

Philips Medical Systems

DICOM

**CONFORMANCE STATEMENT
for MR Scanners and Workstations with
VIA3.0.006 Software**



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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).

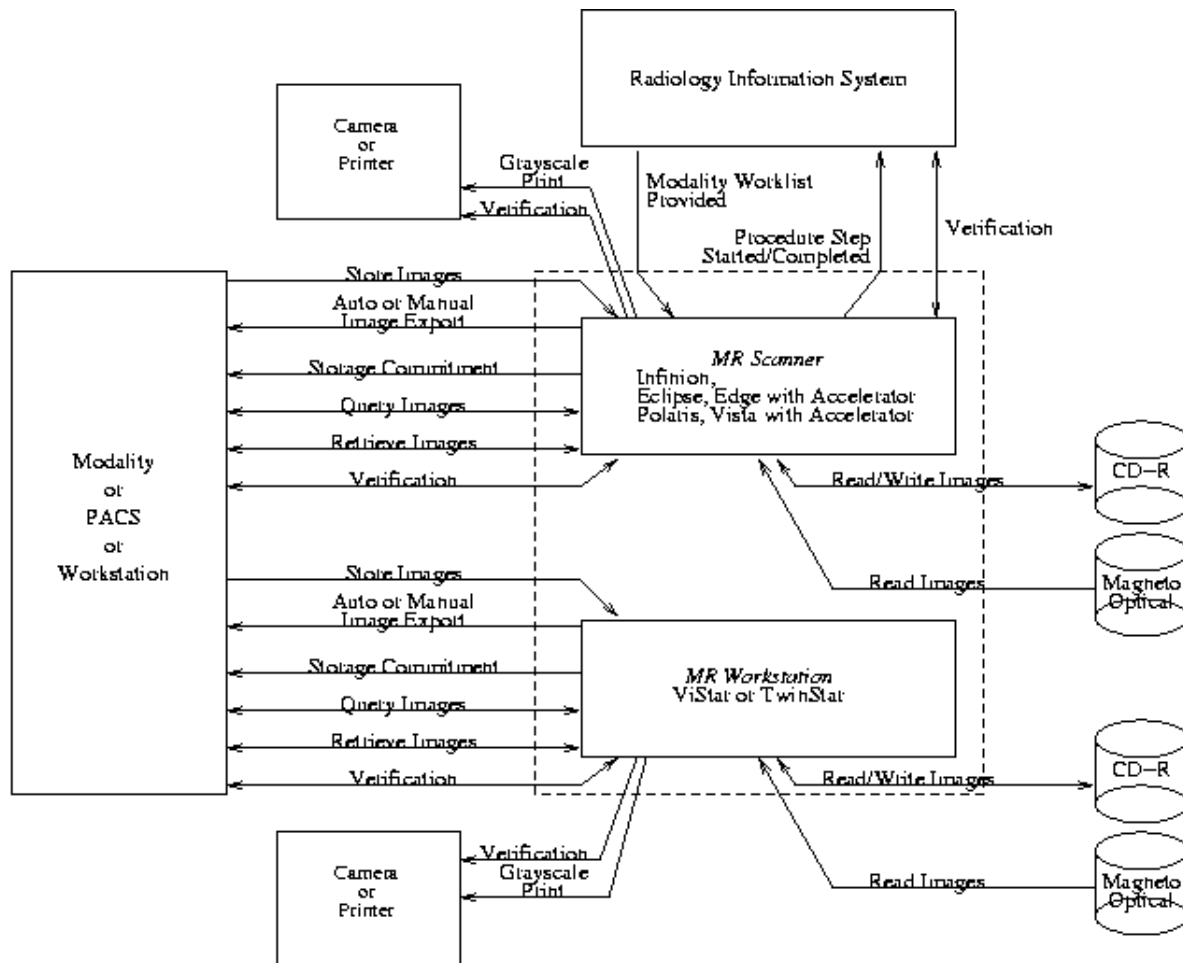
1.7 General Acronyms and Abbreviations.

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 | DICOM Storage Service Class as a Provider |
| Auto or Manual Image Export | DICOM Storage Service Class as a User |
| 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 | DICOM Media Storage as a File Set Creator |
| Read Images | DICOM Media Storage as a File Set Reader |
| 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 VIA3.0.006 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 from a Modality, PACS, or Workstation. (DICOM Import Server)

| | |
|------------------|--------------|
| Software License | DIIMP |
|------------------|--------------|

DICOM Storage Service Class as a User

This facility sends images from the MR Scanner or MR Workstation to a Modality, PACS, or Workstation over an Ethernet network. (DICOM Export Client)

| | |
|------------------|-------------------------------------|
| Software License | none, included with the base system |
|------------------|-------------------------------------|

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, 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) 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 (as previously indicated, the referring physician must have software capable of reading the DICOM CD).*

| | |
|------------------|----------------------------|
| Software License | CDWRITE & DIIMP |
|------------------|----------------------------|

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 by selecting the series. (DICOM CD and Magneto-Optical Reader)

| | |
|------------------|-----------------|
| Software License | DIMEDIAR |
|------------------|-----------------|

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 VIA3.0.006 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

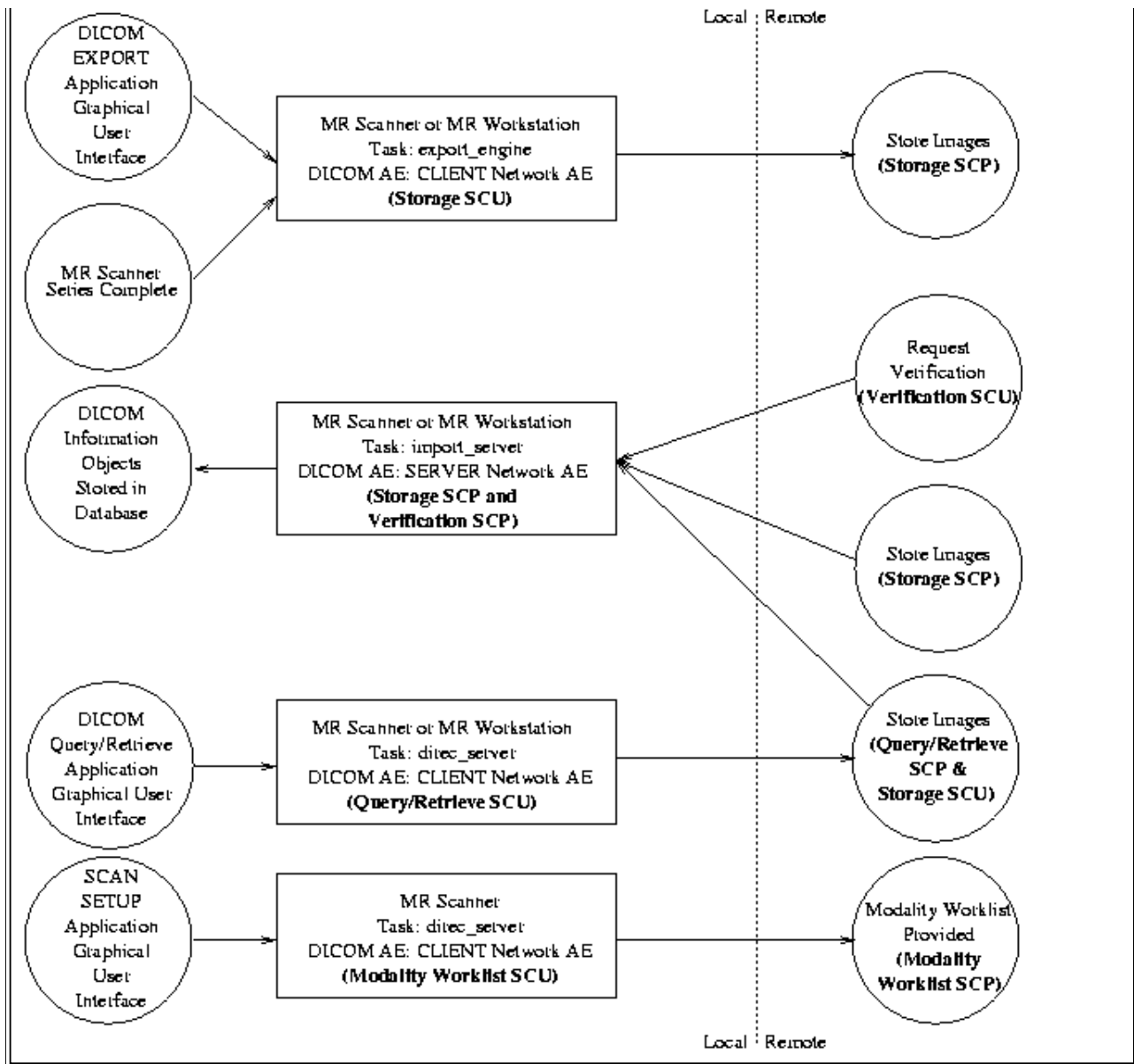
implementation. As such for the remainder of this document, MR Scanner, will be used in place of referring to any particular scanner in the above table, similarly, MR Workstation will be used in place of ViStar or TwinStar.

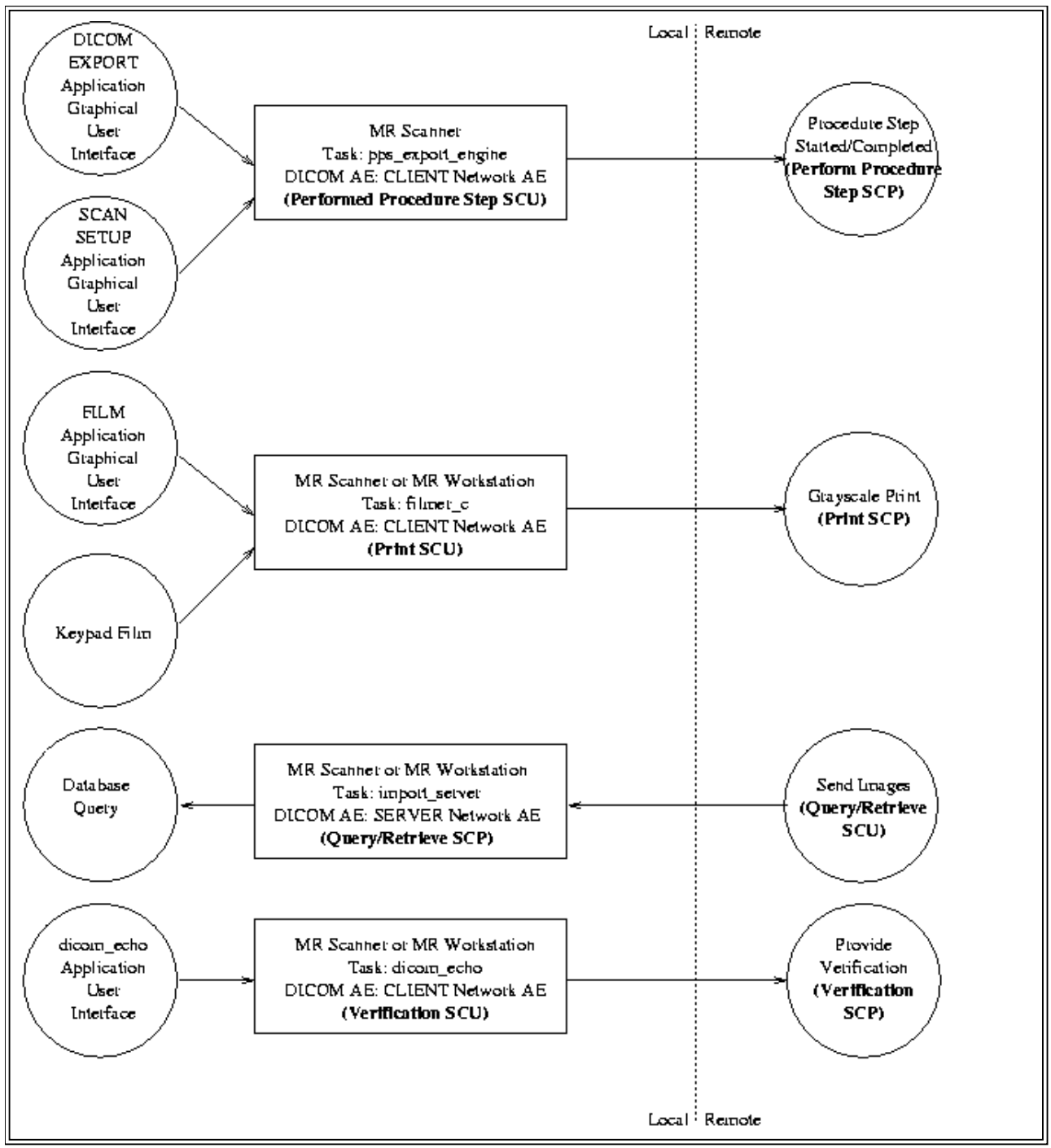
This conformance statement does not apply to other MR products or medical imaging devices manufactured by Philips Medical Systems.

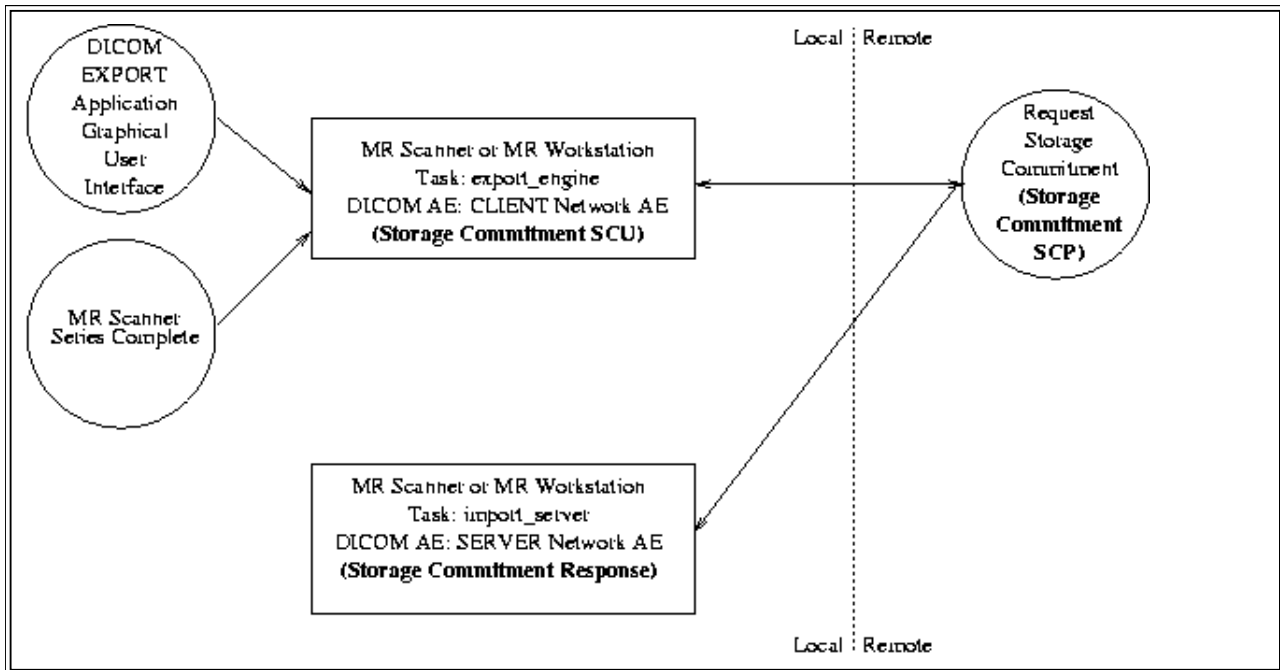
2.1 Application Data Flow Diagram

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.

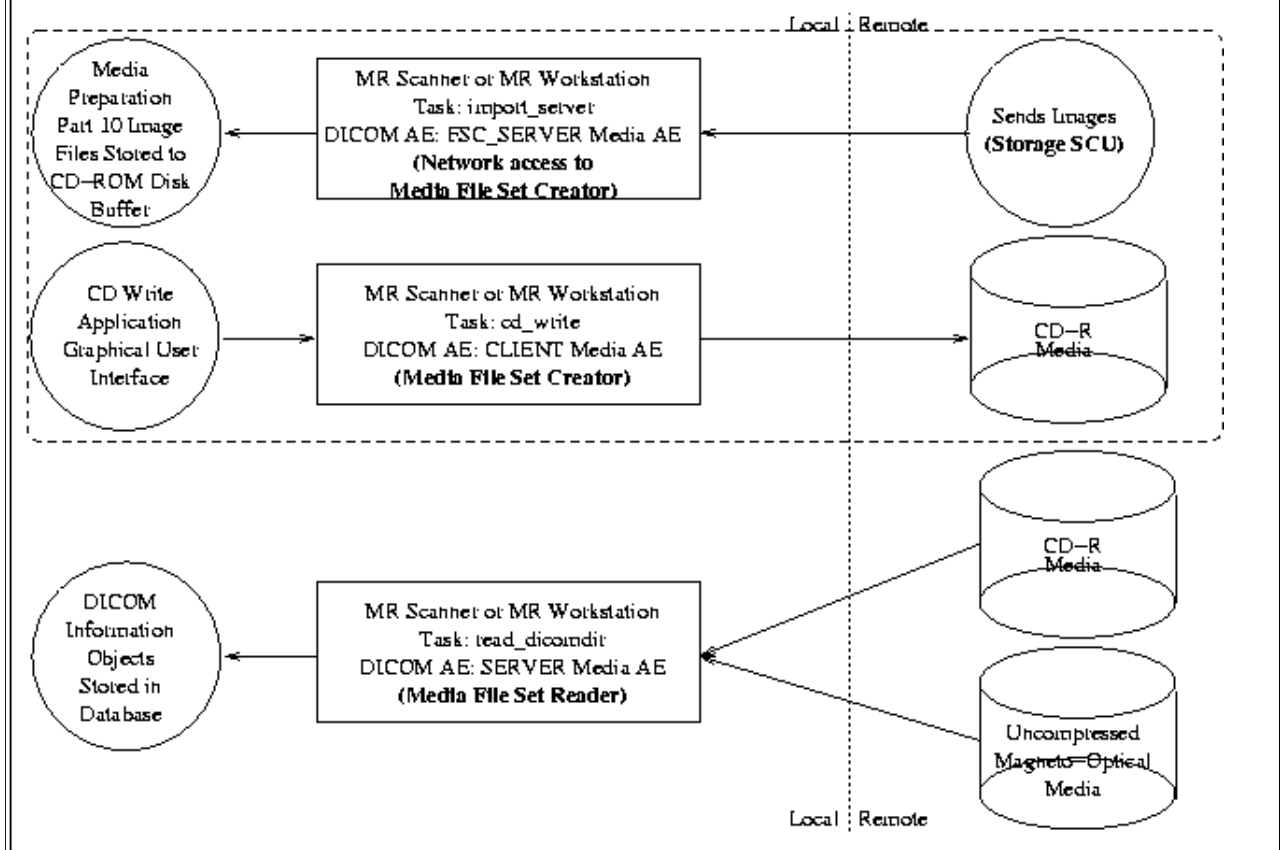
2.1.1 Network Application Data Flow Diagram







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.

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.

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 |
| 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, maximum PDU size is 4096 for GrayScale Print operations, for all other operations performed by the CLIENT Network AE the maximum PDU size is 16 Kbytes.

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: | VIA3.0.006 |

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.

- 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 User's Guide.

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 Implicit VR Little Endian Transfer Syntax | 1.2.840.10008.1.2 | SCU | None |
| CT Image | 1.2.840.10008.5.1.4.1.1.2 | DICOM Implicit VR Little Endian Transfer Syntax | 1.2.840.10008.1.2 | SCU | None |
| MR Image | 1.2.840.10008.5.1.4.1.1.4 | DICOM Implicit VR Little Endian Transfer Syntax | 1.2.840.10008.1.2 | SCU | None |
| NM Image | 1.2.840.10008.5.1.4.1.1.20 | DICOM Implicit VR Little Endian Transfer Syntax | 1.2.840.10008.1.2 | SCU | None |
| US Image | 1.2.840.10008.5.1.4.1.1.6 | DICOM Implicit VR Little Endian Transfer Syntax | 1.2.840.10008.1.2 | SCU | None |
| SC Image | 1.2.840.10008.5.1.4.1.1.7 | DICOM Implicit VR Little Endian Transfer Syntax | 1.2.840.10008.1.2 | SCU | None |

| | | | | | |
|---|----------------------|---|-------------------|-----|------|
| Storage Commitment Push Model SOP Class | 1.2.840.10008.1.20.1 | DICOM Implicit VR Little Endian Transfer Syntax | 1.2.840.10008.1.2 | SCU | None |
|---|----------------------|---|-------------------|-----|------|

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 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 is 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 Implicit VR Little Endian Transfer Syntax | 1.2.840.10008.1.2 | SCU | None |

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, 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 |
| | | | 0040,0001 | 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 |

| | | | | | | |
|-----------|----|---|-------------------------------------|-----------|-------------|--|
| 0040,0100 | SQ | 1 | 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 |
| 2010,0140 | 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 Implicit VR Little Endian Transfer Syntax | 1.2.840.10008.1.2 | SCU | None |
| Patient Root Find | 1.2.840.10008.5.1.4.1.2.1.1 | DICOM Implicit VR Little Endian Transfer Syntax | 1.2.840.10008.1.2 | SCU | None |
| Study Root Find | 1.2.840.10008.5.1.4.1.2.2.1 | DICOM Implicit VR Little Endian Transfer Syntax | 1.2.840.10008.1.2 | SCU | None |

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 Implicit VR Little Endian Transfer Syntax | 1.2.840.10008.1.2 | SCU | None |
| Patient Root Move | 1.2.840.10008.5.1.4.1.2.1.2 | DICOM Implicit VR Little Endian Transfer Syntax | 1.2.840.10008.1.2 | SCU | None |
| Study Root Move | 1.2.840.10008.5.1.4.1.2.2.2 | DICOM Implicit VR Little Endian Transfer Syntax | 1.2.840.10008.1.2 | SCU | None |

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 Implicit VR Little Endian Transfer Syntax | 1.2.840.10008.1.2 | SCU | None |

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 Implicit VR Little Endian Transfer Syntax | 1.2.840.10008.1.2 | SCU | None |

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 | | | | |
| 0040,0260 | SQ | Performed Action Item Sequence | | | | |
| | | Tag | VR | Name | | |
| | | 0008,0100 | SH | Code Value | | |
| | | 0008,0102 | SH | Coding Scheme Designator | | |
| | | 0008,0104 | LO | Code Meaning | | |
| | | Scheduled Step Attributes Sequence | | | | |
| | | Tag | VR | Name | | |
| | | 0008,0050 | SH | Accession Number | | |
| | | 0008,1110 | SQ | Referenced Study Sequence | | |
| | | | | Tag | VR | Name |
| | | | | 0008,1150 | UI | Referenced SOP Class UID |
| | | 0008,1155 | UI | Referenced SOP Instance UID | | |

| | | | | | | |
|-----------|----|--|-----------|---|---|--------------------------|
| | | 0020,000D | UI | Study Instance UID | | |
| | | 0032,1060 | LO | Requested Procedure Description | | |
| | | 0040,0007 | LO | Scheduled Procedure Step Description | | |
| 0040,0270 | SQ | 0040,0008 | SQ | Scheduled Action Item Code Sequence | | |
| | | | | Tag | VR | Name |
| | | | | 0008,0100 | SH | Code Value |
| | | | | 0008,0102 | SH | Coding Scheme Designator |
| | | | | 0008,0104 | LO | Code Meaning |
| | | | 0040,0009 | SH | Scheduled Procedure Step ID | |
| | | | 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 | | | | |

| | | | | | | |
|-----------|----|---|-----------|-----------------------------|-----------|-----------------------------|
| 0040,0340 | SQ | Performed Series Sequence | | | | |
| | | Tag | VR | Name | | |
| | | 0008,0054 | AE | Retrieve AE Title | | |
| | | 0008,103E | LO | Series Description | | |
| | | 0008,1050 | PN | Performing Physician's Name | | |
| | | 0008,1070 | PN | Operators' Name | | |
| | | Referenced Image Sequence | | | | |
| | | | | Tag | VR | Name |
| | | 0008,1140 | SQ | 0008,1150 | UI | Referenced SOP Class UID |
| | | | | 0008,1155 | UI | Referenced SOP Instance UID |
| | | 0018,1030 | LO | Protocol Name | | |
| | | 0020,000E | UI | Series Instance UID | | |
| | | Referenced Standalone SOP Instance Sequence | | | | |
| | | | | Tag | VR | Name |
| | | 0040,0220 | SQ | 0008,1150 | UI | Referenced SOP Class UID |
| | | 0008,1155 | UI | Referenced SOP Instance UID | | |

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 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 Implicit VR Little Endian Transfer Syntax | 1.2.840.10008.1.2 | SCP | None |

| | | | | | |
|----------|----------------------------|---|-------------------|-----|------|
| CT Image | 1.2.840.10008.5.1.4.1.1.2 | DICOM Implicit VR Little Endian Transfer Syntax | 1.2.840.10008.1.2 | SCP | None |
| MR Image | 1.2.840.10008.5.1.4.1.1.4 | DICOM Implicit VR Little Endian Transfer Syntax | 1.2.840.10008.1.2 | SCP | None |
| NM Image | 1.2.840.10008.5.1.4.1.1.20 | DICOM Implicit VR Little Endian Transfer Syntax | 1.2.840.10008.1.2 | SCP | None |
| US Image | 1.2.840.10008.5.1.4.1.1.6 | DICOM Implicit VR Little Endian Transfer Syntax | 1.2.840.10008.1.2 | SCP | None |
| SC Image | 1.2.840.10008.5.1.4.1.1.7 | DICOM Implicit VR Little Endian Transfer Syntax | 1.2.840.10008.1.2 | SCP | None |

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 3.2.2.2-1 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 Implicit VR Little Endian Transfer Syntax | 1.2.840.10008.1.2 | SCP | None |
| Patient Root Find | 1.2.840.10008.5.1.4.1.2.1.1 | DICOM Implicit VR Little Endian Transfer Syntax | 1.2.840.10008.1.2 | SCP | None |
| Study Root Find | 1.2.840.10008.5.1.4.1.2.2.1 | DICOM Implicit VR Little Endian Transfer Syntax | 1.2.840.10008.1.2 | SCP | None |

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 Implicit VR Little Endian Transfer Syntax | 1.2.840.10008.1.2 | SCP | None |
| Patient Root Move | 1.2.840.10008.5.1.4.1.2.1.2 | DICOM Implicit VR Little Endian Transfer Syntax | 1.2.840.10008.1.2 | SCP | None |
| Study Root Move | 1.2.840.10008.5.1.4.1.2.2.2 | DICOM Implicit VR Little Endian Transfer Syntax | 1.2.840.10008.1.2 | SCP | None |

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 Implicit VR Little Endian Transfer Syntax | 1.2.840.10008.1.2 | SCP | None |

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 |
| 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 |

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 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | <table border="1"> <thead> <tr> <th>Tag</th> <th>VR</th> <th>Name</th> </tr> </thead> <tbody> <tr> <td>FFFE,E000</td> <td>DL</td> <td>Item</td> </tr> <tr> <td>0004,1400</td> <td>UL</td> <td>Offset of the Next Directory Record</td> </tr> <tr> <td>0004,1410</td> <td>US</td> <td>Record In-use Flag</td> </tr> <tr> <td>0004,1420</td> <td>UL</td> <td>Offset of Referenced Lower-Level Directory Entity</td> </tr> <tr> <td>0004,1430</td> <td>CS</td> <td>Directory Record Type</td> </tr> <tr> <td>0008,0005</td> <td>CS</td> <td>Specific Character Set</td> </tr> <tr> <td>0010,0010</td> <td>PN</td> <td>Patient's Name</td> </tr> <tr> <td>0010,0020</td> <td>LO</td> <td>Patient ID</td> </tr> <tr> <td>FFFE,E00D</td> <td>DL</td> <td>Item Delimitation Item</td> </tr> <tr> <td>FFFE,E000</td> <td>DL</td> <td>Item</td> </tr> <tr> <td>0004,1400</td> <td>UL</td> <td>Offset of the Next Directory Record</td> </tr> <tr> <td>0004,1410</td> <td>US</td> <td>Record In-use Flag</td> </tr> <tr> <td>0004,1420</td> <td>UL</td> <td>Offset of Referenced Lower-Level Directory Entity</td> </tr> <tr> <td>0004,1430</td> <td>CS</td> <td>Directory Record Type</td> </tr> <tr> <td>0008,0005</td> <td>CS</td> <td>Specific Character Set</td> </tr> <tr> <td>0008,0020</td> <td>DA</td> <td>Study Date</td> </tr> <tr> <td>0008,0030</td> <td>TM</td> <td>Study Time</td> </tr> <tr> <td>0008,0050</td> <td>SH</td> <td>Accession Number</td> </tr> <tr> <td>0008,1030</td> <td>LO</td> <td>Study Description</td> </tr> <tr> <td>0020,000D</td> <td>UI</td> <td>Study Instance UID</td> </tr> <tr> <td>0020,0010</td> <td>SH</td> <td>Study ID</td> </tr> </tbody> </table> | 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 |
| 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 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

0004,1220 SQ

| | | |
|-----------|----|---|
| 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 |
| 0008,0060 | 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 |

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 |

Table 6-2 DICOM Service Object Pair Configurable Parameters

| Service Prompt | DICOM Service Object Pair | Configurable Parameters | | |
|-----------------|-------------------------------------|-------------------------|----|---------------------------|
| Grayscale Print | DICOM Print Service Class as a User | Tag | VR | Name |
| | | 2010,0150 | ST | Configuration Information |

7. Support of Extended Character Sets

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

END OF DOCUMENT