7 CDA & RADLEX)

Standards work to be completed end of 2011

Standards/Profiles Maturity

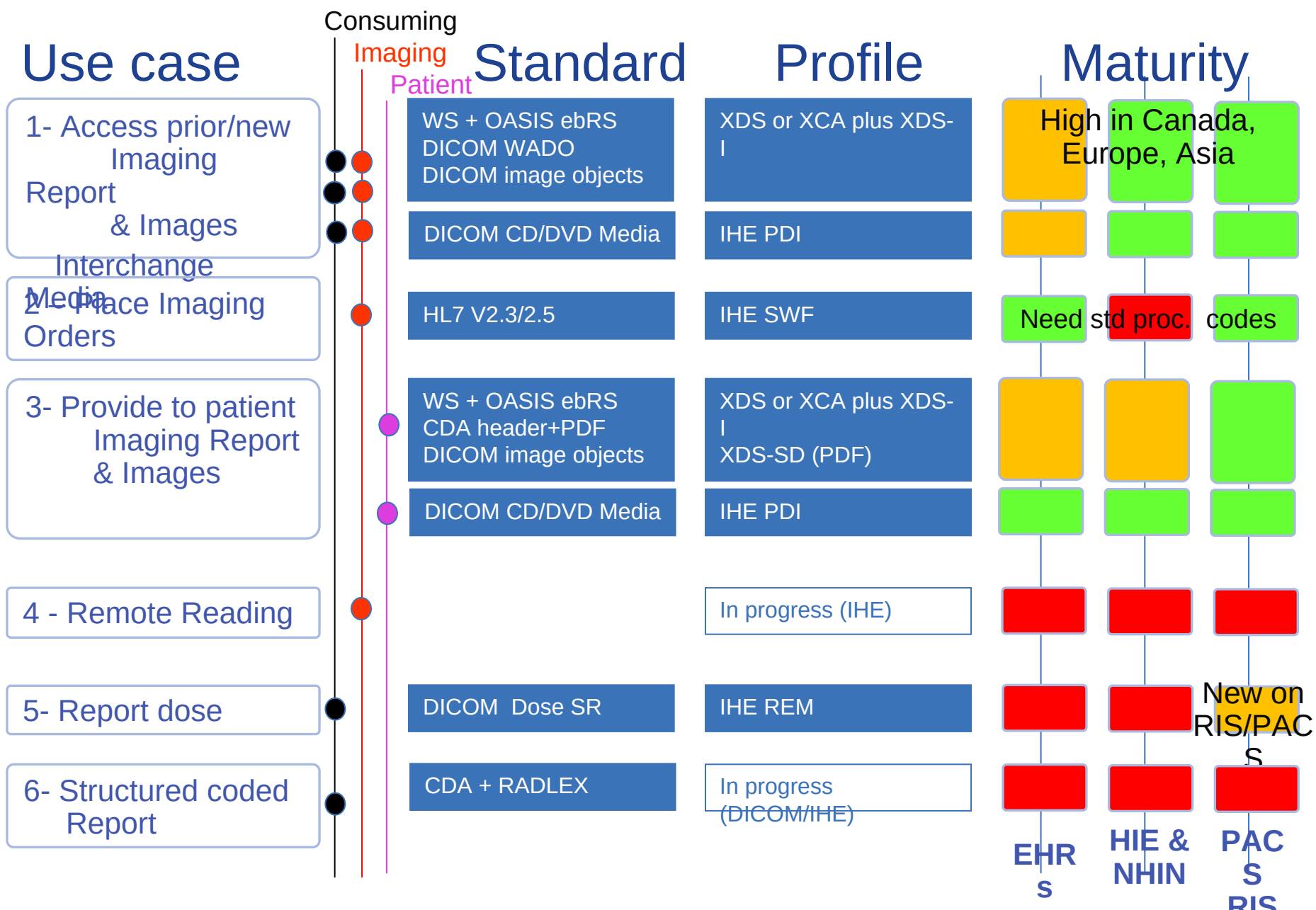


Standards/Profiles Maturity

High

partial

Low



Suggested Next Steps:

1. Use cases need to be refined and prioritized
2. Standards and Profiles maturity evaluation needs to be confirmed