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Analytic Workflow: From Images to Reports

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Analytic Workflow: From Images to Reports



Outline

Workflow Related Service Classes

Relationship to IHE and HL-7

Base Workflow

Workflow Variants

Application Hosting

Conclusions

References (if any)

Contact info of Presenter

Workflow Related Service Classes

- **Basic Worklist**
 - Lists of what needs to be done
 - **Modality and General Purpose Variants**
- **Procedure Step**
 - Records what was done
 - **Modality and General Purpose Variants**
- **Unified Procedure Step**
 - Replacement for General Purpose Variants
- **Storage Commitment**
- **Instance Availability Notification**

- **DICOM defines interface between acquisition/imaging equipment and IT systems**
 - **Archives**
 - **HIS/RIS**
- **HL-7 defines interfaces between IT systems**
- **IHE outlines how it all works together**

**The best way to learn about workflow
is to read the IHE Profiles!**

Each IHE Profile

- describes a clinical information need or workflow scenario
- documents how to use standards (e.g. HL7, DICOM, ...) to accomplish it

Systems that implement the same Profile address a need in a mutually compatible way

Hundreds of products support one or more IHE Radiology Profiles.

Actor

- An abstract name for a system

Transaction

- A well defined communication of a message from a source actor to a destination actor
 - Modality queries for a worklist, or
 - Modality stores images to an Image Manager

Option

- An extra feature in an Integration Profile
- Not required, but you might find it important

Examples of Actors

Acquisition Modality – A system that acquires and creates medical images while a patient is present, e.g., a Computed Tomography scanner or Nuclear Medicine camera.

ADT Patient Registration – A system responsible for adding and/or updating patient demographic and encounter information.

Department System Scheduler/Order Filler – A department-based information system (for instance, Radiology) that provides functions related to the management of orders received

Image Manager – A system that provides functions related to safe storage and management of evidence objects. ... It also accepts/commits dose data and supports query/retrieve.

First car I drove: 1963 Ford Galaxy coupe

Air conditioning was an option

We did not purchase the option

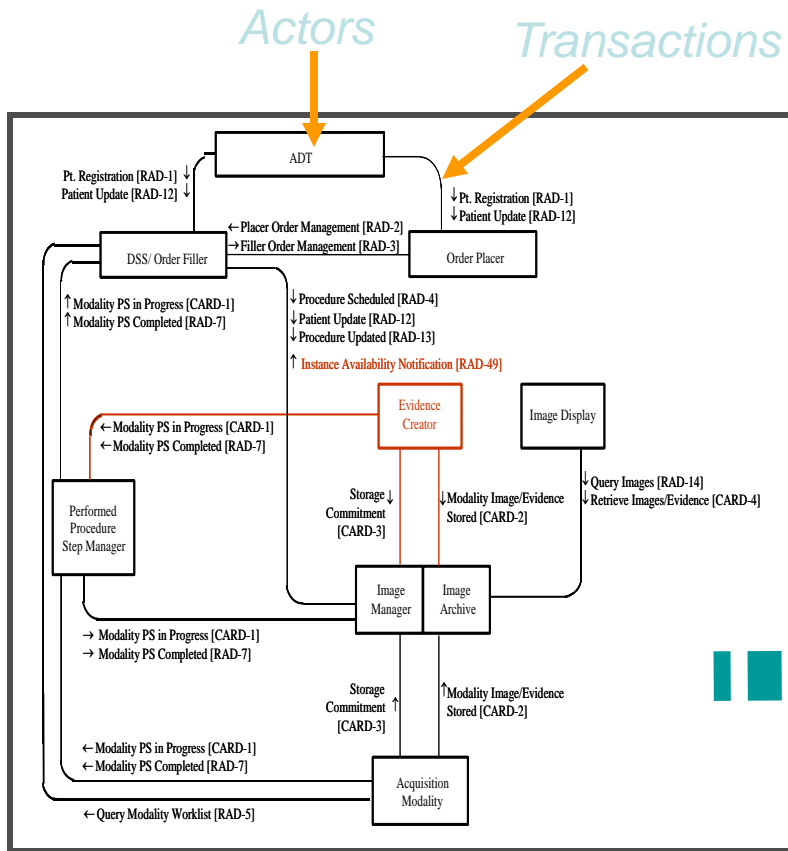
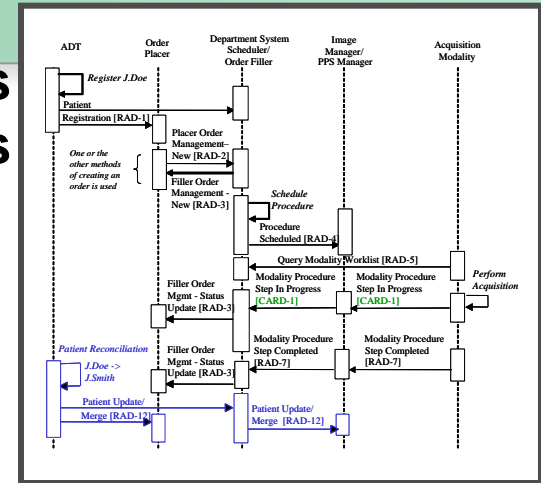
**You do not need options to have a car,
but**

**The options might improve your driving
experience**

An Integration Profile :

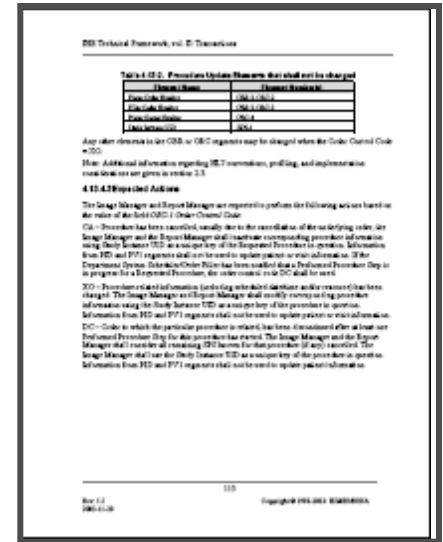
- A Set of **Actors**
- Exchanging **Transactions**

Use cases Process Flows



For each transaction:

- Std referenced
- Options specified
- Mapping required



Where Can We Improve Workflow?

Is the request communicated effectively from the referring physician

- to the technologist?
- to the radiologist reading the study?

Did the technologist perform the procedure or substitute a different one?

Does the patient have priors?

Do I have all of the images and data?

Are the images safely stored on the PACS (can we delete from the modality)?

ADT Patient Registration

Order Placer

Department System Scheduler/Order

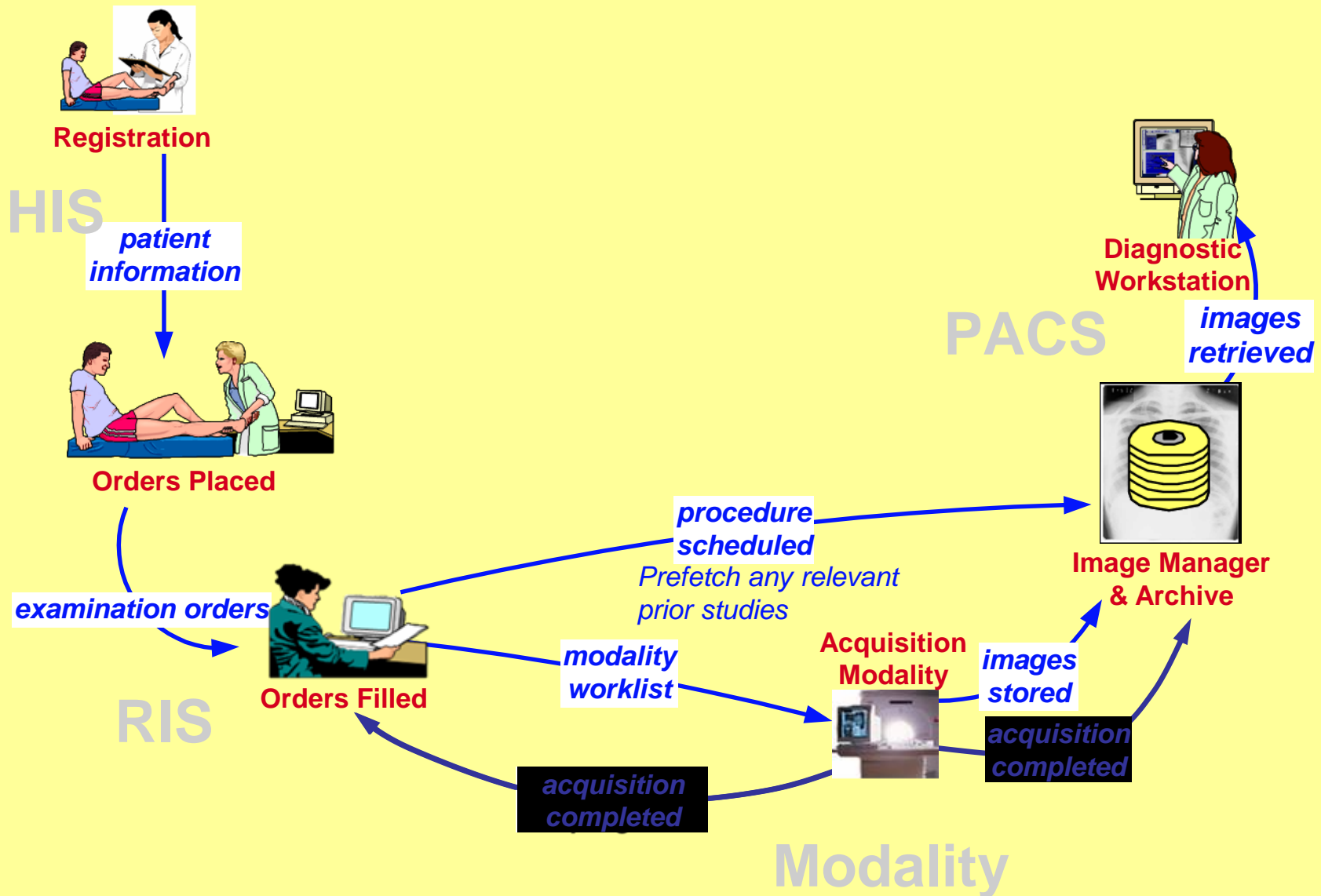
Acquisition Modality

Image Manager

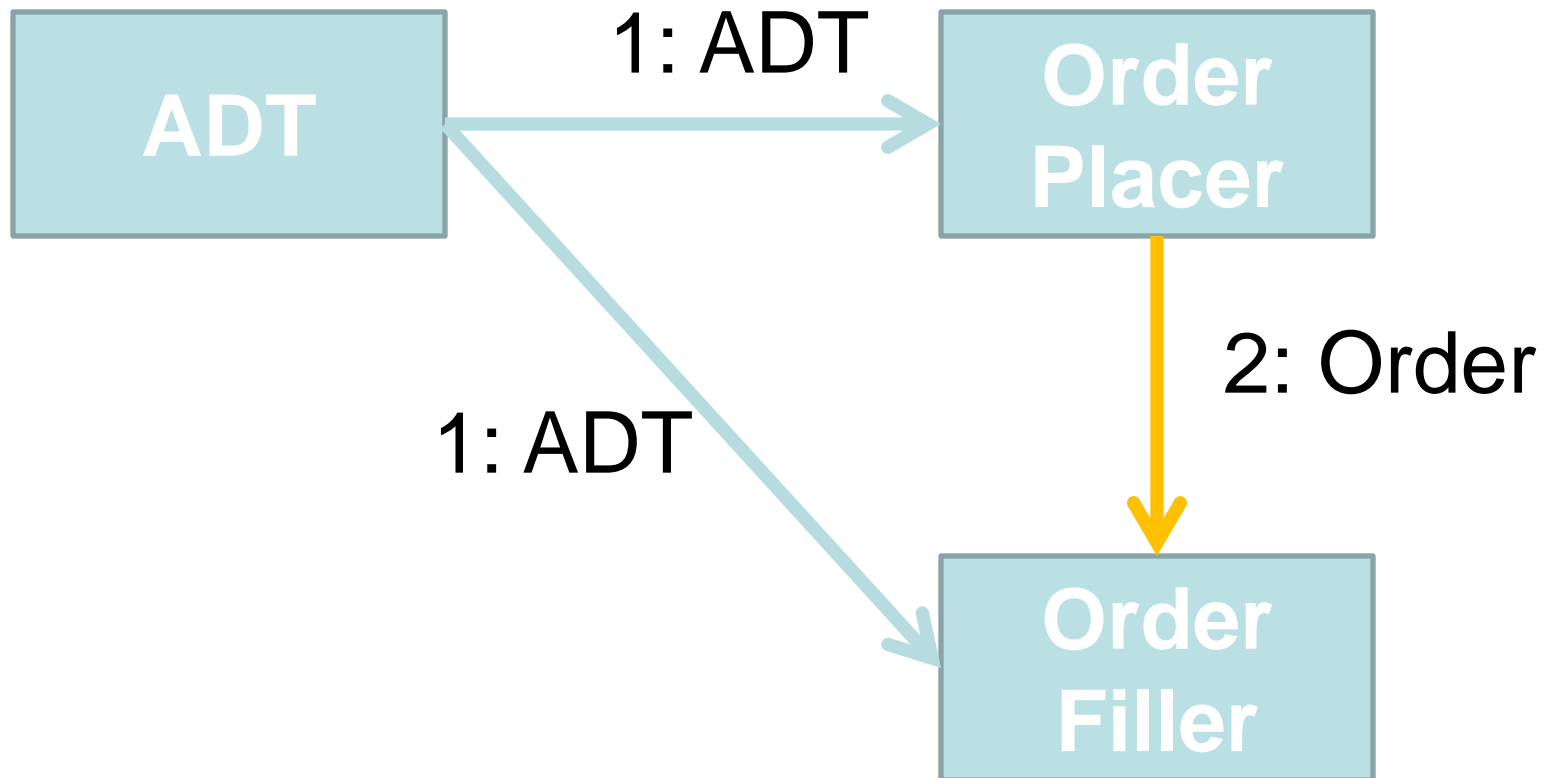
MPPS Manager

Image Display

Evidence Creator



Send Request to Order Filler (RIS)



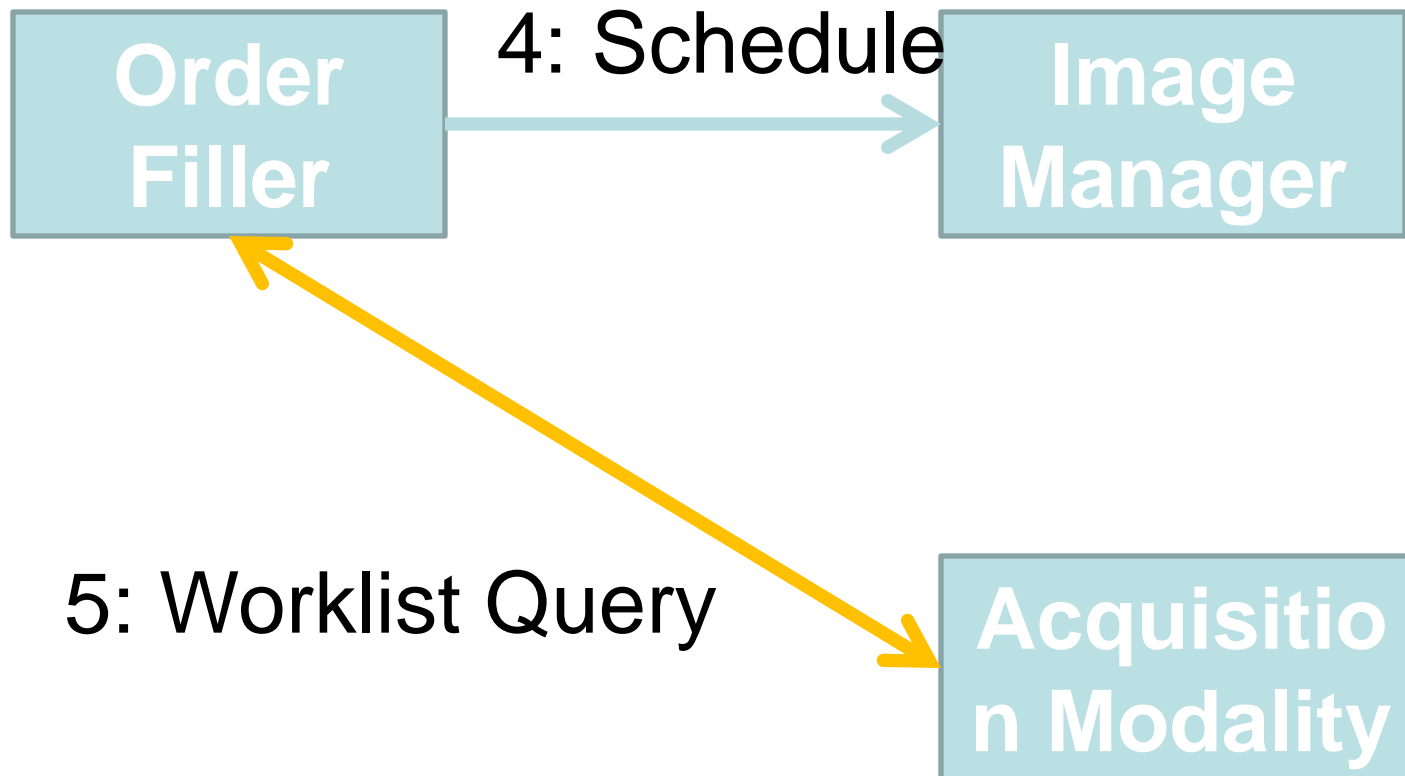
(1: ADT) is shorthand for Radiology Transaction 1

- **ADT tells both Order Placer and Order Filler patient information (common patient ID, demographics)**

(2: Order)

- **Order Placer (HIS) informs Order Filler (RIS) of request from physician**

Schedule the Procedure



(4: Schedule) is a push to the Image Manager

- **Image Manager locates relevant priors based on a consistent patient identifier**
- **Image Manager could set up a reading worklist**

(5: Worklist Query) is a pull by the modality

- **Technologist does not have to type demographics**
- **The requested procedure is visible right on the console**
- **No second RIS terminal is needed**

Assisted Acquisition Protocol Setting Option

Modality translates worklist codes to a protocol

Technologist can accept protocol or select a different one

Modality will inform RIS/PACS of what was performed using coded system

Where Can We Improve Workflow?

Is the request communicated effectively from the referring physician

- ***to the technologist?*** ✓
- ***to the radiologist reading the study?***

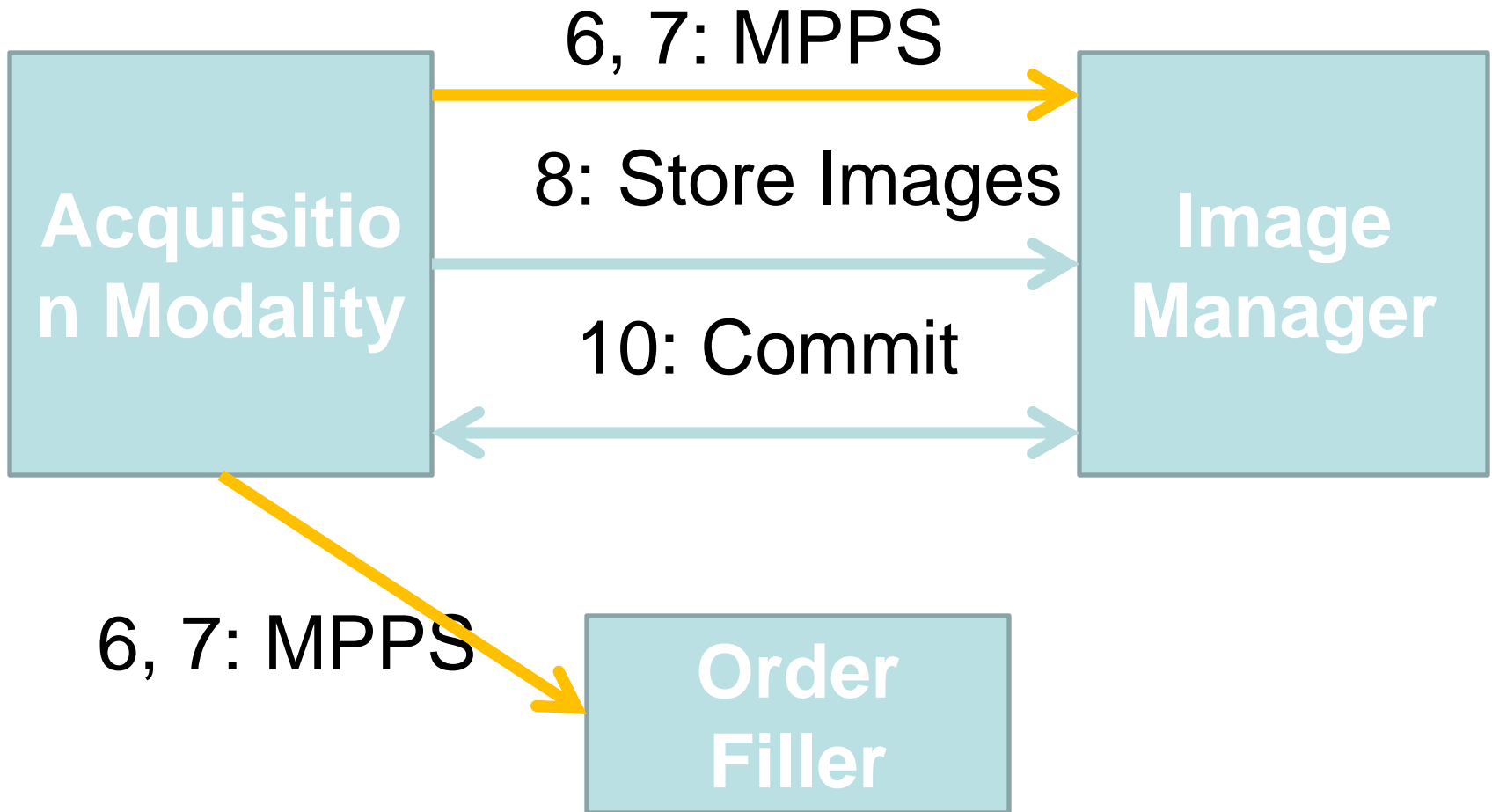
Did the technologist perform the procedure or substitute a different one?

Does the patient have priors? ✓

Do I have all of the images?

Are the images safely stored on the PACS (can we delete from the modality)?

Acquire Images, Alert the Media!!



(6,7: MPPS)

- **Modality tells what procedure was performed**
- **Modality sends a list of images**

(8: Store Images)

- **Standard DICOM push**

(10: Commit)

- **Modality: Image Manager, do you take responsibility for these images?**
- **Image Manager: I do**

Where Can We Improve Workflow?

Is the request communicated effectively from the referring physician

- ***to the technologist?*** ✓
- ***to the radiologist reading the study?***

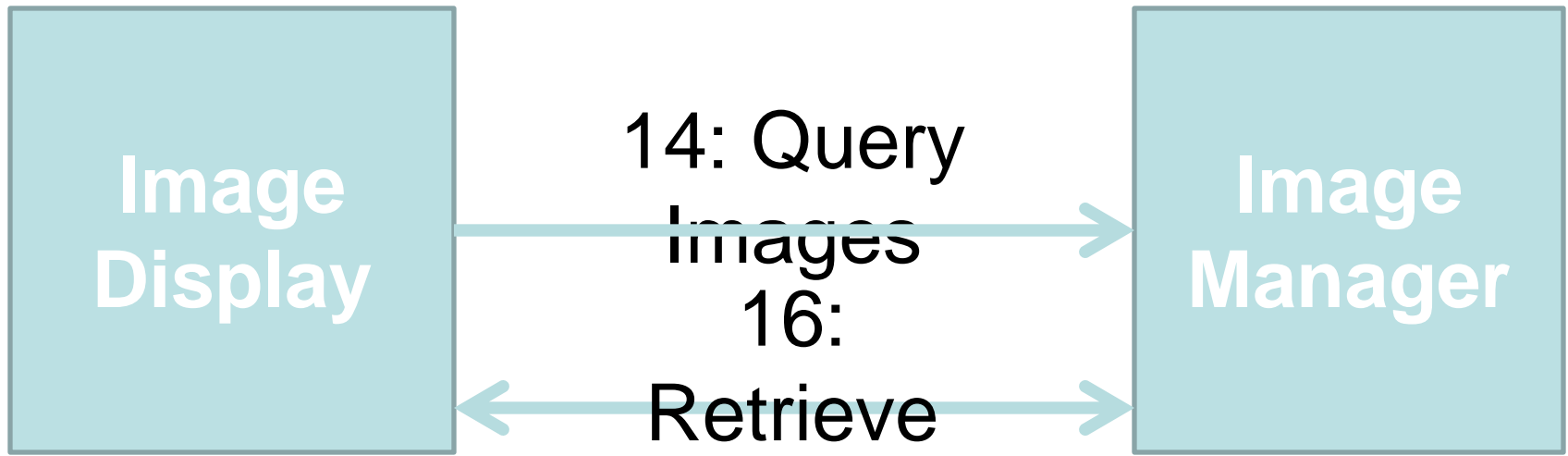
Did the technologist perform the procedure or substitute a different one? ✓

Does the patient have priors? ✓

Do I have all of the images?

Are the images safely stored on the PACS (can we delete from the modality)? ✓

View Images



Can retrieve priors and display with current images

If the display is integrated with the RIS or PACS, it will have access to MPPS data

- **Requested procedure**
- **Performed procedure**
- **List of all images acquired**

Where Can We Improve Workflow?

Is the request communicated effectively from the referring physician

- ***to the technologist?*** ✓
- ***to the radiologist reading the study?*** ✓

Did the technologist perform the procedure or substitute a different one? ✓

Does the patient have priors? ✓

Do I have all of the images? ✓

Are the images safely stored on the PACS (can we delete from the modality)? ✓

- **Mammography**
- **Cardiology**
- **Image-Enabled Office**
- **ECG**
- **Import Reconciliation**
- **Post Acquisition Workflow**
- **...**

Variants on a common theme

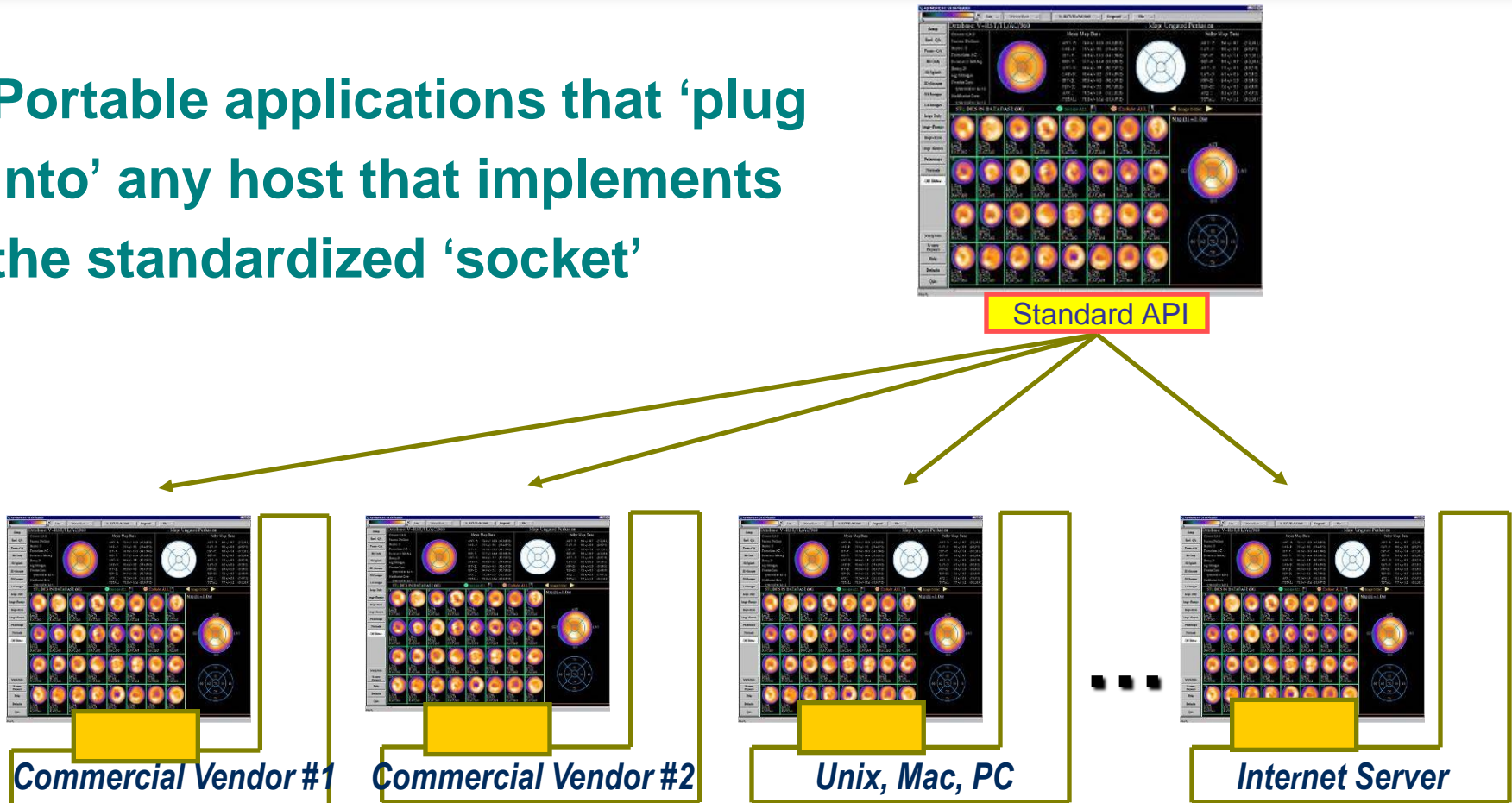
Separate the provision of infrastructure from the application.

- **Infrastructure providers (Hosting Systems) concentrate on the movement and storage of data and results, and on workflow management.**
- **Application providers concentrate on the processing and analysis of that data, providing results back to the infrastructure.**

Minimize the ‘reinvention of the wheel’.

One App, Many Hosts

Portable applications that 'plug into' any host that implements the standardized 'socket'



Benefits of Application Hosting

Users

- **Want one workstation that supports any needed functionality**
- **Want to pick and choose any application to run on that workstation regardless of who created that application**

IT Administrators

- **Tired of changing infrastructure to accommodate new workstations simply to add functionality**

Application Developers

- **Do not have time to customize applications for each of the workstations available in the market from dozens of vendors**

Workstation Vendors

- **Want to expand their list of offered applications beyond those in the base workstation without incurring extra development effort**

References



<http://dicom.nema.org/>



<http://www.HL7.org/>



<http://www.IHE.net/>

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Thank you for your attention !