



GE Healthcare

Technical Publications

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Revision 1

GE MR DICOM CONFORMANCE STATEMENT

Optima MR430s Software Version 3.54

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CONFORMANCE STATEMENT OVERVIEW

Table 0.1 provides an overview of the network services supported by the Optima MR430s product running software version 3.54.

Table 0.1 – NETWORK SERVICES

SOP Classes	User of Service (SCU)	Provider of Service (SCP)
Transfer		
Verification (Echo)	Yes	Yes
CT Image Storage	Yes	Yes
MR Image Storage	Yes	Yes
Secondary Capture Image Storage	Yes	Yes
Query/Retrieve		
Patient Root Query/Retrieve Information Model – FIND	Yes	Yes
Patient Root Query/Retrieve Information Model – MOVE	Yes	Yes
Study Root Query/Retrieve Information Model – FIND	Yes	Yes
Study Root Query/Retrieve Information Model – MOVE	Yes	Yes
Print Management		
Basic Grayscale Print Management Meta SOP Class	Yes	No
Basic Color Print Management Meta SOP Class	Yes	No
Presentation LUT SOP Class	Yes	No
Workflow Management		
Modality Worklist Information Model – FIND SOP Class	Yes	No

Table 0.2 provides an overview of the Media Storage Application Profiles supported by the Optima MR430s product running software version 3.54.

Table 0.2 - MEDIA SERVICES

Media Storage Application Profile	Write Files (FSC or FSU)	Read Files (FSR)
Compact Disk – Recordable		
General Purpose CD-R	Yes (FSC)	Yes
DVD-RAM		
General Purpose DVD-RAM	Yes (FSC)	Yes

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1 DICOM Transfer

1.1 Introduction

1.1.1 Purpose of this Section

This section of the DICOM Conformance Statement for the Optima MR430s software version 3.54 covers DICOM transfer. The document is formatted according to NEMA PS3.2(1996).

1.1.2 Related Documents

NEMA PS3.1-8(1997), the DICOM Standard

1.1.3 Definitions

dcserver	The executable name of the Application Entity
-----------------	---

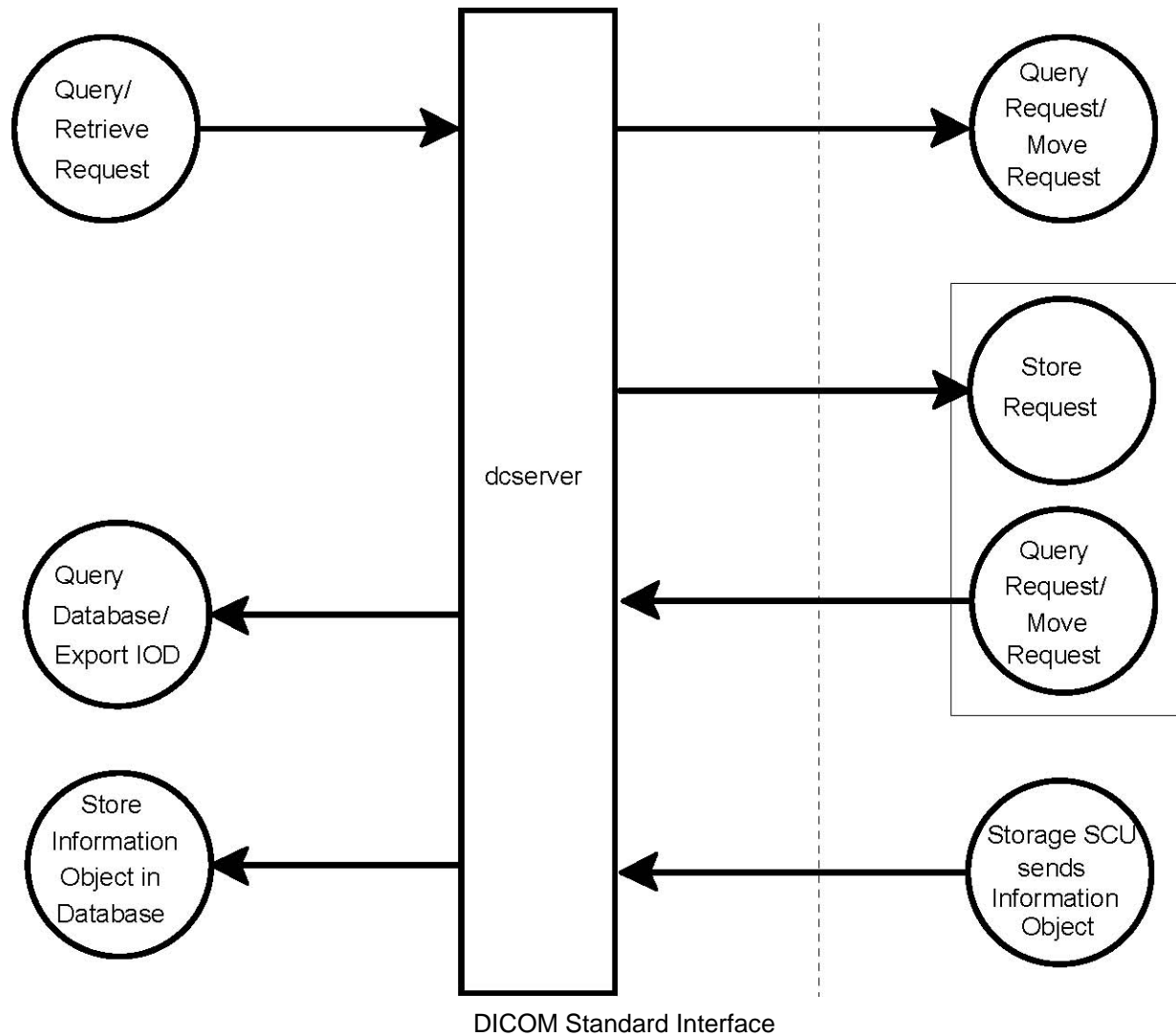
1.1.4 Acronyms and Abbreviations

DICOM	Digital Imaging and Communications in Medicine
DcS	The Optima MR430s DICOM Image Transfer Server
NEMA	North American Electrical Manufacturers Association

1.2 Implementation Model

The Optima MR430s DICOM Image Transfer Server is implemented as a single Application Entity. It can accept associations from Remote Application Entities for the purpose of storing Information Objects in the Local Application Entity database and providing Query and Move access to the study database. The Application Entity can originate associations for Query and Retrieve of Information Objects stored in Remote Application Entities. If a Remote Application Entity initiates a Move operation, an association is originated to service the required Store sub-operations.

The *dcserver* also accepts commands from a user interface component. The user interface causes Query and Move operations to be initiated by *dcserver* using DICOM associations.



1.2.1 Application Data Flow

The *dcserver* runs on the Optima MR430s workstation. A Remote Application Entity initiates an association for Storage Services. Upon notification of acceptance of the association parameters, the Remote Application Entity sends Information Objects to the *dcserver* that stores them in a local database for future use by the scanner software.

The Optima MR430s user initiates Query and Retrieve requests using the *dcserver* component, generally by interaction with a user interface. The *dcserver* component initiates an association with the Remote Application Entity and uses the Query or Retrieve Service Classes to issue commands. The Remote Application Entity responds as a Query/Retrieve Service Class Provider performing C-FIND and C-MOVE operations as required. The *dcserver* component passes the status responses for these commands to the user interface for interpretation and display.

1.2.2 Functional Definitions of Application Entities

The *dcserver* component operates as a daemon. The startup sequence of the computer system initiates its execution. The *dcserver* is left running whether the user is logged in or not.

The *dcserver* uses a configuration file that contains information used to validate association attempts from Remote Application entities. The *dcserver* then listens on the configured port for association requests.

An association request for Storage Services from a Remote Application Entity causes *dcserver* to validate the request according to the configuration parameters set at execution time. The Remote Application Entity then sends the Information Object Instance. The *dcserver* stores the received Information Object Instance in its local database if the data does not already exist. The data remains in the database until removed by some action external to this Application Entity.

An association request from a Remote Application Entity for Query or Move Services causes *dcserver* to validate the request according to the configuration parameters set at execution time. The Remote Application Entity then sends the Query or Retrieve request. The *dcserver* searches the local database for the instance(s) specified. If the request was C_FIND, then a response is returned for each match. If the request was C_MOVE, then an association is originated to the destination Application Entity specified in the C_MOVE message. Incremental responses are sent to the C_MOVE originator to indicate progress of the request.

A request from the user interface causes the *dcserver* component to initiate an association with a Remote Application Entity. The Service Classes offered are specified in the configuration file. The user can then initiate Query and Retrieve requests to *dcserver* that are sent to the Remote Application Entity. The user interface displays the responses from the Remote Application Entity.

1.2.3 Sequencing of Real-World Activities

Not applicable

1.2.4 Application Entity Specifications

The Optima MR430s DICOM Image Transfer capability consists of two logical components. The SCU portion originates associations for Store, Query and Retrieve operations. The SCP portion accepts associations for Store, Query and Retrieve operations. The two components are configured with the same Application Entity Title for use in the Optima MR430s software. They are treated as a single Application Entity in this description. The following DICOM V3.0 SOP Classes as an SCP:*dcs*erver Application Entity provides Standard Conformance to the following SOP Classes:

SOP Class Name	SOP Class UID
Verification	1.2.840.10008.1.1
Patient Root Query/Retrieve Model - FIND	1.2.840.10008.5.1.4.1.2.1.1
Patient Root Query/Retrieve Model - MOVE	1.2.840.10008.5.1.4.1.2.1.2
Study Root Query/Retrieve Model - FIND	1.2.840.10008.5.1.4.1.2.2.1
Study Root Query/Retrieve Model - MOVE	1.2.840.10008.5.1.4.1.2.2.2
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
Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7

The *dcs*erver Application Entity provides Standard Conformance to the following DICOM V3.0 SOP Classes as an SCU:

SOP Class Name	SOP Class UID
Verification	1.2.840.10008.1.1
Patient Root Query/Retrieve Model - FIND	1.2.840.10008.5.1.4.1.2.1.1
Patient Root Query/Retrieve Model - MOVE	1.2.840.10008.5.1.4.1.2.1.2
Study Root Query/Retrieve Model - FIND	1.2.840.10008.5.1.4.1.2.2.1
Study Root Query/Retrieve Model - MOVE	1.2.840.10008.5.1.4.1.2.2.2
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
Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7

1.3 Association Policies

1.3.1 Association Establishment Policies

1.3.1.1 General

The User of the User Interface can select which Application Entity to associate with for Query and Retrieve operations. The configuration file contains the configuration parameters such as host name, port number and specific SOP Classes to negotiate for each accessible Application Entity.

The *dcserver* Application Entity always proposes or accepts the Verification SOP Class.

1.3.1.2 Number of Associations

The *dcserver* can initiate multiple associations concurrently. A configuration parameter is provided to limit the number of associations that can be originated. Currently, the number of concurrent originating associations is limited to a maximum of 3.

1.3.1.3 Asynchronous Nature

This release does not support Multiple outstanding transactions.

1.3.1.4 Implementation Identifying Information

The *dcserver* Implementation Class UID is 2.16.124.113531.1.1.

1.3.2 Association Initiation by Real World Activity

This section details the action of the *dcserver* SCU component as a result of user initiated activity on the Optima MR430s User Interface.

1.3.2.1 Query Request

1.3.2.1.1 Associated Real World Activity

The user selects the Query operation button on the user interface. Wild card or specific information can be specified by the user for Patient Name, Patient ID and/or Study ID.

1.3.2.1.2 Proposed Presentation Contexts

The following table describes the Presentation Contexts that may be presented for the Query request. The configuration file contains 1 of the listed Abstract Syntax's.

Presentation Context Table

Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name	UID		
Patient Root Query / Retrieve Model - FIND	1.2.840.10008.5.1.4.1.2.1. 1	Implicit VR, Little Endian	1.2.840.10008.1. 2	SCU	None
Study Root Query / Retrieve Model - MOVE	1.2.840.10008.5.1.4.1.2.2. 2	Implicit VR, Little Endian	1.2.840.10008.1. 2	SCU	None

1.3.2.1.3 SOP Specific Conformance for Patient Root Query/Retrieve Model - FIND

- The *dcserver* does not use Relational Queries.
- The *dcserver* does not use Extended Negotiation. The Keys supported are listed below:

Patient Level Keys

Description	Tag	Type
Patient's Name	(0010,0010)	R
Patient ID	(0010,0020)	U
Patient's Birth Date	(0010,0030)	O
Patient's Birth Time	(0010,0032)	O
Patient's Sex	(0010,0040)	O
Other Patient IDs	(0010,1000)	O
Other Patient Names	(0010,1001)	O
Ethnic Group	(0010,2160)	O
Patient Comments	(0010,4000)	O

Study Level Keys

Description	Tag	Type
Study Date	(0008,0020)	R
Study Time	(0008,0030)	R
Accession Number	(0008,0050)	R
Study ID	(0020,0010)	R
Study Instance UID	(0020,000D)	U
Referring Physician's Name	(0008,0090)	O
Study Description	(0008,1030)	O
Name of Physician(s) Reading Study	(0008,1060)	O
Admitting Diagnoses Description	(0008,1080)	O
Patient's Age	(0010,1010)	O
Patient's Size	(0010,1020)	O
Patient's Weight	(0010,1030)	O
Occupation	(0010,2180)	O
Additional Patient History	(0010,21B0)	O
Other Study Numbers	(0020,1070)	O
Interpretation Author	(4008,010C)	O

Series Level Keys

Description	Tag	Type
Modality	(0008,0060)	R
Series Number	(0020,0011)	R
Series Instance UID	(0020,000E)	U

Image Level Keys

Description	Tag	Type
Image Number	(0020,0013)	R
SOP Instance UID	(0008,0018)	U

1.3.2.1.4 SOP Specific Conformance for Study Root Query/Retrieve Model - FIND

- The *dcserver* does not use Relational Queries.
- The *dcserver* does not use Extended Negotiation. The Keys supported are listed below:

Study Level Keys

Description	Tag	Type
Study Date	(0008,0020)	R
Study Time	(0008,0030)	R
Accession Number	(0008,0050)	R
Patient's Name	(0010,0010)	R
Patient ID	(0010,0020)	R
Study ID	(0020,0010)	R
Study Instance UID	(0020,000D)	U
Referring Physician's Name	(0008,0090)	O
Study Description	(0008,1030)	O
Name of Physician(s) Reading Study	(0008,1060)	O

Admitting Diagnoses Description	(0008,1080)	O
---------------------------------	-------------	---

Patient's Birth Date	(0010,0030)	O
Patient's Birth Time	(0010,0032)	O
Patient's Sex	(0010,0040)	O
Other Patient IDs	(0010,1000)	O
Other Patient Names	(0010,1001)	O
Patient's Age	(0010,1010)	O
Patient's Size	(0010,1020)	O
Patient's Weight	(0010,1030)	O
Ethnic Group	(0010,2160)	O
Occupation	(0010,2180)	O
Additional Patient History	(0010,21B0)	O
Patient Comments	(0010,4000)	O
Other Study Numbers	(0020,1070)	O
Interpretation Author	(4008,010C)	O

Series Level Keys

Description	Tag	Type
Modality	(0008,0060)	R
Series Number	(0020,0011)	R
Series Instance UID	(0020,000E)	U

Series Level Keys

Description	Tag	Type
Image Number	(0020,0013)	R
SOP Instance UID	(0008,0018)	U

1.3.2.2 Move Request

1.3.2.2.1 Associated Real World Activity

The user selects one or more studies and/or series within studies from a list presented as a result of a previous Query operation.

The user then selects the Transfer operation button on the user interface to initiate the move operation. The Destination Application Entity Title is selectable on the user interface.

1.3.2.2.2 Proposed Presentation Contexts

The following table describes the Presentation Contexts that may be presented for the Move request.

Presentation Context Table

Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name	UID		
Patient Root Query / Retrieve Model - MOVE	1.2.840.10008.5.1.4.1.2.1.2	Implicit VR, Little Endian	1.2.840.10008.1.2	SCU	None

1.3.2.2.3 SOP Specific Conformance for Patient Root Query/Retrieve Model - MOVE

This implementation supports transfers against the Patient Query/Retrieve Information Model described in Section C.6.1.1 of NEMA PS3.4 (1996) Annex C using the C-MOVE SCU behavior described in Section C.4.2.2 of NEMA PS3.4 (1996) Annex C.

1.3.2.3 Store Request

1.3.2.3.1 Associated Real World Activity

The *dcserver* Application Entity initiates an association for C_STORE if it has received a valid C_MOVE message from a Remote Application Entity. The SOP Class UID of the Information Object to be sent over the C_STORE context is used to verify that a valid Presentation Context exists prior to issuing the C_STORE message. A mismatch results in no message being sent but the association remains active.

1.3.2.3.2 Proposed Presentation Contexts

The following table describes the Presentation Contexts that may be presented for the Store request. The configuration file contains one or more of the listed Abstract Syntax's.

Presentation Context Table

Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name	UID		
Verification	1.2.840.10008.1.1	Implicit VR, Little Endian	1.2.840.10008.1.2	SCP	None
CT Image Storage	1.2.840.10008.5.1.4.1.1.2	Implicit VR, Little Endian	1.2.840.10008.1.2	SCP	None
MR Image Storage	1.2.840.10008.5.1.4.1.1.4	Implicit VR, Little Endian	1.2.840.10008.1.2	SCP	None
Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7	Implicit VR, Little Endian	1.2.840.10008.1.2	SCP	None

1.3.2.3.3 SOP Specific Conformance for C-STORE

This implementation supports transfers as an SCU as described in NEMA PS3.4 (1996) Annex B.

The status returned by the accepting Application Entity is used to indicate success or failures of the C_MOVE sub-operation that initiated the transfer. In no case is the Information Object deleted from the local database.

Extended negotiation is not used by *dcserver* for this SOP Class.

The specific Information Object Definitions are specified in Appendix A of this document.

1.3.3 Association Acceptance Policy

Parameters in the *dcserver* configuration file determine association acceptance. Association acceptance can be controlled on the basis of Called Application Entity Title, Calling Application Entity Title and SOP Class UID matching. Acceptance control ranges from no limitations to very specific acceptance policies.

A configuration parameter can be set to limit the number of accepted associations to a specific value.

1.3.3.1 Storage Association Request

1.3.3.1.1 Associated Real-World Activity

The *dcserver* stores image Information Object Instances received on the accepted association into its attached database.

1.3.3.1.2 Presentation Context Table

The following table lists the possible Presentation Contexts. The Application Entity configuration file specifies which of these Presentation Contexts are actually used in a specific configuration.

Presentation Context Table

Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name	UID		
Verification	1.2.840.10008.1.1	Implicit VR, Little Endian	1.2.840.10008.1.2	SCP	None
CT Image Storage	1.2.840.10008.5.1.4.1.1.2	Implicit VR, Little Endian	1.2.840.10008.1.2	SCP	None
MR Image Storage	1.2.840.10008.5.1.4.1.1.4	Implicit VR, Little Endian	1.2.840.10008.1.2	SCP	None
Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7	Implicit VR, Little Endian	1.2.840.10008.1.2	SCP	None

1.3.3.1.3 SOP Specific Conformance for SOP Class Verification

The *dcserver* Application Entity conforms to the DICOM Verification Service Class as a SCP.

1.3.3.1.4 SOP Specific Conformance for SOP Class Storage

The *dcserver* Application Entity conforms to the DICOM Storage Service Class as a SCP for the Abstract Syntax's listed in the table in section 1.3.3.1.2 at conformance level 2. Storage Conformance level 2 requires the Application Entity to retain all Type 1, Type 2 and Type 3 attributes. Appendix A of this document specifies the attributes retained from each of the SOP Class Information Objects listed in section 1.3.3.1.2.

The received Information Object Instance is stored in a database until some external application causes the data to be deleted. The Optima MR430s accesses the stored data for display and other manipulation.

Private attributes are discarded.

In the case where the study database is full, a status of 0xD000 is returned to the Storage SCU and the Information Object is discarded. A blank image may be inserted into the study database in the case of full database. The recovery action is to provide more storage space or to start the database server as appropriate. The returned value can be set to 0x0000 by setting a variable in the configuration file. The variable can apply to all associations or to specific Application entities.

If the Information Object Instance does not match any accepted Abstract Syntax, a status code of 0xA800 is returned. Recovery consists of altering the configuration of the remote or local Application Entity.

The attribute 0x00000902 contains a descriptive message to explain error returns.

Appendix B of this document describes the validations and coercion performed on incoming Information Objects. Failure of a validation results in the return of status C000 in the C-STORE response message.

1.3.3.1.5 Presentation Context Acceptance Criterion

The *dcserver* always accepts the Verification SOP Class.

The *dcserver* accepts Storage SOP Class Presentation Contexts if they are configured in the Application Entity configuration file. The possible Presentation Contexts are listed in section 1.3.3.1.2.

1.3.3.1.6 Transfer Syntax Selection Policies

The *dcserver* presently supports only the default DICOM Little-Endian Transfer Syntax. When support for DICOM Explicit VR encoding is implemented, *dcserver* will choose the most efficient Transfer Syntax based on the machine platform it is operating on. For Big-Endian systems this is DICOM Explicit VR, Big-Endian.

1.3.3.2 Query Association Request

1.3.3.2.1 Associated Real-World Activity

The *dcserver* searches the attached database for the requested Information Objects described in the C_FIND identifier and returns a response for each match.

1.3.3.2.2 Presentation Context Table

The following table lists the possible Presentation Contexts. The Application Entity configuration file specifies which of these Presentation Contexts are actually used in a specific configuration.

Presentation Context Table

Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name	UID		
Verification	1.2.840.10008.1.1	Implicit VR, Little Endian	1.2.840.10008.1. 2	SCP	None
Patient Root Query / Retrieve Model - FIND	1.2.840.10008.5.1.4.1.2. 1 .1	Implicit VR, Little Endian	1.2.840.10008.1. 2	SCP	None
Study Root Query / Retrieve Model - FIND	1.2.840.10008.5.1.4.1.2. 2 .1	Implicit VR, Little Endian	1.2.840.10008.1. 2	SCP	None

1.3.3.2.3 SOP Specific Conformance for SOP Class Verification

The *dcserver* Application Entity conforms to the DICOM Verification Service Class as a SCP.

1.3.3.2.4 SOP Specific Conformance for Patient Root Query/Retrieve Model - FIND

The *dcserver* Application Entity conforms to the DICOM Patient Root Query/Retrieve Service Class as a SCP for the Abstract Syntax's listed in the table in section 1.3.3.2.2. The table in section 1.3.2.1.3 defines the accepted search keys.

A response is returned for each match found in the attached database.

Possible response status values are:

Refused	Out of resources	A700
Failed	Identifier does not match SOP Class	A900
	Unable to Process	C000
Cancel	Terminated due to Cancel Request	FE00
Success	matching completed	0000
Pending	Matches are continuing	FF00

If the Information Object Instance does not match any accepted Abstract Syntax, a status code of 0xA800 is returned. Recovery consists of altering the configuration of the remote or local Application Entity.

The attribute 0x00000902 contains a descriptive message to explain error returns.

1.3.3.2.5 SOP Specific Conformance for Study Root Query/Retrieve Model - FIND

The *dcserver* Application Entity conforms to the DICOM Study Root Query/Retrieve Service Class as a SCP for the Abstract Syntax's listed in the table in section 1.3.3.2.2. The table in section 1.3.2.1.4 defines the accepted search keys.

A response is returned for each match found in the attached database.

Possible response status values are:

Refused	Out of resources	A700
Failed	Identifier does not match SOP Class	A900
	Unable to Process	C000
Cancel	Terminated due to Cancel Request	FE00
Success	matching completed	0000
Pending	Matches are continuing	FF00

If the Information Object Instance does not match any accepted Abstract Syntax, a status code of 0xA800 is returned. Recovery consists of altering the configuration of the remote or local Application Entity.

The attribute 0x00000902 contains a descriptive message to explain error returns.

1.3.3.2.6 Presentation Context Acceptance Criterion

The *dcserver* always accepts the Verification SOP Class.

The *dcserver* accepts SOP Class contexts if they are configured in the Application Entity configuration file. The possible Presentation Contexts are listed in section 1.3.3.2.2.

1.3.3.2.7 Transfer Syntax Selection Policies

The *dcserver* presently supports only the default DICOM Little-Endian Transfer Syntax. When support for DICOM Explicit VR encoding is implemented, *dcserver* will choose the most efficient Transfer Syntax based on the machine platform it is operating on. For Big-Endian systems this is DICOM Explicit VR, Big-Endian.

1.3.3.3 Move Association Request

1.3.3.3.1 Associated Real-World Activity

The *dcserver* initiates an association to the destination Application Entity specified in the C_MOVE command message. The *dcserver* then extracts the requested Information Objects described in the C_MOVE identifier from the attached database and performs C_STORE operations on the destination association.

1.3.3.3.2 Presentation Context Table

The following table lists the possible Presentation Contexts. The Application Entity configuration file specifies which of these Presentation Contexts are actually used in a specific configuration.

Presentation Context Table

Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name	UID		
Verification	1.2.840.10008.1.1	Implicit VR, Little Endian	1.2.840.10008.1.2	SCP	None
Patient Root Query / Retrieve Model - MOVE	1.2.840.10008.5.1.4.1.2.1.2	Implicit VR, Little Endian	1.2.840.10008.1.2	SCP	None
Study Root Query / Retrieve Model - MOVE	1.2.840.10008.5.1.4.1.2.2.2	Implicit VR, Little Endian	1.2.840.10008.1.2	SCP	None

1.3.3.3.3 Specific Conformance for SOP Class Verification

The *dcserver* Application Entity conforms to the DICOM Verification Service Class as a SCP.

1.3.3.3.4 SOP Specific Conformance for Patient Root Query/Retrieve Model - MOVE

The *dcserver* Application Entity conforms to the DICOM Patient Root Query/Retrieve Service Class as a SCP for the Abstract Syntax's listed in the table in section 1.3.3.3.2.

A response is returned for each Information Object sent to the destination Application Entity.

Possible response status values are:

Refused	Out of resources	A700
----------------	------------------	------

	Unable to perform sub-operations	A702
	Move Destination Unknown	A801
Failed	Identifier does not match SOP Class	A900
	Unable to Process	C000
Cancel	Terminated due to Cancel Request	FE00
Success	sub-operations completed	0000
Warning	sub-operations completed, 1 or more failures	B000
Pending	Matches are continuing	FF00

The attribute 0x00000902 contains a descriptive message to explain error returns.

1.3.3.3.5 SOP Specific Conformance for Study Root Query/Retrieve Model - MOVE

The *dcserver* Application Entity conforms to the DICOM Study Root Query/Retrieve Service Class as a SCP for the Abstract Syntax's listed in the table in section 1.3.3.3.2.

A response is returned for each Information Object sent to the destination Application Entity.

Possible response status values are:

Refused	Out of resources	A700
	Unable to perform sub-operations	A702
	Move Destination Unknown	A801
Failed	Identifier does not match SOP Class	A900
	Unable to Process	C000
Cancel	Terminated due to Cancel Request	FE00
Success	sub-operations completed	0000
Warning	sub-operations completed, 1 or more failures	B000

Pending	Matches are continuing	FF00
----------------	------------------------	------

The attribute 0x00000902 contains a descriptive message to explain error returns.

1.3.3.3.6 Presentation Context Acceptance Criterion

The *dcserver* always accepts the Verification SOP Class.

The *dcserver* accepts SOP Class contexts if they are configured in the Application Entity configuration file. The possible Presentation Contexts are listed in section 1.3.3.3.2.

1.3.3.3.7 Transfer Syntax Selection Policies

The *dcserver* presently supports only the default DICOM Little-Endian Transfer Syntax. When support for DICOM Explicit VR encoding is implemented, *dcserver* will choose the most efficient Transfer Syntax based on the machine platform it is operating on. For Big-Endian systems this is DICOM Explicit VR, Big-Endian.

1.4 Communication Profiles

1.4.1 Supported Communication Stacks (Parts 8,9)

The TCP/IP Network Communication Support as defined in PS3.8 (1996) is supported.

1.4.1.1 OSI Stack

Not supported.

1.4.1.2 TCP/IP Stack

1.4.1.2.1 API

The *dcserver* implementation uses Berkeley style sockets.

1.4.1.2.2 Physical Media Support

The Application Entity is not dependent on the physical medium used for the TCP/IP network other than as it affects performance. The physical medium used for TCP/IP communication will be determined by the host platform upon which *dcserver* operates.

1.4.1.3 4.1.3 Point-to-Point Stack

Not supported.

1.5 Extensions/Specialization's/Privatization's

1.5.1 Standard/Extended/Specialized/Private SOPs

Not applicable

1.5.2 Private Transfer Syntax's

No Private Transfer Syntax's are used by *dcserver*.

1.6 Configuration

1.6.1 AE Title/Presentation Address Mapping

The *dcserver* Application Entity maps Application Entity Titles to host name and port number via lookups in the configuration file. The IP address for host name is determined using standard host system calls. The configuration file supports the use of IP addresses in place of host names, this is to reduce the dependence on system configuration files.

1.6.2 Configurable Parameters

- i. The Query/Retrieve and Storage SOP Classes to accept are configurable, globally or Application Entity Title specific.
- ii. The Query/Retrieve and Storage SOP Classes to propose are configurable, globally or Application Entity Title specific.
- iii. The Transfer Syntax's are configurable for each SOP Class, globally or SOP Class specific.
- iv. A configuration parameter is supplied to control matching of Calling Application Entity Title to a value in the configuration file.
- v. A configuration parameter is supplied to control matching of Called Application Entity Title to a value in the configuration file.
- vi. A configuration parameter is supplied to allow Application Entity Title specific association related tracing output to be created for connection troubleshooting.
- vii. A configuration parameter is supplied to allow Application Entity Title specific DIMSE tracing output to be created for message troubleshooting.
- viii. Application entity host names can be specified as either IP address or host name for lookup in */etc/hosts*.
- ix. The number of associations that can be initiated is 3.
- x. The number of associations that can be accepted is configurable.
- xi. The port number to listen on for association requests is configurable.

1.7 Support of Extended Character Sets

Extended character sets are not supported by the Application Entity. The Optima MR430s will accept most extended ASCII character sets into the database, however, the extended character element 0x00080005 is ignored and not stored with the images (see Appendix A for Information Object Definitions). If necessary for export purposes, element 0x00080005 maybe controlled through the use of a configuration parameter.

1.8 Appendix A

This Appendix details the actual Information Object Definitions stored by the *dcserver* Application Entity. They contain Type 1, Type 2 and Type 3 attributes for conformance to Storage Conformance level 2 defined in DICOM Part 3, Information Object Definitions PS3.3 (1996).

The table numbers in this Appendix match those in DICOM Part 3, Information Object Definitions PS3.3 (1996).

1.8.1 Common Modules

Table C.7.1.1 – Patient Module Attributes

Attribute Name	Tag	Type
Patient's Name	0010,0010	2
Patient ID	0010,0020	2
Patient's Birth Date	0010,0030	2
Patient's Sex	0010,0040	2
Patient's Birth Time	0010,0032	3
Other Patient ID	0010,1000	3
Other Patient Names	0010,1001	3
Ethnic Group	0010,2160	3
Patient Comments	0010,4000	3

Table C.7.2.1 -- General Study Module Attributes

Attribute Name	Tag	Type
Study Instance UID	0020,000D	1
Study Date	0008,0020	2
Study Time	0008,0030	2
Referring Physician's Name	0008,0090	2
Study ID	0020,0010	2
Accession Number	0008,0050	2
Study Description	0008,1030	3
Name of Physician(s) Reading Study	0008,1060	3
Series In Study	0020,1000	3

Table C.7.2.2 -- Patient Study Module Attributes

Attribute Name	Tag	Type
Admitting Diagnoses Description	0008,1080	3
Patient's Age	0010,1010	3
Patient's Size	0010,1020	3
Patient's Weight	0010,1030	3
Occupation	0010,2180	3
Additional Patient's History	0010,21B0	3

Table C.7.3.1 -- General Series Module Attributes

Attribute Name	Tag	Type
Modality	0008,0060	1
Series Instance UID	0020,000E	1
Series Number	0020,0011	2
Laterality	0020,0060	2C
Series Date	0008,0021	3
Series Time	0008,0031	3
Performing Physicians' Name	0008,1050	3
Protocol Name	0018,1030	3
Series Description	0008,103E	3
Operators' Name	0008,1070	3
Body Part Examined	0018,0015	3
Patient Position	0018,5100	2C
Smallest Pixel Value in Series	0028,0108	3
Largest Pixel Value in Series	0028,0109	3

Table C.7.4.1 -- Frame Of Reference Module Attributes

Attribute Name	Tag	Type
Frame of Reference UID	0020,0052	1
Position Reference Indicator	0020,1040	2

Table C.7.5.1 -- General Equipment Module Attributes

Attribute Name	Tag	Type
Manufacturer	0008,0070	2
Institution Name	0008,0080	3
Station Name	0008,1010	3
Institutional Department Name	0008,1040	3
Manufacturer's Model Name	0008,1090	3
Device Serial Number	0018,1000	3
Software Versions	0018,1020	3
Spatial Resolution	0018,1050	3
Date of Last Calibration	0018,1200	3
Time of Last Calibration	0018,1201	3
Pixel Padding Value	0028,0120	3

Table C.7.6.1 -- General Image Module Attributes

Attribute Name	Tag	Type
Image Number	0020,0013	2
Patient Orientation	0020,0020	2C
Image Date	0008,0023	2C
Image Time	0008,0033	2C
Image Type	0008,0008	3
Acquisition Number	0020,0012	3
Acquisition Date	0008,0022	3

Acquisition Time	0008,0032	3
Derivation Description	0008,2111	3
Images in Acquisition	0020,1002	3
Image Comments	0020,4000	3

Table C.7.6.2 -- Image Plane Module Attributes

Attribute Name	Tag	Type
Pixel Spacing	0028,0030	1
Image Orientation (Patient)	0020,0037	1
Image Position (Patient)	0020,0032	1
Slice Thickness	0018,0050	2
Slice Location	0020,1041	3

Table C.7.6.3 -- Image Pixel Module Attributes

Attribute Name	Tag	Type
Samples per Pixel	0028,0002	1
Photometric Interpretation	0028,0004	1
Rows	0028,0010	1
Columns	0028,0011	1
Bits Allocated	0028,0100	1
Bits Stored	0028,0101	1
High Bit	0028,0102	1
Pixel Representation	0028,0103	1
Pixel Data	7FE0,0010	1
Planar Configuration	0028,0006	1C
Pixel Aspect Ratio	0028,0034	1C
Smallest Image Pixel Value	0028,0106	3

Largest Image Pixel Value	0028,0107	3
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Table C.7.6.4 -- Contrast/Bolus Module Attributes

Attribute Name	Tag	Type
Contrast/Bolus Agent	0018,0010	2
Contrast/Bolus Route	0018,1040	3
Contrast/Bolus Volume	0018,1041	3
Contrast/Bolus Start Time	0018,1042	3
Contrast/Bolus Stop Time	0018,1043	3
Contrast/Bolus Total Dose	0018,1044	3

1.8.2 CT Storage IOD

Table C.8.2.1 -- CT Image Module Attributes

Attribute Name	Tag	Type
Image Type	0008,0008	1
Samples per Pixel	0028,0002	1
Photometric Interpretation	0028,0004	1
Bits Allocated	0028,0100	1
Bits Stored	0028,0101	1
High Bit	0028,0102	1
Rescale Intercept	0028,1052	1
Rescale Slope	0028,1053	1
KVP	0018,0060	2
Acquisition Number	0020,0012	2
Scan Options	0018,0022	3

Data Collection Diameter	0018,0090	3
Reconstruction Diameter	0018,1100	3
Distance Source to Detector	0018,1110	3
Distance Source to Patient	0018,1111	3
Gantry/Detector Tilt	0018,1120	3
Table Height	0018,1130	3
Rotation Direction	0018,1140	3
Exposure Time	0018,1150	3
X-ray Tube Current	0018,1151	3
Exposure	0018,1152	3
Filter Type	0018,1160	3
Generator Power	0018,1170	3
Focal Spot	0018,1190	3
Convolution Kernel	0018,1210	3

1.8.3 MR Storage IOD

Table C.8.3.1 – MR Image Module Attributes

Attribute Name	Tag	Type
Image Type	0008,0008	1
Samples per Pixel	0028,0002	1
Photometric Interpretation	0028,0004	1
Bits Allocated	0028,0100	1
Scanning Sequence	0018,0020	1
Sequence Variant	0018,0021	1
Scan Options	0018,0022	2
MR Acquisition Type	0018,0023	2
Repetition Time	0018,0080	2C
Echo Time	0018,0081	2
Echo Train Length	0018,0091	2
Inversion Time	0018,0082	2C
Trigger Time	0018,1060	2C
Sequence Name	0018,0024	3
Angio Flag	0018,0025	3
Number of Averages	0018,0083	3
Imaging Frequency	0018,0084	3
Imaged Nucleus	0018,0085	3
Echo Number	0018,0086	3
Magnetic Field Strength	0018,0087	3
Spacing Between Slices	0018,0088	3
Number of Phase Encoding Steps	0018,0089	3
Percent Sampling	0018,0093	3
Percent Phase Field of View	0018,0094	3

Pixel Bandwidth	0018,0095	3
Nominal Interval	0018,1062	3
Beat Rejection Flag	0018,1080	3
Low R-R Value	0018,1081	3
High R-R Value	0018,1082	3
Intervals Acquired	0018,1083	3
Intervals Rejected	0018,1084	3
PVC Rejection	0018,1085	3
Skip Beats	0018,1086	3
Heart Rate	0018,1088	3
Cardiac Number of Images	0018,1090	3
Trigger Window	0018,1094	3
Reconstruction Diameter	0018,1100	3
Receiving Coil	0018,1250	3
Transmitting Coil	0018,1251	3
Acquisition Matrix	0018,1310	3
Phase Encoding Direction	0018,1312	3
Flip Angle	0018,1314	3
SAR	0018,1316	3
Variable Flip Angle Flag	0018,1315	3
dB/dt	0018,1318	3
Temporal Position Identifier	0020,0100	3
Number of Temporal Positions	0020,0105	3
Temporal Resolution	0020,0110	3

1.8.4 SC Storage IOD

Table C.8.6.1 -- SC Image Equipment Module Attributes

Attribute Name	Tag	Type
Conversion Type	0008,0064	1
Modality	0008,0060	3
Secondary Capture Device ID	0018,1010	3
Secondary Capture Device Manufacturer	0018,1016	3
Secondary Capture Device Manufacturer's Model Name	0018,1018	3
Secondary Capture Device Software Version	0018,1019	3
Video Image Format Acquired	0018,1022	3
Digital Image Format Acquired	0018,1023	3

Table C.8.6.2 -- SC Image Module Attributes

Attribute Name	Tag	Type
Date of Secondary Capture	0018,1012	3
Time of Secondary Capture	0018,1014	3

1.9 Appendix B

This Appendix describes the coercion, validity checks and import behaviour performed on Information Objects being imported via *dcserver*.

1.9.1 Validity Checks

- Invalid or missing orientation vector values (0x00200037) results in rejection of MR and CT Information Objects.
- A missing Photo Interpretation attribute (0x00280004) results in rejection of any modality Information Object.
- Missing Bits Allocated, Bits Used and High Bit attributes result in rejection of any modality Information Object.
- Photo Interpretation values (0x00280004) other than MONOCHROME1, MONOCHROME2, PALETTE COLOR or RGB are rejected.

1.9.2 Coercion

- Patient orientation value (0x00200020) is coerced based on the orientation vector value (0x00200037) for CT and MR Information Objects.
- Palette and RGB colour images are converted to greyscale.
- If Pixel Padding Value (0x00280120) is present, the pixel values are adjusted accordingly.
- Image position (0x00200032) and Image orientation (0x00200037) are set to zero for Curved Reformat images.

1.9.3 Import Behaviour

The Optima MR430s software performs some basic organization on imported images prior to database insertion. In most cases this should match the intended organization of the image hierarchy, however under some conditions the presentation on the Optima MR430s and the presentation on external workstations may differ. Further, the presentation within the Optima MR430s may not match the DICOM hierarchy. Thus, DICOM Q/R operations may return a hierarchy which does neither matches the hierarchy presented in the Optima MR430s DICOM user interface nor matches the Optima MR430s patient selection window.

The Optima MR430s will organize objects based on certain DICOM tags. There are three possible configurations to control the insertion behaviour of User Interface Software/*dcserver*. The insertion criterion presented in the following sections 1.9.3.1, 1.9.3.2 and 1.9.3.3 represents the default insertion behaviour. Section 1.9.3.4 represents a less restrictive insertion criterion. Section 1.9.3.5 represents the least restrictive insertion criterion that most closely matches the DICOM hierarchy representation.

1.9.3.1 Import Behaviour (historic) for CT modality images:

Attribute Level	Attribute Name	DICOM tag
Patient	Patient Name	0010,0010
Patient	Patient Id	0010,0020
Study	StudyUID	0020,000D
Series	SeriesUID	0020,000E
Series	ModalityStr	0008,0060
Series	Body Part	0018,0015
Series	FrameUID	0020,0052
Series	Manufacturer	0008,0070
Series	Institution	0008,0080
Series	Department	0008,1040
Series	Series Number	0020,0011
Series	Contrast Agent	0018,0010
Series	Image Type	0008,0008
Image	SOPInstanceUID	0008,0018
Image	Image Number	0020,0013

1.9.3.2 Import Behaviour (historic) for MR modality images:

Attribute Level	Attribute Name	DICOM tag
Patient	Patient Name	0010,0010
Patient	Patient Id	0010,0020
Study	StudyUID	0020,000D
Series	SeriesUID	0020,000E
Series	ModalityStr	0008,0060
Series	Body Part	0018,0015
Series	FrameUID	0020,0052
Series	Manufacturer	0008,0070
Series	Institution	0008,0080
Series	Department	0008,1040
Series	Series Number	0020,0011
Series	Contrast Agent	0018,0010
Series	Image Type	0008,0008
Series	Repetition Time	0018,0080
Series	Echo Time	0018,0081
Series	Inversion Time	0018,0082
Series	Number of Averages	0018,0083
Series	Image Frequency	0018,0084
Series	Imaged Nucleus	0018,0085
Series	Scanning Sequence	0018,0020
Series	Sequence Variant	0018,0021
Series	Scan Options	0018,0022
Series	Flip Angle	0018,1314
Image	SOPInstanceUID	0008,0018

Image	Image Number	0020,0013
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1.9.3.3 Import Behaviour (historic) for SC modality images:

Attribute Level	Attribute Name	DICOM tag
Patient	Patient Name	0010,0010
Patient	Patient Id	0010,0020
Study	StudyUID	0020,000D
Series	SeriesUID	0020,000E
Series	ModalityStr	0008,0060
Series	Body Part	0018,0015
Series	FrameUID	0020,0052
Series	Manufacturer	0008,0070
Series	Institution	0008,0080
Series	Department	0008,1040
Series	Series Number	0020,0011
Series	Contrast Agent	0018,0010
Series	Image Type	0008,0008
Series	Conversion Type	0008,0064
Series	Secondary Capture Device ID	0018,1010
Series	Secondary Capture Device Manufacturer	0018,1016
Series	Secondary Capture Device Manufacturer's Model Name	0018,1018
Series	Secondary Capture Device Software Version	0018,1019
Series	Video Image Format Acquired	0018,1022
Series	Digital Image Format Acquired	0018,1023

Image	SOPInstanceUID	0008,0018
Image	Image Number	0020,0013

1.9.3.4 Less restrictive (mild) Import Behaviour for all modality images:

Attribute Level	Attribute Name	DICOM tag
Patient	Patient Name	0010,0010
Patient	Patient Id	0010,0020
Study	StudyUID	0020,000D
Series	SeriesUID	0020,000E
Series	ModalityStr	0008,0060
Series	FrameUID	0020,0052
Series	Image Type	0008,0008
Image	SOPInstanceUID	0008,0018
Image	Image Number	0020,0013

1.9.3.5 Least restrictive (pure) Import Behaviour for all modality images:

Attribute Level	Attribute Name	DICOM tag
Patient	Patient Name	0010,0010
Patient	Patient Id	0010,0020
Study	StudyUID	0020,000D
Series	SeriesUID	0020,000E
Series	ModalityStr	0008,0060
Series	FrameUID	0020,0052
Image	SOPInstanceUID	0008,0018

1.10 Appendix C Private Data Elements

Below is a listing of private data elements used in this implementation for MR Image IOD definition. This is a full list of all defined private elements.

Attribute Name	DICOM tag	VR	VM
Number of Echoes	0029,5001	UN	1
Scan Duration	0029,5002	UN	1
Scan Parameters	0029,5003	UN	1

2 DICOM Printing

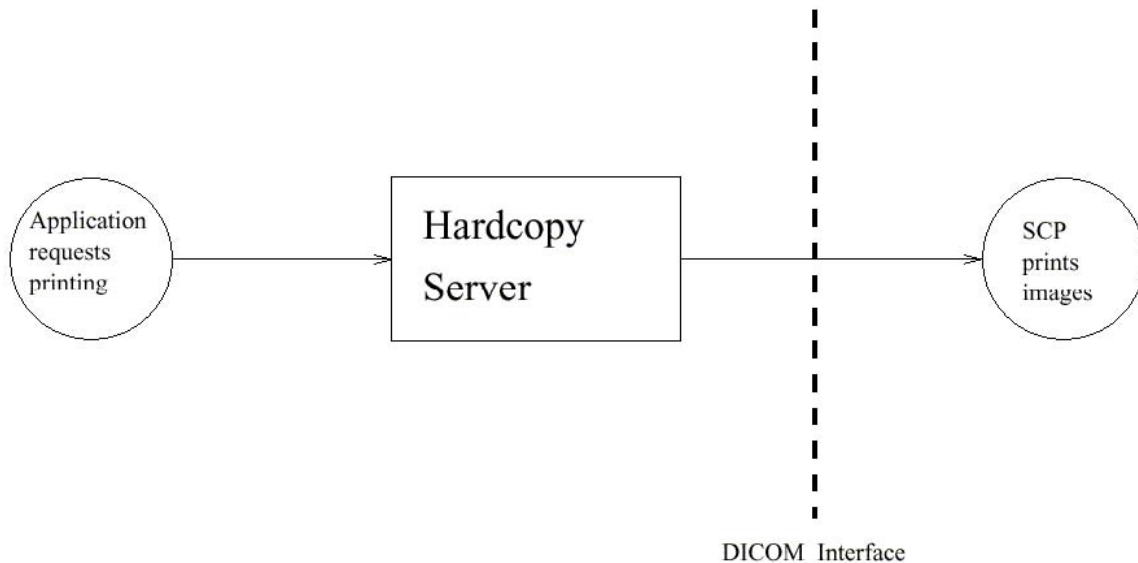
2.1 Introduction

The Optima MR430s Hardcopy Server (*hcserver*) supports printing to DICOM Print Management SCP. The *hcserver* acts as an SCU of the DICOM print management SOP classes. It uses a configuration file for specifying the behaviour specific to different DICOM SCPs.

2.2 Implementation Model

2.2.1 Application Data Flow Diagram

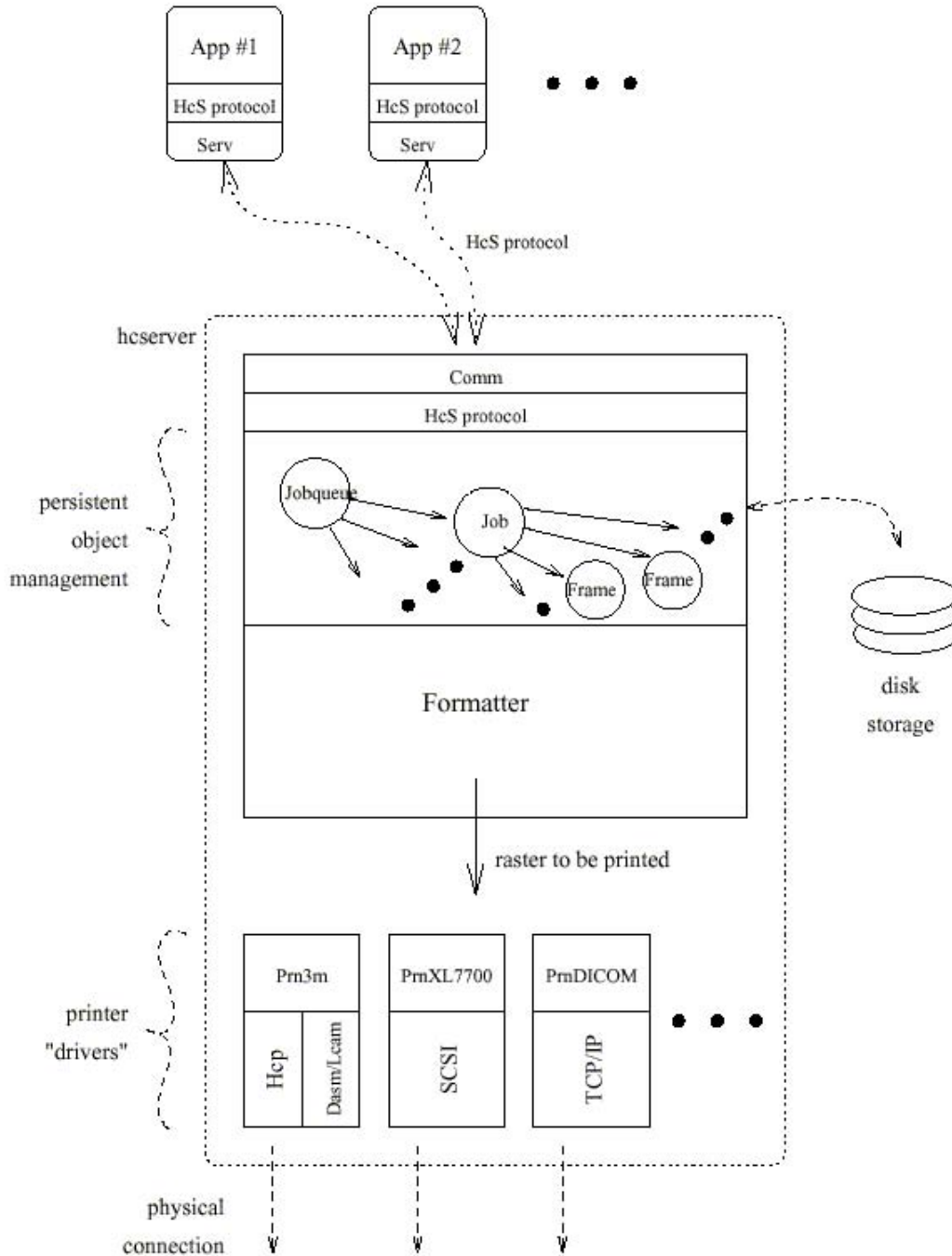
The relationship of the *hcserver* use of DICOM to real world activities is presented in the following diagram.



The application using the Hardcopy Server requests printing to a print device. The Hardcopy Server initiates an association with a DICOM print SCP for the purpose of printing the job requested by the application. The Hardcopy Server can handle simultaneous associations with a number of DICOM print SCPs.

2.2.2 Functional Definition of Application Entities

The model of the *hcserver* is presented in the following diagram.



Multiple client applications are connected to an instance of the Hardcopy server. Each connection can be made locally, if both the client and the server are executing on the same machine, or remotely, when the client and the server are running on different machines connected via networking.

The Hardcopy server consists of a Comm layer, which handles the communications, and a layer for interpreting the HcS command and data protocol. Commands and data result in various objects being created:

Jobqueue

A jobqueue in the model of IAP Hardcopy server consists of several jobs, queued in priority and FIFO order. This permits pre-emptive printing of high priority jobs, if desired.

Job

A job is composed of several frames, each of which defines a physical region of a film and the contents thereof. A job has an associated set of formatting commands, which specify such details as film layout, number of copies, choice of printer, and other parameters that pertain to the entire job.

Frame

A frame is a set of formatting commands, such as commands to display an image with overlay text and graphics, the location of the image on the film, and other relevant information required for printing images onto films.

When a job appears at the front of a queue, the Formatter will prepare the job prior to sending it to the printer. Image viewing transformations are applied, contrast and brightness adjustment are performed, and text and graphics overlays are added. A formatted image is passed to the appropriate printer driver, which handles the physical link to the printer, the data communication between the host computer and the printer, and the processing of status and error messages from the printer.

For printing to a DICOM print server, a DICOM print SCU driver is provided. Multiple instances of DICOM print SCU driver can co-exist, and each instance handles the association with one DICOM print server.

2.2.3 Sequencing of Real-World Activities

N/A.

2.3 Application Entity (AE) Specifications

The *hcserver* represents a single Application Entity. It acts independently of other DICOM applications that may be running on the same system. The *hcserver* can support printing to multiple DICOM printers at the same time, each printer being uniquely identified by an Application Entity Title.

2.3.1 AE Print User - Specification

The *hcserver* provides Standard Conformance to the following DICOM 3.0 SOP Classes as an SCU:

SOP Class Name	SOP Class UID
Basic Grayscale Print Management Meta SOP Class	1.2.840.10008.5.1.1.9
Basic Color Print Management Meta SOP Class	1.2.840.10008.5.1.1.18
Presentation LUT SOP Class	1.2.840.10008.5.1.1.23

2.3.1.1 Association Establishment Policies

2.3.1.1.1 General

The *hcserver* maintains a separate association with each DICOM SCP. It releases the association with DICOM SCP if no operation is done on the association in a selected time period.

2.3.1.1.2 Number of Associations

There is no limit on the number of associations maintained simultaneously with one or different DICOM SCPs.

2.3.1.1.3 Asynchronous Nature

The *hcserver* does not support asynchronous operations and will not perform asynchronous window negotiation.

2.3.1.1.4 Implementation Identifying Information

The *hcserver* implementation class UID is 2.16.124.113531.1.3.1, the implementation version name is ISG_HCS_V1.0.96.

2.3.1.2 Association Initiation Policy

The *hcserver* maintains a list of valid print servers and can present that list to the applications upon request. When the application submits a print job designated for a listed print server to the *hcserver*, the *hcserver* will request an association with the selected print server.

2.3.1.2.1 Printing encoded with Implicit or Explicit VR

The application's print request causes the *hcserver* to initiate an Association. The *hcserver* will propose one of the presentation contexts listed in the Presentation Context Table.

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name	UID		
Basic GrayScale Print Management	1.2.840.10008.5.1.1.9	DICOM Implicit VR Little Endian Transfer Syntax	1.2.840.10008.1.2	SCU	None
Basic GrayScale Print Management	1.2.840.10008.5.1.1.9	DICOM Little Endian Transfer Syntax (Explicit VR)	1.2.840.10008.1.2.1	SCU	None
Basic GrayScale Print Management	1.2.840.10008.5.1.1.9	DICOM Big Endian Transfer Syntax (Explicit VR)	1.2.840.10008.1.2.2	SCU	None
Basic Color Print Management	1.2.840.10008.5.1.1.18	DICOM Implicit VR Little Endian Transfer Syntax	1.2.840.10008.1.2	SCU	None
Basic Color Print Management	1.2.840.10008.5.1.1.9	DICOM Little Endian Transfer Syntax (Explicit VR)	1.2.840.10008.1.2.1	SCU	None
Basic Color Print Management	1.2.840.10008.5.1.1.9	DICOM Big Endian Transfer Syntax (Explicit VR)	1.2.840.10008.1.2.2	SCU	None
Presentation LUT	1.2.840.10008.5.1.1.23	DICOM Little Endian Transfer Syntax (Explicit VR)	1.2.840.10008.1.2.1	SCU	None
Presentation LUT	1.2.840.10008.5.1.1.23	DICOM Big Endian Transfer Syntax (Explicit VR)	1.2.840.10008.1.2.2	SCU	None

2.3.1.2.2 SOP Specific Conformance to Basic Grayscale Print Management Meta SOP Class

The *hcserver* supports the following mandatory SOP classes which are defined under the Basic Grayscale Print Management Meta SOP Class:

Name	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 *hcserver* supports the following SOP class attributes and DIMSE services for the Basic Grayscale Print Management Meta SOP Class.

SOP Class	DIMSE Service	Attribute	Tag
Basic Film Session SOP Class	N-CREATE	Number of Copies	(2000,0010)
		Print Priority	(2000,0020)
		Medium Type	(2000,0030)
		Film Destination	(2000,0040)
		Film Session Label	(2000,0050)
		Memory Allocation	(2000,0060)
Basic Film Box SOP Class	N-CREATE	Image Display Format	(2010,0010)
		Referenced Film Session Sequence	(2010,0500)
		>Referenced SOP Class UID	(0008,1150)
		>Referenced SOP Instance UID	(0008,1155)
		Referenced Presentation LUT Sequence	(2050,0500)
		>Referenced SOP Class UID	(0008,1150)
		>Referenced SOP Instance UID	(0008,1155)

		Film Orientation	(2010,0040)
		Film Size ID	(2010,0050)
		Magnification Type	(2010,0060)
		Max Density	(2010,0130)
		Configuration Information	(2010,0150)
		Smoothing Type	(2010,0080)
		Border Density	(2010,0100)
		Empty Image Density	(2010,0110)
		Min Density	(2010,0120)
		Trim	(2010,0140)
		Illumination	(2010,015E)
		Reflected Ambient Light	(2010,0160)
	N-ACTION		
	N-DELETE		
Basic Grayscale Image Box SOP Class	N-SET	Image Position	(2020,0010)
		Polarity	(2020,0020)
		Magnification Type	(2010,0060)
		Smoothing Type	(2010,0080)
		Requested Image Size	(2010,0080)
		Basic Grayscale Image Sequence	(2020,0110)
		>Samples Per Pixel	(0028,0002)
		>Photometric Interpretation	(0028,0004)
		>Rows	(0028,0010)
		>Columns	(0028,0011)
		>Pixel Aspect Ratio	(0028,0034)
		>Bits Allocated	(0028,0100)
		>Bits Stored	(0028,0101)

		>High Bit	(0028,0102)
		>Pixel Representation	(0028,0103)
		>Pixel Data	(7FE0,0010)
Printer SOP Class	N- EVENTREPORT	Printer Status Info	(2110,0020)
	N-GET	Printer Status	(2110,0010)
		Printer Status Info	(2110,0020)
		Printer Name	(2110,0030)
		Manufacturer	(0008,0070)
		Manufacturer Model Name	(0008,1090)
		Device Serial Number	(0018,1000)
		Software Versions	(0018,1020)

2.3.1.2.2.1 Basic Film Session SOP Class (1.2.840.10008.5.1.1.1) attributes

The *hcserver* supports the following mandatory and optional attribute values in this SOP class:

Attribute Name	Tag	Supported values
Number of Copies	(2000,0010)	Integer String
Print Priority	(2000,0020)	HIGH, MED, LOW
Medium Type	(2000,0030)	PAPER, CLEAR FILM, BLUE FILM
Film Destination	(2000,0040)	MAGAZINE, PROCESSOR
Film Session Label	(2000,0050)	Long String
Memory Allocation	(2000,0060)	IntegerString

2.3.1.2.2.2 Basic Film Box SOP Class (1.2.840.10008.5.1.1.2) attributes

The *hcserver* supports the following mandatory and optional attribute values in this SOP class:

Attribute Name	Tag	Supported values
Image Display Format	(2010,0010)	STANDARD, ROW, COL, SLIDE, SUPERSLIDE, CUSTOM
Referenced Film Session Sequence	(2010,0500)	Sequence of Items
>Referenced SOP Class UID	(0008,1150)	Unique Identifier (UID)
>Referenced SOP Instance UID	(0008,1155)	Unique Identifier (UID)
Referenced Presentation LUT Sequence	(2050,0500)	Sequence of Items
>Referenced SOP Class UID	(0008,1150)	Unique Identifier (UID)
>Referenced SOP Instance UID	(0008,1155)	Unique Identifier (UID)
Film Orientation	(2010,0040)	PORTRAIT, LANDSCAPE
Film Size ID	(2010,0050)	8INX10IN, 10INX14IN, 14INX14IN, 24CMX24CM, 10INX12IN, 11INX14IN, 14INX17IN, 24CMX30CM
Magnification Type	(2010,0060)	REPLICATE, BILINEAR, CUBIC, NONE
Smoothing Type	(2010,0080)	SCP specific
Border Density	(2010,0100)	BLACK, WHITE, where represents the desired density in hundredths of OD
Empty Image Density	(2010,0110)	BLACK, WHITE, where represents the desired density in hundredths of OD
Min Density	(2010,0120)	Unsigned Short
Max Density	(2010,0130)	Unsigned Short
Trim	(2010,0140)	YES, NO
Configuration Information	(2010,0150)	SCP specific
Illumination	(2010,015E)	Unsigned Short
Reflected Ambient Light	(2010,0160)	Unsigned Short

2.3.1.2.2.3 Basic Grayscale Image Box SOP Class (1.2.840.10008.5.1.1.4) attributes

The *hcserver* supports the following mandatory and optional attributes in this SOP class:

Attribute Name	Tag	Supported values
Image Position	(2020,0010)	Unsigned Short
Polarity	(2020,0020)	NORMAL, REVERSE
Magnification Type	(2010,0060)	REPLICATE, BILINEAR, CUBIC, NONE
Smoothing Type	(2010,0080)	SCP specific
Requested Image Size	(2020,0030)	Unsigned Short
Preformatted Grayscale Image Sequence	(2020,0110)	Sequence of Items
>Samples Per Pixel	(0028,0002)	1
>Photometric Interpretation	(0028,0004)	MONOCHROME1, MONOCHROME2
>Rows	(0028,0010)	Unsigned Short
>Columns	(0028,0011)	Unsigned Short
>Pixel Aspect Ratio	(0028,0034)	1/1
>Bits Allocated	(0028,0100)	8
>Bits Stored	(0028,0101)	8
>High Bit	(0028,0102)	7
>Pixel Representation	(0028,0103)	0000H (unsigned integer)
>Pixel Data	(7FE0,0010)	Other Byte String

2.3.1.2.2.4 Printer SOP Class (1.2.840.10008.5.1.1.16) attributes.

The *hcserver* makes use of the following attributes and attribute values in this SOP class:

Attribute Name	Tag	Supported values
Printer Status	(2110,0010)	NORMAL, WARNING, FAILURE
Printer Status Info	(2110,0020)	Long String (Configurable, See Note.)
Printer Name	(2110,0030)	Long String
Manufacturer	(0008,0070)	Long String
Manufacturer Model Name	(0008,1090)	Long String
Device Serial Number	(0018,1000)	Long String
Software Versions	(0018,1020)	Long String(s)

Note: The *hcserver* SCU configuration supports mapping of this attribute to internal *hcserver* printer status codes. For more details please refer to the PrnDICOM man page.\s+2

2.3.1.2.3 SOP Specific Conformance to Basic Color Print Management Meta SOP Class

The *hcserver* supports the following mandatory SOP classes which are defined under the Basic Color Print Management Meta SOP Class.

Name	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 Color Image Box SOP Class	1.2.840.10008.5.1.1.4.1
Printer SOP Class	1.2.840.10008.5.1.1.16

The SOP class attributes and DIMSE services for the Basic Film Session, and Basic Film Box are listed in the SOP Specific Conformance section for the Basic Grayscale Print Management Meta SOP Class. The *hcserver* supports the following SOP class attributes and DIMSE services for the Basic Color Image Box SOP Class.

SOP Class	DISME Service	Attribute	Tag
Basic Color Image Box SOP Class	N-SET	Image Position	(2020,0010)
		Polarity	(2020,0020)
		Magnification Type	(2010,0060)
		Smoothing Type	(2010,0080)
		Requested Image Size	(2020,0030)
		Preformatted Color Image Sequence	(2020,0111)
		>Samples Per Pixel	(0028,0002)
		>Photometric Interpretation	(0028,0004)
		>Planar Configuration	(0028,0006)
		>Rows	(0028,0010)
		>Columns	(0028,0011)
		>Pixel Aspect Ratio	(0028,0030)
		>Bits Allocated	(0028,0100)
		>Bits Stored	(0028,0101)
		>High Bit	(0028,0102)
		>Pixel Representation	(0028,0103)
>Pixel Data	(7FE0,0010)		

2.3.1.2.3.1 Basic Color Image Box SOP Class (1.2.840.10008.5.1.1.4.1) attributes

The *hcserver* supports the following attributes in this SOP class:

Image Position	(2020,0010)	Unsigned Short
Polarity	(2020,0020)	NORMAL, REVERSE
Magnification Type	(2010,0060)	REPLICATE, BILINEAR, CUBIC, NONE

Smoothing Type	(2010,0080)	SCP specific
Requested Image Size	(2020,0030)	Unsigned Short
Preformatted Color Image Sequence	(2020,0111)	Sequence of Items
>Samples Per Pixel	(0028,0002)	3
>Photometric Interpretation	(0028,0004)	RGB
>Planar Configuration	(0028,0006)	0001 (Unsigned Short)
>Rows	(0028,0010)	Unsigned Short
>Columns	(0028,0011)	Unsigned Short
>Pixel Aspect Ratio	(0028,0034)	1/1
>Bits Allocated	(0028,0100)	8
>Bits Stored	(0028,0101)	8
>High Bit	(0028,0102)	7
>Pixel Representation	(0028,0103)	0000H (Unsigned Integer)
>Pixel Data	(7FE0,0010)	Other Byte String

2.3.1.2.4 SOP Specific Conformance to Presentation LUT SOP Class

The *hcserver* supports the following SOP class attributes and DIMSE services for the Presentation LUT SOP Class.

SOP Class	DIMSE Service	Attribute	Tag
Basic Presentation LUT SOP Class	N-CREATE	Presentation LUT Sequence	(2050,0010)
		>LUT Descriptor	(0028,3002)
		>LUT Explanation	(0028,3003)
		>LUT Data	(0028,3006)
		Presentation LUT Shape	(2050,0020)
	N-DELETE		

The *hcserver* supports the following attributes in this SOP class:

Presentation LUT Sequence	(2050,0010)	Sequence of Items
>LUT Descriptor	(0028,3002)	Unsigned Short
>LUT Explanation	(0028,3003)	Long String
>LUT Data	(0028,3006)	Unsigned Short
Presentation LUT Shape	(2050,0020)	Code String

2.3.1.3 Association Acceptance Policy

The *hcserver* does not accept associations.

2.4 Communication Profiles

2.4.1 TCP/IP Stack

The *hcserver* provides DICOM V3.0 TCP/IP Network Communication Support as defined in Part 8 of the DICOM Standard.

2.4.1.1 TCP/IP API

The *hcserver* uses the TCP/IP stack upon which it executes.

2.4.1.2 Physical Media Support

The *hcserver* is indifferent to the physical medium over which TCP/IP executes.

2.5 Extensions/Specifications/Privatisations

N/A.

2.6 Configuration

The *hcserver* configuration is loaded into the running server.

2.6.1 AE Title/ Presentation Address Mapping

A DICOM print server is identified by a "printer name" with associated parameters such as AE title, host name and port number. The IP address corresponding to a given host name is determined using the name lookup database mechanisms provided on the hosting platform.

2.6.2 Definition of Target Print Servers

The list of target print servers is loaded into the running *hcserver*.

2.6.3 Configurable Parameters

The HCdefaults file specifies the configuration parameters for *hcserver*. The following parameters may be configured for the *hcserver*:

Communication Related Options

- Association Timeout
- SCP Application Entity title
- SCU Application Entity Title (Default ISG_PRINT_SCU)
- Explicit Transfer Syntax
- SCP Application Entity Port Number (Default 104)
- SCP Application Entity IP Address
- PDU Size

Basic Film Session SOP Class options

- Print Priority
- Medium Type
- Film Destination
- Film Session Label
- Memory Allocation

Basic Film Box SOP Class options

- Film Orientation
- Film Size ID
- Magnification Type
- Max Density
- Configuration Information
- Border Density
- Empty Image Density
- Min Density
- Smoothing Type
- Trim

Basic Grayscale Image Box SOP Class options

- Polarity
 - Photometric Interpretation
 - Magnification Type
 - Smoothing Type
 - Pixel Aspect Ratio
 - Requested Image Size
- Basic Color Image Box SOP Class options
- Polarity
 - Photometric Interpretation
 - Magnification Type
 - Smoothing Type
 - Pixel Aspect Ratio
 - Requested Image Size

2.6.4 Support of Extended Character Sets

The *hcserver* provides no support for extended character sets in the communication with DICOM SCPs.

3 DICOM Worklist

3.1 Introduction

3.1.1 Scope

This is the DICOM Conformance Statement for Optima MR430s DICOM Worklist Application that uses the Modality Worklist Component.

Throughout the remainder of this document the term "application" will be used to refer to DICOM Worklist Application that uses the Modality Worklist Component.

The application that uses the Modality Worklist Component:

- Acts as a Modality Worklist Service Class User Application Entity.
- Is able to retrieve a Modality Worklist from a Modality Worklist Service Class Provider.

This document was prepared using the guidelines presented in ACR/NEMA Standards Publications, No. PS3, Part 2, Annex B.

The reader should be familiar with the DICOM Standard. In particular, the reader should be familiar with the Basic Worklist Management Service, No. PS3, Part 4, Annex K.

3.1.2 References

[1] ACR/NEMA Standards Publications, No. PS3 1998.

3.1.3 Definitions

Symbol	Meaning
N/A	Not applicable

Table 3-1: Definitions

3.1.4 Acronyms and Abbreviations

Symbol	Meaning
AE	Application Entity
PS 3.<n>	DICOM Standard Version 3.0, part <n>
SCU	Service Class User
SCP	Service Class Provider
UID	Unique Identifier

Table 3-2: Acronyms and Abbreviations

3.2 Implementation Model

The application uses the API of the Modality Worklist Component to retrieve a Modality Worklist from a Modality Worklist SCP. The Modality Worklist Component implements the Basic Worklist Management Service, No. PS3, Part 4, Annex K. In particular, the application:

1. Must provide the AE Title of the Modality Worklist SCU to the Modality Worklist Component.
2. Must provide the AE Title of the Modality Worklist SCP to the Modality Worklist Component.
3. Must provide the IP Address of the Modality Worklist SCP to the Modality Worklist Component.

4. Must provide the port number of the Modality Worklist SCP to the Modality Worklist Component.
5. Provides all or a subset of the following Required/Optional Matching Key Attributes, to the Modality Worklist Component.

ATTRIBUTE NAME	TAG	MATCHING KEY TYPE
1. Scheduled Station AE Title	0x0040,0x0001	Optional
2. Scheduled Procedure Step Start Date	0x0040,0x0002	Required
3. Modality	0x0008,0x0060	Required
4. Patient ID	0x0010,0x0020	Optional
5. Accession Number	0x0008,0x0050	Optional
6. Requested Procedure ID	0x0040,0x1001	Optional

Table 3-3: Required/Optional Matching Key Attributes

6. Issues a request to the Modality Worklist Component, to retrieve a Modality Worklist from the Modality Worklist SCP; the Modality Worklist Component:
 1. Initiates an association to the Modality Worklist SCP, using the Modality Worklist SCU AE Title, Modality Worklist SCP AE Title, Modality Worklist SCP IP Address, and Modality Worklist SCP port number, provided earlier by the application.
 2. Sends a C-FIND request to the Modality Worklist SCP to retrieve a Modality Worklist. The Identifier, that is included in the C-FIND Request, contains the Required/Optional Matching Key Attributes that the application provided earlier. The Identifier also contains the remaining attributes of the Modality Worklist Information Model, as defined in the Basic Worklist Management Service, No. PS3, Part 4, Annex K, Table K.6-1.
 3. Receives and stores the pending C-FIND responses. One pending C-FIND response corresponds to one Modality Worklist item. After the last C-FIND response has been received the Modality Worklist Component releases the previously established association. The Modality Worklist Component notifies the application about the completion of the retrieval of the Modality Worklist.
7. Accesses the Modality Worklist, after the Modality Worklist Component has retrieved the Modality Worklist from the Modality Worklist SCP. The application accesses a subset of the Modality Worklist. Moreover, the application accesses a subset of the attributes of a single Modality Worklist item, as defined in the Modality Worklist Information Model, see the Basic Worklist Management Service, No. PS3, Part 4, Annex K, Table K.6-1, for more details. See also the following table (“Attribute Name”, “Tag”, and “Type” are as defined by NEMA; “Implemented” describes those “Attributes” accessed by the application.

ATTRIBUTE NAME	TAG	TYPE	IMPLEMENTED
1. Specific Character Set	0x0008,0x0005	1C	SPECIAL
2. Scheduled Procedure Step Sequence	0x0040,0x0100	1	NO
1. Scheduled Station AE Title	0x0040,0x0001	1	Table 3.3
2. Scheduled Procedure Step Start Date	0x0040,0x0002	1	Table 3.3
3. Scheduled Procedure Step Start Time	0x0040,0x0003	1	NO
4. Scheduled Procedure Step End Date	0x0040,0x0004	3	NO
5. Scheduled Procedure Step End Time	0x0040,0x0005	3	NO
6. Modality	0x0008,0x0060	1	Table 3.3
7. Scheduled Performing Physician Name	0x0040,0x0006	2	YES
8. Scheduled Procedure Step Description	0x0040,0x0007	1C	NO
9. Scheduled Station Name	0x0040,0x0010	2	NO
10. Scheduled Procedure Step Location	0x0040,0x0011	2	NO
11. Scheduled Action Item Code Sequence	0x0040,0x0008	1C	NO
1. Code Value	0x0008,0x0100	1C	NO
2. Coding Scheme Designator	0x0008,0x0102	1C	NO
3. Code Scheme Version	0x0008,0x0103	3	NO
4. Code Meaning	0x0008,0x0104	3	NO

ATTRIBUTE NAME	TAG	TYPE	IMPLEMENTED
12. Pre-Medication	0x0040,0x0012	2C	NO
13. Scheduled Procedure Step ID	0x0040,0x0009	1	NO
14. Requested Contrast Agent	0x0032,0x1070	2C	NO
15. Scheduled Procedure Step Status	0x0040,0x0020	3	NO
16. Comments on the Scheduled Procedure Step	0x0040,0x0400	3	NO
3. Requested Procedure ID	0x0040,0x1001	1	YES
4. Requested Procedure Description	0x0032,0x1060	1C	NO
5. Requested Procedure Code Sequence	0x0032,0x1064	1C	NO
1. Code Value	0x0008,0x0100	1C	NO
2. Coding Scheme Designator	0x0008,0x0102	1C	NO
3. Code Meaning	0x0008,0x0104	3	NO
6. Study Instance UID	0x0020,0x000D	1	YES
7. Referenced Study Sequence	0x0008,0x1110	2	NO
1. Referenced SOP Class UID	0x0008,0x1150	1C	NO
2. Referenced SOP Instance UID	0x0008,0x1155	1C	NO
8. Requested Procedure Priority	0x0040,0x1003	2	NO
9. Patient Transport Arrangements	0x0040,0x1004	2	NO
10. Reason For Requested Procedure	0x0040,0x1002	3	NO
11. Requested Procedure Comments	0x0040,0x1400	3	NO
12. Requested Procedure Location	0x0040,0x1005	3	NO
13. Confidentiality Code	0x0040,0x1008	3	NO
14. Reporting Priority	0x0040,0x1009	3	NO
15. Names of Intended Recipients of Results	0x0040,0x1010	3	NO
16. Accession Number	0x0008,0x0050	2	YES
17. Requesting Physician	0x0032,0x1032	2	NO
18. Reason for the Imaging Service Request	0x0040,0x2001	3	NO
19. Imaging Service Request Comments	0x0040,0x2400	3	NO
20. Requesting Service	0x0032,0x1033	3	NO
21. Issuing Date of Imaging Service Request	0x0040,0x2004	3	NO
22. Issuing Time of Imaging Service Request	0x0040,0x2005	3	NO
23. Placer Order Number / Imaging Service Request	0x0040,0x2016	3	NO
24. Filler Order Number / Imaging Service Request	0x0040,0x2017	3	NO
25. Order Entered By ...	0x0040,0x2008	3	NO
26. Order Enterer's Location	0x0040,0x2009	3	NO
27. Order Callback Phone Number	0x0040,0x2010	3	NO
28. Admission ID	0x0038,0x0010	2	NO
29. Issuer of Admission ID	0x0038,0x0011	3	NO
30. Institution Name	0x0008,0x0080	3	NO
31. Institution Address	0x0008,0x0081	3	NO
32. Institution Code Sequence	0x0008,0x0082	3	NO
1. Code Value	0x0008,0x0100	3	NO
2. Coding Scheme Designator	0x0008,0x0102	3	NO
3. Code Meaning	0x0008,0x0104	3	NO
33. Current Patient Location	0x0038,0x0300	2	NO
34. Visit Status ID	0x0038,0x0008	3	NO
35. Patient's Institution Residence	0x0038,0x0400	3	NO
36. Visit Comments	0x0038,0x4000	3	NO
37. Referenced Patient Sequence	0x0008,0x1120	2	NO
1. Referenced SOP Class UID	0x0008,0x1150	2	NO
2. Referenced SOP Instance UID	0x0008,0x1155	2	NO

ATTRIBUTE NAME	TAG	TYPE	IMPLEMENTED
38. Referring Physician's Name	0x0008,0x0090	3	YES
39. Referring Physician's Address	0x0008,0x0092	3	NO
40. Referring Physician's Phone Numbers	0x0008,0x0094	3	NO
41. Admitting Diagnosis Description	0x0008,0x1080	3	NO
42. Admitting Diagnosis Code Sequence	0x0008,0x1084	3	NO
1. Code Value	0x0008,0x0100	3	NO
2. Coding Scheme Designator D	0x0008,0x0102	3	NO
3. Code Meaning	0x0008,0x0104	3	NO
43. Route of Admissions	0x0038,0x0016	3	NO
44. Admitting Date	0x0038,0x0020	3	NO
45. Admitting Time	0x0038,0x0021	3	NO
46. Referenced Visit Sequence	0x0008,0x1125	3	NO
1. Referenced SOP Class UID	0x0008,0x1150	3	NO
2. Referenced SOP Instance UID	0x0008,0x1155	3	NO
47. Referenced Patient Alias Sequence	0x0038,0x0004	3	NO
1. Referenced SOP Class UID	0x0008,0x1150	3	NO
2. Referenced SOP Instance UID	0x0008,0x1155	3	NO
48. Patient Name	0x0010,0x0010	1	YES
49. Patient ID	0x0010,0x0020	1	YES
50. Issuer of Patient ID	0x0010,0x0021	3	NO
51. Other Patient IDs	0x0010,0x1000	3	NO
52. Other Patient Names	0x0010,0x1001	3	NO
53. Patient's Birth Name	0x0010,0x1005	3	NO
54. Patient's Mother's Birth Name	0x0010,0x1060	3	NO
55. Medical Record Locator	0x0010,0x1090	3	NO
56. Patient's Birth Date	0x0010,0x0030	2	YES
57. Patient's Sex	0x0010,0x0040	2	YES
58. Patient's Weight	0x0010,0x1030	2	YES
59. Confidentiality Constraint on Patient Data	0x0040,0x3001	2	NO
60. Patient's Age	0x0010,0x1010	3	YES
61. Patient's Occupation	0x0010,0x2180	3	NO
62. Patient's Birth Time	0x0010,0x0032	3	NO
63. Patient's Insurance Plan Code Sequence	0x0010,0x0050	3	NO
1. Code Value	0x0008,0x0100	3	NO
2. Coding Scheme Designator	0x0008,0x0102	3	NO
3. Code Meaning	0x0008,0x0104	3	NO
64. Patient's Size	0x0010,0x1020	3	NO
65. Patient's Address	0x0010,0x1040	3	NO
66. Military Rank	0x0010,0x1080	3	NO
67. Branch of Service	0x0010,0x1081	3	NO
68. Country of Residence	0x0010,0x2150	3	NO
69. Region of Residence	0x0010,0x2152	3	NO
70. Patient's Telephone Numbers	0x0010,0x2154	3	NO
71. Ethnic Group	0x0010,0x2160	3	NO
72. Patient's Religious Preference	0x0010,0x21F0	3	NO
73. Patient Comments	0x0010,0x4000	3	YES
74. Patient State	0x0038,0x0500	2	NO
75. Pregnancy Status	0x0010,0x21C0	2	NO
76. Medical Alerts	0x0010,0x2000	2	NO
77. Contrast Allergies	0x0010,0x2110	2	NO
78. Special Needs	0x0038,0x0050	2	NO

ATTRIBUTE NAME	TAG	TYPE	IMPLEMENTED
79. Smoking Status	0x0010,0x21A0	3	NO
80. Additional Patient History	0x0010,0x21B0	3	NO
81. Last Menstrual Date	0x0010,0x21D0	3	NO

Table 3-4: Supported Return Key Attributes

3.2.1 Application Data Flow Diagram

The following figure depicts the application data flow.

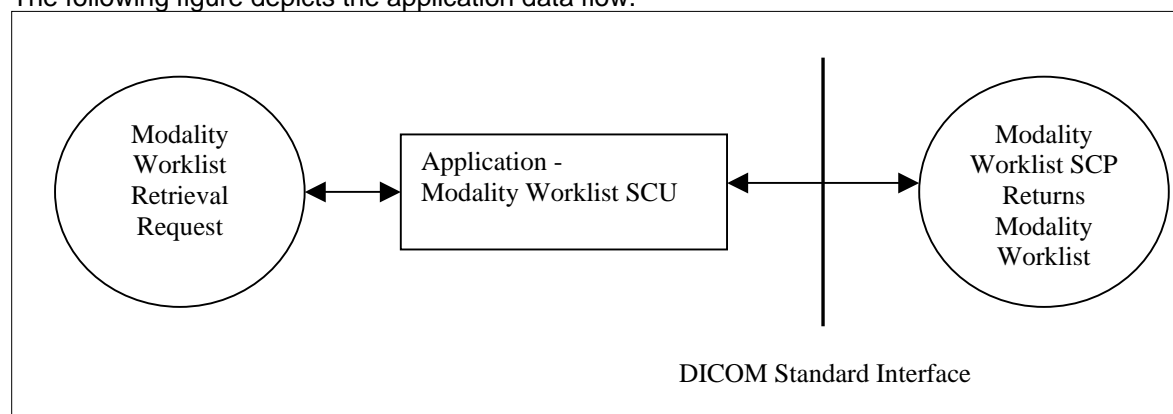


Figure 3-1: Application Data Flow

3.2.2 Functional Definition of Application Entity

The application that uses the Modality Worklist Component acts as a Modality Worklist SCU i.e. the application using the Modality Worklist Component is the Application Entity as referred to in the header of this section.

The application uses the API of the Modality Worklist Component to act as a Modality Worklist SCU in order to retrieve a Modality Worklist from a Modality Worklist SCP. In particular, the API of the Modality Worklist Component provides mechanisms to:

1. Specify the Modality Worklist SCU AE Title.
2. Specify the Modality Worklist SCP AE Title.
3. Specify the Modality Worklist SCP IP Address.
4. Specify the Modality Worklist SCP Port Number.
5. Specify the Required/Optional Matching Key Attributes.
6. Request Modality Worklist Retrieval.
7. Access Individual Items of Modality Worklist.
8. Access Individual Attributes of Modality Worklist Item.

When the application issues a request to the Modality Worklist Component to retrieve a Modality Worklist, the Modality Worklist Component initiates an Association to the Modality Worklist SCP.

When the Association has been established, the Modality Worklist Component sends a C-FIND request to the Modality Worklist SCP to retrieve a Modality Worklist.

When the Modality Worklist has been received, the Modality Worklist Component notifies the application about the availability of the Modality Worklist.

The application can access all Items of the Modality Worklist. The application can also access all attributes of all Items.

3.2.3 Sequencing of Real World Activities

N/A.

3.3 Application Entity Specification

3.3.1 SOP Class Conformance

The Modality Worklist Component is capable of providing Standard Conformance to the following DICOM V3.0 SOP Classes as SCU:

SOP Class Name	SOP Class UID
Modality Worklist Model - FIND	1.2.840.10008.5.1.4.31

Table 3-5: SOP Classes

3.3.2 Association Establishment Policies

3.3.2.1 General

When the application issues a request to the Modality Worklist Component to retrieve a Modality Worklist, the Modality Worklist Component initiates an Association to the Modality Worklist SCP. The Modality Worklist Component assumes the maximum PDU length to be 16384 bytes.

3.3.2.2 Number of Associations

The Modality Worklist Component can originate only one Association at a time. When the Modality Worklist Component has retrieved a Modality Worklist from a Modality Worklist SCP, the Modality Worklist Component releases the Association to the Modality Worklist SCP.

3.3.2.3 Asynchronous Nature

The Modality Worklist Component will allow only one pending C-FIND request on an Association. Therefore, the Modality Worklist Component will not support asynchronous operations and will not perform asynchronous window negotiation.

3.3.2.4 Implementation Identifying Information

The following items identify an application that uses the Modality Worklist Component:

Implementation Class UID: 2.16.124.113531.1.1

Implementation Version Name: DciMsg V1.0

3.3.3 Association Initiation Policy

3.3.3.1 Modality Worklist Retrieval Request

3.3.3.1.1 Associated Real-World Activity

When the application issues a request to the Modality Worklist Component to retrieve a Modality Worklist, the Modality Worklist Component initiates an Association to the Modality Worklist SCP. The following table lists the Presentation Context offered to the Modality Worklist SCP. The Modality Worklist Component does not negotiate SCU/SCP Role Selection and assumes SCU.

3.3.3.1.2 Proposed Presentation Context

Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID				
Modality Worklist Model - FIND	1.2.840.10008.5.1.4.31	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
		Explicit VR Big Endian	1.2.840.10008.1.2.2		

Table 3-6: Proposed Presentation Context

3.4 Communication Profiles

3.4.1 Supported Communication Stacks

The Modality Worklist Component provides DICOM V3.0 TCP/IP Network Communication support as defined in PS 3.8.

3.4.1.1 TCP/IP Stack

The TCP/IP stack is inherited from the platform on which the Modality Worklist Component is running.

3.4.1.1.1 API

The Modality Worklist Component implementation uses Berkeley style sockets.

3.4.1.1.2 Physical Media Support

The Modality Worklist Component is independent of the underlying physical medium of the TCP/IP network.

3.5 Extensions/Specializations/Privatizations

3.5.1 Modality Worklist SOP Class Extension

N/A

3.5.1.1 Private Matching Optional Key Attributes

N/A

3.5.1.2 Private Return Key Attributes

N/A

3.6 Configuration

N/A.

3.7 Support of Extended Character Sets

The Modality Worklist Component supports the DICOM default character repertoire, the Basic G0 Set of the International Reference Version of ISO 646:1990 (ISO-IR 6). This Basic G0 Set is identical with the common character set of ISO 8859.

4 DICOM Media Interchange

4.1 Introduction

This section of the DICOM Conformance Statement for the Optima MR430s software version 3.54 covers DICOM Media Interchange. The Removable Media Agent, from here on known as RMA, is used by the MR430s software and provides simple interface functions supporting DICOM Removable Media service.

4.1.1 Overview

The client application of RMA can obtain patient demographic information from a storage medium via RMA interface.

The client application of RMA can store a file containing s SOP instance to a storage medium.

The client application of RMA can retrieve any SOP instance from a storage medium.

4.1.2 References

[1] Digital Imaging and Communications in Medicine, DICOM V3.0, 2004. ACRNEMA.

4.1.3 Definitions

Application Profile - A Media Storage Application Profile defines a selection of choices at the various layers of the DICOM Media Storage Model which are applicable to a specific need or context in which the media interchange is intended to be performed.

DICOM File: A DICOM File is a File with a content formatted according to the requirements of this Part of the DICOM Standard. In particular such files shall contain the File Meta Information and a properly formatted Data Set.

DICOM File Format: The DICOM File Format provides a means to encapsulate in a File the Data Set representing a SOP Instance related to a DICOM Information Object.

DICOM File Service: The DICOM File Service specifies a minimum abstract view of files to be provided by the Media Format Layer. Constraining access to the content of files by the Application Entities through such a DICOM File Service boundary ensures Media Format and Physical Media independence.

DICOMDIR File: A unique and mandatory DICOM File within a File-set which contains the Media Storage Directory SOP Class. This File is given a single component File ID, DICOMDIR.

File: A File is an ordered string of zero or more bytes, where the first byte is at the beginning of the file and the last byte at the end of the File. Files are identified by a unique File ID and may be written, read and/or deleted.

File ID: Files are identified by a File ID which is unique within the context of the File-set they belong to. A set of ordered File ID Components (up to a maximum of eight) forms a File ID.

File ID Component: A string of one to eight characters of a defined character set.

File Meta Information: The File Meta Information includes identifying information on the encapsulated Data Set. It is a mandatory header at the beginning of every DICOM File.

File-set: A File-set is a collection of DICOM Files (and possibly non-DICOM Files) that share a common naming space within which File IDs are unique.

File-set Creator: An Application Entity that creates the DicomDIR File (see section 8.6) and zero or more DICOM Files.

File-set Reader: An Application Entity that accesses one or more files in a File-set.

File-set Updater: An Application Entity that accesses Files, creates additional Files, or deletes existing Files in a File-set. A File-set Updater makes the appropriate alterations to the DicomDIR file reflecting the additions or deletions.

Information Object Definition (IOD) - An IOD is a data model, which is an abstraction of real-world information. This data model defines the nature and attributes relevant to the class of real-world objects represented.

Media Format: Data structures and associated policies which organize the bit streams defined by the Physical Media format into data file structures and associated file directories.

Media Storage Model: The DICOM Media Storage Model pertains to the data structures used at different layers to achieve interoperability through media interchange.

Media Storage Services: DICOM Media Storage Services define a set of operations with media that facilitate storage to and retrieval from the media of DICOM SOP Instances.

Physical Media: A piece of material with recording capabilities for streams of bits. Characteristics of a Physical Media include form factor, mechanical characteristics, recording properties and rules for recording and organizing bit streams in accessible structures

Service/Object Pair (SOP) Class - The union of an Information Object Definition and a set of DIMSE Services defines a SOP. A DICOM Application Entity may support one or more SOP Classes. A SOP Class UID uniquely identifies a SOP Class.

SOP Instance - A specific occurrence of an Information Object.

Transfer Syntax - The Transfer Syntax is a set of encoding rules that allow DICOM Application Entities to negotiate the encoding techniques (e.g. data element structure, byte ordering, compression) they are able to support. The Transfer Syntax is negotiated during Association Negotiation.

Unique Identifier (UID) - A Unique Identifier is a globally unique, ISO compliant, ASCII-numeric string. It guarantees uniqueness across multiple countries, sites, vendors and equipment.

4.2 Network Exchange

RMA does not support any DICOM network services.

4.3 Media Interchange

4.3.1 Implementation Model

RMA is designed to provide simple interface functionality allowing an application to conduct DICOM Media Storage operations.

The application of RMA-supported system can create a File-set onto a storage medium for purpose of media interchange; it can also read from and update to the File-set. All media storage operations are done via application's user operations provided by the application.

4.3.1.1 Application Data Flow Diagram

The following data flow diagram demonstrates the relationship of local activities and related DICOM Media Storage operations.

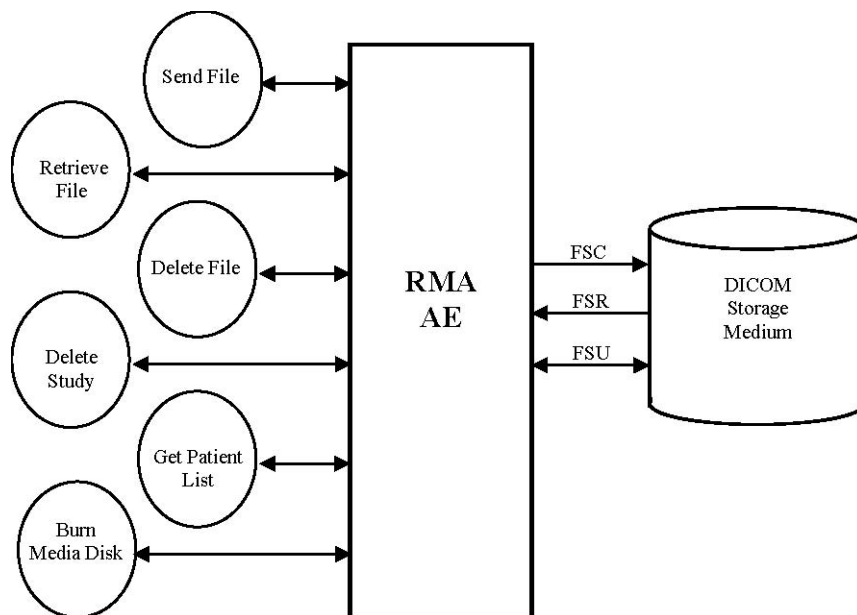


Figure 1 Application data flow of RMA for Media Storage.

4.3.1.2 Functional Definitions of AE's

The operations of RMA AE are carried out via the system application of removable media agent. The startup sequence of the application system initiates RMA's execution. RMA is terminated when the system application is closed.

RMA AE uses configuration file containing information for Application Entity. After the configuration is loaded, RMA AE is ready to perform requested real world activities.

RMA AE logs its operations, errors and warning indications to a log file.

4.3.1.2.1 Send File

RMA AE is used to send a SOP instance to a File-set when RMA interface function “SendFile” is called.

If media disk is CD or DVD, a temporary media storage data folder in local storage is allocated.

After all SOP instances are ready, the File-set in this a temporary folder will be burnt onto a media disk.

4.3.1.2.2 Retrieve File

RMA AE is used to retrieve a SOP instance from a File-set back to local storage when RMA interface function “RetrieveFile” is called.

4.3.1.2.3 Get Patient List

When RMA interface function “GetPatientList” is called, RMA AE is used to obtain DICOM directory information from a File-set and to create a patient list file locally.

4.3.1.2.4 Delete File

RMA AE is used to delete a SOP instance from a File-set when RMA interface function “DeleteFile” is called.

If media disk is CD or DVD, the operation of “DeleteFile” can only apply to instances stored in a temporary media storage folder before the File-set in this temporary folder is burnt into a media disk.

4.3.1.2.5 Delete Study

RMA AE is used to delete a study from a File-set when RMA interface function “DeleteStudy” is called.

If media disk is CD or DVD, the operation of “DeleteStudy” can only apply to studies stored in a temporary media storage folder before the File-set in this temporary folder is burnt into a media disk.

4.3.1.2.6 Burn Media Disk

When RMA interface function “BurnCD” is called, RMA AE is used to copy a File-set stored in a temporary local folder and burn to CD or DVD storage a media disk.

4.3.1.3 Sequence of Real World Activities

In order to execute a real world activity that accesses a media storage device, a media disk must be available. Otherwise RMA AE will log an error and request for a media disk to be inserted.

Deletion of SOP instance or study from File-set via RMA AE can only happen when File-set has at least one instance of at least one study, and the corresponding media disk is updatable.

4.3.1.4 File Meta Information Options

The implementation information written to the File Meta information in each file is:
DICOM Implementation Class and Version for Media Storage

Implementation Class UID	2.16.124.113531.1.10.7
Implementation Version Name	CedaraDcmLib1.2

4.3.2 AE Specification

4.3.2.1 RMA AE Specification

The RMA AE provides standard conformance to the DICOM Interchange Option of the Media Storage Service Class. The Application Profiles and roles are listed below:

DVD-RAM Application Profiles, Activities and Roles for RMA

Application Profiles Supported	Real World Activity	Role	SOP Class Option
STD-GEN-DVD-RAM	Send File	FSC FSU	Interchange
	Delete File	FSU	Interchange
	Delete Study	FSU	Interchange
	Retrieve File	FSR	Interchange
	Get Patient List	FSR	Interchange

CD Application Profiles, Activities and Roles for RMA

Application Profiles Supported	Real World Activity	Role	SOP Class Option
STD-GEN-CD	Burn Media Disk	FSC	Interchange
	Retrieve File	FSR	Interchange
	Get Patient List	FSR	Interchange

4.3.2.1.1 Real World Activities

4.3.2.1.1.1 Activity – Send File

RMA AE is used for transfer a SOP instance to a File-set. It therefore performs following tasks:

- Performs creating (first time) or updating a DICOMDIR file.
- Performs writing DICOM SOP instances from the local storage to a File-set.

RMA AE is a Media Storage File Set-Creator.

4.3.2.1.1.2 Activity – Retrieve File

RMA AE is used for retrieve a DICOM SOP instance from a File-set. It therefore performs following tasks:

- Performs reading the file for a specified SOP instance UID onto the local storage.

RMA AE is a Media Storage File Set-Reader.

4.3.2.1.1.3 Activity – Get Patient List

RMA AE is used for reading study/object information from a File-set. It therefore performs the following task:

- Performs reading the DICOMDIR file.

RMA AE is a Media Storage File Set-Reader.

4.3.2.1.1.4 Activity – Delete File

RMA AE is used for deleting an SOP instance from a File-set. It therefore performs following tasks:

- Performs deleting the SOP instance for a specified SOP instance UID
- Performs updating the DICOMDIR file .

RMA AE is a Media Storage File Set-Updater.

4.3.2.1.1.5 Activity – Delete Study

RMA AE is used for deleting a study from a File-set. It therefore performs following tasks:

- Performs deleting all SOP instances for a specified study UID.
- Performs updating the DICOMDIR file .

RMA AE is a Media Storage File Set-Updater.

4.3.2.1.1.6 Activity – Burn Media Disk

RMA AE is used for copying a File-set from its temporary storage folder and burning it to a CD or DVD medium disk.

RMA AE is a Media Storage File Set-Creator.

4.3.2.1.2 Media Storage Application Profiles

The RMA AE supports all standard application profiles for CD and DVDRAM.

4.3.2.1.2.1 Options

The RMA AE supports the SOP Classes and Transfer Syntaxes listed in table below:

Information Object Definition	SOP Class UID	Transfer Syntax	Transfer Syntax UID
All Object Storages	As defined in <i>Annex A</i> of PS3.6 in reference [1].	Explicit VR Little Endian	1.2.840.10008.1.2.1

4.3.3 Augmented and Private Application Profiles

RMA does not support any augmented and private application profiles.

4.3.4 Configuration

The RMA requires user to pre-set and to maintain configuration parameters of RMA AE. The parameters are as follows:

- Application Entity Title (default: RMA)
- Media drive location
- Temporary folder location
- Burning software selection

4.4 Support of Extended Character Sets

RMA supports the following character sets:

- ISO-IR 100 (Latin alphabet No.1) Supplementary set of ISO 8859