



R2™ DMax/DM/DX/LS

DICOM Conformance Statement

Software Versions 8.6–8.7

MAN-01048 Rev 001

Mammography

R2™ DMax/DM/DX/LS

DICOM Conformance Statement

Software Version 8.7

PN MAN-01048 Rev 001

HOLOGIC™

Technical Support

For support in North America contact:

Toll Free: +1.866.243.2533 (+1.866.CHECKED)

Email: r2support@hologic.com

Hours: Monday – Friday, 6:00 AM – 5:00 PM, PT (GMT –8:00)

Website: www.hologic.com

For support in Europe, South America, or Asia, contact your local dealer or distributor.

© 2008, Hologic, Inc. All rights reserved. Duplication or distribution without written permission is prohibited. Hologic reserves the right to revise this manual. Issued August 2008.

Protected by one or more of the following U.S. Patents: 5133020, 5452367, 5491627, 5537485, 5622171, 5657362, 5673332, 5729620, 5732697, 5740268, 5815591, 5828774, 5832103, 5917929, 6014452, 6035056, 6075879, 6078680, 6185320, 6198838, 6263092, 6266435, 6301378, 6404908, 6434262, 6477262, 6574357, 6580818, 6640001, 6628815, 6909795, 7054473, 7072498, 7146031, 7174515

Hologic, the Hologic logo, CheckMate, DigitalNow, EmphaSize, ImageChecker, R2, and R2 Technology are trademarks or registered trademarks of Hologic in the USA. MergeCOM-3 is a trademark of Merge Healthcare.

Hologic Inc.

35 Crosby Drive
Bedford, MA 01730-1401 USA
Tel: +1.781.999.7300
Sales: +1.781.999.7453
Fax: +1.781.280.0668

Asia Pacific

Room 302, Hung Kei Building
5-8 Queen Victoria Street
Central, Hong Kong
Tel: +852.3102.9200

Hologic N.V.

Authorized Representative
Leuvensesteenweg 250A
1800 Vilvoorde, Belgium
Tel: +32.2.711.4680
Fax: +32.2.725.2087



MergeCOM-3 Advanced Integrator's
Tool Kit is a product of Merge
Healthcare.

1. Overview

R2 DMax, DM, DX, and LS film-scanning systems are used to digitize mammography films, perform Computer-Aided Detection (CAD) on the images, and export CAD results and digitized film images to a digital review workstation, a digital archive, an R2 display unit (CheckMate Ultra or Mammolux), or postscript printer.

The following table provides an overview of the network services supported by the R2 DMax, DM, DX, and LS systems.

SOP Classes	User of Service (SCU)	Provider of Service (SCP)
Transfer		
Mammography CAD SR	Option	No
Digital Mammography X-Ray Image Storage – For Presentation	Option	No
Secondary Capture Image Storage	Option	No
Query/Retrieve		
Patient Root Query/Retrieve Information Model – FIND	Option	No
Study Root Query/Retrieve Information Model – FIND	Option	No
Modality Worklist Information Model – FIND	Option	No

2. Contents

1. Overview	1
2. Contents	3
3. Introduction	5
3.1. Revision History	5
3.2. Audience	5
3.3. Remarks	5
3.4. Definitions, Terms and Abbreviations	6
3.5. References	6
4. Networking	7
4.1. Implementation Model	7
4.1.1. Application Data Flow	7
4.1.2. Functional Definition of Application Entities	8
4.1.3. Sequencing of Real-World Activities	8
4.1.3.1. Local User Interface	8
4.1.3.2. Local Film Digitizing	8
4.2. AE Specifications	9
4.2.1. Local DICOM Storage SCU	9
4.2.1.1. SOP Classes	9
4.2.1.2. Association Policies	9
4.2.1.2.1. General	9
4.2.1.2.2. Number of Associations	9
4.2.1.2.3. Asynchronous Nature	9
4.2.1.2.4. Implementation Identifying Information	9
4.2.1.3. Association Initiation Policy	10
4.2.1.3.1. Local Film Digitizing	10
4.2.1.3.1.1. Description and Sequencing of Activities	10
4.2.1.3.1.2. Proposed Presentation Contexts	10
4.2.1.3.1.3. SOP-Specific Conformance	10
4.2.1.3.1.3.1. Digital Mammography	11
4.2.1.3.1.3.2. CAD Results Composite Objects	12
4.2.1.3.1.3.2.1. Mammography CAD Structured Report (SR)	12
4.2.1.3.1.3.2.1.1. CAD SR 5.x Mode	13
4.2.1.3.1.3.2.1.2. CAD SR 8.1 Mode	13
4.2.1.3.1.3.2.2. Secondary Capture Image	14
4.2.1.4. Association Acceptance Policy	14
4.2.2. Local DICOM Query/Retrieve SCU	15
4.2.2.1. SOP Classes	15
4.2.2.2. Association Policies	15

4.2.2.2.1. General	15
4.2.2.2.2. Number of Associations	15
4.2.2.2.3. Asynchronous Nature	15
4.2.2.2.4. Implementation Identifying Information	15
4.2.2.3. Association Initiation Policy	15
4.2.2.3.1. Local User Interface	15
4.2.2.3.1.1. Description and Sequencing of Activities	15
4.2.2.3.1.2. Proposed Presentation Contexts	16
4.2.2.3.1.3. SOP Specific Conformance	16
4.2.2.4. Association Acceptance Policy	17
4.3. Network Interfaces	17
4.3.1. Physical Network Interface	17
4.4. Configuration	17
4.4.1. AE Title/Presentation Address Mapping	17
4.4.2. Configurable Parameters	17
5. Media Interchange	19
6. Support of Character Sets	19
7. Security Profiles	19

3. Introduction

Hologic, Inc. develops and markets a full line of mammography products including the R2 DMax, DM, DX, and LS systems. This document describes the DICOM services used and provided by R2 DMax, DM, DX, and LS systems. It contains the requirements for DICOM interoperability between these products and products from other vendors, and the information necessary to configure other vendors' products to communicate with these products via DICOM.

R2 DMax, DM, DX, and LS film-scanning systems are used to digitize mammography films, perform Computer-Aided Detection (CAD) on the images, and export CAD results and digitized film images as a Service Class User (SCU) of the Storage Service Class. They also provide a user interface to facilitate use of the Query/Retrieve Service Class or the Modality Worklist Service Class as a Service Class User (SCU) to retrieve patient information to associate with digitized films.

3.1. Revision History

The information in this document applies to R2 software version 8.7. A DICOM Conformance Statement is available for each of the previous software releases.

Note: *R2 DMax, DM, DX, LX, and LS systems shipped with earlier software versions can be upgraded to version 8.7 by Hologic | R2 service personnel.*

3.2. Audience

This document is intended to aid in connecting the R2 DMax, DM, DX, and LS systems to other components that make use of the DICOM standard for interconnecting networked imaging devices. The reader of this document should be familiar with the DICOM standard and PACS components that utilize the standard.

3.3. Remarks

A DICOM conformance statement – the structure and content of which are stipulated by the DICOM standard – is intended to aid in determining the suitability of interconnecting digital imaging devices. References to specific functionality in a conformance statement are not sufficient to guarantee interoperability between components. The following should be considered when evaluating interoperability:

- The DICOM conformance statement for the R2 DMax, DM, DX, and LS systems provides a starting point for ascertaining whether the product can communicate with other systems.
- The only way to know for certain whether the R2 DMax, DM, DX, and LS systems can interoperate with other systems is to perform connectivity testing.
- This document represents a best effort to document the functionality of commercial versions of the R2 DMax, DM, DX, and LS systems and is not a functional specification of any Hologic | R2 component or product. Hologic | R2 reserves the right to make changes at any time to the functionality of the DICOM components described herein, and is committed to following the evolution of the DICOM standard.

3.4. Definitions, Terms and Abbreviations

This document uses the following acronyms.

AE	Application Entity
CAD	Computer Aided Detection
DICOM	Digital Imaging and Communications in Medicine
IOD	Information Object Definition
PDU	Protocol Data Unit
SC	Secondary Capture
SCP	Service Class Provider
SCU	Service Class User
SOP	Service Object Pair
SR	Structured Report
STU	Service Tool Utility
UID	Unique Identifier
VR	Value Representation

3.5. References

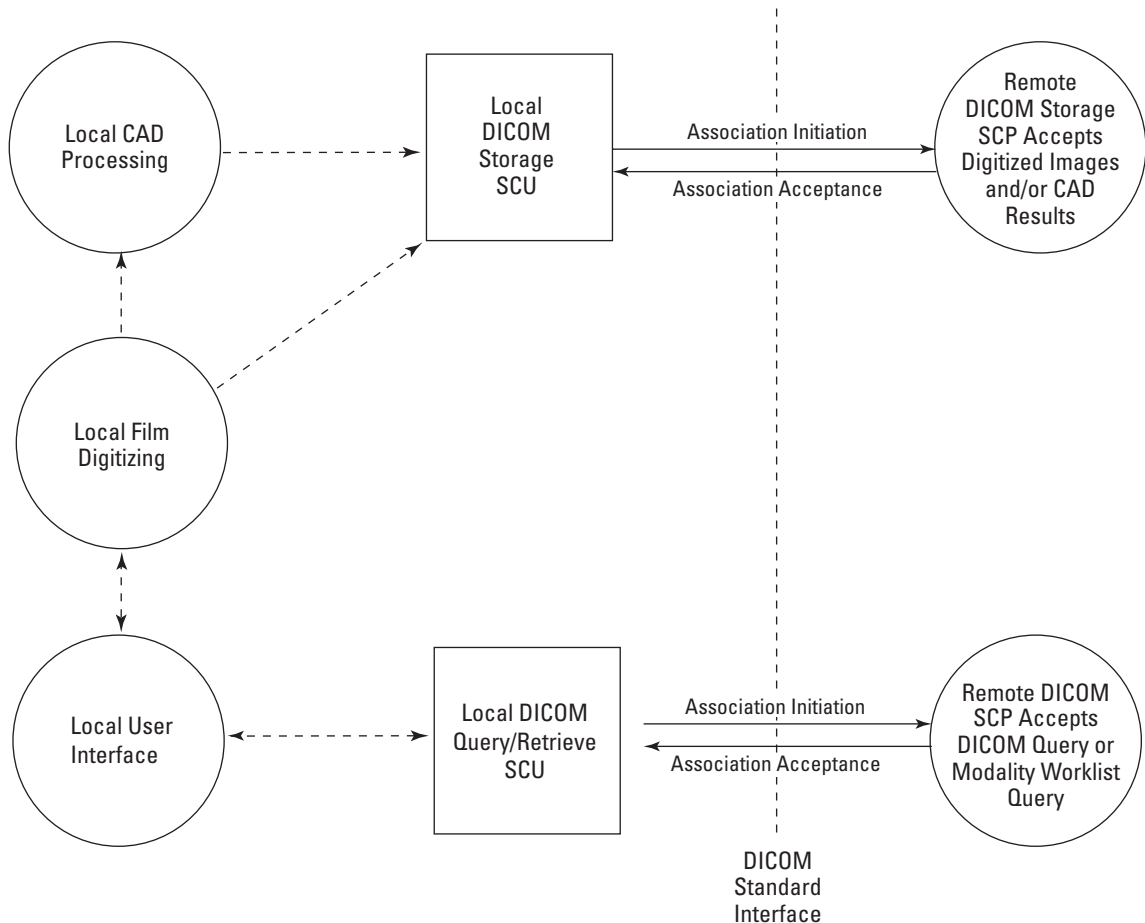
National Electrical Manufacturers Association DICOM Standard, 2007.

4. Networking

4.1. Implementation Model

4.1.1. Application Data Flow

The following diagram depicts the Application Entities (AE) and their relationships to Real-World Activities.



Application Data Flow

The Local CAD Processing is a daemon process that is initiated at system startup. The Local DICOM Storage SCU and Local DICOM Query/Retrieve SCU are executed on demand.

When Local Film Digitizing is the input source to Local CAD Processing, the digitized film images and/or CAD results may be exported in DICOM format. Upon completion of CAD Processing, the digitized film images and/or CAD results are passed to a Local DICOM Storage SCU. The Local DICOM Storage SCU is executed to initiate a push of the digitized film images and/or CAD results to a Remote DICOM Storage SCP.

When Local Film Digitizing is used with R2 Technology's Patient ID application, the Local User Interface may invoke the Local DICOM Query/Retrieve SCU to request

patient information from a Remote DICOM Query/Retrieve SCP or a Remote DICOM Modality Worklist SCP.

4.1.2. Functional Definition of Application Entities

The Local DICOM Storage SCU AE supports the following functions:

- Negotiates and establishes DICOM association with remote destination
- Stores DICOM Composite SOP Instance to remote destination

The Local DICOM Query/Retrieve SCU AE supports the following functions:

- Negotiates and establishes DICOM association with remote destination
- Issues Query (C-FIND) request and accepts responses

4.1.3. Sequencing of Real-World Activities

4.1.3.1. Local User Interface

When R2 Technology's Patient ID application is used to enter patient information for digitized films, a user may initiate a patient Query at the Patient ID application user interface:

- The Local DICOM Query/Retrieve SCU is executed, which initiates an association to a remote application.
- Based on input from the Local User Interface, the Local DICOM Query/Retrieve SCU sends a C-FIND request containing a query for a specified patient, waits for all C-FIND responses, and reports the results to Local User Interface.
- The Local DICOM Query/Retrieve SCU closes the association.

Patient Information retrieved from the remote application will be saved with the R2 Barcode number entered into the Patient ID database.

4.1.3.2. Local Film Digitizing

- A user loads films to Local Film Digitizing, which are digitized, the digitized film images are stored to disk, indexed by the R2 barcode, and optionally queued for Local CAD Processing.
- Upon completion of CAD processing, the digitized film images for the case are paired with study information from the Patient ID database and formatted into DICOM Digital Mammography X-Ray Image – For Presentation (configurable per destination), and the CAD results are formatted into a DICOM Mammography CAD SR or equivalent object (configurable per destination).
- The Local DICOM Storage SCU is executed, which initiates an association to a remote application.
- The Local DICOM Storage SCU sends a C-STORE request for each digitized film image object and structured report or equivalent object, and waits for a C-STORE response.
- The Local DICOM Storage SCU closes the association and exits.

The CAD results that are exported as a DICOM structured report contain references to the corresponding DICOM digitized film images. Image pixel data are not stored

in the DICOM structured report. This DICOM structured report is stored under the same DICOM Study as the images. It is the responsibility of a softcopy display workstation to match the DICOM structured report containing the CAD results with the corresponding DICOM digitized film images, for display of CAD results on the images.

4.2. AE Specifications

4.2.1. Local DICOM Storage SCU

4.2.1.1. SOP Classes

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

SOP Class Name	SOP Class UID
Mammography CAD SR	1.2.840.10008.5.1.4.1.1.88.50
Digital Mammography X-Ray Image Storage – For Presentation	1.2.840.10008.5.1.4.1.1.1.2
Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7

4.2.1.2. Association Policies

The Local DICOM Storage SCU initiates associations, but does not accept associations.

4.2.1.2.1. General

The maximum PDU size offered is 64234. This value is defined in the r2dicom_pro file, based on the mergecom.pro file provided with the MergeCOM-3 Advanced Integrator's Tool Kit.

4.2.1.2.2. Number of Associations

Up to 10 Local DICOM Storage SCU instances may be executed simultaneously, so there may be up to 10 simultaneous associations requested.

4.2.1.2.3. Asynchronous Nature

Asynchronous mode is not supported. All operations are performed synchronously.

4.2.1.2.4. Implementation Identifying Information

The Implementation Class UID is '2.16.840.1.113669.2.1.1', and the Implementation Version Name is 'MergeCOM3_370'. These values are defined in the r2dicom_pro file, based on the mergecom.pro file provided with the MergeCOM-3 Advanced Integrator's Tool Kit.

4.2.1.3. Association Initiation Policy

4.2.1.3.1. Local Film Digitizing

4.2.1.3.1.1. Description and Sequencing of Activities

The Real-World Activity (i.e., Remote DICOM Storage SCP accepts Digital Mammography images and/or CAD Results) is associated with a C-STORE SCU operation (i.e., Local DICOM Storage SCU Application Entity) and is triggered by the completion of Local Film Digitizing, and/or Local CAD Processing. This results in the sending of Digital Mammography images and/or CAD results to a Remote DICOM Storage SCP.

4.2.1.3.1.2. Proposed Presentation Contexts

One of the following Abstract Syntaxes will be proposed with each association request:

Abstract Syntax Name	UID	Transfer Syntax Name	UID	Role	Extended Negotiation
Mammography CAD SR	1.2.840.10008.5.1.4.1.1.88.50	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1	SCU	None
Digital Mammography X-Ray Image Storage – For Presentation	1.2.840.10008.5.1.4.1.1.1.2	JPEG Lossless, Non-Hierarchical, First-Order Prediction	1.2.840.10008.1.2.4.70	SCU	None
		Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1	SCU	None
Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7	JPEG Lossless, Non-Hierarchical, First-Order Prediction	1.2.840.10008.1.2.4.70	SCU	None
		Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1	SCU	None

4.2.1.3.1.3. SOP-Specific Conformance

If a C-STORE response indicates success or warning (B000, B007, B006), the CAD results and associated images shall be permitted to be deleted.

If a C-STORE response indicates failure or an unrecognized status value, the failure will be logged, the association will be reattempted at a later time, and the CAD results and associated images shall not be deleted. After a specified time period of successive failed attempts, no more attempts will be made, and the CAD results and associated images shall be permitted to be deleted. The retry interval and retry duration are configurable per destination.

4.2.1.3.1.3.1. Digital Mammography

For the digitized film images, all Type 1 attributes for the Digital Mammography X-Ray Image IOD shall be present with a non-zero length value.

When the Local DICOM Query/Retrieve SCU is used to retrieve patient information from a remote DICOM Query/Retrieve SCP or a remote DICOM Modality Worklist SCP, the following Type 1 attribute is copied to the digitized film from the query result:

- (0020,000D) Study Instance UID

If any study information is modified on the Local User Interface, a new Study Instance UID is generated by the system.

For the digitized film images, all Type 2 attributes shall be present.

When the Local DICOM Query/Retrieve SCU is used to retrieve patient information from a remote DICOM Query/Retrieve SCP or a remote DICOM Modality Worklist SCP, the following Type 2 attributes are copied to the digitized film from the query result:

- (0008,0020) Study Date
- (0008,0050) Accession Number
- (0008,0090) Referring Physician's Name
- (0010,0010) Patient's Name
- (0010,0020) Patient ID
- (0010,0030) Patient's Birth Date
- (0010,0040) Patient's Sex

The following common Type 2 and Type 3 attributes shall be present with a non-zero length value:

- (0008,0023) Content Date
- (0008,0033) Content Time
- (0008,0070) Manufacturer
- (0008,1010) Station Name
- (0008,1030) Study Description
- (0008,1090) Manufacturer's Model Name
- (0018,1000) Device Serial Number
- (0018,1020) Software Versions
- (0020,0010) Study ID
- (0020,0011) Series Number
- (0020,0013) Instance Number

The following common Type 3 attributes may be present with a non-zero length value:

- (0008,0080) Institution Name
- (0008,0081) Institution Address

The following Digital Mammography X-Ray Image specific Type 2 and Type 3 attributes shall be present with a non-zero length value:

- (0018,7004) Detector Type = FILM
- (0018,700A) Detector ID

4.2.1.3.1.3.2. CAD Results Composite Objects

Two types of CAD results may be produced:

- Mammography CAD Structured Report (SR)
 - CAD SR 5.x Mode
 - CAD SR 8.1 Mode
- Secondary Capture Image Storage

4.2.1.3.1.3.2.1. Mammography CAD Structured Report (SR)

For the Mammography CAD SR, all Type 1 attributes shall be present with a valid value (not zero length), and all Type 2 attributes shall be present. The patient and study attribute values are copied from the source images. The following Type 2 and Type 3 attributes shall be present with a nonzero length value:

- (0008,0020) Study Date
- (0008,0023) Content Date
- (0008,0030) Study Time: may be zero length, if not present or zero length in the corresponding images
- (0008,0033) Content Time
- (0008,0070) Manufacturer
- (0008,1010) Station Name
- (0008,1090) Manufacturer's Model Name
- (0010,0010) Patient's Name
- (0010,0020) Patient ID: may be zero length, if not present or zero length in the corresponding images
- (0018,1000) Device Serial Number
- (0018,1020) Software Versions

The following Type 3 attributes may be present with a nonzero length value:

- (0008,0080) Institution Name
- (0008,0081) Institution Address

For Mammography CAD SR, the Content Sequence (0040,A730) shall follow the rules of TID 4000 Mammography CAD Document Root Template, as defined in DICOM PS 3.16. All Mandatory content items shall be present.

The following User Optional content item may be present:

- TID 4019 CAD Algorithm Identification, Row 3 (111002, DCM, 'Algorithm Parameters')

Local CAD Processing is capable of performing 'Mammography breast density' and 'Calcification Cluster' detection. While the system does do Spatial Collocation Analysis, and the Mammography CAD SR object correctly encodes the result as Composite Features in the Mammography CAD Overall

Impression/Recommendation content sub-tree, the system fails to report the analysis (TID 4016 Analyses Performed) in the Summary of Detections and Analyses content sub-tree.

There are two Mammography CAD SR output modes, 5.x and 8.1, that can be configured via the Service Tool Utility (STU) associated with the application. The

configured output mode applies to all destinations that are receiving Mammography CAD SR.

4.2.1.3.1.3.2.1.1. CAD SR 5.x Mode

The 5.x mode provides backward compatibility with previous releases of R2 5.x products. It supports the following Templates:

- TID 4000 Mammography CAD Document Root
- TID 4001 Mammography CAD Overall Impression/Recommendation
- TID 4003 Mammography CAD Individual Impression/Recommendation
- TID 4006 Mammography CAD Single Image Finding
- TID 4010 Mammography CAD Calcification Cluster
- TID 4015 CAD Detections Performed
- TID 4017 CAD Detection Performed
- TID 4019 CAD Algorithm Identification
- TID 4020 CAD Image Library Entry
- TID 4021 Mammography CAD Geometry

Content items that require ‘Rendering Intent’ as a Child content item shall have the value ‘Presentation Required’ or ‘Presentation Optional’.

The following User Optional content items may be present if the PeerView Digital Feature is licensed:

- TID 4006 Mammography CAD Single Image Finding, Row 24, Include TID 4006 for (F-01776, SRT, ‘Individual Calcification’)
- TID 4010 Mammography CAD Calcification Cluster, Row 3 (111038, DCM, ‘Number of calcifications’)
- TID 4021 Mammography CAD Geometry Template, Row 3 (111041, DCM, ‘Outline’), for (F-01796, SRT, ‘Mammography breast density’) and (F-01776, SRT, ‘Individual Calcification’) findings

4.2.1.3.1.3.2.1.2. CAD SR 8.1 Mode

The 8.1 mode incorporates new R2 CAD algorithm enhancements implemented since the 5.x releases. In addition to the Templates supported in 5.x mode, the following Templates are supported:

- TID 4004 Mammography CAD Composite Feature
- TID 4005 Mammography CAD Composite Feature Body

Content items that require ‘Rendering Intent’ as a Child content item shall have the value ‘Presentation Required’ or ‘Presentation Optional’. If the ‘Rendering Intent’ is ‘Presentation Optional’, the following User Optional content items shall be present:

- TID 4006 Mammography CAD Single Image Finding, Row 3 (111071, DCM, ‘CAD Operating Point’)
- TID 4023 CAD Operating Points, Row 1 (111072, DCM, ‘Maximum CAD Operating Point’)

The following User Optional content items may be present if the PeerView Digital feature is licensed:

- TID 4006 Mammography CAD Single Image Finding, Row 24, Include TID 4006 for (F-01776, SRT, 'Individual Calcification')
- TID 4010 Mammography CAD Calcification Cluster, Row 3 (111038, DCM, 'Number of calcifications')
- TID 4021 Mammography CAD Geometry Template, Row 3 (111041, DCM, 'Outline'), for (F-01796, SRT, 'Mammography breast density'), (F-01775, SRT, 'Calcification Cluster'), and (F-01776, SRT, 'Individual Calcification') findings

The following additional Templates are supported if the PeerView Advanced feature is licensed:

- TID 4009 Mammography CAD Individual Calcification
- TID 4011 Mammography CAD Density
- TID 1400 Linear Measurement

The following User Optional content items may be present if the PeerView Advanced feature is licensed:

- TID 4006 Mammography CAD Single Image Finding, Row 5 (111012, DCM, 'Certainty of Finding')
- TID 4009 Mammography CAD Individual Calcification, Row 2, DTID (1400) 'Linear Measurement', where concept name of Row 1 is (G-A185,SNM3, 'Long Axis')
- TID 4010 Mammography CAD Calcification Cluster, Row 4, DTID (1400) 'Linear Measurement', where concept name of Row 1 is (G-A185,SNM3, 'Long Axis')
- TID 4011 Mammography CAD Density, Row 4, DTID (1400) 'Linear Measurement', where concept name of Row 1 is (G-A185,SNM3, 'Long Axis')

The following additional Template is supported if the Breast Geometry feature is licensed:

- TID 4008 Mammography CAD Breast Geometry

The following User Optional content item may be present if the Breast Geometry feature is licensed:

- TID 4008 Mammography CAD Breast Geometry, Row 3 (111045, DCM, 'Pectoral Muscle Outline')

4.2.1.3.1.3.2.2. Secondary Capture Image

For the Secondary Capture Image, a single object instance contains non-diagnostic representations of up to four images for a case in a 2×2 layout, with the R2 CAD markers burned into the image pixel data. All of the Type 1 and Type 2 attributes for the Secondary Capture Image IOD shall be present. The DICOM Patient and Study information shall be the same as that of the original images. This type of CAD results output is intended for legacy systems that do not yet support Mammography CAD SR.

4.2.1.4. Association Acceptance Policy

The Local DICOM Storage SCU does not accept associations.

4.2.2. Local DICOM Query/Retrieve SCU

4.2.2.1. SOP Classes

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

SOP Class Name	SOP Class UID
Patient Root Query/Retrieve Information Model - FIND	1.2.840.10008.5.1.4.1.2.1.1
Study Root Query/Retrieve Information Model - FIND	1.2.840.10008.5.1.4.1.2.2.1
Modality Worklist Information Model - FIND	1.2.840.10008.5.1.4.31

4.2.2.2. Association Policies

The Local DICOM Query/Retrieve SCU initiates associations, but does not accept associations.

4.2.2.2.1. General

The default maximum PDU size offered is 64234. This value is defined in the r2dicom_pro file, based on the mergecom.pro file provided with the MergeCOM-3 Advanced Integrator's Tool Kit.

4.2.2.2.2. Number of Associations

There is one association requested from the Local DICOM Query/Retrieve SCU at one time.

4.2.2.2.3. Asynchronous Nature

Asynchronous mode is not supported. All operations are performed synchronously.

4.2.2.2.4. Implementation Identifying Information

The Implementation Class UID is '2.16.840.1.113669.2.1.1', and the Implementation Version Name is 'MergeCOM3_370'. These values are defined in the r2dicom_pro file, based on the mergecom.pro file provided with the MergeCOM-3 Advanced Integrator's Tool Kit.

4.2.2.3. Association Initiation Policy

4.2.2.3.1. Local User Interface

4.2.2.3.1.1. Description and Sequencing of Activities

The Real-World Activity (i.e., Remote DICOM Query/Retrieve SCP or DICOM Modality Worklist SCP Handles Requests) is associated with C-FIND operations (i.e., Local DICOM Query/Retrieve SCU Application Entity) and is triggered by user interaction with Local User Interface. This results in the correlating of patient information with the Local Film Digitizing.

4.2.2.3.1.2. Proposed Presentation Contexts

One of the following Abstract Syntaxes will be proposed with each association request:

Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name	UID		
Patient Root Query/Retrieve Information 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
		Explicit VR Little Endian	1.2.840.10008.1.2.1	SCU	None
Study Root Query/Retrieve Information Model – FIND	1.2.840.10008.5.1.4.1.2.2.1	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1	SCU	None
Modality Worklist Information 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	SCU	None

4.2.2.3.1.3. SOP Specific Conformance

The Local DICOM Query/Retrieve SCU does not generate relational queries or retrievals, and does not support extended negotiation.

For Patient level queries, the following Required and Unique Key Attributes are requested with the specified type of matching:

- (0010,0010) Patient’s Name: Single Value, Wildcard, or Universal
- (0010,0020) Patient ID: Single Value or Universal

For Patient level queries, the following Optional Key Attributes are requested with the specified type of matching:

- (0010,0030) Patient’s Birth Date: Universal
- (0010,0040) Patient’s Sex: Universal

For Study level queries, the following Required and Unique Key Attributes are requested with the specified type of matching:

- (0008,0020) Study Date: Universal
- (0008,0030) Study Time: Universal
- (0008,0050) Accession Number: Single Value or Universal
- (0010,0010) Patient’s Name: Single Value, Wildcard, or Universal
- (0010,0020) Patient ID: Single Value or Universal
- (0020,0010) Study ID: Universal
- (0020,000D) Study Instance UID: Universal

For Study level queries, the following Optional Key Attributes are requested with the specified type of matching:

- (0008,0090) Referring Physician’s Name: Universal
- (0010,0030) Patient’s Birth Date: Universal

- (0010,0040) Patient's Sex: Universal

For Modality Worklist queries, the following Required and Unique Key Attributes are requested with the specified type of matching:

- (0040,0100) Scheduled Procedure Step Sequence
 - (0040,0002) Scheduled Procedure Step Start Date: Universal – used as the 'Study Date' for the digitized image
 - (0040,0003) Scheduled Procedure Step Start Time: Universal
- (0010,0010) Patient's Name: Single Value, Wildcard, or Universal
- (0010,0020) Patient ID: Single Value or Universal

For Modality Worklist queries, the following Optional Key Attributes are requested with the specified type of matching:

- (0008,0050) Accession Number: Single Value or Universal
- (0008,0090) Referring Physician's Name: Universal
- (0010,0030) Patient's Birth Date: Universal
- (0010,0040) Patient's Sex: Universal
- (0020,000D) Study Instance UID: Universal

4.2.2.4. Association Acceptance Policy

The Local DICOM Query/Retrieve SCU does not accept associations.

4.3. Network Interfaces

4.3.1. Physical Network Interface

10/100 Base-T Ethernet with RJ45 connector. The application is indifferent to the physical medium over which TCP/IP executes. The TCP/IP stack is inherited from the Linux operating system.

4.4. Configuration

The Service Tool Utility (STU) is used for DICOM configuration.

4.4.1. AE Title/Presentation Address Mapping

Presentation address mapping is configured in the `r2dicom_app` file (based on the `mergecom.app` file provided with the MergeCOM-3 Advanced Integrator's Tool Kit), which is created automatically by the STU. The file contents are derived from the DICOM input devices (Storage SCU) and DICOM output devices (Storage SCP) identified during configuration.

The Listen Port for the Local DICOM Storage SCP (default = 1115) is defined in the `r2dicom_pro` file (based on the `mergecom.pro` file provided with the MergeCOM-3 Advanced Integrator's Tool Kit). The AE Titles for the SCUs and SCPs are provided to the application from the configuration files and a database internal to the application.

4.4.2. Configurable Parameters

The following fields are configurable for the Local DICOM Storage SCU and Query/Retrieve SCU:

- AE Title
- Hostname (of the product instance)
- IP Address (of the product instance)
- Net Mask (of the product instance)
- Default Gateway (of the product instance)

The following fields are configurable for each output device (Remote DICOM Storage SCP):

- AE Title
- Hostname
- IP Address
- TCP/IP Port Number
- Device Label
- Retry Interval (in minutes)
- Retry Duration (in hours)
- Service List and Transfer Syntax List (i.e., presentation context) to be requested by the Local DICOM Storage SCU for this device are determined automatically from the Output Format assigned during input-to-output mapping.

The following fields are configurable for the Remote DICOM Query/Retrieve SCP:

- AE Title
- Hostname
- IP Address
- TCP/IP Port Number
- Query Timeout (in seconds)
- DICOM Modality Filter: MG only or all modalities
- DICOM Query Type: DICOM Modality Worklist Query, DICOM Patient Root Query, or DICOM Study Root Query

5. Media Interchange

Not applicable.

6. Support of Character Sets

The systems support only the default character set, ISO-IR 6.

7. Security Profiles

The R2 DMax, DM, DX, and LS film-scanning systems do not support any specific DICOM security measures. It is assumed that the R2 systems are used within a secured environment. It is assumed that a secured environment includes at a minimum:

- Firewall or router protections to ensure that only approved external hosts have network access to the R2 systems.
- Firewall or router protections to ensure that the R2 systems only have network access to approved external hosts and services.
- Any communication with external hosts and services outside the locally secured environment use appropriate secure network channels (e.g. such as a Virtual Private Network (VPN)).
- Other network security procedures such as automated intrusion detection may be appropriate in some environments. Additional security features may be established by the local security policy and are beyond the scope of this conformance statement.



HOLOGIC™