

Voyager PACS DICOM Conformance Statement

Product Versions:

Voyager PACS Server Version 1.9

Voyager Diagnostic Workstation Version 3.2

Document Issue: 2.0, Revision 2, January 2007

1 Overview

Voyager PACS software components allow to store, archive, display and transmit studies of medical images, and help manage workflow in radiology practices.

Voyager PACS consists of a variety of server components referred to as **Voyager PACS Server**, and a client application referred to as **Voyager Diagnostic Workstation**.

Voyager Diagnostic Workstation can be run as a standalone image display, acquisition and transmission workstation, or can log into a Voyager PACS Server to access shared image and patient information.

Voyager Diagnostic Workstation performs the following tasks through a graphical user interface:

- Display of worklists for various users
- Display patient information and images
- Transmit and retrieve images to distant locations via DICOM and proprietary protocols
- Print images to film and paper
- Scan images and documents, capture images from videostreams
- Edit/add patient information
- Import and export images from/to CD/DVD.

Voyager PACS Server performs the following tasks through faceless modules:

- Image Storage from modalities and archive
- Retrieval of images
- Image Compression
- Radiology Worklist Management, provision of worklists to image modalities
- Study Relocation to other servers

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3 Revision History

Document Issue	Date of Issue	Author	Description
1.0	Jan 14, 1997	WF	Voyager 1.0 Teleradiology product only
1.2	May 9, 1998	WF	Voyager 2.2
2.0	June 1, 2006	Dr. Robert Hofstetter	Voyager 3.1 and PACS components including Query-Retrieve, Worklist management, Media Services
2.02	January 10, 2007	Dr. Robert Hofstetter	Updates for Workstation 3.2, Server 1.9

Intended Audience

This document has been written for system integration and deployment engineers involved in configuration and troubleshooting DICOM data exchange and communication between Voyager PACS and 3rd party products. Software designers may use this document to create software that can communicate with Voyager PACS components. The Reader of this document should be familiar with the DICOM 3.0 standard.

References

See Digital Imaging and Communications in Medicine (DICOM), parts 1 through 12 (NEMA PS 3.1-12).

Definitions

See Digital Imaging and Communications in Medicine (DICOM), parts 1 through 12 (NEMA PS 3.1-12).

Symbols and Abbreviations

See Digital Imaging and Communications in Medicine (DICOM), parts 1 through 12 (NEMA PS 3.1-12).

4 Implementation Model

4.1 Application Data Flow

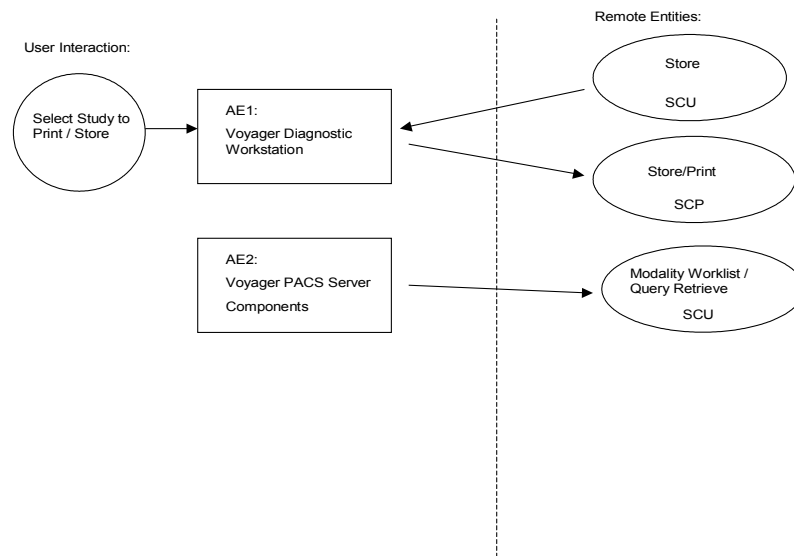


Figure 1: Application Data Flow Diagram

4.2 Functional Definitions of AEs

Voyager Diagnostic Workstation

- Echo (Echo SCP)

Diagnostic Workstation will accept associations with Presentation Contexts for SOP Class of the Verification Service Class, and will respond successfully to echo requests. Echo SCP is only available if Store SCP is configured.

- Send Study Images (Store SCU)

Diagnostic Workstation sends study images located on it's own database or retrieved from Voyager PACS Server to a DICOM Store SCP.

- Receive Images (Store SCP)

Diagnostic Workstation can be configured to act as a DICOM Store SCP and receive images from an external modalities or other applications. The images are then stored on the Diagnostic Workstation's internal database.

- Print Images (Print SCU)

Diagnostic Workstation initiates printing of user selectable study images in user selectable page layouts on DICOM compatible printers.

- Media Service (DICOMDIR)

Diagnostic Workstation allows to import and export one or more studies from/to external media such as CD and DVD in a DICOM compatible format.

Voyager PACS Server

- Echo (Echo SCP)

Voyager PACS Server will accept associations with Presentation Contexts for SOP Class of the Verification Service Class, and will respond successfully to echo requests.

- Receive Images (Store SCP)

Voyager PACS Server acts as a DICOM Store SCP to receive images from external modalities. The images are stored on the local server archive or on a linked satellite archive server.

- Query by External Devices (Find SCP)

Voyager PACS Server responds to queries for Patient/Study/Image information from external devices.

- Retrieve to External Devices (Move SCP)

Voyager PACS Server executes retrieve requests by external devices and moves study images to the requesting device or any other compatible application entity.

- Modality Worklist Management (Worklist SCP)

Voyager PACS Server responds to modality worklist requests (C-Find) and returns matching records out of its database. This database may contain information from manual data entry clients, or retrieved from HL7 messages received from a connected Radiology Information System.

4.3AE Specifications

4.3.1Echo SCP

Applies to Diagnostic Workstation and PACS Server.

SOP Class Name	SOP Class UID	SCU	SCP
Verification SOP Class	1.2.840.10008.1.1	No	Yes

Echo SCP maximum PDU size and number of associations is unlimited.

4.3.2Store SCP/SCU

Applies to the Store SCP and SCUs of Voyager Diagnostic Workstation and Voyager PACS Server entities.

SOP Class Name	SOP Class UID	SCU	SCP
StoredPrintStorage	1.2.840.10008.5.1.1.27	Y	Y
HardcopyGrayscaleImageStorage	1.2.840.10008.5.1.1.29	Y	Y
HardcopyColorImageStorage	1.2.840.10008.5.1.1.30	Y	Y
ComputedRadiographyImageStorage	1.2.840.10008.5.1.4.1.1.1	Y	Y
DigitalXRayImageStorageForPresentation	1.2.840.10008.5.1.4.1.1.1.1	Y	Y
DigitalXRayImageStorageForProcessing	1.2.840.10008.5.1.4.1.1.1.1.1	Y	Y
DigitalMammographyXRayImageStorageForPresentation	1.2.840.10008.5.1.4.1.1.1.2	Y	Y
DigitalMammographyXRayImageStorageForProcessing	1.2.840.10008.5.1.4.1.1.1.2.1	Y	Y
DigitalIntraOralXRayImageStorageForPresentation	1.2.840.10008.5.1.4.1.1.1.3	Y	Y
DigitalIntraOralXRayImageStorageForProcessing	1.2.840.10008.5.1.4.1.1.1.3.1	Y	Y

CTImageStorage	1.2.840.10008.5.1.4.1.1.2	Y	Y
EnhancedCTImageStorage	1.2.840.10008.5.1.4.1.1.2.1	Y	Y
RETIRED UltrasoundMultiframeImageStorage	1.2.840.10008.5.1.4.1.1.3	Y	Y
UltrasoundMultiframeImageStorage	1.2.840.10008.5.1.4.1.1.3.1	Y	Y
MRImageStorage	1.2.840.10008.5.1.4.1.1.4	Y	Y
RETIRED NuclearMedicineImageStorage	1.2.840.10008.5.1.4.1.1.5	Y	Y
RETIRED UltrasoundImageStorage	1.2.840.10008.5.1.4.1.1.6	Y	Y
UltrasoundImageStorage	1.2.840.10008.5.1.4.1.1.6.1	Y	Y
SecondaryCaptureImageStorage	1.2.840.10008.5.1.4.1.1.7	Y	Y
StandaloneOverlayStorage	1.2.840.10008.5.1.4.1.1.8	N	Y,not displayed
StandaloneCurveStorage	1.2.840.10008.5.1.4.1.1.9	N	Y,not displayed
TwelveLeadECGWaveformStorage	1.2.840.10008.5.1.4.1.1.9.1.1	N	Y,not displayed
GeneralECGWaveformStorage	1.2.840.10008.5.1.4.1.1.9.1.2	N	Y,not displayed
AmbulatoryECGWaveformStorage	1.2.840.10008.5.1.4.1.1.9.1.3	N	Y,not displayed
HemodynamicWaveformStorage	1.2.840.10008.5.1.4.1.1.9.2.1	N	Y,not displayed
CardiacElectrophysiologyWaveformStorage	1.2.840.10008.5.1.4.1.1.9.3.1	N	Y,not displayed
BasicVoiceAudioWaveformStorage	1.2.840.10008.5.1.4.1.1.9.4.1	N	Y
XRrayAngiographicImageStorage	1.2.840.10008.5.1.4.1.1.12.1	Y	Y
XRrayFluoroscopyImageStorage	1.2.840.10008.5.1.4.1.1.12.2	Y	Y
RETIRED XRrayAngiographicBiPlaneImageStorage	1.2.840.10008.5.1.4.1.1.12.3	Y	Y
NuclearMedicineImageStorage	1.2.840.10008.5.1.4.1.1.20	Y	Y
RETIRED VLImageStorage	1.2.840.10008.5.1.4.1.1.77.1	Y	Y
VLEndoscopicImageStorage	1.2.840.10008.5.1.4.1.1.77.1.1	Y	Y
VLMicroscopicImageStorage	1.2.840.10008.5.1.4.1.1.77.1.2	Y	Y
VLSlideCoordinatesMicroscopicImageStorage	1.2.840.10008.5.1.4.1.1.77.1.3	Y	Y
VLPhotographicImageStorage	1.2.840.10008.5.1.4.1.1.77.1.4	Y	Y
RETIRED VLMultiFrameImageStorage	1.2.840.10008.5.1.4.1.1.77.2	Y	Y
PETImageStorage	1.2.840.10008.5.1.4.1.1.128	Y	Y
RTImageStorage	1.2.840.10008.5.1.4.1.1.481.1	Y	Y
RTDoseStorage	1.2.840.10008.5.1.4.1.1.481.2	N	Y,not displayed
EnhancedMRImageStorage	1.2.840.10008.5.1.4.1.1.4.1	Y	Y
MRSpectroscopyStorage	1.2.840.10008.5.1.4.1.1.4.2	Y	Y
RawDataStorage	1.2.840.10008.5.1.4.1.1.66	N	Y,not displayed
MultiframeSingleBitSecondaryCaptureImageStorage	1.2.840.10008.5.1.4.1.1.7.1	Y	Y
MultiframeGrayscaleByteSecondaryCaptureImageStorage	1.2.840.10008.5.1.4.1.1.7.2	Y	Y
MultiframeGrayscaleWordSecondaryCaptureImageStorage	1.2.840.10008.5.1.4.1.1.7.3	Y	Y
MultiframeTrueColorSecondaryCaptureImageStorage	1.2.840.10008.5.1.4.1.1.7.4	Y	Y
GrayscaleSoftcopyPresentationStateStorage	1.2.840.10008.5.1.4.1.1.11.1	N	Y, not applied

SOP Classes for Images generated (Scanned or Captured) within Voyager PACS

SOP Class Name	SOP Class UID	
SecondaryCaptureImageStorage	1.2.840.10008.5.1.4.1.1.7	For 8/12/24 bit scanned films and documents, Video Frame Capture

*SOP classes accepted by SCU can be enabled/disabled in the configuration file AssociationConfiguration.txt

Maximum PDU size

The maximum accepted PDU size for the storage SCP is unlimited

Maximum Number of Associations

- Storage SCU: Manually invoked store jobs in the Diagnostic Workstation are executed in a sequential order. Thus the maximum number of associations for Storage SCU is 1.
- Storage SCP: 150 per installed Dicom Store Service.

Asynchronous Nature

Storage SCP will not perform asynchronous operations window negotiation.

Association Initiation Policy

Storage SCP will not initiate any association;

Storage SCU will initiate an association on a user interface command. If a storage job could not be executed successfully, the system will retry the association for a configurable number of times. The retry intervals are doubled for every unsuccessful attempt.

Association Acceptance Policy

Storage SCP accepts any association request, from any requesting AE Title and network address, to any AE Title and network address. AE Titles and network addresses are not used to refuse associations.

Activity when receiving Storage Request (Storage SCP)

Sequencing:

When Voyager Store SCP receives a storage request the images are stored in a temporary folder. Once the association has been terminated and a configurable timeout period has expired, the images are moved to their final locations on the archive and are indexed in the database.

Accepted Presentation Contexts

Presentation Context	UID	SCP	SCU
Implicit VR Little Endian	1.2.840.10008.1.2	Y,Preferred	Y,Preferred
Explicit VR Little Endian	1.2.840.10008.1.2.1	Y	Y
Explicit VR Big Endian	1.2.840.10008.1.2.2	Y	Y
JPEGLSLosslessTransferSyntax	1.2.840.10008.1.2.4.80	Y	N
RLELosslessTransferSyntax	1.2.840.10008.1.2.5	Y	N
JPEGBaseline	1.2.840.10008.1.2.4.50	Y	N
JPEG2000TransferSyntax	1.2.840.10008.1.2.4.91	Y	N

*Presentation Contexts accepted by SCU can be enabled/disabled in the configuration file AssociationConfiguration.txt

No Extended Negotiation is performed in both Storage SCP and Storage SCU.

Storage SCP issued Response Statuses

Service Status	Further Meaning	Status Codes	Reason
Refused	Out of Resources	A700	Could not save file
Error	Data Set does not match SOP Class	A900	SOP Class in image file different from what negotiated
	Cannot understand	C000	Can not parse image data set
Success		0000	

Voyager allows image transfers to be scheduled for specific times and has mechanisms for retrying a transfer in case that a transfer failed at an earlier time. After a configurable number of unsuccessful attempts Voyager will mark the transfer as failed. The Voyager system keeps a log of transfers that is viewable by the user. The log indicates the status of transfers.

Storage SCP Timeout

An association is never terminated due to a timeout by the Voyager Storage SCP. The calling entity is required to terminate the association. Image archiving and indexing is commenced only after the calling entity has terminated the association, or has commenced storing images with a different StudyInstanceUID via the same association.

Required Attributes for Objects received through Store SCP

The following attributes are required in stored image files to ensure proper image archive and display.

Attribute	Tag	Comment
Patient ID	0010,0020	Study will not be archived if missing
StudyInstance UID	0020,000D	
SOP Instance UID	0010,0020	
Bits Allocated	0028,0100	Essential for correct display
Bits Stored	0028,0101	Essential for correct display
High Bit	0028,0102	Essential for correct display
Rows	0028,0010	Essential for correct display
Columns	0028,0011	Essential for correct display

Transparency between incoming and outgoing data

Voyager PACS does not alter any image attributes if images have been received through Store SCP and are later sent on through any Voyager Store SCU or C-Move, except:

- Images archive is configured “compressed” and the uncompressed image copy has been cleaned up.
- Images have been transmitted “compressed” between two entities of Voyager.
- The user has modified image pixel data (such as image orientation etc) and explicitly hit the save button.
- Images have been scanned from film or documents, or captured from video input, within an instance of Voyager Diagnostic Workstation.

4.3.3 Modality Worklist SCP

SOP Class

FINDModalityWorklistInformationModel	1.2.840.10008.5.1.4.31
--------------------------------------	------------------------

Maximum PDU size

The maximum accepted PDU size for the storage SCP is unlimited

Maximum Number of Associations

Maximum number of associations is 16384.

Asynchronous Nature

Modality Worklist SCP will not perform asynchronous operations window negotiation.

Association Initiation Policy

Modality Worklist SCP will not initiate any association;

Association Acceptance Policy

Storage SCP accepts any association request, from any requesting AE Title and network address. AE Titles and network addresses are not used to refuse associations.

However if an AE Title of a calling modality is not registered with the PACS Server (using PACS Manager) any C-Find request will return 0 response datasets.

C-Find Matching and Response Attributes

An incoming C-Find request is parsed, and any populated matching attribute is used to search for a pending radiology order on the Order Table of the Voyager PACS Database. The response data structures are then filled from data on the Order table and returned to the caller.

Voyager PACS Worklist SCP only returns radiology orders scheduled for a specific modality (such as CT, CR) and a specific AcquisitionLocation. Thus the AE Title, Modality and AcquisitionLocation of the calling Worklist SCU AE **must** be registered (using PACS Manager) with the Worklist SCP on the PACS Server. If an unregistered Worklist SCU AE performs a query, no records are returned.

To narrow down the number of returned records to each Worklist SCU, additional matching conditions can be configured on the PACS Server. These conditions include: State of a radiology order, scheduled start time range. These conditions are configured in PACS Manager.

The following attributes are supported as matching keys and response values.

Attribute	Tag	Type of Matching	Response	Default Map to Voyager Database Field
PatientID	0010,0020	S,*	Y	Order.URNumber
PatientsBirthDate	0010,0030	S	Y	Order.DateOfBirth
PatientsName	0010,0010	S,*	Y	Order.LastName^Order.FirstName
PatientsAddress	0010,1040	NONE	Y	Order.Street+Order.City+ Order.Postcode+Order.Region+Order.Country

PatientsTelephoneNumbers	0010,2154	NONE	Y	Order.HomePhone+Order.WorkPhone
EthnicGroup	0010,2160	S,*	Y	Order.EthnicGroup
PatientsSex	0010,0040	S,*	Y	Order.Sex
AccessionNumber	0008,0050	S,*	Y	Order.AccessionNum
ScheduledStudyStartDate	0032,1000	R,S	Y	Order.ScheduledStartTime
ScheduledStudyStartTime	0032,1001	R,S	Y	Order.ScheduledStartTime
ScheduledProcedureStepStartDate	0040,0002	R,S	Y	Order.ScheduledStartTime
Modality	0008,0060	S	Y	Order.Modality
RequestedProcedureLocation	0040,1005)	S,*	Y	Order.AcquisitionLocation
BodyPartExamined	0018,0015	S,*	Y	Order.BodyPart
RequestedProcedureComments	0040,1400	NONE	Y	Order.ReferralText
RequestedProcedureID	0040,1001	S,*	Y	Order.RequestedProcedureStepID
Priority	0000,0700	S	Y	Order.Priority
ReferringPhysiciansName	0008,0090	S,*	Y	Order.ReferredBy
NameOfPhysiciansReadingStudy	0008,1060	S,*	Y	Order.ReportedBy
StudyInstanceUID	0020,000d	NONE	Y	Order.StudyDICOMInstanceUID (If not on database, a new StudyInstanceUID is generated and stored)
ScheduledStationAETitle	0040,0001	S	N	look up modality on ImagingResource.AETitle, return all pending procedures for this modality

Note: Additionally any matching key and response attribute can be soft mapped to any Database Field on the Order Table. Default mappings can also be overridden. The corresponding mapping rule can be configured using PACS Manager. Refer to the Voyager PACS Installation documentation for more information.

4.3.4 Query Retrieve SCP

Sop Classes

SOP Class Name	SOP Class UID	SCP
Patient Root Q/R Information Model - FIND	1.2.840.10008.5.1.4.1.2.1.1	Yes
Patient Root Q/R Information Model - MOVE	1.2.840.10008.5.1.4.1.2.1.2	Yes
Study Root Q/R Information Model - FIND	1.2.840.10008.5.1.4.1.2.2.1	Yes
Study Root Q/R Information Model - MOVE	1.2.840.10008.5.1.4.1.2.2.2	Yes
Patient Study Only Information Model - FIND	1.2.840.10008.5.1.4.1.2.3.1	Yes
Patient Study Only Information Model - MOVE	1.2.840.10008.5.1.4.1.2.3.2	Yes

Transfer Syntax

The transfer syntax for C-Find is always DICOM Implicit VR Little Endian 1.2.840.10008.1.2

Association Policies

The Query Retrieve accepts any association for C-Echo, C-Find and C-Move requests.

After a C-Move request the Query Retrieve Service will establish a C-Store association and act as a C-Store SCU to move the requested images.

The network destination and AE Title for the remote C-Store target can be configured through a rule in PACS Manager. By default the C-Store network destination and AE Title is equal to the requesting C-Move SCU.

The DICOM standard Application Context Name for DICOM 3.0 is always accepted:
1.2.840.10008.3.1.1.1

Number of Associations

The number of associations for the Query Retrieve SCP is unlimited.

Asynchronous Nature

Voyager PACS Server Query Retrieve SCP does not support asynchronous communication (multiple outstanding transactions via a single association).

AE identifying Information

Implementation Class UID	1.2.276.0.7230010.3.0.0.3.5.3
Implementation Version Name	VoyagerQR1_2

Association Initiation Policy

Voyager PACS Server Query Retrieve SCP establishes a C-Store association after it has received a C-Move request. See **Association Policies** above.

Association Acceptance Policy

Voyager PACS Server Query Retrieve SCP accepts any association request, from any requesting AE Title and network address. AE Titles and network addresses of Query Retrieve SCUs do not have to be configured.

Description and Sequencing of Activity

If Voyager PACS Server Query Retrieve SCP receives a query (C-FIND) request then the response(s) will be sent over the same Association used to send the C-FIND-Request.

If Voyager PACS Server Query Retrieve SCP receives a retrieval (C-MOVE) request then the responses will be sent over the same Association used to send the C-MOVE-Request. The Query Retrieve SCP will establish a C-Store association and act as a C-Store SCU to send the requested SOP Instances to the C-MOVE Destination. See also **Association Policies**. The Query Retrieve SCP then sends a C-MOVE Response indicating this status after each attempt. Once the STORAGE-SCU has finished attempting to transfer all the requested SOP Instances, the Query Retrieve SCP sends a final C-MOVE Response indicating the overall status of the attempted retrieval.

Sequencing of a C-Find request

1. Peer AE opens an Association with the Voyager PACS Server Query Retrieve SCP.
2. Peer AE sends a C-FIND-RQ Message
3. Query Retrieve SCP returns a C-FIND-RSP Message to the peer AE with matching information. A C-FIND-RSP is sent for each entity matching the identifier specified in the C-FIND-RQ. A final C-FIND-RSP is sent indicating that the matching is complete.

4. Peer AE closes the Association. Further C-FIND or C-MOVE Requests can be sent over the Association before it is closed.

Sequencing of a C-Move request

1. Peer AE opens an Association with the Query Retrieve SCP.
2. Peer AE sends a C-MOVE-RQ Message
3. The Query Retrieve SCP establishes a C-Store association and acts as a C-Store SCU to send the requested SOP Instances to the C-MOVE RQ AE, or another network destination, as configured in PACS Manager (see Voyager PACS Installation Documentation for how to set up a rule for the C Store destination).
4. After attempting to send a SOP Instance, via the C-store association the QUERY-RETRIEVE-SCP AE returns a C-MOVE-RSP indicating this success or failure.
5. Once the STORAGE-SCU AE has completed all attempts to transfer the SOP Instances to the C-MOVE Destination AE, or the first failure occurred, the Query Retrieve SCP sends a final C-MOVE-RSP indicating the overall success or failure of the retrieval.
6. Peer AE closes the Association. Further C-FIND or C-MOVE Requests can be sent over the Association before it is closed.

Query and Response Attributes

Only the attributes requested in the query identifier are returned in the response sets. Query responses are always composed of data from the Voyager PACS Database Patient, Study and Image tables.

Queries must contain at least one partially filled search key. If a query with all search keys empty is received, no response sets are returned.

Note: In addition to the Default Mapping any other DICOM Attribute can be mapped to any of the Voyager PACS Database table fields for the query matching and response data set. Custom mapping is configured in the Voyager PACS Manager.

PATIENT ROOT C-FIND SCP SUPPORTED ELEMENTS

Level Name Attribute Name	Tag	VR	Types of Matching	Default Mapping to Database Field
Patient Level				
Patient's Name	0010,0010	PN	S,*,U	Patient.LastName
Patient ID	0010,0020	LO	S,*,U	Patient.URNumber
Patient's Birth Date	0010,0030	DA	S,U	Patient.Dob
Patient's Sex	0010,0040	CS	S,U	Patient.Sex
Study Level				
Study Date	0008,0020	DA	S,R,U	Study.StudyDate
Study Time	0008,0030	TM	R,U	Study.StudyDate
Accession Number	0008,0050	SH	S,*,U	Study.AccessionNum
Study ID	0020,0010	SH	NONE	-
Study Instance UID	0020,000D	UI	S,U,L	Study.StudyDICOMInsta nceUID
Referring Physician's Name	0008,0090	PN	S,*,U	Study.ReferringDoctor
Study Description	0008,1030	LO	S,*,U	Study.StudyName
Series Level				

Modality	0008,0060	CS	S,U	Study.Modality
Series Number	0020,0011	IS	NONE	-
Series Instance UID	0020,000E	UI	S,U,L	Image.ImageAux
Operator's Name	0008,1070	PN	NONE	-
Image Level				
Instance Number	0020,0013	IS	S,*,U	Image.ImageIndex

S= Single value matching, R = Range Matching, U = Universal Matching, * = Wildcard matching.

STUDY ROOT C-FIND SCP SUPPORTED ELEMENTS

Level Name Attribute Name	Tag	VR	Types of Matching	Default Mapping to Database Field
Study Level				
Patient's Name	0010,0010	PN	S,*,U	Patient.LastName
Patient ID	0010,0020	LO	S,*,U	Patient.URNumber
Patient's Birth Date	0010,0030	DA	S,U	Patient.DoB
Patient's Sex	0010,0040	CS	S,U	Patient.Sex
Study Date	0008,0020	DA	S,R,U	Study.StudyDate
Study Time	0008,0030	TM	R,U	Study.StudyDate
Accession Number	0008,0050	SH	S,*,U	Study.AccessionNum
Study ID	0020,0010	SH	NONE	-
Study Instance UID	0020,000D	UI	S,U,L	Study.StudyDICOMInstanceUID
Referring Physician's Name	0008,0090	PN	S,*,U	Study.ReferringDoctor
Study Description	0008,1030	LO	S,*,U	Study.StudyName
Series Level				
Modality	0008,0060	CS	S,U	Study.Modality
Series Number	0020,0011	IS	NONE	-
Series Instance UID	0020,000E	UI	S,U,L	Image.ImageAux
Image Level				
Instance Number	0020,0013	IS	S,*,U	Image.ImageIndex

S= Single value matching, R = Range Matching, U = Universal Matching, * = Wildcard matching.

PATIENT/STUDY ONLY ROOT C-FIND SCP SUPPORTED ELEMENTS

Level Name Attribute Name	Tag	VR	Types of Matching	Default Mapping to Database Field
Patient Level				
Patient's Name	0010,0010	PN	S,*,U	Patient.LastName
Patient ID	0010,0020	LO	S,*,U	Patient.URNumber
Patient's Birth Date	0010,0030	DA	S,U	Patient.DoB
Patient's Sex	0010,0040	CS	S,U	Patient.Sex
Study Level				
Study Date	0008,0020	DA	S,R,U	Study.StudyDate
Study Time	0008,0030	TM	R,U	Study.StudyDate
Accession Number	0008,0050	SH	S,*,U	Study.AccessionNum
Study ID	0020,0010	SH	S,*,U	-
Study Instance UID	0020,000D	UI	S,U,L	Study.StudyDICOMInstanceUID
Referring Physician's Name	0008,0090	PN	S,*,U	Study.ReferringDoctor
Study Description	0008,1030	LO	S,*,U	Study.StudyName

S= Single value matching, R = Range Matching, U = Universal Matching, * = Wildcard matching.

4.3.5 Printer SCU**Associated Real World Activity**

The Voyager Diagnostic Workstation user selects a study in the local database or Voyager PACS database and submits it to the Print Service as a job for the desired laser imager. The user can choose the images printed, or print the entire study. Several parameters such as the layout and orientation of the film and number of copies can be chosen as well.

Proposed Presentation Contexts

Presentation Context Table for Remote System Retrieve					
Abstract Syntax		Transfer Syntax		Role	Extended
Name	UID	Name	UID		Negotiation
Basic Grayscale Print Management Meta	1.2.840.10008.5.1.1.9	Implicit VR, Little Endian	1.2.840.10008.1.2	SCU	None

SOP Specific Conformance Statement for SOP Classes Basic Greyscale Print Management Meta

The Voyager Diagnostic Workstation Print SCU supports the following mandatory SOP classes as defined by the Basic Grayscale Print Management Meta class:

Supported SOP classes as Basic Grayscale Print Management Meta SOP class	
SOP Class Name	SOP Class UID
Basic Film Session	1.2.840.10008.5.1.1.1
Basic Film Box	1.2.840.10008.5.1.1.2
Basic Grayscale Image Box	1.2.840.10008.5.1.1.4
Printer	1.2.840.10008.5.1.1.16

Conformance for SOP Class Basic Film Session

The Voyager Print Service includes the following attributes in the N-CREATE for the Basic Film Session SOP class:

Attributes for Basic Film Session SOP class N-CREATE	
Description	Tag
Number of Copies	(2000,0010)
Print Priority	(2000,0020)
Medium Type	(2000,0030)
Film Destination	(2000,0040)
Film Session Label	(2000,0050)
Memory Allocation	(2000,0060)

The N-SET and N-ACTION are currently unused. The N-DELETE is used to delete the complete Basic Film Session SOP instance hierarchy.

Conformance for SOP Class Basic Film Box

The Voyager Print Service includes the following attributes in the N-CREATE for the Basic Film Box SOP class:

Attributes for Basic Film Box SOP class N-CREATE		
Description	Tag	Usage
Image Display Format	(2010,0010)	A
Referenced Film Session Sequence	(2010,0500)	A
> Referenced SOP Class UID	(0008,1150)	A
> Referenced SOP Instance UID	(0008,1155)	A
Film Orientation	(2010,0040)	A
Film Size ID	(2010,0050)	A
Magnification Type	(2010,0060)	C
Max Density	(2010,0130)	C
Configuration Information	(2010,0150)	C
Smoothing Type	(2010,0080)	C
Border Density	(2010,0100)	C
Empty Image Density	(2010,0110)	C
Min Density	(2010,0120)	C
Trim	(2010,0140)	C

The N-SET is currently unused. The N-ACTION is used to print a complete Basic Film Box SOP instance and N-DELETE is used to delete it after printing.

Conformance for SOP Class Basic Grayscale Image Box

The Voyager Print Service includes the following attributes in the N-SET for the Basic Grayscale Image SOP class:

Attributes for Basic Grayscale Image SOP Box class N-SET		
Description	Tag	Usage
Image Position	(2020,0010)	A
Preformatted Grayscale Image Sequence	(2020,0110)	A
> Samples Per Pixel	(0028,0002)	A
> Photometric Interpretation	(0028,0004)	A
> Rows	(0028,0010)	A
> Columns	(0028,0011)	A
> Pixel Aspect Ratio	(0028,0034)	A
> Bits Allocated	(0028,0100)	A
> Bits Stored	(0028,0101)	A
> High Bit	(0028,0102)	A
> Pixel Representation	(0028,0103)	A
> Pixel Data	(7FE0,0010)	A
Magnification Type	(2010,0060)	C
Smoothing Type	(2010,0080)	C
Requested Image Size	(2020,0030)	C

Processing of Images Prior to Printing

- Only the 8 bit greyscale image box SOP is supported. Any color image is converted to 8 bit greyscale prior to assignment to the image box.
- Images with a bit depth of 9-16 bits are converted to 8 bit prior to assignment to the image box. For the conversion Voyager uses the WindowCenter and WindowWidth values found with each image, or, if the user has altered these values the values set by the user are used.
- Overlaid text is “burned in” the pixel data of the image prior to assignment to the image box.

Conformance for SOP Class Printer

The Voyager Print Service shall accept N-EVENT-REPORT and return confirmation accordingly. The Voyager Print Service uses N-GET for the Basic Printer SOP class to get information from the SCP.

Optional SOP Classes for Basic Grayscale Print Management Meta

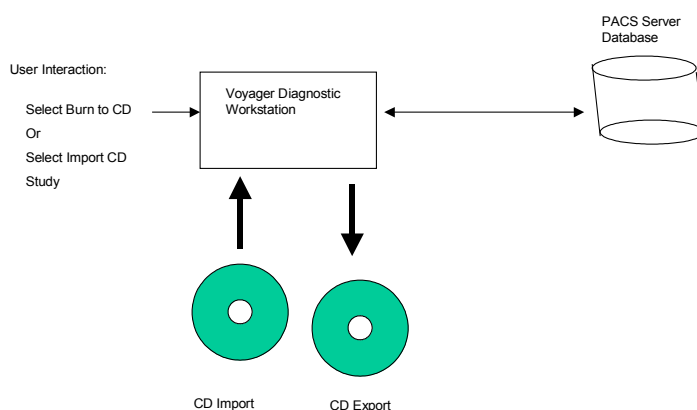
Currently these are not supported by the Voyager Print Service.

Optional SOP Classes for Basic Color Print Management Meta

Currently these are not supported by the Voyager Print Service.

5Media Storage

Application Data Flow



- Selection of a command “Export to CD” will transfer selected studies and images to an Offline CD-R. Voyager Workstation will prompt the user on completion of the burn process.
- Insertion of an Offline CD-R and selecting “Import from CD” will display a list of studies contained on the CD that can be imported as required. The data is first stored on Voyager Diagnostic Workstation local storage and can be transferred to the PACS Server Archive.

The Offline-Media Application Entity provides standard conformance to the DICOM Interchange Option of the Media Storage Service Class. The contents of the export job will be written together with a corresponding DICOMDIR to a single-session CDR. Writing in multi-session mode is not supported. The user can cancel an export job in the job queue.

SUPPORTED MEDIA

Media Storage Application Profile	Write Files (FSC or FSU)	Read Files (FSR)
Compact Disk - Recordable		
General Purpose CD-R	Yes	Yes
General Purpose DVD-R	Yes	Yes
General Purpose DVD-RAM	No	Yes

Options

The Offline-Media CD Export Application Entity always stores images in the transfer syntax, as specified in the standard:

Explicit VR Little Endian 1.2.840.10008.1.2.1

Images can be stored and read in the following SOP Classes:

SOP Class Name	SOP Class UID	Export	Import
StoredPrintStorage	1.2.840.10008.5.1.1.27	Y	Y
HardcopyGrayscaleImageStorage	1.2.840.10008.5.1.1.29	Y	Y
HardcopyColorImageStorage	1.2.840.10008.5.1.1.30	Y	Y
ComputedRadiographyImageStorage	1.2.840.10008.5.1.4.1.1.1	Y	Y
DigitalXRayImageStorageForPresentation	1.2.840.10008.5.1.4.1.1.1.1	Y	Y
DigitalXRayImageStorageForProcessing	1.2.840.10008.5.1.4.1.1.1.1.1	Y	Y
DigitalMammographyXRayImageStorageForPresentation	1.2.840.10008.5.1.4.1.1.1.2	Y	Y
DigitalMammographyXRayImageStorageForProcessing	1.2.840.10008.5.1.4.1.1.1.2.1	Y	Y
DigitalIntraOralXRayImageStorageForPresentation	1.2.840.10008.5.1.4.1.1.1.3	Y	Y
DigitalIntraOralXRayImageStorageForProcessing	1.2.840.10008.5.1.4.1.1.1.3.1	Y	Y
CTImageStorage	1.2.840.10008.5.1.4.1.1.2	Y	Y
EnhancedCTImageStorage	1.2.840.10008.5.1.4.1.1.2.1	Y	Y
RETIRED UltrasoundMultiframeImageStorage	1.2.840.10008.5.1.4.1.1.3	Y	Y
UltrasoundMultiframeImageStorage	1.2.840.10008.5.1.4.1.1.3.1	Y	Y
MRImageStorage	1.2.840.10008.5.1.4.1.1.4	Y	Y
RETIRED NuclearMedicineImageStorage	1.2.840.10008.5.1.4.1.1.5	Y	Y
RETIRED UltrasoundImageStorage	1.2.840.10008.5.1.4.1.1.6	Y	Y
UltrasoundImageStorage	1.2.840.10008.5.1.4.1.1.6.1	Y	Y
SecondaryCaptureImageStorage	1.2.840.10008.5.1.4.1.1.7	Y	Y
XRayAngiographicImageStorage	1.2.840.10008.5.1.4.1.1.12.1	Y	Y
XRayFluoroscopyImageStorage	1.2.840.10008.5.1.4.1.1.12.2	Y	Y
RETIRED XRayAngiographicBiPlaneImageStorage	1.2.840.10008.5.1.4.1.1.12.3	Y	Y
NuclearMedicineImageStorage	1.2.840.10008.5.1.4.1.1.20	Y	Y
RETIRED VLImageStorage	1.2.840.10008.5.1.4.1.1.77.1	Y	Y
VLEndoscopicImageStorage	1.2.840.10008.5.1.4.1.1.77.1.1	Y	Y
VLMicroscopicImageStorage	1.2.840.10008.5.1.4.1.1.77.1.2	Y	Y
VLSlideCoordinatesMicroscopicImageStorage	1.2.840.10008.5.1.4.1.1.77.1.3	Y	Y
VLPhotographicImageStorage	1.2.840.10008.5.1.4.1.1.77.1.4	Y	Y
RETIRED VLMultiFrameImageStorage	1.2.840.10008.5.1.4.1.1.77.2	Y	Y
PETImageStorage	1.2.840.10008.5.1.4.1.1.128	Y	Y
RTImageStorage	1.2.840.10008.5.1.4.1.1.481.1	Y	Y
EnhancedMRImageStorage	1.2.840.10008.5.1.4.1.1.4.1	Y	Y
MRSpectroscopyStorage	1.2.840.10008.5.1.4.1.1.4.2	Y	Y
MultiframeSingleBitSecondaryCaptureImageStorage	1.2.840.10008.5.1.4.1.1.7.1	Y	Y
MultiframeGrayscaleByteSecondaryCaptureImageStorage	1.2.840.10008.5.1.4.1.1.7.2	Y	Y
MultiframeGrayscaleWordSecondaryCaptureImageStorage	1.2.840.10008.5.1.4.1.1.7.3	Y	Y
MultiframeTrueColorSecondaryCaptureImageStorage	1.2.840.10008.5.1.4.1.1.7.4	Y	Y

6Character Sets

No character sets other than the default are supported

7Security

Voyager PACS does not support any DICOM security measures.