

This operation will cause the following actions:

- The DICOM SERVER AE will initiate a DICOM association, negotiate with the Remote AE an appropriate Abstract and Transfer Syntax.
- The DICOM SERVER AE will emit a C-STORE command to send the image, if the negotiation is successful.

2.3.1.2.1.2 Association Initiation Policy

The DICOM SERVER AE initiates a new association with a remote DICOM AE for each job selected by the operator. The operator can select to push to a remote DICOM AE:

- a study, a series, an image or
- a set of several images that belong to the same patient through the end review paradigm

This Real World Activity can be activated by two user interface events:

- Push manually Studies/Series/Images to a remote DICOM AE
- Push the selection or a subset of the selection to a set of remote DICOM AEs through the end review paradigm

2.3.1.2.1.3 Proposed Presentation Context Table

The following table shows the transfer syntax groups that are referred from the Presentation Context Tables. If a group is referred all its transfer syntaxes are proposed or any can be accepted during handshake.

Table 2.3–1 Transfer Syntax Groups table

Transfer Syntax Group	Transfer Syntax	
Name	Name List	UID List
Uncompressed Transfer Group	Implicit VR Little Endian	1.2.840.10008.1.2
	Explicit VR Little Endian	1.2.840.10008.1.2.1
	Explicit VR Big Endian	1.2.840.10008.1.2.2
Compressed Transfer Group	JPEG Lossless HIER 14	1.2.840.10008.1.2.4.70
	JPEG 2000 Lossless ONLY	1.2.840.10008.1.2.4.90
	JPEG Baseline (Process 1)	1.2.840.10008.1.2.4.50
	JPEG Extended (Process 2 & 4)	1.2.840.10008.1.2.4.51
	JPEG 2000	1.2.840.10008.1.2.4.91

Note: The usage of the different transfer syntax groups are defined later in different sections of the document.

Note: The **Compressed Transfer Group** is turned off by default and can be enabled by GE Field Engineer.

The following table shows the proposed presentation contexts for the DICOM Server AE after Real-World Activity “Push” Operation has been performed.

Table 2.3–2 Presentation Context Table – Proposed by DICOM SERVER AE for Push activity

Abstract Syntax		Transfer Syntax Group	Role	Extended Negotiation
Name	UID	Name		
Computed Radiography Image Storage	1.2.840.10008.5.1.4.1.1.1	Uncompressed Transfer Group	SCU	None
CT Image Storage	1.2.840.10008.5.1.4.1.1.2	Uncompressed Transfer Group	SCU	None
MR Image Storage	1.2.840.10008.5.1.4.1.1.4	Uncompressed Transfer Group	SCU	None
X-Ray Angiographic Image Storage	1.2.840.10008.5.1.4.1.1.12.1	Uncompressed Transfer Group	SCU	None
X-Ray Radiofluoroscopic Image Storage	1.2.840.10008.5.1.4.1.1.12.2	Uncompressed Transfer Group	SCU	None
Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7	Uncompressed Transfer Group	SCU	None
Digital X-Ray Image Storage - For Presentation	1.2.840.10008.5.1.4.1.1.1.1	Uncompressed Transfer Group	SCU	None
Digital X-Ray Image Storage - For Processing	1.2.840.10008.5.1.4.1.1.1.1.1	Uncompressed Transfer Group	SCU	None
Digital Mammography X-Ray Image Storage - For Presentation	1.2.840.10008.5.1.4.1.1.1.2	Uncompressed Transfer Group	SCU	None
Digital Mammography X-Ray Image Storage - For Processing	1.2.840.10008.5.1.4.1.1.1.2.1	Uncompressed Transfer Group	SCU	None
Nuclear Medicine Image Storage	1.2.840.10008.5.1.4.1.1.20	Uncompressed Transfer Group	SCU	None
Standalone Curve Storage	1.2.840.10008.5.1.4.1.1.9	Uncompressed Transfer Group	SCU	None
Positron Emission Tomography Image Storage	1.2.840.10008.5.1.4.1.1.128	Uncompressed Transfer Group	SCU	None
Standalone PET Curve Storage	1.2.840.10008.5.1.4.1.1.129	Uncompressed Transfer Group	SCU	None
RT Image Information Storage	1.2.840.10008.5.1.4.1.1.481.1	Uncompressed Transfer Group	SCU	None
RT Dose Storage	1.2.840.10008.5.1.4.1.1.481.2	Uncompressed Transfer Group	SCU	None
RT Structure Set Information Storage	1.2.840.10008.5.1.4.1.1.481.3	Uncompressed Transfer Group	SCU	None
RT Plan Information Storage	1.2.840.10008.5.1.4.1.1.481.5	Uncompressed Transfer Group	SCU	None
NM Genie Private Data	1.2.840.113619.4.27	Uncompressed Transfer Group	SCU	None
PET Advance Private Data	1.2.840.113619.4.30	Uncompressed Transfer	SCU	None

		Group		
GE Private DICOM 3D Object	1.2.840.113619.4.26	Uncompressed Transfer Group	SCU	None
Ultrasound Image Storage	1.2.840.10008.5.1.4.1.1.6.1	Uncompressed Transfer Group	SCU	None
Ultrasound Multi-frame Image Storage	1.2.840.10008.5.1.4.1.1.3.1	Uncompressed Transfer Group	SCU	None
Ultrasound Image Storage (Retired)	1.2.840.10008.5.1.4.1.1.6	Uncompressed Transfer Group	SCU	None
Ultrasound Multi-frame Image Storage (Retired)	1.2.840.10008.5.1.4.1.1.3	Uncompressed Transfer Group	SCU	None
Basic Text SR	1.2.840.10008.5.1.4.1.1.88.11	Uncompressed Transfer Group	SCU	None
Enhanced SR	1.2.840.10008.5.1.4.1.1.88.22	Uncompressed Transfer Group	SCU	None
Comprehensive SR	1.2.840.10008.5.1.4.1.1.88.33	Uncompressed Transfer Group	SCU	None
Mammography CAD SR	1.2.840.10008.5.1.4.1.1.88.50	Uncompressed Transfer Group	SCU	None
Spatial Registration Storage	1.2.840.10008.5.1.4.1.1.66.1	Uncompressed Transfer Group	SCU	None
Deformable Spatial Registration Storage	1.2.840.10008.5.1.4.1.1.66.3	Uncompressed Transfer Group	SCU	None
Key Object Selection Document Storage	1.2.840.10008.5.1.4.1.1.88.59	Uncompressed Transfer Group	SCU	None
X-Ray Radiation Dose SR Storage	1.2.840.10008.5.1.4.1.1.88.67	Uncompressed Transfer Group	SCU	None
Encapsulated PDF Storage	1.2.840.10008.5.1.4.1.1.104.1	Uncompressed Transfer Group	SCU	None

Note: Grayscale Softcopy Presentation State Storage (1.2.840.10008.5.1.4.1.1.11.1) and Blending Softcopy Presentation State Storage (1.2.840.10008.5.1.4.1.1.11.4) abstract syntax is received on network / read from media and some properties (image number, date/time, description and creator's name) are displayed in the BROWSER but the basic Advantage Workstation 4.7 applications cannot display this object in a meaningful way (only black image is visible) and objects content is not taken into account while displaying the referenced images.

Note: See **Table 2.3-1** for the list of transfer syntaxes available for the Transfer Syntax Group.

2.3.1.2.1.3.1 SOP Specific DICOM Conformance Statement for Image Storage SOP Classes

Following are the status codes that are more specifically processed when receiving messages from a **Storage** SCP equipment :

Service Status	Status Code	Further Meaning	Application Behavior When Receiving Status Code
Failure	A700-A7FF	Refused: Out of resources	Upon receiving a C-STORE confirmation containing any status that is not Success or Refused, this implementation will consider the current request to be a failure and will terminate the association except if the C-STORE is invoked from a C-MOVE SCP. In this case it will continue to attempt to send the remaining images in the request on the same association.
	A900-A9FF	Error: Data Set does not match SOP Class	
	C000-CFFF	Error: Cannot Understand	
	0122	SOP Class Not Supported	
Warning	B000	Coercion of Data Elements	Ignored.
	B006	Elements Discarded	
	B007	Data Set does not match SOP Class	
Success	0000		This implementation will perform the next C-STORE operation. The association will be maintained if possible.
*	*	Any other status code.	Upon receiving a C-STORE confirmation containing a Refused status, this implementation will terminate the association.

This implementation can perform multiple C-STORE operations over a single association.

Each C-STORE operation supports an “Association Timer”. This timer starts when the association request is sent and stops when the association is established. Default time-out is 30 seconds.

Each C-STORE operation supports an “Operation Inactivity Timer”. This timer starts when a C-STORE request is emitted and is reset each time a C-STORE response has been received, or when subsequent C-STORE are received. Default time-out is 180 seconds.

If any of the two timers mentioned above expires, the connection is aborted and the operation is considered as failed.

2.3.1.2.1.3.2 SOP Specific DICOM Conformance Statement for the Grayscale and Blending Softcopy Presentation State Storage SOP Class

The DICOM SERVER AE does not support creation and application of the transformations defined by Grayscale and Blending Softcopy Presentation State Storage SOP Instances.

The objects are just received/sent on network and read from/written on media. Some properties (image number, date/time, description and creator’s name) are displayed in the

BROWSER but the basic Advantage Workstation 4.7 applications cannot display this object in a meaningful way (only black image is visible) and objects content is not taken into account while displaying the referenced images.

2.3.1.2.2 Real-World Activity: Manual Query

2.3.1.2.2.1 Associated Real-World Activity

The operator initiates a Manual Query on a Remote database or a set of Remote databases by clicking on the corresponding icon. A new BROWSER (known as the REMOTE BROWSER) appears on the screen(s) upon successful query.

The “Query” operation will cause the DICOM Server AE to initiate an association to the selected Remote AE. Once a list of Study/Series/Image has been queried, the operator can invoke the “Retrieve” operation by choosing “Get Exam” or “Get Series” or “Get Image” from the displayed REMOTE BROWSER (drag on drop the selection on the icon representing the Advantage Workstation 4.7 or click on the “Get” icon).

Note: The SCU will cancel the C-FIND by issuing a C-FIND-CANCEL request after the reception of 500 studies. This number is configurable by the GE Field Engineer.

Note: The REMOTE BROWSER is able to display up to 1500 studies at a time when querying a set of remote DICOM AEs. This number is configurable by the GE Field Engineer.

2.3.1.2.2.2 Association Initiation Policy

The DICOM SERVER AE initiates a new association for querying Study Folders (or Series/Images) on a remote DICOM AE. This association corresponds to one Real World Activity.

2.3.1.2.2.3 Proposed Presentation Context Table

Presentation Context Table – Proposed by DICOM SERVER AE for Activity Manual Query				
Abstract Syntax		Transfer Syntax Group	Role	Extended Negotiation
Name	UID	Name		
Study Root Query/Retrieve Information Model - FIND	1.2.840.10008.5.1.4.1.2.2.1	Uncompressed Transfer Group	SCU	None

Note: See **Table 2.3–1** for the list of transfer syntaxes available for the Transfer Syntax Group.

2.3.1.2.2.3.1 SOP Specific DICOM Conformance Statement for C-FIND-SCU

DICOM Server AE is able to generate C-Find-Cancel, see the table below.

Following are the status codes that are more specifically processed when receiving messages from a C-FIND SCP equipment :

Service Status	Status Code	Further Meaning	Application Behavior When Receiving Status Code
Failure	A700	Refused: Out of resources	Upon receiving a C-FIND response with any failure status, this implementation will consider the current request to be a failure and will terminate the association.
	A900	Error: Identifier does not match SOP Class	
	C000-CFFF	Error: Unable to process	
	0122	SOP Class Not Supported	
Cancel	FE00	Matching terminated due to cancel	Displays a message that the query was stopped.
Success	0000	Matching is complete - No final identifier is supplied	Results displayed in the Remote Patient List. If the query is done on Study level the Patient List automatically selects the first study and continues the query on series level. If this is finished the first series is automatically selected and query is continued on image level. If study level query results in more than 500 studies the patient list displays a message about this limitation and cancels the query.
Pending	FF00	Matches are continuing - Current Match is supplied and any Optional Keys were supported in the same manner as Required Keys.	Processed.
	FF01	Matches are continuing - Warning that one or more Optional Keys were not supported for existence and/or matching for this Identifier	
*	*	Any other status code.	

The C-FIND SCU will only perform hierarchical query (No extended negotiation supported)

Each C-FIND SCU supports an “Association Timer” and an “Operation Inactivity Timer”. These timers are defaulted to 30 and 90 seconds.

The DICOM SERVER AE will parse each matching C-FIND-RSP reply and will abort the association if an entry does not contain a valid dataset.

2.3.1.2.2.3.1.1 Patient name format definition

DICOM SERVER AE is able to send the Patient Name in following wildcard matching formats:

- “PATIENT_NAME” if IS filter is selected in filter manager for patient name
- “PATIENT_NAME”* if BEGINS filter is selected or Search Selected feature is used
- “*PATIENT_NAME*” if CONTAINS filter is selected

Where “PATIENT_NAME” may contain the following ASCII characters:

- a-z, A-Z, 1-9
- `~!@#\$\$%^&()-_+=[]{}|;:”’<>.,?/

If the query has no result at patient level and the Field Engineer configured the station to try an automatic second query DICOM SERVER AE will replace ‘^’ and ‘ ‘ characters in the patient name with ‘*’ or ‘?’ depending on the configuration and issue a second query.

2.3.1.2.3 Real-World Activity: Search Selected Query

This activity uses the “Manual Query” real-world activity. For detailed information refer to the previous section. Only the differences are detailed here.

2.3.1.2.3.1 Associated Real-World Activity

The operator queries a Remote database or a set of Remote databases by clicking on the “*Search Selected*” icon. A new BROWSER (known as the REMOTE BROWSER) appears on the screen(s) with the patient name and patient id automatically filled in based on the information of the selected patient.

Due to limitations the Patient’s Name and Id are cut to the longest starting ASCII substring. For example “Kovács^Olivér” is cut to “Kov” since “á” is not an ASCII character. The Specific Character Set (0008,0005) field is set to the DICOM original Specific Character Set information.

See Patient name format definition in 2.3.1.2.2.3.1.1 for more information.

See status management in 2.3.1.2.2.3.1 for more information.

2.3.1.2.4 Real-World Activity: Manual Retrieve

2.3.1.2.4.1 Associated Real-World Activity

The operator then has to perform the Real-World activity “*Query*” to get a list of Studies, Series and Images. Once the list of list of Studies, Series and Images is retrieved, the operator can invoke the “*Retrieve*” operation by choosing “*Get Exam*” or “*Get Series*”

or “Get Image” from the displayed REMOTE BROWSER (drag on drop the selection on the icon representing the Advantage Workstation 4.7 or click on the “Get” icon).

2.3.1.2.4.2 Association Initiation Policy

The DICOM SERVER AE initiates a new association for retrieving Studies, Series and Images on a remote DICOM AE. This association corresponds to one Real World Activity.

2.3.1.2.4.3 Proposed Presentation Context Table

When the remote DICOM AE is declared as a Study Root Provider or the invoked operation is “Get Study” or “Get Series” or “Get Image”, the presentation context shown in following table is proposed.

Presentation Context Table – Proposed by DICOM SERVER AE for Activity Manual Retrieve				
Abstract Syntax		Transfer Syntax Group	Role	Extended Negotiation
Name	UID	Name		
Study Root Query/Retrieve Information Model - MOVE	1.2.840.10008.5.1.4.1.2.2.2	Uncompressed Transfer Group	SCU	None

Note: See **Table 2.3–1** for the list of transfer syntaxes available for the Transfer Syntax Group.

2.3.1.2.4.3.1 SOP Specific DICOM Conformance Statement for the Study Root Query/Retrieve Information Model – MOVE SOP Classes

When the operator starts a *Move* operation at any level (Study, Series, Image) the DICOM Server AE will initiate a C-MOVE-RQ request to the Remote AE with the DICOM Server AE as the Destination AE. The Storage SCP (“Receive Images from Remote AE”) will handle the incoming images.

Each C-MOVE SCU supports an “Association Timer” and an “Operation Inactivity Timer”. These timers are defaulted to 30 and 600 seconds. DICOM Server AE does not support C-MOVE Cancel operation.

Following are the status codes that are more specifically processed when receiving messages from a C-MOVE SCP equipment :

Service Status	Status Code	Further Meaning	Application Behavior When Receiving Status Code
Failure	A701	Refused: Out of resources - Unable to calculate number of matches	Upon receiving a C-MOVE response with any failure status this implementation will consider the current request to be a failure and will terminate the association.
	A702	Refused: Out of resources - Unable to perform sub-operations	
	A801	Refused: Move Destination Unknown	

	A900	Error: Identifier does not match SOP Class	
	C000-CFFF	Error: Unable to process	
	0122	SOP Class Not Supported	
Cancel	FE00	Sub-operations terminated due to a Cancel indication	This implementation will release the association.
Warning	B000	Sub-operations Complete - One or more Failures.	Processed.
Success	0000	Sub-operations Complete - No Failure.	This implementation will perform the next C-MOVE operation.
Pending	FF00	Sub-operations are continuing -	Processed.
*	*	Any other status code.	Upon receiving a C-MOVE response with any other status this implementation will consider the current request to be a failure and will terminate the association.

2.3.1.2.5 Real-World Activity: Manual Ping

2.3.1.2.5.1 Associated Real-World Activity

The service engineer would like to check whether a Remote AE is up and DICOM services are available. For this operation a terminal is opened and “sendecho” command is typed. The command line tool asks for local and remote Application Entity Title, remote IP address and port then checks the status of the remote DICOM Verification SOP class.

2.3.1.2.5.2 Association Initiation Policy

The DICOM SERVER AE initiates a new association for checking the status of the Remote AE. This association corresponds to one Real World Activity.

2.3.1.2.5.3 Proposed Presentation Context Table

The DICOM SERVER AE proposes the following presentation context table.

Presentation Context Table – Proposed by DICOM SERVER AE for Activity Manual DICOM Ping				
Abstract Syntax		Transfer Syntax Group	Role	Extended Negotiation
Name	UID	Name		
Verification	1.2.840.10008.1.1	Uncompressed Transfer Group	SCU	None

Note: See **Table 2.3–1** for the list of transfer syntaxes available for the Transfer Syntax Group.

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2.3.1.3 Association Acceptance Policy

The DICOM SERVER AE refuses the association if they are too many open connections.

There are two DICOM Acceptance Policies that is configurable by GE Field Engineer:

- **Strict DICOM Acceptance Policy**
In this mode only the DICOM hosts that are configured on AW4.7 are accepted.
- **Free DICOM Acceptance Policy**
In this mode all DICOM hosts are accepted for Query and Store operations. Retrieve operation always requires the destination DICOM host to be configured on AW4.7.

2.3.1.3.1 Real-World Activity: Receive Images from Remote AE

This AE is indefinitely listening for associations. No operator action is required to receive an image.

2.3.1.3.1.1 Associated Real-World Activity

The Real-World Activity associated with the Receive Images operation is the storage of the images on the disk drive of the Advantage Workstation 4.7 and the declaration of the images in the database of the same station.

2.3.1.3.1.2 Presentation Context Table

Acceptable Presentation Contexts for DICOM Server AE and Real-World Activity Receive Images from Remote AE.

Presentation Context Table – Proposed by DICOM SERVER AE for Activity Receive Images from Remote AE				
Abstract Syntax		Transfer Syntax Group	Role	Extended Negotiation
Name	UID	Name		
Computed Radiography Image Storage	1.2.840.10008.5.1.4.1.1.1	Uncompressed Transfer Group Compressed Transfer Group	SCP	None
CT Image Storage	1.2.840.10008.5.1.4.1.1.2			
MR Image Storage	1.2.840.10008.5.1.4.1.1.4			
X-Ray Angiographic Image Storage	1.2.840.10008.5.1.4.1.1.12.1			
X-Ray Radiofluoroscopic Image Storage	1.2.840.10008.5.1.4.1.1.2			
Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.2			
Digital X-Ray Image Storage - For Presentation	1.2.840.10008.5.1.4.1.1.1.1			
Digital X-Ray Image Storage - For Processing	1.2.840.10008.5.1.4.1.1.1.1.1			
Digital Mammography X-Ray Image Storage - For Presentation	1.2.840.10008.5.1.4.1.1.1.2			

Digital Mammography X-Ray Image Storage - For Processing	1.2.840.10008.5.1.4.1.1.1.2.1			
Nuclear Medicine Image Storage	1.2.840.10008.5.1.4.1.1.20			
Standalone Curve Storage	1.2.840.10008.5.1.4.1.1.9			
Positron Emission Tomography Image Storage	1.2.840.10008.5.1.4.1.1.128			
Standalone PET Curve Storage	1.2.840.10008.5.1.4.1.1.129			
RT Image Information Storage	1.2.840.10008.5.1.4.1.1.481.1			
RT Dose Storage	1.2.840.10008.5.1.4.1.1.481.2			
RT Structure Set Information Storage	1.2.840.10008.5.1.4.1.1.481.3			
RT Plan Information Storage	1.2.840.10008.5.1.4.1.1.481.5			
NM Genie Private Data	1.2.840.113619.4.27			
PET Advance Private Data	1.2.840.113619.4.30			
GE Private DICOM 3D Object	1.2.840.113619.4.26			
Ultrasound Image Storage	1.2.840.10008.5.1.4.1.1.2			
Ultrasound Multi-frame Image Storage	1.2.840.10008.5.1.4.1.1.2			
Ultrasound Image Storage (Retired)	1.2.840.10008.5.1.4.1.1.6			
Basic Text SR	1.2.840.10008.5.1.4.1.1.88.11			
Enhanced SR	1.2.840.10008.5.1.4.1.1.88.22			
Comprehensive SR	1.2.840.10008.5.1.4.1.1.88.33			
Mammography CAD SR	1.2.840.10008.5.1.4.1.1.88.50			
Spatial Registration Storage	1.2.840.10008.5.1.4.1.1.66.1			
Deformable Spatial Registration Storage	1.2.840.10008.5.1.4.1.1.66.3			
Key Object Selection Document Storage	1.2.840.10008.5.1.4.1.1.88.59			
X-Ray Radiation Dose SR Storage	1.2.840.10008.5.1.4.1.1.88.67			
Encapsulated PDF Storage	1.2.840.10008.5.1.4.1.1.104.1			

Note:

Grayscale Softcopy Presentation State Storage (1.2.840.10008.5.1.4.1.1.11.1) and Blending Softcopy Presentation State Storage (1.2.840.10008.5.1.4.1.1.11.4) abstract syntax is received on network / read from media and some properties (image number, date/time, description and creator's name) are displayed in the BROWSER but the basic Advantage Workstation 4.7 applications cannot display this object in a meaningful way (only black image is visible) and objects content is not taken into account while displaying the referenced images.

Note: See **Table 2.3–1** for the list of transfer syntaxes available for the Transfer Syntax Group.

2.3.1.3.1.2.1 SOP Specific DICOM Conformance to Storage SOP Classes

The DICOM SERVER AE provides Level 1 (BASE) Conformance, and stores all mandatory (Type 1 and 2) data elements of received SOP Instances. It also stores selected optional (Type 3) data elements, and private data elements for which it has a data dictionary entry.

The DICOM SERVER AE does not support Digital Signatures Level 0 support, as it does not provide Level 2 (FULL) Conformance.

When a compressed image arrives on the station it is always stored in decompressed format. The Lossy Image Compression attribute (0028,2110) is added and set to “01” on originally lossy compressed images.

Successfully received SOP Instances may be accessed via the user interface and by DICOM network query retrieve. SOP Instances may be deleted by End Of Review or autodelete tools if configured so or manually by the user.

The DICOM SERVER does not perform coercion and data editing.

In case of failure, the image will not be installed in the local database. Following are the status codes the Application may send back to the SCU Equipment after performing the requested **Storage** :

Service Status	Status Code	Further Meaning	Status Code Explanation	Related Fields Sent Back to the SCU
Failure	A700	Refused: Out of resources	Indicates that probably there was not enough disk space to store the image or database inconsistency issue. The user should attempt recovery by removing some images from the Advantage Workstation 4.7. The association is aborted.	
	0110	Processing failure	Indicates that there was an internal error processing the incoming DICOM entity i.e. reading patient/exam/series/image level information from the message, converting messages to a file, writing the file to disk. The association is aborted.	
Success	0000		<p>Image is most probably declared in the database:</p> <p>In the event of a successful C-STORE operation, the image has successfully been written to disk, but may not have been declared in the database.</p> <p>For performance reasons the declaration of second and successor images of the same CT and MR series are not synchronized – while the declaration of the first image of each series is always done before status is sent back to SCU.</p> <p>Indeed, the successful status code is returned before</p>	None

			the declaration of these images since it is assumed that if the first image was declared successfully and this image is written on the disk it has no reason not to be declared. Thus, if the declaration failed the association is aborted.	
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Each C-STORE SCP operation supports an “Operation Inactivity Timer” with time out values of 605 seconds.

The image will then be accessed in the same manner as any other image by the applications on the Advantage Workstation 4.7.

When declaration of an image during a C-STORE operation fails, a message will appear in the browser informing the user of a failure.

Image Declaration phase

- Note:** To be displayed in the Viewer an image containing overlay planes defined in the high bits of the pixels (7FE0,0010) must fulfill the following conditions:
- the pixels are unsigned integers (0028,0103),
 - the pixel allocated bits is equal to 16 (0028,0100)
 - the overlay sizes, (60xx,0010) and (60xx,0011), are equal to the image size, (0028,0010) and (0028,0011)
 - the overlay origins (60xx,0050) are equal to x=1, y=1,
- Note:** To be displayed in the Viewer an image containing overlay planes defined in the header fields (60xx, 3000) must fulfill the following conditions:
- the file contains a single frame (0028,0008),
 - the overlay origins (60xx,0050) are equal to x=1, y=1,
 - the sizes of all overlays, (60xx,0010) and (60xx,0011), are equal to the image size, (0028,0010) and (0028,0011)
- Note:** Only the 8 first overlay planes can be displayed in the Viewer.
- Note:** The Viewer does not support multi-frame overlays ((60xx, 0015) and (60xx, 0051))
- Note:** Images that have the fields Patient’s Name (0010,0010) and Patient ID (0010,0020) empty are accepted into the local database.
- Note:** If the pixel size is available measurement algorithm uses:
- either because defined in the image header
 - (0008,2111) for combined images

- (0018,1164) or (0028,0030) if the first one is undefined, for CR images
- (0018,1164) for Senovision, DX and MG images
- (0028,0030) for other images
- (no header field is used for XA and RF images)
- either because the end user has calibrated the image, measurements shall be indicated in millimeters for distance or square millimeters for areas. Otherwise, they shall be indicated in pixels or square pixels.

Note: Standalone Overlay Storage SOP Class instances will be formatted into Secondary Capture SOP Class instances when installed on the Advantage Workstation 4.7.

Note: All kind of color images are stored by the Advantage Workstation 4.7, but only images that have a photometric interpretation (0028,0004) equal to “MONOCHROME 1”, “MONOCHROME 2”, “PALETTE COLOR” or “RGB” with planar configuration (0028,0006) equal to 0 (color by pixel) or 1 (color by plane) are displayable.

Note: Modality LUT (0028,3000) will be ignored by the Advantage Workstation 4.7.

Note: Images with non-square pixels are not handled correctly by the Advantage Workstation 4.7.

Note: No optional data elements (Type 3) or filled data elements (Type 2) are required to be declared on the Advantage Workstation 4.7.

Note: When 2 images have the same DICOM Instance UID, the latest image received will overwrite the first received image if it has the same patient/study/series identifiers. It will be refused otherwise.

Note: AW annotates the contrast agent “+C” on the CT and MR images with the following algorithm:

If the manufacturer is “GE Medical Systems” then if the Contrast Agent (0018,0010) is valued and has a value different from “NONE” and if the Contrast Route (0018,0040) is valued and contains “IV” then “+C”

Otherwise if the manufacturer is not “GE Medical Systems” then, if the Contrast Agent (0018,0010) is valued and has a value different from “NONE” then “+C”.

2.3.1.3.1.3 Presentation Context Acceptance Criterion

The DICOM SERVER AE evaluates each Presentation Context independently, and accepts any Presentation Context that matches an Abstract Syntax for any Real-World Activity.

2.3.1.3.1.4 Transfer Syntax Selection Policies

Within each Presentation Context, the DICOM SERVER AE will select Transfer Syntaxes according to the following priority (highest priority first):

If the compressed DICOM networking is enabled:

1. JPEG Lossless HIER 14
2. JPEG 2000 Lossless ONLY
3. JPEG Baseline (Process 1)
4. JPEG Extended (Process 2 & 4)
5. JPEG 2000
6. Explicit VR Little Endian
7. Explicit VR Big Endian
8. Implicit VR Little Endian

If the compressed DICOM networking is disabled:

1. Explicit VR Little Endian
2. Explicit VR Big Endian
3. Implicit VR Little Endian

2.3.1.3.2 Real-World Activity: Query Request from Remote AE

This AE is indefinitely listening for associations. No operator action is required to respond to a *query* request.

2.3.1.3.2.1 Associated Real-World Activity

The Real-World Activity associated with the query request is to search the local database for entries that match the request and send a C-FIND response message with a status of "pending" for each matching entry and send a C-FIND response message with a status of "success" after the last "pending" response.

If the C-FIND SCP receives a C-FIND-CANCEL request, it sends a C-FIND response message with a status of "cancel".

2.3.1.3.2.2 Association Acceptance Policy

The DICOM SERVER AE refuses the association if they are too many opened connections.

2.3.1.3.2.3 Presentation Context Table

Acceptable Presentation Contexts for DICOM Server AE and Real-World Activity Query Request.

Presentation Context Table by DICOM SERVER AE for Activity Query Request					
Abstract Syntax		Transfer Syntax Group		Role	Extended Negotiation
Name	UID	Name			

Study Root Query/Retrieve Information Model - FIND	1.2.840.10008.5.1.4.1.2.2.1	Uncompressed Transfer Group	SCP	None
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Note: See **Table 2.3-1** for the list of transfer syntaxes available for the Transfer Syntax Group.

2.3.1.3.2.3.1 SOP Specific Conformance to C-FIND SCP

The DICOM SERVER AE provides matching against query keys as described in 14.2.2 - Study Level – Study Root.

Following are the status codes the Application may send back to the SCU Equipment while performing the requested **Query** :

Service Status	Status Code	Further Meaning	Status Code Explanation	Related Fields Sent Back to the SCU
Failure	A700	Refused: Out of resources	When too many connections are open at the same time.	None
	A900	Error: Identifier does not match SOP Class	When the DICOM Server AE processes an invalid data set.	None
	C001	Error: Unable to process	When the DICOM Server AE processes an internal error or a decoding error	None
Cancel	FE00	Matching terminated due to cancel	If the DICOM remote AE sent a DICOM C-FIND CANCEL request	None
Success	0000	Matching is complete - No final identifier is supplied		None
Pending	FF00	Matches are continuing - Current Match is supplied and any Optional Keys were supported in the same manner as Required Keys.	For pending messages	None
	FF01	Matches are continuing - Warning that one or more Optional Keys were not supported for existence and/or matching for this Identifier	For pending messages when the DICOM remote AE asked for optional key	None

Each C-FIND SCP operation supports an “Operation Inactivity Timer” with a time out value of 605 seconds. This timer corresponds to the number of seconds to wait when data between TCP/IP packets are transferred.

2.3.1.3.2.4 Presentation Context Acceptance Criteria

See 2.3.1.3.3.3 - Presentation Context Table

2.3.1.3.2.5 Transfer Syntax Selection Policy

Only uncompressed transfer syntaxes are selected from the section Uncompressed Transfer Group.

2.3.1.3.3 Real-World Activity: Retrieve Request From Remote AE

This AE is indefinitely listening for associations. No operator action is required to respond to a *retrieve* request.

2.3.1.3.3.1 Associated Real-World Activity

The Real-World Activity associated with the Retrieve Request is to send all images corresponding to the C-MOVE request to the destination AE through a separate association.

If the C-MOVE SCP receives a C-MOVE-CANCEL request, it closes the separate association.

2.3.1.3.3.2 Association Acceptance Policy

The DICOM SERVER AE rejects the association if they are too many open connections.

The DICOM SERVER AE rejects the association if the Remote DICOM AE is not declared on the local Advantage Workstation 4.7.

2.3.1.3.3.3 Presentation Context Table

Acceptable Presentation Contexts for DICOM Server AE and Real-World Activity Retrieve Request.

Presentation Context Table by DICOM SERVER AE for Activity Retrieve Request From Remote AE				
Abstract Syntax		Transfer Syntax Group	Role	Extended Negotiation
Name	UID	Name		
Study Root Query/Retrieve Information Model - MOVE	1.2.840.10008.5.1.4.1.2.2.2	Uncompressed Transfer Group	SCP	None
Patient Root Query/Retrieve Information Model - MOVE	1.2.840.10008.5.1.4.1.2.1.2	Uncompressed Transfer Group	SCP	None

Note: See **Table 2.3–1** for the list of transfer syntaxes available for the Transfer Syntax Group.

2.3.1.3.3.3.1 SOP Specific Conformance to C-MOVE SCP

The DICOM SERVER AE supports Storage Sub-operations for Instances of any of the Composite SOP Classes it supports as an SCU (see Section 2.3.1.2.1.3 - Proposed Presentation Context Table).

The DICOM Server AE provides standard conformance to the baseline Study-root C-MOVE Service Class SCP and Patient-root C-MOVE Service Class SCP.

The DICOM Server AE supports C-MOVE Service Class SCP to any known DICOM Remote host referenced by MOVE AE.

Following are the status codes the Application may send back to the SCU Equipment while performing the requested **Retrieve** :

Service Status	Status Code	Further Meaning	Status Code Explanation	Related Fields Sent Back to the SCU
Failure	A701	Refused: Out of resources - Unable to calculate number of matches	When there is too much data to process.	None
	A702	Refused: Out of resources - Unable to perform sub-operations	When the association with the C-STORE SCP was rejected.	None
	A801	Error: Move Destination Unknown	When the destination unknown.	None
	A900	Error: Identifier does not match SOP Class	When the dataset is invalid.	None
Cancel	FE00	Sub-operations terminated due to a Cancel indication	(C-Move Cancel Request Received) when the C-MOVE SCU cancelled the operation	None
Warning	B000	Sub-operations Complete - One or more Failures.	When one or more failure occurred.	None
Success	0000	Sub-operations Complete - No Failure.	When the whole C-MOVE operation was successful	None
Pending	FF00	Sub-operations are continuing -	For pending messages.	(0000,1020) (0000,1021) (0000,1022) (0000,1023)

Each C-MOVE SCP operation supports an “Operation Inactivity Timer” with a time out value of 605 seconds. This timer corresponds to the number of seconds to wait when data between TCP/IP packets are transferred.

All images requested in a C-MOVE-RQ will be sent over a single association. A C-MOVE-RSP with a “pending” status will be returned to the requester every seven seconds.

2.3.1.3.3.4 Presentation Context Acceptance Criteria

See 2.3.1.3.3.3 - Presentation Context Table

2.3.1.3.3.5 Transfer Syntax Selection Policy

Only uncompressed transfer syntaxes are selected from the section Uncompressed Transfer Group.

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2.3.1.3.4 Real-World Activity: Remote DICOM Ping

2.3.1.3.4.1 Associated Real-World Activity

The Real-World Activity associated with the DICOM Ping from remote host operation is to check the status of the DICOM Server AE.

2.3.1.3.4.2 Association Acceptance Policy

The DICOM SERVER AE rejects the association if they are too many open connections.

2.3.1.3.4.3 Presentation Context Table

Acceptable Presentation Contexts for DICOM Server AE and Real-World Activity DICOM Ping from remote DICOM host.

Presentation Context Table by DICOM SERVER AE for Activity DICOM Ping from remote host				
Abstract Syntax		Transfer Syntax Group	Role	Extended Negotiation
Name	UID	Name		
Verification	1.2.840.10008.1.1	Uncompressed Transfer Group	SCP	None

Note: See **Table 2.3-1** for the list of transfer syntaxes available for the Transfer Syntax Group.

2.3.1.3.4.4 Presentation Context Acceptance Criteria

See 2.3.1.3.3.3 - Presentation Context Table.

2.3.1.3.4.5 Transfer Syntax Selection Policy

Only uncompressed transfer syntaxes are selected from the section Uncompressed Transfer Group.

2.3.2 DICOM STORAGE COMMITMENT SERVER AE Specification

This Application Entity provides Standard Conformance to the following DICOM SOP Classes as an SCU:

SOP Class Name	SOP Class UID
Storage Commitment Push Model	1.2.840.10008.1.20.1

2.3.2.1 Association Establishment Policies

2.3.2.1.1 General

The DICOM STORAGE COMMITMENT SERVER AE uses the same resources as the DICOM SERVER AE, for detailed information please read the section 2.3.1 - DICOM SERVER AE Specification.

2.3.2.1.2 Number of Associations

The DICOM STORAGE COMMITMENT SERVER AE will initiate only one DICOM association at a time to perform a DICOM storage commitment operation as a SCU to a Remote DICOM AE.

The DICOM STORAGE COMMITMENT SERVER AE can have a maximum of 2 open unencrypted DICOM associations and 2 open encrypted DICOM associations at a time to perform a DICOM storage commitment operation as a SCU with Role/selection negotiation.

The Storage Commitment Provider AE can be configured independently from the remote DICOM AE with network address, port, connection encryption flag and AE title.

Storage Commitment request is sent just after images has been remotely stored.

2.3.2.1.3 Asynchronous Nature

Asynchronous mode is not supported. All operations will be performed synchronously.

2.3.2.1.4 Implementation Identifying Information

The DICOM STORAGE COMMITMENT SERVER AE uses the same resources as the DICOM SERVER AE, for detailed information please read the section 2.3.1 - DICOM SERVER AE Specification.

2.3.2.2 Association Initiation Policy

When the DICOM STORAGE COMMITMENT SERVER AE Application Entity initiates an Association for any Real-World Activity, it will propose the Presentation Contexts for all Real-World Activities; i.e., there is only a single, comprehensive Presentation Context Negotiation proposed for the AE.

The DICOM STORAGE COMMITMENT SERVER AE proposes only a single Transfer Syntax in each Presentation Context; i.e., for each Abstract Syntax in the following Presentation Context Tables, the AE proposes one Presentation Context for each specified Transfer Syntax.

2.3.2.2.1 Real-World Activity: Initiate Storage Commitment to a Remote AE

2.3.2.2.1.1 Associated Real-World Activity

The operator can associate a DICOM Storage Commitment Provider AE option to a Remote AE in the Network Manager. When the user selects a Remote AE with this option enabled STORAGE COMMITMENT AE will always try to initiate a Storage Commitment.

The user selects in the BROWSER one or several studies, series or images to be sent. Then, the user can either drag and drop the selection on the icon representing then Remote DICOM AE, or click on the "Push" icon and select a Remote DICOM AE in the LIST OF REMOTE HOST. The user can also decide to use the 'end review' paradigm to send a set of series of the same patient.

This operation will cause the following actions:

- The Advantage Workstation 4.7. retrieves the appropriate DICOM images to push from its database.
- The DICOM SERVER AE initiates a DICOM association, negotiates with the Remote AE an appropriate Abstract and Transfer Syntax.
- If the negotiation is successful, the DICOM SERVER AE emits C-STORE command to send the images to the Remote AE.
- When the images have been sent, the DICOM SERVER AE asks the DICOM STORAGE COMMITMENT SERVER AE to commit all the images that have been successfully sent.
- The DICOM STORAGE COMMITMENT SERVER AE initiates a DICOM association, negotiates with the Remote AE an appropriate Abstract and Transfer Syntax.
- If the negotiation is successful, the DICOM STORAGE COMMITMENT SERVER AE emits a N-ACTION request. Only one N-ACTION request is sent for all images to be committed.
- If the DICOM STORAGE COMMITMENT SERVER AE receives a successful N-ACTION RSP, the server waits a configurable period of time (default = 10s) for the reception of a N_EVENT_REPORT. (See section *Real-World Activity “Listen to remote Storage Commitment SCP”*)

2.3.2.2.1.2 Association Initiation Policy

Only one N-ACTION request is sent for all images that have been sent during the Real World Activity: “Push Studies/Series/images to Remote AE”

2.3.2.2.1.3 Proposed Presentation Context

Presentation Context Table - Proposed				
Abstract Syntax		Transfer Syntax Group	Role	Extended Negotiation
Name	UID	Name		
Storage Commitment Push Model	1.2.840.10008.1.20.1	Uncompressed Transfer Group	SCU	None

Note: See **Table 2.3–1** for the list of transfer syntaxes available for the Transfer Syntax Group.

2.3.2.2.1.3.1 SOP Specific DICOM Conformance Statement for the Storage Commitment Push Model SOP Class SCU (N-ACTION)

The DICOM STORAGE COMMITMENT SERVER AE can receive a N-EVENT-REPORT from the Storage Commitment Provider at any time (See section *Real-World Activity “Listen to remote Storage Commitment SCP”*).

The DICOM STORAGE COMMITMENT SERVER AE uses DICOM network storage services to transfer SOP Instance List which are to be committed. It does not support the optional Storage Media File-Set ID and UID Attributes in the Storage Commitment N-ACTION for transfer of SOP Instances by media for Storage Commitment.

The DICOM STORAGE COMMITMENT SERVER AE may request Storage Commitment for Instances of any of the Composite SOP Classes it supports as an SCU (see Section 2.3.1.2.1.3 - Proposed Presentation Context Table).

The Storage Commitment Information Object is described in Section 4.

If the received N-ACTION Response from the Storage Commitment Provider has a success status, the DICOM STORAGE COMMITMENT SERVER AE waits for an N-EVENT-REPORT during a configurable period of time. This period is set to 10s by default.

Following are the status codes that are more specifically processed when receiving N-Action responses from a **Storage Commitment** SCP equipment:

Service Status	Status Code	Further Meaning	Application Behavior When Receiving Status Code
Failure	0119	Class-instance conflict	An error file is logged, the Storage Commitment is abandoned and a pop-up is displayed to the user.
	0210	Duplicate invocation	
	0115	Invalid argument value	
	0117	Invalid SOP Instance	
	0212	Mistyped argument	
	0123	No such action	
	0114	No such argument	
	0118	No such SOP Class	
	0112	No such SOP Instance	
	0110	Processing failure	
	0213	Resource limitation	
0211	Unrecognized operation		
Success	0000		For each image successfully committed, the image is flagged as “Committed” into the database.
*	*	Any other status code.	Ignored

2.3.2.2.2 Real-World Activity: Open periodic associations with remote DICOM AE

2.3.2.2.2.1 Associated Real-World Activity

The operator can associate a DICOM Storage Commitment Provider AE to a Remote AE.

The system periodically scans the configuration file and opens an “empty” association with all the Remote DICOM AE declared as Storage Commitment Provider. The association is always opened even if Advantage Workstation does not expect any

N_EVENT_REPORT. The time between two association creation is configurable by GE Field Engineer – even to large numbers, that is it can be practically turned off.

This periodic association enables a Storage Commitment Provider to send an N_EVENT_REPORT during a standard association negotiation.

This operation will cause the following actions:

- The DICOM STORAGE COMMITMENT SERVER AE initiates a DICOM association, negotiates with the Remote AE an appropriate Abstract and Transfer Syntax.
- If the negotiation is successful, the DICOM STORAGE COMMITMENT SERVER AE waits a configurable period of time (default = 10s) for the reception of a N_EVENT_REPORT. (See section *Real-World Activity “Listen to remote Storage Commitment SCP”*)

2.3.2.2.2 Association Initiation Policy

After the association negotiation, the DICOM STORAGE COMMITMENT SERVER AE waits for an incoming N_EVENT_REPORT.

2.3.2.2.3 Proposed Presentation Context

See the general Proposed Presentation Context DICOM STORAGE COMMITMENT SERVER AE in Section 2.3.2.2.1.3.

2.3.2.2.3.1 SOP Specific DICOM Conformance Statement for the Storage Commitment Push Model SOP Class (N_EVENT_REPORT)

The DICOM STORAGE COMMITMENT SERVER AE waits for an N-EVENT-REPORT during a configurable period of time. This period is set to 10s by default.

The DICOM STORAGE COMMITMENT SERVER AE can receive a N-EVENT-REPORT from the Storage Commitment Provider at any time (See section *Real-World Activity “Listen to remote Storage Commitment SCP”*).

Following are the status codes the DICOM STORAGE COMMITMENT SERVER AE may send back in the **N-Event-Report** response command to the **Storage Commitment SCP** Equipment that sent the N-Event-Report request:

Service Status	Status Code	Further Meaning	Status Code Explanation	Related Fields Sent Back to the SCU
Failure	0110	Processing failure	This status code is sent back on any error during database manipulations or internal communication failures.	(0000,0002) (0000,0120) (0000,1000) (0000,1002)
Success	0000		Report could be processed without any issue.	None

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2.3.2.3 Association Acceptance Policy

2.3.2.3.1 Real-World Activity: Listen to remote Storage Commitment SCP

The DICOM STORAGE COMMITMENT SERVER AE is indefinitely listening for associations. No operator action is required to receive a Storage Commitment notification (N-EVENT-REPORT).

2.3.2.3.1.1 Associated Real-World Activity

The Real-World Activity associated consists into:

- Flag the images that have been committed (transfer of ownership) in the database.
- Pop up an error when some images of a patient existing in the database have not been committed.

2.3.2.3.1.2 Association Acceptance Policy

The Storage Commitment Provider initiating the association must use the role selection negotiation.

2.3.2.3.1.3 Proposed Presentation Context

See the general Proposed Presentation Context DICOM STORAGE COMMITMENT SERVER AE in Section 2.3.2.2.1.3.

2.3.2.3.1.3.1 SOP Specific DICOM Conformance Statement for the Storage Commitment Push Model SOP Class (N-EVENT-REPORT)

The DICOM STORAGE COMMITMENT SERVER AE will propose the SCP role (via SCP/SCU Role Selection Negotiation) within a Presentation Context for the Storage Commitment Push Model SOP Class. If the destination does not accept that Role Negotiation, the AE will not be able to send Storage Commitment Results using N-Event-Report Requests.

Following are the status codes the Application may send back to the SCP Equipment after receiving the N-EVENT-REPORT:

Service Status	Status Codes	Further Meaning	Status Code sending explanation	Related Fields sent back to the SCU
Error	0110	Processing Failure	Indicates that an internal error occurs while processing.	None
Success	0000			None

The DICOM STORAGE COMMITMENT SERVER AE parses all the items present in the N-EVENT-REPORT.

For each image successfully committed, the image is flagged as “Committed” into the database. An error is logged for any image that cannot be committed and a pop up is displayed to the user when the image still exists in the database.

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2.3.2.3.2 Real-World Activity: Listen to DICOM Verification from remote DICOM AE

2.3.2.3.2.1 Associated Real-World Activity

The Real-World Activity associated with the DICOM Ping from remote host operation is to check the status of the DICOM STORAGE COMMITMENT SERVER AE.

2.3.2.3.2.2 Association Acceptance Policy

The DICOM STORAGE COMMITMENT SERVER AE rejects the association if they are too many open connections.

2.3.2.3.2.3 Presentation Context Table

Acceptable Presentation Contexts for DICOM STORAGE COMMITMENT SERVER AE and Real-World Activity DICOM Ping from remote DICOM host.

Presentation Context Table by DICOM STORAGE COMMITMENT SERVER AE for Activity DICOM Ping from remote host				
Abstract Syntax		Transfer Syntax Group	Role	Extended Negotiation
Name	UID	Name		
Verification	1.2.840.10008.1.1	Uncompressed Transfer Group	SCP	None

Note: See **Table 2.3–1** for the list of transfer syntaxes available for the Transfer Syntax Group.

2.3.2.3.2.4 Presentation Context Acceptance Criteria

See 2.3.2.3.2.3 - Presentation Context Table.

2.3.2.3.2.5 Transfer Syntax Selection Policy

Only uncompressed transfer syntaxes are selected from the section Uncompressed Transfer Group .

2.3.3 DICOM Print SCU AE Specification

This Application Entity provides Standard Conformance to the following DICOM SOP Classes as an SCU:

SOP Class Name	SOP Class UID
Basic Grayscale Print Management Meta SOP Class	1.2.840.10008.5.1.1.9
Basic Color Print Management Meta SOP Class	1.2.840.10008.5.1.1.18

Note: Support of the Basic Grayscale Print Management Meta SOP Class as an SCU mandates support for the Basic Film Session, Basic Film Box, Basic Grayscale Image Box and Printer SOP Classes as an SCU.

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Note: Support of the Basic Color Print Management Meta SOP Class as an SCU mandates support for the Basic Film Session, Basic Film Box, Basic Color Image Box and Printer SOP Classes as an SCU.

2.3.3.1 Association Establishment Policies

2.3.3.1.1 General

The DICOM Application Context Name (ACN) that is always proposed is:

Application Context Name	1.2.840.10008.3.1.1.1
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The Maximum Length PDU negotiation is included in all association establishment requests.

The maximum length PDU for an association initiated by the DICOM Print SCU is:

Maximum Length PDU	28672 Bytes
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The Print Management Service Class does not support extended negotiation.

The user information Items sent by this product are:

- Maximum PDU Length
- Implementation UID

Note: The Maximum length PDU is not configurable

2.3.3.1.2 Number of Associations

The DICOM Print SCU AE supports only one association at a time. The printing requests are internally queued.

2.3.3.1.3 Asynchronous Nature

Asynchronous mode is not supported. All operations will be performed synchronously.

2.3.3.1.4 Implementation Identifying Information

The Implementation UID for this DICOM Implementation is:

Advantage Workstation 4.7 Filmer Implementation UID	1.2.840.113619.6.377
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2.3.3.2 Association Initiation Policy

2.3.3.2.1 Real-World Activity “Manual Image Print”

2.3.3.2.1.1 Associated Real-World Activity

The user has the possibility to drag and drop images from the VIEWER to the FILMER application. The Print Manager application allows to define, suppress and select different

REMOTE DICOM printers and to manipulate some print parameters like the number of copies. When the user requests for a print by pushing the “Print” button, the DICOM Print SCU tries to establish the association with the requested printer and sends the images for printing.

Note: The Print Builder application allows to select different REMOTE DICOM printers and to manipulate some print parameters like the number of copies.

2.3.3.2.1.2 Proposed Presentation Context Table

Presentation Context Table – Proposed					
Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name List	UID List		
Basic Grayscale Print Management Meta SOP Class	1.2.840.10008.5.1.1.9	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
Basic Color Print Management Meta SOP Class	1.2.840.10008.5.1.1.18	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None

2.3.3.2.1.2.1 SOP Specific DICOM Conformance Statement for Print Management SOP Classes

The DICOM Print SCU AE initiates one association with the selected REMOTE DICOM Printer. The DICOM Print SCU AE will not open another association while the current one is active.

The Basic Grayscale Print Management Meta SOP Class and the Color Grayscale Print Management Meta SOP Class are never negotiated simultaneously.

For each of the supported Print Management SOP and Meta SOP Classes, the optional attributes and service elements supported, the valid range of values for mandatory and optional attributes, and the status code behavior are described in Section 2.3.2.3.1.3.1.

2.3.3.2.2 Real-World Activity “Direct Image Print”

2.3.3.2.2.1 Associated Real-World Activity

The user has the possibility to directly send images from the VIEWER to the Print Builder application. The Print Builder application will launch the DICOM Print SCU that tries to establish the association with the default printer and sends the images for printing.

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2.3.3.2.2.2 Proposed Presentation Context Table

Presentation Context Table – Proposed					
Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name List	UID List		
Basic Grayscale Print Management Meta SOP Class	1.2.840.10008.5.1.1.9	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
Basic Color Print Management Meta SOP Class	1.2.840.10008.5.1.1.18	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None

2.3.3.2.2.2.1 SOP Specific DICOM Conformance Statement for Print Management SOP Classes

The DICOM Print SCU AE initiates one association with the selected REMOTE DICOM Printer. The DICOM Print SCU AE will not open another association while the current one is active.

The Basic Grayscale Print Management Meta SOP Class and the Color Grayscale Print Management Meta SOP Class are never negotiated simultaneously.

For each of the supported Print Management SOP and Meta SOP Classes, the optional attributes and service elements supported, the valid range of values for mandatory and optional attributes, and the status code behavior are described in Annex.

2.3.4 EM DICOM SERVER AE Specification

The EM DICOM SERVER is an optional feature.

The EM DICOM SERVER Application Entity provides Standard Conformance to the following DICOM SOP Classes as an **SCP but not as a SCU**:

SOP Class Name	SOP Class UID	SCU	SCP
Verification SOP Class	1.2.840.10008.1.1	No	Yes
CT Image Storage	1.2.840.10008.5.1.4.1.1.2	No	Yes

2.3.4.1 Association Establishment Policies

2.3.4.1.1 General

The DICOM Application Context Name (ACN), which is always proposed, is:

Application Context Name	1.2.840.10008.3.1.1.1
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The maximum length PDU negotiation is included in all association establishment requests.

The maximum length PDU receive size for the EM DICOM SERVER AE is:

Maximum Length PDU	64234 Bytes / Configurable
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Note: The SOP Class Extended Negotiation is not supported.

Note: The user information Items sent by this product are:

- Maximum PDU Length
- Implementation UID

2.3.4.1.2 Number of Associations

The EM DICOM SERVER AE supports 10 unencrypted or encrypted DICOM associations to perform DICOM operation as a SCP.

2.3.4.1.3 Asynchronous Nature

Asynchronous mode is not supported. All operations will be performed synchronously.

2.3.4.1.4 Implementation Identifying Information

The Implementation UID for this DICOM Implementation is:

EM Implementation UID	1.2.840.113619.6.263
EM Implementation Version Name	NUEVO_1_0

2.3.4.2 Association Initiation Policy

Not applicable.

2.3.4.3 Association Acceptance Policy

The EM DICOM SERVER AE refuses the association if they are too many open connections.

2.3.4.3.1 Real-World Activity: Receive Images from Remote AE

The EM DICOM SERVER AE is indefinitely listening for associations. No operator action is required to receive an image.

2.3.4.3.1.1 Associated Real-World Activity

The Real-World Activity associated with the Receive Images operation is the reception, processing of the images on the disk drive of the Advantage Workstation 4.7 and then, the declaration of the images in the database of the same station.

2.3.4.3.1.2 Presentation Context Table

Acceptable Presentation Contexts for EM DICOM Server AE and Real-World Activity Receive Images from Remote AE.

Presentation Context Table – Proposed by EM DICOM SERVER AE for Activity Receive Images from Remote AE			
Abstract Syntax	Transfer Syntax Group	Role	Extended

Name	UID	Name	SCP	Negotiation
CT Image Storage	1.2.840.10008.5.1.4.1.1.2	Uncompressed Transfer Group	SCP	None

Note: The Uncompressed Transfer Syntax Group is composed of Explicit VR Little Endian, Explicit VR Big Endian, Implicit VR Little Endian

2.3.4.3.1.2.1 SOP Specific DICOM Conformance to Storage SOP Classes

The EM DICOM SERVER AE provides Level 2 (FULL) Conformance, and stores all standard and private data elements of received SOP Instances. It does not coerce any data elements during Storage. The DICOM SERVER AE provides Level 1 Digital Signature support.

The EM DICOM SERVER AE monitors an “Operation Inactivity” timer. The connection with the SCU will be terminated if it is inactive for the configured time-out interval. Default time-out is 15 seconds and is configurable.

Successfully received SOP Instances may be accessed via the user interface and by DICOM network query retrieve. SOP Instances are stored until manually deleted by the user.

Following are the status codes the Application may send back to the SCU Equipment after performing the requested Storage :

TABLE 2.3.1.3.1.2-2 STATUS CODES RETURNED BY EM DICOM SERVER AE FOR ACTIVITY *RECEIVE IMAGES*

Service Status	Status Code	Further Meaning	Status Code Explanation	Related Fields Sent Back to the SCU
Failure	A700	Refused: Out of resources	Not enough diskspace to store the DICOM object	(0000,0902)
	A710	Refused: Out of resources	Remote AE is not given permission to store on EM DICOM SERVER AE	(0000,0902)
	A711	Refused: Out of resources	Unable to connect to local database for storage (such as maximum connection limit reached)	(0000,0902)
	A900	Error: Data Set does not match SOP Class	Storage of the DICOM object failed due to corrupt/invalid dataset	(0000,0902)
	C000	Error: Cannot understand	Error while storing DICOM object in the repository	(0000,0902)
Success	0000	Success	DICOM instance stored successfully	None

Image Declaration phase

Images are declared to the database once processing has been done. Further processing/image declaration issues will be only available on AW4.7.

2.3.4.3.1.3 Presentation Context Acceptance Criterion

The EM DICOM SERVER AE evaluates each Presentation Context independently, and accepts any Presentation Context that matches an Abstract Syntax for any Real-World Activity.

2.3.4.3.1.4 Transfer Syntax Selection Policies

Within each Presentation Context, the EM DICOM SERVER AE will select Transfer Syntaxes according to the following priority (highest priority first):

1. Explicit VR Little Endian
2. Implicit VR Little Endian
3. Explicit VR Big Endian

2.3.4.3.2 Real-World Activity: Verify Connectivity

2.3.4.3.2.1 Associated Real-World Activity

A remote Application Entity verifies its ability to communicate with EM DICOM SERVER AE by sending a verification request.

2.3.4.3.2.2 Accepted Presentation Context

Table 2.3.1.3.5.2-1 Presentation Context– Accepted by EM DICOM SERVER AE for Activity *Verify Connectivity*

Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name List	UID List		
Verification	1.2.840.10008.1.1	Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
		Explicit VR Big Endian	1.2.840.10008.1.2.2		

2.3.4.3.2.2.1 SOP Specific DICOM Conformance Statement for Verification SOP class

The EM DICOM SERVER AE provides standard conformance.

The EM DICOM SERVER AE monitors an “Operation Inactivity” timer. The connection with the SCU will be terminated if it is inactive for the configured time-out interval. Default time-out is 15 seconds and is configurable.

2.3.4.3.2.3 Presentation Context Acceptance Criterion

The EM DICOM SERVER AE evaluates each Presentation Context independently, and accepts any Presentation Context that matches an Abstract Syntax for any Real-World Activity.

2.3.4.3.2.4 Transfer Syntax Selection Policies

Within each Presentation Context, the EM DICOM SERVER AE will select Transfer Syntaxes according to the following priority (highest priority first):

1. Explicit VR Little Endian
2. Implicit VR Little Endian
3. Explicit VR Big Endian

2.4 COMMUNICATION PROFILES

2.4.1 Supported Communication Stacks

The DICOM Upper Layer Protocol is supported using TCP/IP, as specified in DICOM PS3.8.

The TCP/IP stack is inherited from a Unix Operating System.

2.4.2 Physical Media Support

The product is provided with a 10/100/1000 Mb/s auto-sensing Ethernet interface. Additional or alternate network interfaces may be available.

Note: For more information about the Physical Media available on Advantage Workstation 4.7, please refer to the Product Data Sheet.

2.5 EXTENSIONS / SPECIALIZATIONS/ PRIVATIZATIONS

2.5.1 Standard Extended / Specialized / Private SOP Classes

Some Private SOP Classes can be used by this product but are not exported outside of the station and so are not described below.

2.5.1.1 Standard Extended SOP Classes

The product provides Standard Extended Conformance to all supported SOP Classes, through the inclusion of additional Type 3 Standard Elements and Private Data Elements.

2.5.1.1.1 Extended Enhanced SR object

The extension of this SOP Class is described in paragraph 8- Enhanced SR Information Object Implementation .

The Enhanced DICOM SR does not implement the TID 2000 but the private ELECTRONIC FILM TID. Refer to §8.

2.5.1.1.2 Extended Secondary Capture object

The extension of this SOP Class is described in paragraph 7 - Secondary Capture Information Object Implementation.

2.5.1.2 Private SOP Class GE DICOM Private 3D object

GE Private 3D Model Objects are described in the AW Volume Viewer Applications DICOM Conformance Statement in the Workstation tab, see 1.6.

2.5.1.3 Private SOP Class GE DICOM Private NM image

GE private DICOM NM images aka Xeleris/eNTEGRA Protocol Data are described in the GENIE ACQUISITION GENIE DICOM Conformance Statement in the Nuclear Medicine DICOM tab, see 1.6.

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2.5.1.4 Private SOP Class GE DICOM Private PET image

GE private DICOM PET images are described in the Discovery 710/610 and Optima 560 DICOM Conformance Statement in the Positron Emission Tomography (PET) DICOM tab see 1.6.

2.5.2 Private Transfer Syntaxes

No Private Transfer Syntax is supported.

2.6 CONFIGURATION

2.6.1 AE Title/Presentation Address Mapping

The GE Field Engineer must configure the hostname of the station during installation. The hostname will then be used for the AET address mapping.

DICOM SERVER AE

The Local AE Title is set to hostname.

DICOM STORAGE COMMITMENT SERVER AE

The Local AE Title is set to SCU_hostname.

The GE Field Engineer can update the DICOM STORAGE COMMITMENT SERVER AET in a configuration file

DICOM PRINT SCU AE

The local DICOM Print SCU AE Title is: “PR_Hostname” where Hostname is the system hostname defined at installation. The default AET PR_Hostname can be overwritten by GE Field Engineer if the length of Local DICOM Print SCU AE Title exceeds 16 characters.

EM DICOM SERVER AE

The Local AE Title is set to SSF2.

The GE Field Engineer can update the EM DICOM SERVER AET in a configuration file.

Note that the EM DICOM SERVER is an optional feature.

2.6.2 Configurable Parameters

The following fields are configurable for the DICOM SERVER AE (local):

- Local AE Title
- Local IP Address (defined by the station)
- Local IP Netmask (defined by the station)

The Local Listening Port Numbers are not configurable. The port listening to unencrypted connections is set to **4006** and the port listening to encrypted connections is set to **2762**.

The following fields are configurable for the DICOM STORAGE COMMITMENT SERVER AE (local):

- Local AE Title
- Local IP Address (defined by the station)
- Local IP Netmask (defined by the station)

The Local Listening Port Numbers are not configurable. The port listening to unencrypted connections is set to **4008** and the port listening to encrypted connections is set to **2764**.

The following fields are configurable for every remote DICOM AE and DICOM STORAGE COMMITMENT AE:

- Remote AE Title
- Remote IP Address
- Listening TCP/IP Port Number
- Connection Encryption Flag

A **default router** IP Address for **all remote nodes** can be configured as well as some specific routes.

The following fields are configurable:

- Association Establishment Timer
- Store, Find, Move, Timers
- Inactivity Timers
- Maximum Length PDU

The following fields are configurable for the DICOM PRINT SCU AE (local):

~sdc/AIA/bin/configure.printAET

- Local AE Title

Note: The Local IP address and the local IP netmask are the ones of the workstation

Note: No local Port Number is defined because the product is never responding to an association request.

The following fields are configurable for every remote DICOM AE:

- Remote AE Title
- Remote IP Address
- Listening TCP/IP Port Number

The Service Tools allow the administrator to add, delete, or update the Remote DICOM Printers parameters described above.

A default router IP Address for all DICOM remote nodes (including printers, Storage SCP Workstations...) can be configured as well as some specific routes.

The following fields are configurable:

- Message report timeout (default=60s)
- Event report timeout (default=3600s)
- Maximum PDU Length

The GE Field Engineer can update this configuration.

Only one association can be performed at a time by this implementation.

Note: All configurations must be performed by a GE Field Engineer.

Note: Configuration Information (2010,0150) is set by the User during the DICOM printer declaration.

The following fields are configurable for the EM DICOM SERVER AE (local):

- Local AE Title
- Local IP Address (defined by the station)
- Local IP Netmask (defined by the station)

The Local Listening Port Numbers are not configurable. The port listening to unencrypted connections is set to **54006** and the port listening to encrypted connections is set to **52762**.

Note that the EM DICOM SERVER is an optional feature.

2.7 SUPPORT OF EXTENDED CHARACTER SETS

The AW4.7 will support the following character sets:

- without character set indication ISO IR 6 as default,

- ISO IR 100 (Latin1),
- ISO IR144 (Russian),
- ISO IR 192 (UTF-8),
- GB18030 (Chinese),
- ISO IR 149 (Korean),
- ISO IR 13, ISO IR 87 (Japanese).

as extended character sets.

These extended character sets are supported in DICOM data exchange and in the database (as currently described in the DICOM standard). However, they may be displayed only with ISO IR 100 fonts.

For specific applications and possible restrictions please find the details in the Dicom Conformance Statement for the specific application.

For other extended character sets, they will be supported for DICOM data exchange and in the database (as currently described in the DICOM standard). But applications, which will load and manipulate these data, may have a restrictive behavior.

2.8 CODES AND CONTROLLED TERMINOLOGY

The product uses no coded terminology.

2.9 SECURITY PROFILES

The product supports the BCP 195 TLS Secure Transport Connection Profile and the Non-Downgrading BCP 195 TLS Secure Transport Connection Profile as specified in DICOM PS3.15, Annex B.9 and Annex B.10, respectively. In addition, only TLS 1.2 is enabled.

The following cipher suites are used for the BCP 195 TLS Secure Transport Connection Profile (in order of preference): ECDHE-RSA-AES256-GCM-SHA384:ECDHE-RSA-AES128-GCM-SHA256:DHE-RSA-AES256-GCM-SHA384:DHE-RSA-AES128-GCM-SHA256:AES256-SHA256:AES128-SHA:DES-CBC3-SHA

The following cipher suites are used for the Non-Downgrading BCP 195 TLS Secure Transport Connection Profile (in order of preference): ECDHE-RSA-AES256-GCM-SHA384:ECDHE-RSA-AES128-GCM-SHA256:DHE-RSA-AES256-GCM-SHA384:DHE-RSA-AES128-GCM-SHA256

The supported cipher suites and their order of preference are configurable by the GE Field Engineer. Using cipher suites such as TLS_RSA_WITH_AES_256_CBC_SHA256 is not recommended

Encrypted DICOM connections are accepted on the following ports. The DICOM SERVER AE SCP accepts TLS connections on port 2762. The STORAGE COMMITMENT SERVER AE accepts TLS connections transferring N-EVENT-REPORT requests on port 2764. These ports are fixed and cannot be configured.

Acting as a service class user, the product supports all service classes over TLS that it supports over unencrypted connections with the following exception: the Verification Service Class (the *sendecho* platform service).

The certificate used to authenticate the workstation is autogenerated during installation. This certificate can later be manually changed to integrate the workstation into an organization defined public key infrastructure. The product uses this certificate for authentication both when it acts as a TLS server and when it acts as a TLS client.

The product provides Service capability to install trusted certificates or trusted certificate authorities for the authentication of remote hosts. The product checks certificates by default but can be configured to ignore some host certificates.

It is assumed that the product is used within a secured environment. It is assumed that a secured environment includes at a minimum:

1. Firewall or router protections to ensure that only approved external hosts have network access to the product.
2. Firewall or router protections to ensure that the product only has network access to approved external hosts and services.
3. Any communications with external hosts and services outside the locally secured environment use appropriate secure network channels (such as a Virtual Private Network (VPN))

All these recommendations must be fulfilled by the hospital.

Note: The GE Field Engineer is responsible to:

- Regenerate the AW DICOM server private and public keys when they are no more valid or install the AW DICOM server private and public keys when it's provided by the hospital public key infrastructure. Indication of timeline validity is provided by the Service Tools.
- Install remote host certification authority or public certificate to check TLS certificates of remote host.
- Download AW DICOM server certification authority/certificate so that remote hosts can check the AW DICOM server TLS certificate.

All instructions are provided in the Installation and Service Manuals.

3. MEDIA STORAGE CONFORMANCE STATEMENT

3.1 INTRODUCTION

This section of the DICOM conformance statement specifies the Advantage Workstation 4.7 compliance to DICOM requirements for Media Interchange. It details the DICOM Media Storage Application Profiles and roles that are supported by this product.

This station provides capabilities to DICOM interchange on CD-Rs (Compact Disc-Recordable), DVDs (Digital Versatile Disc) and USB (Universal Serial Bus) with different application profiles supported. The Advantage Workstation 4.7 Core Software provides the DICOM interchange capability for all the applications that may be used on the Advantage Workstation 4.7 basis. Please, refer to the DICOM conformance statement of each added application for a complete description of their compliance to DICOM.

Note: Due to technology issues, it is possible that some types of DVDs cannot be read or burnt on the Advantage Workstation 4.7. The function of reading and generating DICOM interchange DVDs is also dependent of the hardware on which the Advantage Workstation 4.7 release is installed.

3.2 IMPLEMENTATION MODEL

3.2.1 Application Data Flow Diagram 9.3

The CD/DVD/USB DICOM Media Server Application Entity (AE) handles the DICOM CREATE CD/RESTORE CD functionality for the CD-R, CD-RW, CD+R, CD+RW device as well as the DICOM CREATE DVD/RESTORE DVD functionality for the DVD+/-RW device and the DICOM CREATE USB/RESTORE USB functionality for the USB device. The CD/DVD/USB DICOM Media Server Application Entity (AE) is commanded by the user to perform DICOM services operating on the DICOM media through the use of buttons and menu selections on the graphical user interface of the station.

The user selects the type of media (either CD, DVD or USB) and then requests the creation of a DICOM File Set and the writing of this DICOM File Set on blank media by selecting images in the local Browser and inserting them in the Media Composer. Then, the images of the different media to burn will be generated. Once the generation has been done, the user can ask to burn the complete set of data on one or more media of the same type (CD, DVD or USB)

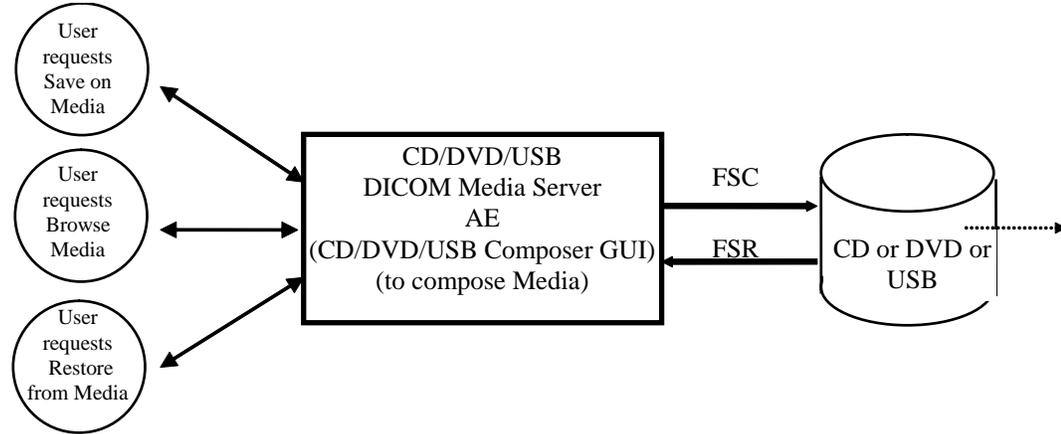
The user can request the reading of a DICOM file set written on an interchange media by selecting the CD/DVD/USB drive as the active device, and browsing the media using the "Query" Item of the device drop down menu, and then restore the selected items by a drag and drop on the local browser icon or by clicking on the suitable restore buttons.

The media interchange application model for the Advantage Workstation 4.7 is shown in the following Illustration :

CD/DVD/USB DICOM Media Server AE Model

ILLUSTRATION 3-1

ADVANTAGE WORKSTATION 4.7 MEDIA INTERCHANGE APPLICATION MODEL AND DATA FLOW DIAGRAM



3.2.2 Functional Definition of the DICOM Media Server AE

3.2.2.1 Functional definition of the DICOM Media Server AE

The CD/DVD/USB DICOM Media Server Application Entity supports the following functions:

- Has access to patient demographics and pixel data in the local database.
- Can generate a DICOM File Set (FSC) in a one shot activity.
- Can update DICOM File Set on USB in a very limited way { see notes }.
- Can write a DICOM File Set (FSC) on a CD-R, CD+R, CD-RW, CD+RW, DVD+R, DVD+RW, DVD-R, DVD-RW
- Can read a DICOM File Set (FSR) on CD-R, CD+R, CD-RW, CD+RW, CDROM, DVD-R, DVD+R, DVD-RW, DVD+RW, DVDROM

Note: Due to technology issues, it is possible that some types of DVDs cannot be read or burnt on the Advantage Workstation 4.7. The function of reading and generating DICOM interchange DVDs is also dependent of the hardware on which the Advantage Workstation 4.7 release is installed.

Note: When exporting data to a USB mass storage device using the Media Composer, the data exported to the USB device will not be fully DICOM compliant if images or series from an exam originate from different Media Composer sessions. In such cases, they will appear on the USB device as duplicate entries on the patient level. When retrieving data from a USB device, the user always have to sort the images/series by the Patient Name / Patient ID and review the list to make sure that all exams belong to the same patient. If the Exam list on the

USB media is sorted by any criteria other than Patient Name / Patient ID, you may miss additional entries for the selected patient.

3.2.3 Sequencing of Real-World Activities

Non Applicable.

3.2.4 File Meta Information Options (See PS3.10)

The File Meta-Information for this implementation is :

File Meta-Information Version	1
Advantage Workstation 4.7 Implementation UID	1.2.840.113619.6.350
Advantage Workstation 4.7 Implementation Version Name	The Implementation Version Name represents the canonical version of the AW, for example: AW4_7_01_186_RHEL
Source Application Entity Title	The Source Application Entity Title is derived from the hostname

3.2.5 Sequencing Requirements

For writing on CD, DVD it is necessary to use blank media. The support of media depends of the hardware that is used.

For writing an USB it is not necessary to use blank media.

3.3 AE SPECIFICATIONS

3.3.1 DICOM MEDIA SERVER AE Specification

The DICOM CD/DVD/USB SERVER Application Entity provides standard conformance to DICOM Interchange Option of the Media Storage Service Class. The supported Application Profiles and roles are listed below.

Supported Application Profile	Real World Activity	Role	Description
STD-GEN-CD STD-XABC-CD AUG-XABC-CD	Browse Media (CD) Restore Media (CD)	FSR	Interchange
STD-GEN-CD STD-XABC-CD AUG-XABC-CD	Create Media (CD)	FSC	Interchange
STD-GEN-DVD-JPEG STD-GEN-DVD-J2K	Browse Media (DVD) Restore Media (DVD)	FSR	Interchange