



Scheduled Workflow

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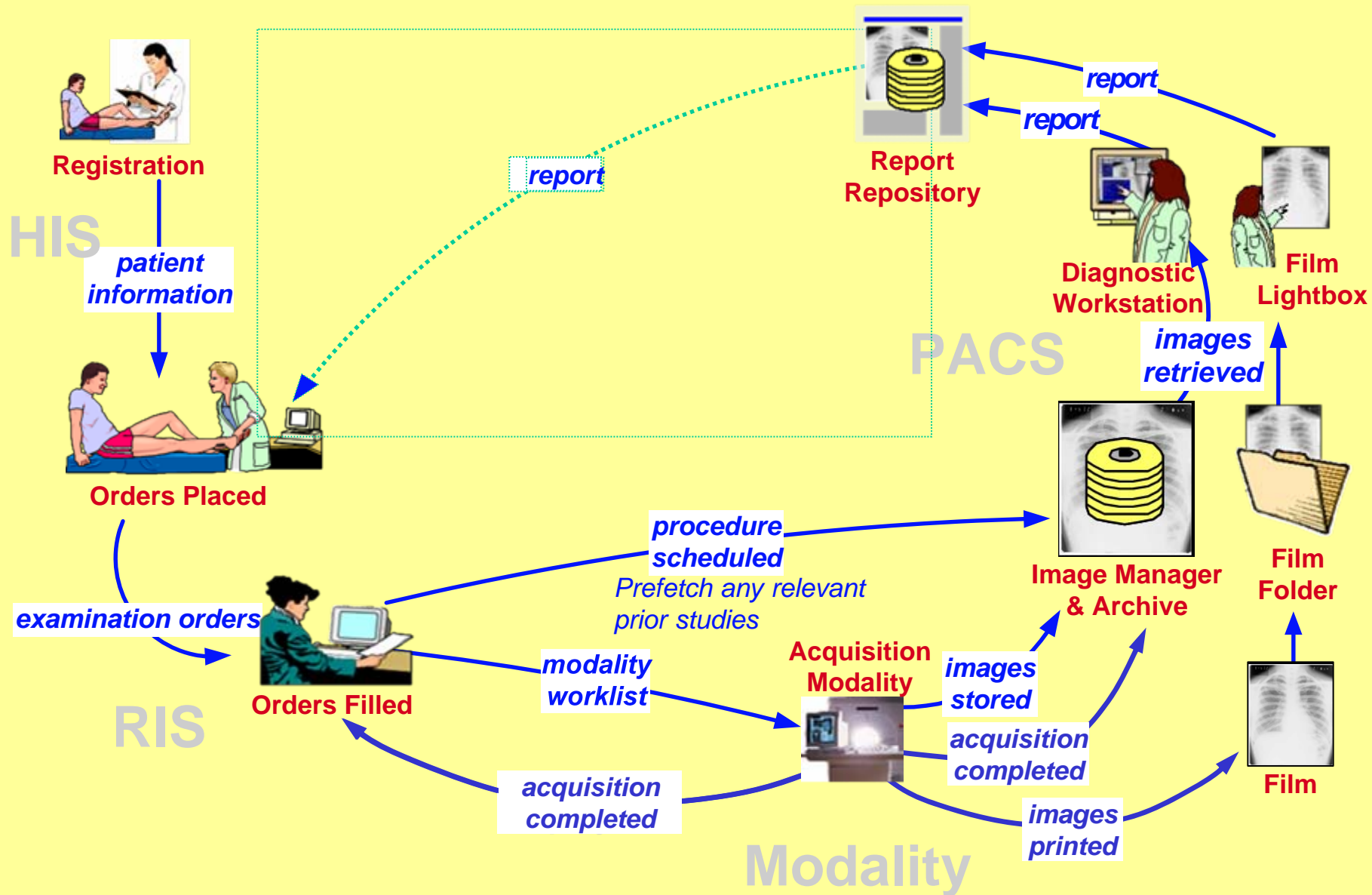
GE Healthcare



Scope

- **Backbone of IHE Radiology**
- **Integrates Registration, Scheduling, Acquisition Workflow and Image Content**
- **Bridges HL7 and DICOM Spaces**

Use Case



Value Proposition

- **Preserve Order Continuity**
 - “Close the Loop”
 - maintain accession number, avoid confusion with Filler #, Placer #, etc.
- **Improve Demographic Integrity**
 - Data entry errors
 - significant occurrence
 - significant consequences
 - Enter once, pass from system to system

Value Proposition

- **Improve Workflow Efficiency**
 - **Use of Worklists**
 - less time spent doing data entry/selection
 - enables semi-automation of setup
- **Reliable Storage**
 - **Storage Commitment**
 - fewer lost studies
 - more confidence in results

Value Proposition

- **Improve Order Tracking**
 - **MPPS from Modality to RIS & PACS**
 - more timely feedback
 - more precise feedback
- **Reduce Integration Effort at Site**
 - **Get Vendors on the Same Page**
 - **Provide Implementation Guidance**
 - **Pre-test at Connectathon**

IHE Workflow Concepts

IHE has selected three UNAMBIGUOUS HL7/DICOM TERMS:

ORDER : A request for radiologic service

REQUESTED PROCEDURE : A unit of work resulting in one Report
(with associated codified, billable acts)

PROCEDURE STEP : The smallest unit of work in the workflow:

Scheduled Procedure Step: A unit of work to do

Performed Procedure Step: A unit of work done

Workflow Concept Mapping

This three-level workflow structure is user oriented:

ORDER:

A request for imaging service
(Accession Number)



CLINICIAN

OR REFERING DOC:
The Imaging Dept Customer

REQUESTED PROCEDURE :

Units of work resulting in one Report
with associated codified, billable acts
(Requested Procedure ID)



RADIOLOGIST :

In Charge of producing
the Report

PROCEDURE STEP :

The smallest unit of work
in the workflow
(modality worklist entry)

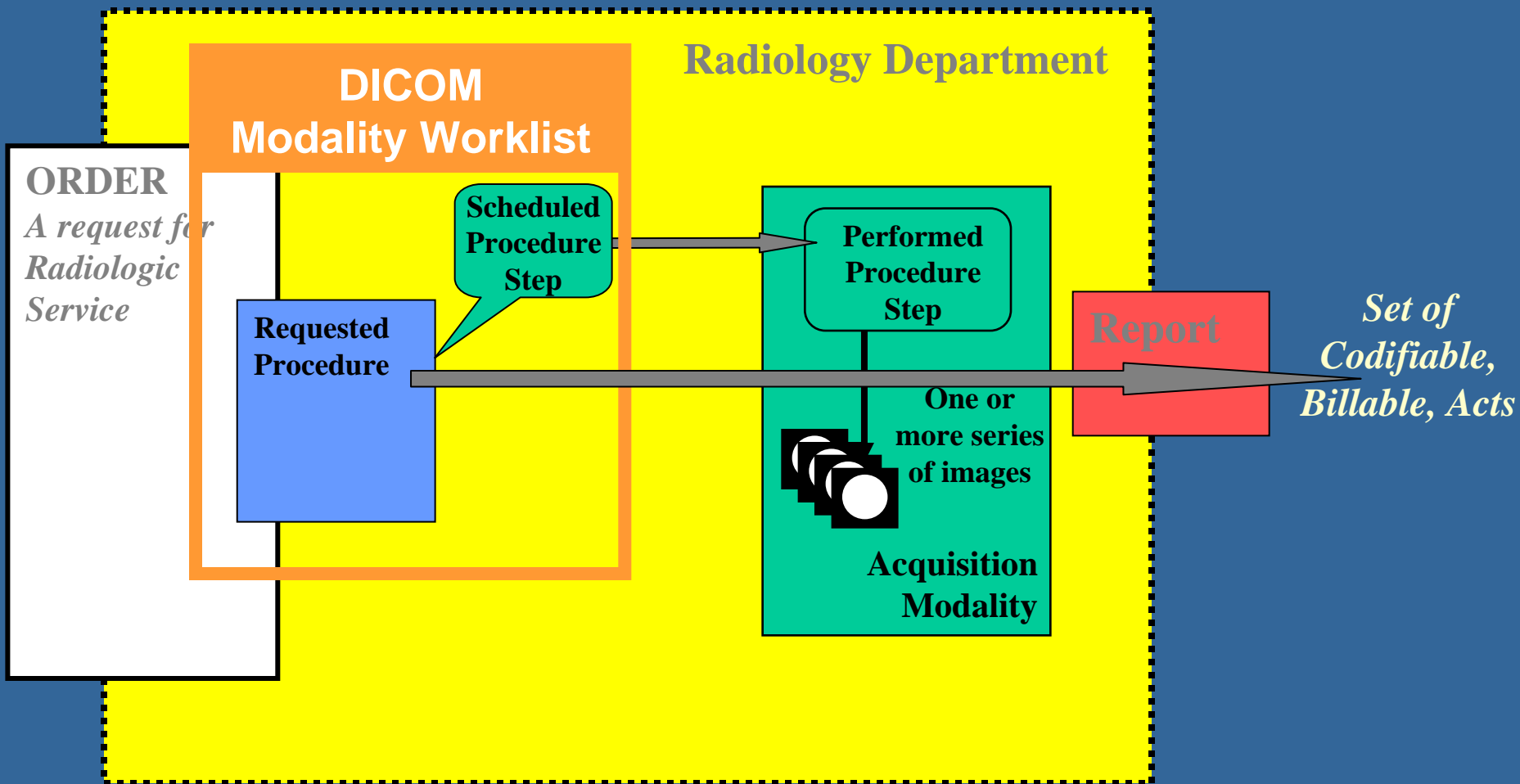


TECHNOLOGIST

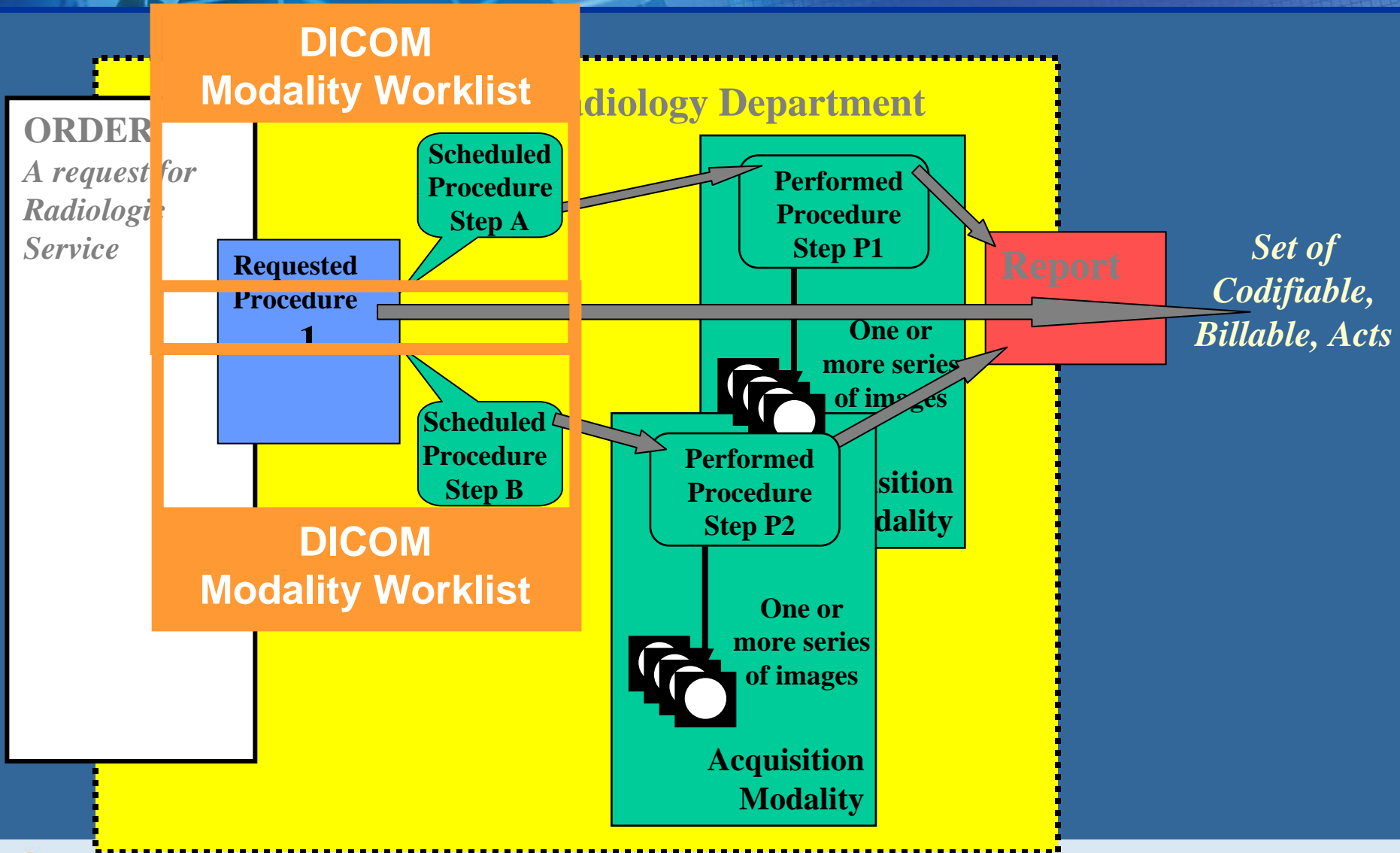
(and RADIOLOGIST)
In charge of acquiring
images, etc.

Normal Workflow

Typical workflow: One Order – One Procedure – **One Report**



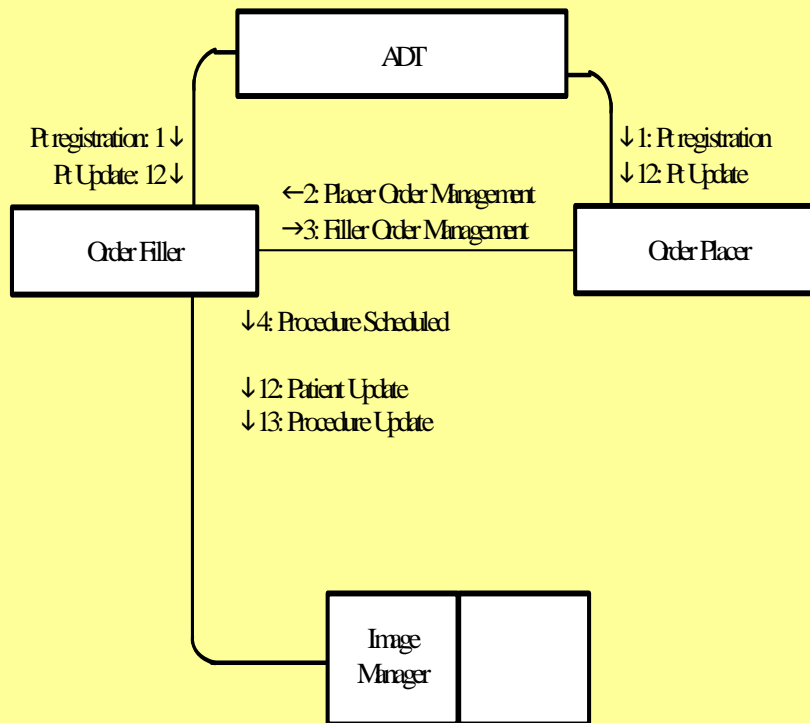
Multiple Modality Steps



Participant Actors

- **ADT Patient Registration**
- **Order Placer**
- **Order Filler – Department System Scheduler**
- **Image Manager – Archive**
- **Acquisition Modality**
- **Image Display**
- **Evidence Creator**

Order Flow



HL7 Actors:

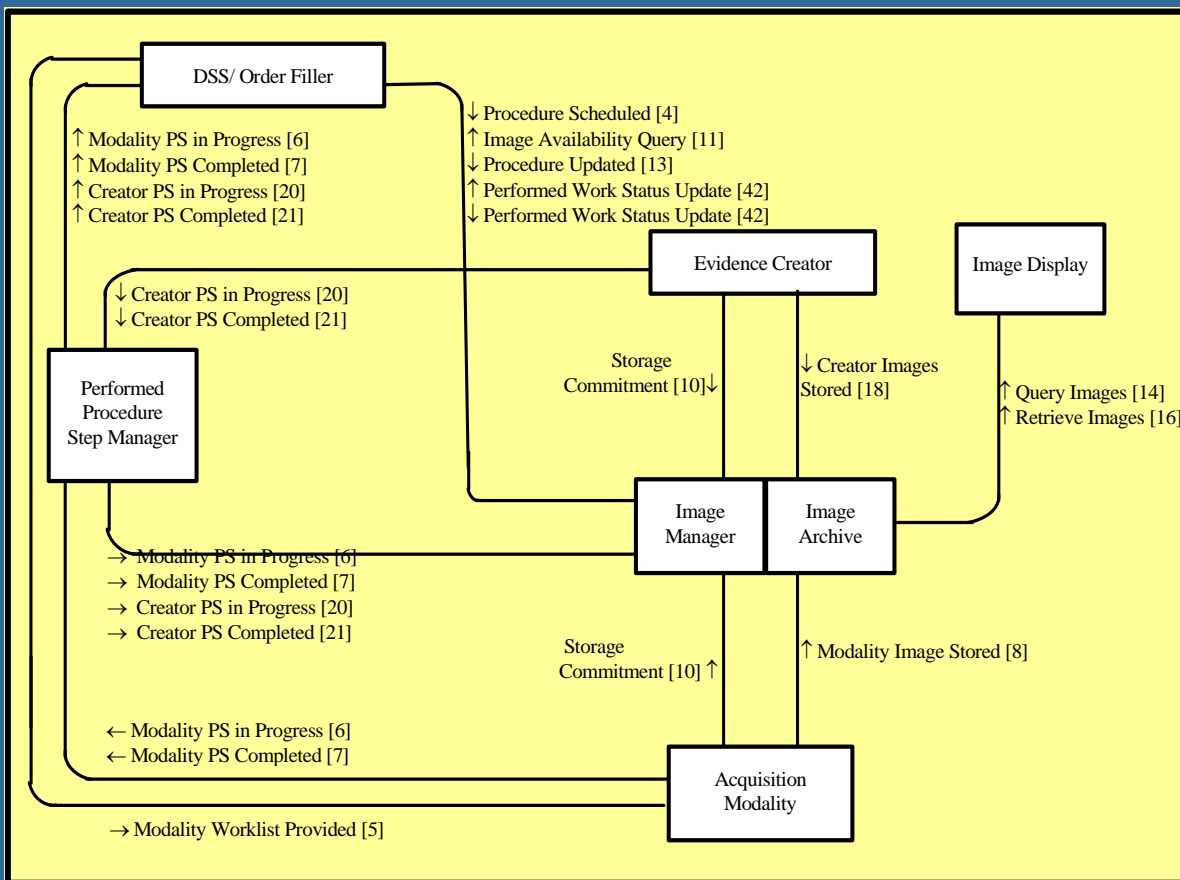
- ADT/Patient Registration
- Order Placer
- DSS / Order Filler
- Image Manager

- **Patient Registration**
 - Admit: In Patient, Out Patient, Pre-Admit
 - Cancel
- **Patient Update**
 - Transfer, Discharge, Outpatient-to-Inpatient, Inpatient-to-Outpatient
 - Update Patient Demographics
 - Merge Patient Records
 - Cancel Transfer, Cancel Discharge

Order Flow

- **Order Management**
 - New Order: Enterprise and Department
 - Cancel Order
 - Order Status Update
- **Schedule Procedure**
 - Schedule new Procedure for an order
 - Reschedule/Change Procedure details

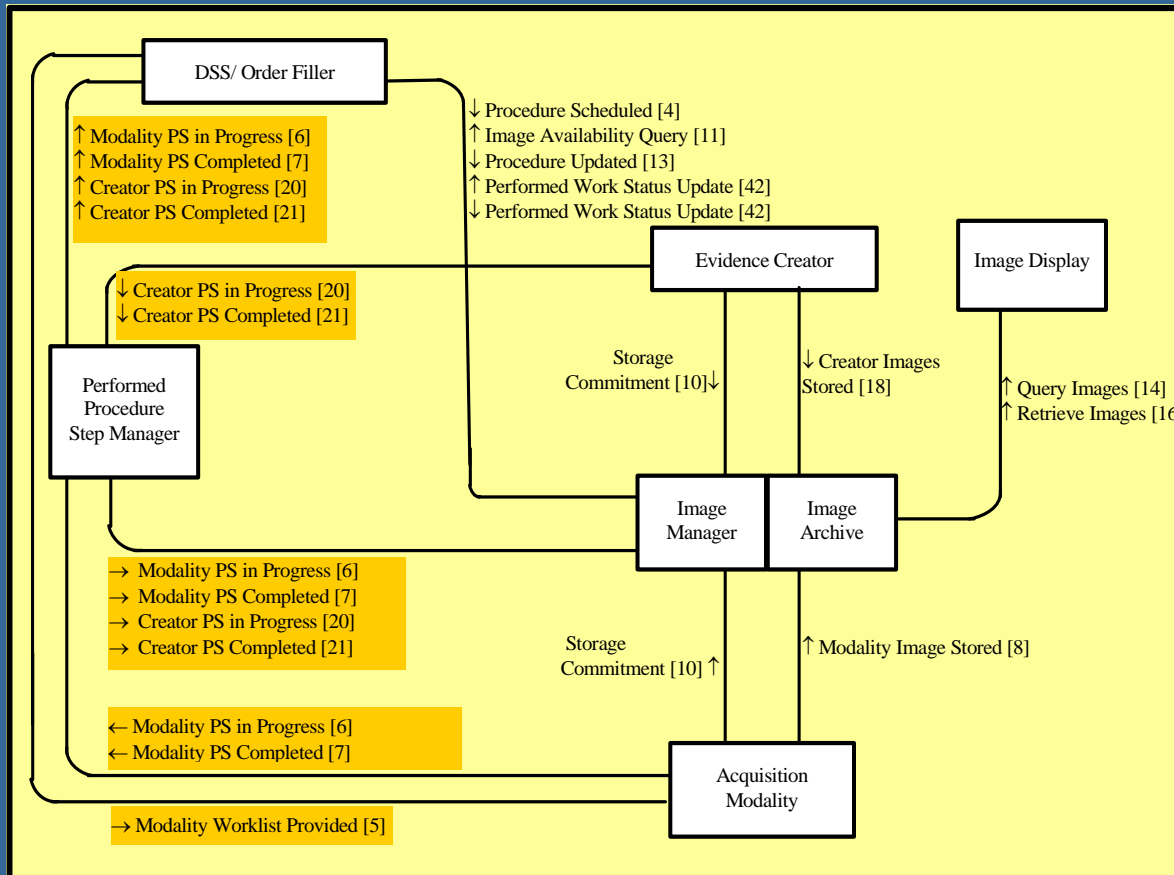
Procedure Flow



DICOM Actors:

- DSS / Order Filler
- PPS Manager
- Image Manager / Archive
- Acquisition Modality
- Evidence Creator
- Image Display

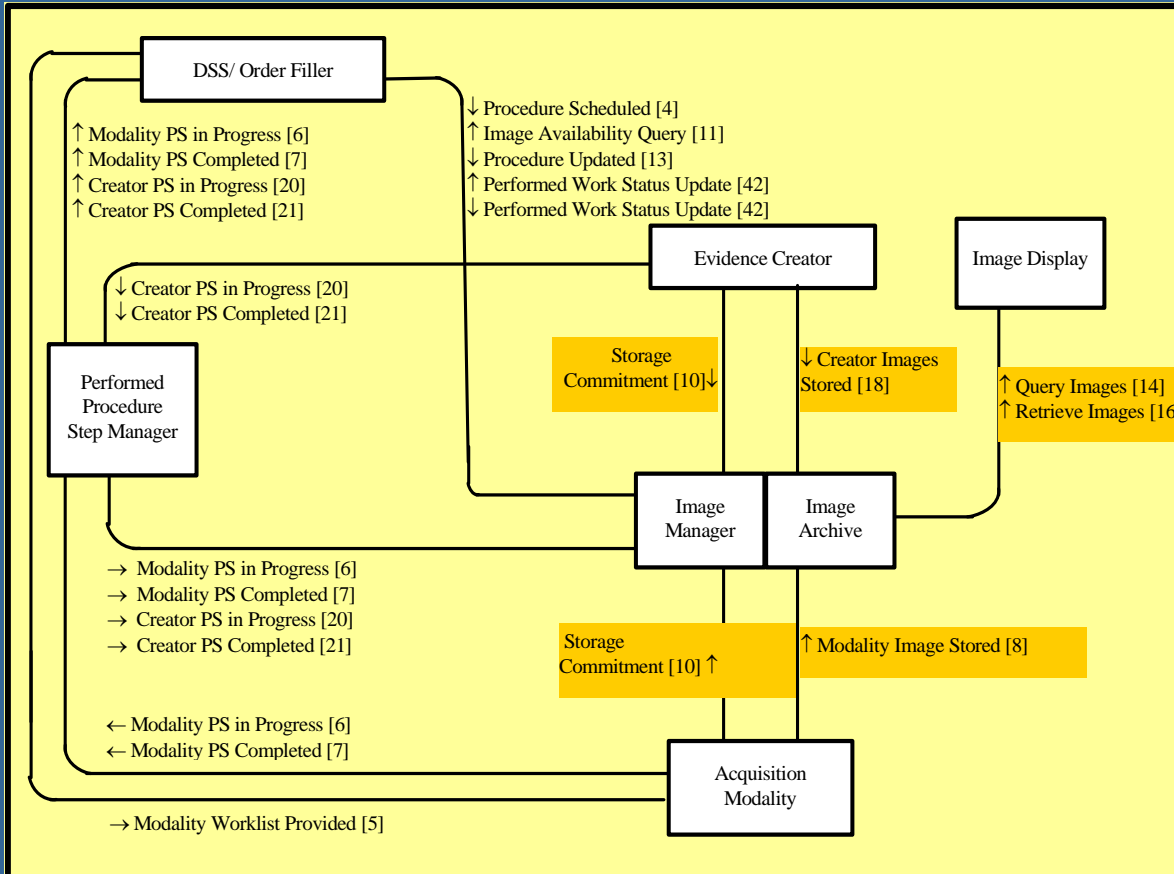
Acquisition Workflow Management



DICOM:

- Modality Worklist Management (MWL)
- Modality Performed Procedure Step (MPPS)

Image Management



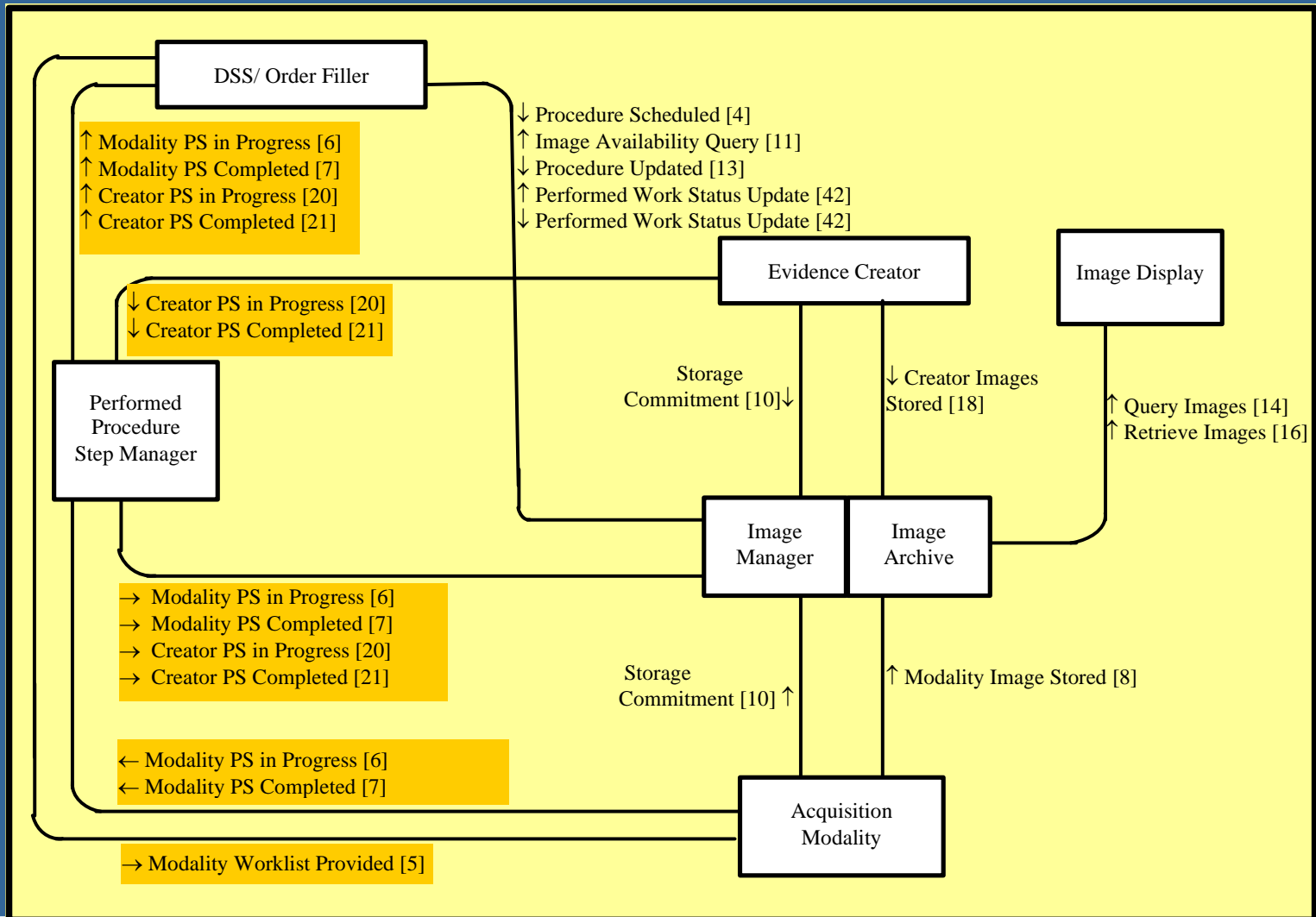
DICOM:

- Image Storage
- Storage Commitment
- Query/Retrieve

Scheduled Workflow Options

- **Tune up Workflow Management**
 - Patient-based or Broad Worklist Queries,
 - Assisted Protocol Setting,
 - Exception Management,
 - Billing and Material Management
- **Notification of Performed Work Status or Availability of Results:**
 - Images,
 - Other Evidence documents,
 - Appointments

Assisted Protocol Option



Assisted Protocol Option Value Proposition

- Department System Scheduler can maintain the list of procedure protocols AND directly control protocol settings on the Modality.
- Less variations in the way the procedures are performed
- Centralized configuration with less effort

Assisted Protocol Option Mechanism

- Order Filler/DSS passes Scheduled Protocol Codes to the Acquisition Modality inside the Modality Worklist Item (DICOM)
- Modality configuration is set accordingly either automatically or manually accepted/modified by operator
- Modality populates Performed Protocol Code information in MPPS
- The Protocol Code tables in all actors have to be synchronized

Exception Management Option Value Proposition

- Provides better feedback on discontinued studies
- Handles selection of wrong worklist item

Exception Management Option Mechanism

- **Modality can provide Discontinue Reason Code to indicate WHY the procedure has not been completed, for example:**
 - **Equipment failure**
 - **Incorrect procedure ordered**
 - **Incorrect worklist entry selected**
 - **Patient condition prevented continuing**

Appointment Notification Option Value Proposition

- Order Placer can keep track of appointments scheduled for a patient within Radiology Department via notifications about scheduling, re-scheduling and cancellation events
- Better synchronization of scheduling processes between enterprise and radiology

Appointment Notification Option Mechanism

- One appointment corresponds to one or more Scheduled Procedure Steps
- Department System Scheduler/Order Filler generates Appointment Notification messages and sends them to the corresponding Order Placer actor.
- One message may convey multiple appointments corresponding to a single order
- Order Placer receives Appointment Notification messages and internally processes them.

What is not in the option

- Order Placer cannot request re-scheduling – it only can do it by cancel and re-order
- Notifications on re-scheduling of the service from one location to another may or may not be sent
- This option does not address needs of enterprise-wide scheduling

Instance Availability Notification Value Proposition

- **Notifies all workflow management actors of availability of newly-acquired images and other evidence objects, for further use in workflow.**
- **Avoids “performance penalty” of Instance Availability query.**
- **Helps tighten the information loop by confirming the images have**

Instance Availability Notification Option Mechanism

- Image Manager/Image Archive generates an Instance Availability Notification message and sends it to the DSS/Order Filler ,Post-Processing Manager, Report Manager.
- Workflow Managers receive an Instance Availability Notification message and internally process it to make workflow-related decisions

Instance Availability Notification Option

- **Examples of internal actions:**
 - The Department System Scheduler/Order Filler may update the procedure status internally, indicating that images for the procedure have been stored.
 - The Post-Processing Manager may add or rearrange items to a corresponding worklist.
 - The Report Manager may add items to a corresponding worklist.

Instance Availability Values

- **“ONLINE”**
 - the images are immediately available, and if a retrieval would have been requested, it would succeed in a reasonably short time
- **“NEARLINE”**
 - the images need to be retrieved from relatively slow media such as optical disk or tape, and if a retrieval would have been requested, it would succeed, but may take a considerable time

Instance Availability Values

- **“OFFLINE”**
 - manual intervention is needed before the instances may be retrieved, and if a retrieval would have been requested, it would fail (e.g., by timeout) without such manual intervention.
- **“UNAVAILABLE”**
 - the instances cannot be retrieved, and if a retrieval would have been requested, it would fail.



Patient Information Reconciliation

Expect the Unexpected

Patient Information Reconciliation

- **Extension of Scheduled Workflow**
- **Coordinated update of demographic information in workflow and content objects**

Patient Information Reconciliation Value Proposition

- **Handle “exception” cases**
 - **Trauma/Emergency Treatment Cases**
 - **Patient Unknown or no time for Registration**
 - **Entry Errors by Operator**
 - **Other Demographic Changes**
 - **(e.g. married name)**
- **Multiple sources/destinations for updates**
 - **High risk of unsynchronized/inconsistent data**
- **Workflow must continue**
- **Need to pull together past & current patient records**

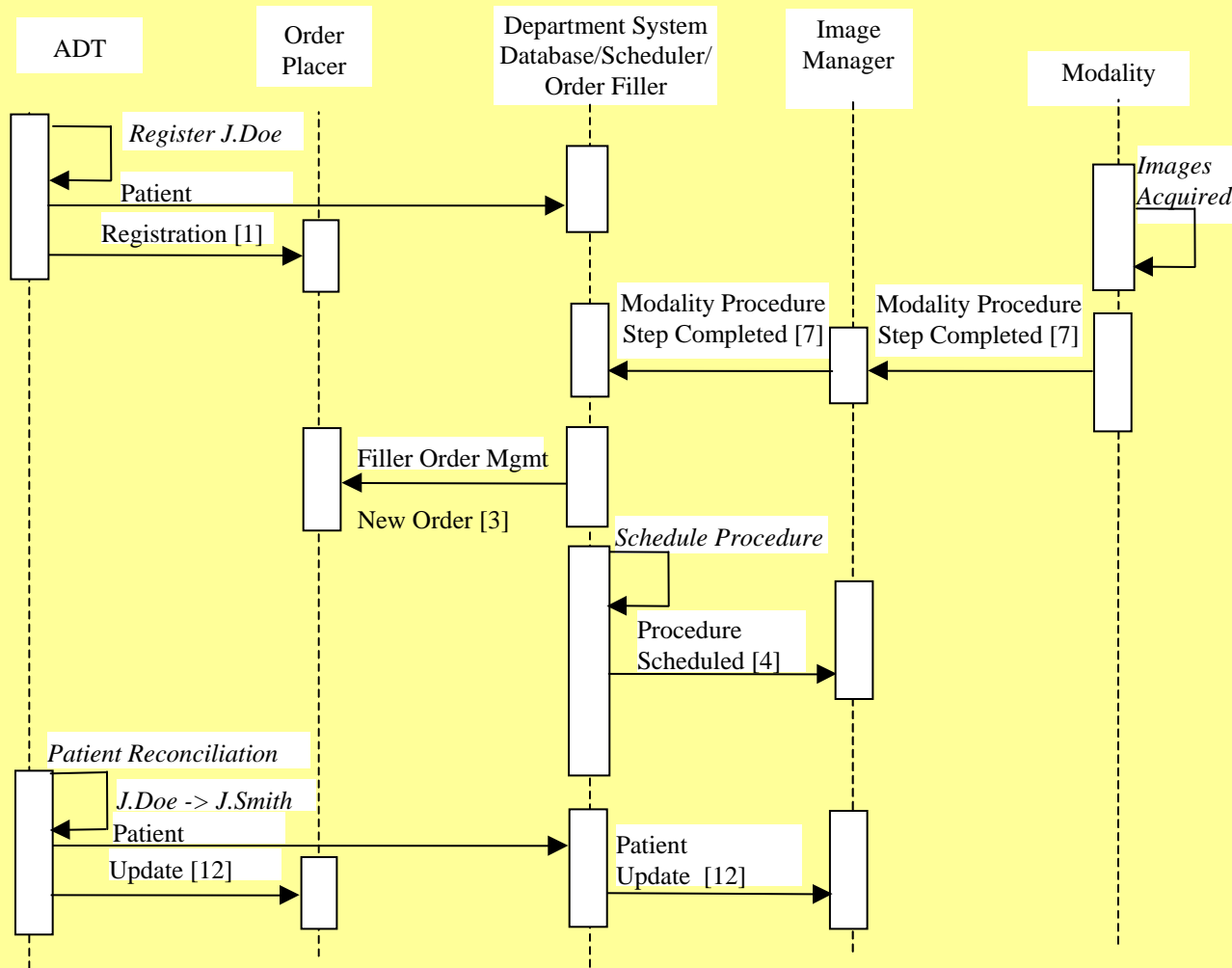
Use Cases

- **ALL ER patients are pre-registered (“John Doe”, “Jane Doe”):**
 - **Case 1: Unidentified Patient registered at ADT and order is placed at Order Placer.**
 - **Case 2: Unidentified Patient registered at ADT and order is placed at DSS/Order Filler.**
 - **Case 3: Unidentified Patient registered at ADT but acquisition completed at Modality prior to order.**

Use Cases

- **ER patients are registered with Departmental IDs:**
 - **Case 4: Unidentified Patient assigned temporary Departmental ID and scheduled at DSS/Order Filler.**
 - **Case 5: Image Acquisition completed prior to assigning temporary Departmental ID or Order (Patient ID entered at the Modality).**

“Emergency” - Case 3





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