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Budapest, Hungary

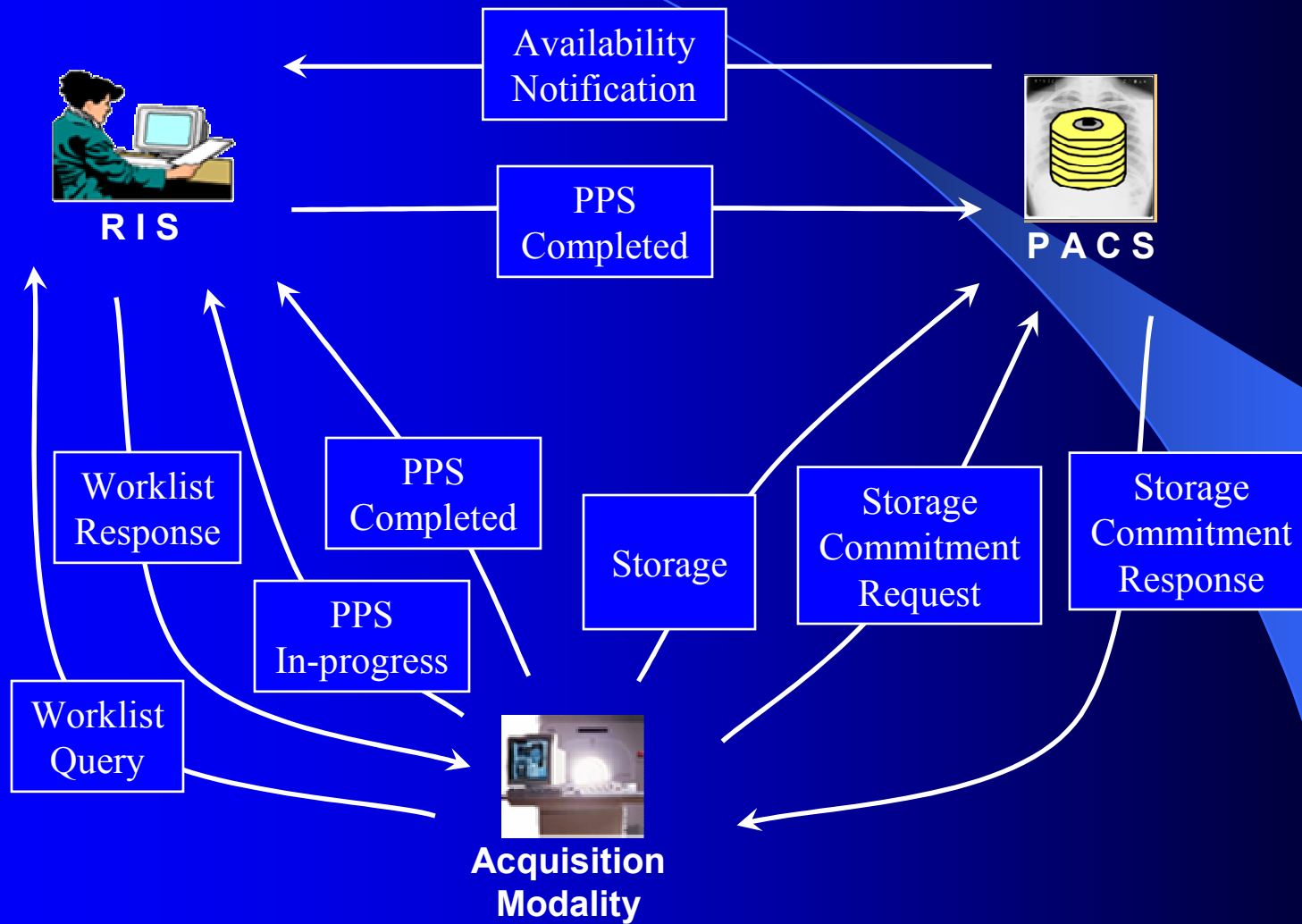
## Managing Acquisition Workflow:

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# Key DICOM Services

- DICOM Modality Worklist
  - Provide demographics and order details
- DICOM Modality Performed Procedure Step (MPPS)
  - Provide logging/tracking of procedure status
- DICOM Storage Commitment
  - Provide confirmation of data storage
- DICOM Instance Availability Notification
  - Provide notification of data availability

# Acquisition Workflow



# Modality Worklist – SCU/SCP

- Providing Demographics and Orders to the Modality:
- Provider (SCP):
  - Usually RIS
  - Sometimes PACS
  - third party box
- User (SCU):
  - Usually Modality / Imaging System
  - Could be non-imaging system (e.g. hemo)
  - Sometimes “broker box” as proxy for outdated modality

# Modality Worklist – Query

- Modality (SCU) queries RIS (SCP)
  - Query can include filters: (AKA Matching Key Attributes)
    - Date/Time of Study
    - Patient Name, ID
    - Accession #
    - Performing System Name
    - Modality
    - Etc.
  - May indicate desired Return Key Attributes
  - Query strategies
    - Narrow query – try to just get specific results
    - Broad query – do additional result filtering on the modality

# Modality Worklist – Response

- RIS (SCP) returns results to Modality (SCU)
  - Results may be null, one worklist entry or many
  - Each entry is a scheduled procedure step
    - Does not necessarily match 1:1 with an order (e.g. lung perfusion order)
    - One step is performed by one piece of equipment
    - May or may not be enough to fill an order
  - Results include details: (AKA Return Key Attributes)
    - Patient Information
      - ID, Name and Demographics
      - Patient Allergies, Pregnancy Status, Instructions
    - Scheduling Information
      - Date, Time
    - Procedure Information
      - Description, Protocol Codes (defined by each radiology site)
      - Contrast/Medications
    - Order Information
      - Accession #, Study UID, Requesting Physician/Dept

# Modality Worklist – Usage

- Modality queries/receives worklist from RIS
- Modality displays worklist to tech
- Tech selects worklist entry
- Modality extracts patient demographics and order details
- Modality inserts details in images, procedure status messages, etc.
  
- Key Benefits
  - Reduced data entry errors
  - Reduced data entry time
  - Up to the minute scheduling

# MPPS – SCU / SCP

- Providing Logging/Tracking of Modality Procedure Status
- Provider (SCP)
  - RIS
  - PACS
  - (one may forward to the other)
- User (SCU)
  - Modality
  - Broker for Modality
  - PACS as Proxy for Modality



# MPPS – In Progress

- Indicates a procedure step is In Progress
- Timing is not prescribed
  - SCU may send at “start of procedure”
  - SCU may send after completion
- Tracking Attributes
  - Accession#, SPS ID, Study UID
  - Patient Demographics, etc
  - Logical to populate these from the Modality Worklist
- May provide progress details
  - Data produced
  - Protocol codes performed
- Implicit “Notification” of unscheduled/trauma cases
  - MPPS does not correspond to any SPS
  - SCP may choose to “backfill” an order or perform other reconciliation

# MPPS – Completed

- Indicates a procedure step has been Completed
- SCU may or may not send immediately
- Tracking Attributes
  - Accession#, SPS ID, Study UID, Patient Demographics, etc
- List of images (and/or other objects) produced
  - A series is part of only one MPPS
- List of protocol codes actually performed
  - May be different than those requested
- List of materials used
- May or may not complete an SPS
  - Multiple MPPS may be performed for one SPS
- Once MPPS “Completed”, additional/appended data must be associated with a new MPPS

# MPPS – Discontinued

- Indicates a procedure step has been discontinued
  - May be aborted
  - May be cancelled
- Reason for Discontinuation
  - Patient no-show, allergy, refusal, pregnancy, death, etc.
  - Cancelled by doctor, duplicate order, incorrect order, etc.
  - Machine failure, wrong worklist entry selected, etc.
  
  - Assists in billing and rescheduling decisions
- Tracking Attributes
  - Accession#, SPS ID, Study UID, Patient Demographics, etc
- May List images (and/or other objects) produced
- May List protocol codes completed
- May List materials used

# MPPS – Usage

- Billing
  - Details of procedures actually performed
  - Can bill sooner and more accurately
- Procedure Status Monitoring
  - Ordering physician can see if started/acquired/cancelled
- Workflow
  - Radiologist can see exams pending/ready for reading
- Patient Tracking
  - Know where patient is/was at a certain time
- Key Benefits
  - Accurate, detailed data on performed steps
  - Can provide up to date status

# Storage Commitment – SCU / SCP

- Providing Confirmation of Data Storage
- Provider (SCP)
  - PACS
- User (SCU)
  - Modality
  - Workstation
  - Another PACS
  - Broker

# Storage Commitment – Request/Response

- Modality (SCU) requests commitment from PACS (SCP)
  - Request specifies:
    - List of Data Object UIDs
- PACS (SCP) responds to Modality (SCU)
  - Response specifies:
    - List of Data Object UIDs
    - If fail, Reason for Failure
      - Resource Limit, Objects not found, etc.

# Storage Commitment – Usage

- Modality requests after storage complete
- Catches network outage losses
- Catches PACS outage losses
- Catches “I thought the morning shift staff sent all their studies to PACS” losses
- Key Benefits
  - Reduces lost data
  - Eliminates manual confirmation time

# Inst. Avail. Notification – SCU/SCP

- Providing Notification of Availability of Imaging Data
- User (SCU): Provides Notification
  - Usually PACS
  - Other devices supporting Retrieve
  - Third party box – query then notify
- Provider (SCP): Uses Notification
  - Usually RIS / Reporting System
  - Maybe Billing System trigger
  - Other Workflow Manager
  - Post-Processing Workstation



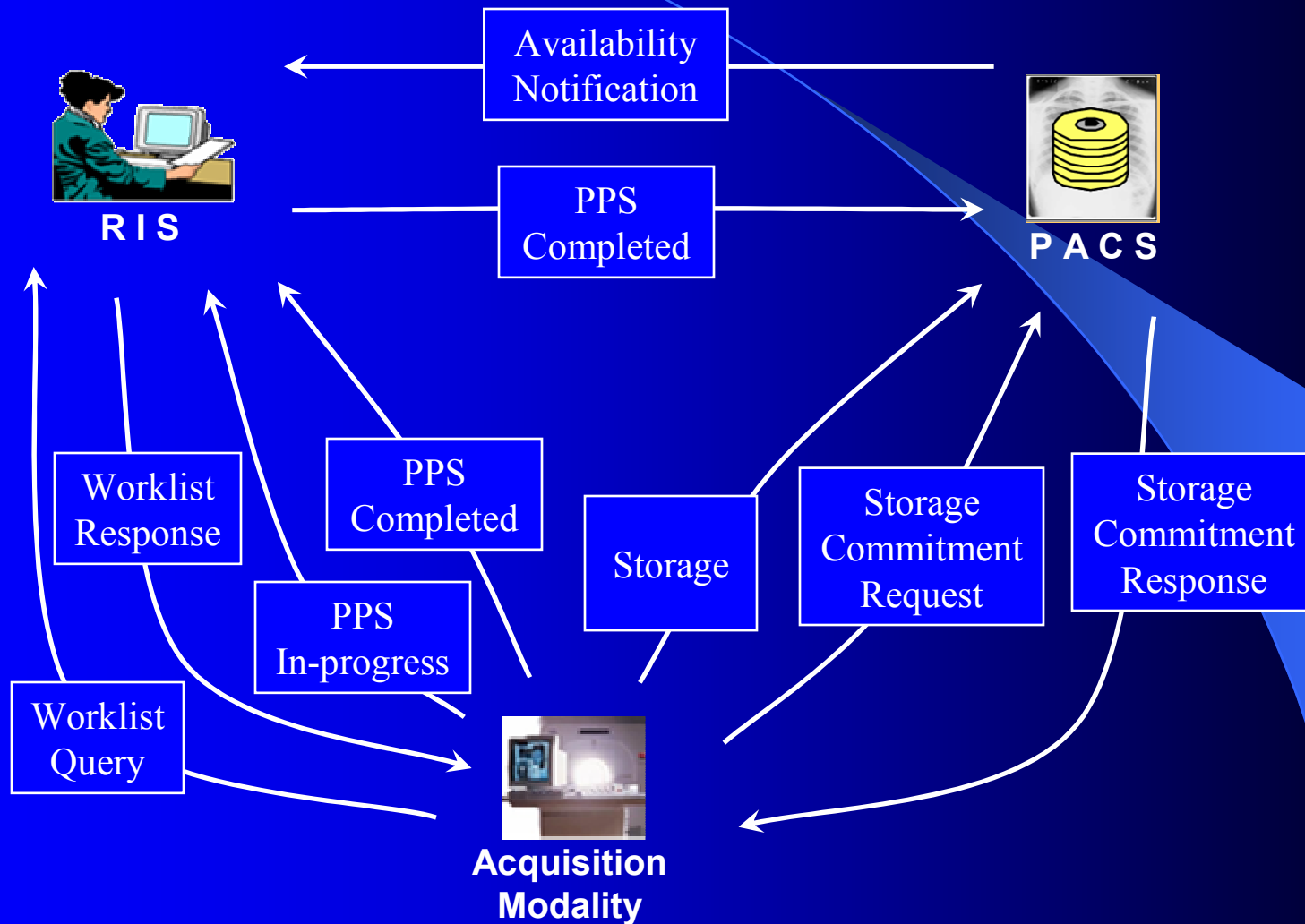
# Inst. Avail. Notification - Notification

- PACS (SCU) notifies RIS (SCP) objects are available to be retrieved
- Notification Details
  - Lists object UIDs available
  - Identifies Retrieve SCP from which they can be retrieved or Media on which it is stored
  - Availability Status: Online / Nearline / Offline / Unavailable
  - May list MPPS details that created the data
- SCU is usually the holder of the objects
- SCU implementation decides timing/grouping
  - Could notify when all images in an MPPS Complete message are available
  - Could notify when images are available for all procedure steps of an order

# Inst. Avail. Notification – Usage

- PACS finishes receiving/storing study images
- PACS notifies Reporting System ready for review
- Generally coordinate scheduling of activity with the transfer of image data between systems
- Helps both “implicit” and “explicit” workflow
- Benefits
  - Allows timely reading workflow and fast reporting
  - Avoids wet reads of incomplete studies
  - Avoids excessive queries to PACS to see if the “images are ready”

# Acquisition Workflow



# “Integrating the Healthcare Enterprise”

- DICOM defines individual services
- DICOM standardizes the communications
- IHE bundles together services like those here

For additional useful guidance on implementing these services as a group:

Refer to:

IHE Radiology Tech Framework, Volume I  
Scheduled Workflow Profile

[www.ihe.net/tf](http://www.ihe.net/tf)