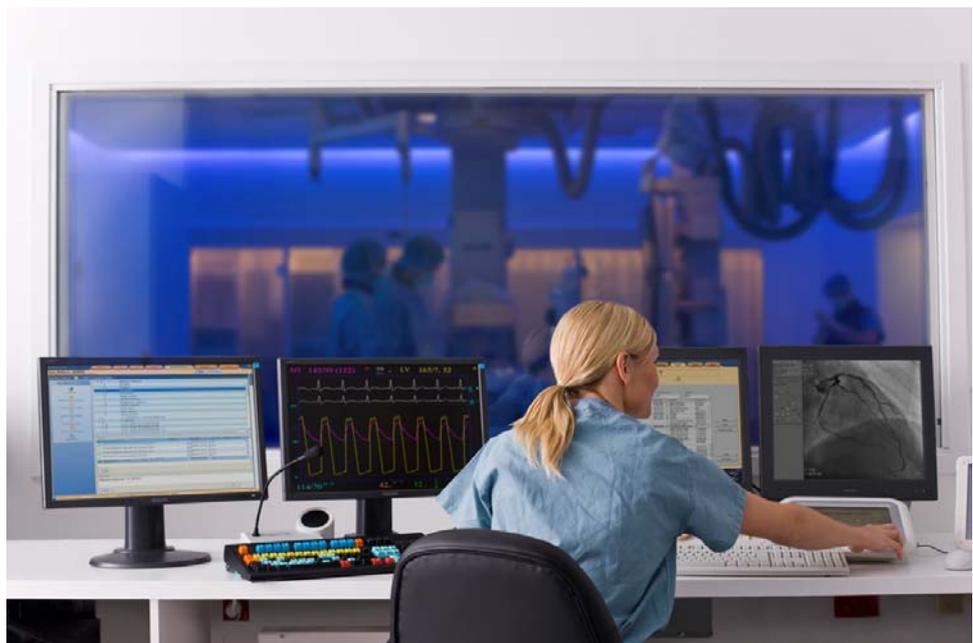# DICOM

Conformance Statement

Xper Connect

PHILIPS

Issued by:
Philips Medical Systems
Interventional Patient Care

305 North Drive
Melbourne, FL 32934

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

Document Number: SAL 0300-F25
Date: 08 May 2008

Table of Contents

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. 17th 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

Xper Connect of Philips Medical Systems is a highly programmable interface engine to connect the Xper Information Management (XperIM) to the Hospital Information Systems (HIS) and/or the Cardiology Information System (CIS).

Xper Connect supports DICOM Modality Worklist Management (MWLM) as a Service Class provider (SCP).

Figure 1: Position of Xper Connect in the HIS/CIS & PACS Domain
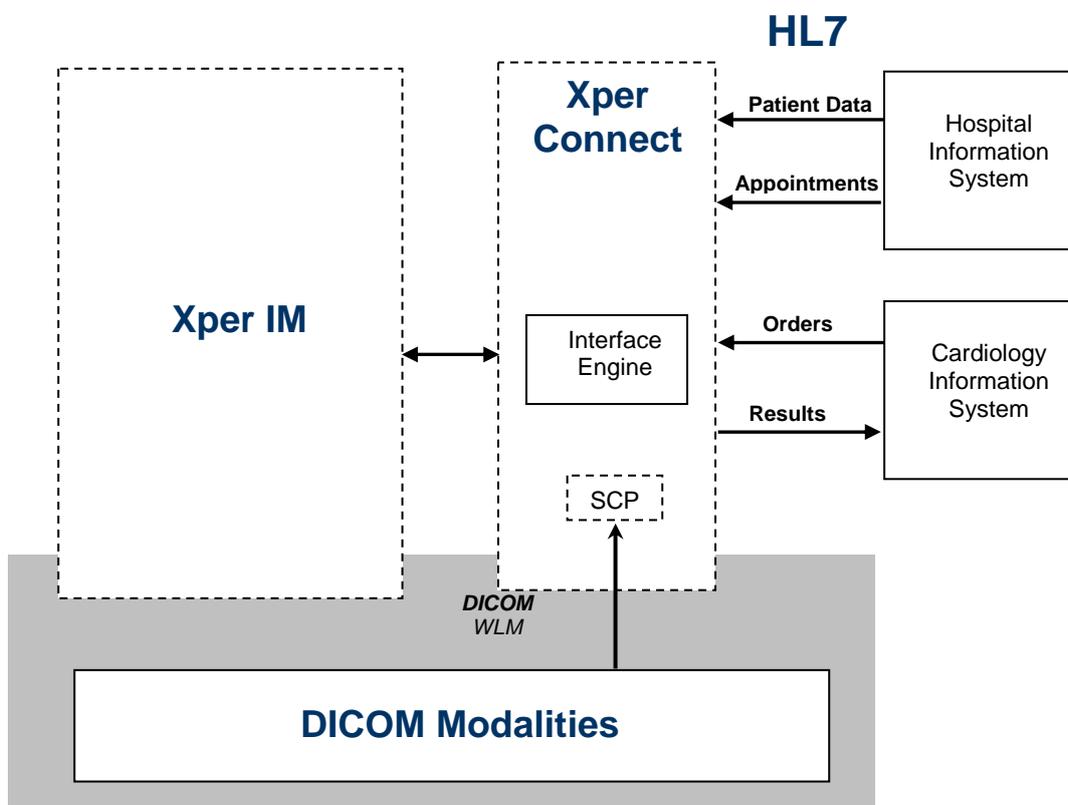
For HL7 details and nomenclature please refer to the related Xper Connect HL7 Interface Specification. The HL7 specification describes the semantics and data structures of the messages between Xper Connect and the (external) information management systems of the hospital(s).

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.

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

Figure 2: Xper Connect R1.3L2 – Application Data Flow Diagram
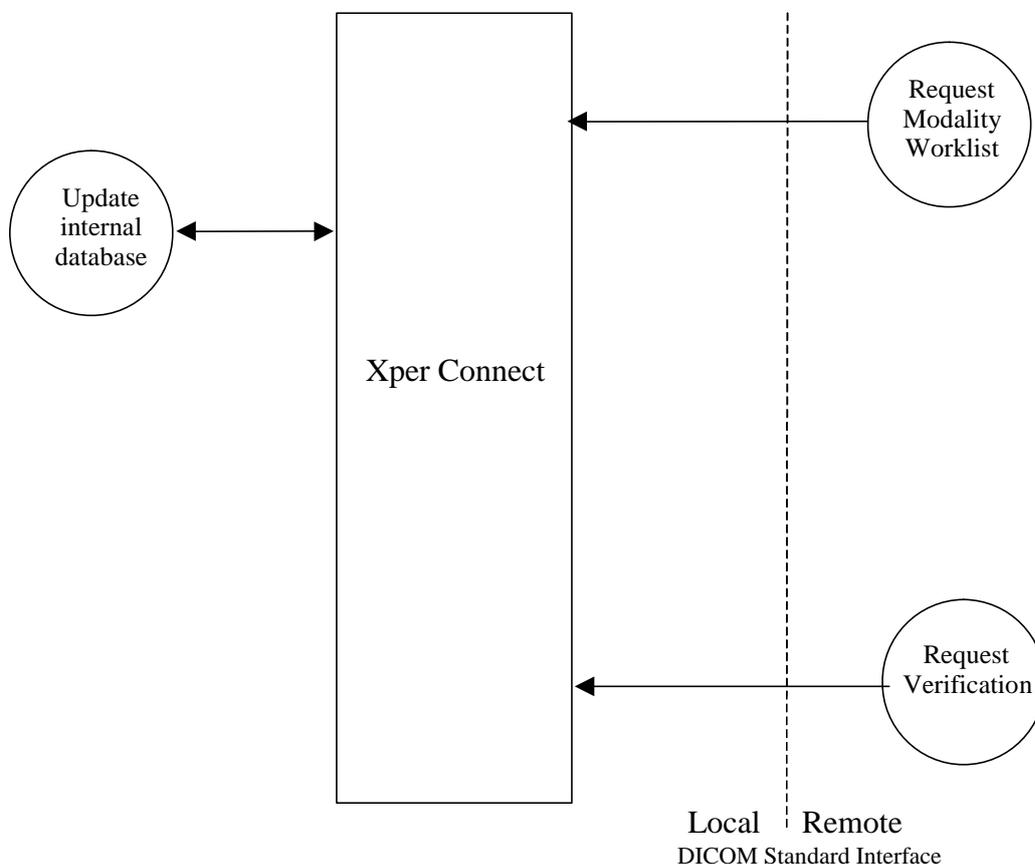
Xper Connect is able to communicate with modalities according to DICOM. It will accept associations in order to receive requests from modalities for an up-to-date Worklist. The Worklist management application of Xper Connect will interpret the modalities requests, retrieve the requested modality worklist data from its internal database and send the detailed worklist contents to the modalities.

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

 Koninklijke Philips Electronics USA 2007

2.2.   Functional definition of Application Entities

Xper Connect implements a DICOM Service Class Provider (SCP) for the Basic Worklist Management SOP Class. This SCP is 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 requests from the SCU's.

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

2.3.   Sequences of Real World Activities

Xper Connect does not require any specific sequence of activities. Modalities are setup in such a way that the requests for MWLM updates are issued at regular intervals. Moreover, the user may press a button on the modality console to refresh the modality worklist instantaneously.

3. AE SPECIFICATIONS

3.1.   AE Specifications Summary

The Xper 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

3.2.   Association Establishment Policies

3.2.1. General

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

3.2.2. Number of Associations

Xper Connect can accept a limited amount of simultaneous connections. The number of active simultaneous connections is configurable up to 15 AE's.

3.2.3. Asynchronous Nature

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

3.2.4. Implementation Identifying Information

The Implementation Class UID:	**1.2.840.1015.1.27.1.2**
The implementation version name:	**1.01**

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

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

3.3.1.2.   Presentation Context Table

Xper 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		

3.3.1.3.   SOP Specific Conformance

Xper 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	Verification is complete	Association will be released. Message logged in Xper Connect

3.3.2. Real World Activity - Request for Modality Worklist

3.3.2.1.   **Associated Real-World Activity**

Xper 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**

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

Table 4.   **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		

3.3.2.3.   **SOP Specific Conformance**

Xper Connect provides standard conformance to the DICOM Modality Worklist C-FIND SOP Class.

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 5.   C-FIND-RSP Status Response

Service Status	Code	Further Meaning	Description
Success	0000	Matching is complete	Association will be released.

Table 6.   Modality Worklist (optional) Return Keys supported

Attribute Name	Tag	VR	Remark / Comment
SOP Common Module			
Specific Character Set	0008,0005	CS	ISO_IR 100
Patient Identification Module			
Patient's Name	0010,0010	PN	
Patient ID	0010,0020	LO	
Issuer of Patient ID	0010,0021	LO	Always Empty
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
Patient Demographic Module			
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	
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
Patient Medical Module			
Medical Alerts	0010,2000	LO	Always Empty
Contrast Allergies	0010,2110	LO	Always Empty

Attribute Name	Tag	VR	Remark / Comment
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
Visit Relationship Module			
Referenced Patient Sequence	0008,1120	SQ	Always Empty
Visit Identification Module			
Admission ID	0038,0010	LO	
Institution Name	0008,0080	LO	Always Empty
Institution Address	0008,0081	ST	Always Empty
Issuer of Admission ID	0038,0011	LO	Always Empty
Institution Code Sequence	0008,0082	SQ	Always Empty
Visit Status Module			
Current Patient Location	0038,0300	LO	
Visit Status ID	0038,0008	CS	Always Empty
Patient's Institution Residence	0038,0400	LO	Always Empty
Visit Comments	0038,4000	LT	Always Empty
Scheduled Procedure Step Module			
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	
>Scheduled Station Name	0040,0010	SH	
>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	Always Empty
>Scheduled Procedure Step End Time	0040,0005	TM	Always Empty
>Scheduled Procedure Step Status	0040,0020	CS	

Attribute Name	Tag	VR	Remark / Comment
>Comments on the Scheduled Procedure Step	0040,0400	LT	Always Empty
>Scheduled Protocol Code Sequence	0040,0008	SQ	
Requested Procedure Module			
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	Always Empty
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 Results	0040,1010	PN	Always Empty
Requested Procedure Comments	0040,1400	LT	Always Empty
Referenced Study Sequence	0008,1110	SQ	Always Empty
>Referenced SOP Class UID	0008,1150	UI	Always Empty
>Referenced SOP Instance UID	0008,1155	UI	
Imaging Service Request Module			
Accession Number	0008,0050	SH	
Referring Physician's Name	0008,0090	PN	Always Empty
Requesting Physician	0032,1032	PN	
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
Additional Module			
Study ID	0020,0010	SH	Always Empty
Study Status ID	0032,000A	CS	

3.4.   Association Initiation Policy

This section describes the conditions under which the AE will initiate an association.
The behavior of the AE during association rejection is summarized in the Tables below.

Table 7.   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 8.   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

Source	Reason / Diagnosis	Behavior
	6 – invalid-PDU-parameter value	The information is logged

4. COMMUNICATION PROFILES

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

4.1. Supported Communication Stacks

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

4.2. Physical Media Support

Supported physical medium include:

➢ IEEE 802.3-1995 (Fast Ethernet) 100BASE-T.

5. CONFIGURATION

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

5.1.   AE Title/Presentation Address mapping

The AE Title of Xper Connect is configurable. The default AE Titles, mapping and port numbers are defined in the Table below.

Table 9.   **AE Title Configuration Table**

Application Entity	Default AE Title	Default TCP/IP Port
WSCP	XperDMWL	104

5.2.   Configurable parameters

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

The Xper Connect Application Entity will accept no association from unknown Application Entities. Modality Application Entities that are to be "known" for Xper Connect are specified during configuration time. These AE specifications can be changed during systems configuration.

The Xper Connect Application Entity rejects association requests from systems that do not address the Xper Connect AE, i.e. that offer a wrong "Called AE Title". The Xper Connect AE Title is specified during configuration time. The AE Title can be changed during systems configuration.

6. SUPPORT OF EXTENDED CHARACTER SETS

6.1.   Character Sets

Xper Connect supports the following character sets:

➢ ISO 8859   Western European (ISO/Windows) (ISO-IR 100)