



Conformance Statements for TCS 2.02a

Medcon, Telemedicine Technology
<http://www.medcon.com>

This document contains DICOM conformance statements for TCS 2.02a.

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1 Introduction

This document contains DICOM conformance statements for TCS 2.02a.

TCS 2.02a includes both ImageManager and ImageDisplay functionality. During installation, user may choose which functionality is to be installed. As an ImageManager, **TCS 2.02a** permits the external systems to have access to data stored on the **TCS 2.02a** database.

As an ImageDisplay, **TCS 2.02a** provides an operator with options to store, query, retrieve and print DICOM data into and from DICOM compatible systems.

2 Implementation Model

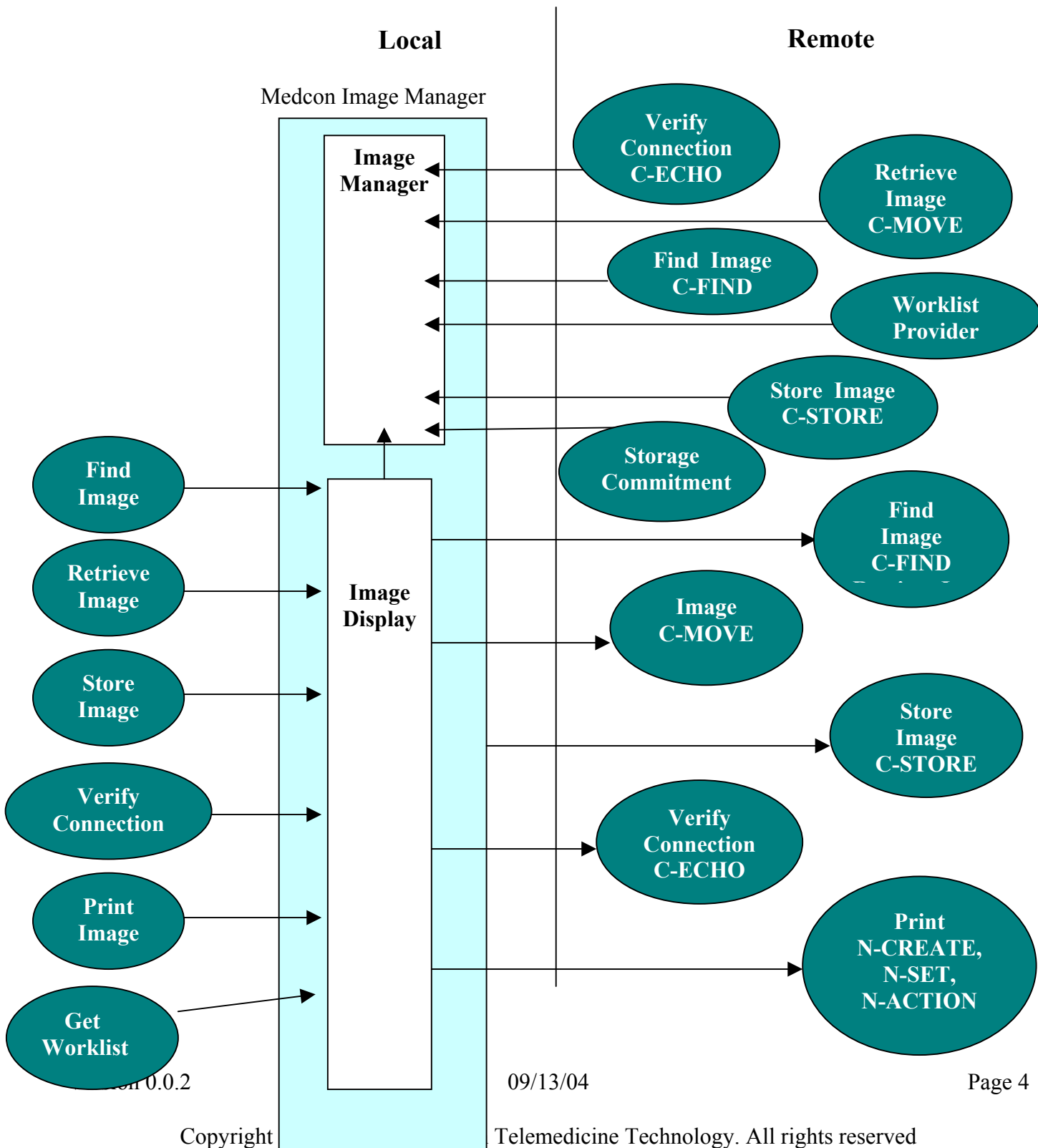
TCS 2.02a provides:

- Image storage (SCU/SCP)
- Queries on images data base (SCU/SCP)
- Retrieving images (SCU/SCP)
- Commitment of the storage of data (SCP)
- Printing images (SCU)
- Getting Worklist (SCU)
- Providing Worklist (SCP)

2.1 Application Data Flow Diagram

Figure 1 shows the relationship between *TCS 2.02a* and external applications.

Figure 1



2.2 Functional Definition of Application Entities

The **TCS 2.02a ImageManager** uses a registry and configuration files that contain information used to validate association attempts from Local and Remote Application entities. The **TCS 2.02a ImageManager** then listens for association requests on the configured port.

An association request for Storage Services from a Remote Application Entity causes the **TCS 2.02a ImageManager** to validate the request according to the configuration parameters set at execution time. The Remote Application Entity then sends the Information Object Instance. The **TCS 2.02a ImageManager** stores the received Information Object Instance on its local database, if the data does not already exist, or in a predefined directory on hard disk. The data remains in that directory until removed by the **TCS 2.02a ImageManager** based on the LimitDays quota.

An association request from a Remote Application Entity for Query or Retrieve Services causes **TCS 2.02a ImageManager** 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 **ImageManager** 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 subassociation for C_STORE operation with destination Application Entity specified in the C_MOVE message.

Operator defines to which DICOM server the requests are routed. In case of a print request, the system passes the request to a DICOM print provider.

TCS 2.02a has the option to solve collisions due to concurrent access to TCS2.02a SCP, by configuring a number of simultaneous associations. In this case, several instances of SCP, each of which listens on a separate port, will be started.

Port numbers start from default value and are subsequently incremented.

Client may choose one of these port numbers to avoid collision with another client.

2.3 Sequencing of Real-World Activities

Not Applicable

3 AE Specifications

TCS 2.02a initiates and accepts Associations. TCS2.02a is composed of a single Application Entity, MEDSERVER AE (AE title is configurable).

3.1 AE TCS 2.02a – Specification

TCS 2.02a provides Standard Conformance to the following DICOM 3.0 SOP Classes as SCP:

TABLE 1. SOP Classes Supported by TCS 2.02a as SCP

SOP Class Name	SOP Class UID
Verification	1.2.840.10008.1.1
Computed Radiography Image Storage	1.2.840.10008.5.1.4.1.1.1
CT Image Storage	1.2.840.10008.5.1.4.1.1.2
Ultrasound Multi-frame Image Storage	1.2.840.10008.5.1.4.1.1.3.1
Ultrasound Image Storage	1.2.840.10008.5.1.4.1.1.6.1
MR Image Storage	1.2.840.10008.5.1.4.1.1.4
Enhanced MR Image Storage	1.2.840.10008.5.1.4.1.1.4.1
Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7
Multi-Frame Single bit Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7.1
Multi-Frame Grayscale Byte Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7.2
Multi-Frame Grayscale Word Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7.3
Multi-Frame True Color Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7.4
X-Ray Angiographic Image Storage	1.2.840.10008.5.1.4.1.1.12.1
X-Ray Radiofluoroscopic Image Storage	1.2.840.10008.5.1.4.1.1.12.2
X-Ray Bi-Plane Angiographic Image Storage	1.2.840.10008.5.1.4.1.1.12.3
Nuclear Medicine Image Storage	1.2.840.10008.5.1.4.1.1.20
Presentation State Storage	1.2.840.10008.5.1.4.1.1.11.1
Positron Emission Tomography Image Storage	1.2.840.10008.5.1.4.1.1.128
RT Image	1.2.840.10008.5.1.4.1.1.481.1
Digital X-Ray Image Storage – For Presentation	1.2.840.10008.5.1.4.1.1.1.1
Digital X-Ray Image Storage – For Processing	1.2.840.10008.5.1.4.1.1.1.1.1
Digital Mammography Image Storage – For Presentation	1.2.840.10008.5.1.4.1.1.1.2
Digital Mammography Image Storage – For Processing	1.2.840.10008.5.1.4.1.1.1.2.1
Digital Intra-oral X-Ray Image Storage – For Presentation	1.2.840.10008.5.1.4.1.1.1.3
Digital Intra-oral X-Ray Image Storage – For Processing	1.2.840.10008.5.1.4.1.1.1.3.1
VL Endoscopic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.1
Microscopic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.2

SOP Class Name	SOP Class UID
Slide-Coordinates Microscopic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.3
Photographic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.4
Storage Commitment Push Model SOP Class	1.2.840.10008.1.20.1
Patient Root Query/Retrieve Info Model - Find	1.2.840.10008.5.1.4.1.2.1.1
Study Root Query/Retrieve Info Model - Find	1.2.840.10008.5.1.4.1.2.2.1
Patient Root Query/Retrieve Info Model - Move	1.2.840.10008.5.1.4.1.2.1.2
Study Root Query/Retrieve Info Model - Move	1.2.840.10008.5.1.4.1.2.2.2

TCS 2.02a provides Standard Conformance to the following DICOM 3.0 SOP Classes as SCU:

TABLE 2. SOP Classes Supported by **TCS 2.02a** as SCU

SOP Class Name	SOP Class UID
Verification	1.2.840.10008.1.1
Patient Root Query/Retrieve Info Model - Find	1.2.840.10008.5.1.4.1.2.1.1
Study Root Query/Retrieve Info Model - Find	1.2.840.10008.5.1.4.1.2.2.1
Patient Root Query/Retrieve Info Model - Move	1.2.840.10008.5.1.4.1.2.1.2
Study Root Query/Retrieve Info Model - Move	1.2.840.10008.5.1.4.1.2.2.2
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
Computed Radiography Image Storage	1.2.840.10008.5.1.4.1.1.1
CT Image Storage	1.2.840.10008.5.1.4.1.1.2
Ultrasound Multi-frame Image Storage	1.2.840.10008.5.1.4.1.1.3.1
Ultrasound Image Storage	1.2.840.10008.5.1.4.1.1.6.1
MR Image Storage	1.2.840.10008.5.1.4.1.1.4
Enhanced MR Image Storage	1.2.840.10008.5.1.4.1.1.4.1
Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7
Multi-Frame Single bit Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7.1
Multi-Frame Grayscale Byte Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7.2
Multi-Frame Grayscale Word Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7.3
Multi-Frame True Color Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7.4
X-Ray Angiographic Image Storage	1.2.840.10008.5.1.4.1.1.12.1
X-Ray Radiofluoroscopic Image Storage	1.2.840.10008.5.1.4.1.1.12.2
X-Ray Bi-Plane Angiographic Image Storage	1.2.840.10008.5.1.4.1.1.12.3
Nuclear Medicine Image Storage	1.2.840.10008.5.1.4.1.1.20
Presentation State Storage	1.2.840.10008.5.1.4.1.1.11.1
Positron Emission Tomography Image Storage	1.2.840.10008.5.1.4.1.1.128
RT Image	1.2.840.10008.5.1.4.1.1.481.1
Digital X-Ray Image Storage – For Presentation	1.2.840.10008.5.1.4.1.1.1.1
Digital X-Ray Image Storage – For Processing	1.2.840.10008.5.1.4.1.1.1.1.1

SOP Class Name	SOP Class UID
Digital Mammography Image Storage – For Presentation	1.2.840.10008.5.1.4.1.1.1.2
Digital Mammography Image Storage – For Processing	1.2.840.10008.5.1.4.1.1.1.2.1
Digital Intra-oral X-Ray Image Storage – For Presentation	1.2.840.10008.5.1.4.1.1.1.3
Digital Intra-oral X-Ray Image Storage – For Processing	1.2.840.10008.5.1.4.1.1.1.3.1
VL Endoscopic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.1
Microscopic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.2
Slide-Coordinates Microscopic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.3
Photographic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.4

3.1.1 Association Establishment Policies

3.1.1.1 General

PDU size is configurable for both SCU/SCP.

3.1.1.2 Number of Associations

The number of simultaneous associations is defined by configuration and should not exceed 16. Asynchronous mode (multiple concurrent operations on one association) is not supported.

3.1.1.3 Implementation Identifying Information

TCS 2.02a will provide an implementation class UID - 2.16.376.1.1.511752891.0.

TCS 2.02a will provide an implementation version name – MEDCON07JAN2004.

3.1.2 Association Initiation Policy

TCS 2.02a attempts to initiate a new association in the following cases:

- 1) It has to check connection to remote system
- 2) It has to transfer (store) a series of images on remote system
- 3) It has to find several images in remote system
- 4) It has to retrieve several images from remote system
- 5) It has to print several images
- 6) It has to get worklist
- 7) It has to confirm storage commitment

3.1.2.1 Real-World Activity – Storing Images

3.1.2.1.1 Associated Real-World Activity

The associated Real-World Activity is an attempt to store a series of images on a remote system. The *TCS 2.02a Image Manager* 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.

3.1.2.1.2 Proposed Presentation Contexts

TCS 2.02a will propose one Presentation Context, as shown in Table 3. The proposed Presentation Context will use the SOP Class UID that corresponds to the Series modality.

TABLE 3. Proposed Presentation Contexts

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name	UID		
See Note	See Note	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
See Note	See Note	Explicit VR Little Endian	1.2.840.10008.1.2.1	SCU	None
See Note	See Note	JPEG Lossless, Hierarchical, First-Order Prediction	1.2.840.10008.1.2.4.70	SCU	None
See Note	See Note	JPEG Lossy Process 1	1.2.840.10008.1.2.4.50	SCU	None
See Note	See Note	RLE Lossless	1.2.840.10008.1.2.5	SCU	None

Note: The Abstract Syntax corresponds to the SOP Class UID for Series modality and can be one of the following:

TABLE 4. Abstract Syntaxes

Abstract Syntax	
Name	UID
Computed Radiography Image Storage	1.2.840.10008.5.1.4.1.1.1
CT Image Storage	1.2.840.10008.5.1.4.1.1.2
Ultrasound Multi-frame Image Storage	1.2.840.10008.5.1.4.1.1.3.1
Ultrasound Image Storage	1.2.840.10008.5.1.4.1.1.6.1
MR Image Storage	1.2.840.10008.5.1.4.1.1.4
Enhanced MR Image Storage	1.2.840.10008.5.1.4.1.1.4.1
Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7
Multi-Frame Single bit Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7.1
Multi-Frame Grayscale Byte Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7.2
Multi-Frame Grayscale Word Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7.3
Multi-Frame True Color Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7.4
X-Ray Angiographic Image Storage	1.2.840.10008.5.1.4.1.1.12.1
X-Ray Radiofluoroscopic Image Storage	1.2.840.10008.5.1.4.1.1.12.2
X-Ray Bi-Plane Angiographic Image Storage	1.2.840.10008.5.1.4.1.1.12.3
Nuclear Medicine Image Storage	1.2.840.10008.5.1.4.1.1.20
Presentation State Storage	1.2.840.10008.5.1.4.1.1.11.1
Positron Emission Tomography Image Storage	1.2.840.10008.5.1.4.1.1.128
RT Image	1.2.840.10008.5.1.4.1.1.481.1

Abstract Syntax	
Name	UID
Digital X-Ray Image Storage – For Presentation	1.2.840.10008.5.1.4.1.1.1.1
Digital X-Ray Image Storage – For Processing	1.2.840.10008.5.1.4.1.1.1.1.1
Digital Mammography Image Storage – For Presentation	1.2.840.10008.5.1.4.1.1.1.2
Digital Mammography Image Storage – For Processing	1.2.840.10008.5.1.4.1.1.1.2.1
Digital Intra-oral X-Ray Image Storage – For Presentation	1.2.840.10008.5.1.4.1.1.1.3
Digital Intra-oral X-Ray Image Storage – For Processing	1.2.840.10008.5.1.4.1.1.1.3.1
VL Endoscopic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.1
Microscopic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.2
Slide-Coordinates Microscopic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.3
Photographic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.4

3.1.2.2 Real-World Activity – Finding Images

3.1.2.2.1 Associated Real-World Activity

The associated Real-World Activity is an attempt to find some of the images in a remote system. The user of the Client Application selects the Query operation button on the user interface. The user can specify wild card or specific information for Patient Name, Patient ID, Patient Sex, Patient Birth date, Study ID, Study UID, Study Accession Number, Study Date range, Study Time range, Referring Physician, Modalities in Study.

Wild card queries can result in an excessive number of responses. The user interface is able to restrict the number of patients displayed.

User can cancel the current Query operation by means of Cancel button.

TCS 2.02a ImageManager defaults to using Patient Root Query Model when initiating query request. The query model used can be changed to Study Root Query Model by changing a configuration parameter.

3.1.2.2.1.1 Multiple Sources Option

TCS 2.02a ImageDisplay has the ability to be configured to access multiple Image Manager/Image Archive sources with a single user request.

If communication with one information source fails, **TCS 2.02a ImageDisplay** provides the information it received from other sources. In addition, the **TCS 2.02a ImageDisplay** informs the users that they are viewing potentially incomplete results.

When **TCS 2.02a ImageDisplay** performs a study-level or series-level query to multiple sources and finds the study/series referenced in multiple places, the study/series is either duplicated or the study/series is split across the systems. When the user queries of the study/series an **TCS 2.02a ImageDisplay** collates the information, determine if the information is actually duplicated or split, and presents a consolidated view of results to the user.

3.1.2.2.2 Proposed Presentation Contexts

For this Real-World Activity, *TCS 2.02a* will propose one of the Presentation Contexts listed in Table 5.

TABLE 5. Proposed Presentation Contexts

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name	UID		
1.2.840.10008.5.1.4.1.2.1.1	Patient Root Query/Retrieve Information Model – FIND SOP Class	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
1.2.840.10008.5.1.4.1.2.2.1	Study Root Query/Retrieve Information Model – FIND SOP Class	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
1.2.840.10008.5.1.4.1.2.1.1	Patient Root Query/Retrieve Information Model – FIND SOP Class	Explicit VR Little Endian	1.2.840.10008.1.2.1	SCU	None
1.2.840.10008.5.1.4.1.2.2.1	Study Root Query/Retrieve Information Model – FIND SOP Class	Explicit VR Little Endian	1.2.840.10008.1.2.1	SCU	None

3.1.2.3 Real-World Activity – Retrieving Images

3.1.2.3.1 Associated Real-World Activity

The associated Real-World Activity is an attempt to retrieve some of images from remote system. The user selects one or more images, series or studies within studies from a list presented as a result of a previous Query operation. Then the user selects the Retrieve operation button on the user interface to initiate the move operation.

User can cancel the current Retrieve operation by means of the Cancel button.

3.1.2.3.1.1 Multiple Sources Option

TCS 2.02a ImageDisplay has the ability to be configured to access multiple Image Manager/Image Archive sources with a single user retrieval request.

When *TCS 2.02a ImageDisplay* performs a study-level or series-level query to multiple sources and finds the study/series referenced in multiple places, the study/series is either duplicated or the study/series is split across the systems. When the user requests a retrieval of the study/series, *TCS 2.02a ImageDisplay* collates the information, determines whether the information is actually duplicated or split, and presents a consolidated view of results to the user.

Avoiding redundant retrieval is managed by checking whether definite IOD has been already retrieved in current session.

3.1.2.3.2 Proposed Presentation Contexts

For this Real-World Activity, *TCS 2.02a* will propose one of the Presentation Contexts listed in Table 6.

TABLE 6. Proposed Presentation Contexts

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name	UID		
Patient Root Query/Retrieve Information Model – MOVE SOP Class	1.2.840.10008.5.1.4 .1.2.1.2	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
Study Root Query/Retrieve Information Model – MOVE SOP Class	1.2.840.10008.5.1.4 .1.2.2.2	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
Patient Root Query/Retrieve Information Model – MOVE SOP Class	1.2.840.10008.5.1.4 .1.2.1.2	Explicit VR Little Endian	1.2.840.10008.1.2.1	SCU	None
Study Root Query/Retrieve Information Model – MOVE SOP Class	1.2.840.10008.5.1.4 .1.2.2.2	Explicit VR Little Endian	1.2.840.10008.1.2.1	SCU	None

3.1.2.4 Real-World Activity – Printing Images

3.1.2.4.1 Associated Real-World Activity

The associated Real-World Activity is a request to print one or more images. The Print Module represents a single Application Entity. It acts independently of other DICOM applications that may be running on the same system. The Print Module can support printing to multiple DICOM printers at the same time, each printer being uniquely identified by an Application Entity Title and port.

3.1.2.4.2 Proposed Presentation Contexts

TCS 2.02a will propose one of the Presentation Contexts listed in Table 7.

TABLE 7. Proposed Presentation Contexts

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name	UID		
Basic Grayscale Print Management Meta SOP Class	1.2.840.10008.5.1.1.9	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
Basic Grayscale Print Management Meta SOP Class	1.2.840.10008.5.1.1.9	Explicit VR Little Endian	1.2.840.10008.1.2.1	SCU	None
Basic Grayscale Print Management Meta SOP Class	1.2.840.10008.5.1.1.9	JPEG Lossless, Hierarchical, First-Order Prediction	1.2.840.10008.1.2.4.70	SCU	None
Basic Grayscale Print Management Meta SOP Class	1.2.840.10008.5.1.1.9	JPEG Lossy Process 1	1.2.840.10008.1.2.4.50	SCU	None
Basic Grayscale Print Management Meta SOP Class	1.2.840.10008.5.1.1.9	RLE Lossless	1.2.840.10008.1.2.4.5	SCU	None
Basic Color Print Management Meta SOP Class	1.2.840.10008.5.1.1.18	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
Basic Color Print Management Meta SOP Class	1.2.840.10008.5.1.1.18	Explicit VR Little Endian	1.2.840.10008.1.2.1	SCU	None
Basic Color Print Management Meta SOP Class	1.2.840.10008.5.1.1.18	JPEG Lossless, Hierarchical, First-Order Prediction	1.2.840.10008.1.2.4.70	SCU	None

Presentation Context Table					
Abstract Syntax		Transfer Syntax			
Basic Color Print Management Meta SOP Class	1.2.840.10008.5.1.1.18	JPEG Lossy Process 1	1.2.840.10008.1.2.4.50	SCU	None
Basic Color Print Management Meta SOP Class	1.2.840.10008.5.1.1.18	RLE Lossless	1.2.840.10008.1.2.4.5	SCU	None

3.1.2.5 Real-World Activity – Verification

3.1.2.5.1 Associated Real-World Activity

The associated Real-World Activity is an attempt to check whether remote AE is ready for DICOM dialog.

3.1.2.5.2 Proposed Presentation Contexts

For this Real-World Activity, *TCS 2.02a* will propose one of the Presentation Contexts listed in Table 8.

TABLE 8. Proposed Presentation Contexts

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name	UID		
Verification	1.2.840.10008.1.1	DICOM Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None
Verification	1.2.840.10008.1.1	DICOM Explicit VR Little Endian	1.2.840.10008.1.2.1	SCP	None

3.1.2.6 Real-World Activity – Getting Modality Worklist from Remote System

TCS 2.02 user requests Modality Worklist from the remote information system. The associated Real-World activity is requested by the user to perform a Worklist query based on user-specified criteria. The association is closed when all data have been received from the remote DICOM network node. The client is also able to abort the association through an operator requested abort or when an error occurs.

TABLE 9. Proposed Presentation Contexts

Presentation Context Table				
Abstract Syntax		Transfer Syntax		Role
Name	UID	Name	UID	
Modality Worklist Information Model -FIND	1.2.840.10008.5.1.4.31	Implicit VR Little Endian	1.2.840.10008.1.2	SCU
Modality Worklist Information Model -FIND	1.2.840.10008.5.1.4.31	Explicit VR Little Endian	1.2.840.10008.1.2.1	SCU

Depending on user requested search type, C-FIND request will contain elements of the following sets of matching key attributes:

- Find by Accession number

Matching Key Attribute	Matching Key Type
(0008,0050) Accession Number	O

- Find by Patient ID and Name

Matching Key Attribute	Matching Key Type
(0010,0020) Patient ID	R
(0010,0010) Patient's Name	R

- Find by Scheduled Date, Station and Physician

Matching Key Attribute	Matching Key Type
(0040,0002) Scheduled Procedure Step Start Date	R
(0040,0006) Scheduled Performing Physician's Name	R
(0040,0010) Scheduled Station Name	R
(0040,0001) Scheduled Station AE Title	R

- Find by Modality

Matching Key Attribute	Matching Key Type
(0008,0060) Modality	R

3.1.3 Association Acceptance Policy

TCS 2.02a accepts an association for storing, finding and retrieving images. If the proposed association is store, *TCS 2.02a* will receive any images transmitted on the association and store the images in the

format specified by PS 3.10 in Medcon system. **TCS 2.02a** places no limitations on who may connect to it, nor on the number of simultaneous connections it will support.

3.1.3.1 Real-World Activity – Storing Images

The Real-World Activity associated with the C-STORE operation is the storage of the image in the Medcon system. **TCS 2.02a** will issue a failure status response if it is unable to store the image. When **TCS 2.02a** receives the association request, it will allow the follow activities to be performed during that association:

- Verification - Allow a remote DICOM device to verify that TCS 2.02a ImageManager is active on the DICOM network
- Storage Commitment - Receive the request for storage commitment. No manual operation is needed.

3.1.3.1.1 Associated Real-World Activity

The Real-World activity associated with the C-STORE operation is the storage of the image on the disk of the system upon which **TCS 2.02a** is running. Images are stored by writing the data set of the C-STORE command to disk and adding PS 3.10 header. **TCS 2.02a** will issue a failure status response if it is unable to store the image on disk or if the image does not conform to the IOD of the SOP class under which it was transmitted.

3.1.3.1.2 Presentation Context Table

Any of the Presentation Contexts shown in Table 8 are acceptable to **TCS 2.02a** for receiving images.

TABLE 9. Acceptable Presentation Contexts for **TCS 2.02a**

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name	UID		
See Note	See Note	Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None
See Note	See Note	Explicit VR Little Endian	1.2.840.10008.1.2.1	SCP	None
See Note	See Note	JPEG Lossless, Hierarchical, First-Order Prediction	1.2.840.10008.1.2.4.70	SCP	None
See Note	See Note	JPEG Lossy Process 1	1.2.840.10008.1.2.4.50	SCP	None
See Note	See Note	RLE Lossless	1.2.840.10008.1.2.4.5	SCP	None

Note: The Abstract Syntax corresponds to the SOP Class UID for Series modality and can be one of the following:

TABLE 10. Abstract Syntaxes

Abstract Syntax	
Name	UID
Computed Radiography Image Storage	1.2.840.10008.5.1.4.1.1.1
CT Image Storage	1.2.840.10008.5.1.4.1.1.2
Ultrasound Multi-frame Image Storage	1.2.840.10008.5.1.4.1.1.3.1
MR Image Storage	1.2.840.10008.5.1.4.1.1.4
Enhanced MR Image Storage	1.2.840.10008.5.1.4.1.1.4.1
Ultrasound Image Storage	1.2.840.10008.5.1.4.1.1.6.1
Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7
Multi-Frame Single bit Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7.1
Multi-Frame Grayscale Byte Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7.2
Multi-Frame Grayscale Word Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7.3
Multi-Frame True Color Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7.4
X-Ray Angiographic Image Storage	1.2.840.10008.5.1.4.1.1.12.1
X-Ray Radiofluoroscopic Image Storage	1.2.840.10008.5.1.4.1.1.12.2
Nuclear Medicine Image Storage	1.2.840.10008.5.1.4.1.1.20
X-Ray Bi-Plane Angiographic Image Storage	1.2.840.10008.5.1.4.1.1.12.3
Presentation State Storage	1.2.840.10008.5.1.4.1.1.11.1
Positron Emission Tomography Image Storage	1.2.840.10008.5.1.4.1.1.128
RT Image	1.2.840.10008.5.1.4.1.1.481.1
Digital X-Ray Image Storage – For Presentation	1.2.840.10008.5.1.4.1.1.1.1
Digital X-Ray Image Storage – For Processing	1.2.840.10008.5.1.4.1.1.1.1.1
Digital Mammography Image Storage – For Presentation	1.2.840.10008.5.1.4.1.1.1.2
Digital Mammography Image Storage – For Processing	1.2.840.10008.5.1.4.1.1.1.2.1
Digital Intra-oral X-Ray Image Storage – For Presentation	1.2.840.10008.5.1.4.1.1.1.3
Digital Intra-oral X-Ray Image Storage – For Processing	1.2.840.10008.5.1.4.1.1.1.3.1
VL Endoscopic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.1
Microscopic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.2
Slide-Coordinates Microscopic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.3
Photographic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.4

3.1.3.1.2.1 SOP Specific Conformance

3.1.3.1.2.1.1 SOP Specific Conformance to Storage SOP Classes

TCS 2.02a conforms to the SOPs of the Storage Service Class at Level 2 (Full). No elements are discarded or coerced by *TCS 2.02a*. In the event of a successful C-STORE operation, the Images have successfully been written to Medcon system. They may be accessed by Medcon applications or through DICOM Query/Retrieve Model.

If *TCS 2.02a* returns one of the following status codes, then the C-STORE was unsuccessful:

- **A700** (Out of Resources) - Indicates that there was not enough space to store the images.
- **A800** (SOP Class Not Supported) - Indicates that the SOP Class of the Image in the C-STORE operation did not match the Abstract Syntax negotiated for the Presentation Context. This indicates a problem with the SCU of the Service Class.
- **A900** (Data Set does not match SOP Class) - Indicates that the Data Set does not encode an instance of the SOP Class specified. This indicates a problem with SCU of the Service Class.
- **C000** (Cannot understand) - Indicates that *TCS 2.02a* cannot parse the Data Set into elements. This indicates a problem with the SCU.

3.1.3.1.3 Presentation Context Acceptance Criterion

TCS 2.02a defines no limit on the number of presentation contexts accepted.

If *TCS 2.02a* runs out of resources when trying to accept multiple presentation contexts, *TCS 2.02a* will reject the association request. *TCS 2.02a* does not check for duplicate presentation contexts and will accept duplicate presentation contexts.

3.1.3.1.4 Transfer Syntax Selection Policies

TCS 2.02a prefers explicit Little Endian Transfer Syntax with compressed pixel data.

If offered a choice of Transfer Syntaxes in a Presentation Context, it will apply the following priority to the choice of Transfer Syntax:

1. JPEG Lossless, Hierarchical, First-Order Prediction Transfer Syntax
2. Explicit Little Endian Transfer Syntax
3. Implicit Little Endian Transfer Syntax

3.1.3.2 Real World Activity – Finding Images

3.1.3.2.1 Associated Real World Activity

The Associated Real-World Activity associated with the C-FIND operation is the finding of the image in the Medcon system. *TCS 2.02a* will issue a failure status response if it is unable to find the image. The search is performed by comparing the keys specified in request with corresponding keys of images in system.

3.1.3.2.2 Presentation Context Table

Any of the Presentation Contexts shown in Table 11 are acceptable to *TCS 2.02a* for finding images.

TABLE 11. Acceptable Presentation Contexts

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name	UID		
Patient Root Query/Retrieve Information Model – FIND SOP Class	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 Information Model – FIND SOP Class	1.2.840.10008.5.1.4.1 .2.2.1	Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None
Patient Root Query/Retrieve Information Model – FIND SOP Class	1.2.840.10008.5.1.4.1 .2.1.1	Explicit VR Little Endian	1.2.840.10008.1.2.1	SCP	None
Study Root Query/Retrieve Information Model – FIND SOP Class	1.2.840.10008.5.1.4.1 .2.2.1	Explicit VR Little Endian	1.2.840.10008.1.2.1	SCP	None

3.1.3.2.2.1 SOP Specific Conformance for FIND SOP Classes

TCS 2.02a conforms to the SOPs of the Find Service Class at Level 2 (Full).

The *TCS 2.02a ImageManager* searches the Medcon database for the requested Information Objects described in the C_FIND identifier and returns a response for each match.

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.

The attribute (0000,0902) contains a descriptive message to explain error returns.

3.1.3.2.3 Presentation Context Acceptance Criterion

TCS 2.02a defines no limit on the number of presentation contexts accepted.

If *TCS 2.02a* runs out of resources when trying to accept multiple presentation contexts, *TCS 2.02a* will reject the association request. *TCS 2.02a* does not check for duplicate presentation contexts and will accept duplicate presentation contexts.

3.1.3.2.4 Transfer Syntax Selection Policy

The *TCS 2.02a* Application Entity conforms to the DICOM Patient Root Query/Retrieve and DICOM Study Root Query/Retrieve Service Class as an SCP for the Abstract Syntaxes listed in the table in section 3.1.3.2.2

TCS 2.02a prefers explicit Little Endian Transfer Syntax.

If offered a choice of Transfer Syntaxes in a Presentation Context, it will apply the following priority to the choice of Transfer Syntax:

1. Explicit Little Endian Transfer Syntax
2. Implicit Little Endian Transfer Syntax

3.1.3.3 Real World Activity – Retrieving

3.1.3.3.1 Associated Real World Activity

The Real-World Activity associated with the C-MOVE operation is the retrieving of the image from the Medcon system. *TCS 2.02a* will issue a failure status response if it is unable to retrieve the image.

3.1.3.3.2 Presentation Context Table

Any of the Presentation Contexts shown in Table 12 are acceptable to *TCS 2.02a* for retrieving images.

TABLE 12. Acceptable Presentation Contexts

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name	UID		
Patient Root Query/Retrieve Information Model – MOVE SOP Class	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 Information Model – MOVE SOP Class	1.2.840.10008.5.1.4.1 .2.2.2	Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None
Patient Root Query/Retrieve Information Model – MOVE SOP Class	1.2.840.10008.5.1.4.1 .2.1.2	Explicit VR Little Endian	1.2.840.10008.1.2.1	SCP	None
Study Root Query/Retrieve Information Model – MOVE SOP Class	1.2.840.10008.5.1.4.1 .2.2.2	Explicit VR Little Endian	1.2.840.10008.1.2.1	SCP	None

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

3.1.3.3.2.1 SOP Specific Conformance for MOVE SOP Classes

TCS 2.02a conforms to the SOPs of the Move Service Class at Level 2 (Full). 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 (0000,0902) contains a descriptive message to explain error returns.

3.1.3.3.3 Presentation Context Acceptance Criterion

TCS 2.02a defines no limit on the number of presentation contexts accepted. If *TCS 2.02a* runs out of resources when trying to accept multiple presentation contexts, *TCS 2.02a* will reject the association request. *TCS 2.02a* does not check for duplicate presentation contexts and will accept duplicate presentation contexts.

3.1.3.3.4 Transfer Syntax Selection Policy

TCS 2.02a prefers Explicit Little Endian Transfer Syntax. If offered a choice of Transfer Syntaxes in a Presentation Context, it will apply the following priority to the choice of Transfer Syntax:

1. Explicit Little Endian Transfer Syntax
2. Implicit Little Endian Transfer Syntax

3.1.3.4 Real World Activity – Verification

TCS 2.02a accepts associations from nodes that wish to perform a verification operation on *TCS 2.02a*.

3.1.3.4.1 Associated Real World Activity – Verification

The Real World Activity associated with the C-ECHO request is that an external node wishes to verify network or server operation without initiating any actual work.

3.1.3.4.2 Presentation Context Table

Table 13 shows the Presentation Contexts that may be accepted by *TCS 2.02a* for verification operations.

TABLE 13. Acceptable Presentation Contexts for *TCS 2.02a* for Verification

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name	UID		
Verification	1.2.840.10008.1.1	DICOM Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None
Verification	1.2.840.10008.1.1	DICOM Explicit VR Little Endian	1.2.840.10008.1.2.1	SCP	None

3.1.3.4.2.1 SOP Specific Conformance for SOP Class Verification

Not Applicable.

3.1.3.4.3 Presentation Context Acceptance Criterion

TCS 2.02a will accept the verification SOP classes listed in Table 10 above. *TCS 2.02a* defines no limit on the number of presentation contexts accepted. If *TCS 2.02a* runs out of resources when trying to accept multiple presentation contexts, *TCS 2.02a* will reject the association request.

3.1.3.4.4 Transfer Syntax Selection Policies

TCS 2.02a prefers Explicit Little Endian Transfer Syntax.

If offered a choice of Transfer Syntaxes in a Presentation Context, it will apply the following priority to the choice of Transfer Syntax:

1. Explicit Little Endian Transfer Syntax
2. Implicit Little Endian Transfer Syntax

3.1.3.5 Real-World Activity – Storage Commitment

The associated Real-World Activity is an attempt to make the commitment for the safekeeping of the SOP instances. *TCS 2.02a* uses Storage Commitment SOP Class Push Model implementation in order to guarantee the safe storage of SOP instances.

TCS 2.02a always returns the N-EVENT-REPORT on a separate association. This association is opened with reverse role negotiation, that is, the Calling AE is the SCP and the Called AE is the SCU.

After an N-ACTION request containing the Study Component Sequence has been received, the Storage Commitment N-EVENT-REPORT is built and returned.

3.1.2.5.2 Proposed Presentation Contexts

For this Real-World Activity, *TCS 2.02a* will propose the Presentation Contexts listed in Table 14.

TABLE 14. Proposed Presentation Contexts

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name	UID		
Storage Commitment Push Model	1.2.840.10008.1.20.1	DICOM Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None

3.1.3.6 Real-World Activity – Providing Modality Worklist

TCS 2.02 Worklist SCP application will wait for an association as an SCP for the Modality Worklist Service Class. When a Find request is received, a search is done in *TCS*

Database for the data with the requested attributes, and a list of found attributes is returned to the remote requester. The **TCS 2.02** Worklist Service accepts a number of associations, which is configured at the time of system initialization.

Asynchronous mode is not supported.

TABLE 15. Proposed Presentation Contexts

Abstract Syntax		Transfer Syntax		Role
Name	UID	Name	UID	
Modality Worklist Information Model -FIND	1.2.840.10008.5.1.4.31	Implicit VR Little Endian	1.2.840.10008.1.2	SCP
Modality Worklist Information Model -FIND	1.2.840.10008.5.1.4.31	Explicit VR Little Endian	1.2.840.10008.1.2.1	SCP

The supported Return Key Attributes are as follows:

Description	Tag	Matching Key Type	Return Key Type
Scheduled Procedure	Step		
Scheduled Procedure Step Sequence	0040,0100	R	1
>Scheduled Station AE Title	0040,0001	R	1
>Scheduled Procedure Step Start Date	0040,0002	R	1
>Scheduled Procedure Step Start Time	0040,0003	R	1
>Modality	0008,0060	R	1
>Scheduled Performing Physician's Name	0040,0006	R	2
>Scheduled Procedure Step Description	0040,0007	O	1C
>Scheduled Station Name	0040,0010	O	2
>Scheduled Procedure Step ID	0040,0009	O	1
>Scheduled Procedure Step Location	0040,0011	O	2
>Scheduled Action Item Code Sequence	0040,0008	O	1C

Description	Tag Step	Matching Key Type	Return Key Type
Scheduled Procedure			
>>Code Value	0008,0100	O	1C
>>Coding Scheme Designator	0040,0102	O	1C
>>Pre-Medication	0040,0012	O	2C
>Scheduled Procedure Step Status	0040,0020	O	3
Requested Procedure			
Requested Procedure ID	0040,1001	O	1
Requested Procedure Description	0032,1060	O	1C
Requested Procedure Code Sequence	0032,1064	O	1C
>Code Value	0008,0100	O	1C
>Coding Scheme Designator	0008,0102	O	1C
Study Instance UID	0020,000D	O	1
Referenced Study Sequence	0008,1110	O	2
>Referenced SOP Class UID	0008,1150	O	1C
>Referenced SOP Instance UID	0008,1155	O	1C
Requested Procedure Priority	0040,1003	O	2
Imaging Service Request			
Accession Number	0008,0050	O	2
Requesting Physician	0032,1032	O	2
Referring Physician's Name	0008,0090	O	2
Visit Identification			
Admission ID	0038,0010	O	2
Current Patient Location	0038,0300	O	2
Patient Identification			
Patient's Name	0010,0010	R	1
Patient ID	0010,0020	R	1
Patient Demographic			
Patients Birth Date	0010,0030	O	2
Patient's Sex	0010,0040	O	2

Description	Tag Step	Matching Key Type	Return Key Type
Scheduled Procedure			
Patient's Weight	0010,1030	O	2
Confidentiality constraint on patient data	0040,3001	O	2
Patient Medical			
Patient State	0038,0500	O	2
Pregnancy Status	0010,21C0	O	2
Medical Alerts	0010,2000	O	2
Contrast Allergies	0010,2110	O	2
Special Needs	0038,0050	O	2
All other Attributes from the Patient Medical Module		O	3

4 Communication Profiles

4.1 TCP/IP Stack

TCS 2.02a provides DICOM V3.0 TCP/IP Network Communication Support as defined in Part 8 of the DICOM Standard.

4.1.1 TCP/IP API

TCS 2.02a Image Manager inherits its TCP/IP stack from the computer system upon which it executes.

5 Extensions/Specializations/Privatization

TCS 2.02a supports all the private tags on level 2. Medcon private tags are listed in table 16.

TABLE 16. Medcon Private attributes

Data Element Tag	Name	Remark
(000D,0010)	Private Attributes Identification Code	
(000D,1000)	Patient TCS Location ID	
(000D,1001)	Study TCS Location ID	
(000D,1002)	Instance TCS Location ID	
(000D,1003)	Instance TCS ID	
(000D,1004)	Instance TCS Location ID	
(000D,1005)	Patient TCS ID	

Data Element Tag	Name	Remark
(000D,1006)	Related File	
(000D,1007)	Additional Patient ID	
(000D,1021)	Patient Creation Date	
(000D,1022)	Patient Creation Time	
(000D,1038)	Instance Description	
(000D,1062)	TCS Document File	
(000D,1063)	Annotation Note	
(000D,1076)	Annotation Creation Date	
(000D,1077)	Annotation Creation Time	
(000D,1082)	Instance Creation Date	
(000D,1083)	Instance Creation Time	
(000D,1090)	TCS Document Type	
(000D,0011)	Private Attributes Identification Code	
(000D,1101)	Patient Name	
(000D,1102)	Patient ID	
(000D,1103)	Patient Additional ID	
(000D,1104)	Patient Optional ID	
(000D,1105)	Series Description	
(000D,1106)	Series Optional ID	
(000D,1107)	Referring Physicians Name	
(000D,1108)	Performing Physicians Name	Names are Delimited by “\”
(000D,1109)	Instance Name	
(000D,1110)	Instance Description	

Elements from (000D,1101) – (000D,1110) are used for recording the UNICODE version of the relevant standard and private elements (if required).

All elements represent internal information used for media exchange between Medcon Systems.

6 Configuration

TCS 2.02a maintains configuration data in Registry and Configuration files. Configuration may be performed by **TCS 2.02a** Administration utility or manually.

6.1 Configurable Parameters.

AE Title = MEDSERVER_0117
 TCP Listen Port = 1133

Parameter Name	Default Value	Remark
PDU Size	16768 bytes	
List of permitted SCP for Query / Retrieve / Store	Empty	
List of SCU to be accepted associations from	Any association	
List of trusted Certification Authorities.		In case of operation inside secure domain
Number of simultaneous associations	3	
Option to do recompression		Option to change transfer syntax may be defined per modality for Store SCP.
Days Limit	10	Number of days for keeping received SOP instances in temporary directory.
Additional constant filters for worklist (WL) requests: Modality Performing Physician Station AE Titles Station Name	Empty	These parameters will be constantly added to WL requests.
Retrieve Timeout	45 min	Time for internal retrieving from TCS 2.02a Archive
Network Timeout		Timeout after which TCS 2.02a identifies network problems.
Remote Printer Port		
Remote Printer Host		
Remote Printer AE Title		