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## **Digital Imaging and Communications in Medicine (DICOM)**

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### *Supplement 60: Hanging Protocols*

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4 **Foreword**

6 This Supplement to the DICOM Standard proposes the storage, exchange, and query/retrieve of  
8 composite Hanging Protocol objects. The objective is for a radiologist, or a department, to be  
10 able to set up Hanging Protocols for a variety of reading situations on one workstation, and have  
the capability to have those Hanging Protocols available on several other workstations,  
independent of the manufacturer. This Supplement has been prepared by the DICOM Working  
Group 11 (Display).

12 This document is a Supplement to the DICOM Standard. It is an extension to the following parts  
of the published DICOM Standard:

- 14 Part 2 Conformance
- Part 3 Information Object Definitions
- Part 4 Service Class Specifications
- 16 Part 6 Data Dictionary
- Part 16 Content Mapping Resource
- 18 Part 17 Explanatory Information

**Scope and Field of Application**

20 This Supplement contains the definition of the Hanging Protocol Information Object and the  
Hanging Protocol Storage and Query/Retrieve Service Classes.

22

## Part 17 Addendum

2 Item #1: Add a new Informative Annex

### Annex X Hanging Protocols (Informative)

4 The Hanging Protocol Composite IOD contains information about user viewing preferences,  
6 related to image display station (workstation) capabilities. The associated Service Classes  
8 support the storage (C-STORE), query (C-FIND) and retrieve (C-MOVE) of Hanging Protocol  
10 Instances between servers and workstations. The goal is for users to be able to conveniently  
define their preferred methods of presentation and interaction for different types of viewing  
circumstances once, and then to automatically layout image sets according to the users'  
preferences on workstations of similar capability.

12 The primary expectation is to facilitate the automatic and consistent hanging of images according  
14 to definitions provided by the users, sites or vendors of the workstations by providing the  
capability to:

- 16 • Save defined Hanging Protocols
- 18 • Search for Hanging Protocols by name, level (single user, user group, site, manufacturer),  
user identification code, modality, anatomy, and laterality.
- 20 • Allow automatic hanging of image sets to occur for all studies on workstations with sufficiently  
compatible capabilities by matching against user or site defined Hanging Protocols. This  
includes supporting automatic hanging when the user reads from different locations, or on  
different but similar workstation types.

22 How relevant image sets (e.g., from the current and prior studies) are obtained is not defined by  
24 the Hanging Protocol IOD or Service Classes.

26 Conformance with the DICOM Grayscale Standard Display Function and the DICOM Softcopy  
Presentation States in conjunction with the Hanging Protocol IOD allows the complete picture of  
28 what the users see, and how they interact with it, to be defined, stored and reproduced as  
similarly as possible, independent of workstation type. Further, it is anticipated that implementors  
30 will make it easy for users to point to a graphical representation of what they want (such as 4x1  
versus 12x1 format with a horizontal alternator scroll mechanism) and select it.

#### X.1 Example Scenario

32 User A sits down at workstation X, with two 1024x1280 resolution screens (Figure X.1-1) that  
recently has been installed and hence has no user specific Hanging Protocols defined. The user  
34 brings up the list of studies to be read and selects the first study, a chest CT, together with the  
relevant prior studies. The workstation queries the Hanging Protocol Query SCP for instances of  
36 the Hanging Protocol Storage SOP Class. It finds none for this specific user, but matches a site  
specific Hanging Protocol Instance, which was set up when the workstation was installed at the  
38 site. It applies the site Hanging Protocol Instance, and the user reads the current study in  
comparison to the prior studies.

40 The user decides to customize the viewing style, and uses the viewing application to define what  
type of Hanging Protocol is preferred (layout style, interaction style) by pointing and clicking on  
42 graphical representations of the choices. The user chooses a 3-column by 4-row tiled

2 presentation with a “vertical alternator” interaction, and a default scroll amount of one row of  
images. The user places the current study on the left screen, and the prior study on the right  
4 Hanging Protocol Instance to be stored to the Hanging Protocol Storage SCP.

6 When the same user comes back the next day to read chest CT studies at workstation X and a  
study is selected, the application queries the Hanging Protocol Query SCP to determine which  
Hanging Protocol Instances best match the scenario of this user on this workstation for this study.  
8 The best match returned by the SCP in response to the query is with the user ID matching his  
userid, the study type matched to the study type(s) of the image set selected for viewing, and the  
10 screen types matching the workstation in use.

12 A list of matches is produced, with the Hanging Protocol Instance that the user defined yesterday  
for chest CT matching the best, and the current CT study is automatically displayed on the left  
screen with that Hanging Protocol. Alternative next best matches are available to the user via the  
14 application interface’s pull-down menu list of all closely matching Hanging Protocol Instances.

16 Because this Hanging Protocol defines an additional image set, the prior year’s chest CT study  
for the same patient is displayed next to the current study, on the right screen.

18 The next week, the same user reads chest CTs at a different site in the same enterprise on a  
similar type workstation, workstation Y, from a different vendor. The workstation has a single  
2048x2560 screen (Figure X.1-1). This workstation queries the Hanging Protocol Query SCP,  
20 and retrieves matching Hanging Protocol Instances, choosing as the best match the Hanging  
Protocol Instance used on workstation X before by user A. This Hanging Protocol is  
22 automatically applied to display the chest CT study. The current chest CT study is displayed on  
the left half of the 2048x2560 screen, and the prior chest CT study is displayed on the right half of  
24 the screen, with 3 columns and 8 rows each, maintaining the same vertical alternator layout. The  
sequence of communications between the workstations and the SCP is depicted in Figure X.1-2.

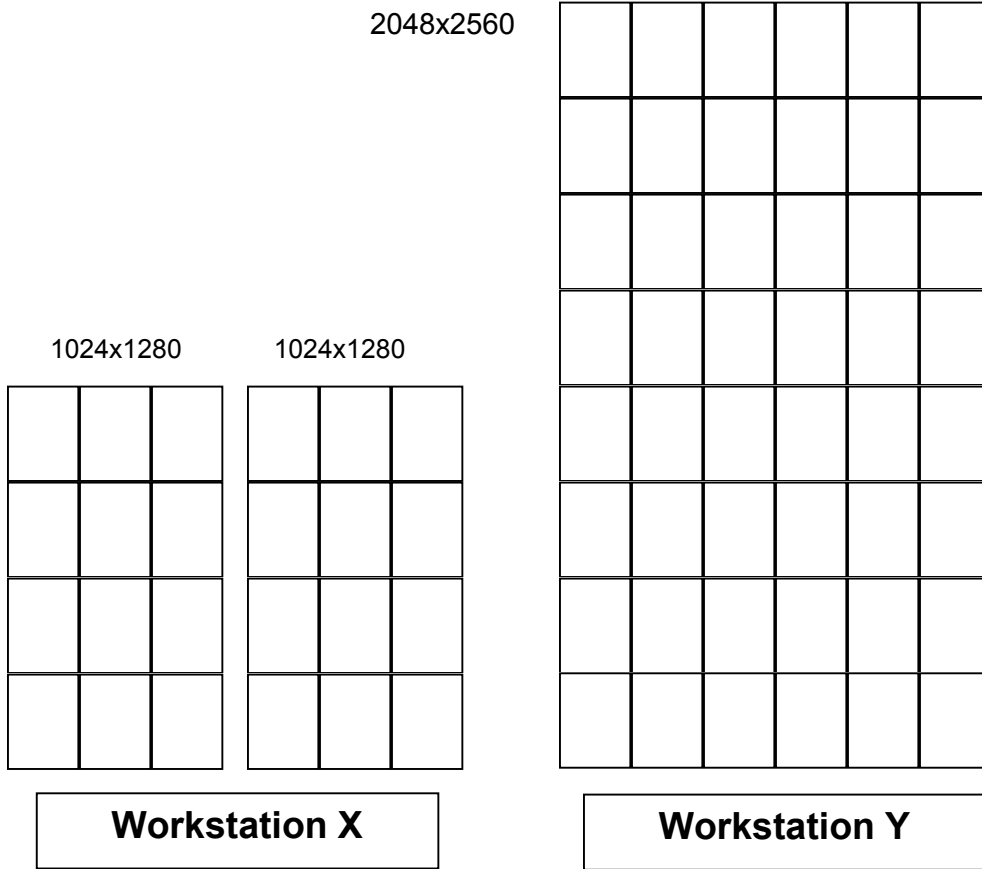


Figure X.1-1. Spatial layout of screens for workstations in Example Scenario.

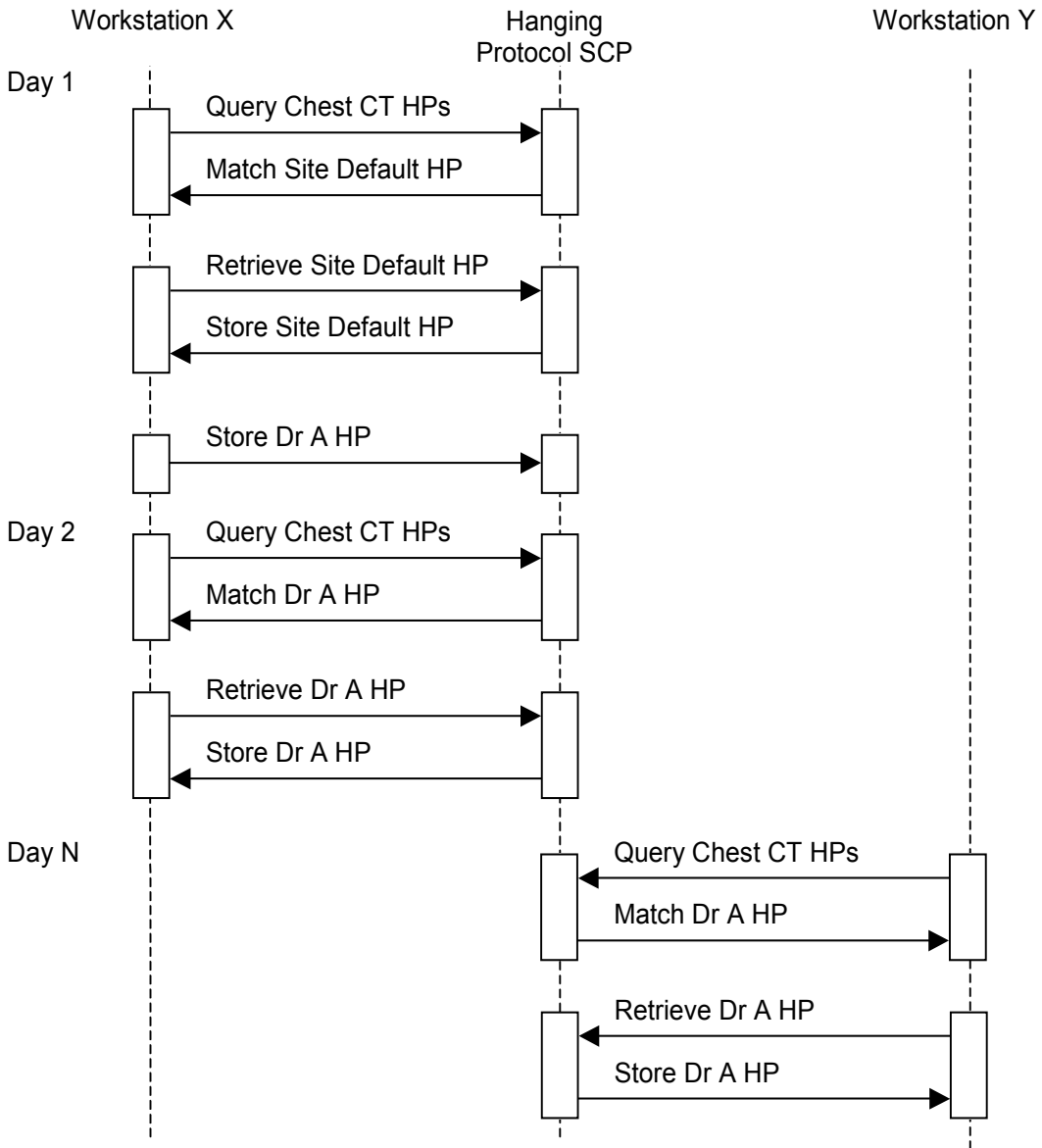


Figure X.1-2. **Sequence diagram for Example Scenario**



## 2 X.2 HANGING PROTOCOL INTERNAL PROCESS MODEL

4 The overall process flow of Hanging Protocols can be seen in Figure X.2-1, and consists of three  
6 main steps: selection, processing, and layout. The selection is defined in the ***Hanging Protocol  
Definition Module***. The processing and layout are defined in the ***Hanging Protocol Display  
Module***. The first process step, the selection of sets of images that need to be available from  
8 DICOM image objects, is defined by the Image Sets Sequence of the ***Hanging Protocol  
Definition Module***. This is a N:M mapping, with multiple image sets potentially drawing from the  
same image objects.

10 The second part of the process flow consists of the filtering, reformatting, sorting, and  
presentation intent operations that map the Image Sets into their final form, the Display Sets.  
12 This is defined in the ***Hanging Protocol Display Module***. This is a 1:M relationship, as multiple  
Display Sets may draw their images from the same Image Set. The filtering operation allows for  
14 selecting a subset of the Image Set and is defined by the Hanging Protocol Display Module Filter  
Operations Sequence. Reformatting allows operations such as multiplanar reformatting to  
16 resample images from a volume (Reformatting Operation Type, Reformatting Thickness,  
Reformatting Interval, Reformatting Operation Initial View Direction, 3D Rendering Type). The  
18 Hanging Protocol Display Module Sorting Operations Sequence allows for ordering of the images.  
Default presentation intent (a subset of the Presentation State operations such as intensity  
20 window default setting) is defined by the Hanging Protocol Display Module presentation intent  
attributes. The Display Sets are containers holding the final sets of images after all operations  
22 have occurred. These sets contain the images ready for rendering to locations on the screen(s).

The rendering of a Display Set to the screen is determined by the layout information in the Image  
24 Boxes Sequence within a Display Sets Sequence Item in the Hanging Protocol Display Module.  
A Display Set is mapped to a single Image Boxes Sequence. This is generally a single Image  
26 Box (rectangular area on screen), but may be an ordered set of image boxes. The mapping to an  
ordered set of image boxes is a special case to allow the images to flow in an ordered sequence  
28 through multiple locations on the screen (e.g., newspaper columns). Display Environment Spatial  
Position specifies rectangular locations on the screen where the images from the Display Sets will  
30 be rendered. The type of interaction to be used is defined by the Image Boxes Sequence Item  
attributes. A vertically scrolling alternator could be specified by having Image Box Layout Type  
32 equal TILED and Image Box Scroll Direction equal VERTICAL.

34 An example of this processing is shown in Figure X.2-2. The figure is based on the Neurosurgery  
Planning Hanging Protocol Example contained in this Annex, and corresponds to the display sets  
for Display Set Presentation Group #1 (CT only display of current CT study).

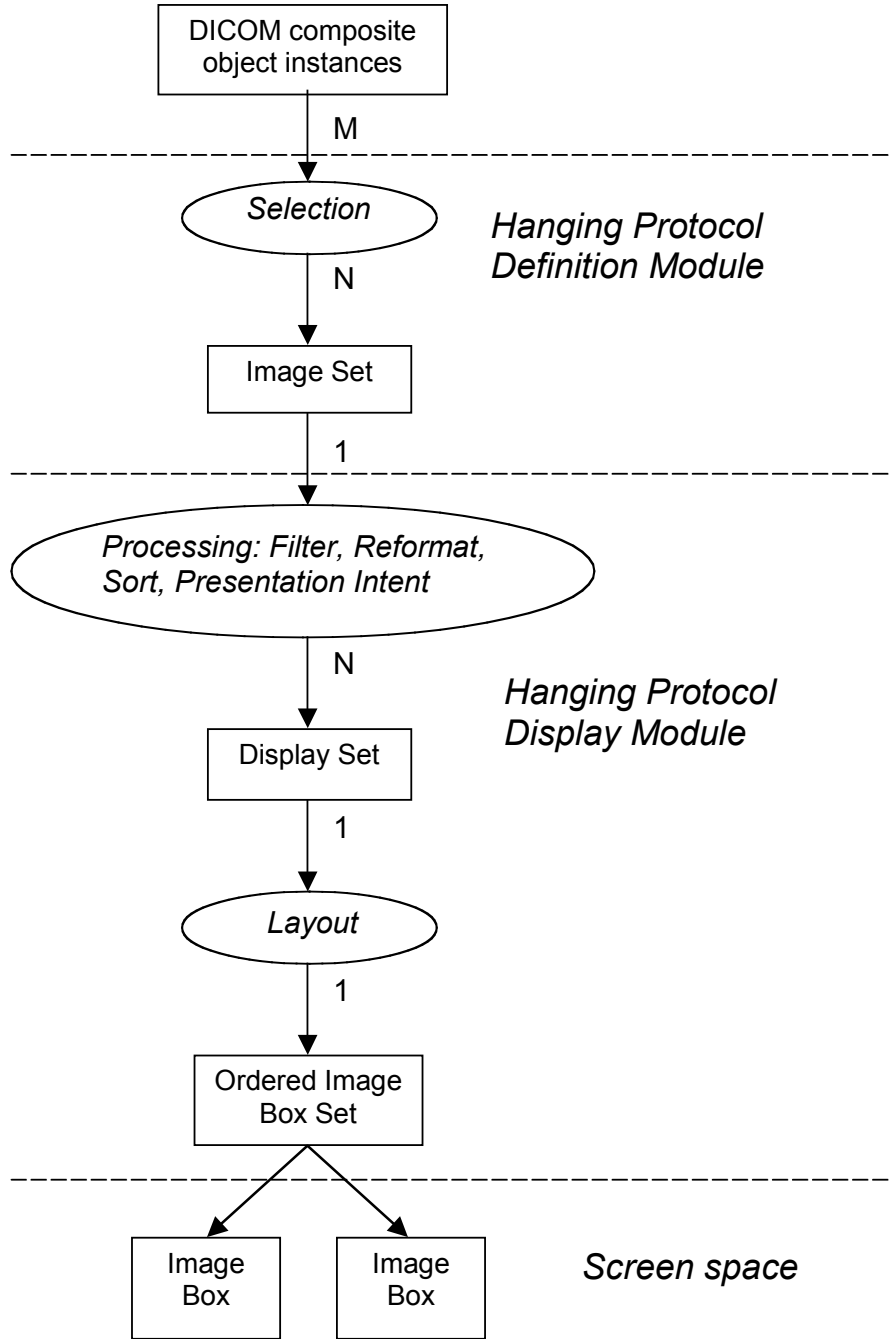


Figure X.2-1 Hanging Protocol Internal Process Model

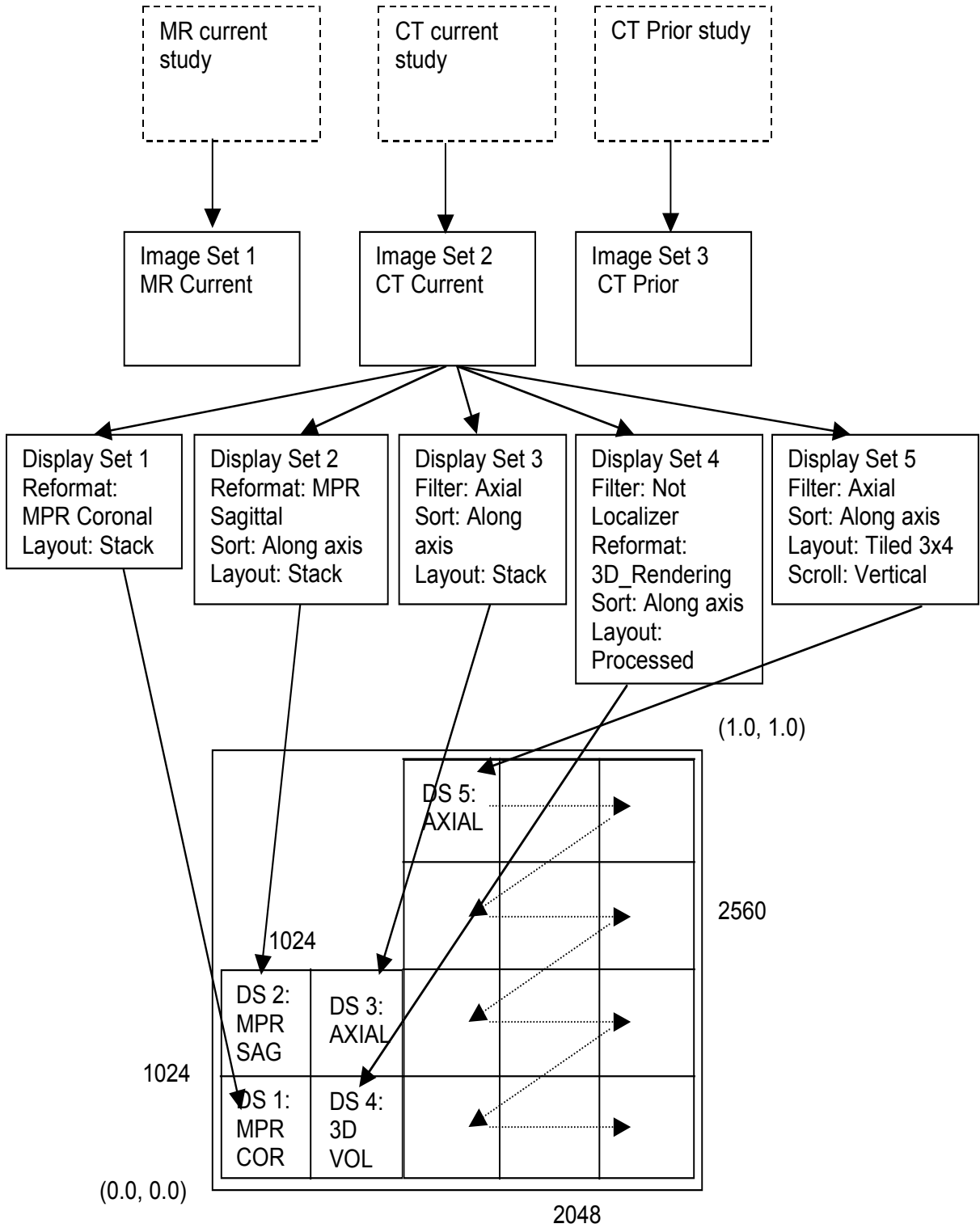


Figure X.2-2 Example Process Flow

### X.3 CHEST X-RAY HANGING PROTOCOL EXAMPLE

- 2 Goal: A Hanging Protocol for Chest X-ray, PA & Lateral (LL, RL) views, current & prior, with the following layout:

Screen 1		Screen 2	
Display Set 1, 1 Image Box: Prior Lateral	Display Set 2, 1 Image Box: Prior PA	Display Set 3, 1 Image Box: Current PA	Display Set 4, 1 Image Box: Current Lateral

4

6 The Hanging Protocol Definition does not specify a specific modality, but rather a specific anatomy (Chest). The Image Sets Sequence provides more detail, in that it specifies the modalities in addition to the anatomy for each image set.

#### 8 X.3.1 Hanging Protocol Definition Module

Hanging Protocol Name: "Chest X-ray"

10 Hanging Protocol Description: "Current and Prior Chest PA and Lateral"

Hanging Protocol Level: "SITE"

12 Hanging Protocol Creator: "Senior Radiologist"

Hanging Protocol Creation Datetime: "20020823133455"

14 Hanging Protocol Definition Sequence:

➤ Item 1:

16 ➤ Anatomic Region Sequence:

○ Item 1: (T-D3000, SNM3, "Chest")

18 ➤ Laterality: *zero length*

➤ Procedure Code Sequence: *zero length*

20 ➤ Reason for Requested Procedure Code Sequence: *zero length*

Number of Priors Referenced: 1

22 Image Sets Sequence:

➤ Item 1:

24 ➤ Image Set Selector Sequence:

○ Item 1:

26 ○ Image Set Selector Usage Flag: "NO\_MATCH"

○ Selector Attribute: (0008,2218) [Anatomic Region Sequence]

28 ○ Selector Attribute VR: "SQ"

○ Selector Code Sequence Value:

30 ■ Item 1: (T-D3000, SNM3, "Chest")

○ Selector Value Number: 1

32 ○ Item 2:

○ Image Set Selector Usage Flag: "NO\_MATCH"

34 ○ Selector Attribute: (0008,0060) [Modality]

○ Selector Attribute VR: "CS"

36 ○ Selector CS Value: "CR\DX"

- Selector Value Number: 1
- 2 ➤ Time Based Image Sets Sequence:
  - Item 1:
  - 4 ○ Image Set Number: 1
  - Image Set Selector Category: "RELATIVE\_TIME"
  - 6 ○ Relative Time: 0\0
  - Relative Time Units: "MINUTES"
  - 8 ○ Image Set Label: "Current Chest X-ray"
  - Item 2:
  - 10 ○ Image Set Number: 2
  - Image Set Selector Category: "ABSTRACT\_PRIOR"
  - 12 ○ Abstract Prior Value: 1\1
  - Image Set Label: "Prior Chest X-ray"
- 14 Hanging Protocol User Identification Code Sequence: *zero length*  
Hanging Protocol User Group Name: "ABC Hospital"

### 16 X.3.2 Hanging Protocol Environment Module

Number of Screens: 2

18 Nominal Screen Definition Sequence:

- Item 1:
- 20 ➤ Number of Vertical Pixels: 2560
- Number of Horizontal Pixels: 2048
- 22 ➤ Display Environment Spatial Position: 0.0\1.0\0.5\0.0, representing (0,1), (0.5,0)
- Screen Minimum Grayscale Bit Depth: 8
- 24 ➤ Application Maximum Repaint Time: 100
- Item 2:
- 26 ➤ Number of Vertical Pixels: 2560
- Number of Horizontal Pixels: 2048
- 28 ➤ Display Environment Spatial Position: 0.5\1.0\1.0\0.0, representing (0.5,1), (1,0)
- Screen Minimum Grayscale Bit Depth: 8
- 30 ➤ Application Maximum Repaint Time: 100

### 32 X.3.3 Hanging Protocol Display Module

Display Sets Sequence:

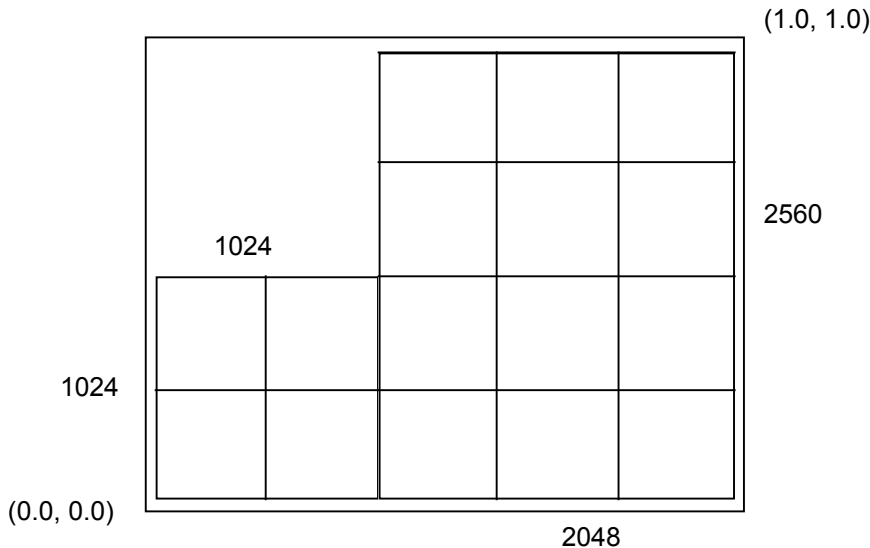
- 34 ➤ Item 1:
- Display Set Number: 1
- 36 ➤ Display Set Presentation Group: 1
- Image Set Number: 2
- 38 ➤ Image Boxes Sequence:
  - Item 1:
  - 40 ○ Image Box Number: 1
  - Display Environment Spatial Position: 0.0\1.0\0.25\0.0, representing (0,1), (0.25,0)
  - 42 ○ Image Box Layout Type: "SINGLE"
- 44 ➤ Filter Operations Sequence:
  - Item 1:
  - 46 ○ Selector Attribute: (0018,5101) [View Position]
  - Selector Attribute VR: "CS"
  - 48 ○ Selector CS Value: "RL\LL"
  - Selector Value Number: 1
  - 50 ○ Filter-by Operator: "MEMBER\_OF"
- Sorting Operations Sequence: *zero length*

- Display Set Patient Orientation: "A\F"
- 2 ➤ Show Image True Size Flag: "NO"
- Show Graphic Annotation Flag: "NO"
- 4 ➤ Item 2:
  - Display Set Number: 2
  - 6 ➤ Display Set Presentation Group: 1
  - Image Set Number: 2
  - 8 ➤ Image Boxes Sequence:
    - Item 1:
    - 10 ○ Image Box Number: 1
    - Display Environment Spatial Position: 0.25\1.0\0.5\0.0, representing (0.25,1),
    - 12 (0.5,0)
    - Image Box Layout Type: "SINGLE"
  - 14 ➤ Filter Operations Sequence:
    - Item 1:
    - 16 ○ Selector Attribute: (0018,5101) [View Position]
    - Selector Attribute VR: "CS"
    - 18 ○ Selector CS Value: "PA"
    - Selector Value Number: 1
    - 20 ○ Filter-by Operator: "MEMBER\_OF"
  - Sorting Operations Sequence: *zero length*
  - 22 ➤ Display Set Patient Orientation: "R\F"
  - Show Image True Size Flag: "NO"
  - 24 ➤ Show Graphic Annotation Flag: "NO"
  - Item 3:
    - 26 ➤ Display Set Number: 3
    - Display Set Presentation Group: 1
    - 28 ➤ Image Set Number: 1
    - Image Boxes Sequence:
      - 30 ○ Item 1:
      - Image Box Number: 1
      - 32 ○ Display Environment Spatial Position: 0.5\1.0\0.75\1.0, representing (0.5,1),
      - (0.75,0)
      - 34 ○ Image Box Layout Type: "SINGLE"
    - Filter Operations Sequence:
      - 36 ○ Item 1:
      - Selector Attribute: (0018,5101) [View Position]
      - 38 ○ Selector Attribute VR: "CS"
      - Selector CS Value: "PA"
      - 40 ○ Selector Value Number: 1
      - Filter-by Operator: "MEMBER\_OF"
    - 42 ➤ Sorting Operations Sequence: *zero length*
    - Display Set Patient Orientation: "R\F"
    - 44 ➤ Show Image True Size Flag: "NO"
    - Show Graphic Annotation Flag: "NO"
    - 46 ➤ Item 4:
      - Display Set Number: 4
      - 48 ➤ Display Set Presentation Group: 1
      - Image Set Number: 1
      - 50 ➤ Image Boxes Sequence:
        - Item 1:
        - 52 ○ Image Box Number: 1

- Display Environment Spatial Position: 0.75\1.0\1.0\0.0, representing (0.75,1), (1,0)
  - Image Box Layout Type: "SINGLE"
  - Filter Operations Sequence:
    - Item 1:
      - Selector Attribute: (0018,5101) [View Position]
      - Selector Attribute VR: "CS"
      - Selector CS Value: "RL\LL"
      - Selector Value Number: 1
      - Filter-by Operator: "MEMBER\_OF"
    - Sorting Operations Sequence: *zero length*
    - Display Set Patient Orientation: "A\F"
    - Show Image True Size Flag: "NO"
    - Show Graphic Annotation Flag: "NO"
- Partial Data Display Handling: "MAINTAIN\_LAYOUT"

#### X.4 NEUROSURGERY PLANNING HANGING PROTOCOL EXAMPLE

- 18 Goal: A Hanging Protocol for MR & CT of Head, for a neurosurgery plan. 1Kx1K screen on left shows orthogonal MPR slices through the acquisition volume, and in one presentation group has a 3D interactive volume rendering in the lower right quadrant. In all display sets the 1Kx1K screen is split into 4 512x512 quadrants. The 2560x2048 screen has a 4 row by 3 column tiled display area. There are 4 temporal presentation groups: CT<sub>new</sub>, MR, combined CT<sub>new</sub> and MR, combined CT<sub>new</sub> and CT<sub>old</sub>.
- 24 Display Environment Spatial Position attribute values for image boxes are represented in terms of ratios in pixel space [(0/3072, 512/2560), (512/3072,0/2560)] rather than (0.0,0.0), (1.0,1.0) space, for ease of understanding the example.



#### 28 X.4.1 Hanging Protocol Definition Module

- Hanging Protocol Name: "NeurosurgeryPlan"  
30 Hanging Protocol Description: "Neurosurgery planning, requiring MR and CT of head"  
Hanging Protocol Level: "SITE"  
32 Hanging Protocol Creator: "Smith^Joseph"

Hanging Protocol Creation Datetime: "20020101104200"

2 Hanging Protocol Definition Sequence:

- Item 1:
- 4 ➤ Modality: "MR"
- Anatomic Region Sequence:
  - 6 ○ Item 1: (T-D1100, SNM3, "Head")
- Laterality: *zero length*
- 8 ➤ Procedure Code Sequence:
  - Item 1: (98765, 99Local, 1.5, "NeuroSurgery Plan Local5")
- 10 ➤ Reason for Requested Procedure Code Sequence:
  - Item 1: (I67.1, I10, "Cerebral aneurysm")
- 12 ➤ Item 2:
- Modality: "CT"
- 14 ➤ Anatomic Region Sequence:
  - Item 1: (T-D1100, SNM3, "Head")
- 16 ➤ Laterality: *zero length*
- Procedure Code Sequence:
  - 18 ○ Item 1: (98765, 99Local, 1.5, "NeuroSurgery Plan Local5")
- Reason for Requested Procedure Code Sequence:
  - 20 ○ Item 1: (I67.1, I10, "Cerebral aneurysm")

Number of Priors Referenced: 1

22 Image Sets Sequence:

- Item 1:
- 24 ➤ Image Set Selector Sequence:
  - Item 1:
  - 26 ○ Image Set Selector Usage Flag: "NO\_MATCH"
  - Selector Attribute: (0018,0015) [Body Part Examined]
  - 28 ○ Selector Attribute VR: "CS"
  - Selector CS Value: "HEAD"
  - 30 ○ Selector Value Number: 1
  - Item 2:
  - 32 ○ Image Set Selector Usage Flag: "NO\_MATCH"
  - Selector Attribute: (0008,0060) [Modality]
  - 34 ○ Selector Attribute VR: "CS"
  - Selector CS Value: "MR"
  - 36 ○ Selector Value Number: 1
- Time Based Image Sets Sequence:
  - 38 ○ Item 1:
  - Image Set Number: 1
  - 40 ○ Image Set Selector Category: "RELATIVE\_TIME"
  - Relative Time: 0\0
  - 42 ○ Relative Time Units: "MINUTES"
  - Image Set Label: "Current MR Head"
- 44 ➤ Item 2:
- Image Set Selector Sequence:
  - 46 ○ Item 1:
  - Image Set Selector Usage Flag: "NO\_MATCH"
  - 48 ○ Selector Attribute: (0018,0015) [Body Part Examined]
  - Selector Attribute VR: "CS"
  - 50 ○ Selector CS Value: "HEAD"
  - Selector Value Number: 1
  - 52 ○ Item 2:
  - Image Set Selector Usage Flag: "NO\_MATCH"



- 2           ○ Selector Attribute: (0008,0060) [Modality]
- Selector Attribute VR: "CS"
- Selector CS Value: "CT"
- 4           ○ Selector Value Number: 1
- Time Based Image Sets Sequence:
- 6           ○ Item 1:
- Image Set Number: 2
- 8           ○ Image Set Selector Category: "RELATIVE\_TIME"
- Relative Time: 0\0
- 10          ○ Relative Time Units: "MINUTES"
- Image Set Label: "Current CT Head"
- 12          ○ Item 2:
- Image Set Number: 3
- 14          ○ Image Set Selector Category: "ABSTRACT\_PRIOR"
- Abstract Prior Value: 1\1
- 16          ○ Image Set Label: "Prior CT Head"

Hanging Protocol User Identification Code Sequence: *zero length*

18 Hanging Protocol User Group Name: "ABC Hospital"

#### 20 **X.4.2 Hanging Protocol Environment Module**

Number of Screens: 2

22 Nominal Screen Definition Sequence:

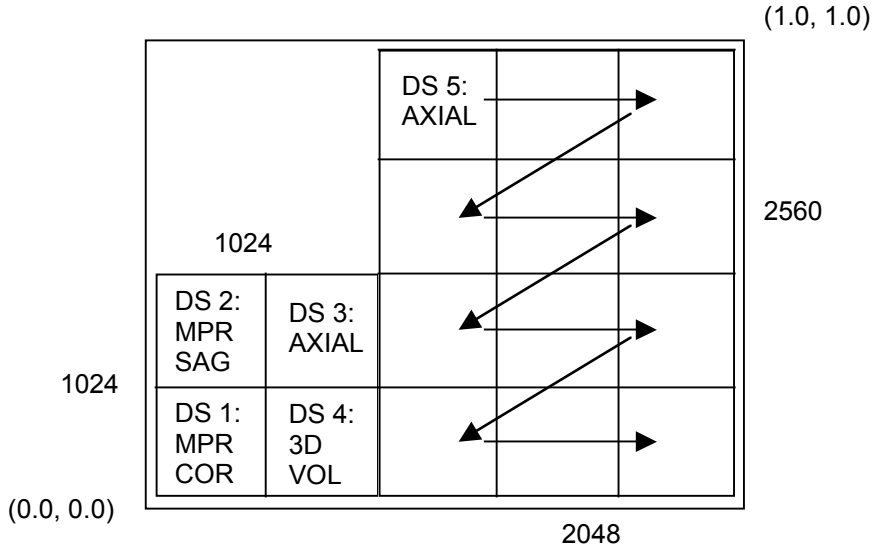
- 24           ➤ Item 1:
- Number of Vertical Pixels: 1024
- Number of Horizontal Pixels: 1024
- 26           ➤ Display Environment Spatial Position: 0.0\0.28\0.33\0.0, representing (0.0, 0.28), (0.33, 0.0)
- 28           ➤ Screen Minimum Color Bit Depth: 8
- Application Maximum Repaint Time: 70
- 30           ➤ Item 2:
- Number of Vertical Pixels: 2560
- 32           ➤ Number of Horizontal Pixels: 2048
- Display Environment Spatial Position 0.33\1.0\1.0\0.0, representing (0.33, 1.0), (1.0, 0.0)
- 34           ➤ Screen Minimum Grayscale Bit Depth: 8
- Application Maximum Repaint Time: 10

36

#### **X.4.3 Hanging Protocol Display Module**

38 Display Sets Sequence:

40 [Group #1 is CT only display (current CT)]

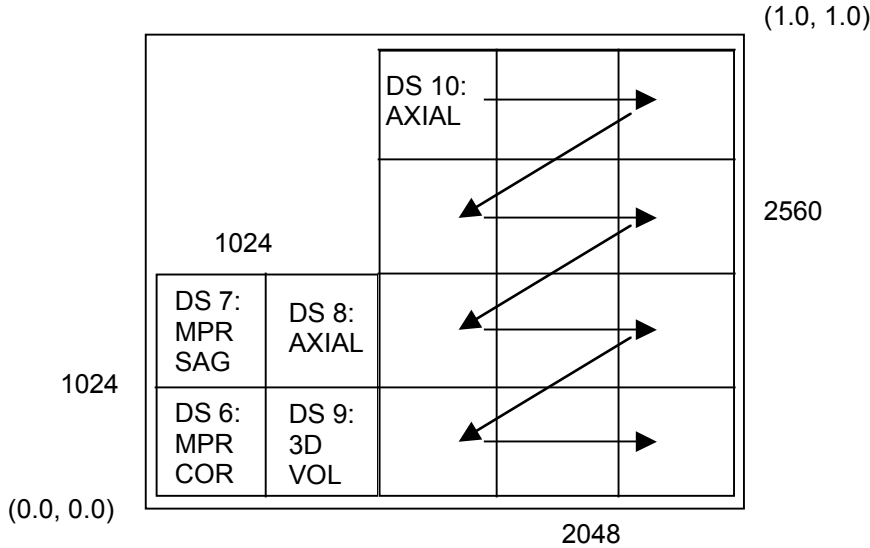


- 2    ➤ Item 1:
- 3    ➤ Display Set Number: 1
- 4    ➤ Display Set Presentation Group: 1
- 5    ➤ Image Set Number: 2
- 6    ➤ Image Boxes Sequence:
  - 7    ○ Item 1: [lower left quadrant of 1024x1024]
  - 8    ○ Image Box Number: 1
  - 9    ○ Display Environment Spatial Position: (0/3072, 512/2560), (512/3072,0/2560)
  - 10    ○ Image Box Layout Type: "STACK"
- 11    ➤ Filter Operations Sequence:
  - 12    ○ Item 1:
  - 13    ○ Filter-by Category: "IMAGE\_PLANE"
  - 14    ○ Selector Attribute VR: "CS"
  - 15    ○ Selector CS Value: "AXIAL"
  - 16    ○ Filter-by Operator: "MEMBER\_OF"
- 17    ➤ Sorting Operations Sequence:
  - 18    ○ Item 1:
  - 19    ○ Sort-by Category: "ALONG\_AXIS"
  - 20    ○ Sorting Direction: "INCREASING"
- 21    ➤ Reformatting Operation Type: "MPR"
- 22    ➤ Reformatting Thickness: 5
- 23    ➤ Reformatting Interval: 5
- 24    ➤ Reformatting Operation Initial View Direction: "CORONAL"
- 25    ➤ Display Set Patient Orientation: "L\F"
- 26    ➤ VOI Type: BRAIN
- 27    ➤ Display Set Presentation Group Description: "Current CT only"
- 28    ➤ Item 2:
- 29    ➤ Display Set Number: 2
- 30    ➤ Display Set Presentation Group: 1
- 31    ➤ Image Set Number: 2
- 32    ➤ Image Boxes Sequence:
  - 33    ○ Item 1: [upper left quadrant of 1024x1024]
  - 34    ○ Image Box Number: 1
  - 35    ○ Display Environment Spatial Position: (0/3072, 1024/2560), (512/3072, 512/2560)

- Image Box Layout Type: "STACK"
- 2 ➤ Filter Operations Sequence:
  - Item 1:
  - 4 ○ Filter-by Category: "IMAGE\_PLANE"
  - Selector Attribute VR: "CS"
  - 6 ○ Selector CS Value: "AXIAL"
  - Filter-by Operator: "MEMBER\_OF"
- 8 ➤ Sorting Operations Sequence:
  - Item 1:
  - 10 ○ Sort-by Category: "ALONG\_AXIS"
  - Sorting Direction: "INCREASING"
- 12 ➤ Reformatting Operation Type: "MPR"
- Reformatting Thickness: 5
- 14 ➤ Reformatting Interval: 5
- Reformatting Operation Initial View Direction: "SAGITTAL"
- 16 ➤ Display Set Patient Orientation: "P\F"
- VOI Type: BRAIN
- 18 ➤ Item 3:
- Display Set Number: 3
- 20 ➤ Display Set Presentation Group: 1
- Image Set Number: 2
- 22 ➤ Image Boxes Sequence:
  - Item 1: [upper right quadrant of 1024x1024]
  - 24 ○ Image Box Number: 1
  - Display Environment Spatial Position: (512/3072, 1024/2560), (1024/3072, 26 512/2560)
  - Image Box Layout Type: "STACK"
- 28 ➤ Filter Operations Sequence:
  - Item 1:
  - 30 ○ Filter-by Category: "IMAGE\_PLANE"
  - Selector Attribute VR: "CS"
  - 32 ○ Selector CS Value: "AXIAL"
  - Filter-by Operator: "MEMBER\_OF"
- 34 ➤ Sorting Operations Sequence:
  - Item 1:
  - 36 ○ Sort-by Category: "ALONG\_AXIS"
  - Sorting Direction: "INCREASING"
- 38 ➤ Display Set Patient Orientation: "L\P"
- VOI Type: BRAIN
- 40 ➤ Show Graphic Annotation Flag: "YES"
- Item 4:
- 42 ➤ Display Set Number: 4
- Display Set Presentation Group: 1
- 44 ➤ Image Set Number: 2
- Image Boxes Sequence:
  - 46 ○ Item 1: [lower right quadrant of 1024x1024]
  - Image Box Number: 1
  - 48 ○ Display Environment Spatial Position: (512/3072, 512/2560), (1024/3072, 0/2560)
  - Image Box Layout Type: "PROCESSED"
- 50 ➤ Filter Operations Sequence:
  - Item 1:
  - 52 ○ Selector Attribute: (0008,0008) [Image Type]
  - Selector Attribute VR: "CS"

- Selector CS Value: "LOCALIZER "
- Selector Value Number: 3
- Filter-by Operator: "NOT\_MEMBER\_OF"
- Sorting Operations Sequence: *zero length*
- Reformatting Operation Type: "3D\_RENDERING"
- Reformatting Operation Initial View Direction: "CORONAL"
- 3D Rendering Type: "VOLUME"
- Display Set Patient Orientation: "\F"
- Show Graphic Annotation Flag: "NO"
- Item 5:
- Display Set Number: 5
- Display Set Presentation Group: 1
- Image Set Number: 2
- Image Boxes Sequence:
  - Item 1: [entire 2048x2560 space]
  - Image Box Number: 1
  - Display Environment Spatial Position: (1024/3072, 2560/2560), (3072/3072, 0/2560)
  - Image Box Layout Type: "TILED"
  - Image Box Tile Horizontal Dimension: 3
  - Image Box Tile Vertical Dimension: 4
  - Image Box Scroll Direction: "VERTICAL"
  - Image Box Small Scroll Type: "ROW\_COLUMN"
  - Image Box Small Scroll Amount: 1
  - Image Box Large Scroll Type: "PAGE"
  - Image Box Large Scroll Amount: 1
- Filter Operations Sequence:
  - Item 1:
  - Filter-by Category: "IMAGE\_PLANE"
  - Selector Attribute VR: "CS"
  - Selector CS Value: "AXIAL"
  - Filter-by Operator: "MEMBER\_OF"
- Sorting Operations Sequence:
  - Item 1:
  - Sort-by Category: "ALONG\_AXIS"
  - Sorting Direction: "INCREASING"
- Display Set Patient Orientation: "L\P"
- VOI Type: BRAIN
- Show Graphic Annotation Flag: "YES"

[Group #2 is MR only display]

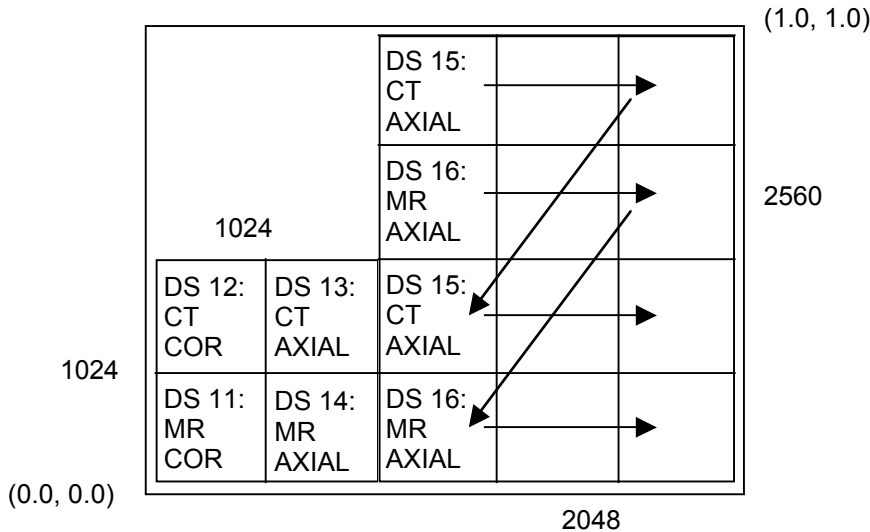


- 2    ➤ Item 6:
- 3    ➤ Display Set Number: 6
- 4    ➤ Display Set Presentation Group: 2
- 5    ➤ Image Set Number: 1
- 6    ➤ Image Boxes Sequence:
  - 7    ○ Item 1: [lower left quadrant of 1024x1024]
  - 8    ○ Image Box Number: 1
  - 9    ○ Display Environment Spatial Position: (0/3072, 512/2560), (512/3072,0/2560)
  - 10    ○ Image Box Layout Type: "STACK"
- 11    ➤ Filter Operations Sequence:
  - 12    ○ Item 1:
  - 13    ○ Filter-by Category: "IMAGE\_PLANE"
  - 14    ○ Selector Attribute VR: "CS"
  - 15    ○ Selector CS Value: "AXIAL"
  - 16    ○ Filter-by Operator: "MEMBER\_OF"
- 17    ➤ Sorting Operations Sequence:
  - 18    ○ Item 1:
  - 19    ○ Sort-by Category: "ALONG\_AXIS"
  - 20    ○ Sorting Direction: "INCREASING"
- 21    ➤ Reformatting Operation Type: "MPR"
- 22    ➤ Reformatting Thickness: 5
- 23    ➤ Reformatting Interval: 5
- 24    ➤ Reformatting Operation Initial View Direction: "CORONAL"
- 25    ➤ Display Set Patient Orientation: "P\F"
- 26    ➤ Display Set Presentation Group Description: "MR only"
- 27    ➤ Item 7:
- 28    ➤ Display Set Number: 7
- 29    ➤ Display Set Presentation Group: 2
- 30    ➤ Image Set Number: 1
- 31    ➤ Image Boxes Sequence:
  - 32    ○ Item 1: [upper left quadrant of 1024x1024]
  - 33    ○ Image Box Number: 1
  - 34    ○ Display Environment Spatial Position: (0/3072, 1024/2560), (512/3072, 512/2560)
  - 35    ○ Image Box Layout Type: "STACK"

- Filter Operations Sequence:
  - Item 1:
  - Filter-by Category: "IMAGE\_PLANE"
  - Selector Attribute VR: "CS"
  - Selector CS Value: "AXIAL"
  - Filter-by Operator: "MEMBER\_OF"
- Sorting Operations Sequence:
  - Item 1:
  - Sort-by Category: "ALONG\_AXIS"
  - Sorting Direction: "INCREASING"
- Reformatting Operation Type: "MPR"
- Reformatting Thickness: 5
- Reformatting Interval: 5
- Reformatting Operation Initial View Direction: "SAGITTAL"
- Display Set Patient Orientation: "P\F"
- Item 8:
- Display Set Number: 8
- Display Set Presentation Group: 2
- Image Set Number: 1
- Image Boxes Sequence:
  - Item 1: [upper right quadrant of 1024x1024]
  - Image Box Number: 1
  - Display Environment Spatial Position: (512/3072, 1024/2560), (1024/3072, 512/2560)
  - Image Box Layout Type: "STACK"
- Filter Operations Sequence:
  - Item 1:
  - Filter-by Category: "IMAGE\_PLANE"
  - Selector Attribute VR: "CS"
  - Selector CS Value: "AXIAL"
  - Filter-by Operator: "MEMBER\_OF"
- Sorting Operations Sequence:
  - Item 1:
  - Sort-by Category: "ALONG\_AXIS"
  - Sorting Direction: "INCREASING"
- Display Set Patient Orientation: "L\P"
- Item 9:
- Display Set Number: 9
- Display Set Presentation Group: 2
- Image Set Number: 1
- Image Boxes Sequence:
  - Item 1: [lower right quadrant of 1024x1024]
  - Image Box Number: 1
  - Display Environment Spatial Position: (512/3072, 512/2560), (1024/3072, 0/2560)
  - Image Box Layout Type: "PROCESSED"
- Filter Operations Sequence: *zero length*
- Sorting Operations Sequence: *zero length*
- Reformatting Operation Type: "3D\_RENDERING"
- Reformatting Operation Initial View Direction: "CORONAL"
- 3D Rendering Type: "VOLUME"
- Display Set Patient Orientation: "X\F"
- Item 10:
- Display Set Number: 10

- Display Set Presentation Group: 2
- Image Set Number: 1
- Image Boxes Sequence:
  - Item 1: [entire 2048x2560 space]
  - Image Box Number: 1
  - Display Environment Spatial Position: (1024/3072, 2560/2560), (3072/3072, 0/2560)
  - Image Box Layout Type: "TILED"
  - Image Box Tile Horizontal Dimension: 3
  - Image Box Tile Vertical Dimension: 4
  - Image Box Scroll Direction: "VERTICAL"
  - Image Box Small Scroll Type: "ROW\_COLUMN"
  - Image Box Small Scroll Amount: 1
  - Image Box Large Scroll Type: "PAGE"
  - Image Box Large Scroll Amount: 1
- Filter Operations Sequence:
  - Item 1:
  - Filter-by Category: "IMAGE\_PLANE"
  - Selector Attribute VR: "CS"
  - Selector CS Value: "AXIAL"
  - Filter-by Operator: "MEMBER\_OF"
- Sorting Operations Sequence:
  - Item 1:
  - Sort-by Category: "ALONG\_AXIS"
  - Sorting Direction: "INCREASING"
- Display Set Patient Orientation: "L\^P"

28 [Group #3 is combined MR & CT]



- Item 11: [MR coronal]
- Display Set Number: 11
- Display Set Presentation Group: 3
- Image Set Number: 1
- Image Boxes Sequence:
  - Item 1: [lower left quadrant of 1024x1024]
  - Image Box Number: 1

- Display Environment Spatial Position: (0/3072, 512/2560), (512/3072,0/2560)
- Image Box Layout Type: "STACK"
- Filter Operations Sequence:
  - Item 1:
  - Filter-by Category: "IMAGE\_PLANE"
  - Selector Attribute VR: "CS"
  - Selector CS Value: "AXIAL"
  - Filter-by Operator: "MEMBER\_OF"
- Sorting Operations Sequence:
  - Item 1:
  - Sort-by Category: "ALONG\_AXIS"
  - Sorting Direction: "INCREASING"
- Reformatting Operation Type: "MPR"
- Reformatting Thickness: 5
- Reformatting Interval: 5
- Reformatting Operation Initial View Direction: "CORONAL"
- Display Set Patient Orientation: "L\F"
- Show Graphic Annotation Flag: "NO"
- Display Set Presentation Group Description: "MR & CT combined"
- Item 12: [CT coronal]
- Display Set Number: 12
- Display Set Presentation Group: 3
- Image Set Number: 2
- Image Boxes Sequence:
  - Item 1: [upper left quadrant of 1024x1024]
  - Image Box Number: 1
  - Display Environment Spatial Position: (0/3072, 1024/2560), (512/3072, 512/2560)
  - Image Box Layout Type: "STACK"
- Filter Operations Sequence:
  - Item 1:
  - Filter-by Category: "IMAGE\_PLANE"
  - Selector Attribute VR: "CS"
  - Selector CS Value: "AXIAL"
  - Filter-by Operator: "MEMBER\_OF"
- Sorting Operations Sequence:
  - Item 1:
  - Sort-by Category: "ALONG\_AXIS"
  - Sorting Direction: "INCREASING"
- Reformatting Operation Type: "MPR"
- Reformatting Thickness: 5
- Reformatting Interval: 5
- Reformatting Operation Initial View Direction: "CORONAL"
- Display Set Patient Orientation: "L\F"
- VOI Type: BRAIN
- Show Graphic Annotation Flag: "NO"
- Item 13: [CT axial]
- Display Set Number: 13
- Display Set Presentation Group: 3
- Image Set Number: 2
- Image Boxes Sequence:
  - Item 1: [upper right quadrant of 1024x1024]
  - Image Box Number: 1

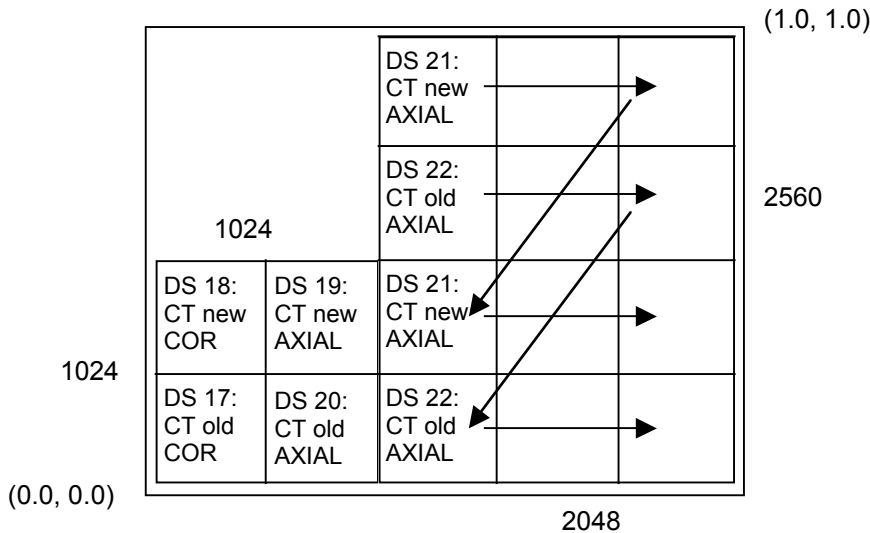


- Display Environment Spatial Position: (512/3072, 1024/2560), (1024/3072, 512/2560)
- Image Box Layout Type: "STACK"
- Filter Operations Sequence:
  - Item 1:
    - Filter-by Category: "IMAGE\_PLANE"
    - Selector Attribute VR: "CS"
    - Selector CS Value: "AXIAL"
    - Filter-by Operator: "MEMBER\_OF"
- Sorting Operations Sequence:
  - Item 1:
    - Sort-by Category: "ALONG\_AXIS"
    - Sorting Direction: "INCREASING"
- Display Set Patient Orientation: "L\^P"
- VOI Type: BRAIN
- Show Graphic Annotation Flag: "YES"
- Item 14: [MR axial]
- Display Set Number: 14
- Display Set Presentation Group: 3
- Image Set Number: 1
- Image Boxes Sequence:
  - Item 1: [lower right quadrant of 1024x1024]
  - Image Box Number: 1
  - Display Environment Spatial Position: (512/3072, 512/2560), (1024/3072, 0/2560)
  - Image Box Layout Type: "STACK"
- Filter Operations Sequence:
  - Item 1:
    - Filter-by Category: "IMAGE\_PLANE"
    - Selector Attribute VR: "CS"
    - Selector CS Value: "AXIAL"
    - Filter-by Operator: "MEMBER\_OF"
- Sorting Operations Sequence:
  - Item 1:
    - Sort-by Category: "ALONG\_AXIS"
    - Sorting Direction: "INCREASING"
- Display Set Patient Orientation: "L\^P"
- Show Graphic Annotation Flag: "NO"
- Item 15: [CT two part scrolled, rows 1 & 3]
- Display Set Number: 15
- Display Set Presentation Group: 3
- Image Set Number: 2
- Image Boxes Sequence:
  - Item 1: [row 1 (top row) of 2048x2560 space]
  - Image Box Number: 1
  - Display Environment Spatial Position: (1024/3072, 2048/2560), (3072/3072, 1536/2560)
  - Image Box Layout Type: "TILED"
  - Image Box Tile Horizontal Dimension: 3
  - Image Box Tile Vertical Dimension: 1
  - Image Box Scroll Direction: "HORIZONTAL"
  - Image Box Small Scroll Type: "IMAGE"
  - Image Box Small Scroll Amount: 1

- Image Box Large Scroll Type: "ROW\_COLUMN"
- Image Box Large Scroll Amount: 1
- Item 2: [row 3 of 2048x2560 space]
- Image Box Number: 2
- Display Environment Spatial Position: (1024/3072, 1024/2560), (3072/3072, 512/2560)
- Image Box Layout Type: "TILED"
- Image Box Tile Horizontal Dimension: 3
- Image Box Tile Vertical Dimension: 1
- Image Box Scroll Direction: "HORIZONTAL"
- Image Box Small Scroll Type: "IMAGE"
- Image Box Small Scroll Amount: 1
- Image Box Large Scroll Type: "ROW\_COLUMN"
- Image Box Large Scroll Amount: 1
- Filter Operations Sequence:
  - Item 1:
  - Filter-by Category: "IMAGE\_PLANE"
  - Selector Attribute VR: "CS"
  - Selector CS Value: "AXIAL"
  - Filter-by Operator: "MEMBER\_OF"
- Sorting Operations Sequence:
  - Item 1:
  - Sort-by Category: "ALONG\_AXIS"
  - Sorting Direction: "INCREASING"
- Display Set Patient Orientation: "L\^P"
- VOI Type: BRAIN
- Show Graphic Annotation Flag: "YES"
- Item 16: [MR two part scrolled, rows 2 & 4]
- Display Set Number: 16
- Display Set Presentation Group: 3
- Image Set Number: 1
- Image Boxes Sequence:
  - Item 1: [row 2 of 2048x2560 space]
  - Image Box Number: 1
  - Display Environment Spatial Position: (1024/3072, 1536/2560), (3072/3072, 1024/2560)
  - Image Box Layout Type: "TILED"
  - Image Box Tile Horizontal Dimension: 3
  - Image Box Tile Vertical Dimension: 1
  - Image Box Scroll Direction: "HORIZONTAL"
  - Image Box Small Scroll Type: "IMAGE"
  - Image Box Small Scroll Amount: 1
  - Image Box Large Scroll Type: "ROW\_COLUMN"
  - Image Box Large Scroll Amount: 1
  - Item 2: [row 4 (bottom row) of 2048x2560 space]
  - Image Box Number: 2
  - Display Environment Spatial Position: (1024/3072, 512/2560), (3072/3072, 0/2560)
  - Image Box Layout Type: "TILED"
  - Image Box Tile Horizontal Dimension: 3
  - Image Box Tile Vertical Dimension: 1
  - Image Box Scroll Direction: "HORIZONTAL"

- Image Box Small Scroll Type: "IMAGE"
- Image Box Small Scroll Amount: 1
- Image Box Large Scroll Type: "ROW\_COLUMN"
- Image Box Large Scroll Amount: 1
- Filter Operations Sequence:
  - Item 1:
  - Filter-by Category: "IMAGE\_PLANE"
  - Selector Attribute VR: "CS"
  - Selector CS Value: "AXIAL"
  - Filter-by Operator: "MEMBER\_OF"
- Sorting Operations Sequence:
  - Item 1:
  - Sort-by Category: "ALONG\_AXIS"
  - Sorting Direction: "INCREASING"
- Display Set Patient Orientation: "LVP"
- Show Graphic Annotation Flag: "NO"

18 [Group #4 is combined CT new & CT old]



- Item 17: [CT old coronal]
- Display Set Number: 17
- Display Set Presentation Group: 4
- Image Set Number: 3
- Image Boxes Sequence:
  - Item 1: [lower left quadrant of 1024x1024]
  - Image Box Number: 1
  - Display Environment Spatial Position: (0/3072, 512/2560), (512/3072,0/2560)
  - Image Box Layout Type: "STACK"
- Filter Operations Sequence:
  - Item 1:
  - Filter-by Category: "IMAGE\_PLANE"
  - Selector Attribute VR: "CS"
  - Selector CS Value: "AXIAL"
  - Filter-by Operator: "MEMBER\_OF"
- Sorting Operations Sequence:
  - Item 1:

- Sort-by Category: "ALONG\_AXIS"
- Sorting Direction: "INCREASING"
- Reformatting Operation Type: "MPR"
- Reformatting Thickness: 5
- Reformatting Interval: 5
- Reformatting Operation Initial View Direction: "CORONAL"
- Display Set Patient Orientation: "L\F"
- VOI Type: BRAIN
- Display Set Presentation Group Description: "CT old & CT new combined"
- Item 18: [CT new coronal]
- Display Set Number: 18
- Display Set Presentation Group: 4
- Image Set Number: 2
- Image Boxes Sequence:
  - Item 1: [upper left quadrant of 1024x1024]
  - Image Box Number: 1
  - Display Environment Spatial Position: (0/3072, 1024/2560), (512/3072, 512/2560)
  - Image Box Layout Type: "STACK"
- Filter Operations Sequence:
  - Item 1:
    - Filter-by Category: "IMAGE\_PLANE"
    - Selector Attribute VR: "CS"
    - Selector CS Value: "AXIAL"
    - Filter-by Operator: "MEMBER\_OF"
- Sorting Operations Sequence:
  - Item 1:
    - Sort-by Category: "ALONG\_AXIS"
    - Sorting Direction: "INCREASING"
- Reformatting Operation Type: "MPR"
- Reformatting Thickness: 5
- Reformatting Interval: 5
- Reformatting Operation Initial View Direction: "CORONAL"
- Display Set Patient Orientation: "L\F"
- VOI Type: BRAIN
- Item 19: [CT new axial]
- Display Set Number: 19
- Display Set Presentation Group: 4
- Image Set Number: 2
- Image Boxes Sequence:
  - Item 1: [upper right quadrant of 1024x1024]
  - Image Box Number: 1
  - Display Environment Spatial Position: (512/3072, 1024/2560), (1024/3072, 512/2560)
  - Image Box Layout Type: "STACK"
- Filter Operations Sequence:
  - Item 1:
    - Filter-by Category: "IMAGE\_PLANE"
    - Selector Attribute VR: "CS"
    - Selector CS Value: "AXIAL"
    - Filter-by Operator: "MEMBER\_OF"
- Sorting Operations Sequence:
  - Item 1:
    - Sort-by Category: "ALONG\_AXIS"

- Sorting Direction: "INCREASING"
- 2 ➤ Display Set Patient Orientation: "L\^P"
- VOI Type: BRAIN
- 4 ➤ Show Graphic Annotation Flag: "YES"
- Item 20: [CT old axial]
- 6 ➤ Display Set Number: 20
- Display Set Presentation Group: 4
- 8 ➤ Image Set Number: 3
- Image Boxes Sequence:
  - 10 ○ Item 1: [lower right quadrant of 1024x1024]
  - Image Box Number: 1
  - 12 ○ Display Environment Spatial Position: (512/3072, 512/2560), (1024/3072, 0/2560)
  - Image Box Layout Type: "STACK"
- 14 ➤ Filter Operations Sequence:
  - Item 1:
    - 16 ○ Filter-by Category: "IMAGE\_PLANE"
    - Selector Attribute VR: "CS"
    - 18 ○ Selector CS Value: "AXIAL"
    - Filter-by Operator: "MEMBER\_OF"
- 20 ➤ Sorting Operations Sequence:
  - Item 1:
    - 22 ○ Sort-by Category: "ALONG\_AXIS"
    - Sorting Direction: "INCREASING"
- 24 ➤ Display Set Patient Orientation: "L\^P"
- VOI Type: BRAIN
- 26 ➤ Show Graphic Annotation Flag: "YES"
  
- 28 ➤ Item 21: [CT new two part scrolled, rows 1 & 3]
- Display Set Number: 21
- 30 ➤ Display Set Presentation Group: 4
- Image Set Number: 2
- 32 ➤ Image Boxes Sequence:
  - Item 1: [row 1 (top row) of 2048x2560 space]
  - 34 ○ Image Box Number: 1
  - Display Environment Spatial Position: (1024/3072, 2048/2560), (3072/3072, 1536/2560)
  - 36 ○ Image Box Layout Type: "TILED"
  - 38 ○ Image Box Tile Horizontal Dimension: 3
  - Image Box Tile Vertical Dimension: 1
  - 40 ○ Image Box Scroll Direction: "HORIZONTAL"
  - Image Box Small Scroll Type: "IMAGE"
  - 42 ○ Image Box Small Scroll Amount: 1
  - Image Box Large Scroll Type: "ROW\_COLUMN"
  - 44 ○ Image Box Large Scroll Amount: 1
  - Item 2: [row 3 of 2048x2560 space]
  - 46 ○ Image Box Number: 2
  - Display Environment Spatial Position: (1024/3072, 1024/2560), (3072/3072, 512/2560)
  - 48 ○ Image Box Layout Type: "TILED"
  - 50 ○ Image Box Tile Horizontal Dimension: 3
  - Image Box Tile Vertical Dimension: 1
  - 52 ○ Image Box Scroll Direction: "HORIZONTAL"
  - Image Box Small Scroll Type: "IMAGE"

- Image Box Small Scroll Amount: 1
- 2 ○ Image Box Large Scroll Type: "ROW\_COLUMN"
- Image Box Large Scroll Amount: 1
- 4 ➤ Filter Operations Sequence:
  - Item 1:
  - 6 ○ Filter-by Category: "IMAGE\_PLANE"
  - Selector Attribute VR: "CS"
  - 8 ○ Selector CS Value: "AXIAL"
  - Filter-by Operator: "MEMBER\_OF"
- 10 ➤ Sorting Operations Sequence:
  - Item 1:
  - 12 ○ Sort-by Category: "ALONG\_AXIS"
  - Sorting Direction: "INCREASING"
- 14 ➤ Display Set Patient Orientation: "L\^P"
- VOI Type: BRAIN
- 16 ➤ Show Graphic Annotation Flag: "YES"
  
- 18 ➤ Item 22: [CT old two part scrolled, rows 2 & 4]
- Display Set Number: 22
- 20 ➤ Display Set Presentation Group: 4
- Image Set Number: 3
- 22 ➤ Image Boxes Sequence:
  - Item 1: [row 2 of 2048x2560 space]
  - 24 ○ Image Box Number: 1
  - Display Environment Spatial Position: (1024/3072, 1536/2560), (3072/3072, 1024/2560)
  - 26 ○ Image Box Layout Type: "TILED"
  - 28 ○ Image Box Tile Horizontal Dimension: 3
  - Image Box Tile Vertical Dimension: 1
  - 30 ○ Image Box Scroll Direction: "HORIZONTAL"
  - Image Box Small Scroll Type: "IMAGE"
  - 32 ○ Image Box Small Scroll Amount: 1
  - Image Box Large Scroll Type: "ROW\_COLUMN"
  - 34 ○ Image Box Large Scroll Amount: 1
  - Item 2: [row 4 (bottom row) of 2048x2560 space]
  - 36 ○ Image Box Number: 2
  - Display Environment Spatial Position: (1024/3072, 512/2560), (3072/3072, 0/2560)
  - 38 ○ Image Box Layout Type: "TILED"
  - 40 ○ Image Box Tile Horizontal Dimension: 3
  - Image Box Tile Vertical Dimension: 1
  - 42 ○ Image Box Scroll Direction: "HORIZONTAL"
  - Image Box Small Scroll Type: "IMAGE"
  - 44 ○ Image Box Small Scroll Amount: 1
  - Image Box Large Scroll Type: "ROW\_COLUMN"
  - 46 ○ Image Box Large Scroll Amount: 1
- Filter Operations Sequence:
  - 48 ○ Item 1:
  - Filter-by Category: "IMAGE\_PLANE"
  - 50 ○ Selector Attribute VR: "CS"
  - Selector CS Value: "AXIAL"
  - 52 ○ Filter-by Operator: "MEMBER\_OF"
- Sorting Operations Sequence:

- Item 1:
- Sort-by Category: "ALONG\_AXIS"
- Sorting Direction: "INCREASING"
- Display Set Patient Orientation: "L\^P"
- VOI Type: BRAIN
- Show Graphic Annotation Flag: "YES"

8 Partial Data Display Handling: "MAINTAIN\_LAYOUT"

[Link up (synchronize) the MR and CT tiled scroll panes in Display Sets 15 and 16, and the CT new and CT old tiled scroll panes in Display Sets 21 and 22]

10 Synchronized Scrolling Sequence:

- Item 1:
- Display Set Scrolling Group: 15\16
- Item 2:
- Display Set Scrolling Group: 21\22

16 **X.5 HANGING PROTOCOL QUERY EXAMPLE**

18 The following is an example of a general C-FIND Request for the Hanging Protocol Information Model – FIND SOP Class that is searching for all Chest related Hanging Protocols for the purpose of reading projection Chest X-ray. The user is at a workstation that has two 2Kx2.5K screens.

22 C-FIND Request:

Nesting	Attribute	Tag	VR	VL (hex)	Value
	Affected SOP Class UID	(0000,0002)	UI	0018	1.2.840.10008.5.1.4.38.2
	Command Field	(0000,0100)	US	0002	0020H [C-FIND-RQ]
	Message ID	(0000,0110)	US	0002	0010H
	Priority	(0000,0700)	US	0002	0000H [MEDIUM]
	Data Set Type	(0000,0800)	US	0002	0102H
	SOP Class UID	(0008,0016)	UI	0000	
	SOP Instance UID	(0008,0018)	UI	0000	
	Hanging Protocol Name	(0072,0002)	SH	0000	
	Hanging Protocol Description	(0072,0004)	LO	0000	
	Hanging Protocol Level	(0072,0006)	CS	0000	
	Hanging Protocol Creator	(0072,0008)	LO	0000	
	Hanging Protocol Creation Datetime	(0072,000A)	DT	0000	
	Hanging Protocol Definition Sequence	(0072,000C)	SQ	ffffff	
%item					
>	Modality	(0008,0060)	CS	0000	
>	Anatomic Region Sequence	(0008,2218)	SQ	ffffff	
%item					
>>	Code Value	(0008,0100)	SH	0008	T-D3000
>>	Coding Scheme Designator	(0008,0102)	SH	0004	SNM3
>>	Code Meaning	(0008,0104)	LO	0006	Chest
%enditem					
%endseq					

>	Procedure Code Sequence	(0008,1032)	SQ	0000	
>	Laterality	(0020,0060)	CS	0000	
>	Reason for Requested Procedure Code Sequence	(0040,100A)	SQ	0000	
%enditem					
%endseq					
	Hanging Protocol User Identification Code Sequence	(0072,000E)	SQ	0000	
	Number of Priors Referenced	(0072,0014)	US	0000	
	Number of Screens	(0072,0100)	US	0000	
	Nominal Screen Definition Sequence	(0072,0102)	SQ	0000	

- 2 The following is an example of a set of C-FIND Responses for the Hanging Protocol Information Model – FIND SOP Class, answering the C-FIND Request listed above. There are a few  
4 matches for this general query. The application needs to select the best choice among the matches, which is the second response. The first response is for Chest CT, and the third  
6 response does not match the user’s workstation environment as well as does the second.

C-FIND Response #1:

Nesting	Attribute	Tag	VR	VL (hex)	Value
	Affected SOP Class UID	(0000,0002)	UI	0018	1.2.840.10008.5.1.4.38.2
	Command Field	(0000,0100)	US	0002	8020H [C-FIND-RSP]
	Message ID Being Responded To	(0000,0120)	US	0002	0010H
	Data Set Type	(0000,0800)	US	0002	0102H
	Status	(0000,0900)	US	0002	FF00H [Pending]
	SOP Class UID	(0008,0016)	UI	0018	1.2.840.10008.5.1.4.38.1
	SOP Instance UID	(0008,0018)	UI	0024	1.2.840.10008.5.1.4.1.1.76392.999.2
	Hanging Protocol Name	(0072,0002)	SH	000a	CT 1 prior
	Hanging Protocol Description	(0072,0004)	LO	0038	Dual screen layout for current and single prior chest CT
	Hanging Protocol Level	(0072,0006)	CS	000c	SINGLE_USER
	Hanging Protocol Creator	(0072,0008)	LO	0008	Dr. Chan
	Hanging Protocol Creation Datetime	(0072,000A)	DT	000c	200408210718
	Hanging Protocol Definition Sequence	(0072,000C)	SQ	ffffff	
%item					
>	Modality	(0008,0060)	CS	0002	CT
>	Anatomic Region Sequence	(0008,2218)	SQ	ffffff	
%item					
>>	Code Value	(0008,0100)	SH	0008	T-D3000
>>	Coding Scheme Designator	(0008,0102)	SH	0004	SNM3
>>	Code Meaning	(0008,0104)	LO	0006	Chest
%enditem					



Nesting	Attribute	Tag	VR	VL (hex)	Value
%endseq					
>	Procedure Code Sequence	(0008,1032)	SQ	0000	
>	Laterality	(0020,0060)	CS	0000	
>	Reason for Requested Procedure Code Sequence	(0040,100A)	SQ	0000	
%enditem					
%endseq					
	Hanging Protocol User Identification Code Sequence	(0072,000E)	SQ	0000	
%item					
>	Code Value	(0008,0100)	SH	000a	58489749P
>	Coding Scheme Designator	(0008,0102)	SH	0008	HOSP_ID
>	Code Meaning	(0008,0104)	LO	000e	Susan H. Chan
%enditem					
%endseq					
	Number of Priors Referenced	(0072,0014)	US	0002	1
	Number of Screens	(0072,0100)	US	0002	2
	Nominal Screen Definition Sequence	(0072,0102)	SQ	0000	

2 C-FIND Response #2:

Nesting	Attribute	Tag	VR	VL (hex)	Value
	Affected SOP Class UID	(0000,0002)	UI	0018	1.2.840.10008.5.1.4.38.2
	Command Field	(0000,0100)	US	0002	8020H [C-FIND-RSP]
	Message ID Being Responded To	(0000,0120)	US	0002	0010H
	Data Set Type	(0000,0800)	US	0002	0102H
	Status	(0000,0900)	US	0002	FF00H [Pending]
	SOP Class UID	(0008,0016)	UI	0018	1.2.840.10008.5.1.4.38.1
	SOP Instance UID	(0008,0018)	UI	0020	1.2.840.123456.20030822.223344.1
	Hanging Protocol Name	(0072,0002)	SH	000c	Chest X-ray
	Hanging Protocol Description	(0072,0004)	LO	0026	Current and Prior Chest PA and Lateral
	Hanging Protocol Level	(0072,0006)	CS	0004	SITE
	Hanging Protocol Creator	(0072,0008)	LO	0012	Senior Radiologist
	Hanging Protocol Creation Datetime	(0072,000A)	DT	000e	20020823133455
	Hanging Protocol Definition Sequence	(0072,000C)	SQ	ffffff	
%item					
>	Modality	(0008,0060)	CS	0000	
>	Anatomic Region Sequence	(0008,2218)	SQ	ffffff	
%item					
>>	Code Value	(0008,0100)	SH	0008	T-D3000

Nesting	Attribute	Tag	VR	VL (hex)	Value
>>	Coding Scheme Designator	(0008,0102)	SH	0004	SNM3
>>	Code Meaning	(0008,0104)	LO	0006	Chest
%enditem					
%endseq					
>	Procedure Code Sequence	(0008,1032)	SQ	0000	
>	Laterality	(0020,0060)	CS	0000	
>	Reason for Requested Procedure Code Sequence	(0040,100A)	SQ	0000	
%enditem					
%endseq					
	Hanging Protocol User Identification Code Sequence	(0072,000E)	SQ	0000	
	Number of Priors Referenced	(0072,0014)	US	0002	1
	Number of Screens	(0072,0100)	US	0002	0002H
	Nominal Screen Definition Sequence	(0072,0102)	SQ	ffffff	
%item					
>	Number of Vertical Pixels	(0072,0104)	US	0002	2560
>	Number of Horizontal Pixels	(0072,0106)	US	0002	2048
>	Display Environment Spatial Position	(0072,0108)	FD	0020	0.0\1.0\0.5\0.0
>	Screen Minimum Grayscale Bit Depth	(0072,010A)	US	0002	0008H
>	Application Maximum Repaint Time	(0072,010E)	US	0002	0064H
%enditem					
%item					
>	Number of Vertical Pixels	(0072,0104)	US	0002	2560
>	Number of Horizontal Pixels	(0072,0106)	US	0002	2048
>	Display Environment Spatial Position	(0072,0108)	FD	0020	0.5\1.0\1.0\0.0
>	Screen Minimum Grayscale Bit Depth	(0072,010A)	US	0002	0008H
>	Application Maximum Repaint Time	(0072,010E)	US	0004	0064H
%enditem					
%endseq					

2 C-FIND Response #3:

Nesting	Attribute	Tag	VR	VL (hex)	Value
	Affected SOP Class UID	(0000,0002)	UI	0018	1.2.840.10008.5.1.4.38.2
	Command Field	(0000,0100)	US	0002	8020H [C-FIND-RSP]
	Message ID Being Responded To	(0000,0120)	US	0002	0010H
	Data Set Type	(0000,0800)	US	0002	0102H
	Status	(0000,0900)	US	0002	FF00H [Pending]
	SOP Class UID	(0008,0016)	UI	0018	1.2.840.10008.5.1.4.38.1
	SOP Instance UID	(0008,0018)	UI	002a	1.2.840.113986.2.664566.21121125.85669.967

Nesting	Attribute	Tag	VR	VL (hex)	Value
	Hanging Protocol Name	(0072,0002)	SH	0010	Chest X-ray_LGon
	Hanging Protocol Description	(0072,0004)	LO	003e	Prior and Current Lateral of Chest X-ray for two screen system
	Hanging Protocol Level	(0072,0006)	CS	000c	SINGLE_USER
	Hanging Protocol Creator	(0072,0008)	LO	0012	Dr. Leia Gonzales
	Hanging Protocol Creation Datetime	(0072,000A)	DT	000e	20030822101100
	Hanging Protocol Definition Sequence	(0072,000C)	SQ	ffffff	
%item					
>	Modality	(0008,0060)	CS	0002	DX
>	Anatomic Region Sequence	(0008,2218)	SQ	ffffff	
%item					
>>	Code Value	(0008,0100)	SH	0008	T-D3000
>>	Coding Scheme Designator	(0008,0102)	SH	0004	SNM3
>>	Code Meaning	(0008,0104)	LO	0006	Chest
%enditem					
%endseq					
>	Procedure Code Sequence	(0008,1032)	SQ	0000	
>	Laterality	(0020,0060)	CS	0000	
>	Reason for Requested Procedure Code Sequence	(0040,100A)	SQ	0000	
%enditem					
%endseq					
	Hanging Protocol User Identification Code Sequence	(0072,000E)	SQ	0000	
%item					
>	Code Value	(0008,0100)	SH	0004	Lgon
>	Coding Scheme Designator	(0008,0102)	SH	0008	99Local
>	Coding Scheme Version	(0008,0103)	SH	0004	v40a
>	Code Meaning	(0008,0104)	LO	000c	log-in name
%enditem					
%endseq					
	Number of Priors Referenced	(0072,0014)	US	0002	1
	Number of Screens	(0072,0100)	US	0002	0002H
	Nominal Screen Definition Sequence	(0072,0102)	SQ	ffffff	
%item					
>	Number of Vertical Pixels	(0072,0104)	US	0002	1280
>	Number of Horizontal Pixels	(0072,0106)	US	0002	1024
>	Display Environment Spatial Position	(0072,0108)	FD	0020	0.0\1.0\0.5\0.0
>	Screen Minimum Grayscale Bit Depth	(0072,010A)	US	0002	0008H
>	Application Maximum Repaint Time	(0072,010E)	US	0004	0064H
%enditem					
%item					
>	Number of Vertical Pixels	(0072,0104)	US	0002	1280
>	Number of Horizontal Pixels	(0072,0106)	US	0002	1024



### Part 3 Addendum

2 *Item #2: Add to Part 3 the following under Section 7.X:*

#### 4 **7.X EXTENSION OF THE DICOM MODEL OF THE REAL-WORLD FOR HANGING PROTOCOLS**

6 The DICOM Model of the Real World is extended for Hanging Protocols with the addition of an  
entity that is separate from the rest of the DICOM Real World objects, as shown in Figure 7.X-1.  
8 A Hanging Protocol is not associated with any specific objects in the existing DICOM Information  
model, because it is not associated with a specific patient. There is no hierarchy applied to  
10 Hanging Protocol objects.



Hanging  
Protocol

12 **Figure 7.X-1 DICOM MODEL OF THE REAL WORLD – HANGING PROTOCOL**

##### 7.X.1 Hanging Protocol Information Entity

14 A Hanging Protocol entity specifies the viewing preferences of a specific user or group, for a  
specific type of study (Modality, Anatomy, Laterality combination, and optionally Procedure,  
16 and/or Reason). A Hanging Protocol definition includes descriptors that identify the Hanging  
Protocol, the creator, the type of study it addresses, the type of image sets to display, the  
18 intended display environment, and the intended layout for the screen(s).

*Item #3: Insert the following sections in Part 3, Annex A Composite IODs*

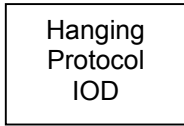
#### 20 **A.X HANGING PROTOCOL INFORMATION OBJECT DEFINITION**

##### A.X.1 Hanging Protocol IOD Description

22 A Hanging Protocol entity specifies the viewing preferences of a specific user or group, for a  
specific type of study (Modality, Anatomy, Laterality combination, and optionally Procedure,  
24 and/or Reason), that may be exchanged between connecting devices that claim conformance to  
the DICOM Standard. The Hanging Protocol contains information about the Hanging Protocol,  
26 the creator, the type of study it addresses, the type of image sets to display, the intended display  
environment, and the intended layout for the screen(s).

##### 28 **A.X.2 Hanging Protocol IOD Entity-Relationship Model**

30 A Hanging Protocol is not related to other Information Entities of the DICOM real-world model, as  
it is not associated with a specific patient. The E-R model for the Hanging Protocol IOD is shown  
in Figure A.X.2-1.



2

**Figure A.X.2-1 HANGING PROTOCOL IOD E-R MODEL**

**A.X.3 Hanging Protocol IOD Module Table**

4

Table A.X.3-1 lists the modules that make up the Hanging Protocol IOD.

6

**Table A.X.3-1  
HANGING PROTOCOL IOD MODULES**

IE	Module	Reference	Usage
Hanging Protocol	SOP Common	C.12.1	M
	Hanging Protocol Definition	C.X.1	M
	Hanging Protocol Environment	C.X.2	M
	Hanging Protocol Display	C.X.3	M

8

*Item #4: Insert the following sections in Part 3, Annex C Information Module Definitions*

10

**C.X.1 Hanging Protocol Definition Module**

12

Table C.X.1-1 specifies the Attributes that describe and identify the high level definition of a Hanging Protocol, including its overall purpose, and the types of image sets to which it applies. See the Hanging Protocols informative annex (PS 3.17) for further explanation.

14

**Table C.X.1-1  
Hanging Protocol Definition Module Attributes**

Attribute Name	Tag	Type	Attribute Description
Hanging Protocol Name	(0072,0002)	1	Short descriptor that identifies the Hanging Protocol.
Hanging Protocol Description	(0072,0004)	1	Explanation of the objective or intent of the Hanging Protocol.
Hanging Protocol Level	(0072,0006)	1	Identifies the level at which this Hanging Protocol is defined, and the intended use.  Enumerated values: MANUFACTURER SITE USER_GROUP SINGLE_USER
Hanging Protocol Creator	(0072,0008)	1	Identifies the creator of the Hanging Protocol.

Attribute Name	Tag	Type	Attribute Description
Hanging Protocol Creation Datetime	(0072,000A)	1	Date and time on which the Hanging Protocol was created.
Hanging Protocol Definition Sequence	(0072,000C)	1	Sequence that defines the type of imaging studies to which this Hanging Protocol applies. One or more sequence items shall be present. See C.X.1.1.1.
>Modality	(0008,0060)	1C	Type of equipment that originally acquired the data used to create images or related objects to which this Hanging Protocol applies. See C.7.3.1.1.1 for Defined Terms.  Required if Anatomic Region Sequence (0008,2218) is not present. May be present otherwise.
>Anatomic Region Sequence	(0008,2218)	1C	Sequence that identifies the anatomic region of interest to which this Hanging Protocol applies. One or more sequence items may be present.  Required if Modality (0008,0060) is not present. May be present otherwise.
>>Include Code Sequence Macro Table 8.8-1			<i>Defined Context ID 4</i>
>Laterality	(0020,0060)	2C	Laterality of the body part to which this Hanging Protocol applies.  Enumerated Values: R – Right L – Left B – Both U – Unpaired  Zero length means not applicable.  Required if Anatomic Region Sequence (0008,2218) is present.
> Procedure Code Sequence	(0008,1032)	2	Sequence that identifies a procedure to which this Hanging Protocol applies. One or more sequence items may be present.
>>Include Code Sequence Macro Table 8.8-1			<i>No Baseline Context ID is defined</i>
>Reason for Requested Procedure Code Sequence	(0040,100A)	2	Sequence that identifies a reason for procedure to which this Hanging Protocol applies. One or more sequence items may be present.
>>Include Code Sequence Macro Table 8.8-1			<i>No Baseline Context ID is defined</i>
Number of Priors Referenced	(0072,0014)	1	Identifies the number of prior image sets used in this Hanging Protocol.
Image Sets Sequence	(0072,0020)	1	Sequence describing one or more types of Image Sets to which the Hanging Protocol applies. One or more sequence items shall be present. See C.X.1.1.2.
>Image Set Selector	(0072,0022)	1	Sequence containing Image Set selection

Attribute Name	Tag	Type	Attribute Description
Sequence			attributes and values that are used to identify one type of image or object set for the Hanging Protocol. One or more sequence items shall be present. See C.X.1.1.3.
>>Image Set Selector Usage Flag	(0072,0024)	1	Indicates the behavior of matching against an image object when the Selector Attribute (0072,0026) is not available in the image object. Enumerated Values: MATCH – if the attribute is not in the image object, consider the image to be a match anyway. NO_MATCH – if the attribute is not in the image object, then do not consider the image to be a match.
>>Selector Attribute	(0072,0026)	1	Data Element Tag of an Attribute from an Image or other IOD to use for Image Set selection.
>>Selector Attribute VR	(0072,0050)	1	The Value Representation of the Selector Attribute (0072,0026). See PS 3.5 for Enumerated Values of Value Representation.
<i>&gt;&gt;Include Hanging Protocol Selector Attribute Context Macro Table C.X.4-1</i>			
<i>&gt;&gt;Include Hanging Protocol Selector Attribute Value Macro Table C.X.4-2</i>			
>>Selector Value Number	(0072,0028)	1	Positive integer identifying which value of a multi-valued attribute identified by Selector Attribute (0072,0026) is to be used for Image Set selection. The value 1 identifies the first value. The value zero identifies any value.
>Time Based Image Sets Sequence	(0072,0030)	1	Sequence containing time based Image Set selection categories and values that are used to identify one type of image set for the Hanging Protocol per sequence item. One or more sequence items shall be present. The Image Set Selector Sequence (0072,0022) shall be applied to each sequence item to define an image set. See C.X.1.1.2.
>>Image Set Number	(0072,0032)	1	A monotonically increasing integer, starting from 1, incrementing by one, unique within the Hanging Protocol Instance. Note: Each item of the Display Sets Sequence (0072,0200) references one Image Set Number (0072,0032).
>>Image Set Selector Category	(0072,0034)	1	Category of the Time Based Image Set selector. Enumerated Values: RELATIVE_TIME ABSTRACT_PRIOR
>>Relative Time	(0072,0038)	1C	Exactly two numeric values, indicating the start and end values of a prior range of instance acquisition times relative to the date and time of



Attribute Name	Tag	Type	Attribute Description
			<p>a current image set. The units shall be specified in Relative Time Units (0072,003A).</p> <p>The value pair 0\0 shall indicate a current image set. The value pair n\n shall indicate "prior from the instance acquisition time of a current image set by n units".</p> <p>Required if the value of Image Set Selector Category (0072,0034) is RELATIVE_TIME.</p> <p>Note: 1. A value pair "1\7" with Relative Time Units (0072,003A) of DAYS would indicate the range "prior by 1 to 7 days before a current image set".</p> <p>2. The VR of this attribute is unsigned, hence future time cannot be represented.</p>
>>Relative Time Units	(0072,003A)	1C	<p>Units of time for Relative Time (0072,0038).</p> <p>Enumerated Values: SECONDS, MINUTES, HOURS, DAYS, WEEKS, MONTHS, YEARS.</p> <p>Required if Relative Time (0072,0038) is present.</p>
>>Abstract Prior Value	(0072,003C)	1C	<p>Identifies a prior image set in abstract terms.</p> <p>Exactly two integer values, indicating the range of prior studies to include. Each value shall be greater than zero, where 1 indicates the most recent prior and higher values indicate successively older priors. The special value -1 shall indicate the oldest prior.</p> <p>Notes: 1. The value pair n\n indicates the nth prior.</p> <p>2. The value pair -1\1 indicates the oldest prior.</p> <p>3. The value pair m\n indicates the mth through nth priors, where m is the more recent prior.</p> <p>4. The value pair 1\1 indicates all priors.</p> <p>5. The value pair m\1 indicates the mth prior and all priors older than m.</p> <p>Required if Image Set Selector Category (0072,0034) is ABSTRACT_PRIOR and Abstract Prior Code Sequence (0072,003E) is not present.</p>
>>Abstract Prior Code Sequence	(0072,003E)	1C	<p>Identifies a prior image set using coded terminology. Only one sequence item shall be present.</p> <p>Required if Image Set Selector Category (0072,0034) is ABSTRACT_PRIOR and Abstract Prior Value (0072,003C) is not present.</p>
>>>Include Code Sequence Macro Table 8.8-1			Defined Context ID 31
>>Image Set Label	(0072,0040)	3	Description of the objective of the image set defined by this sequence item.

Attribute Name	Tag	Type	Attribute Description
Hanging Protocol User Identification Code Sequence	(0072,000E)	2	Sequence that provides a coded identifier for the person, group, or site for which this Hanging Protocol was defined. Only one sequence item may be present.  Note: If a standardized naming schema becomes available, it should be used. Meanwhile, local coding schemes such as employee numbers and department numbers are likely to be used.
>Include Code Sequence Macro Table 8.8-1			No baseline context ID is defined.
Hanging Protocol User Group Name	(0072,0010)	3	Group or site for which this Hanging Protocol was defined.
Source Hanging Protocol Sequence	(0072,0012)	3	Sequence that identifies the Hanging Protocol from which this Hanging Protocol was derived, or on which it is based. One sequence item may be present.
>Referenced SOP Class UID	(0008,1150)	1	Uniquely identifies the SOP Class UID.
>Referenced SOP Instance UID	(0008,1155)	1	Uniquely identifies the SOP Instance UID.

## 2 C.X.1.1 Attribute Descriptions

### C.X.1.1.1 Hanging Protocol Definition Sequence Attributes

4 The Hanging Protocol Definition Sequence (0072,000C) provides a collection of one or more  
6 sequence items that defines the intent for the Hanging Protocol with respect to modality,  
anatomy, laterality, procedure and/or reason.

8 This allows for some degree of flexibility in defining the intent for the Hanging Protocol, while  
providing a precise structure for query matching using the existing rules for Sequence Matching,  
as defined in PS 3.4.

- 10 Notes:1. The Hanging Protocol Definition Sequence (0072,000C) does not imply anything about the  
related image sets. These are defined in the Image Sets Sequence (0072,0020).
- 12 2. When creating a Hanging Protocol Instance, the values that are used for Procedure Code  
14 Sequence (0008,1032) or Reason for Requested Procedure Code Sequence (0040,100A) may  
come from a variety of sources, but are expected to be consistent throughout the domain in  
16 which a Hanging Protocol Instance will be exchanged. The following are recommended as  
potential sources of values.
- Procedure Code Sequence (0008,1032):
- 18 • SNOMED codes
  - ICD-10-PCS Procedure Codes
  - 20 • Local Codes
- Reason for Requested Procedure Code Sequence (0040,100A):
- 22 • SNOMED codes
  - ICD-9-CM
  - 24 • ICD-10-CM
  - Local Codes

26

### C.X.1.1.2 Image Sets Sequence

2 The Image Sets Sequence (0072,0020) within a Hanging Protocol Instance serves to identify the  
4 type of image or other object sets to which the Hanging Protocol is intended to apply. Multiple  
6 types of image sets may be identified for a Hanging Protocol, to combine, for example, multiple  
imaging studies for a specific anatomy, or multiple imaging studies performed over a period of  
time, to monitor the progress of a condition. All image sets shall be for the same patient.

8 The images to be included in an Image Set may be specified directly by matching attribute values  
within the images, or indirectly through Key Object Selection Documents or Presentation States  
by matching their attribute values.

10 Key Object Selection Documents shall be matched by their SOP Class UID. The available Key  
Object Selection Documents may be further matched on the values of their other attributes (e.g.,  
12 Concept Name Code Sequence, Coding Scheme Designator = "DCM" and Code Value =  
"113003", which has a code meaning of "For Surgery"). When the Hanging Protocol Instance is  
14 applied, the image object instances referenced by the matching Key Object Selection Document  
instances comprise the image set.

16 Presentation States shall be matched by their SOP Class UID. The available Presentation States  
may be further matched on the values of their other attributes (e.g., Content Label). When the  
18 Hanging Protocol Instance is applied, the image object instances referenced by the matching  
Presentation State instances comprise the image set.

20 Note: Image Sets Sequence (0072,0020) allows other objects such as waveforms and SR documents to  
be identified. However, Hanging Protocol Display module operations such as filtering,  
22 reformatting, and sorting are defined only for image objects. The only expectation for non-  
image objects is to associate the objects with a position on a screen.

24 Each sequence item in the Image Sets Sequence (0072,0020) shall follow these rules:

- 26 • Each sequence item in the Time Based Image Sets Sequence (0072,0030) shall identify  
one image set, based on time criteria.
- 28 • The Items of the Image Set Selector Sequence (0072,0022) shall collectively identify one  
type of image set.
- 30 • One instance of time based criteria combined with the Items of the Image Set Selector  
Sequence (0072,0022) shall identify one image set.
- 32 • The number of image sets identified by a sequence item of the Image Sets Sequence  
(0072,0020) shall equal the number of items in the Time Based Image Sets Sequence  
(0072,0030).
- 34 • The value of the Image Set Number (0072,0032) in each Time Based Image Sets  
Sequence (0072,0030) sequence item shall be unique across all sequence items of the  
36 Image Sets Sequence (0072,0020).

38 Notes: 1. The identification of a current image set is established by the application prior to selection of a  
Hanging Protocol Instance. The current image set is not necessarily from a single study.  
40 2. In mammography screening, for example, the Hanging Protocol defines the current image set  
plus the screening image set for the patient from the year prior. There would be one sequence  
42 item in the Image Sets Sequence (0072,0020). Within this sequence item, the Items of the  
Image Set Selector Sequence (0072,0022) would identify a mammography screening image set  
44 type. The Time Based Image Sets Sequence (0072,0030) would have two sequence items, one  
to identify the current, and one to identify the prior.

### **C.X.1.1.3 Image Set Selector Sequence Attributes**

2 The Image Set Selector Sequence (0072,0022) contains sequence items that specify the DICOM attribute tags and values that shall be used to identify the image or other object set.

4 The Image Set Selector Usage Flag (0072,0024) indicates whether the attribute identified by the Selector Attribute (0072,0026) causes matching to succeed or fail if the attribute is not available in  
6 an image object.

8 Within a sequence item, the Selector Attribute (0072,0026) identifies a DICOM attribute tag that is likely to be present in image or other object instances that are desired for the Image Set. If it is a multi-valued attribute, the Selector Value Number (0072,0028) indicates which value is intended to be used for matching. The Selector Attribute VR (0072,0050) identifies the Value Representation of the Selector Attribute (0072,0026). The value of Selector Attribute VR (0072,0050) determines which attribute of the Hanging Protocol Selector Attribute Value Macro is required to specify one or more desired values for the DICOM attribute tag. If more than one value is specified for the attribute, or more than one sequence item is specified in the Selector Code Sequence Value (0072,0080), then image object instances with a corresponding attribute that matches any one of the values shall be included in the Image Set.

18 Note: The values used for the Selector Attribute (0072,0026) are intended to identify a type of image set via the general categories of modality, anatomy, procedure intent and/or reason. Therefore the values of the tags represented by Selector Attribute (0072,0026) are likely to be coded terms, enumerated values, defined terms or free text. The use of free text attributes is less desirable, because their values are less predictable for matching.

22 In an image object, some attributes occur at the top level, or nested within a Sequence or Functional Group Sequence, or both. In addition, a Private Attribute may be identified as a Selector Attribute (0072,0026). The attributes of the Hanging Protocol Selector Attribute Context Macro identify a Sequence, Functional Group Sequence, or Private Group context for the Selector Attribute (0072,0026).

28 The creator of a Hanging Protocol Instance uses this collection of attributes to identify one type of image set to which the Hanging Protocol is intended to apply. The user of a Hanging Protocol Instance (e.g., softcopy review workstation or pre-fetching application) uses this collection of attributes to match a specific image set to a Hanging Protocol, and/or to determine which image sets need to be retrieved in order to use a Hanging Protocol Instance. The Key Attributes to match against to obtain image sets are specified in the Selector Attribute (0072,0026) and its context in each sequence item.

34 If the value of the tag represented by Selector Attribute (0072,0026) contains a free text description (i.e., Selector Attribute VR = LO, SH, ST, LT, UT), whether exact or partial matching is used to identify a specific image instance when applying a Hanging Protocol Instance is implementation dependent.

### **C.X.2 Hanging Protocol Environment Module**

40 Table C.X.2-1 specifies the Attributes that describe and identify the best suited display environment for a Hanging Protocol.

42 Different viewing styles and interactions may be defined depending on a workstation's capabilities. For example, the hanging preferences for viewing a screening mammogram study on a 1Kx1K screen with a 10 second repaint time versus a 2Kx2.5K screen may differ.

44 Notes: 1. The term Screen is intended to include all types of display devices (e.g., CRT, LCD, etc.).  
46 2. This information may be used by an application to select a subset of the available screens on which to apply a Hanging Protocol.

2

**Table C.X.2-1  
Hanging Protocol Environment Module Attributes**

Attribute Name	Tag	Type	Attribute Description
Number of Screens	(0072,0100)	2	Positive integer indicating the number of screens for which this Hanging Protocol is intended.
Nominal Screen Definition Sequence	(0072,0102)	2	Sequence of zero or more items that describes the set of screens for which this Hanging Protocol is intended.
>Number of Vertical Pixels	(0072,0104)	1	Positive integer indicating the intended number of rows of the addressable area of the screen in pixels. Note: The goal is not absolute size matching.
>Number of Horizontal Pixels	(0072,0106)	1	Positive integer indicating the intended number of columns of the addressable area of the screen in pixels. Note: The goal is not absolute size matching.
>Display Environment Spatial Position	(0072,0108)	1	Exactly four unitless floating point values indicating the rectangular coordinate position of the screen within the overall bounding box that encompasses all the screens. See C.X.2.1.1.
>Screen Minimum Grayscale Bit Depth	(0072,010A)	1C	Positive integer indicating the desired minimum number of grayscale bits per pixel of the screen. Required if Screen Minimum Color Bit Depth (0072,010C) is not present.
>Screen Minimum Color Bit Depth	(0072,010C)	1C	Positive integer indicating the desired minimum total number of bits per color channel used to present a pixel. Required if Screen Minimum Grayscale Bit Depth (0072,010A) is not present. Note: A 24-bit color system with 8 bits per color channel (red, green, blue) would have a value of 8.
>Application Maximum Repaint Time	(0072,010E)	3	Positive integer indicating the desired maximum time in milliseconds required by the application to repaint the full screen once (i.e., recalculate all pixels and paint them to the screen). Note: This is not the screen refresh time.

4 **C.X.2.1 Attribute Descriptions**

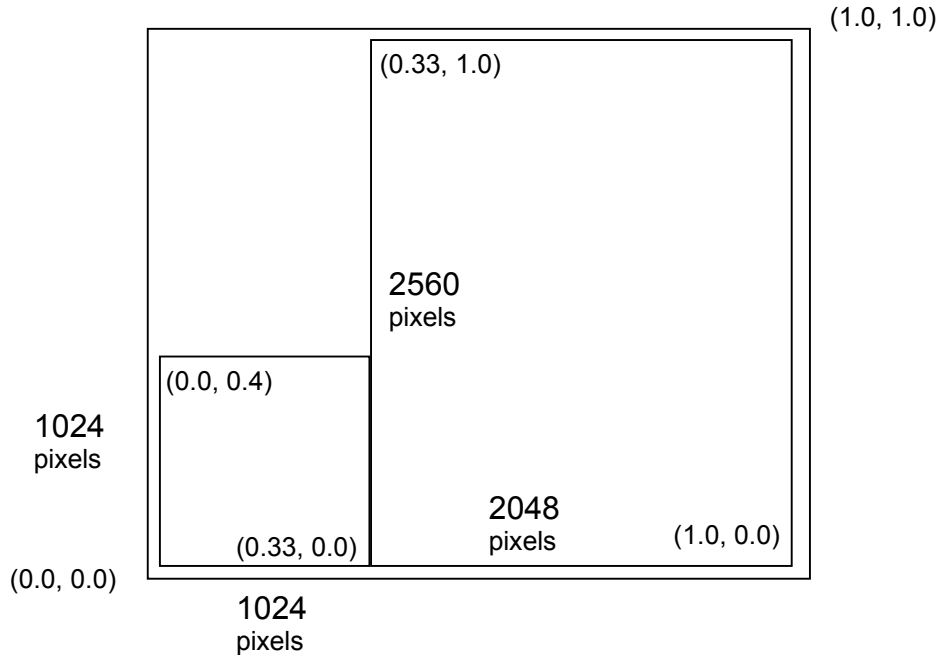
**C.X.2.1.1 Display Environment Spatial Position**

6 For the Display Environment Spatial Position (0072,0108) attribute, the lower left corner of the  
 8 overall bounding box has Cartesian coordinates of (0.0,0.0). The upper right corner has  
 10 coordinates of (1.0,1.0). The scale of the box is based on the Number of Vertical Pixels  
 (0072,0104) and Number of Horizontal Pixels (0072,0106), not the physical size of the screens  
 that are part of the workstation. The coordinates of each individual screen's box are defined in  
 absolute coordinates relative to the (0,0) and (1,1) range of the overall box. Position of a box is

2 given by a (x1,y1), (x2,y2) pair that identifies the upper left corner and lower right corner if the box is rectangular.

4 Note: The goal is not absolute position matching of the image boxes rendered on the screens using  
6 Hanging Protocol layout information, but that the relative positioning of the image boxes should be consistent between different workstations.

8 The following figure depicts a 1K x 1K screen positioned to the left of a 2K x 2.5K screen. The  
10 Display Environment Spatial Position (0072,0108) of the 1K x 1K screen is (0.0,0.4) (0.33,0.0), and the Display Environment Spatial Position (0072,0108) of the 2K x 2.5K screen is (0.33,1.0) (1.0,0.0).



12 **C.X.3 Hanging Protocol Display Module**

14 Table C.X.3-1 specifies the Attributes that describe operations (filter, reformat, sort, presentation intent), layout and interactions for a Hanging Protocol. See the Hanging Protocols informative annex (PS 3.17) for further explanation.

16

**Table C.X.3-1  
Hanging Protocol Display Module Attributes**

Attribute Name	Tag	Type	Attribute Description
Display Sets Sequence	(0072,0200)	1	Sequence that describes one or more display sets used to present the Image Sets defined in the Image Sets Sequence (0072,0020). One or more sequence items shall be present. See C.X.3.1.
>Display Set Number	(0072,0202)	1	A monotonically increasing integer, starting from 1, incrementing by one, unique within the Hanging Protocol Instance. It shall be used to identify linked display sets in the Display Set Scrolling Group (0072,0212).

Attribute Name	Tag	Type	Attribute Description
>Display Set Presentation Group	(0072,0204)	1	Positive integer value that designates this Display Set as part of a specific presentation group. All Display Sets with the same Display Set Presentation Group (0072,0204) value shall be displayed at the same time. The value 1 shall indicate that this Display Set is part of the initial presentation group. Subsequent values incrementing by 1 shall imply successive temporal ordering of display.
>Image Set Number	(0072,0032)	1	Image Set Number (0072,0032) value from a Time Based Image Sets Sequence (0072,0030) Item within the Image Sets Sequence (0072,0020) Item that is selected for display by this Display Set.  Note: Multiple Image Boxes Sequence (0072,0300) Items within a Display Sets Sequence (0072,0200) Item may be used to spread one image set over multiple image boxes with the same Display Set characteristics.
>Image Boxes Sequence	(0072,0300)	1	Sequence that defines the image boxes for this Display Set. Exactly one sequence item shall be present unless Image Box Layout Type (0072,0304) is TILED, in which case one or more items shall be present.
>>Image Box Number	(0072,0302)	1	A monotonically increasing integer that identifies the order of image boxes for scrolling, starting from 1, incrementing by one, unique within a Display Set Sequence Item.
>>Display Environment Spatial Position	(0072,0108)	1	Exactly four unitless floating point values indicating the rectangular coordinate position of the image box within the overall bounding box that encompasses all the display space (across all screens). See C.X.2.1.1.
>>Image Box Layout Type	(0072,0304)	1	Type of layout of the image box.  All types except for TILED are single rectangles containing a single frame of image pixel data. The types are primarily distinguished by their interaction technique.  Defined Terms:  TILED: a scrollable array of rectangles, each containing a single frame of image pixel data.  STACK: a single rectangle containing a steppable single frame, intended for user-controlled stepping through the image set, usually via continuous device interaction (e.g., mouse scrolling) or by single stepping (mouse or button click).  CINE: a single rectangle, intended for video type play back where the user controls are play

Attribute Name	Tag	Type	Attribute Description
			<p>sequence, rate of play, and direction.</p> <p>PROCESSED: intended for interactive 3D visualizations that have custom interfaces.</p> <p>SINGLE: a single rectangle, intended for images and objects with no defined methods of interaction.</p> <p>Note: This value may also be used for non-image objects, such as waveforms and SR documents.</p>
>>Image Box Tile Horizontal Dimension	(0072,0306)	1C	<p>Positive integer defining the horizontal Image Box tile dimension; the number of columns.</p> <p>Required if the value of Image Box Layout Type (0072,0304) is TILED.</p>
>>Image Box Tile Vertical Dimension	(0072,0308)	1C	<p>Positive integer defining the vertical Image Box tile dimension; the number of rows.</p> <p>Required if the value of Image Box Layout Type (0072,0304) is TILED.</p>
>>Image Box Scroll Direction	(0072,0310)	1C	<p>Enumerated Values:</p> <p>VERTICAL: scroll images by row</p> <p>HORIZONTAL: scroll images by column.</p> <p>Required if the value of Image Box Layout Type (0072,0304) is TILED, and the value of Image Box Tile Horizontal Dimension (0072,0306) or Image Box Tile Vertical Dimension (0072,0308) is greater than 1.</p>
>>Image Box Small Scroll Type	(0072,0312)	2C	<p>Defines the type of small increment scrolling to be applied to this Image Box.</p> <p>Required if the value of Image Box Layout Type (0072,0304) is TILED, and the value of Image Box Tile Horizontal Dimension (0072,0306) or Image Box Tile Vertical Dimension (0072,0308) is greater than 1. Scrolling is not specified if zero length.</p> <p>Enumerated Values:</p> <p>PAGE: In a TILED image box, replace all image slots with the next N x M images in the set,</p> <p>ROW_COLUMN: in a TILED image box, move each row or column of images to the next row or column, depending on Image Box Scroll Direction (0072,0310)</p> <p>IMAGE: In a TILED image box, move each image to the next slot, either horizontally or vertically, depending on Image Box Scroll Direction (0072,0310)</p> <p>Note: If there are multiple image boxes of different Tile Dimensions in a Display Set, then only IMAGE scrolling applies, and the</p>



Attribute Name	Tag	Type	Attribute Description
			value of this attribute is ignored.
>>Image Box Small Scroll Amount	(0072,0314)	1C	<p>Defines the positive integer number of pages, rows, columns, or images per small increment scroll, based on the values of Image Box Small Scroll Type (0072,0312) and Image Box Scroll Direction (0072,0310). The value applies to both forward and backward scrolling.</p> <p>Required if Image Box Small Scroll Type (0072,0312) is present with a value.</p>
>>Image Box Large Scroll Type	(0072,0316)	2C	<p>Defines the type of large increment scrolling to be applied to this Image Box.</p> <p>Required if the value of Image Box Layout Type (0072,0304) is TILED, and the value of Image Box Tile Horizontal Dimension (0072,0306) or Image Box Tile Vertical Dimension (0072,0308) is greater than 1.</p> <p>Enumerated Values:</p> <p>PAGE: In a TILED image box, replace all image slots with the next N x M images in the set,</p> <p>ROW_COLUMN: in a TILED image box, move each row or column of images to the next row or column, depending on Image Box Scroll Direction (0072,0310)</p> <p>IMAGE: In a TILED image box, move each image to the next slot, either horizontally or vertically, depending on Image Box Scroll Direction (0072,0310)</p> <p>Note: If there are multiple image boxes of different Tile Dimensions in a Display Set, then only IMAGE scrolling applies, and the value of the attribute is ignored.</p>
>>Image Box Large Scroll Amount	(0072,0318)	1C	<p>Defines the positive integer number of pages, rows, columns, or images per large increment scroll, based on the values of Image Box Large Scroll Type (0072,0316) and Image Box Scroll Direction (0072,cc50). The value applies to both forward and backward scrolling.</p> <p>Required if Image Box Large Scroll Type (0072,0316) is present with a value.</p>
>>Image Box Overlap Priority	(0072,0320)	3	<p>If this Image Box overlaps in spatial position with others, this attribute indicates the layer of this Image Box in relation to the others. The value shall be a positive integer in the range 1 to 100, where 1 = top and 100 = bottom.</p> <p>If this attribute is not present, then the expected behavior is not defined.</p>
>>Preferred Playback Sequencing	(0018,1244)	1C	Describes the preferred playback sequencing for the Image Box. Overrides any Preferred

Attribute Name	Tag	Type	Attribute Description
			<p>Playback Sequencing (0018,1244) value in the image objects being displayed.</p> <p>Required if the value of Image Box Layout Type (0072,0304) is CINE.</p> <p>Enumerated Values:            0 = Looping (1,2...n,1,2,...n,1,2,...n,...)            1 = Sweeping (1,2,...n,n-1,...2,1,2,...n,...)            2 = Stop (1,2...n)</p>
>>Recommended Display Frame Rate	(0008,2144)	1C	<p>Recommended rate at which the frames of a multi-frame image shall be displayed, in frames/second. Shall have a value greater than zero. Overrides any Recommended Display Frame Rate (0008,2144) value in the image objects being displayed.</p> <p>Required if the value of Image Box Layout Type (0072,0304) is CINE and if Cine Relative to Real-Time (0072,0330) is not present.</p>
>>Cine Relative to Real-Time	(0072,0330)	1C	<p>A positive unitless floating point numeric factor equal to playback rate divided by acquisition rate.</p> <p>Required if the value of Image Box Layout Type (0072,0304) is CINE and if Recommended Display Frame Rate (0008,2144) is not present.</p> <p>Note: The capture rate may change within the image object, as specified in Frame Time (0018,1063) or Frame Time Vector (0018,1065).</p>
>Filter Operations Sequence	(0072,0400)	2	<p>Sequence that defines filter criteria to be applied to the image set identified by Image Set Number (0072,0032). Zero or more items shall be included in this sequence. See C.X.3.1.1.</p>
>>Filter-by Category	(0072,0402)	1C	<p>Category of the filter operation. See C.X.3.1.1.</p> <p>Defined terms: IMAGE_PLANE</p> <p>Required if Selector Attribute (0072,0026) is not present.</p>
>>Filter-by Attribute Presence	(0072,0404)	1C	<p>Operation to be applied based on the presence or absence of the attribute represented by Selector Attribute (0072,0026) in each image of the Image Set.</p> <p>Required if Selector Attribute (0072,0026) is present and Filter-by Operator (0072,0406) is not present.</p> <p>Enumerated Values:            PRESENT: Include the image if the attribute is present            NOT_PRESENT: Include the image if the</p>

Attribute Name	Tag	Type	Attribute Description
			attribute is not present
>>Selector Attribute	(0072,0026)	1C	<p>Data Element Tag of an Attribute from an Image IOD to use as a filter. See C.X.3.1.1 for potential attributes.</p> <p>Required if Filter-by Category (0072,0402) is not present.</p>
>>Selector Attribute VR	(0072,0050)	1C	<p>The Value Representation of the Selector Attribute (0072,0026).</p> <p>Required if Selector Attribute (0072,0026) or Filter-by Category (0072,0402), and Filter-by Operator (0072,0406) are present.</p>
<i>&gt;&gt;Include Hanging Protocol Selector Attribute Context Macro Table C.X.4-1</i>			
<i>&gt;&gt;Include Hanging Protocol Selector Attribute Value Macro Table C.X.4-2</i>			
>>Selector Value Number	(0072,0028)	1C	<p>Positive integer identifying which value of the attribute identified by Selector Attribute (0072,0026) is to be used for filtering. The value 1 identifies the first value. The value zero identifies any value.</p> <p>Required if Selector Attribute (0072,0026) and Filter-by Operator (0072,0406) are present.</p>
>>Filter-by Operator	(0072,0406)	1C	<p>Operation to be applied between the value(s) in the Hanging Protocol Selector Attribute Value Macro ("selector"), and the value(s) of the attribute identified by Selector Attribute (0072,0026) in each image of the Image Set. See C.X.3.1.1.</p> <p>Required if Filter-by Category (0072,0402) is present, or if Selector Attribute (0072,0026) is present and Filter-by Attribute Presence (0072,0404) is not present.</p> <p>Enumerated Values:</p> <p>RANGE_INCL: the values lie within the specified range, or are equal to the endpoints; applies only to numeric, date or time Selector Attribute (0072,0026); two values shall be present in the selector, the first of which is less than or equal to the second</p> <p>RANGE_EXCL: the values lie outside the specified range, and are not equal to the endpoints; applies only to numeric Selector Attribute (0072,0026); two values shall be present in the selector, the first of which is less than or equal to the second</p> <p>GREATER_OR_EQUAL: applies only to numeric Selector Attribute (0072,0026)</p> <p>LESS_OR_EQUAL: applies only to numeric Selector Attribute (0072,0026)</p>

Attribute Name	Tag	Type	Attribute Description
			<p>GREATER_THAN: applies only to numeric Selector Attribute (0072,0026)</p> <p>LESS_THAN: applies only to numeric Selector Attribute (0072,0026)</p> <p>MEMBER_OF: one of the values in the image is present in the values of the selector; if one value is present in each, this is an “equal to” operator</p> <p>NOT_MEMBER_OF: none of the values in the image is present in the values of the selector; if one value is present in each, this is a “not equal to” operator</p>
>Sorting Operations Sequence	(0072,0600)	2	Sequence that defines sorting criteria to be applied to the result of filter and reformat operations, to define the order in which to present the images in the Image Boxes. Zero or more items shall be included in this sequence. See C.X.3.1.2.
>>Selector Attribute	(0072,0026)	1C	<p>Data Element Tag of an Attribute from an Image IOD to be used for sorting. See C.X.3.1.2 for potential attributes.</p> <p>Required if Sort-by Category (0072,0602) is not present.</p>
<i>&gt;&gt;Include Hanging Protocol Selector Attribute Context Macro Table C.X.4-1</i>			
>>Selector Value Number	(0072,0028)	1C	<p>Positive integer identifying which value of the attribute identified by Selector Attribute (0072,0026) is to be used for sorting. The value of 1 identifies the first value. Shall not be zero.</p> <p>Required if Selector Attribute (0072,0026) is present.</p>
>>Sort-by Category	(0072,0602)	1C	<p>Category of the sorting operation. See C.X.3.1.2.</p> <p>Defined terms:</p> <p>ALONG_AXIS: for CT, MR, other cross-sectional image sets</p> <p>BY_ACQ_TIME</p> <p>Required if Selector Attribute (0072,0026) is not present.</p>
>>Sorting Direction	(0072,0604)	1	<p>Sorting direction to be applied to the value(s) in the image set of the attribute identified by Selector Attribute (0072,0026) or Sort-by Category (0072,0602).</p> <p>Enumerated Values: INCREASING, DECREASING</p>
>Blending Operation Type	(0072,0500)	3	<p>Type of blending of superimposed and underlying images from the image set, performed before reformatting. See C.X.3.1.3.</p> <p>Defined Terms:</p>

Attribute Name	Tag	Type	Attribute Description
			COLOR – apply a pseudo-color to the superimposed image while blending
>Reformatting Operation Type	(0072,0510)	3	Reformatting operation to be applied to the Image Set. Defined terms: MPR, 3D_RENDERING, SLAB
>Reformatting Thickness	(0072,0512)	1C	The desired thickness of the reformatted images in millimeters. Required if value of Reformatting Operation Type (0072,0510) is SLAB or MPR. May be present otherwise.
>Reformatting Interval	(0072,0514)	1C	The desired spacing of the reformatted images in millimeters. The spacing is measured from the center-to-center of each reconstructed image. Required if value of Reformatting Operation Type (0072,0510) is SLAB or MPR. May be present otherwise.
>Reformatting Operation Initial View Direction	(0072,0516)	1C	Initial view of the reformatted images. Required if the value of Reformatting Operation Type (0072,0510) is MPR or 3D_RENDERING. May be present otherwise. Defined Terms: SAGITTAL, AXIAL, CORONAL, OBLIQUE
>3D Rendering Type	(0072,0520)	1C	Describes the intended 3D rendering type. One or more values shall be present. The first value shall not be zero length. Required if the value of Reformatting Operation Type (0072,0510) is 3D_RENDERING: Defined Terms for value 1: MIP, SURFACE, VOLUME Additional values may be used to identify implementation specific sub-types.
>Display Set Patient Orientation	(0072,0700)	3	Patient direction of the rows and columns of the images, as intended for display. See C.X.3.1.4.
>VOI Type	(0072,0702)	3	Expected value of interest transformation for display (e.g., Window Center and Window Width or VOI LUT). Defined Terms: LUNG MEDIASTINUM ABDO_PELVIS LIVER SOFT_TISSUE BONE BRAIN

Attribute Name	Tag	Type	Attribute Description
			POST_FOSSA
>Pseudo-color Type	(0072,0704)	3	<p>A category of pseudo-color palette choice to be applied after application of the VOI LUT. If this attribute is not present, a pseudo-color palette shall not be applied.</p> <p>Defined Terms: BLACK_BODY HOT_IRON DEFAULT</p>
>Show Grayscale Inverted	(0072,0706)	3	<p>Whether or not to invert the rendered luminance of the displayed values. See C.X.3.1.4.</p> <p>Enumerated values: YES = The maximum output value after the display pipeline has been applied shall be displayed with the minimum available luminance. NO = The maximum output value after the display pipeline has been applied shall be displayed with the maximum available luminance.</p> <p>Notes: 1. The YES and NO values of this Attribute correspond to the Presentation LUT Shape (2050,0020) values of INVERSE and IDENTITY, as described in C.11.6.1.2. 2. Only applicable to display of grayscale images.</p>
>Show Image True Size Flag	(0072,0710)	3	<p>Indicates whether or not to display images with the physical size of the rendered image pixel the same on the screen as specified in the image attributes, unless overridden by a Presentation State instance.</p> <p>Enumerated values: YES = Display images at True Size. NO = The rendered size is not specified.</p>
>Show Graphic Annotation Flag	(0072,0712)	3	<p>Indicates whether or not to display items from the Graphic Annotation Sequence (0070,0001) in an applied Presentation State, and the attributes of the Overlay Plane module in the image objects or applied Presentation State.</p> <p>Enumerated Values: YES NO</p>
>Show Patient Demographics Flag	(0072,0714)	3	<p>Indicates whether or not to display patient and study identification information.</p> <p>Enumerated Values: YES</p>

Attribute Name	Tag	Type	Attribute Description
			NO
>Show Acquisition Techniques Flag	(0072,0716)	3	Indicates whether or not to display image acquisition technique information. Enumerated Values: YES NO
>Display Set Presentation Group Description	(0072,0206)	3	Description of the intent of the Display Set Presentation Group (0072,0204). If present, shall have the same value in all sequence Items assigned the same value for Display Set Presentation Group (0072,0204).
Partial Data Display Handling	(0072,0208)	2	If one or more Image Sets identified by Image Set Number (0072,0032) in the Display Sets Sequence (0072,0200) Items is not available, indicate whether or not to maintain the expected layout in the absence of complete Image Sets. Enumerated Values: MAINTAIN_LAYOUT: If one or more Image Sets is not available, maintain the layout with empty Image Boxes. ADAPT_LAYOUT: If one or more Image Sets is not available, rearrange the layout at the discretion of the application. If this attribute is zero length, then the expected behavior is not defined.
Synchronized Scrolling Sequence	(0072,0210)	3	Each sequence item of this attribute identifies a group of Display Sets to which synchronized scrolling is to be applied. Zero or more sequence items may be present. The dimensions along which the synchronization occurs shall be those specified in the Sorting Operations Sequence (0072,0600).
>Display Set Scrolling Group	(0072,0212)	1	Multi-valued list of two or more Display Set Number (0072,0202) values. Indicates that the images within the specified Display Sets are scrolled in parallel, to maintain the established synchronization.
Navigation Indicator Sequence	(0072,0214)	3	Describes a geometric relationship between Display Sets for the purpose of static or interactive localization or navigation. One or more sequence items may be present.
>Navigation Display Set	(0072,0216)	1C	Display Set Number (0072,0202) of the Display Set where the geometric relationship to the Reference Display Sets (0072,0218) is graphically depicted. Required if there is a one-way interaction such that the location of the Reference Display Sets is

Attribute Name	Tag	Type	Attribute Description
			<p>indicated on or controlled by the Navigation Display Set.</p> <p>Note: For example, the graphical representation may indicate either the number of slices displayed or contained in the Reference Display Set(s).</p>
>Reference Display Sets	(0072,0218)	1	<p>One or more Display Set Number (0072,0202) values.</p> <p>If Navigation Display Set is present, shall list those Display Sets that are controlled by or indicated on the Navigation Display Set.</p> <p>If Navigation Display Set is absent, shall indicate that all of the Reference Display Sets cross-reference each other.</p>

2 **C.X.3.1 Attribute Descriptions**

4 The attributes of a Display Set Sequence Item shall be applied to the image set represented by the value of Image Set Number (0072,0032) in the following order:

- 6 • Filter Operations Sequence
- Reformatting
- Sorting Operations Sequence
- 8 • Presentation Intent

**C.X.3.1.1 Filter Operations Sequence**

10 The items in the Filter Operations Sequence (0072,0400) determine which subset of the images in the identified Image Set are to be displayed in the associated Display Set image boxes. If there are multiple Items in the Filter Operations Sequence (0072,0400), the filter operations shall be applied in Item order, and the output of the preceding filter shall serve as the input to the succeeding filter (i.e., an AND operation).

16 When Filter-by Category (0072,0402) has a value of IMAGE\_PLANE, Selector Attribute VR (0072,0050) shall have a value of "CS", and abstract enumerated values shall be used for the value of the associated Selector CS Value (0072,0062) attribute, which may be computed from the values of Image Orientation (Patient) (0020,0037) or Patient Orientation (0020,0020). Enumerated Values: AXIAL, CORONAL, SAGITTAL, OBLIQUE.

20 An application that is applying a Hanging Protocol Instance shall support any value for Selector Attribute (0072,0026). If the attribute identified by Selector Attribute is not present in an image of the referenced Image Set, then the image is included in the filter output. The attributes of the Hanging Protocol Selector Attribute Context Macro specify whether the Selector Attribute (0072,0026) is contained in a Sequence, Functional Group Sequence, or Private Group.

26 Notes: 1. The following attributes from image IODs are examples of some possible values for the Selector Attribute (0072,0026) of the Filter Operations Sequence (0072,0400). This is not a complete list:

- 28 • Value 3 of Image Type (0008,0008) or Frame Type (0008,9007)
- Anatomic Region Sequence (0008,2218)
- 30 • Pixel Presentation (0008,9205)



- 2 • Volume Based Calculation Technique (0008,9207)
- Acquisition Contrast (0008,9209)
- 4 • Contrast/Bolus Agent (0018,0010)
- Body Part Examined (0018,0015)
- Scanning Sequence (0018,0020)
- 6 • Intervention Drug Start Time (0018,0035)
- Echo Time (0018,0081)
- 8 • Echo Number (0018,0086)
- Protocol Name (0018,1030)
- 10 • Contrast/Bolus Start Time (0018,1042)
- Contrast/Bolus Stop Time (0018,1043)
- 12 • Trigger Time (0018,1060)
- Image Trigger Delay (0018,1067)
- 14 • Radiopharmaceutical Start Time (0018,1072)
- Radiopharmaceutical Stop Time (0018,1073)
- 16 • Trigger Window (0018,1094)
- View Position (0018,5101)
- 18 • Echo Pulse Sequence (0018,9008)
- Phase Contrast (0018,9014)
- 20 • Effective Echo Time (0018,9082)
- Laterality (0020,0060)
- 22 • Image Laterality (0020,0062)
- Slice Location (0020,1041)
- 24 • View Code Sequence (0054,0220)

26 2. For a multi-frame image set, it is the responsibility of the application to apply the filter operations to individual frames within a multi-frame image instance in the image set, versus multiple single frame image instances in the image set that represent individual frames.

28

### **C.X.3.1.2 Sorting Operations Sequence**

30 The Items in the Sorting Operations Sequence (0072,0600) define the order in which the images  
32 resulting from the filter and reformat operations on the Image Set are to be displayed in the  
associated Image Boxes of the Display Set. The sorting criteria may include the value of a  
34 numeric, date, or time Attribute that is expected to be present in each of the image objects in the  
filtered Image Set, and/or an abstract sorting category. A sorting direction shall be associated  
36 with each sorting criterion. If a textual Attribute is used for sorting, then the INCREASING sorting  
direction indicates alphabetical order, and DECREASING indicates reverse alphabetical order.

38 If a code sequence Attribute is used for sorting, then the Code Meaning (0008,0104) shall be  
sorted alphabetically. If a string numeric Attribute is used for sorting (VR of IS or DS), then  
40 sorting shall be on the numeric value, and padding shall be ignored. When sorting by date or  
time Attribute, then sorting shall be on the temporal value, not the alphabetic string.

42 If there are multiple Items in the Sorting Operations Sequence (0072,0600), then the sorting  
operations shall be applied in Item order. The least rapidly varying attribute for the sorting  
operation shall be the first Item in the sequence.

44 Note: For example, a Sorting Operations Sequence (0072,0600) with two Items:

- 46 Item #1: (0018,5101) View Position, INCREASING
- Item #2: (0008,0020) Study Date, INCREASING

results in the following order, based on these attribute values in the image objects:

View Position (0018,5101)	Study Date (0008,0020)
AP	20030201
AP	20030501
LL	20020705
LL	20030102
RL	20030101
RL	20030201

2

When the Sort-by Category (0072,0602) is used with a value of ALONG\_AXIS, such as for CT, MR or other cross-sectional image sets, the sorting operation is computed from the values Image Position (Patient) (0020,0032) and Image Orientation (Patient) (0020,0037) in the image objects.

4

For the image set to be displayed, a “dominant axis” of the set shall be determined. The dominant axis is the normal to the Image Orientation (Patient) (0020,0037) attribute (assuming all selected images are parallel), computed as the dot product in a right-handed coordinate system (see C.7.6.2.1.1). The INCREASING direction for ALONG\_AXIS of the image set shall be in the positive direction along the dominant axis. The DECREASING direction shall be in the negative direction along that axis.

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When the Sort-by Category (0072,0602) is used with a value of BY\_ACQ\_TIME, the sorting operation is computed from appropriate values in the image objects (e.g., Frame Acquisition DateTime, Acquisition Time, Content Time, Acquisition DateTime), since the specific attribute used may vary from one Image Instance or SOP Class to another, yet the Hanging Protocol Instance may be generally applicable.

14

16

An application that is applying a Hanging Protocol Instance shall support any value for Selector Attribute (0072,0026), provided that it is present in the referenced Image Set. The attributes of the Hanging Protocol Selector Attribute Context Macro specify whether the Selector Attribute (0072,0026) is contained in a Sequence, Functional Group Sequence or Private Group.

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20

Notes: 1. The following attributes from image IODs are examples of some possible values for the Selector Attribute (0072,0026) of the Sorting Operations Sequence (0072,0600). This is not a complete list:

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- Acquisition Datetime (0008,002A)
- Acquisition Time (0008,0032)
- Echo Time (0018,0081)
- Echo Number (0018,0086)
- Trigger Time (0018,1060)
- View Position (0018,5101)
- Effective Echo Time (0018,9082)
- Acquisition Number (0020,0012)
- Instance Number (0020,0013)
- Slice Location (0020,1041), although Sort-by Category (0072,0602) with value ALONG\_AXIS may be more reliable
- Trigger Delay Time (0020,9153)
- Stage Number (0008,2122)
- View Number (0008,2128)

2. For a multi-frame image set, it is the responsibility of the application to apply the sorting operations to individual frames within a multi-frame image instance in the image set, versus multiple single frame image instances in the image set that represent individual frames.

2 **C.X.3.1.3 Blending Operation Type**

4 A Blending Operation Type (0072,0500) of COLOR implies that the filtered selected image set  
6 contains two sets of images appropriate for blending, such as CT and PET images defined in the  
8 same frame of reference or associated by a spatial registration object. The decision as to which  
10 subset are the underlying images and which subset are the superimposed images is left to the  
12 discretion of the display application. There is no mechanism to explicitly specify the two subsets.

14 The relative opacity and color-related aspects of blending are not specified by the Hanging  
16 Protocol, and are left to the discretion of the application.

18 **C.X.3.1.4 Presentation Intent Attributes**

20 The attributes that indicate the presentation intent for each Display Set of a Hanging Protocol  
22 Instance are: Display Set Patient Orientation (0072,0700), VOI Type (0072,0702), Pseudo-color  
24 Type (0072,0704), Show Grayscale Inverted (0072,0706), Show Image True Size Flag  
26 (0072,0710), Show Graphic Annotation Flag (0072,0712), Show Patient Demographics Flag  
28 (0072,0714), and Show Acquisition Techniques Flag (0072,0716).

- 30 • If one Presentation State instance is defined for the images that are to be displayed, then it  
32 shall be applied.
- 34 • If more than one Presentation State instance is defined for the images that are to be  
36 displayed, then the presentation intent attributes, if present, shall be used to select the  
38 closest matching Presentation State instance to apply (for example, matching VOI Type  
40 (0072,0702) in the Hanging Protocol Instance with Window Center & Width Explanation in the  
42 Presentation State instance). Otherwise, the application shall determine which Presentation  
44 State instance to apply.
- 46 • If no Presentation State instance is defined for the images that are to be displayed, then the  
presentation intent attributes, if present, shall be applied (for example, matching VOI Type  
(0072,0702) in the Hanging Protocol Instance with Window Center & Width Explanation in the  
Image). Otherwise, the display related information in the image instances shall be applied.

28 The intent of the VOI Type (0072,0702) attribute is to support generic intensity window settings  
30 for the Display Sets in a Hanging Protocol, such as lung, soft tissue, or bone for chest CT. It is  
32 expected for most other modalities that the window/center or VOI LUT values, if not provided in a  
Presentation State instance, would be provided in the image instance rather than by intent in a  
Hanging Protocol Instance.

34 The value of Show Grayscale Inverted (0072,0706) shall override any such intent expressed in  
the images or associated Presentation States to which the Hanging Protocol is applied.

- 36 Notes:
- 38 1. For example, an image may have a MONOCHROME2 Photometric Interpretation (0028,0004)  
and no Presentation LUT Shape (2050,0020), which implies that maximum values are displayed  
with maximum available luminance, but the presence of a Show Grayscale Inverted (0072,0706)  
value of YES in the Hanging Protocol requires maximum values to be displayed with minimum  
available luminance.
  - 40 2. For example, an image may have an applicable Presentation State with a Presentation LUT  
42 Shape (2050,0020) of IDENTITY, which implies that maximum values are displayed with  
maximum available luminance, but the presence of a Show Grayscale Inverted (0072,0706)  
44 value of YES in the Hanging Protocol requires maximum values to be displayed with minimum  
available luminance.
  - 46 3. For example, an image may have an applicable Presentation State with a Presentation LUT,  
in which case the minimum possible LUT output value (i.e., 0) will be interpreted as maximum  
available luminance if the value of Show Grayscale Inverted (0072,0706) is YES.

The intent of Display Set Patient Orientation (0072,0700) is to describe the preferred image rotation and/or flip for presentation within an image box. Each of the two values shall be an anatomic direction designated by the capital letters: A (anterior), P (posterior), R (right), L (left), H (head), F (foot), or X (unspecified). Each value of the orientation attribute shall contain at least one of these characters. If refinements in the orientation descriptions are to be specified, then they shall be designated by one or two additional letters in each value. Within each value, the letters shall be ordered with the principal orientation designated in the first character. If the value "X" is used for one of the values, the patient direction for that value is not defined.

The first value is the patient direction to be oriented at the right side of the image box for each image. The second value is the patient direction to be positioned at the bottom of the image image box. The application shall use the patient orientation information of each image (if available) to compute the best rotate and/or flip operation to be applied within the display set. If the patient orientation of an image is not defined, then this attribute shall be ignored.

#### C.X.4 Hanging Protocol Selector Attribute Macros

##### C.X.4.1 Hanging Protocol Selector Attribute Context Macro

Table C.X.4-1 specifies the Attributes that identify the context for a Data Element Tag that is used as a Selector Attribute (0072,0026) in the Image Set Selector Sequence (0072,0022), Filter Operations Sequence (0072,0400), or Sorting Operations Sequence (0072,0600). The attribute may be an attribute nested within a Sequence or Functional Group Sequence, and/or a Private Attribute.

**Table C.X.4-1**  
**Hanging Protocol Selector Attribute Context Macro Attributes**

Attribute Name	Tag	Type	Attribute Description
Selector Sequence Pointer	(0072,0052)	1C	Contains the Data Element Tag of the Sequence that contains the Attribute that is identified by the Selector Attribute (0072,0026).  Required if the Selector Attribute (0072,0026) is nested in a Sequence. Shall not be used to identify code sequence attributes. See Selector Code Sequence Value (0072,0080).
Functional Group Pointer	(0020,9167)	1C	Contains the Data Element Tag of the Functional Group Sequence that contains the Attribute that is identified by the Selector Attribute (0072,0026).  Required if the value of the Selector Attribute (0072,0026) is the Data Element Tag of an Attribute that is contained within a Functional Group Sequence.
Selector Sequence Pointer Private Creator	(0072,0054)	1C	Identification of the creator of a group of private data elements. Required if the Selector Sequence Pointer (0072,0052) value is the Data Element Tag of a Private Attribute.
Functional Group Private Creator	(0020,9238)	1C	Identification of the creator of a group of private data elements. Required if the Functional Group Pointer (0020,9167) value is the Data Element Tag of a Private Attribute.
Selector Attribute Private Creator	(0072,0056)	1C	Identification of the creator of a group of private data elements. Required if the Selector Attribute (0072,0026) value is the Data Element Tag of a

Attribute Name	Tag	Type	Attribute Description
			Private Attribute.

2 **C.X.4.1.1. Hanging Protocol Selector Attribute Context Macro Attribute Descriptions**

**C.X.4.1.1.1 Selector Sequence Pointer**

4 The Sequence Attribute in the referenced Image identified by the value of Selector Sequence  
6 Pointer (0072,0052) may have more than one Item, in which case the filter or image set selector  
8 is applied to the values of the attribute identified by Selector Attribute (0072,0026) in all Items of  
the Sequence. The Selector shall match the specified value(s) of the specified Attribute in any  
Item of the Sequence Attribute in the referenced Image.

10 If the Functional Group Pointer (0020,9167) attribute is not present, then the Sequence Attribute  
identified by Selector Sequence Pointer (0072,0052) resides in the top level Data Set of the  
referenced Image.

12 **C.X.4.1.1.2 Functional Group Pointer**

14 The Functional Group Sequence is a Sequence Attribute contained within a Shared Functional  
Groups Sequence (5200,9229) Item or a Per-frame Functional Groups Sequence (5200,9230)  
Item. See C.7.6.16.

16 The Selector Sequence Pointer (0072,0052) may be used to further nest the reference to a  
Sequence Attribute within a Functional Group Sequence identified by Functional Group Pointer  
18 (0020,9167).

**C.X.4.1.1.3 Private Attribute References**

20 The Functional Group Private Creator (0020,9238), Selector Sequence Pointer Private Creator  
22 (0072,0054), and the Selector Attribute Private Creator (0072,0056) each has a value that  
corresponds to the Private Creator Data Element numbers (gggg,00pp), where gggg is odd and  
pp ranges from 10 to FF. These identify a block of Private Data Elements within the block  
24 (gggg,ppxx). When the Selector Attribute (0072,0026), Selector Sequence Pointer (0072,0052) or  
Functional Group Sequence Pointer (0020,9167) points to a Private Data Element, (gggg,ppxx), it  
26 shall have the value (gggg,00xx).

**C.X.4.2 Hanging Protocol Selector Attribute Value Macro**

28 Table C.X.4-2 specifies the Attributes that identify the value(s) for a Data Element Tag that is  
used as a Selector Attribute (0072,0026) in the Image Set Selector Sequence (0072,0022) or  
30 Filter Operations Sequence (0072,0400).

32 **Table C.X.4-2  
Hanging Protocol Selector Attribute Value Macro Attributes**

Attribute Name	Tag	Type	Attribute Description
Selector AT Value	(0072,0060)	1C	The value(s) of the attribute identified by Selector Attribute (0072,0026). Required if Selector Attribute VR (0072,0050) is present and the value is AT.
Selector CS Value	(0072,0062)	1C	The value(s) of the attribute identified by Selector Attribute (0072,0026). Required if Selector Attribute VR (0072,0050) is present and the value is CS.
Selector IS Value	(0072,0064)	1C	The value(s) of the attribute identified by Selector

Attribute Name	Tag	Type	Attribute Description
			Attribute (0072,0026). Required if Selector Attribute VR (0072,0050) is present and the value is IS. Some leniency in precision and format (including padding with spaces and leading zeros, e.g., "001" = " 1 " = "1") will be required.
Selector LO Value	(0072,0066)	1C	The value(s) of the attribute identified by Selector Attribute (0072,0026). Required if Selector Attribute VR (0072,0050) is present and the value is LO.
Selector LT Value	(0072,0068)	1C	The value(s) of the attribute identified by Selector Attribute (0072,0026). Required if Selector Attribute VR (0072,0050) is present and the value is LT.
Selector PN Value	(0072,006A)	1C	The value(s) of the attribute identified by Selector Attribute (0072,0026). Required if Selector Attribute VR (0072,0050) is present and the value is PN.
Selector SH Value	(0072,006C)	1C	The value(s) of the attribute identified by Selector Attribute (0072,0026). Required if Selector Attribute VR (0072,0050) is present and the value is SH.
Selector ST Value	(0072,006E)	1C	The value(s) of the attribute identified by Selector Attribute (0072,0026). Required if Selector Attribute VR (0072,0050) is present and the value is ST.
Selector UT Value	(0072,0070)	1C	The value(s) of the attribute identified by Selector Attribute (0072,0026). Required if Selector Attribute VR (0072,0050) is present and the value is UT.
Selector DS Value	(0072,0072)	1C	The value(s) of the attribute identified by Selector Attribute (0072,0026). Required if Selector Attribute VR (0072,0050) is present and the value is DS. Some leniency in precision and format (including padding and scientific notation) will be required.
Selector FD Value	(0072,0074)	1C	The value(s) of the attribute identified by Selector Attribute (0072,0026). Required if Selector Attribute VR (0072,0050) is present and the value is FD.
Selector FL Value	(0072,0076)	1C	The value(s) of the attribute identified by Selector Attribute (0072,0026). Required if Selector Attribute VR (0072,0050) is present and the value is FL.
Selector UL Value	(0072,0078)	1C	The value(s) of the attribute identified by Selector

Attribute Name	Tag	Type	Attribute Description
			Attribute (0072,0026). Required if Selector Attribute VR (0072,0050) is present and the value is UL.
Selector US Value	(0072,007A)	1C	The value(s) of the attribute identified by Selector Attribute (0072,0026). Required if Selector Attribute VR (0072,0050) is present and the value is US.
Selector SL Value	(0072,007C)	1C	The value(s) of the attribute identified by Selector Attribute (0072,0026). Required if Selector Attribute VR (0072,0050) is present and the value is SL.
Selector SS Value	(0072,007E)	1C	The value(s) of the attribute identified by Selector Attribute (0072,0026). Required if Selector Attribute VR (0072,0050) is present and the value is SS.
Selector Code Sequence Value	(0072,0080)	1C	The value(s) of the attribute identified by Selector Attribute (0072,0026). One or more sequence items shall be present. See C.X.4.2.1.2. Required if Selector Attribute VR (0072,0050) is present and the value is SQ, and Selector Attribute (0072,0026) is a code sequence.
>Include Code Sequence Macro Table 8.8-1			No baseline context ID is defined.

2 **C.X.4.2.1 Hanging Protocol Selector Attribute Value Macro Attribute Descriptions**

**C.X.4.2.1.1 Selector Attribute Value Matching**

- 4 The value of Specific Character Set (0008,0005) in the Image and the Hanging Protocol Instance may differ and shall be taken into account for matching.
- 6 The value of Specific Character Set (0008,0005) may influence how matching of text Attributes is performed, in an implementation dependent manner. No requirements are specified for case sensitive or accent sensitive matching, or for ignoring padding.
- 8

**C.X.4.2.1.2 Selector Code Sequence Value**

- 10 The matching shall be performed on Coding Scheme Designator (0008,0102) and Code Value (0008,0100). The Code Meaning (0008,0104) is required to be present, but shall be ignored for matching purposes. The matching is case sensitive, and leading and trailing spaces are not significant. The Coding Scheme Version (0008,0103) shall be ignored unless Coding Scheme Designator (0008,0102) is not sufficient to identify the Code Value (0008,0100) unambiguously.
- 14

Item #5: Add the following to Annex F:

16

**Table F.3-3  
DIRECTORY INFORMATION MODULE**

18

Attribute Name	Tag	Type	Attribute Description
>Directory Record Type	(0004,1430)	1C	... Enumerated Values (see Section F.5):

			<b>HANGING PROTOCOL</b>
--	--	--	-------------------------

2

**Table F.4-1  
RELATIONSHIP BETWEEN DIRECTORY RECORDS**

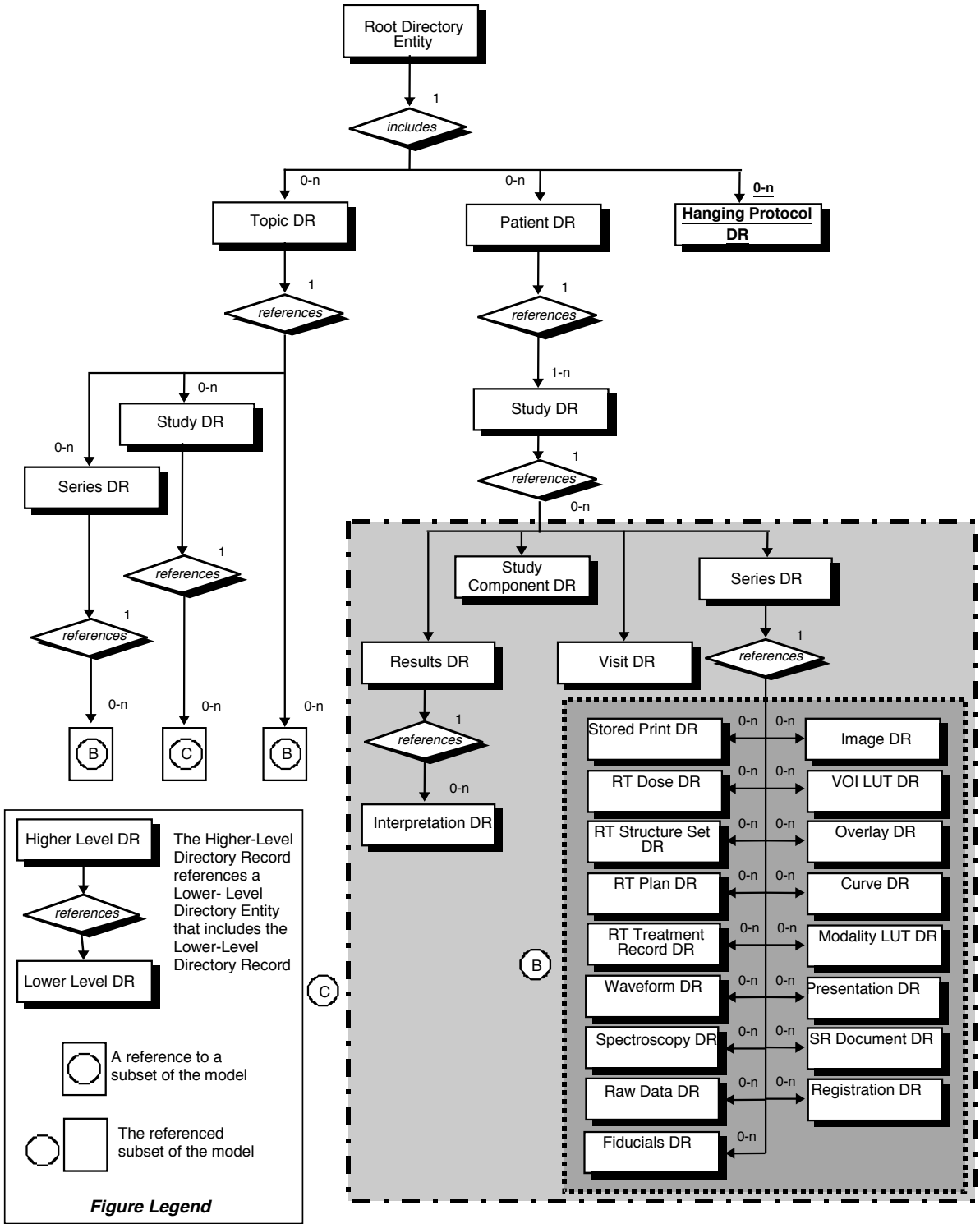
<b>Directory Record Type</b>	<b>Section</b>	<b>Directory Record Types which may be included in the next lower-level directory Entity</b>
(Root Directory Entity)	-	PATIENT, <b>HANGING PROTOCOL</b> , TOPIC, PRIVATE
...		
<b>HANGING PROTOCOL</b>	<b>F.5.X</b>	<b>PRIVATE</b>

4

6

*Item #6: Update Figure F.4-1 Basic Directory IOD Information Model: add Hanging Protocol DR to the right of Patient DR, as 0-n under "<includes>".*





2

4

**Figure F.4-1**  
**BASIC DIRECTORY IOD INFORMATION MODEL**

### F.5.X Hanging Protocol Directory Record Definition

2 The Directory Record is based on the specification of Section F.3. It is identified by a Directory  
4 Record Type of Value "HANGING PROTOCOL". Table F.5-X lists the set of keys with their  
6 associated Types for such a Directory Record Type. The description of these keys may be found  
8 in the Modules related to the Hanging Protocol IOD. This Directory Record shall be used to  
reference a Hanging Protocol SOP Instance. This type of Directory Record may reference a  
Lower-Level Directory Entity which includes one or more Directory Records as defined in Table  
F.4-1.

10 **Table F.5-X**  
**HANGING PROTOCOL KEYS**

<b>Attribute Name</b>	<b>Tag</b>	<b>Type</b>	<b>Attribute Description</b>
Specific Character Set	(0008,0005)	1C	Required if an extended or replacement character set is used in one of the keys
Hanging Protocol Name	(0072,0002)	1	
Hanging Protocol Description	(0072,0004)	1	
Hanging Protocol Level	(0072,0006)	1	
Hanging Protocol Creator	(0072,0008)	1	
Hanging Protocol Creation Datetime	(0072,000A)	1	
Hanging Protocol Definition Sequence	(0072,000C)	1	
Number of Priors Referenced	(0072,0014)	1	
Hanging Protocol User Identification Code Sequence	(0072,000E)	2	
Any other Attribute of the Hanging Protocol IOD		3	

12 Note: Because (0004,1511) Referenced SOP Instance UID in File may be used as a "pseudo" Directory  
Record Key (See Table F.3-3), it is not duplicated in this list of keys.

14

**Part 4 Addendum**

2 *Item #7: Add Hanging Protocol Storage Media Storage SOP Class to Table I.4-1*

**I.4 MEDIA STANDARD STORAGE SOP CLASSES**

SOP Class Name	SOP Class UID	IOD Specification
Hanging Protocol Storage	1.2.840.10008.5.1.4.38.1	Hanging Protocol IOD

4

*Item #8: Add the following Annex*

6 **Annex Z HANGING PROTOCOL STORAGE SERVICE CLASS**

**Z.1 OVERVIEW**

8 **Z.1.1 Scope**

10 The Hanging Protocol Storage Service Class defines an application-level class-of-service that allows one DICOM AE to send a Hanging Protocol SOP Instance to another DICOM AE.

**Z.1.2 Service Definition**

12 The Hanging Protocol Storage Service Class consists of a single SOP Class: the Hanging Protocol Storage SOP Class. It uses the Hanging Protocol IOD that represents the Hanging Protocol IE. This IOD is defined in PS 3.3. The Hanging Protocol Storage Service Class uses the C-STORE DIMSE Service specified in PS 3.7. A successful completion of the C-STORE has the following semantics:

- Both the SCU and the SCP support Hanging Protocol information.
- The Hanging Protocol information is stored in some medium.
- For some time frame, the Hanging Protocol information may be accessed.

- 20 Notes:
1. Support for the Hanging Protocol Storage SOP Class does not imply support for the Hanging Protocol Query/Retrieve Service Class.
  - 22 2. The duration of the storage is also implementation dependent, but is described in the Conformance Statement of the SCP.
  - 24 3. The Hanging Protocol Storage SOP Class is intended to be used in a variety of environments: e.g., for workstations to transfer Hanging Protocol SOP Instances to other workstations or archives, for archives to transfer Hanging Protocol SOP Instances to workstations, etc.

**Z.2 ASSOCIATION NEGOTIATION**

28 The Association negotiation rules as defined in PS 3.7 apply to the SOP Class of this Service Class. No SOP Class specific application information is used.

30 **Z.3 CONFORMANCE OVERVIEW**

32 The application-level services addressed by this Service Class definition are specified in a single SOP Class: Hanging Protocol Storage SOP Class.

## Z.4 HANGING PROTOCOL STORAGE SOP CLASS

2 This Section defines the SCU and SCP behavior for the Hanging Protocol Storage SOP Class.  
4 The C-STORE DIMSE-C Service shall be the mechanism used to transfer Hanging Protocol SOP  
Instances between peer DICOM AEs as described in PS 3.7.

### Z.4.1 Service Class User

6 The DICOM AE that claims conformance to this SOP Class as an SCU shall be capable of  
8 sending a Hanging Protocol SOP Instance that meets the requirements of the Hanging Protocol  
IOD. It shall be invoked by the SCU through the use of the DIMSE C-STORE request used in  
conjunction with this SOP Class.

10 The SCU shall include a Data Set with the Attributes as defined in the Hanging Protocol IOD in  
PS 3.3.

12 The SCU shall recognize the status of the C-STORE service and take appropriate action based  
14 on the success or failure of the service. This SOP Class places no further requirements on what  
the SCU shall do other than that it shall distinguish between successful and failed C-STORE  
16 responses. This behavior shall be documented as part of the SOP Class Conformance  
Statement.

### Z.4.2 Service Class Provider

18 The DICOM AE that claims conformance to this SOP Class as an SCP shall receive a Hanging  
20 Protocol SOP Instance through the use of the DIMSE C-STORE service used in conjunction with  
this SOP Class.

22 The SCP shall store and provide access to all Type 1, Type 2, and Type 3 Attributes defined in  
the Hanging Protocol IOD, as well as any Standard Extended Attributes (including Private  
Attributes) included in the SOP Instance. The SCP may, but is not required to validate that the  
24 Attributes of the Hanging Protocol SOP Instance meet the requirements of the Hanging Protocol  
IOD. The SCP shall not modify the values of any Attributes in the Hanging Protocol SOP  
26 Instance without assigning a new SOP Instance UID.

28 If a display device acting as an SCP applies a Hanging Protocol to a set of images, all mandatory  
Hanging Protocol and presentation intent attributes shall be applied.

30 The SCP shall return, via the C-STORE response primitive, the Response Status Code applicable  
to the associated request. By performing this service successfully, the SCP indicates that the  
32 Hanging Protocol SOP Instance has been successfully stored. Table Z.4-1 shows the response  
status values. General status code values and fields related to status code values are defined in  
PS 3.7.

34

**Table Z.4-1  
C-STORE RESPONSE STATUS VALUES**

<b>Service Status</b>	<b>Further Meaning</b>	<b>Status Codes</b>	<b>Related Fields</b>
Failure	Refused: Out of Resources	A700	(0000,0902)
	Error: Data Set Does Not Match SOP Class	A900	(0000,0901) (0000,0902)
	Error: Cannot Understand	C000	(0000,0901) (0000,0902)
Success		0000	None

36

2 Note: Status Codes are returned in DIMSE response messages (See PS 3.7). The code values stated in  
column "Status Codes" are returned in Status Command Element (0000,0900).

### 3 **Z.4.3 Hanging Protocol Storage SOP Class UID**

4 The Hanging Protocol Storage SOP Class shall be uniquely identified by the Hanging Protocol  
Storage SOP Class UID, which shall have a value "1.2.840.10008.5.1.4.38.1".

### 6 **Z.4.4 Conformance Statement Requirements**

7 An implementation may conform to the Hanging Protocol Storage SOP Class as an SCU, SCP or  
8 both. The Conformance Statement shall be in the format defined in PS 3.2.

#### 9 **Z.4.4.1 SCU Conformance Requirements**

10 An implementation that conforms to the Hanging Protocol Storage SOP Class as an SCU that is a  
creator of Hanging Protocol SOP Instances shall state in its Conformance Statement:

- 12 - The manner in which the values of the Hanging Protocol IOD Attributes are derived from  
displayed images, layouts, operator intervention or defaults.
- 14 - Any Private Attributes that are used as the value of Selector Attribute (0072,0026) in the  
Image Set Selector Sequence, Filter Operations Sequence or Sorting Operations  
16 Sequence.
- The optional Attributes that may be included in a Hanging Protocol SOP Instance.
- 18 - The behavior of the SCU in the case of a successful C-STORE response status.
- The behavior of the SCU in each case of a failure C-STORE response status.

#### 20 **Z.4.4.2 SCP Conformance Requirements**

21 An implementation that conforms to the Hanging Protocol Storage SOP Class as an SCP that  
22 interprets Hanging Protocol SOP Instances for display shall state in its Conformance Statement:

- 24 - The range of display environments that the SCP will support (e.g., number of screens,  
size of screens, overlapping image boxes).
- 26 - The optional Attributes of the Hanging Protocol IOD that it is capable of interpreting and  
those that are not supported.
- 28 - Description of application behavior when the value of Partial Data Display Handling  
(0072,0208) is ADAPT\_LAYOUT or zero length.
- 30 - Description of application behavior when the display environment of the Hanging Protocol  
Instance differs from the display environment of the application, with respect to  
preserving layout versus spatial resolution.
- 32 - The Image Storage SOP Classes for which the Hanging Protocol Storage SOP Class is  
supported

34 An implementation that conforms to the Hanging Protocol Storage SOP Class as an SCP shall  
state in its Conformance Statement:

- 36 - The behavior of the SCP in the case of a successful C-STORE operation, including the  
access method for a stored Hanging Protocol SOP Instance, and the duration of the  
38 storage.

- 2           - The meaning of each case of a failure C-STORE response status, as well as appropriate  
recovery action.

4    Item #9: Add the following Annex

## **Annex Y           HANGING PROTOCOL QUERY/RETRIEVE SERVICE CLASS**

### **6    Y.1 OVERVIEW**

#### **Y.1.1 Scope**

8    The Hanging Protocol Query/Retrieve Service Class defines an application-level class-of-service  
that facilitates access to Hanging Protocol composite objects. It provides query and  
10   retrieve/transfer capabilities similar to the Basic Worklist Management Service Class and  
Query/Retrieve Service Class.

#### **12   Y.1.2 Conventions**

See Conventions for the Basic Worklist Management Service (K.1.2).

#### **14   Y.1.3 Query/Retrieve Information Model**

16   In order to serve as an SCP of the Hanging Protocol Query/Retrieve Service Class, a DICOM AE  
possesses information about the Attributes of a number of Hanging Protocol composite SOP  
Instances. The information is organized into a Hanging Protocol Information Model.

#### **18   Y.1.4 Service Definition**

20   Two peer DICOM AEs implement a SOP Class of the Hanging Protocol Query/Retrieve Service  
Class with one serving in the SCU role and one serving in the SCP role. SOP Classes of the  
Hanging Protocol Query/Retrieve Service Class are implemented using the DIMSE-C C-FIND and  
22   C-MOVE services as defined in PS 3.7.

24   The semantics of the C-FIND service are the same as those defined in the Service Definition of  
the Basic Worklist Management Service Class.

26   The semantics of the C-MOVE service are the same as those defined in the Service Definition of  
the Query/Retrieve Service Class, with the exception that there is only one level of retrieval.

### **Y.2 HANGING PROTOCOL INFORMATION MODEL DEFINITION**

28   The Hanging Protocol Information Model is identified by the SOP Class negotiated at Association  
establishment time. The SOP Class is composed of both an Information Model and a DIMSE-C  
30   Service Group.

32   The Hanging Protocol Information Model is defined, with the Entity-Relationship Model Definition  
and Key Attributes Definition analogous to those defined in the Worklist Information Model  
Definition of the Basic Worklist Management Service.

### **34   Y.3 HANGING PROTOCOL INFORMATION MODEL**

The Hanging Protocol Information Model is based upon a one level entity:

- 36                   — Hanging Protocol object instance

2 The Hanging Protocol object instance contains Attributes associated with the Hanging Protocol  
object IE of the Composite IODs as defined in PS 3.3.

**Y.4 DIMSE-C SERVICE GROUPS**

4 **Y.4.1 C-FIND Operation**

6 See the C-FIND Operation definition for the Basic Worklist Management Service Class (K.4.1),  
and substitute “Hanging Protocol” for “Worklist. The “Worklist” Search Method shall be used.

8 The SOP Class UID identifies the Hanging Protocol Information Model against which the C-FIND  
is to be performed. The Key Attributes and values allowable for the query are defined in the SOP  
Class definition for the Hanging Protocol Information Model.

10 **Y.4.2 C-MOVE Operation**

12 See the C-MOVE Operation definition for the Query/Retrieve Service Class (C.4.2). No Extended  
Behavior or Relational-Retrieve is defined for the Hanging Protocol Query/Retrieve Service Class.

14 Query/Retrieve Level (0008,0052) is not relevant to the Hanging Protocol Query/Retrieve Service  
Class, and therefore shall not be present in the Identifier. The only Unique Key Attribute of the  
Identifier shall be SOP Instance UID (0008,0018). The SCU shall supply one UID or a list of  
16 UIDs.

Note: More than one entity may be retrieved, using List of UID matching.

18 **Y.5 ASSOCIATION NEGOTIATION**

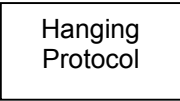
See the Association Negotiation definition for the Basic Worklist Management Service Class (K.5).

20 **Y.6 SOP CLASS DEFINITIONS**

**Y.6.1 Hanging Protocol Information Model**

22 **Y.6.1.1 E/R Model**

24 The Hanging Protocol Information Model consists of a single entity. In response to a given C-  
FIND request, the SCP shall send one C-FIND response per matching Hanging Protocol  
Instance.



**Figure Y.6-1 HANGING PROTOCOL INFORMATION MODEL E/R DIAGRAM**

28 **Y.6.1.2 Hanging Protocol Attributes**

Table Y.6-1 defines the Attributes of the Hanging Protocol Information Model:

30 **Table Y.6-1  
Attributes for the Hanging Protocol Information Model**

Description / Module	Tag	Match- ing Key Type	Return Key Type	Remark / Matching Type
<b>SOP Common</b>				

Description / Module	Tag	Match- ing Key Type	Return Key Type	Remark / Matching Type
Specific Character Set	(0008,0005)	-	1C	This attribute is required if expanded or replacement character sets are used. See C.2.2.2 and C.4.1.1.
SOP Class UID	(0008,0016)	R	1	
SOP Instance UID	(0008,0018)	U	1	
<b>Hanging Protocol Definition</b>				
Hanging Protocol Name	(0072,0002)	R	1	This attribute shall be retrieved with Single Value, Wild Card or Universal matching.
Hanging Protocol Description	(0072,0004)	-	1	
Hanging Protocol Level	(0072,0006)	R	1	This attribute shall be retrieved with Single Value or Universal matching.
Hanging Protocol Creator	(0072,0008)	-	1	
Hanging Protocol Creation Datetime	(0072,000A)	-	1	
Hanging Protocol Definition Sequence	(0072,000C)	R	1	This attribute shall be retrieved with Sequence or Universal matching.
>Modality	(0008,0060)	R	2	This attribute shall be retrieved with Single Value or Universal matching.
>Anatomic Region Sequence	(0008,2218)	R	2	This attribute shall be retrieved with Sequence or Universal matching.
>> Code Value	(0008,0100)	R	1	This attribute shall be retrieved with Single Value or Universal matching.
>> Coding Scheme Designator	(0008,0102)	R	1	This attribute shall be retrieved with Single Value or Universal matching.
>>>Coding Scheme Version	(0008,0103)	-	3	
>>>Code Meaning	(0008,0104)	-	1	
>Laterality	(0020,0060)	R	2	This attribute shall be retrieved with Single Value or Universal matching.
> Procedure Code Sequence	(0008,1032)	R	2	This attribute shall be retrieved with Sequence or Universal matching.
>> Code Value	(0008,0100)	R	1	This attribute shall be retrieved with Single Value or Universal matching.
>> Coding Scheme Designator	(0008,0102)	R	1	This attribute shall be retrieved with Single Value or Universal matching.
>>>Coding Scheme Version	(0008,0103)	-	3	



Description / Module	Tag	Match- ing Key Type	Return Key Type	Remark / Matching Type
>>Code Meaning	(0008,0104)	-	1	
>Reason for Requested Procedure Code Sequence	(0040,100A)	R	2	This attribute shall be retrieved with Sequence or Universal matching.
>> Code Value	(0008,0100)	R	1	This attribute shall be retrieved with Single Value or Universal matching.
>> Coding Scheme Designator	(0008,0102)	R	1	This attribute shall be retrieved with Single Value or Universal matching.
>>Coding Scheme Version	(0008,0103)	-	3	
>>Code Meaning	(0008,0104)	-	1	
Number of Priors Referenced	(0072,0014)	R	1	This attribute shall be retrieved with Single Value or Universal matching.
Hanging Protocol User Identification Code Sequence	(0072,000E)	R	2	This attribute shall be retrieved with Sequence or Universal matching.
>Code Value	(0008,0100)	R	1	This attribute shall be retrieved with Single Value or Universal matching.
>Coding Scheme Designator	(0008,0102)	R	1	This attribute shall be retrieved with Single Value or Universal matching.
>Coding Scheme Version	(0008,0103)	-	3	
>Code Meaning	(0008,0104)	-	1	
Hanging Protocol User Group Name	(0072,0010)	R	3	
<b>Hanging Protocol Environment</b>				
Number of Screens	(0072,0100)	R	2	
Nominal Screen Definition Sequence	(0072,0102)	-	2	
>Number of Vertical Pixels	(0072,0104)	-	1	
>Number of Horizontal Pixels	(0072,0106)	-	1	
>Display Environment Spatial Position	(0072,0108)	-	1	
>Screen Minimum Grayscale Bit Depth	(0072,010A)	-	1C	Required if Screen Minimum Color Bit Depth (0072,010C) is not present.
>Screen Minimum Color Bit Depth	(0072,010C)	-	1C	Required if Screen Minimum Grayscale Bit Depth (0072,010A) is not present.
>Application Maximum Repaint Time	(0072,010E)	-	3	

### **Y.6.1.3 Conformance Requirements**

2 An implementation may conform to one of the Hanging Protocol Information Model SOP Classes as an SCU, SCP or both. The Conformance Statement shall be in the format defined in PS 3.2.

#### **4 Y.6.1.3.1 SCU Conformance**

##### **Y.6.1.3.1.1 C-FIND SCU Conformance**

6 An implementation that conforms to one of the Hanging Protocol Information Model SOP Classes shall support queries against the Hanging Protocol Information Model using the C-FIND SCU Behavior described for the Basic Worklist Management Service Class (see K.4.1.2 and Y.4.1).

10 An implementation that conforms to one of the Hanging Protocol Information Model SOP Classes as an SCU shall state in its Conformance Statement whether it requests Type 3 Return Key Attributes, and shall list these Optional Return Key Attributes.

12 An implementation that conforms to one of the Hanging Protocol Information Model SOP Classes as an SCU shall state in its Conformance Statement how it makes use of Specific Character Set (0008,0005) when encoding queries and interpreting responses.

##### **Y.6.1.3.1.2 C-MOVE SCU Conformance**

16 An implementation that conforms to one of the Hanging Protocol Information Model SOP Classes as an SCU shall support transfers against the Hanging Protocol Information Model using the C-MOVE SCU baseline behavior described for the Query/Retrieve Service Class (see C.4.2.2.1 and Y.4.2).

#### **20 Y.6.1.3.2 SCP Conformance**

##### **Y.6.1.3.2.1 C-FIND SCP Conformance**

22 An implementation that conforms to one of the Hanging Protocol Information Model SOP Classes as an SCP shall support queries against the Hanging Protocol Information Model using the C-FIND SCP Behavior described for the Basic Worklist Management Service Class (see K.4.1.3).

26 An implementation that conforms to one of the Hanging Protocol Information Model SOP Classes as an SCP shall state in its Conformance Statement whether it supports Type 3 Return Key Attributes, and shall list these Optional Return Key Attributes.

28 An implementation that conforms to one of the the Hanging Protocol Information Model SOP Classes as an SCP shall state in its Conformance Statement how it makes use of Specific Character Set (0008,0005) when interpreting queries, performing matching and encoding responses.

##### **32 Y.6.1.3.2.2 C-MOVE SCP Conformance**

34 An implementation that conforms to one of the Hanging Protocol Information Model SOP Classes as an SCP shall support transfers against the Hanging Protocol Information Model using the C-MOVE SCP baseline behavior described for the Query/Retrieve Service Class (see C.4.2.3.1).

36 An implementation that conforms to one of the Hanging Protocol Information Model SOP Classes as an SCP, which generates transfers using the C-MOVE operation, shall state in its Conformance Statement the Hanging Protocol Storage Service Class SOP Class under which it shall support the C-STORE sub-operations generated by the C-MOVE.

**Y.6.1.4 SOP Classes**

- 2 The SOP Classes of the Hanging Protocol Information Model in the Hanging Protocol Query/Retrieve Service Class identify the Hanging Protocol Information Model, and the DIMSE-C
- 4 operations supported. The following Standard SOP Classes are identified:

<b>SOP Class Name</b>	<b>SOP Class UID</b>
Hanging Protocol Information Model - FIND	1.2.840.10008.5.1.4.38.2
Hanging Protocol Information Model - MOVE	1.2.840.10008.5.1.4.38.3

**Part 6 Addendum**

2 **Item #10: Add the following Data Elements to Part 6 Section 6 Registry of DICOM data elements:**

<b>Tag</b>	<b>Name</b>	<b>VR</b>	<b>VM</b>
(0072,0002)	Hanging Protocol Name	SH	1
(0072,0004)	Hanging Protocol Description	LO	1
(0072,0006)	Hanging Protocol Level	CS	1
(0072,0008)	Hanging Protocol Creator	LO	1
(0072,000A)	Hanging Protocol Creation Datetime	DT	1
(0072,000C)	Hanging Protocol Definition Sequence	SQ	1
(0072,000E)	Hanging Protocol User Identification Code Sequence	SQ	1
(0072,0010)	Hanging Protocol User Group Name	LO	1
(0072,0012)	Source Hanging Protocol Sequence	SQ	1
(0072,0014)	Number of Priors Referenced	US	1
(0072,0020)	Image Sets Sequence	SQ	1
(0072,0022)	Image Set Selector Sequence	SQ	1
(0072,0024)	Image Set Selector Usage Flag	CS	1
(0072,0026)	Selector Attribute	AT	1
(0072,0028)	Selector Value Number	US	1
(0072,0030)	Time Based Image Sets Sequence	SQ	1
(0072,0032)	Image Set Number	US	1
(0072,0034)	Image Set Selector Category	CS	1
(0072,0038)	Relative Time	US	2
(0072,003A)	Relative Time Units	CS	1
(0072,003C)	Abstract Prior Value	SS	2
(0072,003E)	Abstract Prior Code Sequence	SQ	1

<b>Tag</b>	<b>Name</b>	<b>VR</b>	<b>VM</b>
(0072,0040)	Image Set Label	LO	1
(0072,0050)	Selector Attribute VR	CS	1
(0072,0052)	Selector Sequence Pointer	AT	1
(0072,0054)	Selector Sequence Pointer Private Creator	LO	1
(0072,0056)	Selector Attribute Private Creator	LO	1
(0072,0060)	Selector AT Value	AT	1-n
(0072,0062)	Selector CS Value	CS	1-n
(0072,0064)	Selector IS Value	IS	1-n
(0072,0066)	Selector LO Value	LO	1-n
(0072,0068)	Selector LT Value	LT	1-n
(0072,006A)	Selector PN Value	PN	1-n
(0072,006C)	Selector SH Value	SH	1-n
(0072,006E)	Selector ST Value	ST	1-n
(0072,0070)	Selector UT Value	UT	1-n
(0072,0072)	Selector DS Value	DS	1-n
(0072,0074)	Selector FD Value	FD	1-n
(0072,0076)	Selector FL Value	FL	1-n
(0072,0078)	Selector UL Value	UL	1-n
(0072,007A)	Selector US Value	US	1-n
(0072,007C)	Selector SL Value	SL	1-n
(0072,007E)	Selector SS Value	SS	1-n
(0072,0080)	Selector Code Sequence Value	SQ	1
(0072,0100)	Number of Screens	US	1
(0072,0102)	Nominal Screen Definition Sequence	SQ	1
(0072,0104)	Number of Vertical Pixels	US	1
(0072,0106)	Number of Horizontal Pixels	US	1

<b>Tag</b>	<b>Name</b>	<b>VR</b>	<b>VM</b>
(0072,0108)	Display Environment Spatial Position	FD	4
(0072,010A)	Screen Minimum Grayscale Bit Depth	US	1
(0072,010C)	Screen Minimum Color Bit Depth	US	1
(0072,010E)	Application Maximum Repaint Time	US	1
(0072,0200)	Display Sets Sequence	SQ	1
(0072,0202)	Display Set Number	US	1
(0072,0204)	Display Set Presentation Group	US	1
(0072,0206)	Display Set Presentation Group Description	LO	1
(0072,0208)	Partial Data Display Handling	CS	1
(0072,0210)	Synchronized Scrolling Sequence	SQ	1
(0072,0212)	Display Set Scrolling Group	US	2-n
(0072,0214)	Navigation Indicator Sequence	SQ	1
(0072,0216)	Navigation Display Set	US	1
(0072,0218)	Reference Display Sets	US	1-n
(0072,0300)	Image Boxes Sequence	SQ	1
(0072,0302)	Image Box Number	US	1
(0072,0304)	Image Box Layout Type	CS	1
(0072,0306)	Image Box Tile Horizontal Dimension	US	1
(0072,0308)	Image Box Tile Vertical Dimension	US	1
(0072,0310)	Image Box Scroll Direction	CS	1
(0072,0312)	Image Box Small Scroll Type	CS	1
(0072,0314)	Image Box Small Scroll Amount	US	1
(0072,0316)	Image Box Large Scroll Type	CS	1
(0072,0318)	Image Box Large Scroll Amount	US	1
(0072,0320)	Image Box Overlap Priority	US	1
(0072,0330)	Cine Relative to Real-Time	FD	1

Tag	Name	VR	VM
(0072,0400)	Filter Operations Sequence	SQ	1
(0072,0402)	Filter-by Category	CS	1
(0072,0404)	Filter-by Attribute Presence	CS	1
(0072,0406)	Filter-by Operator	CS	1
(0072,0500)	Blending Operation Type	CS	1
(0072,0510)	Reformatting Operation Type	CS	1
(0072,0512)	Reformatting Thickness	FD	1
(0072,0514)	Reformatting Interval	FD	1
(0072,0516)	Reformatting Operation Initial View Direction	CS	1
(0072,0520)	3D Rendering Type	CS	1-n
(0072,0600)	Sorting Operations Sequence	SQ	1
(0072,0602)	Sort-by Category	CS	1
(0072,0604)	Sorting Direction	CS	1
(0072,0700)	Display Set Patient Orientation	CS	2
(0072,0702)	VOI Type	CS	1
(0072,0704)	Pseudo-color Type	CS	1
(0072,0706)	Show Grayscale Inverted	CS	1
(0072,0710)	Show Image True Size Flag	CS	1
(0072,0712)	Show Graphic Annotation Flag	CS	1
(0072,0714)	Show Patient Demographics Flag	CS	1
(0072,0716)	Show Acquisition Techniques Flag	CS	1

2

*Item #11: Add the following UID to Part 6 Annex A Registry of DICOM Unique Identifiers (UID):*

4

UID Value	UID Name	UID Type	Part
-----------	----------	----------	------

1.2.840.10008.5.1.4.38.1	Hanging Protocol Storage	SOP Class	PS 3.4
1.2.840.10008.5.1.4.38.2	Hanging Protocol Information Model – FIND	SOP Class	PS 3.4
1.2.840.10008.5.1.4.38.3	Hanging Protocol Information Model – MOVE	SOP Class	PS 3.4

2

**Part 16 Addendum**

*Item #12: Add the following context group to PS 3.16:*

4

**CID 31 Abstract Priors**

6

This Context Group includes codes that may be used to identify imaging procedures that may be referred to as priors for the purpose of image set selection in Hanging Protocols.

8

**Context ID 31  
Abstract Priors**

10

**Type: Extensible      Version: 20050111**

<b>Coding Scheme Designator</b>	<b>Code Value</b>	<b>Code Meaning</b>
SRT	G-7292	On admission
SRT	R-400B2	Intraoperative
SRT	R-41FD9	Pre-admission
SRT	R-411C0	Pre-dose
SRT	R-404DA	Post-dose
SRT	R-413C5	Pre-operative
SRT	R-413B7	Post-operative
DCM	109110	On admission to unit
DCM	109111	On discharge
DCM	109112	On discharge from unit
DCM	109113	Pre-intervention
DCM	109114	Post-intervention
DCM	109115	At last appointment

12

*Item #13: Add the following definitions to PS 3.16, Annex D:*

14



Code Value	Code Meaning	Definition	Notes
...	...	...	...
109110	On admission to unit	The occasion on which a procedure was performed on admission to a specialist unit (e.g., intensive care).	
109111	On discharge	The occasion on which a procedure was performed on discharge from hospital as an in-patient.	
109112	On discharge from unit	The occasion on which a procedure was performed on discharge from a specialist unit (e.g., intensive care).	
109113	Pre-intervention	The occasion on which a procedure was performed immediately prior to non-surgical intervention (e.g, percutaneous angioplasty, biopsy).	
109114	Post-intervention	The occasion on which a procedure was performed immediately after to non-surgical intervention (e.g, percutaneous angioplasty, biopsy).	
109115	At last appointment	The occasion on which a procedure was performed at the most recent outpatient visit.	
...	...	...	...

**Part 2 Addendum**

2 Item #14: Add the following to PS 3.2, Annex A:

4

**Table A.1-2  
UID VALUES**

UID Value	UID NAME	Category
...		
<u>1.2.840.10008.5.1.4.38.1</u>	<b>Hanging Protocol Storage</b>	<b>Transfer</b>
<u>1.2.840.10008.5.1.4.38.2</u>	<b>Hanging Protocol Information Model – FIND</b>	<b>Query/Retrieve</b>
<u>1.2.840.10008.5.1.4.38.3</u>	<b>Hanging Protocol Information Model – MOVE</b>	<b>Query/Retrieve</b>

6

*Item #15: Add the following Informative Annex:*

2

**ANNEX W (Informative) CONFORMANCE STATEMENT  
SAMPLE ImageViewer with Hanging Protocol Support**

4 Disclaimer:

6 This document is an example DICOM Conformance Statement for a fictional image display device for DICOM images and Hanging Protocol objects obtained over the network.

8 As stated in the annex title, this document is truly informative, and not normative. A conformance  
10 statement of an actual product might implement additional services and options as appropriate for  
12 its specific purpose. In addition, an actual product might implement the services described in a  
different manner and, for example, with different characteristics and/or sequencing of activities. In  
other words, this conformance statement example does not intend to standardize a particular  
manner that a product might implement DICOM functionality.

**W.0 COVER PAGE**

2

Company Name: EXAMPLE-ViewingPRODUCTS.

4

Product Name: SAMPLE ImageViewer with Hanging Protocol Support

6

Version: 1.0-rev. A.1

8

Internal document number: 4226-xxx-yyy-zzz rev 1

10

Date: YYYYMMDD

12

**W.1 CONFORMANCE STATEMENT OVERVIEW**

- 2 The application supports accepting Images and Presentation States from remote systems, and  
 4 querying a remote system for Hanging Protocol Instances that may then be retrieved to the local  
 system. It also supports sending locally loaded images and created Presentation State and  
 Hanging Protocol Instances across the network to remote systems.

6

**Table W.1-1  
NETWORK SERVICES**

<b>SOP Classes</b>	<b>User of Service (SCU)</b>	<b>Provider of Service (SCP)</b>
<b>Transfer</b>		
Ultrasound Image Storage	Yes	Yes
Ultrasound Multi-frame Image Storage	Yes	Yes
MR Image Storage	Yes	Yes
Digital Mammography X-Ray Image Storage – For Presentation	Yes	Yes
Grayscale Softcopy Presentation State Storage SOP Class	Yes	Yes
Hanging Protocol Storage	Yes	Yes
<b>Query/Retrieve</b>		
Hanging Protocol Information Model – FIND	Yes	No
Hanging Protocol Information Model – MOVE	Yes	No

8

10

2 **W.2 TABLE OF CONTENTS**

A table of contents shall be provided to assist readers in easily finding the needed information.

4 **W.3 INTRODUCTION**

**W.3.1 Revision History**

<b>Document Version</b>	<b>Date of Issue</b>	<b>Author</b>	<b>Description</b>
1.1	April 30, 2004	WG 11	Version for Letter Ballot

6

**W.3.2 Remarks**

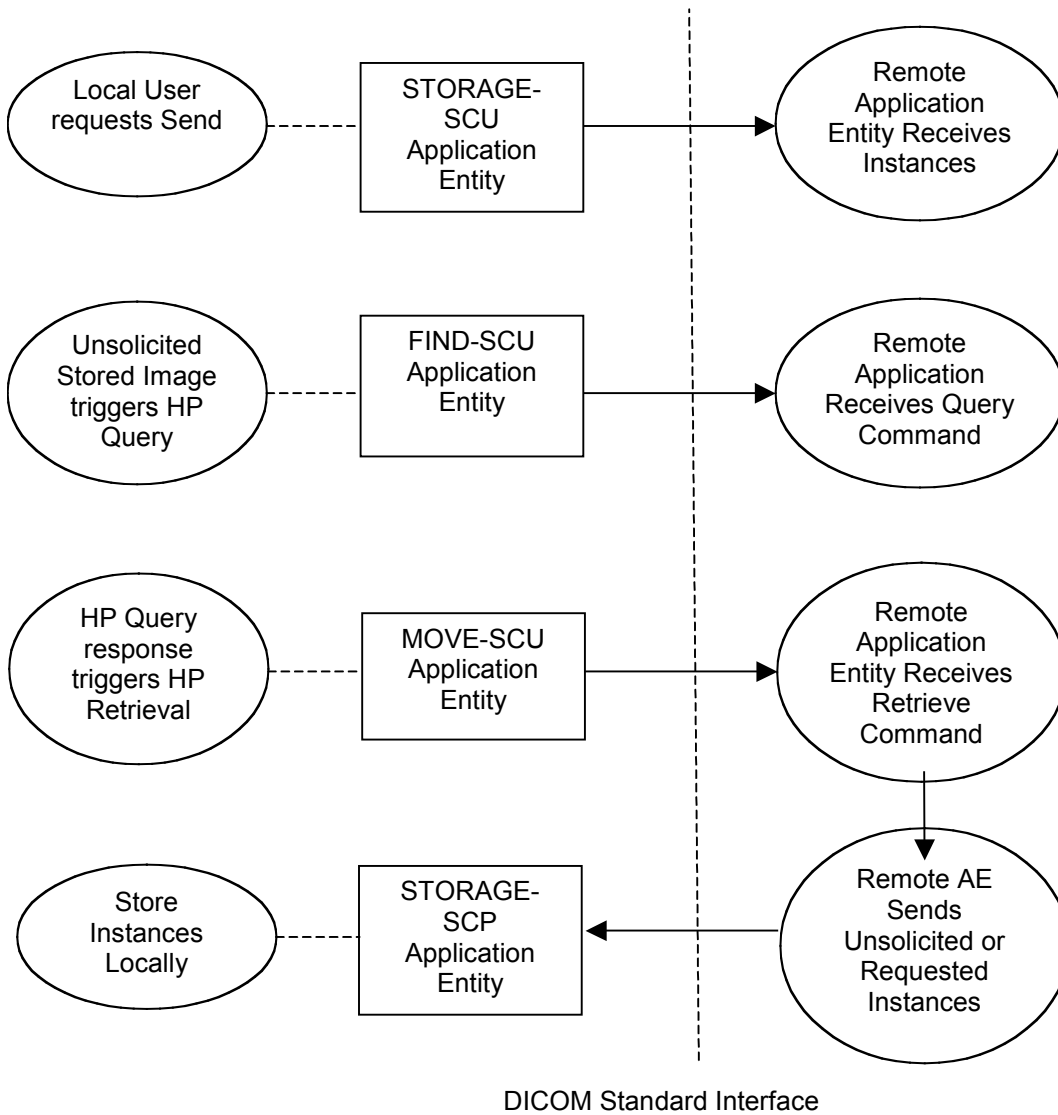
8 This application is supplied for demonstration purposes only and has not been tested or approved for clinical or commercial use.

10

## W.4 NETWORKING

### 2 W.4.1 Implementation Model

#### W.4.1.1 Application Data Flow



4

**Figure W.4.1-1  
Implementation Model**

6

8 The application provides both a user interface, internal database and network listener that spawns additional threads as necessary to handle incoming connections.

8

10 Conceptually the network services may be modeled as the following separate AEs, though in fact all the AEs share a single (configurable) AE Title:

10

- 12 — STORAGE-SCP, which receives incoming Image, Presentation State, and Hanging Protocol Instances

12

- 2       — STORAGE-SCU, which sends outbound Image, Presentation State, and Hanging Protocol Instances
- 4       — FIND-SCU, which queries remote AEs for Hanging Protocol Instances
- 4       — MOVE-SCU, which retrieves Hanging Protocol Instances

**W.4.1.2 Functional Definitions of AE's**

6       **W.4.1.2.1 STORAGE-SCP**

8       STORAGE-SCP waits in the background for connections, will accept associations with Presentation Contexts for SOP Classes of the Storage Service Class and Hanging Protocol Storage Service Class, and will store the received instances to the local database where they may subsequently be listed and viewed through the user interface.

10       **W.4.1.2.2 STORAGE-SCU**

12       STORAGE-SCU is activated through the user interface when a user selects instances from the local database, or the currently displayed instance, and requests that they be sent to a remote AE (selected from a pre-configured list).

14       **W.4.1.2.3 FIND-SCU**

16       FIND-SCU is activated in the background when images for a study are received, to query for matching Hanging Protocols if an appropriate Hanging Protocol Instance is not available in the local database.

18       **W.4.1.2.4 MOVE-SCU**

20       MOVE-SCU is activated in the background, to retrieve Hanging Protocol Instances identified in the query results returned to the FIND-SCU. A connection to the remote AE is established to initiate and monitor the retrieval, and the STORAGE-SCP AE receives the retrieved instances.

22       **W.4.1.3 Sequencing of Real-World Activities**

24       All SCP activities are performed asynchronously in the background and not dependent on any sequencing.

26       Storage SCU activities are sequentially initiated in the user interface, and another activity may not be initiated until the prior activity has completed. Find and Move SCU activities are performed asynchronously in the background, where Move activities are triggered by the results of Find activities.

30       **W.4.2 AE Specifications**

32       **W.4.2.1 STORAGE-SCP**

32       **W.4.2.1.1 SOP Classes**

STORAGE-SCP provide Standard Conformance to the following SOP Class(es):

34

**Table W.4.2-1  
SOP Classes Supported by STORAGE-SCP**

SOP Class Name	SOP Class UID	SCU	SCP
Ultrasound Image Storage	1.2.840.10008.5.1.4.1.1.6.1	No	Yes
Ultrasound Multi-frame Image Storage	1.2.840.10008.5.1.4.1.1.3.1	No	Yes
MR Image Storage	1.2.840.10008.5.1.4.1.1.4	No	Yes

SOP Class Name	SOP Class UID	SCU	SCP
Digital Mammography X-Ray Image Storage – For Presentation	1.2.840.10008.5.1.4.1.1.1.2	No	Yes
Grayscale Softcopy Presentation State Storage	1.2.840.10008.5.1.4.1.1.11.1	No	Yes
Hanging Protocol Storage	1.2.840.10008.5.1.4.38.1	No	Yes

2 **W.4.2.1.2 Association Policies**

**W.4.2.1.2.1 General**

4 STORAGE-SCP accepts but never initiates associations.

6 **Table W.4.2-2  
Maximum PDU Size Received as a SCP for STORAGE-SCP**

Maximum PDU size received	Unlimited
---------------------------	-----------

8 **W.4.2.1.2.2 Number of Associations**

10 **Table W.4.2-3  
Number of Associations as a SCP for STORAGE-SCP**

Maximum number of simultaneous associations	Unlimited
---	-----------

12 **W.4.2.1.2.3 Asynchronous Nature**

14 STORAGE-SCP will only allow a single outstanding operation on an Association. Therefore, STORAGE-SCP will not perform asynchronous operations window negotiation.

**W.4.2.1.2.4 Implementation Identifying Information**

16 **Table W.4.2-4  
DICOM Implementation Class and Version for STORAGE-SCP**

Implementation Class UID	1.2.840.999999.3.6
Implementation Version Name	Viewer1.0

18

**W.4.2.1.3 Association Initiation Policy**

20 STORAGE-SCP does not initiate associations.

**W.4.2.1.4 Association Acceptance Policy**

22 When STORAGE-SCP accepts an association, it will respond to storage requests. If the Called AE Title does not match the pre-configured AE Title shared by all the SCPs of the application, the association will be rejected.

24

**W.4.2.1.4.1 Activity – Receive Storage Request**

26 **W.4.2.1.4.1.1 Description and Sequencing of Activities**

28 As instances are received they are copied to the local file system and a record inserted into the local database. If the received instance is a duplicate of a previously received instance, the old file and database record will be overwritten with the new one.



**W.4.2.1.4.1.2 Accepted Presentation Contexts**

2  
4

**Table W.4.2-5  
Accepted Presentation Contexts for  
STORAGE-SCP and Receive Storage Request**

<b>Presentation Context Table</b>					
<b>Abstract Syntax</b>		<b>Transfer Syntax</b>		<b>Role</b>	<b>Extended Negotiation</b>
<b>Name</b>	<b>UID</b>	<b>Name</b>	<b>UID</b>		
See Table W.4.2-1	See Table W.4.2-1	Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1	SCP	None

6 **W.4.2.1.4.1.2.1 Extended Negotiation**

No extended negotiation is performed, though STORAGE-SCP:

- 8 — is a Level 2 Storage SCP (Full – does not discard any data elements)
- does not support digital signatures
- 10 — does not coerce any received data elements

**W.4.2.1.4.1.3 SOP Specific Conformance**

12 **W.4.2.1.4.1.3.1 SOP Specific Conformance to Storage Service Class**

STORAGE-SCP provides standard conformance to the Storage Service Class.

14 When displaying an image in the viewing application, if a Hanging Protocol Instance is not being applied or the instance being applied does not contain presentation intent attributes, the newest Grayscale Softcopy Presentation State containing references to the image will be automatically applied, and the GSPS Presentation Label and Presentation Description will be displayed. The user has the option to select any other Presentation States that also reference the image. If no Presentation State references the image then no Presentation State will be applied by default. If a Hanging Protocol Instance is being applied, the presentation intent attributes, if present, are used to select the closest matching GSPS instance to apply. If there is no GSPS instance, then the Hanging Protocol Instance presentation intent attributes are applied, if present.

24 All of the Image Storage SOP Classes listed in Table W.4.2-1 are supported as references from instances of the Grayscale Softcopy Presentation State Storage SOP Class.

**W.4.2.1.4.1.3.2 SOP Specific Conformance to Hanging Protocol Storage Service Class**

26 STORAGE-SCP provides standard conformance to the Hanging Protocol Storage Service Class.

28 If Partial Data Display Handling (0072,0208) is zero length, then MAINTAIN\_LAYOUT behavior is applied. If the value is ADAPT\_LAYOUT, then Image Boxes are proportionally resized to occupy all available display space.

30 If the display environment of a Hanging Protocol Instance differs from the display environment of the ImageViewer, then the layout is maintained.

2 The Hanging Protocol SOP instances are stored to a local database until explicitly deleted. When  
a study is selected for display, the application automatically applies a Hanging Protocol Instance  
to the study.

4 **W.4.2.1.4.1.3.3 Presentation Context Acceptance Criterion**

6 STORAGE-SCP will always accept any Presentation Context for the supported SOP Classes with  
the supported Transfer Syntaxes. More than one proposed Presentation Context will be accepted  
8 for the same Abstract Syntax if the Transfer Syntax is supported, whether or not it is the same as  
another Presentation Context.

**W.4.2.1.4.1.3.4 Transfer Syntax Selection Policies**

10 STORAGE-SCP prefers explicit Transfer Syntaxes. If offered a choice of Transfer Syntaxes in a  
Presentation Context, it will apply the following priority to the choice of Transfer Syntax:

- 12 a. first encountered explicit Transfer Syntax,  
14 b. default Transfer Syntax.

16 STORAGE-SCP will accept duplicate Presentation Contexts, that is, if it is offered multiple  
Presentation Contexts, each of which offers acceptable Transfer Syntaxes, it will accept all  
Presentation Contexts, applying the same priority for selecting a Transfer Syntax for each.

18 **W.4.2.1.4.1.3.4 Response Status**

20 STORAGE-SCP will behave as described in the Table below when generating the C-STORE  
response command message.

22 **Table W.4.2-6  
Response Status for STORAGE-SCP and Receive Storage Request**

Service Status	Further Meaning	Status Codes	Reason
Failure	Refused: Out of Resources	A700	Never sent
	Error: Data Set does not match SOP Class	A900	Never sent – data set is not checked prior to storage
	Error: Cannot understand	C000	Never sent
Warning	Coercion of Data Elements	B000	Never sent - no coercion is ever performed
	Data Set does not match SOP Class	B007	Never sent - data set is not checked prior to storage
	Elements Discarded	B006	Never sent – all elements are always stored
Success		0000	

24 **W.4.2.2 STORAGE-SCU**

**W.4.2.2.1 SOP Classes**

26 STORAGE-SCU provides Standard Conformance to the following SOP Class(es):

**Table W.4.2-7  
SOP Classes Supported by STORAGE-SCU**

SOP Class Name	SOP Class UID	SCU	SCP
Ultrasound Image Storage	1.2.840.10008.5.1.4.1.1.6.1	Yes	No
Ultrasound Multi-frame Image Storage	1.2.840.10008.5.1.4.1.1.3.1	Yes	No
MR Image Storage	1.2.840.10008.5.1.4.1.1.4	Yes	No
Digital Mammography X-Ray Image Storage – For Presentation	1.2.840.10008.5.1.4.1.1.1.2	Yes	No
Grayscale Softcopy Presentation State Storage	1.2.840.10008.5.1.4.1.1.11.1	Yes	No
Hanging Protocol Storage	1.2.840.10008.5.1.4.38.1	Yes	No

**W.4.2.2.2 Association Policies**

**W.4.2.2.2.1 General**

STORAGE-SCU initiates but never accepts associations.

**Table W.4.2-8  
Maximum PDU Size Received as a SCP for STORAGE-SCU**

Maximum PDU size received	Unlimited
---------------------------	-----------

**W.4.2.2.2.2 Number of Associations**

**Table W.4.2-9  
Number of Associations as a SCP for STORAGE-SCU**

Maximum number of simultaneous associations	1
---	---

**W.4.2.2.2.3 Asynchronous Nature**

STORAGE-SCU will only allow a single outstanding operation on an Association. Therefore, STORAGE-SCU will not perform asynchronous operations window negotiation.

**W.4.2.2.2.4 Implementation Identifying Information**

**Table W.4.2-10  
DICOM Implementation Class and Version for STORAGE-SCU**

Implementation Class UID	1.2.840.999999.3.6
Implementation Version Name	Viewer1.0

**W.4.2.2.3 Association Initiation Policy**

STORAGE-SCU attempts to initiate a new association for each instance it attempts to transfer.

**W.4.2.2.3.1 Activity – Send Storage Request**

**W.4.2.2.3.1.1 Description and Sequencing of Activities**

For each Image, Presentation State, or Hanging Protocol Instance selected from the user interface to be transferred, a single attempt will be made to transmit it to the selected remote AE.

If the send fails, for whatever reason, no retry will be performed, and an attempt will be made to send the next instance.

#### W.4.2.2.3.1.2 Proposed Presentation Contexts

**Table W.4.2-11**  
**Proposed Presentation Contexts for STORAGE-SCU and Receive Storage Request**

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name	UID		
See Table W.4.2-7	See Table W.4.2-7	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1	SCU	None

STORAGE-SCU will propose Presentation Contexts only for the SOP Class of the instance that is to be transferred.

For that SOP Class, STORAGE-SCU will propose multiple Presentation Contexts, one for each of the supported Transfer Syntaxes, and an additional Presentation Context with all of the supported Transfer Syntaxes, in order to determine which Transfer Syntaxes the remote SCP supports, and which it prefers.

#### W.4.2.2.3.1.2.1 Extended Negotiation

No extended negotiation is performed.

#### W.4.2.2.3.1.3 SOP Specific Conformance

##### W.4.2.2.3.1.3.1 SOP Specific Conformance to Storage Service Class

STORAGE-SCU provides standard conformance to the Storage Service Class.

##### W.4.2.2.3.1.3.2 SOP Specific Conformance to Hanging Protocol Storage Service Class

STORAGE-SCU provides standard conformance to the Hanging Protocol Storage Service Class.

In Hanging Protocol Instances created on the Viewer, no Private Attributes are used as the value of Selector Attribute (0072,0026) in any of the Sequence Attributes to which it applies.

##### W.4.2.2.3.1.3.3 Presentation Context Acceptance Criterion

STORAGE-SCU does not accept associations.

##### W.4.2.2.3.1.3.4 Transfer Syntax Selection Policies

STORAGE-SCU prefers explicit Transfer Syntaxes. If offered a choice of Transfer Syntaxes in the accepted Presentation Contexts, it will apply the following priority to the choice of Presentation Context to use for the C-STORE operation:

- a. first encountered explicit Transfer Syntax,
- b. default Transfer Syntax.

##### W.4.2.2.3.1.3.4 Response Status

STORAGE-SCU will behave as described in the Table below in response to the status returned in the C-STORE response command message.

2

**Table W.4.2-12  
Response Behavior for STORAGE-SCU and Send Storage Request**

Service Status	Further Meaning	Status Codes	Behavior
Failure	Refused: Out of Resources	A7xx	The user is notified and the failure is logged
	Error: Data Set does not match SOP Class	A9xx	The user is notified and the failure is logged
	Error: Cannot understand	Cxxx	The user is notified and the failure is logged
Warning	Coercion of Data Elements	B000	Ignored
	Data Set does not match SOP Class	B007	Ignored
	Elements Discarded	B006	Ignored
Success		0000	Ignored

4 **W.4.2.2.4 Association Acceptance Policy**

STORAGE-SCU does not accept associations.

6 **W.4.2.3 FIND-SCU**

**W.4.2.3.1 SOP Classes**

8 FIND-SCU provide Standard Conformance to the following SOP Class(es):

**Table W.4.2-13  
SOP Classes Supported by FIND-SCU**

10

SOP Class Name	SOP Class UID	SCU	SCP
Hanging Protocol Information Model – FIND	1.2.840.10008.5.1.4.38.2	Yes	No

12 **W.4.2.3.2 Association Policies**

**W.4.2.3.2.1 General**

14 FIND-SCU initiates but never accepts associations.

**Table W.4.2-14  
Maximum PDU Size Received as a SCP for FIND-SCU**

16

Maximum PDU size received	Unlimited
---------------------------	-----------

18 **W.4.2.3.2.2 Number of Associations**

**Table W.4.2-15  
Number of Associations as a SCP for FIND-SCU**

20

Maximum number of simultaneous associations	1
---	---

2 **W.4.2.3.2.3 Asynchronous Nature**

FIND-SCU will only allow a single outstanding operation on an Association. Therefore, FIND-SCU will not perform asynchronous operations window negotiation.

4 **W.4.2.3.2.4 Implementation Identifying Information**

6 **Table W.4.2-16  
DICOM Implementation Class and Version for FIND-SCU**

Implementation Class UID	1.2.840.999999.3.6
Implementation Version Name	Viewer1.0

8

**W.4.2.3.3 Association Initiation Policy**

10 FIND-SCU attempts to initiate a new association when a study is received for which an appropriate Hanging Protocol Instance is not already stored in the local database.

12 **W.4.2.3.3.1 Activity – Query Remote AE**

**W.4.2.3.3.1.1 Description and Sequencing of Activities**

14 A single attempt will be made to query the remote AE. If the query fails, for whatever reason, no retry will be performed.

16 **W.4.2.3.3.1.2 Proposed Presentation Contexts**

18 **Table W.4.2-17  
Proposed Presentation Contexts for FIND-SCU and Query Remote AE**

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name	UID		
See Table W.4.2-13	See Table W.4.2-13	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1	SCU	None

20 FIND-SCU will propose multiple Presentation Contexts, one for each of the supported Transfer Syntaxes, and an additional Presentation Context with all of the supported Transfer Syntaxes, in order to determine which Transfer Syntaxes the remote SCP supports, and which it prefers.

**W.4.2.3.3.1.2.1 Extended Negotiation**

24 No extended negotiation is performed.

**W.4.2.3.3.1.3 SOP Specific Conformance**

26 **W.4.2.3.3.1.3.1 SOP Specific Conformance to C-FIND SOP Classes**

FIND-SCU provides standard conformance to the supported C-FIND SOP Class.

28 The following applies to Hanging Protocol Information Model C-FIND.

30 If present in the response, Specific Character Set will be used to identify character sets other than the default character set for matching between Hanging Protocol and Image Instances.

<b>Name</b>	<b>Tag</b>	<b>Types of Matching</b>
SOP Class UID	(0008,0016)	zero length
SOP Instance UID	(0008,0018)	zero length
Hanging Protocol Name	(0072,0002)	S, *, U
Hanging Protocol Description	(0072,0004)	zero length
Hanging Protocol Level	(0072,0006)	S, U
Hanging Protocol Creator	(0072,0008)	zero length
Hanging Protocol Creation Datetime	(0072,000A)	zero length
Hanging Protocol Definition Sequence	(0072,000C)	SQ, U
>Modality	(0008,0060)	From list (US, MR, MG) or zero length
>Anatomic Region Sequence	(0008,2218)	From CID 4, PS 3.16 or zero length
>> Code Value	(0008,0100)	S, U
>> Coding Scheme Designator	(0008,0102)	S, U
>>Coding Scheme Version	(0008,0103)	zero length
>>Code Meaning	(0008,0104)	zero length
>Laterality	(0020,0060)	From list (R, L, U, B) or zero length
> Procedure Code Sequence	(0008,1032)	zero length
>Reason for Requested Procedure Code Sequence	(0040,100A)	zero length
Number of Priors Referenced	(0072,0014)	zero length
Hanging Protocol User Identification Code Sequence	(0072,000E)	From list of local coded terms or zero length
>Code Value	(0008,0100)	S, U
>Coding Scheme Designator	(0008,0102)	S, U
>Coding Scheme Version	(0008,0103)	zero length
>Code Meaning	(0008,0104)	zero length
Hanging Protocol User Group Name	(0072,0010)	zero length
Number of Screens	(0072,0100)	zero length
Nominal Screen Definition Sequence	(0072,0102)	zero length

2 **W.4.2.3.3.1.3.2 Presentation Context Acceptance Criterion**

FIND-SCU does not accept associations.

4 **W.4.2.3.3.1.3.3 Transfer Syntax Selection Policies**

6 FIND-SCU prefers explicit Transfer Syntaxes. If offered a choice of Transfer Syntaxes in the  
accepted Presentation Contexts, it will apply the following priority to the choice of Presentation  
Context to use for the C-FIND operation:

- 8 a. first encountered explicit Transfer Syntax,  
b. default Transfer Syntax.

10 **W.4.2.3.3.1.3.4 Response Status**

12 FIND-SCU will behave as described in Table W.4.2-19 in response to the status returned in the  
C-FIND response command message(s).

14 **Table W.4.2-19  
Response Status for FIND-SCU and Query Remote AE Request**

<b>Service Status</b>	<b>Further Meaning</b>	<b>Status Codes</b>	<b>Behavior</b>
Refused	Out of Resources	A700	Current query is terminated; remaining queries continue
Error	Identifier does not match SOP Class	A900	Current query is terminated; remaining queries continue
	Unable to process	Cxxx	Current query is terminated; remaining queries continue
Cancel	Matching terminated due to Cancel request	FE00	Ignored (should never occur, since cancels never issued)
Success	Matching is complete - No final Identifier is supplied	0000	Current query is terminated. If one or more Pending responses were received, logic is applied to trigger Retrieve of best suited Hanging Protocol Instances; remaining queries continue
Pending	Matches are continuing - Current Match is supplied and any Optional Keys were supported in the same manner as Required Keys	FF00	Identifier stored temporarily for use in setting up Retrieve.
	Matches are continuing - Warning that one or more Optional Keys were not supported for existence and/or	FF01	Identifier stored temporarily for use in setting up Retrieve



Service Status	Further Meaning	Status Codes	Behavior
	matching for this Identifier		

2 **W.4.2.3.4 Association Acceptance Policy**

FIND-SCU does not accept associations.

4 **W.4.2.4 MOVE-SCU**

**W.4.2.4.1 SOP Classes**

6 MOVE-SCU provide Standard Conformance to the following SOP Class(es):

8 **Table W.4.2-20  
SOP Classes Supported by MOVE-SCU**

SOP Class Name	SOP Class UID	SCU	SCP
Hanging Protocol Information Model – MOVE	1.2.840.10008.5.1.4.38.3	Yes	No

10 **W.4.2.4.2 Association Policies**

**W.4.2.4.2.1 General**

12 MOVE-SCU initiates but never accepts associations.

14 **Table W.4.2-21  
Maximum PDU Size Received as a SCP for MOVE-SCU**

Maximum PDU size received	Unlimited
---------------------------	-----------

16 **W.4.2.4.2.2 Number of Associations**

18 **Table W.4.2-27  
Number of Associations as a SCP for MOVE-SCU**

Maximum number of simultaneous associations	1
---	---

20 **W.4.2.4.2.3 Asynchronous Nature**

22 MOVE-SCU will only allow a single outstanding operation on an Association. Therefore, MOVE-SCU will not perform asynchronous operations window negotiation.

**W.4.2.4.2.4 Implementation Identifying Information**

24 **Table W.4.2-23  
DICOM Implementation Class and Version for MOVE-SCU**

Implementation Class UID	1.2.840.999999.3.6
Implementation Version Name	Viewer1.0

26

**W.4.2.4.3 Association Initiation Policy**

28 MOVE-SCU attempts to initiate a new association when the results of the FIND-SCU indicate matching Hanging Protocol Instances to retrieve.

**W.4.2.4.3.1 Activity – Retrieve From Remote AE**

2 **W.4.2.4.3.1.1 Description and Sequencing of Activities**

4 A single attempt will be made to retrieve Hanging Protocol Instances from the remote AE. If the retrieve fails, for whatever reason, no retry will be performed.

**W.4.2.4.3.1.2 Proposed Presentation Contexts**

6 **Table W.4.2-24  
Proposed Presentation Contexts for MOVE-SCU and Retrieve From Remote AE**

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name	UID		
See Table W.4.2-20	See Table W.4.2-20	Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1	SCP	None

8  
10 MOVE-SCU will propose multiple Presentation Contexts, one for each of the supported Transfer Syntaxes, and an additional Presentation Context with all of the supported Transfer Syntaxes, in order to determine which Transfer Syntaxes the remote SCP supports, and which it prefers.

12 **W.4.2.4.3.1.2.1 Extended Negotiation**

No extended negotiation is performed.

14 **W.4.2.4.3.1.3 SOP Specific Conformance**

**W.4.2.4.3.1.3.1 SOP Specific Conformance to C-FIND SOP Classes**

16 MOVE-SCU provides standard conformance to the supported C-MOVE SOP Class.

No CANCEL requests are ever issued.

18 The retrieval is performed from the AE that was specified in the Retrieve AE attribute returned from the query performed by FIND-SCU. The instances are retrieved to the current application's local database by specifying the destination as the AE Title of the STORE-SCP AE of the local application. This implies that the remote C-MOVE SCP must be preconfigured to determine the presentation address corresponding to the STORE-SCP AE. The STORE-SCP AE will accept storage requests addressed to it from anywhere, so no pre-configuration of the local application to accept from the remote AE is necessary (except in so far as it was necessary to configure FIND-SCU).

26 **Table W.4.2-25  
Request Identifier for MOVE-SCU**

Name	Tag	Request Key
<b>Hanging Protocol</b>		
SOP Instance UID	(0008,0018)	List of UIDs

28  
30 **W.4.2.4.3.1.3.2 Presentation Context Acceptance Criterion**

MOVE-SCU does not accept associations.

**W.4.2.4.3.1.3.3 Transfer Syntax Selection Policies**

2 MOVE-SCU prefers explicit Transfer Syntaxes. If offered a choice of Transfer Syntaxes in the  
4 Context to use for the C-MOVE operation:

- a. first encountered explicit Transfer Syntax,
- 6 b. default Transfer Syntax.

**W.4.2.4.3.1.3.4 Response Status**

8 MOVE-SCU will behave as described in the Table below in response to the status returned in the  
C-MOVE response command message(s).

10

**Table W.4.2-26  
Response Status for MOVE-SCU and Retrieve From Remote AE Request**

Service Status	Further Meaning	Status Codes	Related Fields	Behavior
Refused	Out of Resources - Unable to calculate number of matches	A701	(0000,0902)	Retrieval is terminated
	Out of Resources - Unable to perform sub-operations	A702	(0000,1020) (0000,1021) (0000,1022) (0000,1023)	Retrieval is terminated
	Move Destination unknown	A801	(0000,0902)	Retrieval is terminated
Failed	Identifier does not match SOP Class	A900	(0000,0901) (0000,0902)	Retrieval is terminated
	Unable to process	Cxxx	(0000,0901) (0000,0902)	Retrieval is terminated
Cancel	Sub-operations terminated due to Cancel Indication	FE00	(0000,1020) (0000,1021) (0000,1022) (0000,1023)	Retrieval is terminated (should never occur, since cancels never issued)
Warning	Sub-operations Complete - One or more Failures	B000	(0000,1020) (0000,1022) (0000,1023)	Retrieval is terminated
Success	Sub-operations Complete - No Failures	0000	(0000,1020) (0000,1021) (0000,1022) (0000,1023)	Retrieval is terminated
Pending	Sub-operations are continuing	FF00	(0000,1020) (0000,1021) (0000,1022) (0000,1023)	Retrieval continues

12

**W.4.2.4.3.1.3.5 Sub-operation dependent behavior**

14 Since the C-MOVE operation is dependent on completion of C-STORE sub-operations that are  
16 occurring on a separate association, the question of failure of operations on the other  
association(s) must be considered.

2 MOVE-SCU completely ignores whatever activities are taking place in relation to the STORAGE-  
SCP AE that is receiving the retrieved instances. Once the C-MOVE has been initiated it runs to  
4 completion (or failure) as described in the C-MOVE response command message(s). There is no  
attempt by MOVE-SCU to confirm that instances have actually been successfully received or  
locally stored.

6 Whether or not completely or partially successfully retrievals are made available in the local  
database to the user is purely dependent on the success or failure of the C-STORE sub-  
8 operations, not on any explicit action by MOVE-SCU.

10 Whether or not the remote AE attempts to retry any failed C-STORE sub-operations is beyond the  
control of MOVE-SCU.

12 If the association on which the C-MOVE was issued is aborted for any reason, whether or not the  
C-STORE sub-operations continue is dependent on the remote AE; the local STORAGE-SCP will  
continue to accept associations and storage operations regardless.

#### 14 **W.4.2.4.4 Association Acceptance Policy**

MOVE-SCU does not accept associations.

### 16 **W.4.3 Network Interfaces**

#### **W.4.3.1 Physical Network Interface**

18 The application is indifferent to the physical medium over which TCP/IP executes; which is  
dependent on the underlying operating system and hardware.

#### 20 **W.4.3.2 Additional Protocols**

22 When host names rather than IP addresses are used in the configuration properties to specify  
presentation addresses for remote AEs, the application is dependent on the name resolution  
mechanism of the underlying operating system.

### 24 **W.4.4 Configuration**

26 All configuration is performed through the use of Java properties file(s) stored in pre-defined  
locations that are specific to the underlying operating system. Refer to the Release Notes for  
specific details.

#### 28 **W.4.4.1 AE Title/Presentation Address Mapping**

30 The Calling AE Titles of the local application are configurable in the preferences file. The mapping  
of the logical name by which remote AEs are described in the user interface to Called AE Titles  
as well as presentation address (hostname or IP address and port number) is configurable in the  
32 preferences file.

#### **W.4.4.2 Parameters**

34

**Table W.4.4-1  
Configuration Parameters Table**

Parameter	Configurable	Default Value
<b>General Parameters</b>		
PDU Size	No	16kB
Time-out waiting for acceptance or rejection Response to an Association Open Request. (Application Level timeout)	No	None
General DIMSE level time-out values	No	None

Parameter	Configurable	Default Value
<b>General Parameters</b>		
Time-out waiting for response to TCP/IP connect() request. (Low-level timeout)	No	None
Time-out waiting for acceptance of a TCP/IP message over the network. (Low-level timeout)	No	None
Time-out for waiting for data between TCP/IP packets. (Low-level timeout)	No	None
Any changes to default TCP/IP settings, such as configurable stack parameters.	No	None
<b>AE Specific Parameters (all AEs)</b>		
Size constraint in maximum object size	No	None
Maximum PDU size the AE can receive (see note 1)	No	Unlimited
Maximum PDU size the AE can send	No	Unlimited
AE specific DIMSE level time-out values	No	None
Number of simultaneous Associations by Service and/or SOP Class	No	Unlimited
SOP Class support	No	All supported SOP Classes always proposed and accepted
Transfer Syntax support	No	All supported Transfer Syntaxes always proposed and accepted
Other parameters that are configurable	No	None

2 Notes: 1. Though the application can support unlimited PDU sizes, it will never offer a Maximum  
4 Received PDU Length of zero (unlimited) since this triggers a bug in some older systems.

## W.5 MEDIA INTERCHANGE

2 None supported.

## W.6 SUPPORT OF CHARACTER SETS

### 4 W.6.1 Overview

6 Support extends to correctly decoding and displaying the correct symbol in the supported character sets for all names and strings received over the network, and in the local database.

8 No specific support for sorting of strings other than in the default character set is provided in the browsers.

### W.6.2 Character Sets

10 In addition to the default character repertoire, the Defined Terms for Specific Character Set in Table W.6.2-1 are supported:

12

**Table W.6.2-1  
Supported Specific Character Set Defined Terms**

<b>Character Set Description</b>	<b>Defined Term</b>
Latin alphabet No. 1	ISO_IR 100

14

### W.6.3 Character Set Configuration

16 Whether or not characters are displayed correctly depends on the presence of font support in the underlying operating system.

## 18 W.7 SECURITY

### W.7.1 Security Profiles

20 None supported.

### W.7.2 Association Level Security

22 None supported.

Any Calling AE Titles and/or IP addresses may open an Association.

### 24 W.7.3 Application Level Security

None supported.

## 26 W.8 ANNEXES

### W.8.1 IOD Contents

#### 28 W.8.1.1 Created SOP Instances

30 Table W.8.1-1 specifies the attributes of a Hanging Protocol Instance transmitted by the ImageViewer application.

32 The following tables use a number of abbreviations. The abbreviations used in the "Presence of ..." column are:

34 VNAP Value Not Always Present (attribute sent zero length if no value is present)  
ANAP Attribute Not Always Present

ALWAYS Always Present  
 2 EMPTY Attribute is sent without a value

4 The abbreviations used in the “Source” column:

USER the attribute value source is from User input  
 6 AUTO the attribute value is generated automatically  
 CONFIG the attribute value source is a configurable parameter

8

10 NOTE: All dates and times are encoded in the local configured calendar and time. Date, Time and Time zone are configured using the Service/Installation Tool.

12 **W.8.1.1.1 Hanging Protocol IOD**

14 **Table W.8.1-1  
IOD OF CREATED HANGING PROTOCOL SOP INSTANCES**

IE	Module	Reference	Presence of Module
Hanging Protocol	SOP Common	Table W.8.1-2	ALWAYS
	Hanging Protocol Definition	Table W.8.1-3	ALWAYS
	Hanging Protocol Environment	Table W.8.1-4	ALWAYS
	Hanging Protocol Display	Table W.8.1-5	ALWAYS

16

**Table W.8.1-2  
SOP COMMON MODULE OF CREATED SOP INSTANCES**

Attribute Name	Tag	VR	Value	Presence of Value	Source
Specific Character Set	(0008,0005)	CS	From Table W.6.2-1	ALWAYS	CONFIG
SOP Class UID	(0008,0016)	UI	1.2.840.10008.5.1.4.38.1	ALWAYS	AUTO
SOP Instance UID	(0008,0018)	UI	Generated by device	ALWAYS	AUTO

18

20 **Table W.8.1-3  
HANGING PROTOCOL DEFINITION MODULE OF CREATED SOP INSTANCES**

Attribute Name	Tag	VR	Value	Presence of Value	Source
Hanging Protocol Name	(0072,0002)	SH	From user input.	ALWAYS	USER

Attribute Name	Tag	VR	Value	Presence of Value	Source
Hanging Protocol Description	(0072,0004)	LO	From user input.	ALWAYS	USER
Hanging Protocol Level	(0072,0006)	CS	From user input.	ALWAYS	USER
Hanging Protocol Creator	(0072,0008)	LO	From user login.	ALWAYS	AUTO
Hanging Protocol Creation Datetime	(0072,000A)	DT	Generated by device.	ALWAYS	AUTO
Hanging Protocol Definition Sequence	(0072,000C)	SQ	One or more sequence items.	ALWAYS	AUTO
>Modality	(0008,0060)	CS	From Defined Terms, based on user input.	ANAP	USER/AUTO
>Anatomic Region Sequence	(0008,2218)	SQ	One or more sequence items, based on user input.	ANAP	USER/AUTO
>>Include 'Code Sequence Macro'			Defined Context ID 4		
>Laterality	(0020,0060)	CS	R, L, B, U or zero length, based on user input.	ANAP	USER/AUTO
> Procedure Code Sequence	(0008,1032)	SQ	Zero length.	EMPTY	AUTO
>Reason for Requested Procedure Code Sequence	(0040,100A)	SQ	Zero length.	EMPTY	AUTO
Number of Priors Referenced	(0072,0014)	US	Numeric value.	ALWAYS	AUTO
Image Sets Sequence	(0072,0020)	SQ	One or more sequence items.	ALWAYS	AUTO
>Image Set Selector Sequence	(0072,0022)	SQ	One or more sequence items.	ALWAYS	AUTO
>>Image Set Selector Usage Flag	(0072,0024)	CS	MATCH or NO_MATCH, depending on Selector Attribute.	ALWAYS	AUTO
>>Selector Attribute	(0072,0026)	AT	Relevant Attribute Tags from DICOM Data Dictionary.	ALWAYS	AUTO
>>Selector Sequence Pointer	(0072,0052)	AT	Relevant Sequence Attribute Tags from DICOM Data Dictionary, if Selector Attribute is nested in a Sequence.	ANAP	AUTO
>>Selector Attribute VR	(0072,0050)	CS	VR of Selector Attribute	ALWAYS	AUTO
>>The attribute from the Hanging Protocol Selector Attribute Value Macro that is required by the value of Selector Attribute VR.				ALWAYS	AUTO
>>Selector Value Number	(0072,0028)	US	0,1-n	ALWAYS	AUTO
>Time Based Image Sets Sequence	(0072,0030)	SQ	One or more sequence items.	ALWAYS	AUTO



Attribute Name	Tag	VR	Value	Presence of Value	Source
>>Image Set Number	(0072,0032)	US	Generated by device.	ALWAYS	AUTO
>>Image Set Selector Category	(0072,0034)	CS	RELATIVE_TIME or ABSTRACT_PRIOR, based on user input.	ALWAYS	AUTO
>>Relative Time	(0072,0038)	US	From user input.	ANAP	USER
>>Relative Time Units	(0072,003A)	CS	From user input.	ANAP	USER
>>Abstract Prior Value	(0072,003C)	SS	From user input.	ANAP	USER
>>Image Set Label	(0072,0040)	LO	From user input.	ANAP	USER
Hanging Protocol User Identification Code Sequence	(0072,000E)	SQ	One sequence item.	ALWAYS	USER/AUTO
>>Include 'Code Sequence Macro'			<i>Local coded terms for users</i>		
Hanging Protocol User Group Name	(0072,0010)	LO	From user input.	ANAP	USER/AUTO

2

**Table W.8.1-4  
HANGING PROTOCOL ENVIRONMENT MODULE OF CREATED SOP INSTANCES**

Attribute Name	Tag	VR	Value	Presence of Value	Source
Number of Screens	(0072,0100)	US	2	ALWAYS	AUTO
Nominal Screen Definition Sequence	(0072,0102)	SQ	Two sequence items.	ALWAYS	AUTO
>Number of Vertical Pixels	(0072,0104)	US	1024	ALWAYS	AUTO
>Number of Horizontal Pixels	(0072,0106)	US	1280	ALWAYS	AUTO
>Display Environment Spatial Position	(0072,0108)	FD	Sequence Item 1: 0.0I1.0I0.5I0.0 Sequence Item 2: 0.5I1.0I1.0I0.0	ALWAYS	AUTO
>Screen Minimum Color Bit Depth	(0072,010C)	US	8	ALWAYS	AUTO

4

6

**Table W.8.1-5  
HANGING PROTOCOL DISPLAY MODULE OF CREATED SOP INSTANCES**

Attribute Name	Tag	VR	Value	Presence of Value	Source
Display Sets Sequence	(0072,0200)	SQ	One or more sequence items.	ALWAYS	AUTO
>Display Set Number	(0072,0202)	US	Generated by device.	ALWAYS	AUTO

Attribute Name	Tag	VR	Value	Presence of Value	Source
>Display Set Presentation Group	(0072,0204)	US	1	ALWAYS	AUTO
>Image Set Number	(0072,0032)	US	Determined by application.	ALWAYS	AUTO
>Image Boxes Sequence	(0072,0300)	SQ	One sequence item.	ALWAYS	AUTO
>>Image Box Number	(0072,0302)	US	Generated by device.	ALWAYS	AUTO
>>Display Environment Spatial Position	(0072,0108)	FD	Determined by application with user input.	ALWAYS	AUTO
>>Image Box Layout Type	(0072,0304)	CS	TILED, STACK or SINGLE, determined by application with user input.	ALWAYS	AUTO
>>Image Box Tile Horizontal Dimension	(0072,0306)	US	For TILED, determined by application with user input.	ANAP	AUTO
>>Image Box Tile Vertical Dimension	(0072,0308)	US	For TILED, determined by application with user input.	ANAP	AUTO
>>Image Box Scroll Direction	(0072,0310)	CS	For TILED, VERTICAL or HORIZONTAL, determined by application with user input.	ANAP	AUTO
>>Image Box Small Scroll Type	(0072,0312)	CS	For TILED only, value is IMAGE.	ANAP	AUTO
>>Image Box Small Scroll Amount	(0072,0314)	US	For TILED only, value is 1.	ANAP	AUTO
>>Image Box Large Scroll Type	(0072,0316)	CS	For TILED only, value is ROW_COLUMN.	ANAP	AUTO
>>Image Box Large Scroll Amount	(0072,0318)	US	For TILED only, value is 1.	ANAP	AUTO
>Filter Operations Sequence	(0072,0400)	SQ	Zero or more sequence items.	VNAP	AUTO
>>Filter-by Category	(0072,0402)	CS	IMAGE_PLANE if present.	ANAP	USER/AUTO
>>Selector Attribute	(0072,0026)	AT	(0008,0008) Image Type, (0018,0010) Contrast/Bolus Agent, (0018,0086) Echo Number, (0018,5101) View Position, (0054,0220) View Code Sequence, (0054,0222) View Modifier Code Sequence.	ANAP	USER/AUTO
>>Selector Sequence Pointer	(0072,0052)	AT	Relevant Sequence Attribute Tags from DICOM Data Dictionary, if Selector Attribute is nested in a Sequence, such as (0054,0220) View Code Sequence.	ANAP	AUTO

Attribute Name	Tag	VR	Value	Presence of Value	Source
>>Selector Attribute VR	(0072,0050)	CS	VR of Selector Attribute, if present	ANAP	AUTO
>>The attribute from the Hanging Protocol Selector Attribute Value Macro that is required by the value of Selector Attribute VR, if present.				ANAP	AUTO
>>Selector Value Number	(0072,0028)	US	3 for (0008,0008) Image Type, 1 for other Selector Attributes.	ANAP	AUTO
>>Filter-by Operator	(0072,0406)	CS	MEMBER_OF or NOT_MEMBER_OF.	ALWAYS	USER
>Sorting Operations Sequence	(0072,0600)	SQ	Zero or more sequence items.	VNAP	AUTO
>>Selector Attribute	(0072,0026)	AT	(0008,0032) Acquisition Time, (0018,0086) Echo Time, (0020,0013) Instance Number.	ANAP	USER
>>Selector Sequence Pointer	(0072,0052)	AT	Relevant Sequence Attribute Tags from DICOM Data Dictionary, if Selector Attribute is nested in a Sequence.	ANAP	AUTO
>>Selector Value Number	(0072,0028)	US	1 for most Selector Attributes, if present.	ANAP	AUTO
>>Sort-by Category	(0072,0602)	CS	ALONG_AXIS	ANAP	USER
>>Sorting Direction	(0072,0604)	CS	INCREASING or DECREASING	ALWAYS	USER
>Display Set Patient Orientation	(0072,0700)	CS	From user input or automated algorithm.	ANAP	USER/AUTO
>VOI Type	(0072,0702)	CS	From user input or automated algorithm.	ANAP	USER/AUTO
>Show Image True Size Flag	(0072,0710)	CS	NO	ALWAYS	AUTO
>Show Graphic Annotation Flag	(0072,0712)	CS	YES	ALWAYS	AUTO
>Show Patient Demographics Flag	(0072,0714)	CS	YES	ALWAYS	AUTO
>Show Acquisition Techniques Flag	(0072,0716)	CS	YES	ALWAYS	AUTO
Partial Data Display Handling	(0072,0208)	CS	MAINTAIN_LAYOUT	ALWAYS	AUTO
Synchronized Scrolling Sequence	(0072,0210)	SQ	Zero or more sequence items, based on user input or automated algorithm.	ANAP	USER/AUTO
>Display Set Scrolling Group	(0072,0212)	US	Display Set numbers.	ALWAYS	AUTO
Navigation Indicator Sequence	(0072,0214)	SQ	Zero or more sequence items, based on user input.	ANAP	USER

Attribute Name	Tag	VR	Value	Presence of Value	Source
>Navigation Display Set	(0072,0216)	US	Display Set number, user or automated.	ANAP	USER/AUTO
>Reference Display Sets	(0072,0218)	US	Display Set numbers, user or automated.	ALWAYS	USER/AUTO

2 **W.8.1.2 Usage of attributes from received IOD's**

No SOP Class specific fields for images are required.

- 4 The Reformatting Operation Type (0072,0510) attribute with value MPR or SLAB is supported for the MR Image Storage SOP Class only.

6 **W.8.1.3 Attribute Mapping**

Not applicable.

8 **W.8.1.4 Coerced/Modified fields**

No coercion is performed.

10 **W.8.2 Data Dictionary of Private Attributes**

No private attributes are defined.

12 **W.8.3 Coded Terminology and Templates**

- 14 The value for Code Meaning will be displayed for all code sequences. No local lexicon is provided to look up alternative code meanings.

**W.8.4 Grayscale Image Consistency**

- 16 The high resolution display monitor attached to the product can be calibrated according to the Grayscale Standard Display Function (GSDF).

18 **W.8.5 Standard Extended/Specialized/Private SOP Classes**

None

20 **W.8.6 Private Transfer Syntaxes**

None.