Philips Medical Systems
DICOM Conformance Statement

Integris H Release 3 / Integris V Release11

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**Philips
Medical
Systems**

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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-1993 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. The conformance to the DICOM standard is a key element of the Inturis Program (see [INTURIS]).

1.2 Intended audience

This Conformance Statement is intended for:
- (potential) customers,
- system integrators of medical equipment,
- marketing staff 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 3.2-1993 and Supplement 2 (in case of Media specifications).
Additionally, the chapters following 7 specify the details of the applied IODs.

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 3.3-1993 and PS 3.4-1994.
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.X (X refers to the part 1 - 13) and Supplements
              National Electrical Manufacturers Association (NEMA) Publication Sales
              1300 N. 17th Street, Suite 1847
              Rosslyn, Va. 22209, United States of America

[INTURIS]   Philips Inturis Program
              Integrated Clinical Solutions
              Philips Medical Systems Nederland B.V. (see address at page ii)

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 a networked 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 analyse 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).

2 Implementation model

The Integris H Release 3 and Integris V release 11 systems of Philips Medical Systems are image generating systems for the Cardio and Vascular environment respectively. Both systems have the same DICOM export function to transfer images and image related data from Integris to a remote system. This export function is described in this document.
The name 'Integris' in this document refers to both systems Integris H Release 3 and Integris V release 11.

The DICOM Export function is implemented via a DICOM (MVP) converter box. This box is validated and conforms to the DICOM Standard and to this Conformance Statement.
It might be that other types of converter boxes are connected to Integris (not delivered by Philips Medical Systems, possibly installed on hospital project basis). Conformance to the DICOM standard and to this Conformance Statement is not guaranteed for these converter boxes.

2.1 Application Data Flow Diagram

The Integris system behaves as a single Application Entity. The related Implementation Model is shown in Figure 2-1 on page 4.

The DICOM Export function can be activated by the Integris operator. This is done at photo-file basis. The images in a photo-file are a collection of images of several acquisition runs of the same patient (also called examination). Each image in a photo-file can be flagged for export or not. At export request the flagged images will be converted into DICOM format and sent out to a remote destination. This destination is previously selected by the operator from the user interface.

Image data transferred are **photo-file images** with burnt-in image related attributes. They are sent as Secondary Capture (SC) Class instances. The exported images are intended for viewing purposes only at the remote system.

2.2 Functional definition of Application Entities

The Integris AE acts as a Service Class User (SCU) of the Storage Service Class. This export function acts on the selected images in a photo-file of one examination. When the export is initiated, the AE will open an association to the remote system. The selected photo-file images and related image data are converted into a DICOM message to be sent to the remote system. The AE supports also the Verification Class as Service Class User (SCU) and as Service Class Provider (SCP).

2.3 Sequencing of Real World Activities

Not applicable.
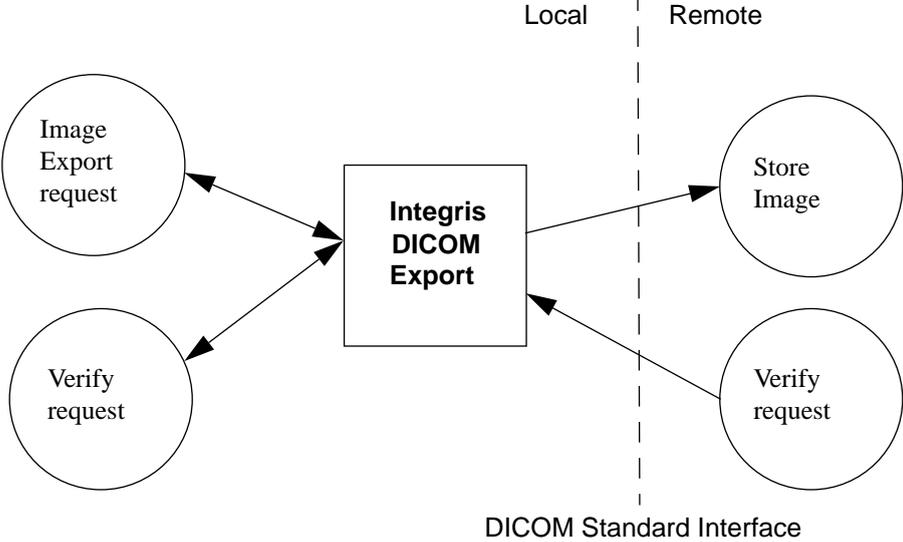
Figure 2-1: Integris DICOM Export Implementation Model

3 AE Specifications

3.1 AE Integris DICOM Export Specification

The Integris DICOM Export Application Entity provides Standard Conformance to the following DICOM V3.0 SOP Classes as an SCU:

Table 3-1: Supported SOP Classes by the Integris DICOM Export AE as SCU

SOP Class Name	UID
Verification	1.2.840.10008.1.1
Secondary Capture Image Storage - STORE	1.2.840.10008.5.1.4.1.1.7

The Integris DICOM Export Application Entity provides Standard Conformance to the following DICOM V3.0 SOP classes as an SCP:

Table 3-2: Supported SOP classes by the Integris DICOM Export AE as SCP

SOP class Name	UID
Verification	1.2.840.10008.1.1

3.1.1 Association Establishment Policies

3.1.1.1 General

Integris has a configurable maximum PDU size (default is 2K = 2096 bytes).

3.1.1.2 Number of Associations

Integris will attempt to establish one association at a time.

3.1.1.3 Asynchronous Nature

Integris does not support asynchronous operations and will not perform asynchronous window negotiation.

3.1.1.4 Implementation Identifying Information

The Implementation Class UID is: 1.3.46.670589.7.2.1.1
The implementation version name is: VISUB MVP Export

3.1.2 Association Initiation Policy

Integris initiates associations as a result of the following local Real-World activities:
- The Image Export Request to send the selected photo-file images from the Integris to a remote system (section 3.1.2.1),
- Request to verify DICOM associations with a remote system (section 3.1.2.2).

3.1.2.1 Request to send images from Integris to a remote system

3.1.2.1.1   Associated Real-World Activity

After selection of a peer system and after selection of one of more images in a photo-file, these images will be sent when initiating the Send command. Integris initiates one association to the selected peer system and uses it to send the selected images via C-STORE requests (and receives the associated C-STORE responses). The association is released by Integris after successful transfer of the images or when an error occurs.
Integris handles each send request one after another.

3.1.2.1.2   Proposed Presentation Contexts

Integris will propose the following presentation contexts:

Table 3-3: Proposed Presentation Contexts for the request to send images

Presentation Context table					
Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name List	UID List		
Secondary Capture Image Storage - STORE	1.2.840.10008 .5.1.4.1.1.7	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None

3.1.2.1.3   C-STORE SCU Conformance

Integris has the following behaviour on successful (with or without warnings) and unsuccessful transfer of images:
- Success (return status 0000)
  The successful transfer is indicated on the console: 'Done'.
- Refused (return status A7xx), Error (return status A9xx or Cxxx) and Warning (return status B00x)
  The failed transfer is indicated on the console: 'Network Error'. The reason is not shown.

While busy with transfer, the status Busy is shown on the Integris console.

Extended negotiation is not supported.

Table 3-4 lists the applied Conditional (DICOM Type 1C and 2C) and Optional (DICOM Type 3) attributes in the SC Image IOD. These attributes are always present in the SC images sent by

Integris.

Table 3-4: Applied Conditional and Optional Attributes of the SC Image IOD

IE	Module	Conditional Attributes	Optional Attributes
Patient	Patient	-	-
Study	General Study	-	-
Series	General Series	Laterality	Series Date, Series Time, Performing Physician's Name
Equipment	General Equipment	-	-
	SC Equipment	-	Institution Name, Manufacturer's Model Name, Software Version(s)
Image	General Image	Patient Orientation	Image Type, Acquisition Number
	Image Pixel	-	-
	SC Image	-	-
	SOP Common	Specific Character Set	-

3.1.2.2 Request to verify application level communication

3.1.2.2.1   Associated Real-World Activity

Integris starts an association to a pre-selected system when the operator requests to verify application level communication using the C-ECHO command.

3.1.2.2.2   Presentation Context Table

Table 3-1: Proposed Presentation Contexts for the verification requests

Presentation Context table					
Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name List	UID List		
Verification	1.2.840.10008 .1.1	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None

3.1.2.2.3   C-ECHO SCU Conformance

Integris provides standard conformance.

3.1.3 Association Acceptance Policy

The Integris AE will accept associations as result of only one remote Real-World activity:
request to verify associations at application level.
Any "Called AE Title" in the association request satisfies.

3.1.3.1 Verify Application Level Communication

3.1.3.1.1   Associated Real-World Activity

Integris accepts associations from systems that wish to verify application level communication
using the C-ECHO command.

3.1.3.1.2   Presentation Context Table

Table 1: Acceptable Presentation Contexts

Presentation Context table					
Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name List	UID List		
Verification	1.2.840.10008.1.1	Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None

3.1.3.1.3   C-ECHO SCP Conformance

Integris provides standard conformance.

3.1.3.1.4   Presentation Context Acceptance Criterion

Not applicable.

3.1.3.1.5   Transfer Syntax Selection Policies

Not applicable.

4 Communication Profiles

4.1 Supported Communication Stacks

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

4.2 TCP/IP Stack

Integris uses the TCP/IP program installed on the PC-based DICOM Export box. This is a sub-routine library that is based on a Berkeley socket interface. Only Class C is supported.

4.2.1 Physical Media Support

Integris supports ISO 8802-3 Thick-wire, Thin-wire and Twisted-pair Ethernet.

5 Extensions/Specializations/Privatizations

Not applicable.

6 Configuration

The Integris system is configured by means of editing the DICOM configuration files on the PC-based DICOM Export (MVP) box. This configuration is intended to be used by Philips service engineers only.

6.1 AE Title/Presentation Address mapping

6.1.1 Local AE Titles and Presentation Addresses

The Integris AE title is configurable. The port number is fixed to 104.

6.1.2 Remote AE Titles and Presentation Addresses

For remote applications that act as Service Class User no information is needed.
For remote applications that act as Service Class Provider the following additional information must be provided:
- The AE title.
- The host name on which the application resides.
- The port number at which the application accepts association requests.

6.2 Configurable parameters

The maximum PDU size is configurable in the following steps: 1K, 2K, 4K, 8K and 16K (default is 2K).

7 Support of Extended Character Sets

Integris supports Extended Character Set "ISO_IR 100" which is the Latin alphabet No 1, supplementary set.

8 Secondary Capture (SC) Image IOD

The modules selected from the IOD module table of DICOM 3.0 are given in the table below.

Table 8-1: Applied Modules in the SC IOD

IE	Module
Patient	Patient
Study	General Study
Series	General Series
Equipment	General Equipment
	SC Equipment
Image	General Image
	Image Pixel
	SOP Common

The details of these applied modules are given in the tables below. The list of possible values are given (if applicable). The situation that an attribute is present conditionally/optionally or that an attribute may contain a zero length value, is indicated too. Standard DICOM conditions are applicable but are not shown in the tables.

Table 8-2: Secondary Capture Image Storage SOP Class - Patient Module

Attribute Name	Tag	Note
Patient's Name	0010,0010	
Patient ID	0010,0020	
Patient's Birth Date	0010,0030	
Patient's Sex	0010,0040	Applied value(s): F, M, O

Table 8-3: Secondary Capture Image Storage SOP Class - General Study Module

Attribute Name	Tag	Note
Study Date	0008,0020	
Study Time	0008,0030	
Accession Number	0008,0050	may be empty
Referring Physician's Name	0008,0090	may be empty

Table 8-3: Secondary Capture Image Storage SOP Class - General Study Module (Continued)

Attribute Name	Tag	Note
Study Instance UID	0020,000D	
Study ID	0020,0010	

Table 8-4: Secondary Capture Image Storage SOP Class - General Series Module

Attribute Name	Tag	Note
Series Date	0008,0021	
Series Time	0008,0031	
Modality	0008,0060	Applied value(s): XA
Performing Physician's Name	0008,1050	
Series Instance UID	0020,000E	
Series Number	0020,0011	
Laterality	0020,0060	Empty

Table 8-5: Secondary Capture Image Storage SOP Class - General Equipment Module

Attribute Name	Tag	Note
Manufacturer	0008,0070	Applied value(s): Philips Medical Systems
Institution Name	0008,0080	
Manufacturer's Model Name	0008,1090	'P h i l i p s M e d i c a l S y s t e m s INTEGRIS H' or "P h i l i p s M e d i c a l S y s t e m s INTEGRIS V'
Software Version(s)	0018,1020	

Table 8-6: Secondary Capture Image Storage SOP Class - SC Equipment Module

Attribute Name	Tag	Note
Conversion Type	0008,0064	'Applied value(s): WSD'

Table 8-7: Secondary Capture Image Storage SOP Class - General Image Module

Attribute Name	Tag	Note
Image Type	0008,0008	Applied value(s): DERIVED \ SEC-ONDARY
Acquisition Number	0020,0012	
Image Number	0020,0013	
Patient Orientation	0020,0020	Empty

Table 8-8: Secondary Capture Image Storage SOP Class - Image Pixel Module

Attribute Name	Tag	Note
Samples per Pixel	0028,0002	'1'
Photometric Interpretation	0028,0004	'MONOCHROME2'
Rows	0028,0010	960 or '1024'
Columns	0028,0011	'1280'
Bits Allocated	0028,0100	'8' or '16'
Bits Stored	0028,0101	'8'
High Bit	0028,0102	'7'
Pixel Representation	0028,0103	'0000H' (unsigned integer)
Pixel Data	7FE0,0010	

Table 8-9: Secondary Capture Image Storage SOP Class - SOP Common Module

Attribute Name	Tag	Note
Specific Character Set	0008,0005	'ISO_IR 100'
SOP Class UID	0008,0016	'1.2.840.10008.5.1.4.1.1.7'
SOP Instance UID	0008,0018	