Management of Acquisition Protocols (MAP)
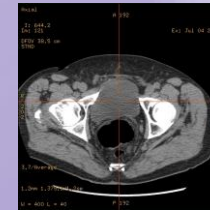
IHE Radiology Domain

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Motivation

One Scanner can have 100 or more protocols…

Quality of Care

– Good, consistent image quality
depends on good protocols, used consistently

Efficient Workflow

– Hanging Protocols, Image Processing, Reporting Workflow
depends on consistent series names, procedure codes, etc.

Dose Management

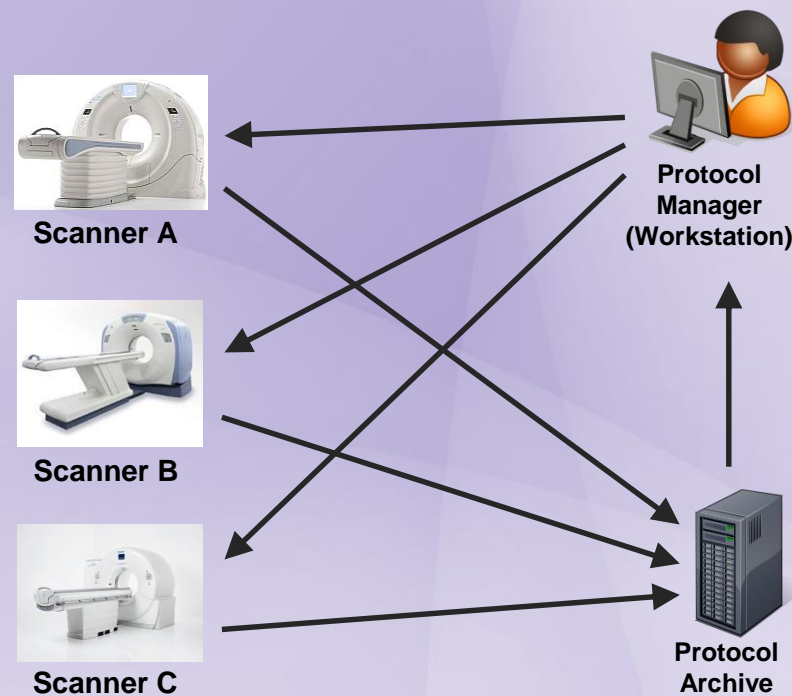– Managing dose depends on managing protocols

Analytics

– Summarizing data depends on consistent tagging

Management of Acquisition Protocols (MAP) Profile

Centralized, cross-vendor review and approval

- Upload protocols
- Periodically review & approve
- Modify (within limits)
- Re-distribute protocols and approvals

Scanner A

Scanner B

Scanner C

Protocol Manager (Workstation)

Protocol Archive

DICOM CT Defined Procedure Protocol IOD

– Encodes a complete protocol

DICOM Protocol Approval IOD
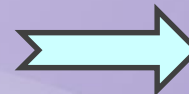
– Encodes list of protocols and associated approvals

DICOMweb - NPI Service

– RESTful transactions to Store, Query, and Retrieve Non-patient Instances

DICOM Protocol Objects

Defined Protocol

Device=Aquilion Series
…
Pat. Pos. : Feet First / Supine
Pat. Instruct : Single Breath Hold
/ Full Inspiration
…
kVp : 80~140
Slice Thickness : 1.0~2.5mm
Recon. Kernel : Std.
…

Performed Protocol

Device=Aquilion ONE
Version=3.0.4
…
Pat. Pos=Feet First / Supine
Pat. Instruct=Given
…
kVp=120
Slice Thickness=1.0mm
Recon. Kernel=FC12
…

tba…

Defined Protocol Details

- Scanner transcodes to / from internal format

- Vendor/Model Specific content
  - No expectation to execute on different models
  - Private tags expected for model-specific details

- Private Tag Dictionary
  - Private Data Element Characteristics Sequence (0008,0300)
  - Supports better review & comparison

- Specifies Constraints on Parameters
  - Specific value, set, range, etc.
  - Constraint Violation Significance (0082,0036)
    - Informative, Warning, Failure

- Instructions Sequence
  - Can be used as instructions to tech (brief & long versions)

- Specification Sequences constrain parameters for

  - Equipment
    - What scanner make / model / version, etc.
  - Patient
    - What age, sex, weight, etc.
  - Acquisition Elements
    - Acquisition element = localizer, helical, etc.
    - Parameters = kVp, revolution time, table height, Dose Check, etc.
  - Reconstruction Elements
    - Reconstruction element = thin slice recon, thick slice recon, etc.
    - Parameters = kernel, slice thickness, spacing, series description, etc.
  - Storage Elements
    - Storage element = send-to-PACS, send-to-3DWS, etc.
    - Parameters = destination AETitle, DICOMweb URL, XDS, etc.

- Scanner only encodes details it needs / supports

Protocol Approval Details

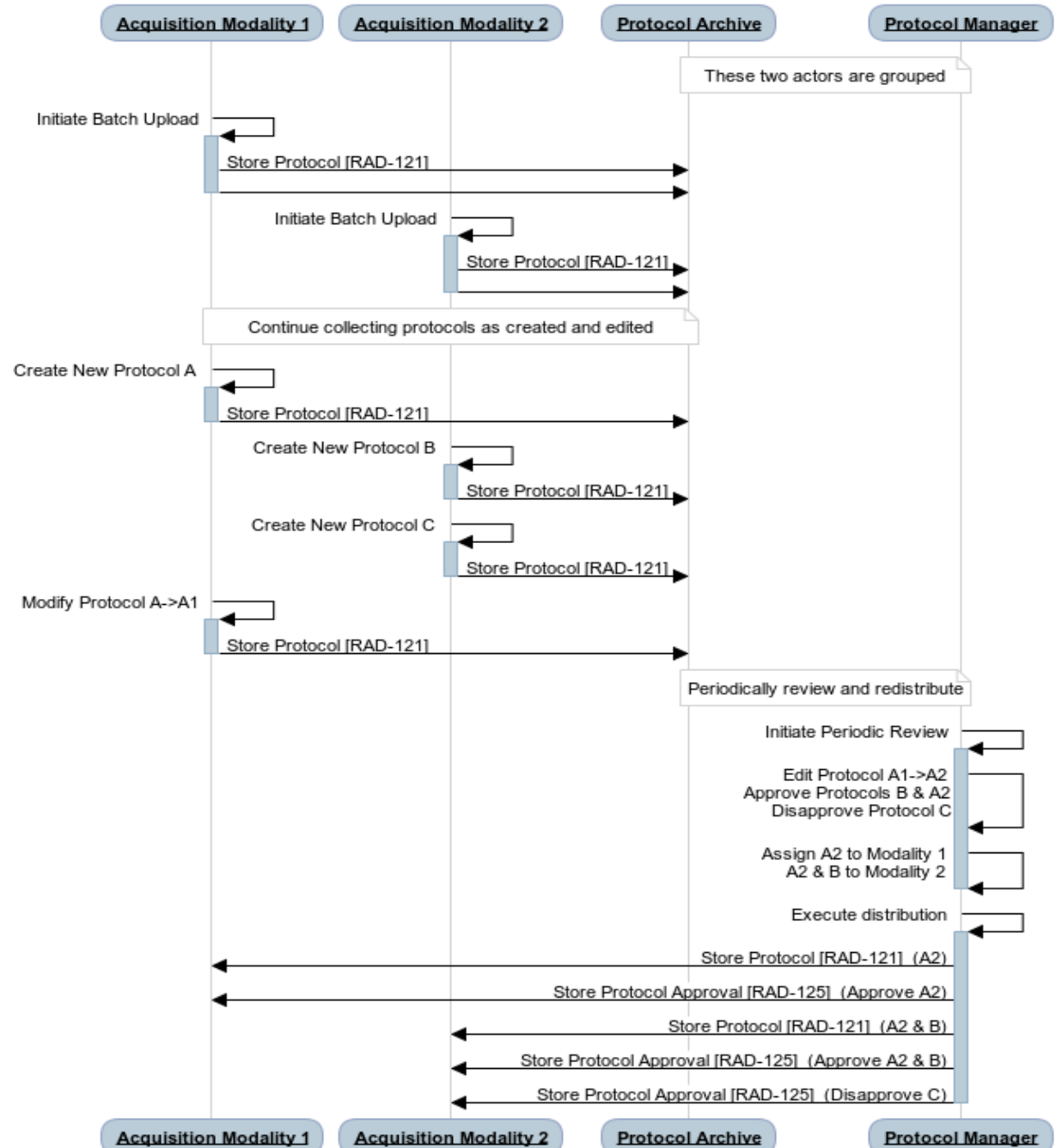| Approval Subject Sequence:	
Referenced SOP Instance UID	*UID(s) of Defined Protocols*
Approval Sequence:	
Assertion Code	(128603,DCM,"<u>Approved for use at the institution</u>")
Asserter Identification Sequence	
Person Name	Welby^Marcus^^Dr.^MD
Person Identification Code	(940801,99NPI,"<u>Welby^Marcus^^Dr.^MD</u>")
Organizational Role Code	(128671,DCM,"<u>Chair of Protocol Committee</u>")
Institution Name	Mercy Hospital
Assertion DateTime	20170718145327
Assertion Expiration DateTime	20180718000000
Institution Code	(000011113,99NPI,"<u>Mercy Hospital, Centerville</u>")

Some Approval Codes

Coding Scheme Designator	Code Value	Code Meaning
…	…	…
DCM	128601	Appropriate for the indications
DCM	128621	Inappropriate for the indications
DCM	128603	Approved for use at the institution
DCM	128623	Disapproved for use at the institution
DCM	128604	Approved for use in the clinical trial
DCM	128624	Disapproved for use in the clinical trial
DCM	128605	Approved for use on pregnant patients
DCM	128617	Disapproved for use on pregnant patients
DCM	128609	Disapproved for any use
DCM	128613	Eligible for reimbursement
DCM	128615	Ineligible for reimbursement
DCM	128607	Inside operational limits of the device
DCM	128619	Outside operational limits of the device
DCM	128608	Optimized for the device instance
DCM	128620	Not optimized for the device instance
DCM	128610	Deprecated protocol
…	…	…

DICOMweb

RESTful NPI Store

- POST Operation
- [https://*image-archive*/defined-procedure-protocols/*uid*](https://image-archive/defined-procedure-protocols/uid)
- Content-Type: application/dicom or application/dicom+json
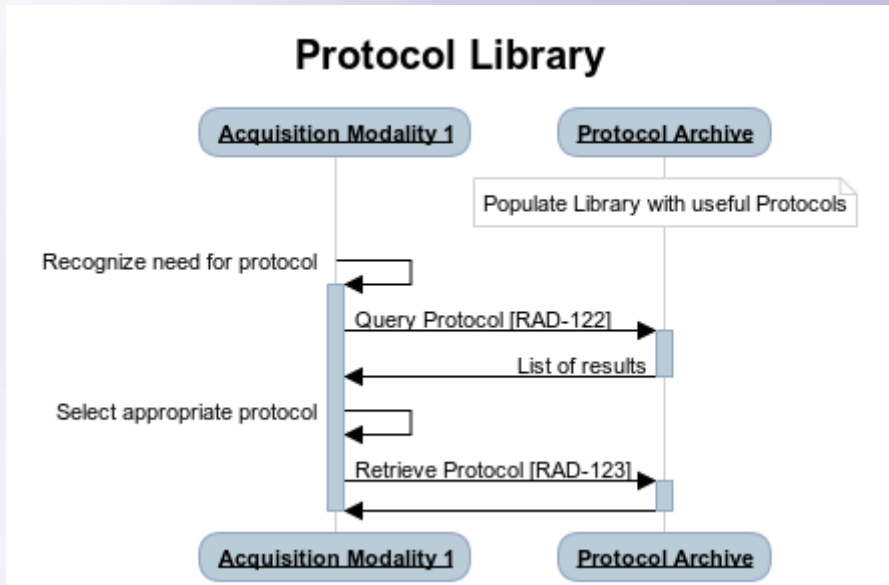- Payload: binary DICOM object or JSON

```
"00080070": {
    "vr": "LO", "Value": ["Acme Corporation"]
},
"00081090": {
    "vr": "LO", "Value": ["Prime CT"]
},
"00181000": {
    "vr": "LO", "Value": ["A72309234M43"]
},
"00181030": {
    "vr": "LO", "Value": ["Std Adult Head w Contrast"]
},
"00080012": {
    "vr": "DA", "Value": ["20170317"]
},
"00080013": {
    "vr": "TM", "Value": ["1305"]
}, …
```
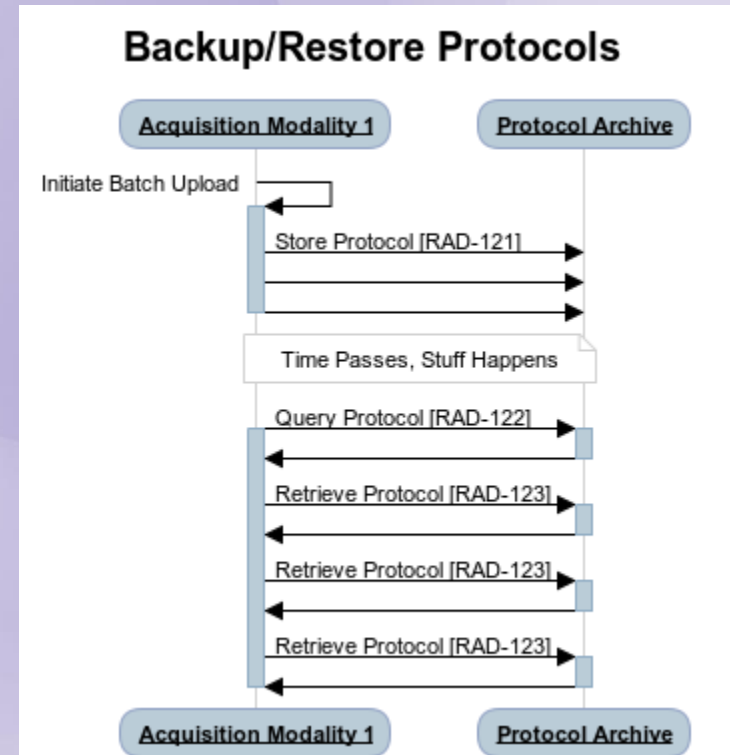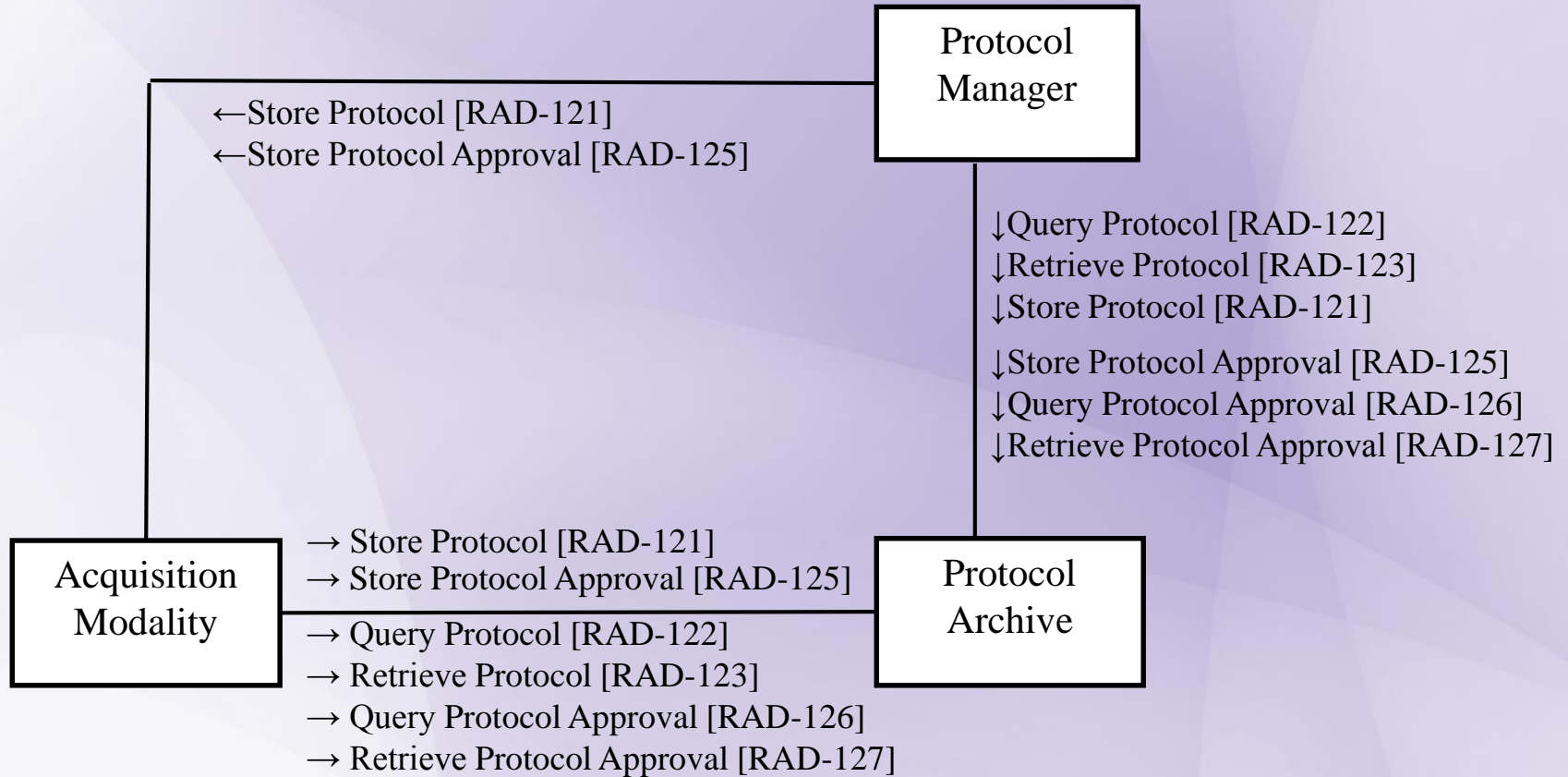
Reviewing Site Protocols

Additional Use Cases

Protocol Library

Acquisition Modality 1 — Protocol Archive

Populate Library with useful Protocols

Recognize need for protocol

Query Protocol [RAD-122]

List of results

Select appropriate protocol

Retrieve Protocol [RAD-123]

Acquisition Modality 1 — Protocol Archive

Backup/Restore Protocols

Acquisition Modality 1 — Protocol Archive

Initiate Batch Upload

Store Protocol [RAD-121]

Time Passes, Stuff Happens

Query Protocol [RAD-122]

Retrieve Protocol [RAD-123]

Retrieve Protocol [RAD-123]

Retrieve Protocol [RAD-123]

Acquisition Modality 1 — Protocol Archive