Philips Medical Systems

DICOM

CONFORMANCE STATEMENT

for MR Scanners and Workstations with VIA5.0 Software

28 August 2003

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1. Introduction

This chapter provides general information about the purpose, scope and contents of this

Conformance Statement.

1.1 Scope and Field of Application

The scope of this DICOM Conformance Statement is to facilitate data exchange with equipment of Philips Medical Systems. This document specifies the compliance to the DICOM standard (formally called the NEMA PS 3.X standards). It contains a short description of the applications involved and provides technical information about the data exchange capabilities of the equipment. The main elements describing these capabilities are: the supported DICOM Service Object Pair (SOP) Classes, Roles, Information Object Definitions (IOD) and Transfer Syntaxes.

The field of application is the integration of the Philips Medical Systems equipment into an environment of medical devices. This Conformance Statement should be read in conjunction with the DICOM standard and its addenda [DICOM].

1.2 Intended Audience

This Conformance Statement is intended for:

- (potential) customers
- system integrators of medical equipment
- marketing staff interested in system functionality
- software designers implementing DICOM interfaces

It is assumed that the reader is familiar with the DICOM standard.

1.3 Contents and Structure

The DICOM Conformance Statement is contained in chapter 2 through 7 and follows the contents and structuring requirements of DICOM PS 3.2.

1.4 Used Definitions, Terms and Abbreviations

DICOM definitions, terms and abbreviations are used throughout this Conformance Statement. For a description of these, see NEMA PS 3.3 and PS 3.4.

The word Philips in this document refers to Philips Medical Systems.

1.5 References

1.5.1 [DICOM] The Digital Imaging and Communications in Medicine

(DICOM) standard (NEMA PS 3.X):
National Electrical Manufacturers Association (NEMA)
Publication Sales 1300 N. 17th Street, Suite 1847
Rosslyn, Va. 22209, United States of America

1.6 Important Note to the Reader

This Conformance Statement by itself does not guarantee successful interoperability of Philips equipment with non-Philips equipment. The user (or user's agent) should be aware of the following issues:

- Interoperability

  Interoperability refers to the ability of application functions, distributed over two or more systems, to work successfully together. The integration of medical devices into a IT environment may require application functions that are not specified within the scope of DICOM. Consequently, using only the information provided by this Conformance Statement does not guarantee interoperability of Philips equipment with non-Philips equipment.

  It is the user's responsibility to analyze thoroughly the application requirements and to specify a solution that integrates Philips equipment with non-Philips equipment.

- Validation

  Philips equipment has been carefully tested to assure that the actual implementation of the DICOM interface corresponds with this Conformance Statement.

  Where Philips equipment is linked to non-Philips equipment, the first step is to compare the relevant Conformance Statements. If the Conformance Statements indicate that successful information exchange should be possible, additional validation tests will be necessary to ensure the functionality, performance, accuracy and stability of image and image related data. It is the responsibility of the user (or user's agent) to specify the appropriate test suite and to carry out the additional validation tests.

- New versions of the DICOM Standard

  The DICOM Standard will evolve in future to meet the user's growing requirements and to incorporate new features and technologies. Philips is actively involved in this evolution and plans to adapt its equipment to future versions of the DICOM Standard. In order to do so, Philips reserves the right to make changes to its products or to discontinue its delivery.

  The user should ensure that any non-Philips provider linking to Philips equipment, also adapts to future versions of the DICOM Standard. If not, the incorporation of DICOM enhancements into Philips equipment may lead to loss of connectivity (in case of networking) and incompatibility (in case of media).

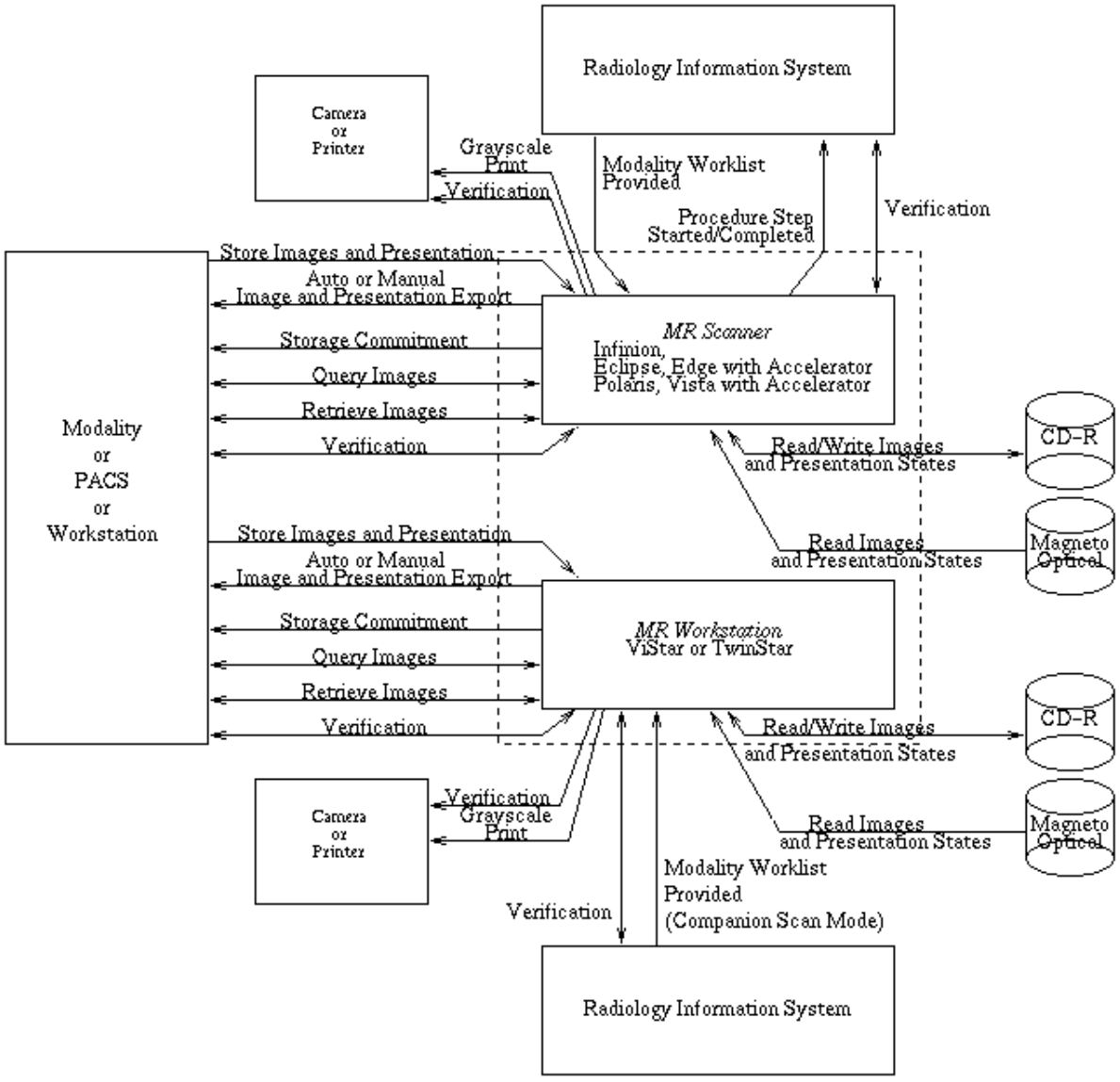
1.7 General Acronyms and Abbreviations.

The following acronyms and abbreviations are used in the document.

Acronym	Definition
ACC	American College of Cardiology
AE	Application Entity
ACR	American College of Radiology
ANSI	American National Standard Institute
DICOM	Digital Imaging and Communication in Medicine
DIMSE	DICOM Message Service Element
ELE	Explicit VR Little Endian
EBE	Explicit VR Big Endian
FSC	File Set Creator
FSR	File Set Reader
ILE	Implicit VR Little Endian
HIS	Hospital Information System
IOD	Information Object Definition
NEMA	National Electrical Manufacturers Association
PDU	Protocol Data Unit
RIS	Radiology Information System
RWA	Real World Activity
SCP	Service Class Provider
SCU	Service Class User
SOP	Service Object Pair
TCP/IP	Transmission Control Protocol/Internet protocol
UID	Unique Identifier

2. Implementation Model

The following general diagram provides an overview of the MR Scanner or MR Workstation capabilities, the diagram below is only a simple example, many variations on network configurations can be supported:



The diagram above attempts to introduce the reader to the features provided using abbreviated non-DICOM terminology. In comparing this conformance statement to those of other vendors and as a guide to the remainder of this document, the following cross reference guide is provided:

Description in diagram	DICOM Service Object Pair
Store Images and Presentation	DICOM Storage Service Class as a Provider for Supported image SOP classes and Grayscale Softcopy Presentation State SOP class.
Auto or Manual Image and Presentation Export	DICOM Storage Service Class as a User for Supported image SOP classes and Grayscale Softcopy Presentation State SOP class.
Query/Retrieve Client	DICOM Query/Retrieve Service Class as a User
Query/Retrieve Server	DICOM Query/Retrieve Service Class as a Provider
Grayscale Print	DICOM Print Service Class as a User
Modality Worklist	DICOM Modality Worklist Management Service Class as a User
Procedure Step Started/Completed	DICOM Modality Perform Procedure Step Service Class as a User
Write Images and Presentation States	DICOM Media Storage as a File Set Creator for Supported image SOP classes and Grayscale Softcopy Presentation State SOP class.
Read Images and Presentation States	DICOM Media Storage as a File Set Reader for Supported image SOP classes and Grayscale Softcopy Presentation State SOP class.
Storage Commitment	DICOM Push Model Storage Commitment Service Class as a User
Verification Server	DICOM Verification as a Provider
Verification Client	DICOM Verification as a User

The next section of the document provides a brief description of each supported DICOM Service Object Pair. The MR VIA5.0 software release is a layered product; as such not all systems are licensed to enable all of the supported DICOM Service Object Pairs. Following each brief description, the software license required to enable the DICOM Service Object Pair is identified.

As the reader reviews each independent description, please note that each feature describes half of the interoperability scenario supported by the MR system. These features also require sufficient network bandwidth and the complimentary DICOM 3.0 compliant device to complete the scenario.

DICOM Storage Service Class as a Provider
This facility permits the MR Scanner or MR Workstation to receive images and Grayscale Softcopy Presentation State objects from a Modality, PACS, or Workstation. (DICOM Import Server)

Software License	**DIIMP, DIGSPS**

DICOM Storage Service Class as a User
This facility sends images and Grayscale Softcopy Presentation State objects from the MR Scanner or MR Workstation to a Modality, PACS, or Workstation over an Ethernet network. (DICOM Export Client)

Software License	**DIGSPS**

DICOM Query/Retrieve Service Class as a User
This facility permits the MR Scanner or MR Workstation to browse other DICOM databases on the network and to copy operator selected images from the DICOM database to the local system for review and image processing. (DICOM Query/Retrieve Client)

Software License	none, included with the base system

DICOM Query/Retrieve Service Class as a Provider
This facility permits the Modality, PACS, or Workstation to browse the Philips MR local database from the network and permits it to copy the images to the Modality, PACS, or Workstation. (DICOM Query/Retrieve Server)

Software License	**DIQUERY**

DICOM Print Service Class as a User
This facility permits images to be sent over a network to any valid DICOM printer. (DICOM Print Client)

Software License	**DIFILM**

DICOM Modality Worklist Management Service Class as a User
This facility is restricted to MR Scanners and Workstations with the Companion Scan Option. It provides the ability to access a DICOM conformant HIS/RIS and permits the MR scanner the ability to download the patient name, demographics, accession number for the study.(DICOM Modality Worklist Client)

Software License	**DIMODWL**

DICOM Modality Perform Procedure Step Service Class as a User
This facility is restricted to MR Scanners, it provides the ability to access a DICOM conformant HIS/RIS to schedule procedures/protocols on the MR scanner. The MR scanner relays details on procedures/protocols performed back to the scheduling device.(DICOM Perform Procedure Step Client)

Software License	**DIPPS**

DICOM Media Storage as a File Set Creator
This facility permits images (in DICOM format), Grayscale Softcopy Presentation State objects

and a DICOM directory structure (DICOMDIR) to be stored on a CD. The CD can be used for archiving images and for situations where another workstation cannot access the Philips MR image data from a network. (DICOM CD Writer)

Practical examples where this might be used would be:

- *Computer Aided Surgery applications where there are no network facilities in the operating room.*
- *ACR Accreditation/Data Submission*
- *Transferring images to a referring physician (software capable of displaying the images is included on the CD's. The software operates under Windows 98/ME/NT, and 2000).*

Software License	**CDWRITE, DIIMP, DIGSPS & ACUIMAGE**

DICOM Media Storage as a File Set Reader
This facility permits the DICOM directory structure stored with the images to be read when an uncompressed DICOM CD or uncompressed DICOM Magneto-Optical is installed in the system. The operator can then access the images and Grayscale Softcopy Presentation State objects by selecting the series. (DICOM CD and Magneto-Optical Reader)

Software License	**DIMEDIAR, DIGSPS**

DICOM Push Model Storage Commitment Service Class as a User
This facility permits another system to provide the ability to archive images in DICOM format rather than archiving the images using the Magneto-Optical format provided by the MR system. The facility is limited to images and the patient, study, and series information, which describe the images. Any other archive requirements require a careful review of the conformance statement to assure that the information is included in a DICOM Export operation. (DICOM Storage Commitment Client)

Software License	**DIQUERY or DIIMP**

DICOM Verification as a Provider
This is a non-clinical facility used to confirm that the configuration information of the User, i.e. Application Entity Titles, Communication Port, and Internet Protocol Address, matches the information configured into the MR system. (DICOM Verification Server)

Software License	**DIQUERY or DIIMP**

DICOM Verification as a User
This is a non-clinical facility used to confirm that the configuration information of the Provider, i.e. Application Entity Titles, Communication Port, and Internet Protocol Address, matches the information configured into the MR system. (DICOM Verification Client)

Software License	none, included with the base system

Supported System Configurations
The VIA5.0 software release is capable of being operated on the following MR products:

MR Scanners		**Independent Medical Imaging Workstations**
Infinion	Edge with Accelerator	ViStar
Eclipse	Vista with Accelerator	TwinStar
Polaris		

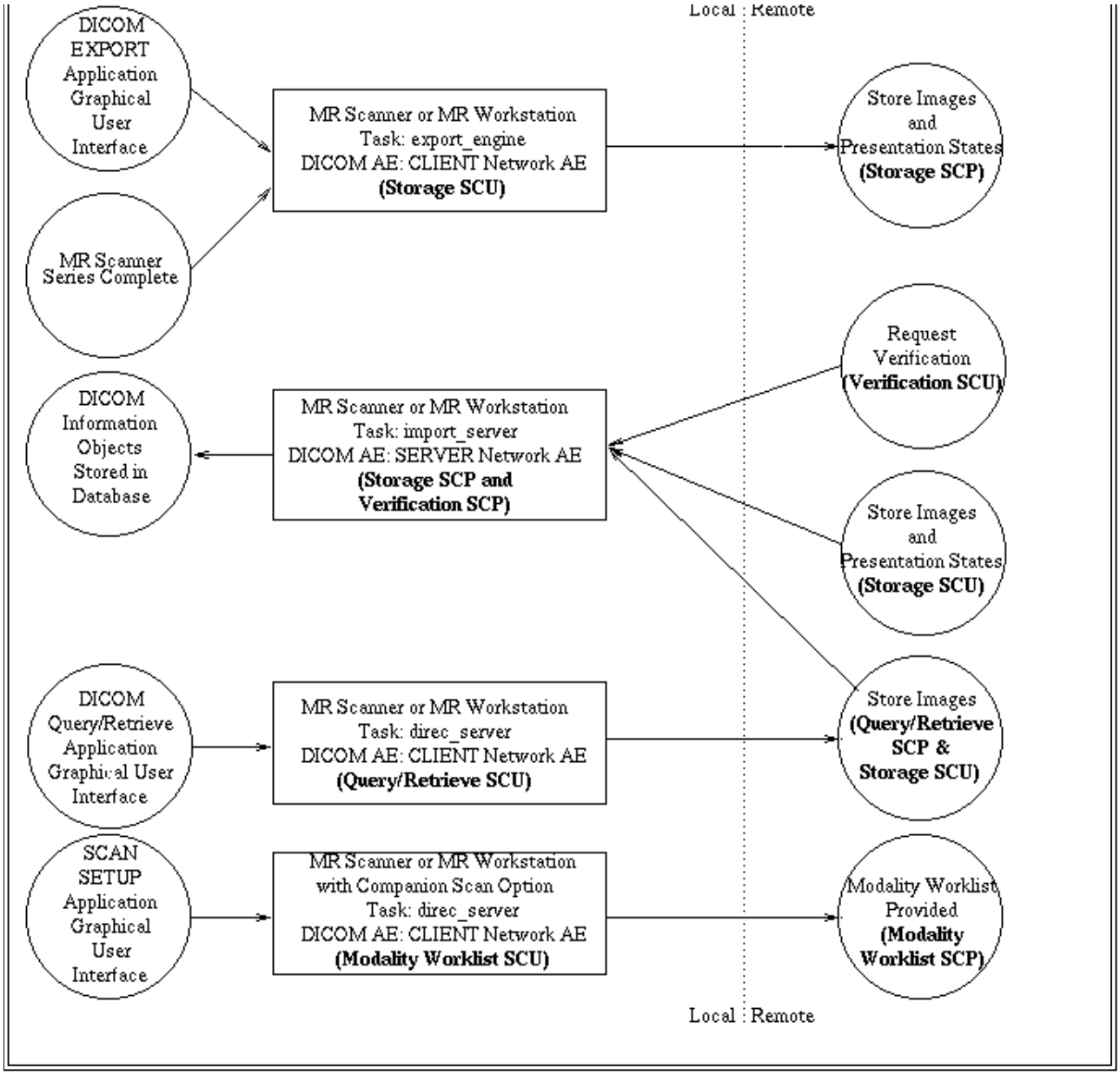
All of the systems identified in the above table utilize the same DICOM software implementation. As such for the remainder of this document, MR Scanner, will be used in place of referring to any particular scanner in the above table, similarly, MR Workstation will be used in place of ViStar or TwinStar.

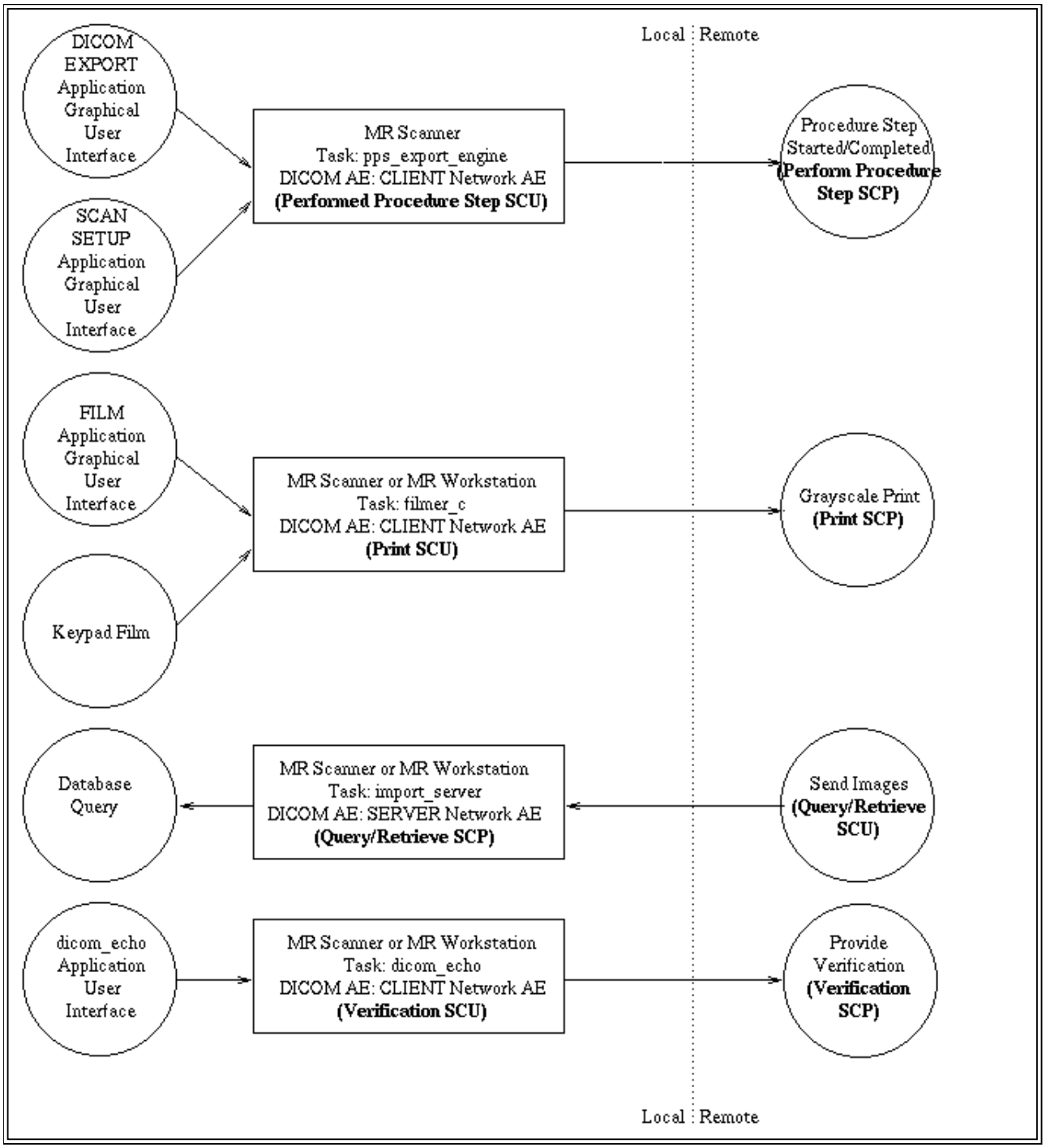
This conformance statement does not apply to other MR products or medical imaging devices manufactured by Philips Medical Systems.

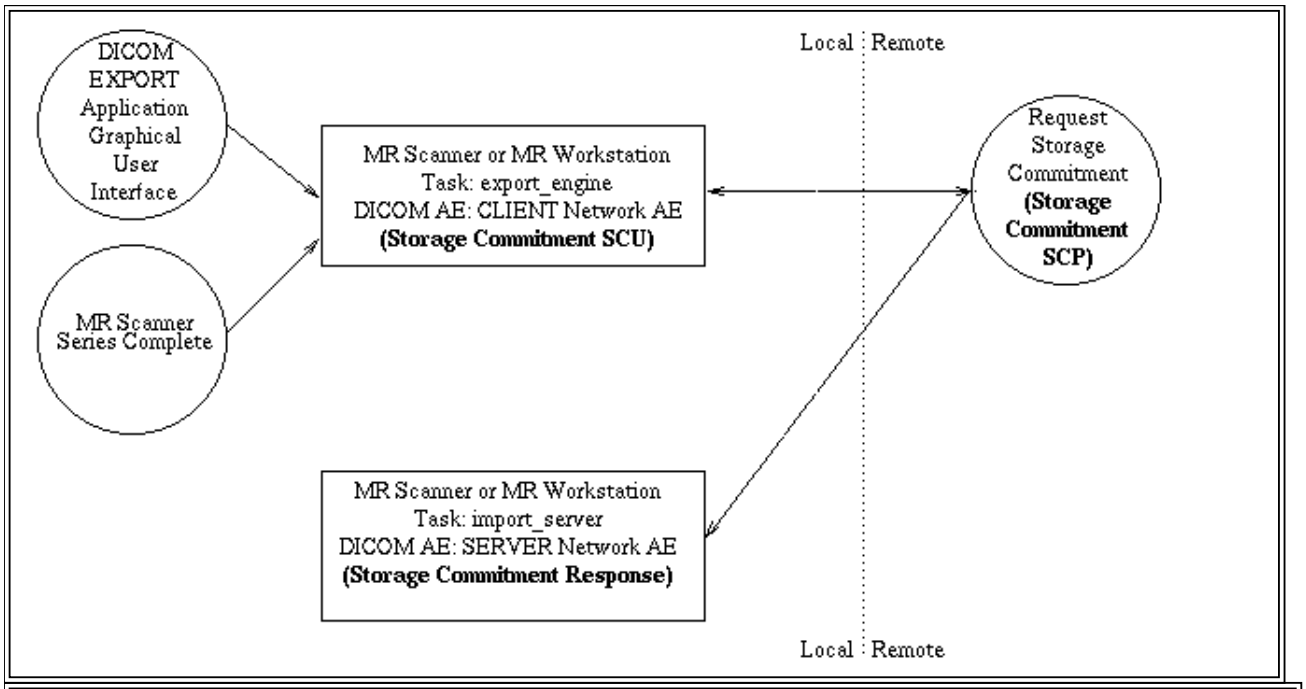
2.1 Application Data Flow Diagram

The application software defines three DICOM Application Entity Titles, for the thirteen basic functions outlined below. The recommendation is that the Application Entity Titles be unique on a network, and that different Application Entity Titles be used for Service Class User (Client) operations, Service Class Provider (Server), and Network File Set Creator (Server) operations.

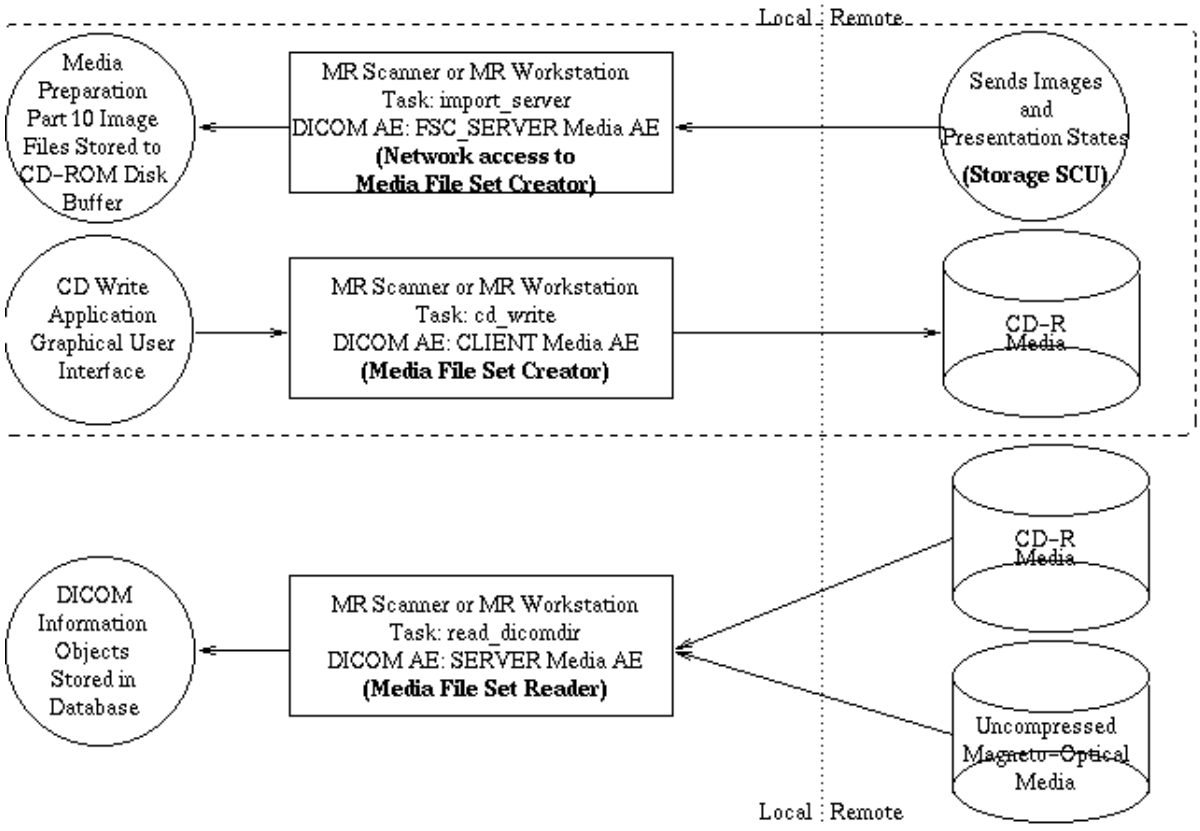
2.1.1 Network Application Data Flow Diagram


Local : Remote
DICOM EXPORT Application Graphical User Interface
MR Scanner Series Complete
MR Scanner or MR Workstation Task: export_engine DICOM AE: CLIENT Network AE (Storage SCU)
Store Images and Presentation States (Storage SCP)
DICOM Information Objects Stored in Database
MR Scanner or MR Workstation Task: import_server DICOM AE: SERVER Network AE (Storage SCP and Verification SCP)
Request Verification (Verification SCU)
Store Images and Presentation States (Storage SCU)
DICOM Query/Retrieve Application Graphical User Interface
MR Scanner or MR Workstation Task: direc_server DICOM AE: CLIENT Network AE (Query/Retrieve SCU)
Store Images (Query/Retrieve SCP & Storage SCU)
SCAN SETUP Application Graphical User Interface
MR Scanner or MR Workstation with Companion Scan Option Task: direc_server DICOM AE: CLIENT Network AE (Modality Worklist SCU)
Modality Worklist Provided (Modality Worklist SCP)
Local : Remote


Local
Remote
DICOM EXPORT Application Graphical User Interface
SCAN SETUP Application Graphical User Interface
MR Scanner
Task: pps_export_engine
DICOM AE: CLIENT Network AE
(Performed Procedure Step SCU)
Procedure Step Started/Completed
(Perform Procedure Step SCP)
FILM Application Graphical User Interface
Keypad Film
MR Scanner or MR Workstation
Task: filmer_c
DICOM AE: CLIENT Network AE
(Print SCU)
Grayscale Print
(Print SCP)
Database Query
MR Scanner or MR Workstation
Task: import_server
DICOM AE: SERVER Network AE
(Query/Retrieve SCP)
Send Images
(Query/Retrieve SCU)
dicom_echo Application User Interface
MR Scanner or MR Workstation
Task: dicom_echo
DICOM AE: CLIENT Network AE
(Verification SCU)
Provide Verification
(Verification SCP)
Local
Remote



2.1.2 Media Application Data Flow Diagram



2.2 Functional Definitions of Application Entities

2.2.1 CLIENT Network AE

The CLIENT Network AE supports the following functions:

- Storage SCU and (optionally) Storage Commitment SCU services are initiated by the task export_engine.

  The export_engine task begins execution when at least one series of images is queued for sending via DICOM. The export_engine establishes an association with the remote Storage SCP, sends all images in the series, then terminates the association. If the export_engine detects an error while sending an image, it will attempt to resend it; after three successive errors with the same image, the export_engine will notify the operator and request operator intervention. Next a new association is (optionally) made to a Storage Commitment SCP (which may or may not be the same AE that received the images) and a Storage Commitment request is sent. This request includes all the images that were just exported. The export_engine can process the Storage Commitment response if necessary (and if the Storage Commitment SCP is able to return the response immediately on the same association). However, the usual procedure is for the Storage Commitment response to be returned later on a separate association. The association is then closed. Finally, a new association is (optionally) made to the Storage SCP and any Grayscale Softcopy Presentation States which reference the series that was just exported are exported. This association is then closed.

  If no errors are detected, the export_engine continues to run until the export queue is emptied.

  The MR Scanners and MR Workstations support re-exporting of any multi-modality series of images that may have been imported into their databases via DICOM.

- Query/Retrieve SCU service is initiated by the task direc_server.

  The direc_server background task accepts query requests from the archiver application. When a query for patients, studies, or series, are requested the process will establish an association with the operator selected remote Query/Retrieve SCP. The successful association will result in the query request being sent to the Query/Retrieve SCP from the direc_server task. The direc_server task will wait for the results of the query and will pass this on to the archiver application for display. The operator selected information patients, studies, or series will be moved or copied to the local database.

- Modality Worklist SCU service is initiated by the task direc_server.

  The direc_server task runs as a background process that accepts query requests from the scan setup application. When a query for scheduled patients is requested the process will establish an association with the operator selected remote Modality Worklist SCP. The successful association will result in the query request being sent to the Modality Worklist SCP from the direc_server task. The direc_server task will wait for the results of the query

and will pass this on to the scan setup application for display. In the event that an error occurred, the user will be notified.

- Modality Performed Procedure Step SCU service is initiated by the task pps_export_engine.

  The pps_export_engine begins execution when a Performed Procedure Step action is queued for sending to the HIS/RIS system. The pps_export_engine will send a N_CREATE message for Performed Procedure Step status "In Progress" and a N_SET for a "Complete" or "Discontinued" status. If the pps_export_engine detects an error while sending, it will notify the operator and request operator intervention. If no errors are detected, the pps_export_engine continues to run until the performed procedure step export queue is emptied.

- Basic Grayscale Print SCU service is initiated by the task filmer_c.

  The filmer_c task runs as a server process that accepts requests initiated by Keypad Film and the Film application. Each time the operator presses the PRINT button, filmer_c establishes an association with the remote Print SCP, sends a film, and then terminates the association. The process is repeated as necessary to film all of the images. If the filmer_c detects an error while sending a film, the filmer_c task will notify the operator and request operator intervention.

- Verification SCU service is initiated by the task dicom_echo.

  The dicom_echo task is a diagnostic tool that must be manually invoked. Each time the operator invokes dicom_echo, an association with the specified Verification SCP is established, diagnostic messages are displayed and the association is terminated.

2.2.2 SERVER Network AE

The SERVER Network AE supports the following functions:

- Storage SCP, Verification SCP, and Storage Commitment Responses returned on a separate association, are accepted by the task import_server.

  The import_server task initiates (forks) a separate process for each association requested by remote Storage SCUs, Verification SCUs, and Storage Commitment Responses. The number of simultaneous associations that may be supported is only limited by the available resources and options supported by the underlying operating system.

- Query/Retrieve SCP service is also accepted by the task import_server.

  The import_server initiates (forks) a separate process for each association requested by remote Query/Retrieve SCUs. The number of simultaneous associations that may be supported is only limited by the available resources and options supported by the underlying operating system. The actual transfer of images to the requesting SCU, is performed by the export_engine task and occurs on a separate association.

2.2.3 FSC_SERVER Media AE

- Storage SCP services are accepted by the task import_server for the purpose of creating Part 10, Media files.

  The import_server task initiates (forks) a separate process for each association requested by remote Storage SCUs. The number of simultaneous associations that may be supported is only limited by the available resources and options supported by the underlying operating system. The import server creates files in DICOM Part 10 format on the local disk in a location designated the CD-ROM disk buffer.

2.2.4 CLIENT Media AE

- File Set Creator SCU service is initiated by the task cd_write.

  The cd_write task performs the function File Set Creator. The cd_write task waits for an operator to request that a DICOM CD-R be written/burned. The task examines the CD-ROM location where DICOM Part 10 image files have been deposited, evaluates the amount of data to be written to CD-R and, if necessary, divides the data in a manner such that all information for a patient is written to the same CD-R. The task invokes the OFFIS utility dcmpgdir, which generates the DICOMDIR file in the root directory. A DOS format README text file, which includes a patient directory, is also written into the root directory. The CD-R is then written to and any information transferred to the CD-R is deleted from the CD-ROM disk buffer location. The operator is then at liberty to write/burn any additional CD-R's until all of the buffered information is deleted.

2.2.5 SERVER Media AE

- File Set Reader (SCP) is provided by the task read_dicomdir.

  The read_dicomdir task performs the function of File Set Reader. The read_dicomdir task (forks) a separate process for each CD or Magneto-Optical disk installed in the system. The process examines the mounted file system for the file DICOMDIR in the root directory. If a DICOMDIR file is located, a database is created with entries from the DICOMDIR. The ability to read media is limited to supported image SOP classes and the ability of the operating system to mount the media. DICOM File Set Read is limited to uncompressed data.

2.3 Sequencing of Real World Activities

The following sequence of Real World activities are supported by the system:

- The user requests a Worklist (initiates a WLM request).
- The WLM response is shown on the User Interface and the user loads the examination (protocol) into the scan queue.
- The user starts the examination (protocol) and a MPPS N-CREATE message is send back to the RIS system.
- As each series completes they are automatically queued to be exported. The operator has the

option of manually selecting series to be exported once the examination completes if all of the images/series are not needed on the Modality, PACS, or Workstation. If configured the export operation is followed by a Storage Commitment request to the system and if licensed, any Grayscale Softcopy Presentation States which reference the exported series of images are sent.

The system receives the status responses from the C-Store requests and notifies the user the series have been unsuccessfully exported.

The operator can determine if Storage Commitment is complete for a series by reviewing the directory display.

- A MPPS N-SET command is sent to the RIS system to notify the RIS system that the examination (protocol) is completed.
- The operator can re-access a series once it has been deleted from the system through Query/Retrieve requests to the Modality, PACS, or Workstation receiving the exported images.
- The operator can generate a DICOM CD-R for the examination (protocol) as an archive, to transport the examination where a network interface is not practical (such as to an operating room for computer aided surgery systems), or to transport the examination to a remote referring physician who does not have access to the hospital network.

3. AE Specifications

The Network capabilities of the system consist of two DICOM Application Entities:

- The CLIENT Network AE
- The SERVER Network AE

The Media capabilities of the system consist of three DICOM Application Entities:

- The FSC_SERVER Media AE
- The SERVER Media AE
- The CLIENT Media AE

The specifications for these will be discussed below.

3.1 CLIENT Network AE

The CLIENT Network AE provides Standard Conformance to the following DICOM 3.0 SOP classes as an SCU:

- The CLIENT Network AE, export_engine task, provides Standard Conformance to the DICOM V3.0 SOP classes as an SCU, specified in Table 3.1-1

Table 3.1-1 Supported SOP Classes

SOP Class Name	SOP Class UID
CR Image Storage	1.2.840.10008.5.1.4.1.1.1
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
NM Image Storage	1.2.840.10008.5.1.4.1.1.20
US Image Storage	1.2.840.10008.5.1.4.1.1.6
SC Image Storage	1.2.840.10008.5.1.4.1.1.7
XA Image Storage	1.2.840.10008.5.1.4.1.1.12.1
XRF Image Storage	1.2.840.10008.5.1.4.1.1.12.2
Grayscale Softcopy Presentation State Storage	1.2.840.10008.5.1.4.1.1.11.1
Storage Commitment Push Model SOP Class	1.2.840.10008.1.20.1

NOTE: The actual level of conformance may depend on the conformance of DICOM information objects originally received.

- The CLIENT Network AE, direc_server task, provides Standard Conformance to the DICOM V3.0 SOP classes as an SCU, specified in Table 3.1-2.

Table 3.1-2 Supported SOP Classes

SOP Class Name	SOP Class UID
Modality Worklist Information Model, Find	1.2.840.10008.5.1.4.31
Patient Root Query/Retrieve Information Model, Find	1.2.840.10008.5.1.4.1.2.1.1
Patient Root Query/Retrieve Information Model, Move	1.2.840.10008.5.1.4.1.2.1.2
Study Root Query/Retrieve Information Model, Find	1.2.840.10008.5.1.4.1.2.2.1
Study Root Query/Retrieve Information Model, Move	1.2.840.10008.5.1.4.1.2.2.2
Patient/Study Only Query/Retrieve Information Model, Find	1.2.840.10008.5.1.4.1.2.3.1
Patient/Study Only Query/Retrieve Information Model, Move	1.2.840.10008.5.1.4.1.2.3.2

- The CLIENT Network AE, pps_export_engine task, provides Standard Conformance to the

DICOM V3.0 SOP classes as an SCU, specified in Table 3.1-3

Table 3.1-3 Supported SOP Classes

SOP Class Name	SOP Class UID
Modality Performed Procedure Step	1.2.840.10008.3.1.2.3.3

- The CLIENT Network AE, filmer_c task, provides Standard Conformance to the DICOM V3.0 Meta SOP classes as an SCU, specified in Table 3.1-4

Table 3.1-4 Supported Meta SOP Classes

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

Support for this Meta SOP Class as SCU also implies support for the SOP Classes listed in table 3.1-5 as an SCU. However, the SCU never presents individual Presentation Contexts for these SOP Classes.

Table 3.1-5 Supported SOP Classes

SOP Class Name	SOP Class UID
Basic Film Session SOP Class	1.2.840.10008.5.1.1.1
Basic Film Box SOP Class	1.2.840.10008.5.1.1.2
Basic Grayscale Image Box SOP Class	1.2.840.10008.5.1.1.4
Printer SOP Class	1.2.840.10008.5.1.1.16

- The CLIENT Network AE, dicom_echo task, provides Standard Conformance to the DICOM V3.0 SOP classes as an SCU, specified in Table 3.1-6.

Table 3.1-6 Supported SOP Classes

SOP Class Name	SOP Class UID
Verification	1.2.840.10008.1.1

3.1.1 Association Establishment Policies

3.1.1.1 General

The CLIENT Network AE always proposes the following DICOM Application Context Name (ACN): 1.2.840.10008.3.1.1.1

SOP class extended negotiation is not supported.

The CLIENT Network AE, filmer_c task, will attempt to establish an association each time the PRINT button is pressed on a filming keypad or in the FILM application (i.e. for each separate film page). The association is maintained until all images for one film page have been processed.

3.1.1.2 Number of Associations

The number of associations for the CLIENT Network AE are described below based on the type of operation being performed. None of the operations are implemented using simultaneous associations.

- C-STORE operations: the CLIENT Network AE, export_engine task, establishes a new association for each series of images transferred, and terminates the association after each series transfer is completed.
- C-MOVE operations: the CLIENT Network AE, export_engine task, establishes a new association for each image transferred, and terminates the association after each image transfer is completed.
- WLM Query operations: the CLIENT Network AE, direc_server task, establishes a new association each time the operator updates/refreshes an HIS/RIS directory listing. This association is maintained until all requested patient scheduling information has been received, or an error condition is detected.
- MPPS N-CREATE and MPPS N-SET operations: the CLIENT Network AE, pps_export_engine task, establishes a new association for each operation performed.
- Storage Commitment operations: the CLIENT Network AE, export_engine task, establishes a new association for each series which has been stored to a destination configured as a location which is intended to respond to Storage Commitment.
- Grayscale print operations: the CLIENT Network AE, filmer_c task, establishes a new association for each sheet of media, i.e. film, transparency, paper, etc.
- Verification operations: the CLIENT Network AE, dicom_echo task, establishes a new association for each time the task is invoked from the command line.

3.1.1.3 Asynchronous Nature

There is no asynchronous activity in this implementation.

3.1.1.4 Implementation Identifying Information

THE IMPLEMENTATION CLASS UID:	**2.16.840.1.113662.4.2.1**
THE IMPLEMENTATION VERSION NAME:	**VIA5.0**

3.1.2 Association Acceptance Policy

The CLIENT Network AE does not handle incoming associations.

3.1.3 Association Initiation Policy

The CLIENT Network AE initiate associations for the following purposes:

- The CLIENT Network AE, export_engine task, initiates an association for each series queued for transfer. If necessary, a second association is automatically established for the purpose of requesting Storage Commitment for the images that were just sent and if licensed, a third association is established for sending Grayscale Softcopy Presentation

States which reference the exported series.

- The CLIENT Network AE, pps_export_engine task, initiates an association for each "START STEP" and "END STEP" message relayed from the scan setup application.
- Selecting a new remote SCP (a new destination for DICOM EXPORT or a new source for the Modality Worklist SCU) initiates a temporary association to determine the roles and services supported by the remote SCP.
- The CLIENT Network AE, direc_server task, initiates an association each time the operator updates/refreshes an HIS directory listing.
- The CLIENT Network AE, filmer_c task, initiates an association once each time film is printed.
- The CLIENT Network AE, dicom_echo task, initiates an association once each time it is invoked.

3.1.3.1 Real-World Activity 1. Sending a Series of Images

3.1.3.1.1 Associated Real-World Activity

To export DICOM information an operator:

Enables "MANUAL" DICOM EXPORT; selects a valid "Destination" AE for DICOM EXPORT; selects interactively from the available databases sets of Patients, Studies, or Series for DICOM EXPORT.

Enables "AUTO" DICOM EXPORT; selects a valid "Destination" AE for DICOM EXPORT; which will cause newly reconstructed series and any series created through the VIEW application to be queued for DICOM EXPORT.

Issues a "Continue" command when a series is unable to transfer completely possibly because of an error situation. The export_engine will retry sending any given image a maximum of three times before notifying the operator that a problem exists (a warning message is posted in the system’s DICOM log file).

For complete user interface details, consult the Instructions for Use.

3.1.3.1.2 Presentation Context Table

Table 3.1.3.1.2-1 Proposed Presentation Contexts, Sending a Series of Images

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Ext.Neg.
Name	UID	Name List	UID List		

CR Image	1.2.840.10008.5.1.4.1.1.1	DICOM Explicit VR Little Endian Transfer Syntax	1.2.840.10008.1.2.1	SCU	None
		DICOM Implicit VR Little Endian Transfer Syntax	1.2.840.10008.1.2		
CT Image	1.2.840.10008.5.1.4.1.1.2	DICOM Explicit VR Little Endian Transfer Syntax	1.2.840.10008.1.2.1	SCU	None
		DICOM Implicit VR Little Endian Transfer Syntax	1.2.840.10008.1.2		
MR Image	1.2.840.10008.5.1.4.1.1.4	DICOM Explicit VR Little Endian Transfer Syntax	1.2.840.10008.1.2.1	SCU	None
		DICOM Implicit VR Little Endian Transfer Syntax	1.2.840.10008.1.2		

NM Image	1.2.840.10008.5.1.4.1.1.20	DICOM Explicit VR Little Endian Transfer Syntax	1.2.840.10008.1.2.1	SCU	None
		DICOM Implicit VR Little Endian Transfer Syntax	1.2.840.10008.1.2		
US Image	1.2.840.10008.5.1.4.1.1.6	DICOM Explicit VR Little Endian Transfer Syntax	1.2.840.10008.1.2.1	SCU	None
		DICOM Implicit VR Little Endian Transfer Syntax	1.2.840.10008.1.2		
SC Image	1.2.840.10008.5.1.4.1.1.7	DICOM Explicit VR Little Endian Transfer Syntax	1.2.840.10008.1.2.1	SCU	None
		DICOM Implicit VR Little Endian Transfer Syntax	1.2.840.10008.1.2		

Grayscale Softcopy Presentation State	1.2.840.10008.5.1.4.1.1.11.1	DICOM Explicit VR Little Endian Transfer Syntax	1.2.840.10008.1.2.1	SCU	None
		DICOM Implicit VR Little Endian Transfer Syntax	1.2.840.10008.1.2		
Storage Commitment Push Model SOP Class	1.2.840.10008.1.20.1	DICOM Explicit VR Little Endian Transfer Syntax	1.2.840.10008.1.2.1	SCU	None
		DICOM Implicit VR Little Endian Transfer Syntax	1.2.840.10008.1.2		

3.1.3.1.3 SOP Specific Conformance to Storage SOP Classes

When the CLIENT Network AE, export_engine task, detects any errors, a message suggesting to the operator an alternative course of action is always displayed. An operator may elect to: continue (retry), skip the series (delete it from the export queue), or cancel all remaining series in the queue. If the CLIENT Network AE is unable to open an association with a selected destination AE, an appropriate message is displayed on the screen. There are no special messages displayed when a successful response to the C-STORE operation is received.

When the CLIENT Network AE sends any image that was originally received via DICOM, to a remote database, the original information object received is, whenever possible, re-sent.

The CLIENT Network AE provides conformance to the Grayscale Softcopy Presentation State SOP Class, when licensed.

Grayscale Softcopy Presentation State SOP Class

The CLIENT Network AE, export_engine task, sends Grayscale Softcopy Presentation

State objects which reference the series just exported.

After all referencing Presentation State objects are sent, the association is closed.

The CLIENT Network AE also in conjunction with Sending a Series of Images provides standard conformance to the Storage Commitment Push Model SOP Class, when configured.

Storage Commitment Push Model SOP Class

The CLIENT Network AE, export_engine task, sends a storage commitment request (i.e. generates an N-ACTION primitive) each time an image or group of images are exported.

Storage Commitment may be requested for any of the image SOP Classes listed in section 3.1.3.1.2-1 Proposed Presentation Contexts.

The Referenced Study Component Sequence Attribute is not supported in this implementation. It does not support the Storage Media File-Set ID and UID Attributes in the N-ACTION request.

If an association in unable to be opened with the Storage Commitment SCP, an error message is presented and operator action is requested.

Storage Commitment results are received in the form of N-EVENT-REPORT messages. The Storage Commitment results messages report a list of images for which Storage Commitment has been accepted, and a list of images for which Storage Commitment could not be provided. These lists are matched up with a list of images for which Storage commitment was previously requested. For those that have been accepted, an 'archived' status is recorded so that these images are eligible to be deleted. For those that have failed, the automatic export function will try to export the image again. This process will repeat until either the export and Storage Commitment operations are successful, or until the retry count is exceeded.

Images are not automatically deleted; that is left to the operator. However, the operator will be warned if they attempt to delete images that have not been archived.

When exporting MR Scanner or MR Workstation images the following required elements will be included.

Table 3.1.3.1.3-1 Required Elements for MR Scanner or MR Workstation Images

Tag	VR	Name
0008,0008	CS	Image Type
0008,0020	DA	Study Date
0008,0023	DA	Image Date
0008,0030	TM	Study Time

0008,0033	TM	Image Time
0008,0050	SH	Accession Number
0008,0060	CS	Modality
0008,0070	LO	Manufacturer
0008,0090	PN	Referring Physician’s Name
0010,0010	PN	Patient’s Name
0010,0020	LO	Patient ID
0010,0030	DA	Patient’s Birth Date
0010,0040	CS	Patient’s Sex
0018,0010	LO	Contrast/Bolus Agent
0018,0020	CS	Scanning Sequence
0018,0021	CS	Sequence Variant
0018,0022	CS	Scan Options
0018,0023	CS	MR Acquisition Type
0018,0050	DS	Slice Thickness
0018,0080	DS	Repetition Time
0018,0081	DS	Echo Time
0018,0082	DS	Inversion Time
0018,0091	IS	Echo Train Length
0018,1060	DS	Trigger Time
0018,5100	CS	Patient Position
0020,000D	UI	Study Instance UID
0020,000E	UI	Series Instance UID
0020,0010	SH	Study ID
0020,0011	IS	Series Number
0020,0013	IS	Image Number
0020,0032	DS	Image Position (Patient)
0020,0037	DS	Image Orientation (Patient)
0020,0052	UI	Frame of Reference UID
0020,0060	CS	Laterality
0020,1040	LO	Position Reference Indicator
0028,0002	US	Samples per Pixel
0028,0004	CS	Photometric Interpretation
0028,0010	US	Rows
0028,0011	US	Columns
0028,0030	DS	Pixel Spacing
0028,0100	US	Bits Allocated

0028,0101	US	Bits Stored
0028,0102	US	High Bit
0028,0103	US	Pixel Representation

When exporting MR Scanner or MR Workstation images the following optional elements (Type 3) may be included.

Table 3.1.3.1.3-2 Optional Elements for MR Scanner or MR Workstation Images

Tag	Name	Conditions for inclusion
0008,0021	Series Date	Always
0008,0031	Series Time	Always
0008,0080	Institution Name	Always
0008,0090	Referring Physician's Name	When entered by the operator
0008,1010	Station Name	Always
0008,1030	Study Description	When entered by the operator
0008,1060	Name of Physician(s) Reading Study	When entered by the operator
0008,1070	Operator's Name	When entered by the operator
0008,1090	Manufacturer's Model Name	Always
0008,1140	Referenced Image Sequence	Sent for images which have a corresponding localizer, scout, or pilot
0010,1010	Patient's Age	When entered by the operator
0010,1030	Patient's Weight	When entered by the operator
0010,4000	Patient Comments	When entered by the operator
0018,0083	Number of Averages	Always
0018,0084	Imaging Frequency	When entered by the operator
0018,0087	Magnetic Field Strength	Always
0018,0094	Percent Phase Field of View	Always
0018,0095	Pixel Bandwidth	Always
0018,1000	Device Serial Number	Always
0018,1020	Software Version(s)	Always
0018,1030	Protocol Name	Always
0018,1250	Receiving Coil	Always
0018,1310	Acquisition Matrix	Always

0018,1314	Flip Angle	Always
0020,0012	Acquisition Number	When entered by the operator
0020,0100	Temporal Position Identifier	Temporally related images
0020,0105	Number of Temporal Positions	Temporally related images
0020,0110	Temporal Resolution	Temporally related images
0020,1002	Images in Acquisition	Always
0020,1041	Slice Location	Always
0028,1050	Window Center	Always
0028,1051	Window Width	Always

Table 3.1.3.1.3-3 Private Elements for MR Scanner or MR Workstation Images

When exporting MR Scanner or MR Workstation images the following private elements may be included.

Tag	Name	Value Representation
7101,0010	Private MR Creator Data element	LO
7101,1000	MR Processing Field 1	OB
7101,1001	MR Processing Field 1 Length	SL
7101,1002	MR Processing Field 2	OB
7101,1003	MR Processing Field 2 Length	SL
7101,1004	Scan Duration	SH
7101,1005	MR Processing Field 3	SH
7101,1006	MR Processing Field 4	SH
7101,1010	Image Normalization Factor	DS

Table 3.1.3.1.3-4 Secondary Capture provided in place of Overlays for MR Scanner or MR Workstation Images

Overlay information is not included with exported images, the operator has the ability to store secondary capture images as they appear on the MR Scanners and MR Workstations with any grids/annotation included in the pixel data. The captured images will be stored in the database as 512x512 matrix 16 bit images with bits 8 through 15 set to zero.

Tag	Type	Name	Value
0028,0010	US	Rows	512
0028,0011	US	Columns	512
0028,0100	US	Bits Allocated	16
0028,0101	US	Bits Stored	16
0028,0102	US	High Bit	15
0028,1050	DS	Window Center	128
0028,1051	DS	Window Width	256

Table 3.1.3.1.3-5 Localizer, Scout, Pilot Grids for MR Scanner Images

The tags identified below permit a system to generate cross-reference lines between a spatially related slice and a series. All of the information in the table is type 1, mandatory, with the exception of slice thickness, which the MR Scanner supplies, but which is defaulted to zero in our system when images are received from a vendor who does not supply the value.

Tag	Type	Name
0018,0050	2	Slice Thickness
0020,0037	1	Image Orientation (Patient)
0020,0032	1	Image Position (Patient)
0020,0052	1	Frame of Reference UID
0028,0010	1	Rows
0028,0011	1	Columns
0028,0030	1	Pixel Spacing

Additionally the MR Scanner supplies the following information to uniquely identify the pilot slice.

Tag	Type	Name
0008,1140	3	Referenced Image Sequence

The above elements provides the remote SCP with the required information to not only generate a pilot grid but the option of generating mini-pilots whereby each slice position can be independently drawn on the pilot image rather than always displaying a static overlay plane. The optional overlay plane module is therefore not supplied with MR Scanner images.

If the remote SCP cannot generate a pilot grid or mini-pilots based on the information above, the operator has the ability to store secondary capture images as they appear on the MR Scanners and MR Workstations with any grids/annotation included in the pixel data.

3.1.3.2 Real-World Activity 2. Selecting a New Remote SCP

3.1.3.2.1 Associated Real World Activity

Selecting a new remote SCP (a new source for Query/Retrieve) initiates a temporary association to determine the roles and services supported by the remote SCP.

3.1.3.2.2 Proposed Presentation Contexts

These are the same as for Real-World Activity 5.

3.1.3.2.3 SOP Specific Conformance to Storage SOP Classes

Not Applicable.

3.1.3.3 Real-World Activity 3. Modality Worklist Query of Scheduled Patient(s).

3.1.3.3.1 Associated Real World Activity

The Associated Real World Activity of the CLIENT Network AE, direc_server task, is to request patient scheduling information from a remote DICOM server. This occurs when the operator updates/refreshes an HIS/RIS directory listing.

3.1.3.3.2 Proposed Presentation Contexts

Table 3.1.3.3.2-1 Proposed Presentation Contexts, Query Patient Schedules

Presentation Context Table					
Abstract Syntax		**Transfer Syntax**		**Role**	**Ext. Neg.**
Name	**UID**	**Name List**	**UID List**		
Modality Worklist Information Model, Find	1.2.840.10008.5.1.4.31	DICOM Explicit VR Little Endian Transfer Syntax	1.2.840.10008.1.2.1	SCU	None
		DICOM Implicit VR Little Endian Transfer Syntax	1.2.840.10008.1.2		

3.1.3.3.3 SOP Specific Conformance to Find SOP Classes

If the CLIENT Network AE, direc_server task, detects any errors, a message suggesting to the operator an alternative course of action is always displayed. If the direc_server is unable to open an association with a selected AE, an appropriate message is displayed on the screen.

When querying from the MR Scanner or MR Workstation with the Companion Scan Option, the fields included in Table 3.1.3.3.3-2 are part of the C-FIND identifier set. The operator has the ability to specify several of the query matching key values, default key values are identified in Table 3.1.3.3.3-1

Table 3.1.3.3.3-1 Modality Worklist Query Matching Key Values

Tag	Name	Operator Accessible	Default Key Value
0008,0050	Accession Number	Always	NULL
0008,0060	Modality	Always	"MR"
0010,0010	Patient's Name	Always	"*"
0010,0020	Patient ID	Always	NULL
0040,0001	Scheduled Station AE Title	Always	NULL
0040,0002	Scheduled Procedure Step Start Date	Always	24 Hours the range [A, B] where A = Current - 24 Hours, B = Current + 24 Hours
0040, 1001	Requested Procedure ID	Always	NULL

Table 3.1.3.3.3-2 Modality Worklist C-FIND Identifier Set for MR Scanner

Tag	VR	Type	Name
0008,0050	SH	2	Accession Number
0008,0090	PN	2	Referring Physician's Name

0008,1110	SQ	2	Referenced Study Sequence			
			Tag	**VR**	**Type**	**Name**
			0008,1150	UI	1C	Referenced SOP Class UID
			0008,1155	UI	1C	Referenced SOP Instance UID
0010,0010	PN	1	Patient's Name			
0010,0020	LO	1	Patient ID			
0010,0030	DA	2	Patient's Birth Date			
0010,0040	CS	2	Patient's Sex			
0010,1020	DS	2	Patient's Size			
0010,2000	LO	2	Medical Alerts			
0010,2110	LO	2	Contrast Allergies			
0020,000D	UI	1	Stud Instance UID			
0032,1032	PN	2	Requesting Physician			
0032,1060	LO	1C	Requested Procedure Description			
0032,1064	SQ	1C	Requested Procedure Code Sequence			
			Tag	**VR**	**Type**	**Name**
			0008,0100	SH	1C	Code Value
			0008,0102	SH	1C	Coding Scheme Designator
			0008,0104	LO	1C	Code Meaning
			Scheduled Procedure Step Sequence			
			Tag	**VR**	**Type**	**Name**
			0008,0060	CS	1	Modality
			0032,1070	LO	2C	Requested Contrast Agent

0040,0100	SQ	1	0040,0001	AE	1	Scheduled Station AE Title	
			0040,0002	DA	1	Scheduled Procedure Step Start Date	
			0040,0003	TM	1	Scheduled Procedure Step Start Time	
			0040,0006	PN	2	Scheduled Performing Physician’s Name	
			0040,0007	LO	1C	Scheduled Procedure Step Description	
			0040,0008	SQ	1C	Scheduled Action Item Code Sequence	
						Tag	**VR**	**Type**	**Name**
						0008,0100	SH	1C	Code Value
						0008,0102	SH	1C	Coding Scheme Designator
						0008,0104	LO	1C	Code Meaning
			0040,0009	SH	1	Scheduled Procedure Step ID	
			0040,0010	SH	2	Scheduled Station Name	
			0040,0011	SH	2	Scheduled Procedure Step Location	
			0040,0012	LO	2C	Pre-Medication	
			0040,0400	LT	3	Comments on the Scheduled Procedure Step	
0040,1001	SH	1	Requested Procedure ID				

0040,1003	SH	2	Requested Procedure Priority

3.1.3.4 Real-World Activity 4. Sending Film Images

3.1.3.4.1 Associated Real-World Activity

The CLIENT Network AE, filmer_c task, attempts to initiate an association once each time a film is printed. There are two Real World Activities that can cause association establishment: Clicking on the PRINT button on a filming keypad, or clicking on the PRINT button from the FILM application.

3.1.3.4.2 Proposed Presentation Contexts, Sending Film Images

Table 3.1.3.3.4.2-1 Proposed Presentation Contexts, Sending Image File

Presentation Context Table					
Abstract Syntax		**Transfer Syntax**		**Role**	**Ext.Neg.**
Name	**UID**	**Name List**	**UID List**		
Basic Grayscale Print Management Meta SOP Class	1.2.840.10008.5.1.1.9	DICOM Implicit VR Little Endian Transfer Syntax	1.2.840.10008.1.2	SCU	None

3.1.3.4.3 SOP Specific Conformance to Print SOP Classes

If the DICOM print software is unable to open an association with the selected destination AE, a message is displayed on the CAMERA SUMMARY screen.

There are no special messages displayed when a successful response to the print operation is received.

The CLIENT Network AE, filmer_c task, software does not attempt any extended negotiation.

Images are printed using the Basic Grayscale Print Management Meta SOP Class. The following optional elements may be included:

Table 3.1.3.4.3-1 Optional Elements for N-CREATE request for Basic Film Session SOP Class

Tag	Name	Conditions for inclusion
2000,0010	Number of Copies	Always

Table 3.1.3.4.3-2 Optional Elements for N-CREATE request for Basic Film Box SOP Class

Tag	Name	Conditions for inclusion	Comments
2010,0010	Image Display Format	Always	
2010,0040	Film Orientation	Always	Set to PORTRAIT
2010,0100	Border Density	Always	Set to BLACK
2010,0120	Minimum Density	Only if specified	Can be configured separately for each camera
2010,0130	Maximum Density	Only if specified	Can be configured separately for each camera
2010,0140	Trim	Always	Set to NO
2010,0150	Configuration Information	Only if specified	Can be configured separately for each camera

Table 3.1.3.4.3-3 Optional Elements for N-SET request for Basic Grayscale Image Box SOP Class

Tag	Name	Conditions for inclusion	Comments
2020,0020	Polarity	Always	Set to NORMAL

The following identifies all DICOM tags transmitted during a typical grayscale film session.

Table 3.1.3.4.3-4 Basic Grayscale Film Session

Film Session Request

Tag	VR	Name
0000,0000	UL	Group 0000 Length
0000,0002	UI	Affected SOP Class UID
0000,0100	US	Command Field
0000,0110	US	Message ID
0000,0800	US	Data Set Type
2000,0000	UL	Group Length
2000,0010	IS	Number of Copies

Film Session Response

Tag	VR	Name
0000,0000	UL	Group 0000 Length
0000,0002	UI	Affected SOP Class UID
0000,0100	US	Command Field
0000,0120	US	Message Id being Responded to
0000,0800	US	Data Set Type
0000,0900	US	Status
0000,1000	UI	Affected SOP Instance UID

Film Box Request

Tag	VR	Name		
0000,0000	UL	Group 0000 Length		
0000,0002	UI	Affected SOP Class UID		
0000,0100	US	Command Field		
0000,0110	US	Message ID		
0000,0800	US	Data Set Type		
2010,0000	UL	Group Length		
2010,0010	ST	Image Display Format		
2010,0040	CS	Film Orientation		
2010,0100	CS	Border Density		
2010,0140	CS	Trim		
2010,0500	SQ	Referenced Film Session Sequence		
		Tag	**VR**	**Name**
		FFFE,E000	DL	Item
		0008,1150	UI	Referenced SOP Class UID
		0008,1155	UI	Referenced SOP Instance UID
		FFFE,E00D	DL	Item Delimitation Item
		FFFE,E0DD	DL	Sequence Delimitation Item

Film Box Response

Tag	VR	Name
0000,0000	UL	Group 0000 Length
0000,0002	UI	Affected SOP Class UID
0000,0100	US	Command Field
0000,0120	US	Message Id being Responded to
0000,0800	US	Data Set Type
0000,0900	US	Status
0000,1000	UI	Affected SOP Instance UID
2010,0510	SQ	Referenced Image Box Sequence

Tag	VR	Name
FFFE,E000	DL	Item
0008,1150	UI	Referenced SOP Class UID
0008,1155	UI	Referenced SOP Instance UID
FFFE,E00D	DL	Item Delimitation Item
FFFE,E0DD	DL	Sequence Delimitation Item

Image Box Request (per image)

Tag	VR	Name
0000,0000	UL	Group 0000 Length
0000,0003	UI	Requested SOP Class UID
0000,0100	US	Command Field
0000,0110	US	Message ID
0000,0800	US	Data Set Type
0000,1001	UI	Requested SOP Instance UID
2020,0000	UL	Group Length
2020,0010	US	Image Position
2020,0020	CS	Polarity
2020,0110	SQ	Preformatted Grayscale Image Sequence
FFFE,E000	DL	Item
0028,0002	US	Samples per Pixel
0028,0004	CS	Photometric Interpretation
0028,0010	US	Rows
0028,0011	US	Columns
0028,0034	IS	Pixel Aspect Ratio
0028,0100	US	Bits Allocated
0028,0101	US	Bits Stored
0028,0102	US	High Bit
0028,0103	US	Pixel Representation
7FE0,0010	OW or OB	Pixel Data
FFFE,E00D	DL	Item Delimitation Item
FFFE,E0DD	DL	Sequence Delimitation Item

Image Box Response (per image)

Tag	VR	Name
0000,0000	UL	Group 0000 Length
0000,0002	UI	Affected SOP Class UID
0000,0100	US	Command Field
0000,0120	US	Message Id being Responded to
0000,0800	US	Data Set Type
0000,0900	US	Status
0000,1000	UI	Affected SOP Instance UID

Print Command

Tag	VR	Name
0000,0000	UL	Group 0000 Length
0000,0003	UI	Requested SOP Class UID
0000,0100	US	Command Field
0000,0110	US	Message ID
0000,0800	US	Data Set Type
0000,1001	UI	Requested SOP Instance UID
0000,1008	US	Action Type ID

Print Command Response

Tag	VR	Name
0000,0000	UL	Group 0000 Length
0000,0002	UI	Affected SOP Class UID
0000,0100	US	Command Field
0000,0120	US	Message Id being Responded to
0000,0800	US	Data Set Type
0000,0900	US	Status
0000,1000	UI	Affected SOP Instance UID
0000,1008	US	Action Type ID

Printer Configuration Request

Tag	VR	Name
0000,0000	UL	Group 0000 Length
0000,0003	UI	Requested SOP Class UID
0000,0100	US	Command Field
0000,0110	US	Message ID
0000,0800	US	Data Set Type
0000,1001	UI	Requested SOP Instance UID

Printer Configuration Response

Tag	VR	Name
0000,0000	UL	Group 0000 Length
0000,0002	UI	Affected SOP Class UID
0000,0100	US	Command Field
0000,0120	US	Message Id being Responded to
0000,0800	US	Data Set Type
0000,0900	US	Status
0000,1000	UI	Affected SOP Instance UID
0008,0016	UI	SOP Class UID
0008,0018	UI	SOP Instance UID
0008,0070	LO	Manufacturer
0008,1090	LO	Manufacturer's Model Name
0018,1000	LO	Device Serial Number
0018,1020	LO	Software Version(s)
0018,1200	DA	Date of Last Calibration
0018,1201	TM	Time of Last Calibration
2110,0010	CS	Printer Status
2110,0020	CS	Printer Status Info
2110,0030	LO	Printer Name

3.1.3.5 Real-World Activity 5. Requesting Directory Information for Query/Retrieve

3.1.3.5.1 Associated Real-World Activity

The Associated Real World Activity of the CLIENT Network AE, direc_server task, is to request directory information from a remote DICOM server. This occurs when the operator selects the ARCHIVE application from the UTILITY menu, and selects the source SCP to Query for directory information.

3.1.3.5.2 Proposed Presentation Contexts

Table 3.1.3.5.2-1 Proposed Presentation Contexts, Query

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Ext. Neg.
Name	UID	Name List	UID List		

Patient/Study Root Find	1.2.840.10008.5.1.4.1.2.3.1	DICOM Explicit VR Little Endian Transfer Syntax	1.2.840.10008.1.2.1	SCU	None
		DICOM Implicit VR Little Endian Transfer Syntax	1.2.840.10008.1.2		
Patient Root Find	1.2.840.10008.5.1.4.1.2.1.1	DICOM Explicit VR Little Endian Transfer Syntax	1.2.840.10008.1.2.1	SCU	None
		DICOM Implicit VR Little Endian Transfer Syntax	1.2.840.10008.1.2		
Study Root Find	1.2.840.10008.5.1.4.1.2.2.1	DICOM Explicit VR Little Endian Transfer Syntax	1.2.840.10008.1.2.1	SCU	None
		DICOM Implicit VR Little Endian Transfer Syntax	1.2.840.10008.1.2		

3.1.3.5.3 SOP Specific Conformance to Find SOP Classes

If the CLIENT Network AE, direc_server task, detects any errors, a message suggesting to the

operator an alternative course of action is always displayed. If the direc_server is unable to open an association with a selected AE, an appropriate message is displayed on the screen.

When querying from the MR Scanner or MR Workstation, the fields included in one of the Tables [3.1.3.5.3-2, 3.1.3.5.3-3, or 3.1.3.5.3-4] are part of the C-FIND identifier set. The operator has the ability to specify several of the query matching key values, default key values are identified in Table 3.1.3.5.3-1.

Table 3.1.3.5.3-1 Query/Retrieve Query Matching Key Values

Tag	Name	Operator Accessible	Default Key Value
0008,0020	Study Date	Always	24 Hours the range [A, B] where A = Current - 24 Hours, B = Current + 24 Hours
0008,0050	Accession Number	Always	NULL
0008,0060	Modality	During a Series Data C-FIND	"MR"
0010,0010	Patient's Name	Always	"*"
0010,0020	Patient ID	Always	NULL

Table 3.1.3.5.3-2 Query/Retrieve Patient Data C-FIND Identifier Set

Tag	VR	Name
0008,0052	CS	Query/Retrieve Level
0008,0054	AE	Retrieve AE Title
0010,0010	PN	Patient's Name
0010,0020	LO	Patient ID

Table 3.1.3.5.3-3 Query/Retrieve Study Data C-FIND Identifier Set

Tag	VR	Name
0008,0020	DA	Study Date
0008,0030	TM	Study Time
0008,0050	SH	Accession Number
0008,0052	CS	Query/Retrieve Level
0008,0054	AE	Retrieve AE Title
0008,0090	PN	Referring Physician's Name
0008,1030	LO	Study Description
0010,0020	LO	Patient ID
0020,000D	UI	Study Instance UID
0020,0010	SH	Study ID

Table 3.1.3.5.3-4 Query/Retrieve Series Data C-FIND Identifier Set

Tag	VR	Name
0008,0031	TM	Series Time
0008,0052	CS	Query/Retrieve Level
0008,0054	AE	Retrieve AE Title
0008,0060	CS	Modality
0008,103E	LO	Series Description
0010,0020	LO	Patient ID
0018,0015	CS	Body Part Examined
0018,1030	LO	Protocol Name
0018,5100	CS	Patient Position
0020,000D	UI	Study Instance UID
0020,000E	UI	Series Instance UID
0020,0011	IS	Series Number
0020,0060	CS	Laterality

3.1.3.6 Real-World Activity 6. Requesting Series of Images through Query/Retrieve

3.1.3.6.1 Associated Real-World Activity

The Associated Real World Activity is a request for the remote AE to transfer series of images to the MR Scanner or MR Workstation. This occurs when the operator selects from the displayed directory, the set of series of images to be sent to the SERVER Network AE, import_server task. A successful Query of the remote DICOM server must have taken place prior to the transfer request.

3.1.3.6.2 Proposed Presentation Contexts

Table 3.1.3.6.2-1 Proposed Presentation Contexts, C-MOVE

Presentation Context Table					
Abstract Syntax		**Transfer Syntax**		**Role**	**Ext. Neg.**
Name	**UID**	**Name List**	**UID List**		
Patient/Study Root Move	1.2.840.10008.5.1.4.1.2.3.2	DICOM Explicit VR Little Endian Transfer Syntax	1.2.840.10008.1.2.1	SCU	None
		DICOM Implicit VR Little Endian Transfer Syntax	1.2.840.10008.1.2		
Patient Root Move	1.2.840.10008.5.1.4.1.2.1.2	DICOM Explicit VR Little Endian Transfer Syntax	1.2.840.10008.1.2.1	SCU	None
		DICOM Implicit VR Little Endian Transfer Syntax	1.2.840.10008.1.2		

Study Root Move	1.2.840.10008.5.1.4.1.2.2.2	DICOM Explicit VR Little Endian Transfer Syntax	1.2.840.10008.1.2.1	SCU	None
		DICOM Implicit VR Little Endian Transfer Syntax	1.2.840.10008.1.2		

3.1.3.6.3 SOP Specific Conformance to Move SOP Classes

This implementation provides standard conformance as an SCU for C-MOVE.

3.1.3.7 Real-World Activity 7. Verification

3.1.3.7.1 Associated Real-World Activity

Manually invoking the CLIENT Network AE, dicom_echo task, initiates a temporary association to determine if the SCP supports verification.

3.1.3.7.2 Proposed Presentation Contexts

Table 3.1.3.7.2-1 Proposed Presentation Contexts, Verification

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Ext. Neg.
Name	UID	Name List	UID List		
Verification	1.2.840.10008.1.1	DICOM Explicit VR Little Endian Transfer Syntax	1.2.840.10008.1.2.1	SCU	None
		DICOM Implicit VR Little Endian Transfer Syntax	1.2.840.10008.1.2		

3.1.3.7.3 SOP Specific Conformance to Verification SOP Classes

This implementation provides standard conformance as an SCU for verification.

3.1.3.8 Real-World Activity 8. Sending Performed Procedure Step

3.1.3.8.1 Associated Real World Activity

To export Performed Procedure Step information the operator:

Enables "PPS" EXPORT; selects a valid "Destination" AE for PPS EXPORT; which will cause newly started and completed Performed Procedure Steps to be queued for DICOM export.

Issues a "Continue" command when a Performed Procedure Step is unable to be transferred because of an error situation.

3.1.3.8.2 Proposed Presentation Contexts

Table 3.1.3.8.2-1 Proposed Presentation Contexts, Performed Procedure Step

Presentation Context Table					
Abstract Syntax		**Transfer Syntax**		**Role**	**Ext. Neg.**
Name	**UID**	**Name List**	**UID List**		
Performed Procedure Step	1.2.840.10008.3.1.2.3.3	DICOM Explicit VR Little Endian Transfer Syntax	1.2.840.10008.1.2.1	SCU	None
		DICOM Implicit VR Little Endian Transfer Syntax	1.2.840.10008.1.2		

3.1.3.8.3 SOP Specific Conformance to Performed Procedure Step SOP Class

This implementation provides standard conformance as an SCU for Performed Procedure Step.

Table 3.1.3.8.3-1 Performed Procedure Step Identifier Set for MR Scanner

Tag	**VR**	**Name**		
0008,0060	CS	Modality		
0008,1032	SQ	Procedure Code Sequence		
		Tag	**VR**	**Name**
		0008,0100	SH	Code Value
		0008,0102	SH	Coding Scheme Designator
		0008,0104	LO	Code Meaning
0008,1120	SQ	Referenced Patient Sequence		
		Tag	**VR**	**Name**
		0008,1150	UI	Referenced SOP Class UID
		0008,1155	UI	Referenced SOP Instance UID

0010,0010	PN	Patient’s Name
0010,0020	LO	Patient ID
0010,0030	DA	Patient’s Birth Date
0010,0040	CS	Patient’s Sex
0020,0010	SH	Study ID
0040,0241	AE	Performed Station AE Title
0040,0242	SH	Performed Station Name
0040,0243	SH	Performed Location
0040,0244	DA	Performed Procedure Step Start Date
0040,0245	TM	Performed Procedure Step Start Time
0040,0250	DA	Performed Procedure Step End Date
0040,0251	TM	Performed Procedure Step End Time
0040,0252	CS	Performed Procedure Step Status
0040,0253	CS	Performed Procedure Step ID
0040,0254	LO	Performed Procedure Step Description
0040,0255	LO	Performed Procedure Step Description

<table>
<tr><td>0040,0260</td><td>SQ</td><td>Performed Action Item Sequence<table><tr><th>Tag</th><th>VR</th><th>Name</th></tr><tr><td>0008,0100</td><td>SH</td><td>Code Value</td></tr><tr><td>0008,0102</td><td>SH</td><td>Coding Scheme Designator</td></tr><tr><td>0008,0104</td><td>LO</td><td>Code Meaning</td></tr></table></td></tr>
<tr><td>0040,0270</td><td>SQ</td><td>Scheduled Step Attributes Sequence<table><tr><th>Tag</th><th>VR</th><th>Name</th></tr><tr><td>0008,0050</td><td>SH</td><td>Accession Number</td></tr><tr><td>0008,1110</td><td>SQ</td><td>Referenced Study Sequence<table><tr><th>Tag</th><th>VR</th><th>Name</th></tr><tr><td>0008,1150</td><td>UI</td><td>Referenced SOP Class UID</td></tr><tr><td>0008,1155</td><td>UI</td><td>Referenced SOP Instance UID</td></tr></table></td></tr><tr><td>0020,000D</td><td>UI</td><td>Study Instance UID</td></tr><tr><td>0032,1060</td><td>LO</td><td>Requested Procedure Description</td></tr><tr><td>0040,0007</td><td>LO</td><td>Scheduled Procedure Step Description</td></tr><tr><td>0040,0008</td><td>SQ</td><td>Scheduled Action Item Code Sequence<table><tr><th>Tag</th><th>VR</th><th>Name</th></tr><tr><td>0008,0100</td><td>SH</td><td>Code Value</td></tr><tr><td>0008,0102</td><td>SH</td><td>Coding Scheme Designator</td></tr><tr><td>0008,0104</td><td>LO</td><td>Code Meaning</td></tr></table></td></tr><tr><td>0040,0009</td><td>SH</td><td>Scheduled Procedure Step ID</td></tr></table></td></tr>
</table>

		0040,1001	SH	Requested Procedure ID
		0040,1006	SH	Placer Order Number / Procedure
		0040,1007	SH	Filler Order Number / Procedure
		0040,2006	SH	Placer Order Number / Imaging Service Request
		0040,2007	SH	Filler Order Number / Imaging Service Request
0040,0280	ST	Comments on the Performed Procedure Step		

<table>
<tr><td rowspan="15">0040,0340</td><td rowspan="15">SQ</td><td colspan="4">Performed Series Sequence</td></tr>
<tr><td>Tag</td><td>VR</td><td colspan="2">Name</td></tr>
<tr><td>0008,0054</td><td>AE</td><td colspan="2">Retrieve AE Title</td></tr>
<tr><td>0008,103E</td><td>LO</td><td colspan="2">Series Description</td></tr>
<tr><td>0008,1050</td><td>PN</td><td colspan="2">Performing Physician’s Name</td></tr>
<tr><td>0008,1070</td><td>PN</td><td colspan="2">Operators’ Name</td></tr>
<tr><td rowspan="4">0008,1140</td><td rowspan="4">SQ</td><td colspan="3">Referenced Image Sequence</td></tr>
<tr><td>Tag</td><td>VR</td><td>Name</td></tr>
<tr><td>0008,1150</td><td>UI</td><td>Referenced SOP Class UID</td></tr>
<tr><td>0008,1155</td><td>UI</td><td>Referenced SOP Instance UID</td></tr>
<tr><td>0018,1030</td><td>LO</td><td colspan="2">Protocol Name</td></tr>
<tr><td>0020,000E</td><td>UI</td><td colspan="2">Series Instance UID</td></tr>
<tr><td rowspan="4">0040,0220</td><td rowspan="4">SQ</td><td colspan="3">Referenced Standalone SOP Instance Sequence</td></tr>
<tr><td>Tag</td><td>VR</td><td>Name</td></tr>
<tr><td>0008,1150</td><td>UI</td><td>Referenced SOP Class UID</td></tr>
<tr><td>0008,1155</td><td>UI</td><td>Referenced SOP Instance UID</td></tr>
</table>

3.2 SERVER Network AE

The SERVER Network AE, import_server task, provides Standard Conformance to the DICOM V3.0 SOP classes as an SCP, specified in Table 3.2-1.

Table 3.2-1 Supported SOP Classes

SOP Class Name	SOP Class UID
CR Image Storage	1.2.840.10008.5.1.4.1.1.1
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
NM Image Storage	1.2.840.10008.5.1.4.1.1.20
US Image Storage	1.2.840.10008.5.1.4.1.1.6
SC Image Storage	1.2.840.10008.5.1.4.1.1.7
XA Image Storage	1.2.840.10008.5.1.4.1.1.12.1
XRF Image Storage	1.2.840.10008.5.1.4.1.1.12.2
Verification	1.2.840.10008.1.1
Patient Root Query/Retrieve Information Model, Find	1.2.840.10008.5.1.4.1.2.1.1
Patient Root Query/Retrieve Information Model, Move	1.2.840.10008.5.1.4.1.2.1.2
Study Root Query/Retrieve Information Model, Find	1.2.840.10008.5.1.4.1.2.2.1
Study Root Query/Retrieve Information Model, Move	1.2.840.10008.5.1.4.1.2.2.2
Patient/Study Only Query/Retrieve Information Model, Find	1.2.840.10008.5.1.4.1.2.3.1
Patient/Study Only Query/Retrieve Information Model, Move	1.2.840.10008.5.1.4.1.2.3.2

3.2.1 Association Establishment Policies

3.2.1.1 General

The SERVER Network AE, import_server task, maximum PDU size is 16 Kbytes.

3.2.1.2 Number of Associations

The SERVER Network AE, import_server task, has no limitation on the number of simultaneous connections it will support except those imposed by the kernel parameters of the underlying TCP/IP implementation and by the memory resources available on the MR Scanner or MR Workstation.

3.2.1.3 Asynchronous Nature

There is no asynchronous activity in this implementation.

3.2.1.4 Implementation Identifying Information

See Section 3.1.1.4.

3.2.2 Association Acceptance Policy

The SERVER Network AE, import_server task, task accepts associations as:

- a Storage SCP
- a Query/Retrieve SCP
- a Verification SCP
- a Storage Commitment Response

Images and Grayscale Softcopy Presentation States accepted by the SERVER Network AE, import_server task, acting as a Storage SCP, are entered into the database. The MR Scanners and MR Workstations attempt, whenever possible, to store DICOM information in a form that may be re-exported exactly as received.

The SERVER Network AE, import_server task, may be configured to accept associations on various ports (as long as there is no conflict with a port used by other tasks); port 104 is typically used by default. Usually a single Application Title is configured for use by all SCUs that will be sending images to the MR Scanner or MR Workstation. A Philips Medical Systems Field Service Engineer (FSE) must configure the DICOM SERVER Network AE, import_server task.

A new copy of the SERVER Network AE, import_server task, task is executed (via Linux fork) for each new association established.

3.2.2.1 Real-World Activity 1. Receiving a Series of Images

3.2.2.1.1 Association Real-World Activity

A remote system sets up a connection with the SERVER Network AE, import_server task. The SERVER Network AE, import_server task, accepts the association and the communications parameters are negotiated. The remote system transfers its image data to the SERVER Network AE, import_server task. The image will be accepted only, if the Type 1 and Type 2 attributes, as documented in Table 3.2.2.1.1-1 below, are present with a value.

Table 3.2.2.1.1-1 C-STORE Required Fields

Tag	VR	Type	Name
0008,0016	UI	1	SOP Class UID
0008,0018	UI	1	SOP Instance UID
0010,0020	LO	2	Patient ID
0020,000D	UI	1	Study Instance UID
0020,000E	UI	1	Series Instance UID
0020,0010	SH	2	Study ID
0020,0011	IS	2	Series Number
0020,0013	IS	2	Image Number
0028,0004	CS	1	Photometric Interpretation
0028,0008	IS	1	Number of Frames, **Note:** Only Required For Multi-Frame Images
0028,0010	US	1	Rows
0028,0011	US	1	Columns
0028,0100	US	1	Bits Allocated
0028,0101	US	1	Bits Stored
0028,0102	US	1	High Bit
7FE0,0010	OW or OB	1	Pixel Data

3.2.2.1.2 Presentation Context Table

Table 3.2.2.1.2-1 Proposed Presentation Contexts, Receiving a Series of Images

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Ext.Neg.
Name	UID	Name List	UID List		

CR Image	1.2.840.10008.5.1.4.1.1.1	DICOM Explicit VR Little Endian Transfer Syntax	1.2.840.10008.1.2.1	SCP	None
		DICOM Implicit VR Little Endian Transfer Syntax	1.2.840.10008.1.2		
CT Image	1.2.840.10008.5.1.4.1.1.2	DICOM Explicit VR Little Endian Transfer Syntax	1.2.840.10008.1.2.1	SCP	None
		DICOM Implicit VR Little Endian Transfer Syntax	1.2.840.10008.1.2		
MR Image	1.2.840.10008.5.1.4.1.1.4	DICOM Explicit VR Little Endian Transfer Syntax	1.2.840.10008.1.2.1	SCP	None
		DICOM Implicit VR Little Endian Transfer Syntax	1.2.840.10008.1.2		

NM Image	1.2.840.10008.5.1.4.1.1.20	DICOM Explicit VR Little Endian Transfer Syntax	1.2.840.10008.1.2.1	SCP	None
		DICOM Implicit VR Little Endian Transfer Syntax	1.2.840.10008.1.2		
US Image	1.2.840.10008.5.1.4.1.1.6	DICOM Explicit VR Little Endian Transfer Syntax	1.2.840.10008.1.2.1	SCP	None
		DICOM Implicit VR Little Endian Transfer Syntax	1.2.840.10008.1.2		
SC Image	1.2.840.10008.5.1.4.1.1.7	DICOM Explicit VR Little Endian Transfer Syntax	1.2.840.10008.1.2.1	SCP	None
		DICOM Implicit VR Little Endian Transfer Syntax	1.2.840.10008.1.2		

Grayscale Softcopy Presentation State	1.2.840.10008.5.1.4.1.1.11.1	DICOM Explicit VR Little Endian Transfer Syntax	1.2.840.10008.1.2.1	SCP	None
		DICOM Implicit VR Little Endian Transfer Syntax	1.2.840.10008.1.2		

3.2.2.1.3 SOP Specific Conformance to Storage SOP Classes

A successful C-STORE operation implies that the image was successfully entered into the workstation database.

Images will be stored in the workstation database until the operator deletes them.

If the C-STORE operation is unsuccessful, the import_server will return one of the following status codes:

Table 3.2.2.1.3-1 C-STORE error codes

Status code	Meaning
A700 (Out of Resources)	Indicates that there is not enough room to store or process the image. Recovery is left to the user.
A800 (SOP Class not supported)	Indicates that the SOP Class of the image in the C-STORE operation did not match the Abstract Syntax negotiated for the Presentation Context. This indicates a problem with the SCU of the Service Class.
C204 (System Error)	A system error has occurred while storing or processing the incoming image. Recovery is left to the user.
CF01 (Protocol Error)	A system level protocol error occurred while processing the incoming message

3.2.2.2 Real-World Activity 2. Sending Directory Information for Query/Retrieve

3.2.2.2.1 Associated Real-World Activity

A remote system sets up a connection with the SERVER Network AE, import_server task. The

SERVER Network AE, import_server task, accepts the association and the communications parameters are negotiated. The import_server provides directory information from the local database to the remote system.

3.2.2.2.2 Presentation Contexts

Table 3.2.2.2.2-1 Presentation Contexts, Query

Presentation Context Table					
Abstract Syntax		**Transfer Syntax**		**Role**	**Ext. Neg.**
Name	**UID**	**Name List**	**UID List**		
Patient/Study Root Find	1.2.840.10008.5.1.4.1.2.3.1	DICOM Explicit VR Little Endian Transfer Syntax	1.2.840.10008.1.2.1	SCP	None
		DICOM Implicit VR Little Endian Transfer Syntax	1.2.840.10008.1.2		
Patient Root Find	1.2.840.10008.5.1.4.1.2.1.1	DICOM Explicit VR Little Endian Transfer Syntax	1.2.840.10008.1.2.1	SCP	None
		DICOM Implicit VR Little Endian Transfer Syntax	1.2.840.10008.1.2		

Study Root Find	1.2.840.10008.5.1.4.1.2.2.1	DICOM Explicit VR Little Endian Transfer Syntax	1.2.840.10008.1.2.1	SCP	None
		DICOM Implicit VR Little Endian Transfer Syntax	1.2.840.10008.1.2		

3.2.2.2.3 SOP Specific Conformance to Find SOP Classes

A successful FIND operation implies that the directory listing was successfully transferred to the remote system.

If the FIND operation is unsuccessful, the import_server will return one of the following status codes:

Table 3.2.2.2.3-1 C-FIND error codes

Status code	Meaning
C204 (System Error)	A system error has occurred while storing or processing the incoming image. Recovery is left to the user.
CF01 (Protocol Error)	A system level protocol error occurred while processing the incoming message

When querying the MR Scanner or MR Workstation, the fields included in one of the Tables [3.2.2.2.3-2, 3.2.2.2.3-3, or 3.2.2.2.3-4] are part of the C-FIND identifier set.

Table 3.2.2.2.3-2 Query/Retrieve Patient Data C-FIND Identifier Set

Tag	VR	Name
0008,0052	CS	Query/Retrieve Level
0008,0054	AE	Retrieve AE Title
0010,0010	PN	Patient’s Name
0010,0020	LO	Patient ID

Table 3.2.2.2.3-3 Query/Retrieve Study Data C-FIND Identifier Set

Tag	VR	Name
0008,0020	DA	Study Date
0008,0030	TM	Study Time
0008,0050	SH	Accession Number
0008,0052	CS	Query/Retrieve Level
0008,0054	AE	Retrieve AE Title
0008,0090	PN	Referring Physician's Name
0008,1030	LO	Study Description
0010,0020	LO	Patient ID
0020,000D	UI	Study Instance UID
0020,0010	SH	Study ID

Table 3.2.2.2.3-4 Query/Retrieve Series Data C-FIND Identifier Set

Tag	VR	Name
0008,0031	TM	Series Time
0008,0052	CS	Query/Retrieve Level
0008,0054	AE	Retrieve AE Title
0008,0060	CS	Modality
0008,103E	LO	Series Description
0010,0020	LO	Patient ID
0018,0015	CS	Body Part Examined
0018,1030	LO	Protocol Name
0018,5100	CS	Patient Position
0020,000D	UI	Study Instance UID
0020,000E	UI	Series Instance UID
0020,0011	IS	Series Number
0020,0060	CS	Laterality

3.2.2.3 Real-World Activity 3. Sending Images for Query/Retrieve

3.2.2.3.1 Associated Real-World Activity

A remote system sets up a connection with the SERVER Network AE, import_server task. The SERVER Network AE, import_server task, accepts the association and the communications parameters are negotiated. The remote system issues a request to transfer images through a C-MOVE. The SERVER Network AE, import_server task, communicates with the CLIENT Network AE, export_engine task, and the requested images sent.

3.2.2.3.2 Proposed Presentation Contexts

Table 3.1.3.6.2-1 Proposed Presentation Contexts, Move

Presentation Context Table					
Abstract Syntax		**Transfer Syntax**		**Role**	**Ext. Neg.**
Name	**UID**	**Name List**	**UID List**		
Patient/Study Root Move	1.2.840.10008.5.1.4.1.2.3.2	DICOM Explicit VR Little Endian Transfer Syntax	1.2.840.10008.1.2.1	SCP	None
		DICOM Implicit VR Little Endian Transfer Syntax	1.2.840.10008.1.2		
Patient Root Move	1.2.840.10008.5.1.4.1.2.1.2	DICOM Explicit VR Little Endian Transfer Syntax	1.2.840.10008.1.2.1	SCP	None
		DICOM Implicit VR Little Endian Transfer Syntax	1.2.840.10008.1.2		

Study Root Move	1.2.840.10008.5.1.4.1.2.2.2	DICOM Explicit VR Little Endian Transfer Syntax	1.2.840.10008.1.2.1	SCP	None
		DICOM Implicit VR Little Endian Transfer Syntax	1.2.840.10008.1.2		

3.2.2.3.3 SOP Specific Conformance to Move SOP Classes

This implementation provides standard conformance as an SCP for C-MOVE.

3.2.2.4 Real-World Activity 4. Verification

3.2.2.4.1 Associated Real-World Activity

A remote system sets up a connection with the SERVER Network AE, import_server task. The SERVER Network AE, import_server task, accepts the association and the communications parameters are checked against internal configuration information.

3.2.2.4.2 Proposed Presentation Contexts

Table 3.2.2.4.2-1 Proposed Presentation Contexts, Verification

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Ext. Neg.
Name	UID	Name List	UID List		
Verification	1.2.840.10008.1.1	DICOM Explicit VR Little Endian Transfer Syntax	1.2.840.10008.1.2.1	SCP	None
		DICOM Implicit VR Little Endian Transfer Syntax	1.2.840.10008.1.2		

3.2.2.4.3 SOP Specific Conformance to Verification SOP Classes

A successful VERIFICATION operation implies that the remote configuration information was successfully transferred and agreed with the configuration parameters on the local system.

If the VERIFICATION operation is unsuccessful, the import_server will return one of the following status codes:

Table 3.2.2.2.3-1 C-STORE error codes

Status code	Meaning
C204 (System Error)	A system error has occurred while storing or processing the incoming image. Recovery is left to the user.
CF01 (Protocol Error)	A system level protocol error occurred while processing the incoming message

3.2.3 Association Initiation Policy

The SERVER Network AE, import_server task, does not initiate an association.

3.3 FSC_SERVER Media AE

The FSC_SERVER Media AE, import_server task, provides Standard Conformance to the DICOM V3.0 SOP classes as an SCP, specified in Table 3.3-1, for the purpose of generating DICOM Part 10 files.

Table 3.3-1 Supported SOP Classes

SOP Class Name	SOP Class UID
CR Image Storage	1.2.840.10008.5.1.4.1.1.1
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
NM Image Storage	1.2.840.10008.5.1.4.1.1.20
US Image Storage	1.2.840.10008.5.1.4.1.1.6
SC Image Storage	1.2.840.10008.5.1.4.1.1.7
XA Image Storage	1.2.840.10008.5.1.4.1.1.12.1
XRF Image Storage	1.2.840.10008.5.1.4.1.1.12.2
Grayscale Softcopy Presentation State Storage	1.2.840.10008.5.1.4.1.1.11.1
Verification	1.2.840.10008.1.1

The FSC_SERVER Media AE is another instance of the SERVER Network AE, the reader should consult the SERVER Network AE Specifications for the SOP Classes identified in the above table, Table 3.3-1.

3.4 CLIENT Media AE

3.4.1 Application Entity Title

The CLIENT Media AE, cd_write task, provides Standard Conformance to the DICOM V3.0 SOP classes as a FSC.

3.4.2 Real World Activity.

Prior to committing the data to CD-R, the operator must first convert the data to Part 10 format. The operator selects the local CD-ROM disk buffer as a destination for the CLIENT Network AE, export_engine task, and transfers series to the FSC_SERVER Media AE, import_server task.

The operator then selects the CLIENT Media AE, cd_write task, which determines which patients can be transferred to a single CD-R. Information, which will not fit, on a single CD-R will remain on the system until the operator writes the data to subsequent CD-R’s or until the system is restarted.

3.4.3 Application Profile

The CLIENT Media AE, cd_write task, provides Standard Conformance to the DICOM V3.0 SOP classes as a FSC, specified in Table 3.4.3-2 using the Application Profile defined in Table 3.4.3-1.

Table 3.4.3-1 Supported Application Profiles

Application Profiles	Identifier	Real-World Activity	Role	SC Option
Media (General Purpose CD-R)	STD-GEN-CD	Writes image(s) on CD-R disk	FSC	Interchange

Table 3.4-2 Supported Media Storage SOP Classes

SOP Class Name	SOP Class UID
Media Storage Directory Storage	1.2.840.10008.1.3.10
CR Image	1.2.840.10008.5.1.4.1.1.1
CT Image	1.2.840.10008.5.1.4.1.1.2
MR Image	1.2.840.10008.5.1.4.1.1.4
NM Image	1.2.840.10008.5.1.4.1.1.20
US Image	1.2.840.10008.5.1.4.1.1.6
SC Image	1.2.840.10008.5.1.4.1.1.7
Grayscale Softcopy Presentation State	1.2.840.10008.5.1.4.1.1.11.1

3.4.4 DICOMDIR keys

The following identifies all DICOM tags provided in the DICOMDIR:

Table 3.4.4-1 Elements for DICOMDIR

Tag	VR	Name
0002,0000	UL	Group Length
0002,0001	OB	File Meta Information Version
0002,0002	UI	Media Storage SOP Class UID
0002,0003	UI	Media Storage SOP Instance UID
0002,0010	UI	Transfer Syntax UID
0002,0012	UI	Implementation Class UID
0002,0013	SH	Implementation Version Name
0004,1130	CS	File-set ID
0004,1141	CS	File-set Descriptor File ID
0004,1142	CS	Specific Character Set of File-set Descriptor File
0004,1200	UL	Offset of First Directory Record of the RootDirectoryEntity

0004,1202	UL	Offset of Last Directory Record of the RootDirectoryEntity		
0004,1212	US	File-set Consistency Flag		
		Directory Record Sequence		
		Tag	**VR**	**Name**
		FFFE,E000	DL	Item
		0004,1400	UL	Offset of the Next Directory Record
		0004,1410	US	Record In-use Flag
		0004,1420	UL	Offset of Referenced Lower-Level Directory Entity
		0004,1430	CS	Directory Record Type
		0008,0005	CS	Specific Character Set
		0010,0010	PN	Patient’s Name
		0010,0020	LO	Patient ID
		FFFE,E00D	DL	Item Delimitation Item
		FFFE,E000	DL	Item
		0004,1400	UL	Offset of the Next Directory Record
		0004,1410	US	Record In-use Flag
		0004,1420	UL	Offset of Referenced Lower-Level Directory Entity
		0004,1430	CS	Directory Record Type
		0008,0005	CS	Specific Character Set
		0008,0020	DA	Study Date
		0008,0030	TM	Study Time
		0008,0050	SH	Accession Number
		0008,1030	LO	Study Description
		0020,000D	UI	Study Instance UID
		0020,0010	SH	Study ID

		FFFE,E00D	DL	Item Delimitation Item
0004,1220	SQ	FFFE,E000	DL	Item
		0004,1400	UL	Offset of the Next Directory Record
		0004,1410	US	Record In-use Flag
		0004,1420	UL	Offset of Referenced Lower-Level Directory Entity
		0004,1430	CS	Directory Record Type
		0008,0005	CS	Specific Character Set
		0008,0060	CS	Modality
		0020,000E	UI	Series Instance UID
		0020,0011	IS	Series Number
		FFFE,E00D	DL	Item Delimitation Item
		FFFE,E000	DL	Item
		0004,1400	UL	Offset of the Next Directory Record
		0004,1410	US	Record In-use Flag
		0004,1420	UL	Offset of Referenced Lower-Level Directory Entity
		0004,1430	CS	Directory Record Type
		0004,1500	CS	Referenced File ID
		0004,1510	UI	Referenced SOP Class UID in File
		0004,1511	UI	Referenced SOP Instance UID in File
		0004,1512	UI	Referenced Transfer Syntax UID in File
		0008,0005	CS	Specific Character Set
		0008,0008	CS	Image Type
		0020,0013	IS	Image Number

		FFFE,E00D	DL	Item Delimitation Item

The data is organized on the CD with separate subdirectories for each patient, study, and series. A README file provides a patient directory in the event that there is a need to manually traverse the data.

```
.
|-- DICOMDIR
|-- README
|-- PA1\
|     ‘-- ST1\
|           |-- SR1\
|           |     ‘-- I000001
|           |-- SR2\
|           |     |-- I000002
|           |     |-- I000003
|           |     ‘-- I000004
|           ‘-- SR3\
|                 |-- I000005
|                 |-- I000006
|                 |-- I000007
|                 ‘-- I000008
‘-- PA2\
     ‘-- ST1\
           |-- SR1\
           |     ‘-- I001014
           |-- SR2\
           |     ‘-- I001015
           ‘-- SR3\
                 |-- I001016
                 |-- I001017
                 |-- I001018
                 ‘-- I001019
```

3.5 SERVER Media AE

3.5.1 Application Entity Title

The SERVER Media AE, read_dicomdir task, provides Standard Conformance to the DICOM V3.0 SOP classes as a FSR.

3.5.2 Real World Activity.

The SERVER Media AE, read_dicomdir task, (forks) a separate process for each CD or Magneto-Optical installed on the system. The process examines the mounted file system for the file DICOMDIR in the root directory. If a DICOMDIR file is located, a database is created with

entries from the DICOMDIR. The ability to read media is limited to supported image SOP classes and the ability of the operating system to mount the media. DICOM File Set Read is limited to uncompressed data.

3.5.3 Application Profile

The SERVER Media AE, read_dicomdir task, provides Standard Conformance to the DICOM V3.0 SOP classes as a FSR, specified in Table 3.5.3-2 using the Application Profile defined in Table 3.5.3-1

Table 3.5.3-1 Supported Application Profiles

Application Profiles	Identifier	Real-World Activity	Role	SC Option
Media (General Purpose CD-R)	STD-GEN-CD	Reads image(s) on CD-R disk	FSR	Interchange
CT/MR Studies on 650MB MOD	STD-CTMR-MOD650	Reads image(s) on 650MB MOD disk	FSR	Interchange
CT/MR Studies on 1.2GB MOD	STD-CTMR-MOD12	Reads image(s) on 1.2GB MOD disk	FSR	Interchange
CT/MR Studies on 2.3GB MOD	STD-CTMR-MOD23	Reads image(s) on 2.3GB MOD disk	FSR	Interchange

Table 3.5-2 Supported Media Storage SOP Classes

SOP Class Name	SOP Class UID
Media Storage Directory Storage	1.2.840.10008.1.3.10
CR Image	1.2.840.10008.5.1.4.1.1.1
CT Image	1.2.840.10008.5.1.4.1.1.2
MR Image	1.2.840.10008.5.1.4.1.1.4
NM Image	1.2.840.10008.5.1.4.1.1.20
US Image	1.2.840.10008.5.1.4.1.1.6
SC Image	1.2.840.10008.5.1.4.1.1.7
Grayscale Softcopy Presentation State	1.2.840.10008.5.1.4.1.1.11.1

3.5.4 DICOMDIR keys

No optional DICOMDIR keys are required to support the role of FSR.

4. Communication Profiles

4.1 Supported Communications Stacks (Parts 8,9)

The CLIENT Network AE, SERVER Network AE, and FSC_SERVER Media AE provide DICOM 3.0 TCP/IP Network Communications Support as defined in Part 8 of the DICOM Standard.

4.2 OSI Stack

No OSI stack communications are provided with this implementation.

4.3 TCP/IP Stack

The TCP/IP protocol stack is supported.

4.3.1 Physical media supported

The Physical media supported is either Thinnet or Twisted pair Ethernet. Adapters from Thinnet to either Twisted pair Ethernet or Thicknet Ethernet can be provided.

4.4 Point to Point Stack

No point-to-point stack communications are provided with this implementation.

5. Extensions/Specializations/Privatizations

Private elements for MR Scanner or MR Workstation images are identified in table 3.1.3.1.3-3. With the exception of these private elements and Type 3 DICOM extensions, no other specializations, or privatizations are used in this implementation.

6. Configuration

A Philips Medical Systems Field Service Engineer must configure DICOM applications, and other networking applications.

Table 6-1 Configurable Communication Parameters

Field Name	Contents
Local AE Title	Text, limited to 16 characters
Remote Host	IP Address or Hostname
Remote AE Title	Text, limited to 16 characters
Remote and Local Port	Integer Value
PDU Size (Kb.)	Integer Value

Table 6-2 DICOM Service Object Pair Configurable Parameters

DICOM Service Object Pair	Configurable Parameters		
DICOM Print Service Class as a User	**Tag**	**VR**	**Name**
	2010,0130	US	Maximum Density
	2010,0120	US	Minimum Density
	2010,0150	ST	Configuration Information

7. Support of Extended Character Sets

Extended Character Sets are not used or supported in this implementation.

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