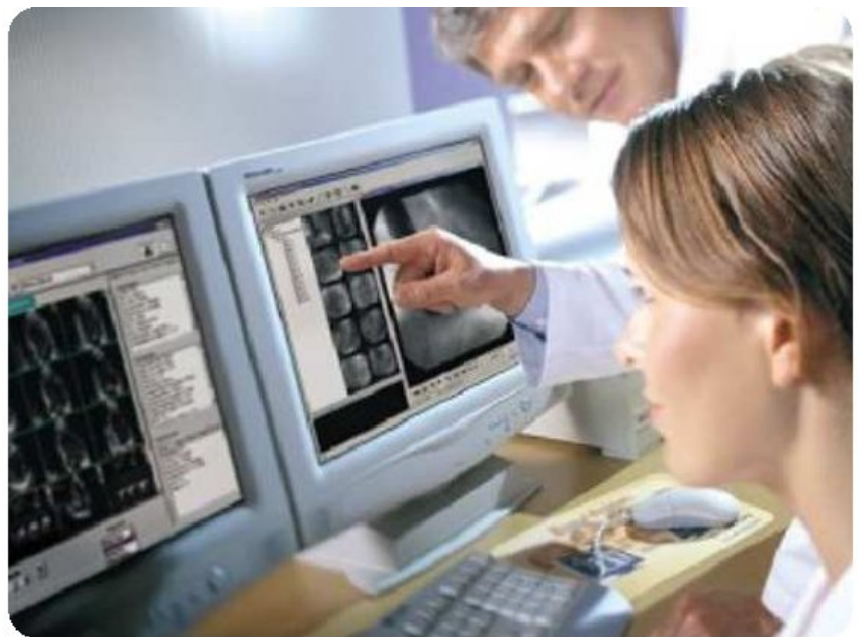


---

# DICOM

## Conformance Statement

Xcelera Connect  
Release 1.3 L2



***Issued by:***

Philips Medical Systems Nederland B.V.  
Healthcare Informatics  
Interoperability Competence Center

P.O. Box 10.000  
5680 DA Best  
The Netherlands

email: <mailto:dicom@philips.com>  
Internet: <http://www.medical.philips.com/connectivity/>

Document Number: XBS 026-070023.02  
Date: 11 January 2008

## Table of Contents

<b>1. INTRODUCTION .....</b>	<b>4</b>
1.1. Scope and Field of Application .....	4
1.2. Intended Audience .....	4
1.3. Contents and Structure .....	4
1.4. Used Definitions, Terms and Abbreviations .....	4
1.5. References .....	4
1.6. Important Note to the Reader .....	4
1.7. General Acronyms and Abbreviations.....	5
<b>2. IMPLEMENTATION MODEL.....</b>	<b>6</b>
2.1. Application Data Flow .....	7
2.2. Functional definition of Application Entities.....	8
2.3. Sequences of Real World Activities .....	8
<b>3. AE SPECIFICATIONS .....</b>	<b>9</b>
3.1. AE Specifications Summary.....	9
3.2. Association Establishment Policies.....	9
3.2.1. General .....	9
3.2.2. Number of Associations .....	9
3.2.3. Asynchronous Nature .....	9
3.2.4. Implementation Identifying Information .....	9
3.2.5. Communication Failure Handling .....	9
3.3. Association Acceptance Policy .....	10
3.3.1. Real World Activity – Request Verification .....	10
3.3.2. Real World Activity - Request for Modality Worklist .....	11
3.3.3. Real World Activity – Create/Update MPPS.....	15
3.4. Association Initiation Policy.....	19
3.4.1. Real World Activity – Forward MPPS Message .....	20
<b>4. COMMUNICATION PROFILES.....</b>	<b>24</b>
4.1. Supported Communication Stacks.....	24
4.2. Physical Media Support .....	24
<b>5. CONFIGURATION.....</b>	<b>25</b>
5.1. AE Title/Presentation Address mapping .....	25
5.2. Configurable parameters .....	25
<b>6. SUPPORT OF EXTENDED CHARACTER SETS .....</b>	<b>26</b>
6.1. Character Sets.....	26

# 1. INTRODUCTION

This chapter provides general information about the purpose, scope and contents of this Conformance Statement.

## 1.1. Scope and Field of Application

The scope of this DICOM Conformance Statement is to facilitate data exchange with equipment of Philips Medical Systems. This document specifies the compliance to the DICOM standard (formally called the NEMA PS 3.X standards). It contains a short description of the applications involved and provides technical information about the data exchange capabilities of the equipment. The main elements describing these capabilities are: the supported DICOM Service Object Pair (SOP) Classes, Roles, Information Object Definitions (IOD) and Transfer Syntaxes.

The field of application is the integration of the Philips Medical Systems equipment into an environment of medical devices. This Conformance Statement should be read in conjunction with the DICOM standard and its addenda [DICOM].

## 1.2. Intended Audience

This Conformance Statement is intended for:

- (Potential) customers
- System integrators of medical equipment
- Healthcare IT consultants interested in system functionality
- Software designers implementing DICOM interfaces

It is assumed that the reader is familiar with the DICOM standard.

## 1.3. Contents and Structure

The DICOM Conformance Statement is contained in chapter 2 through 7 and follows the contents and structuring requirements of DICOM PS 3.2.

## 1.4. Used Definitions, Terms and Abbreviations

DICOM definitions, terms and abbreviations are used throughout this Conformance Statement. For a description of these, see NEMA PS 3.3 and PS 3.4.

The word Philips in this document refers to Philips Medical Systems.

## 1.5. References

[DICOM] The Digital Imaging and Communications in Medicine (DICOM) standard (NEMA PS 3.1 – 3.18),  
National Electrical Manufacturers Association (NEMA)  
Publication Sales 1300 N. 17<sup>th</sup> Street, Suite 1847  
Rosslyn, Va. 22209, United States of America.  
Internet: <http://medical.nema.org/>

## 1.6. Important Note to the Reader

This Conformance Statement by itself does not guarantee successful interoperability of Philips equipment with non-Philips equipment. The user (or user's agent) should be aware of the following issues:

➤ **Interoperability**

Interoperability refers to the ability of application functions, distributed over two or more systems, to work successfully together. The integration of medical devices into an IT environment may require application functions that are not specified within the scope of DICOM. Consequently, using only the information provided by this Conformance Statement does not guarantee interoperability of Philips equipment with non-Philips equipment. It is the user's responsibility to analyze thoroughly the application requirements and to specify a solution that integrates Philips equipment with non-Philips equipment.

➤ **Validation**

Philips equipment has been carefully tested to assure that the actual implementation of the DICOM interface corresponds with this Conformance Statement. Where Philips equipment is linked to non-Philips equipment, the first step is to compare the relevant Conformance Statements. If the Conformance Statements indicate that successful information exchange should be possible, additional validation tests will be necessary to ensure the functionality, performance, accuracy and stability of image and image related data. It is the responsibility of the user (or user's agent) to specify the appropriate test suite and to carry out the additional validation tests.

➤ **New versions of the DICOM Standard**

The DICOM Standard will evolve in future to meet the user's growing requirements and to incorporate new features and technologies. Philips is actively involved in this evolution and plans to adapt its equipment to future versions of the DICOM Standard. In order to do so, Philips reserves the right to make changes to its products or to discontinue its delivery. The user should ensure that any non-Philips provider linking to Philips equipment also adapts to future versions of the DICOM Standard. If not, the incorporation of DICOM enhancements into Philips equipment may lead to loss of connectivity (in case of networking) and incompatibility (in case of media).

## 1.7. General Acronyms and Abbreviations.

The following acronyms and abbreviations are used in the document.

ACC	American College of Cardiology
ACN	Application Context Name
AE	Application Entity
ANSI	American National Standard Institute
CIS	Cardiology Information System
DICOM	Digital Imaging and Communication in Medicine
DIMSE	DICOM Message Service Element
ELE	Explicit VR Little Endian
EBE	Explicit VR Big Endian
HIS	Hospital Information System
HL7	Health Level 7 (Interface Standard)
IHE	Integrated Healthcare Enterprise
ILE	Implicit VR Little Endian
IMS	Image Management System
IOD	Information Object Definition
NEMA	National Electrical Manufacturers Association
MWLM	Modality Worklist Management
MPPS	Modality Performed Procedure Step
PACS	Picture Archiving and Communication System
PAS	Patient Administration System
PDU	Protocol Data Unit
RIS	Radiology Information System
RWA	Real World Activity
SCP	Service Class Provider
SCU	Service Class User
SOP	Service Object Pair
TCP/IP	Transmission Control Protocol/Internet protocol
UID	Unique Identifier
VR	Value Representation

## 2. IMPLEMENTATION MODEL

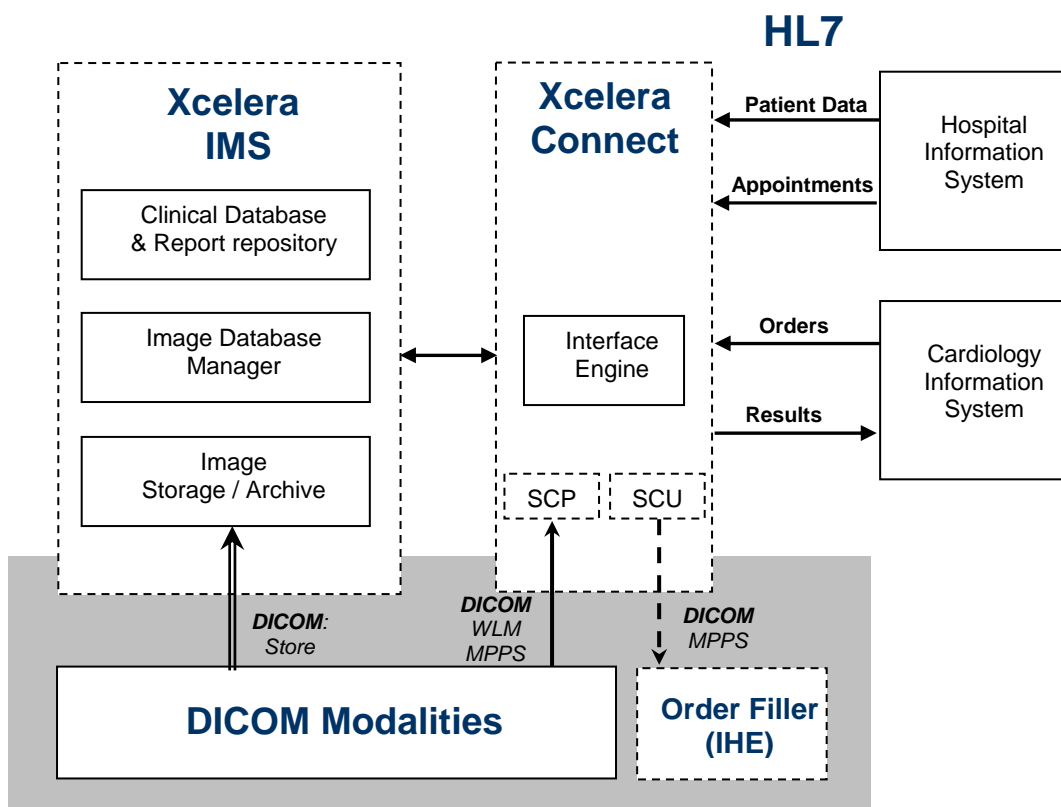
Xcelera Connect Release 1.3 of Philips Medical Systems is a highly programmable interface engine to connect the Xcelera Image Management System (IMS) and DICOM competent (imaging) modalities to the Hospital Information Systems (HIS) and/or the Cardiology Information System (CIS).

Xcelera Connect is a member of the Xcelera (Cardiology IT) product portfolio. Prime objective of the interface engine is to match the HL7 domain of the hospital information management systems (HIS, CIS, EMR) to the DICOM domain of Imaging modalities, Xcelera Image Management system and its connected (diagnostic) viewing workstations.

Xcelera Connect supports DICOM Modality Worklist Management (MWLM) as a Service Class Provider (SCP) and DICOM Modality Performed Procedure Step (MPPS) both as a Service Class Provider (SCP) and Service Class User (SCU).

The SCU role of MPPS is required to support the IHE requirements on Cardiology workflow. Xcelera Connect, on behalf of Xcelera IMS, may propagate the MPPS data from the DICOM modalities to an "IHE competent" Order Filler system.

Figure 1: Position of Xcelera Connect in the HIS/CIS/EMR & PACS Domain



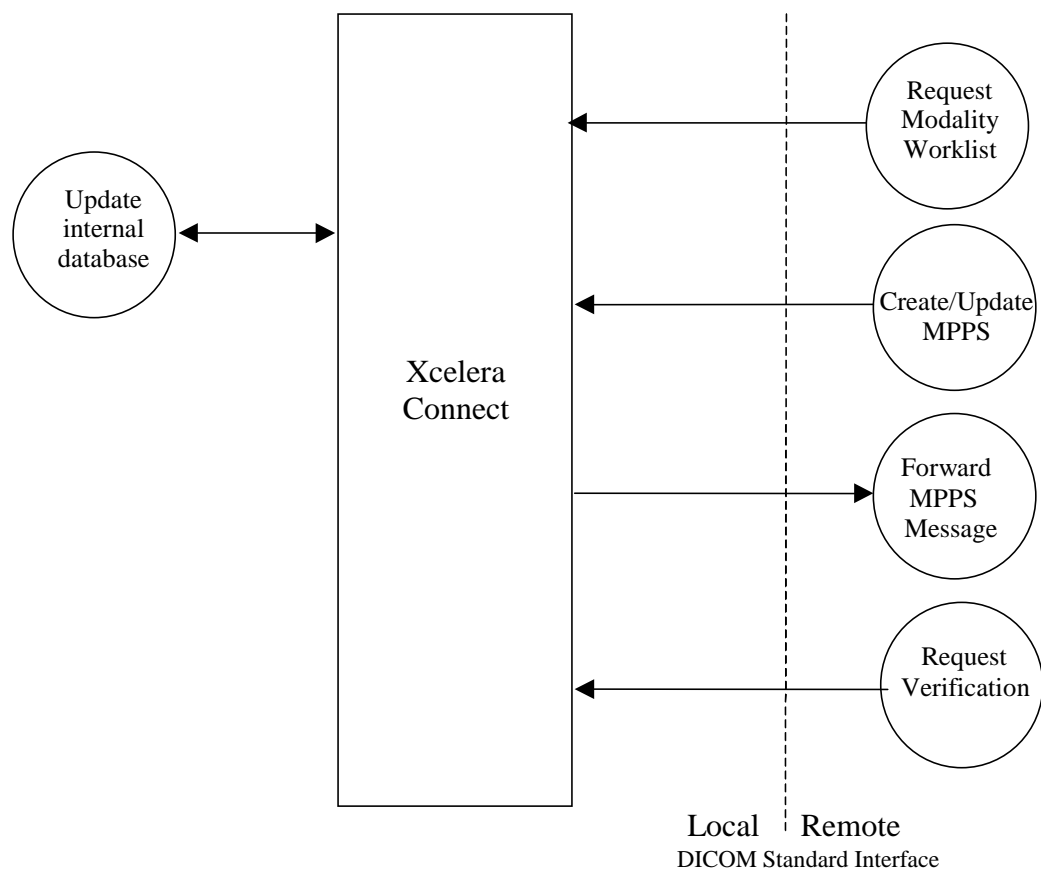
For HL7 details and nomenclature please refer to the related Xcelera Connect HL7 Interface Specification. The HL7 specification describes the semantics and data structures of the messages between Xcelera Connect and the (external) information management systems of the hospital(s).

## 2.1. Application Data Flow

As part of the implementation model, an application data flow diagram is included. This diagram represents all of the Application Entities present in an implementation and graphically depicts the relationship of the AE's use of DICOM to Real-World Activities (RWA) as well as any applicable user interaction.

Xcelera Connect can handle multiple Application Entities. The related Implementation Model (for a single AE) is shown in Figure 2.

**Figure 2: Xcelera Connect R1.3L2 – Application Data Flow Diagram**



Xcelera Connect is able to communicate with modalities according to DICOM. It will accept associations in order to receive requests from modalities for an up-to-date Worklist. The Worklist management application of Xcelera Connect will interpret the modalities requests, retrieve the requested modality worklist data from its internal database and send the detailed worklist contents to the modalities.

Xcelera Connect will also accept associations related to start and completion of (performed) procedures (i.e. examinations). The MPPS message will be interpreted by the relevant application in Xcelera Connect and stored in its internal database.

If required, Xcelera Connect can receive/queue the MPPS messages from the modalities and forward these to an external, DICOM competent information system; acting as a DICOM SCU.

Xcelera Connect also supports DICOM Verification requests from the remote modalities.

## 2.2. Functional definition of Application Entities

Xcelera Connect implements a DICOM Service Class Provider (SCP) for the Basic Worklist Management and for the Modality Performed Procedure Step SOP Class. Both of these SCP's are contained within a single Application Entity. This Application Entity will accept associations from other (Modality type) Application Entities acting as DICOM Service Class Users (SCU). It will then deploy these MWLM and/or MPPS requests from the SCU's.

The Xcelera Connect program supports multiple Application Entities. Each Xcelera Connect Application Entity will support MWLM and MPPS for the modality Application Entities that are configured. The number of Application Entities that can be supported depends on the system resources of the Xcelera Connect platform.

## 2.3. Sequences of Real World Activities

Xcelera Connect does not require any specific sequence of activities.

Modalities are setup in such a way that the requests for MWLM updates is issued at regular intervals. Moreover, the user may press a button on the modality console to refresh the modality worklist instantaneously.

Regarding the MPPS service, the modality has to comply with the normal sequence as defined in the DICOM standard. An MPPS-Created message should be followed by an MPPS-Updated (or Cancelled) and/or a MPPS-Completed message type.



## 3. AE SPECIFICATIONS

### 3.1. AE Specifications Summary

The Xcelera Connect Application Entity provides standard conformance to the DICOM V3.0 SOP classes as a SCP specified in the Table below.

**Table 1. Supported SOP Classes as SCP**

SOP Class Name	SOP Class UID	SCU	SCP
Verification SOP Class	1.2.840.10008.1.1	No	Yes
Modality Worklist Information Model - FIND SOP Class	1.2.840.10008.5.1.4.31	No	Yes
Modality Performed Procedure Step SOP Class	1.2.840.10008.3.1.2.3.3	Yes	Yes

### 3.2. Association Establishment Policies

#### 3.2.1. General

Xcelera Connect always proposes the following DICOM Application Context Name (ACN):  
**1.2.840.10008.3.1.1.1**

The Xcelera Connect offers a maximum PDU size on accepted associations of **28,672** bytes.

#### 3.2.2. Number of Associations

There is no limit (beyond system resources) on the number of Xcelera Connect AE's that can be active simultaneously. However, the number of modality licenses limits the maximum of simultaneous associations.

Xcelera Connect will allow only **1** simultaneous association as an Association Initiator and up to **5** simultaneous associations as an Association Acceptor at a time.

#### 3.2.3. Asynchronous Nature

Xcelera Connect allows a **single** outstanding operation on any association. Therefore, Xcelera Connect does not support asynchronous operations and related negotiation.

#### 3.2.4. Implementation Identifying Information

The Implementation Class UID:	1.3.46.670589.16.5.211
The implementation version name:	XceleraCLM211

#### 3.2.5. Communication Failure Handling

Xcelera Connect considers an ARTIM Timeout of **30 seconds** as a communication failure

### 3.3. Association Acceptance Policy

This section describes the conditions under which the AE will accept (or reject) associations initiated by external DICOM modalities (hereafter called: systems).

#### 3.3.1. Real World Activity – Request Verification

##### 3.3.1.1. Associated Real-World Activity

Xcelera Connect accepts associations from systems to verify application level communication using the **C-ECHO** Service Element.

##### 3.3.1.2. Presentation Context Table

Xcelera Connect will accept the presentation contexts as given in the table below.

**Table 2. Supported Presentation Context for the Verification service**

Abstract Syntax Name	UID	Transfer Syntax	UID List	Role	Ext. Neg.
Verification SOP Class	1.2.840.10008.1.1	ILE	1.2.840.10008.1.2	SCP	None
		ELE	1.2.840.10008.1.2.1		
		EBE	1.2.840.10008.1.2.2		

##### 3.3.1.3. SOP Specific Conformance

Xcelera Connect provides standard conformance to the DICOM Verification Service Class.

##### 3.3.1.3.1. Specific Conformance for Verification C-ECHO SCP

The dataset specific conformance for the Verification C-ECHO SCP Service is described in the Tables below.

**Table 3. C-ECHO-RSP Status Response**

Service Status	Code	Further Meaning	Description
Success	0000	Matching is complete	Association will be released. Message logged in Xcelera Connect
Failure	A900	Identifier does not match SOP Class	Reason will be logged
	Cxxx	Unable to process	Reason will be logged

**Table 4. DICOM Command Communication Failure Behavior**

Exception	Description
REPLAY TIMEOUT	Reason will be logged
ASSOCIATION ABORTED	Reason will be logged
ASSOCIATION TIMEOUT	Reason will be logged

### 3.3.2. Real World Activity - Request for Modality Worklist

#### 3.3.2.1. Associated Real-World Activity

Xcelera Connect accepts associations from systems that wish to have an up-to-date Modality Worklist using the **C-FIND** Service Element.

#### 3.3.2.2. Presentation Context Table

Xcelera Connect will accept the presentation contexts as given in the table below.

**Table 5. Supported Presentation Context for Modality Worklist as SCP**

Abstract Syntax Name	UID	Transfer Syntax	UID List	Role	Ext. Neg.
Modality Worklist Information Model C-FIND SOP Class	1.2.840.10008.5.1.4.31	ILE	1.2.840.10008.1.2	SCP	None
		ELE	1.2.840.10008.1.2.1		
		EBE	1.2.840.10008.1.2.2		

#### 3.3.2.3. SOP Specific Conformance

Xcelera Connect provides standard conformance to the DICOM Modality Worklist C-FIND SOP Class. The following restrictions are applicable for Modality Worklist functionality in Xcelera Connect:

- Relational queries are not supported
- Xcelera Connect is able to handle multiple C-FIND simultaneously
- Xcelera Connect does not support the required matching key attribute: *Scheduled Performing Physician's Name*
- The Xcelera Connect can only handle one wildcard on a matching key in C-FIND-RQ message. When more than one wildcard is used, Xcelera Connect responds with 'no matches'.
- Xcelera Connect cannot handle a C-FIND-RQ that contains the 'Scheduled Procedure Code Sequence'.
- The applied values for the 'Scheduled Procedure Step Start Data' and 'Scheduled Procedure Start Time' that are returned in the worklist response are the date and time as received from the CIS or HIS system in the Order message.

##### 3.3.2.3.1. Specific Conformance for Modality Worklist C-FIND SCP

The dataset specific conformance for the Modality Worklist C-FIND SCP Service is described in the Tables below.

**Table 6. C-FIND-RSP Status Response**

Service Status	Code	Further Meaning	Description
Success	0000	Matching is complete	Association will be released. Message logged in Xcelera Connect
Failure	A900	Identifier does not match SOP Class	Reason will be logged
	Cxxx	Unable to process	Reason will be logged

**Table 7. DICOM Command Communication Failure Behavior**

Exception	Description
REPLAY TIMEOUT	Reason will be logged
ASSOCIATION ABORTED	Reason will be logged
ASSOCIATION TIMEOUT	Reason will be logged

**Table 8. Modality Worklist (optional) Return Keys supported**

Attribute Name	Tag	VR	Remark / Comment
<b>SOP Common Module</b>			
Specific Character Set	0008,0005	CS	ISO_IR 100
<b>Patient Identification Module</b>			
Patient's Name	0010,0010	PN	
Patient ID	0010,0020	LO	
Issuer of Patient ID	0010,0021	LO	
Other Patient IDs	0010,1000	LO	Always Empty
Other Patient Names	0010,1001	PN	Always Empty
Patient's Birth Name	0010,1005	PN	Always Empty
Patient's Mother's Birth Name	0010,1060	PN	Always Empty
Medical Record Locator	0010,1090	LO	Always Empty
<b>Patient Demographic Module</b>			
Patient's Birth Date	0010,0030	DA	
Patient's Sex	0010,0040	CS	Possible values: M, F, O
Patient's Weight	0010,1030	DS	
Confidentiality Constraint on Patient Data Description	0040,3001	LO	Always Empty
Patient's Birth Time	0010,0032	TM	Always Empty
Patient's Age	0010,1010	AS	Always Empty
Patient's Size	0010,1020	DS	
Patient's Address	0010,1040	LO	Always Empty
Military Rank	0010,1080	LO	Always Empty
Branch of Service	0010,1081	LO	Always Empty
Country of Residence	0010,2150	LO	Always Empty
Patient's Telephone Numbers	0010,2154	SH	Always Empty
Ethnic Group	0010,2160	SH	Always Empty
Patient's Religious Preference	0010,21F0	LO	Always Empty
Patient Comments	0010,4000	LT	Always Empty
<b>Patient Medical Module</b>			
Medical Alerts	0010,2000	LO	Always Empty
Contrast Allergies	0010,2110	LO	Always Empty
Pregnancy Status	0010,21C0	US	Always Empty
Special Needs	0038,0050	LO	Always Empty
Patient State	0038,0500	LO	Always Empty
Smoking Status	0010,21A0	CS	Always Empty
Additional Patient History	0010,21B0	LT	Always Empty
Last Menstrual Date	0010,21D0	DA	Always Empty
<b>Visit Relationship Module</b>			
Referenced Patient Sequence	0008,1120	SQ	Always Empty
<b>Visit Identification Module</b>			
Admission ID	0038,0010	LO	Always Empty
Institution Name	0008,0080	LO	

Attribute Name	Tag	VR	Remark / Comment
Institution Address	0008,0081	ST	
Issuer of Admission ID	0038,0011	LO	Always Empty
Institution Code Sequence	0008,0082	SQ	Always Empty
<b>Visit Status Module</b>			
Current Patient Location	0038,0300	LO	Always Empty
Visit Status ID	0038,0008	CS	Always Empty
Patient's Institution Residence	0038,0400	LO	Always Empty
Visit Comments	0038,4000	LT	Always Empty
<b>Scheduled Procedure Step Module</b>			
Scheduled Procedure Step Sequence	0040,0100	SQ	
>Modality	0008,0060	CS	
>Scheduled Station AE Title	0040,0001	AE	
>Scheduled Procedure Step Start Date	0040,0002	DA	
>Scheduled Procedure Step Start Time	0040,0003	TM	
>Scheduled Procedure Step ID	0040,0009	SH	
>Scheduled Procedure Step Description	0040,0007	LO	
>Scheduled Performing Physician's Name	0040,0006	PN	Always Empty
>Scheduled Station Name	0040,0010	SH	Always Empty
>Scheduled Procedure Step Location	0040,0011	SH	Always Empty
>Requested Contrast Agent	0032,1070	LO	Always Empty
>Pre-Medication	0040,0012	LO	Always Empty
>Scheduled Procedure Step End Date	0040,0004	DA	
>Scheduled Procedure Step End Time	0040,0005	TM	
>Scheduled Procedure Step Status	0040,0020	CS	Applied value: SCHEDULED
>Comments on the Scheduled Procedure Step	0040,0400	LT	Always Empty
>Scheduled Protocol Code Sequence	0040,0008	SQ	
<b>Requested Procedure Module</b>			
Study Instance UID	0020,000D	UI	
Requested Procedure ID	0040,1001	SH	
Requested Procedure Description	0032,1060	LO	
Requested Procedure Priority	0040,1003	SH	Always Empty
Patient Transport Arrangements	0040,1004	LO	Always Empty
Reason for the Requested Procedure	0040,1002	LO	
Requested Procedure Location	0040,1005	LO	Always Empty
Confidentiality Code	0040,1008	LO	Always Empty
Reporting Priority	0040,1009	SH	Always Empty
Names of Intended Recipients of	0040,1010	PN	Always Empty

Attribute Name	Tag	VR	Remark / Comment
Results			
Requested Procedure Comments	0040,1400	LT	Always Empty
Referenced Study Sequence	0008,1110	SQ	
>Referenced SOP Class UID	0008,1150	UI	
>Referenced SOP Instance UID	0008,1155	UI	
<b>Imaging Service Request Module</b>			
Accession Number	0008,0050	SH	
Referring Physician's Name	0008,0090	PN	
Requesting Physician	0032,1032	PN	Always Empty
Requesting Service	0032,1033	LO	Always Empty
Reason for the Imaging Service Request (RETIRED)	0040,2001	LO	Always Empty
Issue Date of Imaging Service Request	0040,2004	DA	Always Empty
Issue Time of Imaging Service Request	0040,2005	TM	Always Empty
Order Entered By	0040,2008	PN	Always Empty
Order Enterer's Location	0040,2009	SH	Always Empty
Order Callback Phone Number	0040,2010	SH	Always Empty
Placer Order Number/Imaging Service Request	0040,2016	LO	
Filler Order Number/Imaging Service Request	0040,2017	LO	
Imaging Service Request Comments	0040,2400	LT	Always Empty
<b>Additional Module</b>			
Study ID	0020,0010	SH	Needed by the SONOS (US) In case no Study ID, applied value is 1
Study Status ID	0032,000A	CS	Needed by the SONOS (US) Default value: SCHEDULED

### 3.3.3. Real World Activity – Create/Update MPPS

#### 3.3.3.1. Associated Real-World Activity

Xcelera Connect accepts associations from systems that send an N-CREATE or N-SET Modality Performed Procedure Step (MPPS).

#### 3.3.3.2. Presentation Context Table

Xcelera Connect will accept the presentation contexts as given in the table below.

**Table 9. Supported Presentation Context for MPPS service**

Abstract Syntax Name	UID	Transfer Syntax	UID List	Role	Ext. Neg.
Modality Performed	1.2.840.10008.3.1.2.3.3	ILE	1.2.840.10008.1.2	SCP	None
Procedure Step SOP Class		ELE	1.2.840.10008.1.2.1		
		EBE	1.2.840.10008.1.2.2		

#### 3.3.3.3. SOP Specific Conformance

The following attributes should be present in the MPPS request:

**Table 10. Required attributes in a MPPS-Create request**

Attribute Name	Tag	Note
Performed Procedure Step Start Date	0040,0244	
Performed Procedure Step Start Time	0040,0245	
Patient's Name	0010,0010	
Study Instance UID	0020,000D	

If any of these attributes are not present in the MPPS request Xcelera Connect will consider that an error has occurred and will return *Invalid Attribute Value* (Status Code 0106) or the *Missing Attribute Value* (Status Code 0121) response and discard the request message. It will continue to listen for additional MPPS messages.

#### 3.3.3.3.1. Specific Conformance for MPPS N-CREATE

Xcelera Connect returns the N-CREATE status responses that are mentioned in the table below.

**Table 11. MPPS N-CREATE STATUS Response**

Service Status	Status Codes	Further Meaning
Success	0000	Matching is complete - No final identifier is supplied
Failed	A900	Identifier does not match SOP Class
	Cxxx	Unable to process
Warning	0106	Invalid Attribute Value
	0110	Processing Failed
	0121	Missing attribute Value

**Table 12. DICOM Command Communication Failure Behavior**

Exception	Description
REPLAY TIMEOUT	Reason will be logged
ASSOCIATION ABORTED	Reason will be logged

Exception	Description
ASSOCIATION TIMEOUT	Reason will be logged

**Table 13. Supported attributes in MPPS N-CREATE SCP**

Attribute Name	Tag	VR	Remark / Comment
<b>SOP Common Module</b>			
Specific Character Set	0008,0005	CS	ISO_IR 100
<b>Performed Procedure Step Information Module</b>			
Performed Station AE Title	0040,0241	AE	
Performed Procedure Step Start Date	0040,0244	DA	
Performed Procedure Step Start Time	0040,0245	TM	
Performed Procedure Step Status	0040,0252	CS	
Performed Procedure Step ID	0040,0253	SH	
Performed Station Name	0040,0242	SH	
Performed Location	0040,0243	SH	
Performed Procedure Step End Date	0040,0250	DA	
Performed Procedure Step End Time	0040,0251	TM	
Performed Procedure Step Description	0040,0254	LO	
Performed Procedure Type Description	0040,0255	LO	
Procedure Code Sequence	0008,1032	SQ	
>Code Value	0008,0100	SH	
>Coding Scheme Designator	0008,0102	SH	
>Coding Scheme Version	0008,0103	SH	
>Code Meaning	0008,0104	LO	
<b>Radiation Dose Module</b>			
Image and Fluoroscopy Area Dose Product	0018,115E	DS	
Total Time of Fluoroscopy	0040,0300	US	
Total Number of Exposures	0040,0301	US	
Entrance Dose	0040,0302	US	
<b>Performed Procedure Step Relationship Module</b>			
Patient's Name	0010,0010	PN	
Patient ID	0010,0020	LO	
Patient's Birth Date	0010,0030	DA	
Patient's Sex	0010,0040	CS	
Scheduled Step Attribute Sequence	0040,0270	SQ	
>Study Instance UID	0020,000D	UI	
>Accession Number	0008,0050	SH	
>Requested Procedure Description	0032,1060	LO	
>Scheduled Procedure Step Description	0040,0007	LO	



Attribute Name	Tag	VR	Remark / Comment
>Scheduled Procedure Step ID	0040,0009	SH	
>Requested Procedure ID	0040,1001	SH	
>Referenced Study Sequence	0008,1110	SQ	
>>Referenced SOP Class UID	0008,1150	UI	
>>Referenced SOP Instance UID	0008,1155	UI	
>Scheduled Protocol Code Sequence	0040,0008	SQ	
>>Code Value	0008,0100	SH	
>>Coding Scheme Designator	0008,0102	SH	
>>Code Meaning	0008,0104	LO	
Referenced Patient Sequence	0008,1120	SQ	
>Referenced SOP Class UID	0008,1150	UI	
>Referenced SOP Instance UID	0008,1155	UI	
<b>Image Acquisition Results Module</b>			
Modality	0008,0060	CS	
Study ID	0020,0010	SH	
Performed Series Sequence	0040,0340	SQ	
>Series Instance UID	0020,000E	UI	
>Referenced Image Sequence	0008,1140	SQ	
>>Referenced SOP Class UID	0008,1150	UI	
>>Referenced SOP Instance UID	0008,1155	UI	
<b>Billing and Material Management Code Module</b>			
Film Consumption Sequence	0040,0321	SQ	
>Medium Type	2000,0030	CS	
<b>Additional CathLab related attributes</b>			
Entrance Dose in mGy	0040,8302	DS	
Exposure Channel	0009,1008		
Exposure Start Time	0009,1032		
Scan Options	0018,0022		
Exposure Time	0018,1150		
Positioner Primary Angle	0018,1510		
Positioner Secondary Angle	0018,1511		
Frame Rate	0019,2040		
Exposure Number	0021,1012		
Number of Exposure Results	0029,3008		
Accumulated Fluoroscopy Dose	0041,1020		
Accumulated Exposure Dose	0041,1030		
Total Dose	0041,1040		
Total Number of Frames	0041,1041		

### 3.3.3.3.2. Specific Conformance for the MPPS N-SET

Xcelera Connect returns the N-CREATE status responses that are mentioned in Tables below.

IMPORTANT NOTE: All of the attributes processed by the N-CREATE request are also processed by the N-SET request.

**Table 14. MPPS N-SET STATUS**

Service Status	Status Codes	Further Meaning
Success	0000	Matching is complete - No final identifier is supplied
Failed	A900	Identifier does not match SOP Class
	Cxxx	Unable to process
Warning	0110	Processing Failed

**Table 15. Supported attributes for MPPS N-SET SCP**

Attribute Name	Tag	VR	Remark / Comment
<b>Performed Procedure Step Information Module</b>			
Performed Procedure Step End Date	0040,0250	DA	
Performed Procedure Step End Time	0040,0251	TM	
Performed Procedure Step Status	0040,0252	CS	
<b>Image Acquisition Results Module</b>			
Performed Series Sequence	0040,0340	SQ	
>Protocol Name	0018,1030	LO	
>Series Instance UID	0020,000E	UI	
>Retrieve AE Title	0008,0054	AE	
>Series Description	0008,103E	LO	
>Performing Physician's Name	0008,1050	PN	
>Operators' Name	0008,1070	PN	
>Referenced Image Sequence	0008,1140	SQ	
>>Referenced SOP Class UID	0008,1150	UI	
>>Referenced SOP Instance UID	0008,1155	UI	
>Referenced Non-Image Composite SOP Instance Sequence	0040,0220	SQ	
>>Referenced SOP Class UID	0008,1150	UI	
>>Referenced SOP Instance UID	0008,1155	UI	

### 3.4. Association Initiation Policy

This section describes the conditions under which the AE will initiate an association. The behavior of the AE during associations rejection is summarized in the Tables below. Thereafter, the Real World Activity (RWA) – *Forward MPPS* is described in more details.

**Table 16. DICOM Association Reject Handling**

Result	Source	Reason / Diagnosis	Behavior
1 – rejected-permanent	1 – DICOM UL service-user	1 – no-reason-given	The information is logged
		2 – application-context-name-not-supported	The information is logged
		3 – calling-AE-title-not-recognized	The information is logged
		7 – called-AE-title-not-recognized	The information is logged
	2 – DICOM UL service-provider (ACSE related function)	1 – no-reason-given	The information is logged
		2 – protocol-version-not-supported	The information is logged
3 – DICOM UL service-provider (presentation related function)	1 – temporary-congestion	The information is logged	
	2 – local-limit-exceeded	The information is logged	
2 – rejected-transient	1 – DICOM UL service-user	1 – no-reason-given	The information is logged
		2 – application-context-name-not-supported	The information is logged
		3 – calling-AE-title-not-recognized	The information is logged
		7 – called-AE-title-not-recognized	The information is logged
	2 – DICOM UL service-provider (ACSE related function)	1 – no-reason-given	The information is logged
		2 – protocol-version-not-supported	The information is logged
	3 – DICOM UL service-provider (presentation related function)	1 – temporary-congestion	The information is logged
		2 – local-limit-exceeded	The information is logged

**Table 17. DICOM Association Abort Handling & Policies**

Source	Reason / Diagnosis	Behavior
0 – DICOM UL service-user	0 – reason-not-specified	The information is logged
2 – DICOM UL service-provider	0 – reason-not-specified	The information is logged
	1 – unrecognized-PDU	The information is logged
	2 – unexpected-PDU	The information is logged
	4 – unrecognized-PDU parameter	The information is logged
	5 – unexpected-PDU parameter	The information is logged
	6 – invalid-PDU-parameter value	The information is logged

### 3.4.1. Real World Activity – Forward MPPS Message

#### 3.4.1.1. Associated Real-World Activity

As an SCU, Xcelera Connect may initiate associations to remote (HIS/RIS) systems in order to transfer MPPS related data to these systems.

#### 3.4.1.2. Presentation Context Table

Xcelera Connect will support the presentation contexts as given in the table below.

**Table 18. Supported Presentation Context for MPPS service**

Abstract Syntax Name	UID	Transfer Syntax	UID List	Role	Ext. Neg.
Modality Performed	1.2.840.10008.3.1.2.3.3	ILE	1.2.840.10008.1.2	SCU	None
Procedure Step SOP Class		ELE	1.2.840.10008.1.2.1		
		EBE	1.2.840.10008.1.2.2		

#### 3.4.1.3. SOP Specific Conformance

The following attributes will be present in the MPPS request as sent by Xcelera Connect:

**Table 19. Required attributes in a MPPS-Create request**

Attribute Name	Tag	Note
Performed Procedure Step Start Date	0040,0244	
Performed Procedure Step Start Time	0040,0245	
Patient's Name	0010,0010	
Study Instance UID	0020,000D	

If any of these attributes are not present in the MPPS request, the remote AE may interpret this as an error and hence return *Invalid Attribute Value* (Status Code 0106) or the *Missing Attribute Value* (Status Code 0121) in the response message and discard the transferred MPPS message. It will continue to listen for additional MPPS messages.

##### 3.4.1.3.1. Specific Conformance for MPPS N-CREATE SCU

The remote A E should return the N-CREATE status responses that are mentioned in the table below.

**Table 20. MPPS N-CREATE-RQ Status Response**

Service Status	Status Codes	Further Meaning
Success	0000	Matching is complete - No final identifier is supplied
Failed	A900	Identifier does not match SOP Class
	Cxxx	Unable to process

**Table 21. DICOM Command Communication Failure Behavior**

Exception	Description
REPLAY TIMEOUT	Reason will be logged
ASSOCIATION ABORTED	Reason will be logged
ASSOCIATION TIMEOUT	Reason will be logged

**Table 22. MPPS Request Identifiers for N-CREATE SCU**

Attribute Name	Tag	VR	Remark / Comment
<b>SOP Common Module</b>			
Specific Character Set	0008,0005	CS	ISO_IR 100
<b>Performed Procedure Step Information Module</b>			
Performed Station AE Title	0040,0241	AE	
Performed Procedure Step Start Date	0040,0244	DA	
Performed Procedure Step Start Time	0040,0245	TM	
Performed Procedure Step Status	0040,0252	CS	
Performed Procedure Step ID	0040,0253	SH	
Performed Station Name	0040,0242	SH	
Performed Location	0040,0243	SH	
Performed Procedure Step End Date	0040,0250	DA	
Performed Procedure Step End Time	0040,0251	TM	
Performed Procedure Step Description	0040,0254	LO	
Performed Procedure Type Description	0040,0255	LO	
Procedure Code Sequence	0008,1032	SQ	
>Code Value	0008,0100	SH	
>Coding Scheme Designator	0008,0102	SH	If no CSD, then applied value is "L"
>Coding Scheme Version	0008,0103	SH	
>Code Meaning	0008,0104	LO	
<b>Radiation Dose Module</b>			
Image and Fluoroscopy Area Dose Product	0018,115E	DS	
Total Time of Fluoroscopy	0040,0300	US	
Total Number of Exposures	0040,0301	US	
Entrance Dose	0040,0302	US	
<b>Performed Procedure Step Relationship Module</b>			
Patient's Name	0010,0010	PN	
Patient ID	0010,0020	LO	
Patient's Birth Date	0010,0030	DA	
Patient's Sex	0010,0040	CS	
Scheduled Step Attribute Sequence	0040,0270	SQ	
>Study Instance UID	0020,000D	UI	
>Accession Number	0008,0050	SH	
>Requested Procedure Description	0032,1060	LO	
>Scheduled Procedure Step Description	0040,0007	LO	
>Scheduled Procedure Step ID	0040,0009	SH	
>Requested Procedure ID	0040,1001	SH	
>Referenced Study Sequence	0008,1110	SQ	
>>Referenced SOP Class UID	0008,1150	UI	

Attribute Name	Tag	VR	Remark / Comment
>>Referenced SOP Instance UID	0008,1155	UI	
>Scheduled Protocol Code Sequence	0040,0008	SQ	
>>Code Value	0008,0100	SH	
>>Coding Scheme Designator	0008,0102	SH	
>>Code Meaning	0008,0104	LO	
Referenced Patient Sequence	0008,1120	SQ	
>Referenced SOP Class UID	0008,1150	UI	
>Referenced SOP Instance UID	0008,1155	UI	
Image Acquisition Results Module			
Modality	0008,0060	CS	
Study ID	0020,0010	SH	
Performed Series Sequence	0040,0340	SQ	
>Series Instance UID	0020,000E	UI	
>Referenced Image Sequence	0008,1140	SQ	
>>Referenced SOP Class UID	0008,1150	UI	
>>Referenced SOP Instance UID	0008,1155	UI	
Billing and Material Management Code Module			
Film Consumption Sequence	0040,0321	SQ	
>Medium Type	2000,0030	CS	
Additional CathLab related attributes			
Entrance Dose in mGy	0040,8302	DS	
Exposure Channel	0009,1008		
Exposure Start Time	0009,1032		
Scan Options	0018,0022		
Exposure Time	0018,1150		
Positioner Primary Angle	0018,1510		
Positioner Secondary Angle	0018,1511		
Frame Rate	0019,2040		
Exposure Number	0021,1012		
Number of Exposure Results	0029,3008		
Accumulated Fluoroscopy Dose	0041,1020		
Accumulated Exposure Dose	0041,1030		
Total Dose	0041,1040		
Total Number of Frames	0041,1041		

#### 3.4.1.3.2. Specific Conformance for the MPPS N-SET

The remote AE should return the N-CREATE status responses that are mentioned in Tables below.

IMPORTANT NOTE: All of the attributes provided in the N-CREATE request are also available in the N-SET request.

**Table 23. MPPS N-SET SCU Status**

Service Status	Status Codes	Further Meaning
Success	0000	Matching is complete
Failure	A900	Identifier does not match SOP Class
	Cxxx	Unable to process

**Table 24. MPPS supported attributes N-SET SCU**

Attribute Name	Tag	VR	Remark / Comment
<b>Performed Procedure Step Information Module</b>			
Performed Procedure Step End Date	0040,0250	DA	
Performed Procedure Step End Time	0040,0251	TM	
Performed Procedure Step Status	0040,0252	CS	
<b>Image Acquisition Results Module</b>			
Performed Series Sequence	0040,0340	SQ	
>Protocol Name	0018,1030	LO	
>Series Instance UID	0020,000E	UI	
>Retrieve AE Title	0008,0054	AE	
>Series Description	0008,103E	LO	
>Performing Physician's Name	0008,1050	PN	
>Operators' Name	0008,1070	PN	
>Referenced Image Sequence	0008,1140	SQ	
>>Referenced SOP Class UID	0008,1150	UI	
>>Referenced SOP Instance UID	0008,1155	UI	
>Referenced Non-Image Composite SOP Instance Sequence	0040,0220	SQ	
>>Referenced SOP Class UID	0008,1150	UI	
>>Referenced SOP Instance UID	0008,1155	UI	

## 4. COMMUNICATION PROFILES

Xcelera Connect provides DICOM V3.0 TCP/IP Network Communication Support as defined in Part 8 of the DICOM Standard.

### 4.1. Supported Communication Stacks

Xcelera Connect uses DICOM V3.0 TCP/IP Network Communication software installed on the Platform where the Xcelera Connect DICOM AE is running on.

### 4.2. Physical Media Support

Supported physical medium include:

- IEEE 802.3-1995 (Fast Ethernet) 100BASE-TX.
- IEEE 802.3-1995 10BASE-TX



## 5. CONFIGURATION

The Xcelera Connect can be configured on the DICOM characteristics specified in this section.

### 5.1. AE Title/Presentation Address mapping

The AE Title, the host names or IP address and the port number of Xcelera Connect are configurable.

The default AE Titles, mapping and port numbers are defined in the Table below.

**Table 25. AE Title Configuration Table**

Application Entity	Default AE Title	Default TCP/IP Port
WSCP	XC_Connect	1041
MSCP	XC_MPPS_SCP	1042

### 5.2. Configurable parameters

The real behavior of the Xcelera Connect can be adjusted by configuration parameters.

The Xcelera Connect Application Entity will accept no association from unknown Application Entities. Modality Application Entities that are to be “known” for Xcelera Connect are specified during configuration time. These AE specifications can be changed during systems (re-) configuration.

The Xcelera Connect Application Entity rejects association requests from systems that do not address the Xcelera Connect AE, i.e. that offer a wrong “Called AE Title”. The Xcelera Connect AE Title is specified during configuration time. The AE Title can be changed during systems (re-) configuration.

## **6. SUPPORT OF EXTENDED CHARACTER SETS**

### **6.1. Character Sets**

Xcelera Connect supports the following character sets:

- ISO 8859 Western Europe Supplementary Set 1 (ISO-IR 100)