



*GE Medical Systems*

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# **Technical Publications**

Direction No 2284741ADF

Release 3.1

## **MedoraCOM 3.1 - DICOM Connectivity Package for GE Medora RIS**

**Conformance Statement for DICOM v3.0**

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# 1 INTRODUCTION

## 1.1 OVERVIEW

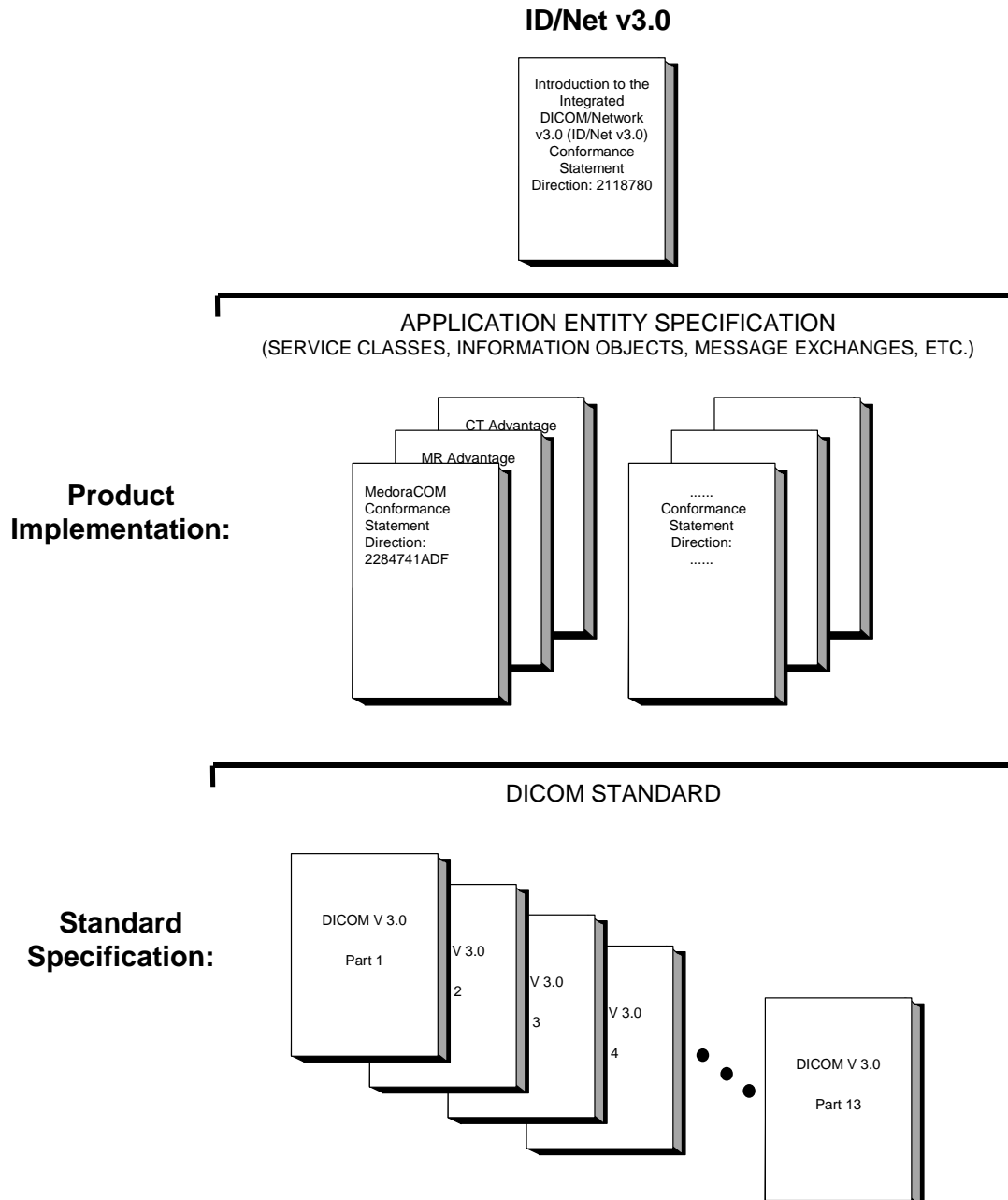
This DICOM Conformance Statement is divided into Sections as described below:

- Section 0(Introduction)**, which describes the overall structure, intent, and references for this Conformance Statement
- Section 2 (Summary)**, which gives a summary of all DICOM services that MedoraCOM supports and the references to the Chapters where the conformance statement of these services are present.
- Section 3 (MedoraCOM Server)**, which specifies the MedoraCOM compliance to DICOM requirements for Basic Modality Worklist SOP Class, Basic Study Content Notification SOP Class and Detached Interpretation Management SOP Class.
- Section 4 (MedoraCOM Detached Management Services)**, which specifies the MedoraCOM compliance to DICOM requirements for Detached Patient Management SOP Class, Detached Study Management SOP Class, Detached Results Management SOP Class and Detached Interpretation Management SOP Class.
- Section 5 (MedoraCOM Image Query / Retrieve)**, which specifies the MedoraCOM compliance to DICOM requirements for Image Query / Retrieve SOP Classes.
- Section 6 (MedoraCOM Image Storage for Key Images)**, which specifies the MedoraCOM compliance to DICOM requirements for Image Storage SOP Classes.
- Section 7 (MedoraCOM PPS Manager)**, which specifies the MedoraCOM compliance to DICOM requirements for Modality Performed Procedure Step SOP Classes.
- Section 8 - 11** give the general information applied to all of the services described in sections 3 - 7, like network interface, configuration, character set support, etc.

## 1.2 OVERALL DICOM CONFORMANCE STATEMENT DOCUMENT STRUCTURE

The Documentation Structure of the GEMS Conformance Statements and their relationship with the DICOM v3.0 Conformance Statements is shown in the illustration below.

**Illustration 1-1**



This document specifies the DICOM v3.0 implementation. It is entitled:

***MedoraCOM - RIS-PACS Communication Manager 3.1***

*Conformance Statement for DICOM v3.0*

*Direction*

This DICOM Conformance Statement documents the DICOM v3.0 Conformance Statement and Technical Specification which are required to interoperate with the GEMS network interface. Introductory information, which is applicable to all GEMS Conformance Statements, is described in the document:

*Introduction to the Integrated DICOM/Network v3.0 (ID/Net v3.0)*

*Conformance Statement*

*Direction: 2118780.*

This Introduction familiarises the reader with DICOM terminology and general concepts. It should be read prior to reading the individual products' GEMS Conformance Statements. The GEMS Conformance Statement, contained in this document, also specifies the Lower Layer communications, which it supports (e.g., TCP/IP). However, the Technical Specifications are defined in the DICOM v3.0 Part 8 standard.

For more information including Network Architecture and basic DICOM concepts, please refer to the Introduction.

For the convenience of software developers, there is "collector" Direction available. By ordering the collector, the Introduction described above and all of the currently published GEMS Product Conformance Statements will be received. The collector Direction is:

ID/Net v3.0 Conformance Statements

Direction: 2117016

For more information regarding DICOM v3.0, copies of the Standard may be obtained by written request or phone by contacting:

NEMA Publication  
1300 North 17th Street  
Suite 1847  
Rosslyn, VA 22209  
USA  
Phone: (703) 841-3200

### **1.3 INTENDED AUDIENCE**

The reader of this document is concerned with software design and/or system integration issues. It is assumed that the reader of this document is familiar with the DICOM v3.0 Standards and with the terminology and concepts, which are used in those Standards.

If readers are unfamiliar with DICOM v3.0 terminology they should first refer to the document listed below, then read the DICOM v3.0 Standard itself, prior to reading this DICOM Conformance Statement document.

*Introduction to the Integrated DICOM/Network v3.0 (ID/Net v3.0)*

*Conformance Statement*

*Direction: 2118780*

## 1.4 SCOPE AND FIELD OF APPLICATION

It is the intent of this document, in conjunction with the *Introduction to the Integrated DICOM/Network v3.0 (ID/Net v3.0) Conformance Statement, Direction: 2118780*, to provide an unambiguous specification for GEMS implementations. This specification, called a Conformance Statement, includes a DICOM v3.0 Conformance Statement and is necessary to ensure proper processing and interpretation of GEMS medical data exchanged using DICOM v3.0. The GEMS Conformance Statements are available to the public.

The reader of this DICOM Conformance Statement should be aware that different GEMS devices are capable of using different Information Object Definitions. For example, a GEMS CT Scanner may send images using the CT Information Object, MR Information Object, Secondary Capture Object, etc. Included in this DICOM Conformance Statement are the Module Definitions, which define all data elements used by this GEMS implementation. If the user encounters unspecified private data elements while parsing a GEMS Data Set, the user is well advised to ignore those data elements (per the DICOM v3.0 standard). Unspecified private data element information is subject to change without notice. If, however, the device is acting as a "full fidelity storage device", it should retain and re-transmit all of the private data elements, which are sent by GEMS devices.

## 1.5 IMPORTANT REMARKS

The use of these DICOM Conformance Statements, in conjunction with the DICOM v3.0 Standards, is intended to facilitate communication with GE imaging equipment. However, **by itself, it is not sufficient to ensure that inter-operation will be successful**. The **user (or user's agent)** needs to proceed with caution and address at least four issues:

- **Integration** - The integration of any device into an overall system of interconnected devices goes beyond the scope of standards (DICOM v3.0), and of this introduction and associated DICOM Conformance Statements when interoperability with non-GE equipment is desired. The responsibility to analyse the applications requirements and to design a solution that integrates GE imaging equipment with non-GE systems is the **user's** responsibility and should not be underestimated. The **user** is strongly advised to ensure that such an integration analysis is correctly performed.
- **Validation** - Testing the complete range of possible interactions between any GE device and non-GE devices, before the connection is declared operational, should not be overlooked. Therefore, the **user** should ensure that any non-GE provider accepts full responsibility for all validation required for their connection with GE devices. This includes the accuracy of the image data once it has crossed the interface between the GE imaging equipment and the non-GE device and the stability of the image data for the intended applications. Such a validation is required before any clinical use (diagnosis and/or treatment) is performed. It applies when images acquired on GE imaging equipment are processed/displayed on a non-GE device, as well as when images acquired on non-GE equipment is processed/displayed on a GE console or workstation.



- **Future Evolution** - GE understands that the DICOM Standard will evolve to meet the user's growing requirements. GE is actively involved in the development of the DICOM v3.0 Standard. DICOM v3.0 will incorporate new features and technologies and GE may follow the evolution of the Standard. The GEMS protocol is based on DICOM v3.0 as specified in each DICOM Conformance Statement. Evolution of the Standard may require changes to devices, which have implemented DICOM v3.0. **In addition, GE reserves the right to discontinue or make changes to the support of communications features (on its products) reflected on by these DICOM Conformance Statements.** The user should ensure that any non-GE provider, which connects with GE devices, also plans for the future evolution of the DICOM Standard. Failure to do so will likely result in the loss of function and/or connectivity as the DICOM Standard changes and GE Products are enhanced to support these changes.
- **To be informed of the evolution of the implementation described in this document, the User is advised to regularly check the GE Internet Server <http://www.ge.com/dicom>.**
- **Interaction** - It is the sole responsibility of the **non-GE provider** to ensure that communication with the interfaced equipment does not cause degradation of GE imaging equipment performance and/or function.

## 1.6 REFERENCES

A list of references, which is applicable to all GEMS Conformance Statements, is included in the *Introduction to the Integrated DICOM/Network v3.0 (ID/Net v3.0) Conformance Statement, Direction: 2118780*.

The information object implementation refers to DICOM PS 3.3 (Information Object Definition).

## 1.7 DEFINITIONS

A set of definitions which is applicable to all GEMS Conformance Statements is included in the *Introduction to the Integrated DICOM/Network v3.0 (ID/Net v3.0) Conformance Statement, Direction: 2118780*.

## 1.8 SYMBOLS AND ABBREVIATIONS

A list of symbols and abbreviations which is applicable to all GEMS Conformance Statements is included in the *Introduction to the Integrated DICOM/Network v3.0 (ID/Net v3.0) Conformance Statement, Direction: 2118780*.

Nevertheless there are the following abbreviations used in this document:

- MCSRV      **MedoraCOM SeRVer**
- MCWLP      **MedoraCOM WorkList Provider**
- MCSCNP      **MedoraCOM Study Content Notification Provider**
- MCDMS      **MedoraCOM Detached Management Services**
- MCQRS      **MedoraCOM Query/Retrieve Services**
- MCKIS      **MedoraCOM Key Image Store**
- MCPPS      **MedoraCOM PPS Manager**

## 2 SUMMARY

This document is the DICOM Conformance Statement for MedoraCOM. MedoraCOM is DICOM 3.0 conformant connectivity package for the GE Medora RIS. **As MedoraCOM is available on different operating system platforms there are however some differences in implementation and not all of these operating system dependant editions support all of the DICOM Service Classes listed below. Even if the service class is provided by all editions there may be some differences in implementation. The main deviations are between MedoraCOM running on Windows NT® and MedoraCOM running on Unix derivatives. If there are differences in implementation there will be some remarks in the chapters describing the DICOM service classes.** In summary MedoraCOM supports the following DICOM functions for the demographic data exchange, work flow management and image communication:

- Service Class Provider (SCP) of the DICOM Verification Service Class
- Service Class User (SCU) of the DICOM Verification Service Class
- Service Class Provider (SCP) of the DICOM Basic Modality Worklist Service Class
- Service Class Provider (SCP) of the DICOM Basic Study Content Notification Service Class
- Service Class Provider (SCP) of the DICOM Detached Patient Management Service Class
- Service Class Provider (SCP) of the DICOM Detached Study Management Service Class
- Service Class Provider (SCP) of the DICOM Detached Results Management Service Class
- Service Class Provider (SCP) of the DICOM Detached Interpretation Management Service Class
- Service Class Provider (SCP) of the DICOM Storage Service Class<sup>1</sup>
- Service Class User (SCU) of the DICOM Query / Retrieve Service Class
- Service Class User (SCU) of the DICOM Modality Performed Procedure Step Service Class
- Service Class Provider (SCP) of the DICOM Modality Performed Procedure Step Service Class

These DICOM services have been implemented in a number of applications, which can be configured to share the same DICOM Application Entity Title or use their own DICOM Application Entity Titles. In MedoraCOM, all DICOM applications are configured to support the same DICOM Application Entity. In this text, we use the term *MedoraCOM Application Entity* to refer to this global Application Entity. All MedoraCOM DICOM applications share the same *MedoraCOM DICOM Application Entity Title*.

This text presents the DICOM Conformance Statement information of these applications in several chapters organised logically according to their functionality. In the following, a brief road map to these chapters is given to facilitate the reading of this document:

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<sup>1</sup> For receiving so called key images or significant images only

### **MedoraCOM Server**

This chapter includes the SCP of the following service classes:

- **Basic Modality Worklist**

This chapter includes the SCP of the DICOM Basic Modality Worklist Service Class for modality worklist sending after having received a request from a remote DICOM application entity.

- **Basic Study Content Notification**

This chapter includes the SCP of the DICOM Basic Study Content Notification Service Class for study content notification receiving from a remote DICOM node.

- **Detached Interpretation Management**

This chapter includes the SCP of the DICOM Detached Results Management Service Class for results being retrieved by a remote DICOM node.

### **MedoraCOM Detached Management Services**

This chapter includes the SCP of the following service classes:

- **Detached Patient Management**

This chapter includes the SCP of the DICOM Detached Patient Management Service Class for patient demographic data sending to a remote DICOM node due to patient data modification in the RIS database either by user interaction or by the HIS interface software.

- **Detached Study Management**

This chapter includes the SCP of the DICOM Detached Study Management Service Class for study data sending to a remote DICOM node due to study data creation and/or modification in the RIS database either by user interaction or by the HIS interface software.

- **Detached Results Management**

This chapter includes the SCP of the DICOM Detached Results Management Service Class for results data sending to a remote DICOM node due to results data creation and/or modification in the RIS database.

- **Detached Interpretation Management**

This chapter includes the SCP of the DICOM Detached Interpretation Management Service Class for either interpretation data sending to a remote DICOM node due to interpretation data creation and/or modification in the RIS database or for allowing remote DICOM application entities to retrieve an interpretation text from the RIS.

### **Image Query & Retrieve**

This chapter includes the SCU of the DICOM Query & Retrieve Service Class for either GE Medora RIS users or internal server processes to query/retrieve image information/images from a remote DICOM Query & Retrieve Service Class Provider.

### **Image Storage**

This chapter includes the SCP of the DICOM Storage Service Class for image receiving from a remote DICOM node. The DICOM Storage Service Class is only supported by the Windows NT<sup>®</sup> edition of MedoraCOM. This component has been implemented to receive key images, which are specified as significant images.

**Modality Performed Procedure Step (MPPS)**

This chapter includes the SCP and the SCU of the DICOM Modality Performed Procedure Step Service Class. The Modality Performed Procedure Step MPPS Service Class is only supported by the Windows NT<sup>®</sup> edition of MedoraCOM. This component has been implemented to provide reception of information related to a performed procedure step from medical modalities or other systems that are acting as an SCU of the Modality Performed Procedure Step Service Class. Furthermore the MedoraCOM PPS manager is able to forward the received information to a third system in order to fulfil the requirements to a PPS manager in terms of IHE.

### **3 MEDORACOM SERVER**

This chapter gives the technical specification of the MedoraCOM Server (MCSRVS) - a part of the DICOM communication interface of GE's Radiology Information System Medora.

As MCSRVS is not a stand-alone process on the respective system environment, it is part of the so called "MedoraCOM Server" process.

MCSRVS provides access to a worklist database maintained in GE Medora RIS using DICOM protocols and messages. More specifically, it implements the Modality Worklist Management SOP Class as an SCP. As a second functionality MCSRVS provides access to a RIS database maintained in GE Medora RIS using DICOM protocols and messages. More specifically, it also implements the Study Content Notification SOP Class as an SCP.

Last but not least MCSRVS supports also the Detached Interpretation Management SOP Class (N-GET).

MCSRVS supports a single application entity (AE).

#### **3.1 IMPLEMENTATION MODEL**

MedoraCOM is implemented as a collection of one or several components and each of these components provide the support of one or several DICOM Service Classes - SOPs. With this component architecture, MedoraCOM can be configured as really demanded in a concrete installation site. The components can be configured as separate DICOM Application Entities, or they can share one same AE Title. In the first case, MedoraCOM supports multiple AE Titles and in the later case MedoraCOM supports one AE Title.

Usually, all components of MedoraCOM share one same AE Title and MedoraCOM appears as one DICOM application. The installation manual of MedoraCOM provides the configuration information of a concrete installation.

The component MCSRVS has been implemented to act as a Service Class Provider (SCP) of the DICOM Standard Basic Worklist Management Service Class, the Basic Study Content Notification and also the Detached Interpretation Management SOP Class. In a client-server-environment, a DICOM SCP acts as a server. In the MedoraCOM documents, therefore, MCSRVS may be also called MedoraCOM Server. The application is either a UNIX® application and can run on most UNIX® platforms or a Windows NT® process to run on a Windows NT® system.

The MedoraCOM Server supports one AE Title. The AE Title can be the same AE Title that other components of MedoraCOM support, or another specialised AE Title.

##### **3.1.1 Application Data Flow Diagram**

MedoraCOM Server is either a WIN 32 process controlled by the RIS-PACS Communication Manager service able to run on a Microsoft® Windows NT™ machine or on a Unix machine.

MedoraCOM Server may be automatically started when the machine is booted or it may be started when the GE Medora RIS server processes are launched what means that no user login is required.

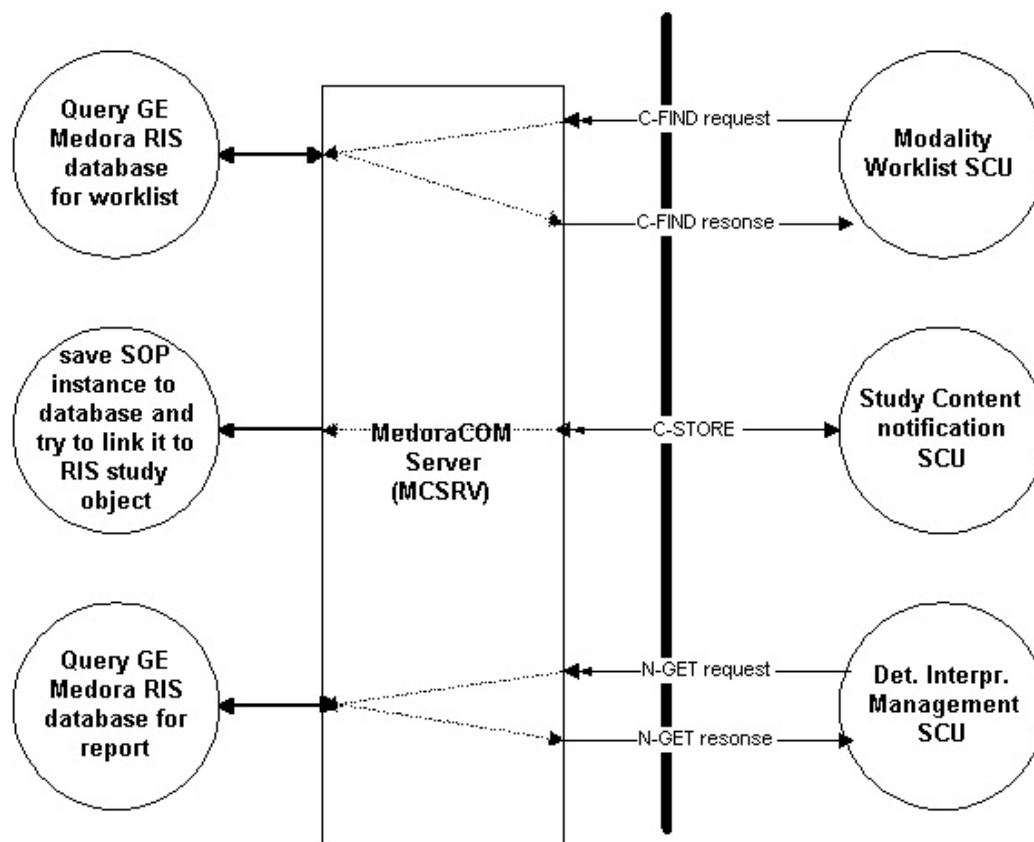
A remote DICOM Application Entity initiates an association for either DICOM Modality Worklist Service Class, DICOM Study Content Notification or DICOM Detached Interpretation Management to MedoraCOM.

When MCSRVR accepts the DIMSE C-FIND association, the remote AE transmits the DICOM information objects within the C-FIND request to MCSRVR. Using these attributes MCSRVR queries the GE Medora RIS database for worklist according to the matching keys given in the C-FIND request.

When MCSRVR accepts the DIMSE C-STORE association, the remote AE transmits the DICOM information objects within the C-STORE request to MCSRVR. If an SOP instance is successfully received on the association, MCSRVR saves the study information in the GE Medora RIS database and tries to build a link between the received study to the corresponding study object in the RIS. Afterwards MCWLP transmits the worklist item within the C-FIND response back to the remote DICOM node.

When MCSRVR accepts the DIMSE N-GET association, the remote AE transmits an interpretation instance UID within the N-GET request to MCSRVR. MCSRVR expects the last component of the UID to be a valid accession number and extracts it from the UID. Using this parameter MCSRVR queries the GE Medora RIS database for the corresponding report and sends the report back to the peer.

**Illustration 3-1**



### 3.1.2 Functional Definition of AE

After being started, MCSRVR is always waiting for an association request from a remote DICOM application entity. MCSRVR will accept an association with the supported SOP classes only for those remote DICOM applications, which are specified in the configuration of MedoraCOM. This means

that not all remote DICOM application entities are permitted for example to query a modality worklist from MedoraCOM.

### **3.1.3 Sequencing of Real-World Activities**

#### **3.1.3.1 Basic Modality Worklist**

With the GE Medora RIS application a radiological examination can be scheduled either by user interaction or by receiving the data by the HIS interface. Based on these actions a study object is created in the RIS and stored in the RIS database. Based on the configuration of the basic data “workplace” and “medical device” and the dependence between these data also a worklist item is created in the RIS database. In the configuration of the medical device also the DICOM application entity title of the remote modality worklist SCU has to be specified.

Note: GE Medora RIS and MedoraCOM support multiple scheduled AE titles per study object. Therefore a single RIS study object can be available as a worklist item in the responses of different modality worklist SCUs. This option may be very useful for scenarios in which the user is not able to decide on what imaging equipment the examination shall take place at the time the study is scheduled.

From the time on the patient is admitted the study will appear in every worklist message, which is transmitted if the given matching keys of a worklist request match the study parameters. After the status of the RIS study object has changed to completed, the study will be no longer included as an item in the worklist message.

#### **3.1.3.2 Basic Study Content Notification**

If MCSRVS receives a valid Study Content Notification SOP instance, the related tables of the database will be updated to keep the track of the images archived in the client’s data. Using the information in the database tables, GE Medora RIS users can retrieve these images at any later time.

#### **3.1.3.3 Detached Interpretation Notification**

If MCSRVS receives a valid N-GET request of the detached interpretation management SOP class, the related tables of the database will be queried in order to get the corresponding report to be sent back to the remote DICOM application entity.

## **3.2 APPLICATION ENTITY SPECIFICATION**

MCSRVS is one functional component of MedoraCOM and supports the DICOM Basic Worklist Service Class, the DICOM Study Content Notification SOP Class and the Detached Interpretation Management SOP Class.

All operational parameters (such as AE titles, port numbers) can be accessed and changed by using the MedoraCOM Monitor application on a Windows NT based system or by editing configuration files on Unix based systems.



MCSRVS provides Standard Conformance to the following DICOM 3.0 SOP Class as an SCP:

**Table 3-1**

SOP Class Name	SOP Class UID	Role
Modality Worklist Management	1.2.840.10008.5.1.4.31	SCP
Basic Study Content Notification	1.2.840.10008.1.9	SCP
Detached Interpretation Management	1.2.840.10008.3.1.2.6.1	SCP

Note: Only the N-GET and N-EVENT-REPORT DIMSE services of the Detached Interpretation Management SOP Class are supported by MedoraCom.

### 3.2.1 Association Establishment Policies

#### 3.2.1.1 General

MCSRVS accepts associations for the purposes of Modality Worklist Management - query, the Study Content Notification - store and the Detached Interpretation Management - get. MCSRVS accepts association requests from a remote DICOM AE only when it is registered in the configuration of MCSRVS (including AE Title (mandatory), optional TCP Port Number and Network Address) but MCSRVS does not initiate any association to a remote DICOM application entity.

The maximal PDU size, which MCSRVS supports, is configurable while the default value is 16 KB.

In general, MCSRVS obeys the association establishment policies of MedoraCOM.

#### 3.2.1.2 Number of Associations

MCSRVS can accept and process multiple associations simultaneously. The maximum number of simultaneous associations is configurable. MedoraCOM Server will create a new process for each connection request it receives.

#### 3.2.1.3 Asynchronous Nature

MCSRVS will not perform asynchronous operations window negotiation.

#### 3.2.1.4 Implementation Identifying Information

MCSRVS will provide a single Implementation Class UID of

”1.2.840.113619.6.95.31.0.3.4.1”

and an implementation version name of

”MEDORACOM31”

### 3.2.2 Association Acceptance Policy

MCSRVS accepts associations for the purposes of retrieving worklist information, saving study, series and image information and retrieving a report. MCSRVS accepts an association request only from remote DICOM application entities, which are known in the configuration of MedoraCOM.

The limitations on processing multiple associations simultaneously are adjustable.

### 3.2.2.1 Associated Real-World Activities

#### 3.2.2.1.1 Basic Modality Worklist

MCSRVS supports a client to query the modality worklist database of the GE Medora RIS. The client is usually an imaging modality or a system, which is delegated by imaging modalities. Each worklist item (organised as a Scheduled Procedure Step defined in the DICOM Standard) represents a scheduled imaging examination for a particular patient to achieve a minimum of user interaction for assignments of PACS study objects to RIS study objects within a complete RIS-PACS workflow it is recommended that all returned key attributes will be encoded in the generated images. Currently MCSRVS does not support more than one scheduled procedure steps per requested procedure.

#### 3.2.2.1.2 Basic Study Content Notification

The associated Real-World Activity is to notify the RIS on the content of an imaging study.

#### 3.2.2.1.3 Detached Interpretation Management

MCSRVS supports a client to query the Radiological Diagnostic Report Database of the GE Medora RIS. The client is usually an image workstation.

### 3.2.2.2 Presentation Context Table

MCSRVS will accept any of the presentation contexts shown in the following table.

**Table 3-2 Acceptable Presentation Contexts for MCSRVS**

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name	UID		
Verification	1.2.840.10008.5.1.4.31	DICOM Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None
		DICOM Explicit VR Little Endian	1.2.840.10008.1.2.1		
		DICOM Explicit VR Big Endian	1.2.840.10008.1.2.2		
Modality Worklist Information Model – FIND	1.2.840.10008.5.1.4.31	DICOM Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None
		DICOM Explicit VR Little Endian	1.2.840.10008.1.2.1		
		DICOM Explicit VR Big Endian	1.2.840.10008.1.2.2		
Basic Study Content Notification SOP Classes	1.2.840.10008.1.9	DICOM Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None
		DICOM Explicit VR Little Endian	1.2.840.10008.1.2.1		
		DICOM Explicit VR Big Endian	1.2.840.10008.1.2.2		
Interpretation Management SOP Class N– GET	1.2.840.10008.3.1.2.6.1	DICOM Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None
		DICOM Explicit VR Little Endian	1.2.840.10008.1.2.1		
		DICOM Explicit VR Big Endian	1.2.840.10008.1.2.2		

### 3.2.2.2.1 SOP Specific Conformance

#### 3.2.2.2.1.1 SOP Specific Conformance to the Modality Worklist Management SOP Class

MCSRVS supports the attributes listed in the following tables for matching and returning, respectively. These lists represent the supported attributes in the current version of the MCWLP maybe will be extended in future software versions.

The Medora Modality Worklist Server supports matching on the Matching Key Attributes listed in the following table.

**Table 3-3 Supported Matching Key Attributes**

Description / Module	Tag	Matching Key Type	Supported by Windows NT Edition	Supported by Unix Edition
Scheduled Procedure Step			☒	☒
Scheduled Procedure Step Sequence	(0040,0100)	R	☒	☒
>Scheduled Station AE Title	(0040,0001)	R	☒	☒
>Scheduled Procedure Step Start Date	(0040,0002)	R	☒	☒
>Scheduled Procedure Step Start Time	(0040,0003)	R	☒	☒
>Modality	(0008,0060)	R	☒	☒
>Scheduled Performing Physician's Name	(0040,0006)	R	☒	☒
>Comments on the Scheduled Procedure Step	(0040,0400)	O	☒	☒
Patient Identification			☒	☒
Patient's Name	(0010,0010)	R	☒	☒
Patient ID	(0010,0020)	R	☒	☒

The Medora Modality Worklist Server supports the Return Key Attributes listed in the following table.

**Table 3-4 Supported Return Key Attributes**

Description / Module	Tag	Return Key Type	Supported by Windows NT Edition	Supported by Unix Edition
<b>SOP Common</b>			☒	☒
Specific Character Set	(0008,0005)	1C	☒	☒
<b>Scheduled Procedure Step</b>			☒	☒
Scheduled Procedure Step Sequence	(0040,0100)	1	☒	☒
>Scheduled Station AE Title	(0040,0001)	1	☒	☒
>Scheduled Procedure Step Start Date	(0040,0002)	1	☒	☒
>Scheduled Procedure Step Start Time	(0040,0003)	1	☒	☒

Description / Module	Tag	Return Key Type	Supported by Windows NT Edition	Supported by Unix Edition
>Modality	(0008,0060)	1	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
>Scheduled Performing Physician's Name	(0040,0006)	2	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
>Scheduled Procedure Step Description	(0040,0007)	1C	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
>Scheduled Station Name	(0040,0010)	2	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
>Scheduled Procedure Step Location	(0040,0011)	2	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
>Pre-Medication	(0040,0012)	2C	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
>Scheduled Procedure Step ID	(0040,0009)	1	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
>Requested Contrast Agent	(0032,1070)	2C	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
>Comments on the Scheduled Procedure Step	(0040,0400)	3	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Referenced Study Sequence	(0008,1110)	2	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
>Referenced SOP Class UID	(0008,1150)	1C	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
>Referenced SOP Instance UID	(0008,1155)	1C	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
<b>Requested Procedure</b>			<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Requested Procedure ID	(0040,1001)	1	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Requested Procedure Alternative ID <sup>2</sup>	(0041,1001)	2	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Requested Procedure Code Sequence	(0032,1064)	1C	<input checked="" type="checkbox"/>	<input type="checkbox"/>
>Code Value	(0008,0100)	1C	<input checked="" type="checkbox"/>	<input type="checkbox"/>
>Coding Scheme Designator	(0008,0102)	1C	<input checked="" type="checkbox"/>	<input type="checkbox"/>
>Code Meaning	(0008,0104)	3	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Requested Procedure Description	(0032,1060)	1C	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Study Instance UID	(0020,000D)	1	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Requested Procedure Priority	(0040,1003)	2	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Patient Transport Arrangements	(0040,1004)	2	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
<b>Imaging Service Request</b>			<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Accession Number	(0008,0050)	2	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Requesting Physician	(0032,1032)	2	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Referring Physician's Name	(0008,0090)	2	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
<b>Visit Identification</b>			<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Admission ID	(0038,0010)	2	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

<sup>2</sup> Requested Procedure Alternative ID is a private element defined by GEMS IT. This element is used to provide an alternative means to identify a requested procedure outside of the DICOM object oriented model. Such a means can be defined by institutions to meet their concrete requirements. Clients not supporting this element can simply ignore it.

Description / Module	Tag	Return Key Type	Supported by Windows NT Edition	Supported by Unix Edition
<b>Visit Status</b>			<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Current Patient Location	(0038,0300)	2	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
<b>Visit Relationship</b>			<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Referenced Patient Sequence	(0008,1120)	2	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
>Referenced SOP Class UID	(0008,1150)	1C	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
>Referenced SOP Instance UID	(0008,1155)	1C	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
<b>Patient Identification</b>			<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Patient's Name	(0010,0010)	1	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Patient ID	(0010,0020)	1	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
<b>Patient Demographic</b>			<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Patients Birth Date	(0010,0030)	2	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Patient's Sex	(0010,0040)	2	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Patient's Weight	(0010,1030)	2	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Confidentiality constraint on patient data	(0040,3001)	2	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
<b>Patient Medical</b>			<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Patient State	(0038,0500)	2	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Pregnancy Status	(0010,21C0)	2	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Medical Alerts	(0010,2000)	2	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Contrast Allergies	(0010,2110)	2	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Special Needs	(0038,0050)	2	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

### 3.2.2.2.1.2 SOP Specific Conformance to the Study Content Notification SOP Class

MCSRVS provides the Standard Conformance to the DICOM Study Content Notification Service Class.

In the event of a successful C-STORE operation, MCSRVS saves all UIDs identifying the notified imaging study in the RIS and uses the Study Instance UID and the patient information for trying to build a link between the study and a study object in the RIS. The RIS may use these UIDs to move the images at a later time.

In order to facilitate to link the notified imaging study appropriately to a study object in the RIS, this implementation of MCSRVS prefers that the remote DICOM application should submit a Basic Study Content Notification IOD instance with some extension, which is listed in the next chapter. In general, MCSCNP can handle any additional attributes included in the SOP instance. Those attributes not listed in Table 3-6 Additional Attributes in the Basic Study Content Notification IOD Supported by MC will be simply ignored.

The SCP behaviour as a result of receiving the Study Content Notification information consists of storing study, series and image identification data in the RIS database to provide the ability studies, series and/or images to be retrieved by the RIS. Therefore the SCP support the 2C attribute Retrieve AE title (0008,0054).

MCSRVR returns one of the following status codes to indicate an unsuccessful the C-STORE:

**Table 3-5 Reponse Codes**

<b>Response Code</b>	<b>Status</b>	<b>Further Meaning</b>
0000	Success	Complete Study Content exists on RIS
A700	Out of Resources	Indicates that there was not enough disk space to store the information included in the SOP instance. Recovery from this condition is left to the administrator of MedoraCOM.
A800	SOP Class Not Supported	Indicates that the SOP Class of the instance dataset 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 the Data Set cannot be parsed into elements by MCSCN. This indicates a problem with the SCU.

**3.2.2.2.1.3 Extension of the Basic Study Content Notification IOD**

MCSRVR supports the following additional data attributes in a DICOM standard Basic Study Content Notification IOD instances:

**Table 3-6 Additional Attributes in the Basic Study Content Notification IOD Supported by MCSR V**

Description / Module	Tag	Supported by Windows NT Edition	Supported by Unix Edition
<b>Study Level</b>			
Accession Number	(0008,0050)	☒	☒
Study Date	(0008,0020)	☒	☒
Study Time	(0008,0030)	☒	☒
Study Description	(0008,1030)	☒	☒
<b>Series Level</b>			
Modality	(0008,0060)	☒	☒
Series Date	(0008,0021)	☒	☒
Series Time	(0008,0031)	☒	☒
Series Description	(0008,103E)	☒	☒

MCSR V will make use of these additional data attributes to facilitate the link between the notified imaging study and a study object in the RIS.

**3.2.2.2.1.4 SOP Specific Conformance to the Detached Interpretation Management SOP Class**

MCSR V supports a client to retrieve the attributes listed in the following tables in a N-GET request. These lists represent the supported attributes in the current version of the MCSR V and may be extended in future software versions.

**Table 3-7 Attribute List**

Description / Module	Tag	Return Key Type	Supported by Windows NT Edition	Supported by Unix Edition
<b>SOP Common</b>				
Specific Character Set	(0008,0005)	1C	☒	☒
<b>Interpretation Relationship</b>				
Referenced Results Sequence	(0008,1100)	1	☒	☒
>Referenced SOP Class UID	(0008,1150)	1C	☒	☒
>Referenced SOP Instance UID	(0008,1155)	1C	☒	☒
<b>Interpretation Identification</b>				
>Interpretation ID	(4008,0200)	2	☒	☒

Description / Module	Tag	Return Key Type	Supported by Windows NT Edition	Supported by Unix Edition
<b>Interpretation State</b>				
Interpretation Type ID	(4008,0210)	2	☒	☒
Interpretation Status ID	(4008,0212)	2	☒	☒
<b>Interpretation Transcription</b>				
Interpretation Transcription Date	(4008,0108)	3	☒	☒
Interpretation Text	(4008,010B)	2	☒	☒
Interpretation Author	(4008,010C)	2	☒	☒
<b>Interpretation Approval</b>				
Interpretation Approver Sequence	(4008,0111)	3	☒	☒
>Interpretation Approval Date	(4008,0112)	3C	☒	☒
>Interpretation Approval Time	(4008,0113)	3C	☒	☒
>Physicians Approving Interpretation	(4008,0114)	3C	☒	☒
Interpretation Diagnosis Description	(4008,0115)	3	☒	☒

### 3.2.2.2 Presentation Context Acceptance Criterion

MCSRVS will always accept a Presentation Context for the Modality Worklist SOP Class, the Study Content Notification SOP Class and the Detached Interpretation Management SOP Class with the DICOM Default Transfer Syntax.

MCSRVS will accept any number of presentation contexts specified in Table 3-2 Acceptable Presentation Contexts for MCSRVS. MCSRVS will examine proposed Presentation contexts in the order proposed. For the presentation contexts of the same abstract syntax but different transfer syntaxes, only one of these presentation contexts will be accepted with the most preferred transfer syntax chosen by MCSRVS. The policy of making this choice is described in the next section.

### 3.2.2.3 Transfer Syntax Selection Policy

MCSRVS selects a transfer syntax to accept for the worklist query, receiving study information or retrieving a diagnostic report with the following general rules: First of all, it prefers a transfer syntax which provides the explicit VR representation. After the VR choice has been made, MCSRVS tries to select the transfer syntax using following preference in descending order:

1. Explicit VR Little Endian
2. Explicit VR Big Endian
3. Implicit VR Little Endian

Different Transfer Syntaxes will not be selected.



## **4 MEDORACOM DETACHED MANAGEMENT SERVICES**

### **4.1 IMPLEMENTATION MODEL**

MedoraCOM is implemented as a collection of one or several components and each of these components provides support of one or several DICOM Service Classes - SOPs. With this component architecture, MedoraCOM can be configured as actually demanded in a concrete installation site. The components can be configured as separate DICOM Application Entities, or they can share a common AE Title. In the first case, MedoraCOM supports multiple AE Titles and in the later case MedoraCOM support one AE Title.

Usually, all components of MedoraCOM share a same AE Title and MedoraCOM appears as one DICOM application. The Installation Notes of MedoraCOM provides the configuration information of a concrete installation.

The component MedoraCOM Detached Management Services (MCDMS) has been implemented to support the Service Class Provider (SCP) of the DICOM Detached Patient Management, Detached Study Management, Detached Results Management and Detached Interpretation Management SOP Classes. In a client-server-environment, a DICOM SCP acts as a server. In the MedoraCOM documents, therefore, MCDMS may be also called MedoraCOM NER Server. The application is either a UNIX® application and can run on most UNIX® platforms or a Windows NT® application to run on a Windows NT® system.

The component MCDMS supports one AE Title. The AE Title can be the same AE Title that MedoraCOM supports, or another specialised AE Title.

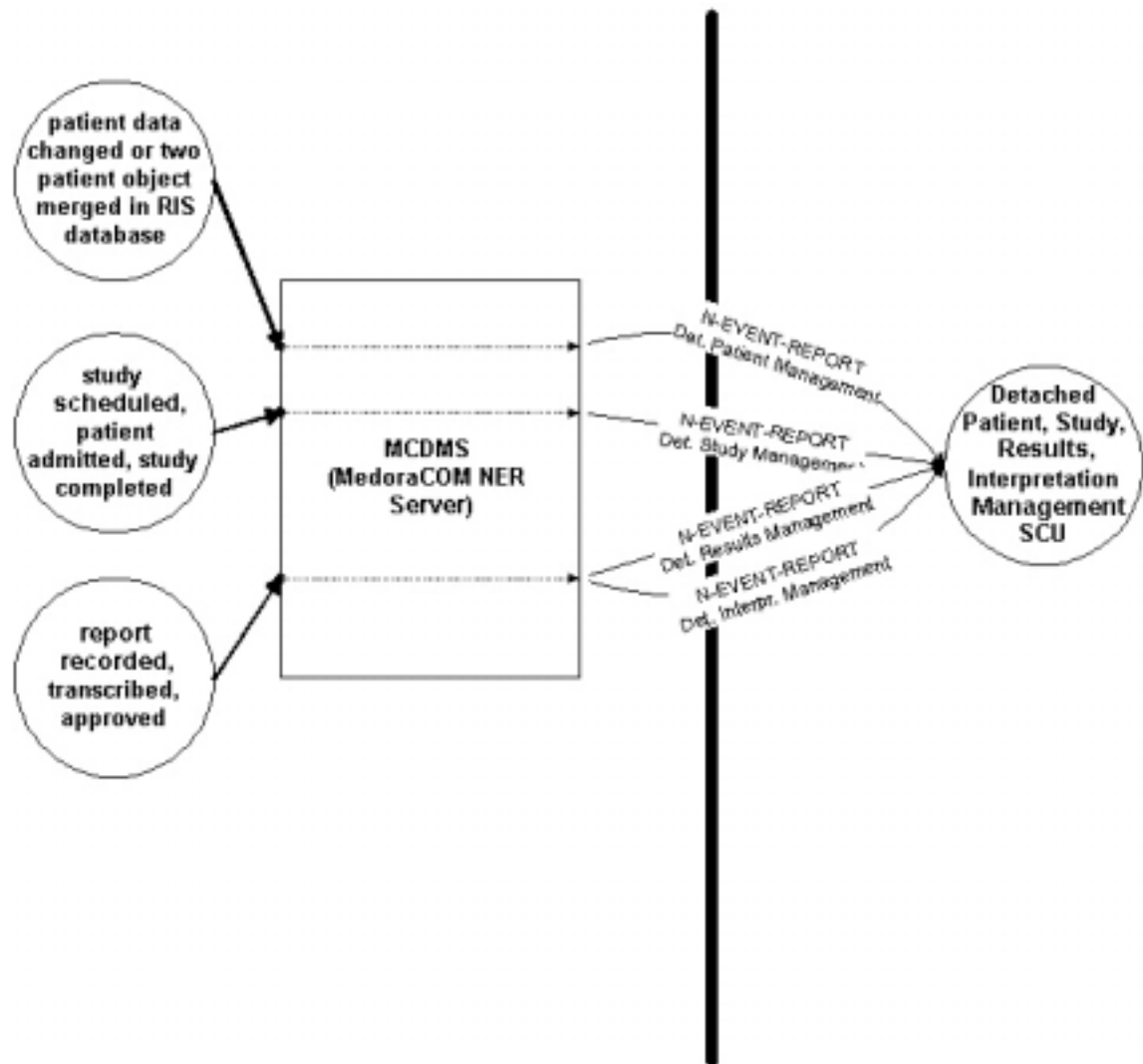
### **4.2 APPLICATION DATA FLOW DIAGRAM**

MedoraCOM NER Server is either a WIN 32 process controlled by the RIS-PACS Communication Manager service able to run on a Microsoft® Windows NT™ machine or a Unix application to run on a Unix machine.

MedoraCOM NER Server may be automatically started when the machine is booted or it may be started when the GE Medora RIS server processes are launched.

MCDMS initiates an association for either the DICOM Detached Patient Management, the Detached Study Management, the Detached Results Management or the Detached Interpretation Management Service Class to one specified remote DICOM application entity. When the remote DICOM node accepts the association, the MCDMS transmits the DICOM information objects within the N-EVENT\_REPORT request to the remote AE. If an SOP instance could not successfully transmitted on the association, MCDMS caches the underlying event and retries to send the information until it is successfully completed.

Illustration 4-1



#### 4.2.1 Functional Definition of AE

MCDMS provides an interface to send patient related changes of data, study scheduling information, study status information and/or report related information to a remote DICOM node (often it is a PACS controller) to notify the remote AE about the changes of information in the RIS database. It is configurable which DICOM service classes shall be used by MCDMS. The data of all the detached management service classes can only be sent to one single SCU. Due to that it is for instance impossible to send patient related data to one remote DICOM AE and study related information to another remote DICOM AE.

#### 4.2.2 Sequencing of Real-World Activities

Using the following mechanisms data can be kept consistent on all concerned information and management systems.

#### 4.2.2.1 Detached Patient Management

When patient data are changed in the GE Medora RIS database either by user interaction or the HIS interface modifications of patient data are forwarded from the HIS to the departmental information systems, the MCDMS component is notified by a trigger mechanism to catch the event and forward the changed data to just one specified destination remote DICOM AE.

#### 4.2.2.2 Detached Study Management

When a study is scheduled, the patient is admitted, study date/time is changed or the activity recording is done in the GE Medora RIS database usually by user interaction, the MCDMS component is notified by a trigger mechanism to catch the event and forward the study data to just one specified destination remote DICOM AE.

#### 4.2.2.3 Detached Results Management

When a report is transcribed or approved in the GE Medora RIS database, the MCDMS component is notified by a trigger mechanism to catch the event and forward the changed data to just one specified destination remote DICOM AE. If the N-EVENT-REPORT message of the detached results management service class could be successfully sent to the peer, also a N-EVENT-REPORT message of the detached interpretation management service class will be sent afterwards containing the report text.

#### 4.2.2.4 Detached Interpretation Management

When a report is transcribed or approved in the GE Medora RIS database, the MCDMS component is notified by a trigger mechanism to catch the event and forward the changed data to just one specified destination remote DICOM AE. The N-EVENT-REPORT message of the detached interpretation management service class will only be sent if the event of the detached results management service class could successfully be transmitted before but both events are handled using two associations.

#### 4.2.2.5 Study States in GE Medora RIS

State	Description
SCHEDULED:	An appointment for the examination is made
REGISTERED:	Patient has arrived and has been admitted.
WAITING:	Patient is waiting for the examination
STARTED	Study is in progress.
COMPLETED	Study is completed
RECORDED	Report assigned to study is dictated.
TRANSCRIBED	Report is written.
REPORTED	All assigned report are approved ( amendments ).

#### 4.2.2.6 Report States in GE Medora RIS

State	Description
<b>NOT REPORTED:</b>	<b>Report is neither dictated nor written.</b>
RECORDED:	Diagnostic report has been dictated.
TRANSCRIBED:	Report is written.
READ:	Report has been read.
CORRECTED:	Report has been modified.
APPROVED:	Report has been verified.

### 4.3 APPLICATION ENTITY SPECIFICATION

MCDMS is one functional component of MedoraCOM and supports the DICOM Detached Patient management, the Detached Study Management, the Detached Results and the Detached Interpretation Management Service Class.

All operational parameters (such as AE titles, port numbers) can be accessed and changed by using the MedoraCOM Monitor application on a Windows NT™ based system or by editing configuration files on Unix based systems.

### 4.3.1 Association Establishment Policies

MCDMS provides Conformance to the following DICOM 3.0 SOP Class as an SCP only concerning the N-EVENT-REPORT DIMSE service:

**Table 4-1**

SOP Class Name	SOP Class UID	Role
Detached Patient Management	1.2.840.10008.3.1.2.1.1	SCP
Detached Results Management	1.2.840.10008.3.1.2.5.1	SCP
Detached Interpretation Management	1.2.840.10008.3.1.2.6.1	SCP
Detached Study Management	1.2.840.10008.3.1.2.3.1	SCP

Note: Only the N-GET and N-EVENT-REPORT DIMSE services of the Detached Interpretation Management SOP Class are supported by MedoraCom and only the N-EVENT-REPORT DIMSE service is supported of the Detached Patient Management, Detached Results Management and Detached Study Management SOP Classes.

#### 4.3.1.1 General

MedoraCOM NER Server (MCDMS) opens associations with the SCP/SCU role selection negotiation to a specified remote AE for the purpose reporting events to that AE. MedoraCOM NER Server does not accept any associations from other AEs.

#### 4.3.1.2 Number of Associations

MedoraCOM NER Server (MCDMS) can create only one association at a time.

#### 4.3.1.3 Asynchronous Mature

(MCDMS) will not perform asynchronous operations.

#### 4.3.1.4 Implementation Identifying Information

(MCDMS) will provide a single Implementation Class UID of

”1.2.840.113619.6.95.31.0.3.4.1”

and an implementation version name of

”MEDORACOM31”

### 4.3.2 Association Acceptance Policy

MedoraCOM NER Server (MCDMS) does not accept any associations requested by remote DICOM application entities.

### 4.3.2.1 Associated Real-World Activities

The associated real-world activity is to notify the remote DICOM node on the change of any patient related data.

### 4.3.2.2 Presentation Context Table

The Medora NER Server (MCDMS) will support any of the presentation contexts shown in the following table. The order of the presentation context for each information model listed below also represents the order which is used to try to establish an association to the SCU.

#### Supported Presentation Contexts for the Medora N-Event-Report Server

**Table 4-2**

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name	UID		
Detached Patient Management SOP Class – EVENT-REPORT	1.2.840.10008.3.1.2.1.1	DICOM Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None
		DICOM Explicit VR Little Endian	1.2.840.10008.1.2.1		
		DICOM Explicit VR Big Endian	1.2.840.10008.1.2.2		
Detached Study Management SOP Class – EVENT-REPORT	1.2.840.10008.3.1.2.3.1	DICOM Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None
		DICOM Explicit VR Little Endian	1.2.840.10008.1.2.1		
		DICOM Explicit VR Big Endian	1.2.840.10008.1.2.2		
Detached Results Management SOP Class – EVENT-REPORT	1.2.840.10008.3.1.2.5.1	DICOM Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None
		DICOM Explicit VR Little Endian	1.2.840.10008.1.2.1		
		DICOM Explicit VR Big Endian	1.2.840.10008.1.2.2		
Detached Interpr. Management SOP Class – EVENT-REPORT	1.2.840.10008.3.1.2.6.1	DICOM Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None
		DICOM Explicit VR Little Endian	1.2.840.10008.1.2.1		
		DICOM Explicit VR Big Endian	1.2.840.10008.1.2.2		

### 4.3.2.2.1 SOP Specific Conformance

#### 4.3.2.2.1.1 SOP Specific Conformance to the Detached Patient Management SOP Class Patient Updated ( Event ID = 3 )

**Table 4-3 Supported Attributes**

Description / Module	Tag	Type SCU/SCP	Supported by Windows NT Edition	Supported by Unix Edition
Specific Character Set	(0008,0005)	1C	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
<b>Referenced Study Sequence<sup>3</sup></b>	(0008,1110)	-/3	<input checked="" type="checkbox"/>	<input type="checkbox"/>
>Referenced SOP Class UID	(0008,1150)	-/1C	<input checked="" type="checkbox"/>	<input type="checkbox"/>
>Referenced SOP Instance UID	(0008,1155)	-/1C	<input checked="" type="checkbox"/>	<input type="checkbox"/>
<b>Patient Identification Module</b>			<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Patient ID	(0010,0020)	-/1	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Patient's Name <sup>4</sup>	(0010,0010)	-/1	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Patient's Birth Name <sup>4</sup>	(0010,1005)	-/1	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Other Patient ID <sup>3/4</sup>	(0010,1000)	-/1	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
<b>Patient Demographic Module</b>			<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Patient's Birth Date <sup>4</sup>	(0010,0030)	-/1	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Patient's Sex <sup>4</sup>	(0010,0040)	-/1	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Patient's Weight <sup>4</sup>	(0010,1030)	-/1	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Patient's Address <sup>4</sup>	(0010,1040)	-/1	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Medical Alerts <sup>4</sup>	(0010,2000)	-/1	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Country of Residence <sup>4</sup>	(0010,2150)	-/1	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Patient's Telephone Numbers <sup>4</sup>	(0010,2154)	-/1	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Patient Comments <sup>4</sup>	(0010,4000)	-/1	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Patient's Institution Residence <sup>5</sup>	(0038,0400)	-/1	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Current Patient Location <sup>6</sup>	(0038,0300)	-/2	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

<sup>3</sup> The attributes Other Patient ID and Referenced Study Sequence will only be included into the Patient Management N-EVENT-REPORT message if the privately defined semantics of a Patient Merge event, which is not defined as standard in DICOM, will be passed to the SCU but only in a certain configuration. For more information please refer to chapter Extensions/Specializations/Privatizations.

<sup>4</sup> If data have changed in RIS.

<sup>5</sup> If patient updated event is sent in combination with a study scheduled event.

<sup>6</sup> If patient updated event is sent in combination with a study scheduled event. If patient is an in-patient the tag contains the code of the requesting service, otherwise it is empty.

**4.3.2.2.1.2 SOP Specific Conformance to the Detached Study Management SOP Class**

**4.3.2.2.1.2.1 Study Scheduled ( Event ID = 2 ) and Study Updated ( Event ID = 9 )**

**Table 4-4 Supported Attributes**

Description / Module	Tag	Type SCU/SCP	Supported by Windows NT Edition	Supported by Unix Edition
Specific Character Set	(0008,0005)	1	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Accession Number	(0008,0050)	-1	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Referenced Patient Sequence	(0008,1120)	-1	<input checked="" type="checkbox"/>	<input type="checkbox"/>
>Referenced SOP Class UID	(0008,1150)	-1C	<input checked="" type="checkbox"/>	<input type="checkbox"/>
>Referenced SOP Instance UID	(0008,1155)	-1C	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Referenced Visit Sequence <sup>7</sup>	(0008,1125)	-1	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
>Referenced SOP Class UID	(0008,1150)	-1C	<input type="checkbox"/>	<input type="checkbox"/>
>Referenced SOP Instance UID	(0008,1155)	-1C	<input type="checkbox"/>	<input type="checkbox"/>
Study Priority ID	(0032,000c)	-1	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Scheduled Study Start Date	(0032,1000)	-1	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Scheduled Study Start Time	(0032,1001)	-1	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Scheduled Study Location	(0032,1020)	-2	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Scheduled Study Location AE Title <sup>8</sup>	(0032,1021)	-2	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Reason for Study	(0032,1030)	-2	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Requesting Physician	(0032,1032)	-3	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Requesting Service	(0032,1033)	-3	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Requested Procedure Description	(0032,1060)	-2	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Requested Procedure Code Sequence	(0032,1064)	-2C	<input checked="" type="checkbox"/>	<input type="checkbox"/>
>Code Value <sup>9</sup>	(0008,0100)	-2C	<input checked="" type="checkbox"/>	<input type="checkbox"/>
>Coding Scheme Designator <sup>9</sup>	(0008,0102)	-1C	<input checked="" type="checkbox"/>	<input type="checkbox"/>
>Code Meaning <sup>9</sup>	(0008,0104)	-2C	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Study Comments	(0032,4000)	-2	<input checked="" type="checkbox"/>	<input type="checkbox"/>

**4.3.2.2.1.2.2 Patient Arrived ( Event ID = 3 )**

<sup>7</sup> Sequence always with zero items

<sup>8</sup> The attribute Scheduled Study Location AE Title can be multi-valued – e.g., "CT01\CT02". For more information please refer to chapter Extensions/ Specializations/Privatizations

<sup>9</sup> If sequence is present.



The sending of a patient arrived event to the remote DICOM application entity is only supported by the Windows NT edition of MedoraCOM in certain configurations.

**Table 4-5 Supported Attributes**

Description / Module	Tag	Type SCU/SCP	Supported by Windows NT Edition	Supported by Unix Edition
Specific Character Set	(0008,0005)	1	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Study Arrival Date	(0032,1040)	-/1	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Study Arrival Time	(0032,1041)	-/1	<input checked="" type="checkbox"/>	<input type="checkbox"/>

Note: As GE Medora RIS does not support the study component level MedoraCom cannot provide the Referenced Study Component Sequence.

**4.3.2.2.1.2.3 Study Completed ( Event ID = 5 )**

The sending of a study completed event to the remote DICOM application entity is only supported by the Windows NT edition of MedoraCOM in certain configurations.

**Table 4-6 Supported Attributes**

Description / Module	Tag	Type SCU/SCP	Supported by Windows NT Edition	Supported by Unix Edition
Specific Character Set	(0008,0005)	1	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Study Completion Date	(0032,1050)	-/1	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Study Completion Time	(0032,1051)	-/1	<input checked="" type="checkbox"/>	<input type="checkbox"/>

**4.3.2.2.1.2.4 Study Deleted ( Event ID = 8 )**

The sending of a study deleted event to the remote DICOM application entity is only supported by the Windows NT edition of MedoraCOM in certain configurations.

**4.3.2.2.1.3 SOP Specific Conformance to the Detached Results Management SOP Class Results Created ( Event ID = 1 )**

**Table 4-7 Supported Attributes**

Description / Module	Tag	Type SCU/SCP	Supported by Windows NT Edition	Supported by Unix Edition
Specific Character Set	(0008,0005)	1	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Instance Creation Date	(0008,0012)	-/1	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Instance Creation Time	(0008,0013)	-/1	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Instance Creator UID	(0008,0014)	-/1	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Referenced Study Sequence	(0008,1110)	-/1	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

Description / Module	Tag	Type SCU/SCP	Supported by Windows NT Edition	Supported by Unix Edition
>Referenced SOP Class UID	(0008,1150)	-1C	☒	☒
>Referenced SOP Instance UID	(0008,1155)	-1C	☒	☒
Results ID	(4008,0040)	-1	☒	☒
Referenced Interpretation Sequence	(4008,0050)	-2	☒	☒
>Referenced SOP Class UID	(0008,1150)	-1C	☒	☒
>Referenced SOP Instance UID	(0008,1155)	-1C	☒	☒

**4.3.2.2.1.4 SOP Specific Conformance to the Detached Interpretation Management SOP Class**

**4.3.2.2.1.4.1 Interpretation Created ( Event ID = 1 )**

**Table 4-8 Supported Attributes**

Description / Module	Tag	Type SCU/SCP	Supported by Windows NT Edition	Supported by Unix Edition
Specific Character Set	(0008,0005)	1	☒	☒
Instance Creation Date	(0008,0012)	-1	☒	☒
Instance Creation Time	(0008,0013)	-1	☒	☒
Instance Creator UID	(0008,0014)	-1	☒	☒
Referenced Results Sequence	(0008,1100)	-1	☒	☒
>Referenced SOP Class UID	(0008,1150)	-1C	☒	☒
>Referenced SOP Instance UID	(0008,1155)	-1C	☒	☒
Interpretation Text <sup>5</sup>	(4008,010B)	-3	☒	☐
Interpretation Diagnosis Description <sup>10</sup>	(4008,0115)	-3	☒	☒
Interpretation ID	(4008,0200)	-3	☒	☐
Interpretation Type ID	(4008,0210)	-1	☒	☒
Interpretation Status ID	(4008,0212)	-1	☒	☒

<sup>10</sup> The report body text is available in both attributes the Interpretation Text and the Interpretation Diagnosis Description. Since the maximum length of Interpretation Text is limited by DICOM to 1024 characters it will be cut after 1024 characters if the original text is longer. For more information please refer to chapter Extensions/Specializations/Privatizations.

4.3.2.2.1.4.2 *Interpretation Recorded ( Event ID = 2 )*

**Table 4-9 Supported Attributes**

Description / Module	Tag	Type SCU/SCP	Supported by Windows NT Edition	Supported by Unix Edition
Specific Character Set	(0008,0005)	1	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Interpretation Recorded Date	(4008,0100)	-/1	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Interpretation Recorded Time	(4008,0101)	-/2	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Interpretation Recorder	(4008,0102)	-/2	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Interpretation ID	(4008,0200)	-/3	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Interpretation Type ID	(4008,0210)	-/2	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Interpretation Status ID	(4008,0212)	-/2	<input checked="" type="checkbox"/>	<input type="checkbox"/>

4.3.2.2.1.4.3 *Interpretation Transcribed ( Event ID = 3 )*

**Table 4-10 Supported Attributes**

Description / Module	Tag	Type SCU/SCP	Supported by Windows NT Edition	Supported by Unix Edition
Specific Character Set	(0008,0005)	1	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Interpretation Transcription Date	(4008,0108)	-/1	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Interpretation Transcription Time	(4008,0109)	-/1	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Interpretation Author	(4008,010C)	-/1	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Interpretation ID	(4008,0200)	-/3	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Interpretation Type ID	(4008,0210)	-/1	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Interpretation Status ID	(4008,0212)	-/1	<input checked="" type="checkbox"/>	<input type="checkbox"/>

**4.3.2.2.1.4.4 Interpretation Approved ( Event ID = 4 )**

The sending of an interpretation approved event to the remote DICOM application entity is only supported by the Windows NT edition of MedoraCOM in certain configurations.

**Table 4-11 Supported Attributes**

Description / Module	Tag	Type SCU/SCP	Supported by Windows NT Edition	Supported by Unix Edition
Specific Character Set	(0008,0005)	1	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Referenced Results Sequence	(0008,1100)	-/3	<input checked="" type="checkbox"/>	<input type="checkbox"/>
>Referenced SOP Class UID	(0008,1150)	-/1C	<input checked="" type="checkbox"/>	<input type="checkbox"/>
>Referenced SOP Instance UID	(0008,1155)	-/1C	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Interpretation Text <sup>5</sup>	(4008,010B)	-/3	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Interpretation Approver Sequence	(4008,0111)	-/1	<input checked="" type="checkbox"/>	<input type="checkbox"/>
>Interpretation Approval Date	(4008,0112)	-/1C	<input checked="" type="checkbox"/>	<input type="checkbox"/>
>Interpretation Approval Time	(4008,0113)	-/1C	<input checked="" type="checkbox"/>	<input type="checkbox"/>
>Physician Approving Interpretation	(4008,0114)	-/3C	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Interpretation Diagnosis Description <sup>11</sup>	(4008,0115)	-/2	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Interpretation ID	(4008,0200)	-/3	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Interpretation Type ID	(4008,0210)	-/3	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Interpretation Status ID	(4008,0212)	-/2	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Interpretation Diagnosis Codes Sequence	(4008,0117)	-/2	<input checked="" type="checkbox"/>	<input type="checkbox"/>
>Code Value	(0008,0100)	-/3	<input checked="" type="checkbox"/>	<input type="checkbox"/>
>Coding Scheme Designator	(0008,0102)	-/3	<input checked="" type="checkbox"/>	<input type="checkbox"/>
>Coding Scheme Version	(0008,0103)	-/3	<input checked="" type="checkbox"/>	<input type="checkbox"/>
>Code Meaning	(0008,0104)	-/3	<input checked="" type="checkbox"/>	<input type="checkbox"/>

**4.3.2.2.2 Presentation Context Acceptance Criterion**

MCDMS will always accept a presentation context for the Detached Patient Management SOP Class, the Detached Study Management SOP Class, the Detached Results Management SOP Class, and the Detached Interpretation Management SOP Class with the DICOM Default Transfer Syntax.

MCDMS will accept any number of presentation contexts specified in Table 4-2. MCDMS will examine proposed presentation contexts in the order proposed. For the presentation contexts of the same abstract syntax but different transfer syntaxes, only one of these presentation context will be accepted

<sup>11</sup> The report body text is available in both attributes the Interpretation Text and the Interpretation Diagnosis Description. Since the maximum length of Interpretation Text is limited by DICOM to 1024 characters it will be cut after 1024 characters if the original text is longer. For more information please refer to chapter Extensions/Specializations/Privatizations.

with the most preferred transfer syntax chosen by MCDMS. The policy of making this choice is described in the next section.

#### **4.3.2.2.3 Transfer Syntax Selection Policy**

MedoraCOM NER Server will prefer to create Transfer Syntaxes having an explicit VR encoding. The order of preference is:

1. Explicit VR Little Endian
2. Explicit VR Big Endian
3. Implicit VR Little Endian

Different Transfer Syntaxes will not be selected.

## 5 MEDORACOM IMAGE QUERY/RETRIEVE SERVICES

### 5.1 IMPLEMENTATION MODEL

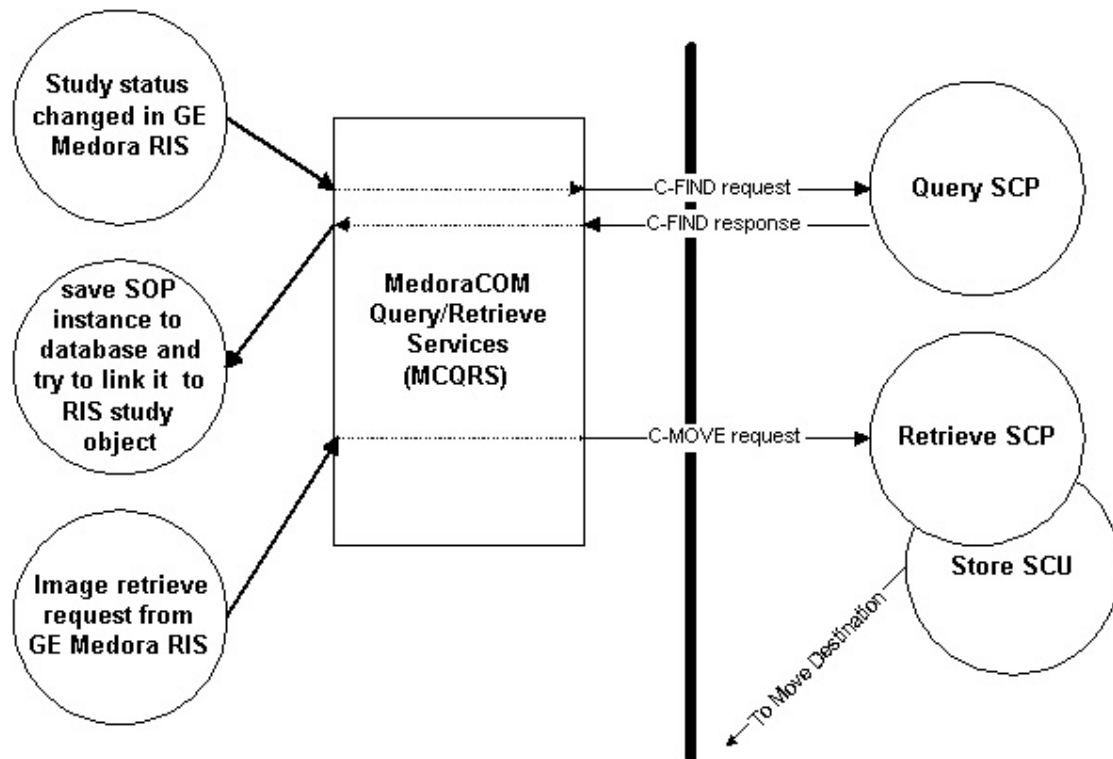
The GE Medora RIS application provides a user interface for defining pre-fetching and auto-routing rules and initiating image retrieval on demand. The user-defined rules are stored in several tables of the RIS database. The detailed specification is already available within another document. Therefore only main issues shall be discussed within this document. Using the study, series and image information received either by the study content notification or by a query using C-FIND the RIS is able to control the image workflow by supporting mechanisms to automatically auto-route and pre-fetch of images as well as transfer images on demand. Therefore the DIMSE service C-FIND is used to gain the study, series and image information and the C-MOVE is used to request sending the images to any DICOM node known by the RIS.

#### 5.1.1 Application Data Flow Diagram

MedoraCOM Query/Retrieve Services (MCQRS) are WIN 32 processes that are controlled by RIS-PACS Communication Manager service able to run on a Microsoft® Windows NT™ machine.

MCQRS initiates an association to a remote DICOM Application Entity (PACS or other IS). If the association is accepted by the remote AE, MCQRS sends either a query request (C-FIND) an image retrieve request (C-MOVE) based on one of the supported DICOM Retrieve Information Model (see later) by specifying the move destination.

Illustration 5-1



### 5.1.2 Functional Definition of AE

MedoraCOM Query/Retrieve Services may be automatically started when the machine is booted or it may be started when the GE Medora RIS server processes are launched. Upon a service request coming from the GE Medora RIS System, MCQRS is triggered to perform the DIMSE service operation. The communication among the GE Medora RIS System, MedoraCOM and MCQRS is carried out with some Inter-Process Communication (IPC) methods and is beyond of the scope of this document.

Having been triggered, MCQRS initiates an association to the remote DICOM AE (PACS or other IS) which parameters are defined during the installation of MedoraCOM. If there are more than one remote DICOM AEs to which the Medora System wants to communicate through MedoraCOM, a concrete remote AE shall be specified with the trigger event. If the association is successfully accepted by the remote AE, MCQRS then performs the concrete job specified in the request.

### 5.1.3 Sequencing of Real-World Activities

MedoraCom can be set up to perform a DICOM query using the DIMSE-C-FIND command to a remote DICOM AE for getting study, series and image information similar to the DICOM study contents notification. MedoraCom can be configured to initiate a query after the RIS study status has been changed to

- patient arrived
- study started
- study completed
- report transcribed and
- report approved.

MCQRS also performs an image retrieve request by performing the DIMSE-C-MOVE command and will notify MedoraCOM of the move results (how many images moved and how many failed).

In case of unsuccessful completion MedoraCOM will retry the operation certain times of for a certain time depending on the configuration of MedoraCOM.

## 5.2 APPLICATION ENTITY SPECIFICATION

As stated previously, MCQRS is a component of MedoraCOM and can be configured to operate as one DICOM AE or separate AEs, according to the demand of the user. Usually, all MedoraCOM components run under one AE Title.

All operational parameters (such as AE titles, port numbers) of MCQRS are saved in the configuration data files or the Windows NT registry database of MedoraCOM.

### 5.2.1 Association Establishment Policies

MCQRS provides Standard Conformance to the following DICOM 3.0 SOP Class as an SCU:

**Table 5-1**

SOP Class Name	SOP Class UID	Role
Study Root Query / Retrieve Information Model - FIND	1.2.840.10008.5.1.4.1.2.2.1	SCU
Study Root Query / Retrieve Information Model - MOVE	1.2.840.10008.5.1.4.1.2.2.2	SCU

**5.2.1.1 General**

MCQRS will attempt to establish an association whenever a request is coming from the GE Medora RIS System with all valid parameters, including the AE title, TCP port number, host name and network address. It will only attempt to establish associations if it determines that the request / retrieve parameters are valid with respect to this Conformance Statement.

The maximum PDU size which MCQRS will use is configurable.

**5.2.1.2 Number of Associations**

MedoraCOM keeps at most four instances of MCQRS running - one for querying a remote AE, one for image auto-routing, one for image pre-fetching and one for image transfer on demand - simultaneously. If a new request comes when such an association is still in process, the new request is queued and will be processed later.

**5.2.1.3 Asynchronous Nature**

(MCQRS) will not perform asynchronous operations.

**5.2.1.4 Implementation Identifying Information**

(MCDMS) will provide a single Implementation Class UID of

”1.2.840.113619.6.95.31.0.3.4.1”

and an implementation version name of

”MEDORACOM31”

**5.2.2 Association Initiation Policy**

MedoraCOM Query/Retrieve Services (MCQRS) attempt to initiate a new association each time it is requested by the internal event management of Medora.

**5.2.2.1 Associated Real-World Activities**

The associated Real-World Activity is either gaining study, series and/or image information from remote using DIMSE-C-FIND applications or the attempt to perform the service operation DIMSE-C-MOVE issued by MedoraCOM. If MCQRS successfully establishes an association to a remote AE, it will request it to move images to the specified destination.

MedoraCOM will be informed about the move results.



### 5.2.2.2 Proposed Presentation Contexts

MCQRS-FIND will propose the Presentation Contexts shown in Table Table 5-2 Proposed Presentation Context of MCQRS for a C-FIND.

MCQRS-FIND supports only the Transfer Syntax as listed. If a remote AE does not support the Transfer Syntax, the association establishment will fail.

**Table 5-2 Proposed Presentation Context of MCQRS for a C-FIND**

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name List	UID List		
Study Root Query / Retrieve Information Model - FIND	1.2.840.10008.5.1.4.1.2.2.1	DICOM Explicit VR Little Endian	1.2.840.10008.1.2.1	SCU	None
		DICOM Explicit VR Big Endian	1.2.840.10008.1.2.2		
		DICOM Implicit VR Little Endian	1.2.840.10008.1.2		

MCQRS-MOVE will propose the Presentation Contexts shown in Table 5-3 Proposed Presentation Context of MCQRS for a C-MOVE.

MCQRS-MOVE supports only the Transfer Syntax as listed. If a remote AE does not support the Transfer Syntax, the association establishment will fail.

**Table 5-3 Proposed Presentation Context of MCQRS for a C-MOVE**

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name List	UID List		
Study Root Query / Retrieve Information Model - FIND	1.2.840.10008.5.1.4.1.2.2.1	DICOM Explicit VR Little Endian	1.2.840.10008.1.2.1	SCU	None
		DICOM Explicit VR Big Endian	1.2.840.10008.1.2.2		
		DICOM Implicit VR Little Endian	1.2.840.10008.1.2		

#### 5.2.2.2.1 SOP Specific Conformance

MCQRS provides standard conformance to the DICOM Query / Retrieve Service Class.

MCQRS does not provide extended negotiation and does not use relational retrieve. It uses only hierarchical query/retrieve on study, series or image levels.

**Table 5-4Keys Used by a Query Issued by MCQRS**

Key	Tag	Level	Matching Key	Return Key	Supported by Windows NT Edition	Supported by Unix Edition	Type of Matching
Study Instance UID	(0020,000D)	STUDY SERIES	✓ ✓	✓ ✓	✓	<input type="checkbox"/>	Single Value
Study Date	(0008,0020)	STUDY		✓	☒	<input type="checkbox"/>	Universal
Accession Number	(0008,0050)	STUDY	✓	✓	☒	<input type="checkbox"/>	Universal

Key	Tag	Level	Matching Key	Return Key	Supported by Windows NT Edition	Supported by Unix Edition	Type of Matching
Series Instance UID	(0020,000E)	SERIES IMAGE	✓	✓ ✓	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Single Value
Series Number	(0020,0011)	SERIES		✓	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Universal
Modality	(0008,0060)	SERIES		✓	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Universal
Instance Number	(0020,0013)	IMAGE		✓	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Universal
Overlay Number	(0020,0022)	IMAGE		✓	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Universal
Curve Number	(0020,0024)	IMAGE		✓	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Universal
Lookup Table Number	(0020,0026)	IMAGE		✓	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Universal
SOP Instance UID	(0008,0018)	IMAGE		✓	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Universal

## 6 MEDORACOM IMAGE STORAGE FOR KEY IMAGES

MedoraCOM implemented an application MCKIS for receiving so called key images or significant images to set the key image status in the image table of GE Medora RIS as well as to convert them into bitmaps to be displayed as thumbnails in the RIS application. The DICOM image itself is not stored in the RIS. The MedoraCOM Key Image Store SCP is only available on Windows NT.

### 6.1 IMPLEMENTATION MODEL

MedoraCOM implemented an application MCKIS for receiving so called key images or significant images to set the key image status in the image table of GE Medora RIS as well as to convert them into bitmaps to be displayed as thumbnails in the RIS application. The DICOM image itself is not stored in the RIS.

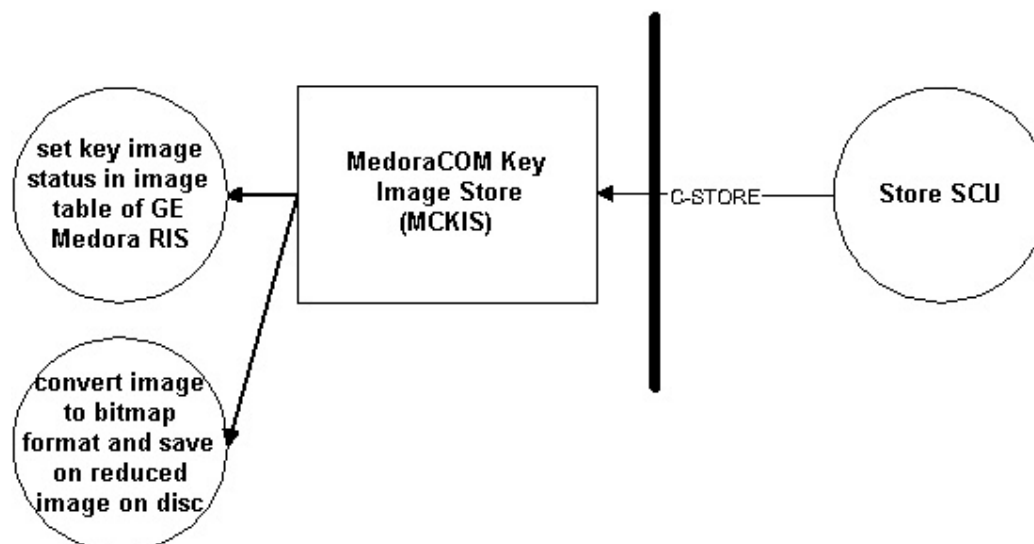
#### 6.1.1 Application Data Flow Diagram

MCKIS is a WIN 32 process controlled by the RIS-PACS Communication Manager service able to run on any Microsoft® Windows NT™ machine.

MedoraCOM Key Image Store may be automatically started when the machine is booted or it may be started when the GE Medora RIS server processes are launched.

A remote DICOM Application Entity initiates an association for DICOM Storage Service Class to MedoraCOM Key Image Store. When MCKIS accepts the association, the remote AE transmits the DICOM Image Information Objects to MCKIS. MCKIS set the key image status in the RIS database and saves the bitmap images as described above.

Illustration 6-1



## 6.1.2 Functional Definitions

After being started, MCKIS is always waiting for an association request from a remote DICOM Application Entity. MCKIS will accept an association with the supported SOP classes for all remote DICOM applications.

## 6.1.3 Sequencing of Real-World Activities

After receiving images from a remote application, MCKIS sets the key image status and stores the reduced and converted images in a specified folder on the hard disk. MCKIS neither defines, nor requires any consequence event of the remote DICOM Application Entity after it receives the images over an association originated by MCKIS. Details about the usage and further handling of key images are beyond the scope of this document.

## 6.2 APPLICATION ENTITY SPECIFICATIONS

MCKIS provides the Standard Conformance to the following DICOM V3.0 SOP Classes as an SCP:

**Table 6-1**

SOP Class Name	SOP Class UID	Role
Computed Radiography Image Information Object Storage	1.2.840.10008.5.1.4.1.1.1	SCP
CT Image Information Object Storage	1.2.840.10008.5.1.4.1.1.2	SCP
MR Image Information Object Storage	1.2.840.10008.5.1.4.1.1.4	SCP
Nuclear Medicine Image Information Object Storage	1.2.840.10008.5.1.4.1.1.20	SCP
Retired Nuclear Medicine Image Information Object Storage	1.2.840.10008.5.1.4.1.1.5	SCP
Ultrasound Image Information Object Storage	1.2.840.10008.5.1.4.1.1.6.	SCP
Retired Ultrasound Image Information Object Storage	1.2.840.10008.5.1.4.1.1.6	SCP
Ultrasound Multiple Frame Image Information Object Storage	1.2.840.10008.5.1.4.1.1.3.	SCP
Retired Multiple Frame Ultrasound Image Information Object Storage	1.2.840.10008.5.1.4.1.1.3	SCP
Secondary Capture Image Information Object Storage	1.2.840.10008.5.1.4.1.1.7	SCP
X-Ray Angiographic Image Information Object Storage	1.2.840.10008.5.1.4.1.1.12.1	SCP

SOP Class Name	SOP Class UID	Role
X-Ray Fluoroscopy Image Information Object Storage	1.2.840.10008.5.1.4.1.1.12.2	SCP
X-Ray Angiographic Biplane Image Information Object Storage	1.2.840.10008.5.1.4.1.1.12.3	SCP

## 6.2.1 Association Establishment Policies

### 6.2.1.1 General

MCKIS accepts associations for the purposes of image storage. MCKIS accepts association requests from a remote DICOM AE but MCKIS does not initiate any association to a remote DICOM application entity.

The maximal PDU size which MCKIS supports is configurable while the default value is 16 KB.

In general, MCKIS obeys the association establishment policies of MedoraCOM.

### 6.2.1.2 Number of Associations

MCKIS will attempt only one association establishment at a time. MCKIS can accept and process multiple associations simultaneously. Maximally there can be five associations running concurrently. MCKIS will create a new thread for each connection request it receives. There can be a maximum of five.

### 6.2.1.3 Asynchronous Nature

MCKIS will not perform asynchronous operations window negotiation.

### 6.2.1.4 Implementation Identifying Information

MCKIS will provide a single Implementation Class UID of

"1.2.840.113619.6.95.31.0.3.4.1"

and an implementation version name of

"MEDORACOM31"

## 6.2.2 Association Acceptance Policy

MCKIS accepts associations for the purpose of Image Storage. MCKIS accepts an association request from all remote DICOM Application Entity without checking if it is listed in its configuration database. When MCKIS accepts an association, it will receive any number of images transmitted on that association.

### 6.2.2.1 Associated Real-World Activity

The associated Real-World Activity of MCKIS is to receive one or several so called key images or significant images. Details about the usage and further handling of key images are beyond the scope of this document.

### 6.2.2.2 Presentation Context Table

MCKIS will accept the Presentation Contexts shown in the following table, depending on which SOP Instances should be received.

**Table 6-2 Supported Presentation Contexts for the Medora Key Image Store**

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name	UID		
Verification	1.2.840.10008.5.1.4.31	DICOM Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None
		DICOM Explicit VR Little Endian	1.2.840.10008.1.2.1		
		DICOM Explicit VR Big Endian	1.2.840.10008.1.2.2		
Computed Radiography Image Information Object Storage	1.2.840.10008.5.1.4.1.1.1	DICOM Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None
		DICOM Implicit VR Little Endian	1.2.840.10008.1.2.1		
		DICOM Explicit VR Big Endian	1.2.840.10008.1.2.2		
CT Image Information Object Storage	1.2.840.10008.5.1.4.1.1.2	DICOM Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None
		DICOM Implicit VR Little Endian	1.2.840.10008.1.2.1		
		DICOM Explicit VR Big Endian	1.2.840.10008.1.2.2		
MR Image Information Object Storage	1.2.840.10008.5.1.4.1.1.4	DICOM Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None
		DICOM Implicit VR Little Endian	1.2.840.10008.1.2.1		
		DICOM Explicit VR Big Endian	1.2.840.10008.1.2.2		
Nuclear Medicine Image Information Object Storage	1.2.840.10008.5.1.4.1.1.20	DICOM Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None
		DICOM Implicit VR Little Endian	1.2.840.10008.1.2.1		
		DICOM Explicit VR Big Endian	1.2.840.10008.1.2.2		
Retired Nuclear Medicine Image Information Object Storage	1.2.840.10008.5.1.4.1.1.5	DICOM Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None
		DICOM Implicit VR Little Endian	1.2.840.10008.1.2.1		
		DICOM Explicit VR Big Endian	1.2.840.10008.1.2.2		

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name	UID		
Ultrasound Image Information Object Storage	1.2.840.10008.5.1.4.1.1.6.	DICOM Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None
		DICOM Implicit VR Little Endian	1.2.840.10008.1.2.1		
		DICOM Explicit VR Big Endian	1.2.840.10008.1.2.2		
Retired Ultrasound Image Information Object Storage	1.2.840.10008.5.1.4.1.1.6	DICOM Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None
		DICOM Implicit VR Little Endian	1.2.840.10008.1.2.1		
		DICOM Explicit VR Big Endian	1.2.840.10008.1.2.2		
Ultrasound Multiple Frame Image Information Object Storage	1.2.840.10008.5.1.4.1.1.3.	DICOM Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None
		DICOM Implicit VR Little Endian	1.2.840.10008.1.2.1		
		DICOM Explicit VR Big Endian	1.2.840.10008.1.2.2		
Retired Multiple Frame Ultrasound Image Information Object Storage	1.2.840.10008.5.1.4.1.1.3	DICOM Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None
		DICOM Implicit VR Little Endian	1.2.840.10008.1.2.1		
		DICOM Explicit VR Big Endian	1.2.840.10008.1.2.2		
Secondary Capture Image Information Object Storage	1.2.840.10008.5.1.4.1.1.7	DICOM Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None
		DICOM Implicit VR Little Endian	1.2.840.10008.1.2.1		
		DICOM Explicit VR Big Endian	1.2.840.10008.1.2.2		
X-Ray Angiographic Image Information Object Storage	1.2.840.10008.5.1.4.1.1.12.1	DICOM Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None
		DICOM Implicit VR Little Endian	1.2.840.10008.1.2.1		
		DICOM Explicit VR Big Endian	1.2.840.10008.1.2.2		
X-Ray Fluoroscopy Image Information Object Storage	1.2.840.10008.5.1.4.1.1.12.2	DICOM Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None
		DICOM Implicit VR Little Endian	1.2.840.10008.1.2.1		
		DICOM Explicit VR Big Endian	1.2.840.10008.1.2.2		
X-Ray Angiographic Biplane Image Information Object Storage	1.2.840.10008.5.1.4.1.1.12.3	DICOM Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None
		DICOM Implicit VR Little Endian	1.2.840.10008.1.2.1		
		DICOM Explicit VR Big Endian	1.2.840.10008.1.2.2		

### 6.2.2.2.1 SOP Specific Conformance

MCKIS conforms to the SOPs' of the Storage Service Class at Level 2 (Full). No attributes are discarded or MCKIS. In the event of a successful C-STORE operation, the key image status is set and the

converted and reduced images are saved. A successful C-STORE response ensures that MCKIS has handled a valid DICOM Composite Information Object.

MCKIS returns one of the following status codes, when the C-STORE was unsuccessful:

Response Code	Status	Further Meaning
A700	Out of Resources	Indicates that there was not enough disk space to store the image. Recovery from this condition is left to the user of MedoraCOM.
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 the Data Set cannot be parsed into elements by MCKIS. This indicates a problem with the SCU.

MCKIS supports minimum image data set which only includes Type 1 data attributes filled with valid values. MedoraCOM Key Image Store supports an image matrix of any size and any depth.

MCKIS supports palette coded colour images.

MCKIS supports RGB and YBR\_FULL coded colour images.

MCKIS supports the overlays embedded in the image pixel matrix.

MCKIS does not support YBR\_FULL\_442 or YBR\_PATIAL\_422 or other format coded colour images.

MCKIS supports neither stand-alone overlays nor any curves.

#### 6.2.2.2.2 Presentation Context Acceptance Criterion

MCKIS will accept any number of Presentation Contexts specified in Table 6-2 Supported Presentation Contexts for the Medora Key Image Store. MCKIS will examine proposed Presentation Contexts in the order in which they are proposed. For the Presentation Contexts of the same Abstract Syntax but different Transfer Syntaxes, only one of these Presentation Context will be accepted with the most preferred Transfer Syntax chosen by MCKIS. The policy of making this choice is described in the next section. MCKIS can accept more than one Abstract Syntax in one association.

In the case that a MedoraCOM runs out of resources, MCKIS will reject the association request.

#### 6.2.2.2.3 Transfer Syntax Selection Policies

MCKIS selects a transfer syntax to accept for the image transmission with the following general rules: First of all, it prefers a transfer syntax which provides the explicit VR representation. After the VR



choice has been made, MCKIS tries to select the transfer syntax of the same byte coding scheme of multiple byte data element as the one used on the platform it is running on.

As MCKIS runs on the Microsoft® Windows NT™ Intel platforms, the concrete selection order of MCKIS is listed as follows:

Little Endian Transfer Syntax with Explicit VR

Big Endian Transfer Syntax with Explicit VR

Little Endian Transfer Syntax with Implicit VR

## **7 MEDORACOM PPS MANAGER**

This chapter gives the technical specification of the MedoraCOM PPS Manager (MCPPS) - a part of the DICOM communication interface of GE's Radiology Information System Medora.

MCPPS implements a PPS Manager as defined in the IHE Year 2 Technical Framework. It consists of two processes one provides a DICOM Modality Performed Procedure Step SCP listening on a TCP port waiting for DICOM associations requested by SCUs. If configured this process tries to act also as an SCU in order to forward the received messages to a third system. The second process provides a DICOM Modality Performed Procedure Step SCU in order to send PPS messages to a third system in case the first attempt which is carried out by the PPS Manager process directly after reception has failed.

Usually MCPPS supports a single application entity titles (AET) but MCPPS SCP and MCPPS SCU may also be configured to support two different application entity titles.

### **7.1 IMPLEMENTATION MODEL**

The component MCPPS has been implemented to act as a Service Class Provider (SCP) and a Service Class User of the DICOM MPPS Service Class. The MedoraCOM PPS Manager is only available on Windows NT.

The MedoraCOM PPS Manager supports one AE Title. The AE Title can be the same AE Title that other components of MedoraCOM support, or another specialised AE Title.

#### **7.1.1 Application Data Flow Diagram**

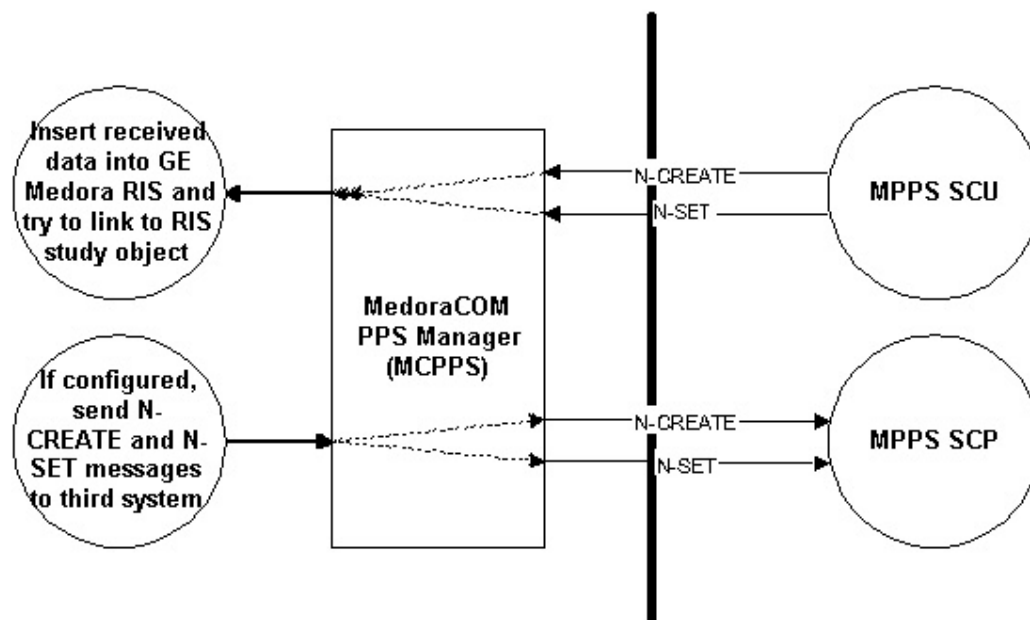
MCPPS consists of two WIN 32 processes controlled by the RIS-PACS Communication Manager service, which are able to run on any Microsoft® Windows NT™ machine.

MedoraCOM PPS Manager may be automatically started when the machine is booted or it may be started when the GE Medora RIS server processes are launched what means that no user login is required.

A remote DICOM Application Entity initiates an association for a DICOM Modality Performed Procedure Step Service Class.

When MCPPS accepts the DIMSE N-CREATE or N-SET association, the remote AE transmits the DICOM information within the N-CREATE/N-SET message to MCPPS. If configured MCPPS is acting as DICOM Modality Performed Procedure Step SCU sending the PPS messages to a third system. The received data is stored in the Radiology Information System Medora and if possible automatically assigned to a patient/procedure in Medora.

**Illustration 7-1**



### 7.1.2 Functional Definition of AE

After being started, MCPPS is always waiting for an association request from a remote DICOM application entity. MCPPS will accept an association with the supported SOP class only for those remote DICOM applications, which are specified in the configuration of MedoraCOM. This means that not all remote DICOM application entities are permitted to transmit PPS messages to MedoraCOM.

### 7.1.3 Sequencing of Real-World Activities

Normally the medical modality (MPPS SCU) indicates

- the beginning of the PPS by sending a N-CREATE message to the MPPS SCP
- and the end of the PPS by sending a N-SET message with the status “DISCONTINUED” or “COMPLETED”

If MCPPS receives a valid Modality Performed Procedure Step SOP instance the information is stored into a structure of several database tables directly depicting the structure of the DICOM Modality Performed Procedure Step SOP Class and - if configured - forwarded to a third device. If possible the received MPPS SOP instance is assigned to a previously scheduled procedure step in the database of GE Medora RIS.

## 7.2 APPLICATION ENTITY SPECIFICATION

MCPPS is one functional component of MedoraCOM and supports the DICOM Modality Performed Procedure Step Service Class.

All operational parameters (such as AE titles, port numbers) can be accessed and changed by using the MedoraCOM Monitor application on a Windows NT based system.

## 7.2.1 Association Establishment Policies

MCPPS provides Standard Conformance to the following DICOM 3.0 SOP Class as an SCP and SCU:

**Table 7-1**

SOP Class Name	SOP Class UID	Role
Modality Performed Procedure Step	1.2.840.10008.3.1.2.3.3	SCP
Modality Performed Procedure Step	1.2.840.10008.3.1.2.3.3	SCU

### 7.2.1.1 General

MCPPS accepts associations for the purposes of Modality Performed Procedure Step SOP Class. MCPPS accepts association requests from a remote DICOM AE only when it is registered in the configuration of MCPPS (including AE Title (mandatory), optional TCP Port Number and Network Address).

If configured, MCPPS also will attempt to establish an association to the configured peer SCP whenever a valid N-CREATE or N-SET message is received from the PPS Manager SCP.

The maximal PDU size, which MCPPS supports, is configurable while the default value is 16 KB.

In general, MCPPS obeys the association establishment policies of MedoraCOM.

### 7.2.1.2 Number of Associations

MCPPS can accept and process multiple associations simultaneously. The maximum number of simultaneous associations is configurable. MedoraCOM PPS Manager will create a new process for each connection request it receives.

### 7.2.1.3 Asynchronous Nature

MCPPS will not perform asynchronous operations window negotiation.

### 7.2.1.4 Implementation Identifying Information

MCPPS will provide a single Implementation Class UID of

”1.2.840.113619.6.95.31.0.3.4.1”

and an implementation version name of

”MEDORACOM31”

## 7.2.2 Association Acceptance and Initiation Policy

MCPPS accepts associations for the purposes of retrieving modality performed procedure step information. MCPPS accepts an association request only from remote DICOM application entities, which are known in the configuration of MedoraCOM.

The limitations on processing multiple associations simultaneously are adjustable.

MCPPS also attempts to initiate a new association to a peer PPS SCP each time it receives a valid N-CREATE/N-SET message.

### 7.2.2.1 Associated Real-World Activities

After an imaging modality has started the performance of a Procedure Step it should inform the IS by sending an N-CREATE service request to MCPSS (SCP). At the end of the Performed Procedure Step the imaging modality shall send a N-SET command with all other mandatory attributes to MCPSS (SCP).

If MCPSS (SCP) receives a valid Modality Performed Procedure Step SOP instance the information is stored into a structure of several database tables directly depicting the structure of the DICOM Modality Performed Procedure Step SOP Class and - if configured - forwarded to a third device (PPS Manager SCU). If possible the received MPPS SOP instance is assigned to a previously scheduled procedure step in the database of GE Medora RIS.

### 7.2.2.2 Presentation Context Tables

MCPSS (SCP) will accept any of the presentation contexts shown in the following table.

**Table 7-2 Acceptable Presentation Contexts for MCPSS**

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name	UID		
Verification	1.2.840.10008.5.1.4.31	DICOM Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None
		DICOM Explicit VR Little Endian	1.2.840.10008.1.2.1		
		DICOM Explicit VR Big Endian	1.2.840.10008.1.2.2		
Modality Performed Procedure Step SOP Class	1.2.840.10008.3.1.2.3.3	DICOM Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None
		DICOM Explicit VR Little Endian	1.2.840.10008.1.2.1		
		DICOM Explicit VR Big Endian	1.2.840.10008.1.2.2		

MCPSS (SCU) will propose the Presentation Contexts shown in Table Table 7-3 Proposed Presentation Contexts of MCPSS.

MCPSS (SCU) supports only the Transfer Syntax as listed. If a remote AE does not support the Transfer Syntax, the association establishment will fail.

**Table 7-3 Proposed Presentation Contexts of MCPPS**

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name	UID		
Modality Performed Procedure Step SOP Class	1.2.840.10008.3.1.2.3.3	DICOM Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
		DICOM Explicit VR Little Endian	1.2.840.10008.1.2.1		
		DICOM Explicit VR Big Endian	1.2.840.10008.1.2.2		

**7.2.2.2.1 SOP Specific Conformance**

MCPPS provides the Standard Conformance to the DICOM Modality Performed Procedure Step Service Class as an SCU and SCP.

Description / Module	Tag	Type N-CREATE SCU/SCP	Type N-SET SCU/SCP	Requirement Type Final State <sup>12</sup>	Supported by Windows NT Edition	Supported by Unix Edition
<b>SOP Common Module</b>					<input checked="" type="checkbox"/>	<input type="checkbox"/>
SOP Class UID	(0008,0016)	3/3	3/3		<input checked="" type="checkbox"/>	<input type="checkbox"/>
SOP Instance UID	(0008,0018)	3/3	3/3		<input checked="" type="checkbox"/>	<input type="checkbox"/>
Specific Character Set	(0008,0005)	1C/1C (Required if an extended or replacement character set is used)	Not allowed		<input checked="" type="checkbox"/>	<input type="checkbox"/>
Instance Creation Date	(0008,0012)	3/3	3/3		<input checked="" type="checkbox"/>	<input type="checkbox"/>
Instance Creation Time	(0008,0013)	3/3	3/3		<input checked="" type="checkbox"/>	<input type="checkbox"/>
Instance Creator UID	(0008,0014)	3/3	3/3		<input checked="" type="checkbox"/>	<input type="checkbox"/>
<b>Performed Procedure Step Relationship Module</b>					<input checked="" type="checkbox"/>	<input type="checkbox"/>

<sup>12</sup> The requirement for the final state is that which applies at the time that the Performed Procedure Step Status (0040,0252) is N-SET to a value of COMPLETED or DISCONTINUED, as described in F.7.2.2.2. It is only described if it is different from the SCP requirement for the N-CREATE.

Description / Module	Tag	Type N-CREATE SCU/SCP	Type N-SET SCU/SCP	Requirement Type Final State <sup>12</sup>	Supported by Windows NT Edition	Supported by Unix Edition
Patient's Name	(0010,0010)	3/3 <sup>13</sup>	Not allowed		<input checked="" type="checkbox"/>	<input type="checkbox"/>
Patient ID	(0010,0020)	3/3 <sup>13</sup>	Not allowed		<input checked="" type="checkbox"/>	<input type="checkbox"/>
Patient's Birth Date	(0010,0030)	3/3 <sup>13</sup>	Not allowed		<input checked="" type="checkbox"/>	<input type="checkbox"/>
Patient's Sex	(0010,0040)	3/3 <sup>13</sup>	Not allowed		<input checked="" type="checkbox"/>	<input type="checkbox"/>
Referenced Patient Sequence	(0008,1120)	3/3 <sup>13</sup>	Not allowed		<input checked="" type="checkbox"/>	<input type="checkbox"/>
>Referenced SOP Class UID	(0008,1150)	1C/1C (Required if an extended or replacement character set is used)	Not allowed		<input checked="" type="checkbox"/>	<input type="checkbox"/>
>Referenced SOP Instance UID	(0008,1155)	1C/1C (Required if an extended or replacement character set is used)	Not allowed		<input checked="" type="checkbox"/>	<input type="checkbox"/>
Scheduled Step Attribute Sequence	(0040,0270)	1/1	Not allowed		<input checked="" type="checkbox"/>	<input type="checkbox"/>
>Study Instance UID	(0020,000D)	1/1	Not allowed		<input checked="" type="checkbox"/>	<input type="checkbox"/>
>Referenced Study Sequence	(0008,1110)	3/3 <sup>13</sup>	Not allowed		<input checked="" type="checkbox"/>	<input type="checkbox"/>
>>Referenced SOP Class UID	(0008,1150)	1C/1C (Required if an extended or replacement character set is used)	Not allowed		<input checked="" type="checkbox"/>	<input type="checkbox"/>

<sup>13</sup> The original attribute type defined in the DICOM Standard is 2/2 or 2C/2. The PPS Manager SCP handles these attributes like type 3 attributes in case some tags are missing. **However** the PPS Manager SCU forwards the message as it was received by the SCP, what means that the PPS Manager does not add any information that is missing.

Description / Module	Tag	Type N-CREATE SCU/SCP	Type N-SET SCU/SCP	Requirement Type Final State <sup>12</sup>	Supported by Windows NT Edition	Supported by Unix Edition
>>Referenced SOP Instance UID	(0008,1155)	1C/1C (Required if an extended or replacement character set is used)	Not allowed		<input checked="" type="checkbox"/>	<input type="checkbox"/>
>Accession Number	(0008,0050)	3/3 <sup>13</sup>	Not allowed		<input checked="" type="checkbox"/>	<input type="checkbox"/>
>Placer Order Number/ Imaging Service Request	(0040,2006)	3/3	Not allowed		<input checked="" type="checkbox"/>	<input type="checkbox"/>
>Filler Order Number/ Imaging Service Request	(0040,2007)	3/3	Not allowed		<input checked="" type="checkbox"/>	<input type="checkbox"/>
>Requested Procedure ID	(0040,1001)	3/3 <sup>13</sup>	Not allowed		<input checked="" type="checkbox"/>	<input type="checkbox"/>
>Requested Procedure Description	(0032,1060)	3/3 <sup>13</sup>	Not allowed		<input checked="" type="checkbox"/>	<input type="checkbox"/>
>Placer Order Number/ Procedure	(0040,1006)	3/3	Not allowed		<input checked="" type="checkbox"/>	<input type="checkbox"/>
>Filler Order Number/ Procedure	(0040,1007)	3/3	Not allowed		<input checked="" type="checkbox"/>	<input type="checkbox"/>
>Scheduled Procedure Step ID	(0040,0009)	3/3 <sup>13</sup>	Not allowed		<input checked="" type="checkbox"/>	<input type="checkbox"/>
>Scheduled Procedure Step Description	(0040,0007)	3/3 <sup>13</sup>	Not allowed		<input checked="" type="checkbox"/>	<input type="checkbox"/>
>Scheduled Action Item Code Sequence	(0040,0008)	3/3 <sup>13</sup>	Not allowed		<input checked="" type="checkbox"/>	<input type="checkbox"/>
>>Code Value	(0008,0100)	1C/1C (Required if an extended or replacement character set is used)	Not allowed		<input checked="" type="checkbox"/>	<input type="checkbox"/>
>>Coding Scheme designator	(0008,0102)	1C/1C (Required if an extended or replacement character set is used)	Not allowed		<input checked="" type="checkbox"/>	<input type="checkbox"/>
>>Code Meaning	(0008,0104)	3/3	Not allowed		<input checked="" type="checkbox"/>	<input type="checkbox"/>



Description / Module	Tag	Type N-CREATE SCU/SCP	Type N-SET SCU/SCP	Requirement Type Final State <sup>12</sup>	Supported by Windows NT Edition	Supported by Unix Edition
<b>Performed Procedure Step Information</b>					<input checked="" type="checkbox"/>	<input type="checkbox"/>
Performed Procedure Step ID	(0040,0253)	1/1	Not allowed		<input checked="" type="checkbox"/>	<input type="checkbox"/>
Performed Station AE Title	(0040,0241)	1/1	Not allowed		<input checked="" type="checkbox"/>	<input type="checkbox"/>
Performed Station Name	(0040,0242)	3/3 <sup>13</sup>	Not allowed		<input checked="" type="checkbox"/>	<input type="checkbox"/>
Performed Location	(0040,0243)	3/3 <sup>13</sup>	Not allowed		<input checked="" type="checkbox"/>	<input type="checkbox"/>
Performed Procedure Step Start Date	(0040,0244)	1/1	Not allowed		<input checked="" type="checkbox"/>	<input type="checkbox"/>
Performed Procedure Step Start Time	(0040,0245)	1/1	Not allowed		<input checked="" type="checkbox"/>	<input type="checkbox"/>
Performed Procedure Step Status	(0040,0252)	1/1	3/1		<input checked="" type="checkbox"/>	<input type="checkbox"/>
Performed Procedure Step Description	(0040,0254)	3/3 <sup>13</sup>	3/2		<input checked="" type="checkbox"/>	<input type="checkbox"/>
Performed Procedure Type Description	(0040,0255)	3/3 <sup>13</sup>	3/2		<input checked="" type="checkbox"/>	<input type="checkbox"/>
Procedure Code Sequence	(0008,1032)	3/3 <sup>13</sup>	3/2		<input checked="" type="checkbox"/>	<input type="checkbox"/>
>Code Value	(0008,0100)	1C/1 (Required if Sequence Item is present)	1C/1 (Required if Sequence Item is present)		<input checked="" type="checkbox"/>	<input type="checkbox"/>
>Coding Scheme Designator	(0008,0102)	1C/1 (Required if Sequence Item is present)	1C/1 (Required if Sequence Item is present)		<input checked="" type="checkbox"/>	<input type="checkbox"/>
>Code Meaning	(0008,0104)	3/3	3/3		<input checked="" type="checkbox"/>	<input type="checkbox"/>
Performed Procedure Step End Date	(0040,0250)	3/3 <sup>13</sup>	3/1	1	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Performed Procedure Step End Time	(0040,0251)	3/3 <sup>13</sup>	3/1	1	<input checked="" type="checkbox"/>	<input type="checkbox"/>
<b>Image Acquisition Results</b>					<input checked="" type="checkbox"/>	<input type="checkbox"/>

Description / Module	Tag	Type N-CREATE SCU/SCP	Type N-SET SCU/SCP	Requirement Type Final State <sup>12</sup>	Supported by Windows NT Edition	Supported by Unix Edition
Modality	(0008,0060)	1/1	Not allowed		<input checked="" type="checkbox"/>	<input type="checkbox"/>
Study ID	(0020,0010)	3/3 <sup>13</sup>	Not allowed		<input checked="" type="checkbox"/>	<input type="checkbox"/>
Performed Action Item Code Sequence	(0040,0260)	3/3 <sup>13</sup>	3/2		<input checked="" type="checkbox"/>	<input type="checkbox"/>
>Code Value	(0008,0100)	1C/1 (Required if Sequence Item is present)	1C/1 (Required if Sequence Item is present)		<input checked="" type="checkbox"/>	<input type="checkbox"/>
>Coding Scheme Designator	(0008,0102)	1C/1 (Required if Sequence Item is present)	1C/1 (Required if Sequence Item is present)		<input checked="" type="checkbox"/>	<input type="checkbox"/>
>Code Meaning	(0008,0104)	3/3	3/3		<input checked="" type="checkbox"/>	<input type="checkbox"/>
Performed Series Sequence	(0040,0340)	3/3 <sup>13</sup>	3/1	1 <sup>14</sup>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
>Performing Physician's Name	(0008,1050)	3/3 <sup>13</sup>	3/3 <sup>13</sup>	2	<input checked="" type="checkbox"/>	<input type="checkbox"/>
>Protocol Name	(0018,1030)	1C/1 (Required if Sequence Item is present)	1C/1 (Required if Sequence Item is present)	1	<input checked="" type="checkbox"/>	<input type="checkbox"/>
>Operator's Name	(0008,1070)	3/3 <sup>13</sup>	3/3 <sup>13</sup>	2	<input checked="" type="checkbox"/>	<input type="checkbox"/>
>Series Instance UID	(0020,000E)	1C/1 (Required if Sequence Item is present)	1C/1 (Required if Sequence Item is present)	1	<input checked="" type="checkbox"/>	<input type="checkbox"/>
>Series Description	(0008,103E)	3/3 <sup>13</sup>	3/3 <sup>13</sup>	2	<input checked="" type="checkbox"/>	<input type="checkbox"/>
>Retrieve AE Title	(0008,0054)	3/3 <sup>13</sup>	3/3 <sup>13</sup>	2	<input checked="" type="checkbox"/>	<input type="checkbox"/>

<sup>14</sup> The Performed Series Sequence (0040,0340) may not be empty (zero length) at the time that the Performed Procedure Step Status (0040,0252) is N-SET to a value of COMPLETED or DISCONTINUED. In other words a Series must exist for every Performed Procedure Step, though it may contain no Images or Stand-alone objects, if none were created, as described in F.7.2.2.2. (DICOM Standard).

Description / Module	Tag	Type N-CREATE SCU/SCP	Type N-SET SCU/SCP	Requirement Type Final State <sup>12</sup>	Supported by Windows NT Edition	Supported by Unix Edition
>Referenced Image Sequence	(0008,1140)	3/3 <sup>13</sup>	3/3 <sup>13</sup>	See F.7.2.2.2. (DICOM Standard)	<input checked="" type="checkbox"/>	<input type="checkbox"/>
>>Referenced SOP Class UID	(0008,1150)	1C/1 (Required if Sequence Item is present)	1C/1 (Required if Sequence Item is present)		<input checked="" type="checkbox"/>	<input type="checkbox"/>
>>Referenced SOP Instance UID	(0008,1155)	1C/1 (Required if Sequence Item is present)	1C/1 (Required if Sequence Item is present)		<input checked="" type="checkbox"/>	<input type="checkbox"/>
>Referenced Standalone SOP Instance Sequence	(0040,0220)	3/3 <sup>13</sup>	3/3 <sup>13</sup>	See F.7.2.2.2. (DICOM Standard)	<input checked="" type="checkbox"/>	<input type="checkbox"/>
>>Referenced SOP Class UID	(0008,1150)	1C/1 (Required if Sequence Item is present)	1C/1 (Required if Sequence Item is present)		<input checked="" type="checkbox"/>	<input type="checkbox"/>
>>Referenced SOP Instance UID	(0008,1155)	1C/1 (Required if Sequence Item is present)	1C/1 (Required if Sequence Item is present)		<input checked="" type="checkbox"/>	<input type="checkbox"/>
>All other attributes from Performed Series Sequence		3/3	3/3		<input checked="" type="checkbox"/>	<input type="checkbox"/>
All other attributes from Radiation Dose Module and Billing and Material Code Module		3/3	3/3		<input checked="" type="checkbox"/>	<input type="checkbox"/>

**7.2.2.2.1.1 PPS-Manager SCP**

In the event of an successful N-CREATE and N-SET operation, MCPPS saves all UIDs identifying the received performed procedure step in the RIS and uses the Study Instance UID and the patient information for trying to build a link between the performed procedure step and a scheduled procedure step/study object in the RIS. The RIS may use these UIDs to move the images at a later time.

The SCP behaviour as a result of receiving the Performed Procedure Step information consists of storing the data assigned to the PPS SOP Instance in the RIS database.

MCPPS returns one of the following status codes to indicate an unsuccessful N-CREATE/N-SET:

**Table 7-4 Reponse Codes**

<b>Response Code</b>	<b>Status</b>	<b>Further Meaning</b>
0000	Success	Receiving and processing of PPS was successfully.
0111	Duplicate SOP Instance	The new managed SOP Value supplied by the invoking DIMSE-service-user was already registered for a managed SOP Instance of the specified SOP Class.
0106	Invalid Attribute value	The Attribute Value specified was out of range or otherwise inappropriate.
B102	Calling Error	Any other error during parsing message was encountered.
B101	Refused-Attribute empty	A required Attribute Value was empty (Type 1).
B100	Refused-Attribute missing	A required Attribute was missing (Type 1 and 2).
B200	Refused-Attribute not allowed	An Attribute was included in the message, which is not defined within Table F.7.2-1 of the DICOM Standard.
0110	Processing Failure	A general failure in processing the operation was encountered.
0112	No such SOP Instance	The SOP Instance was not recognized.

**7.2.2.2.1.2 PPS-Manager SCU**

MCPPS does not provide extended negotiation. The SCU behaviour as a result of receiving the Performed Procedure Step information (by PPS-Manager SCP) consists of forwarding the data to a third device. In case the association could not be established or the response code from the third system is unequal Success (0000) the PPS information objects are queued and the PPS-Manager SCU attempts later to forward the information. This is repeated until the data could be forwarded successfully or the system administrator deletes the PPS object from the queue.

**7.2.2.2.2 Presentation Context Acceptance Criterion**

MCPPS (SCP) will always accept a Presentation Context for the Modality Performed Procedure SOP Class with the DICOM Default Transfer Syntax.

MCPPS (SCP) will accept any number of presentation contexts specified in Table 7-2 Acceptable Presentation Contexts for MCPPS. MCPPS will examine proposed Presentation contexts in the order proposed. For the presentation contexts of the same abstract syntax but different transfer syntaxes, only one of these presentation contexts will be accepted with the most preferred transfer syntax chosen by MCPPS. The policy of making this choice is described in the next section.

#### **7.2.2.2.3 Transfer Syntax Selection Policy**

MCPPS (SCP) selects an transfer syntax to accept for receiving a Performed Procedure Step with the following general rules: First of all, it prefers a transfer syntax which provides the explicit VR representation. After the VR choice has been made, MCPPS (SCP) tries to select the transfer syntax using following preference in descending order:

1. Explicit VR Little Endian
2. Explicit VR Big Endian
3. Implicit VR Little Endian

Different Transfer Syntaxes will not be selected.

## **8 COMMUNICATION PROFILES**

### **8.1 SUPPORTED COMMUNICATION STACKS**

MedoraCOM provides DICOM V3.0 TCP/IP Network Communication Support as defined in PS 3.8.

#### **8.1.1 TCP/IP Stack**

MedoraCOM inherits its TCP/IP stack from the base operating system upon which it executes.

#### **8.1.2 Physical Media Support**

MedoraCOM is indifferent to the physical medium over which TCP/IP executes. Support for the physical network medium is provided by the underlying base operating system.

## 9 EXTENSIONS/SPECIALIZATIONS/PRIVATIZATIONS

### 9.1 MEDORACOM SERVER

#### 9.1.1 Detached Interpretation Management ( N-GET )

##### **Requested SOP Instance UID:**

To match the correct interpretation the Requested SOP Instance UID has to have the following format:

MedoraInterpretationInstanceUIDRoot.AccessionNumber

MedoraInterpretationInstanceUIDRoot = 1.2.840.113619.6.95.31.0.3.4.1.9999.16 or  
1.2.276.0.14.999.999.16

AccessionNumber = Medora internal study ID

If configured in MedoraCOM the date of birth of the affected patient is required to be appended to the Requested SOP Instance UID. In that case the Requested SOP Instance UID has to have the following format:

MedoraInterpretationInstanceUIDRoot.AccessionNumber.DateOfBirth

DateOfBirth = Date of Birth of the patient using the format  
YYYYMMDD

##### **Referenced SOP Instance UID:**

The Referenced SOP Instance UID is generated by MedoraCOM.

MedoraResultsInstanceUIDRoot.AccessionNumber

MedoraResultsInstanceUIDRoot = 1.2.840.113619.6.95.31.0.3.4.1.9999.15 or  
1.2.276.0.14.999.999.15

AccessionNumber = Medora internal study ID

If configured in MedoraCOM additionally the date of birth of the concerned patient is appended to the Referenced SOP Instance UID. In that case the Referenced SOP Instance UID will have the following format:

MedoraResultsInstanceUIDRoot.AccessionNumber.DateOfBirth

DateOfBirth = Date of Birth of the patient using the format  
YYYYMMDD

### 9.2 MEDORACOM DETACHED MANAGEMENT SERVICES

#### 9.2.1 Detached Patient Management

First of all please note that only the N-EVENT-REPORT DIMSE-N service of the Detached Patient Management SOP Class is supported by MedoraCom.

In both cases described below of a patient related N-EVENT-REPORT the Event Type ID will be set to 3 (patient updated).

**Table 9-1 Patient Management Event Mapping**

Real World Event / Medora RIS Event	DICOM N-EVENT-REPORT	Supported by Windows NT Edition	Supported by Unix Edition
Update of an affected column	Patient Updated ( Event Type ID = 3 )	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Merge of two patients	Patient Updated ( Event Type ID = 3 )	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

### 9.2.1.1.1 Patient Update

MCDMS will trigger a N-EVENT-REPORT request if at least one of the columns listed in Table 4-3 Supported Attributes has been changed in GE Medora RIS. Since MCDMS gets a database trigger for each single column of a RIS patient object which has been changed, MCDMS waits a configurable time for further events concerning the same patient to ensure that network traffic will be kept on a minimum level.

### 9.2.1.1.2 Patient Merge

The implementation for notifying PACS about a performed merge of two logical patient objects in the RIS are a private definition with TIANI and MITRA. In that case the N-EVENT-REPORT may contain any attribute listed in table Table 4-3 Supported Attributes but the "Other Patient ID" attribute (0010,1000) is different from "Patient ID" (0010,0020), what means that the patient object defined by "Other Patient ID" should be merged to the patient object identified by "Patient ID". All existing studies of the patient object defined by "Other Patient ID" should be linked to the patient object identified by "Patient ID".

The patient object identified by the attribute (0010,0020) shall be updated with all other attributes included in the N-EVENT-REPORT and the patient object identified by the attribute (0010,1000) shall be deleted and all studies etc. of this patient object shall be assigned to the remaining patient object.

## 9.2.2 Detached Study Management

First of all please note that only the N-EVENT-REPORT DIMSE-N service of the Detached Study Management SOP Class is supported by MedoraCom.

**Table 9-2 Study Management Event Mapping**

Real World Event / Medora RIS Event	DICOM N-EVENT-REPORT	Supported by Windows NT Edition	Supported by Unix Edition
Appointment made	Study Scheduled ( Event Type ID = 2 )	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Patient arrives for study	Patient Arrived ( Event Type ID = 3 )	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Study parameters changed	Study Updated ( Event Type ID = 9 )	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Study done	Study Completed ( Event Type ID = 5 )	<input checked="" type="checkbox"/>	<input type="checkbox"/>



Real World Event / Medora RIS Event	DICOM N-EVENT-REPORT	Supported by Windows NT Edition	Supported by Unix Edition
Study cancelled	Study Deleted ( Event Type ID = 8 )	<input checked="" type="checkbox"/>	<input type="checkbox"/>

Every time a study is scheduled a study N-EVENT-REPORT is issued using the Event Type ID 2 ( study scheduled ). When the patient arrives and the study is announced in the RIS a Patient Arrived event is sent and when the study is marked as completed in the RIS a Study Completed event is sent.

### 9.2.3 Detached Results Management

First of all please note that only the N-EVENT-REPORT DIMSE-N service of the Detached Results Management SOP Class is supported by MedoraCom.

**Table 9-3 Results Management Event Mapping**

Real World Event / Medora RIS Event	DICOM N-EVENT-REPORT	Supported by Windows NT Edition	Supported by Unix Edition
Report created	Report Created ( Event Type ID = 1 )	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Report approved	Report Created ( Event Type ID = 1 )	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

### 9.2.4 Detached Interpretation Management

First of all please note that only the N-EVENT-REPORT DIMSE-N service and the N-GET DIMSE-N service of the Detached Interpretation Management SOP Class are supported by MedoraCom.

Within the Detached Interpretation Management implementation some standard DICOM attributes are included which are not specified by DICOM to be part of the Detached Interpretation Management N-EVENT-REPORT messages.

**Table 9-4 Interpretation Management Event Mapping**

Real World Event / Medora RIS Event	DICOM N-EVENT-REPORT	Supported by Windows NT Edition	Supported by Unix Edition
Report created	Interpretation Created (Event Type ID = 1) <sup>15</sup>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Report approved	Interpretation Created (Event Type ID = 1) <sup>15</sup>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Report dictated	Interpretation Created (Event Type ID = 1) <sup>16</sup> Interpretation Recorded (Event Type ID = 2)	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Report written	Interpretation Created (Event Type ID = 1) <sup>16</sup> Interpretation Transcribed (Event Type ID = 3)	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Report approved	Interpretation Created (Event Type ID = 1) <sup>16</sup> Interpretation Approved (Event Type ID = 4)	<input checked="" type="checkbox"/>	<input type="checkbox"/>

Depending on the operating system and the configuration following scenarios are feasible:

- 1) Every time a report has been approved a result N-EVENT-REPORT as well as an interpretation N-EVENT-REPORT is issued using the Event Type ID 1 ( results / interpretation created ).
- 2) Every time a report has been created a interpretation N-EVENT-REPORT is issued using the Event Type ID 1 ( interpretation created ) and every time a report has been approved a interpretation N-EVENT-REPORT with Event Type ID 4 ( interpretation approved ) is sent.

<sup>15</sup> Event mapping for privatisation type "None" or TIANI.

<sup>16</sup> Event mapping for privatisation type MITRA PACS Broker

## **10 CONFIGURATION**

MedoraCOM Server (MCSR), MedoraCOM Key Image Storage Server (MCKIS) and MedoraCOM PPSManager SCP (MCPPS) can be configured for the TCP/IP port number on which it will listen for incoming TCP/IP connections.

MedoraCOM NER Server (MCDMS), MedoraCOM Image Query/Retrieve Server (MCQRS) and MedoraCOM PPSManager SCU (MCPPS) can be configured for the TCP/IP port number on which it will try to connect to a remote AE.

## **11 SUPPORT OF EXTENDED CHARACTER SETS**

MedoraCOM supports the ISO-IR 100 character set in addition to the default character repertoire.