

## SIENET Imaging Workflow Management VA15

**HS**

### DICOM Conformance Statement

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# 0 Introduction

## 0.1 Purpose

This DICOM Conformance Statement is written according to part PS 3.2 of [1].

This Conformance Statement describes the DICOM Interface of the Siemens implementation of a RIS running Software Version SIENET Imaging Workflow Management (IWM) VA15.

The IWM DICOM Interface acts as a Service Class Provider (SCP) for Modality Performed Procedure Step and Worklist Service Class. In addition C-FIND is used as SCP to provide reports.

### Definitions, Acronyms and Abbreviations

ACR	<b>A</b> merican <b>C</b> ollege of <b>R</b> adiology
AE	DICOM <b>A</b> pplication <b>E</b> ntity
API	<b>A</b> pplication <b>P</b> rogrammers <b>I</b> nterface
BMWL	<b>B</b> asic <b>M</b> odality <b>W</b> orklist
DR	<b>D</b> ata <b>R</b> ange <b>M</b> atching
DT	<b>D</b> efined <b>T</b> erms
EV	<b>E</b> numerated <b>V</b> alues
IOD	DICOM <b>I</b> nformation <b>O</b> bject <b>D</b> efinition
MPPS	<b>M</b> odality <b>P</b> erformed <b>P</b> rocedure <b>S</b> tep
NEMA	<b>N</b> ational <b>E</b> lectrical <b>M</b> anufacturers <b>A</b> ssociation
PLA	<b>P</b> acsnet <b>L</b> ogical <b>A</b> ddress (to identify an application on a PACSnet node)
RIS	<b>R</b> adiology <b>I</b> nformation <b>S</b> ystem
IWM	<b>I</b> maging <b>W</b> orkflow <b>M</b> anagement
sasdl	process on IWM Server
sasmpss	process on IWM Server for MPPS
SCU	DICOM <b>S</b> ervice <b>C</b> lass <b>U</b> ser (client using this DICOM service)
SCP	DICOM <b>S</b> ervice <b>C</b> lass <b>P</b> rovider (server providing this service)
SOP	<b>S</b> ervice/ <b>O</b> bject <b>P</b> air
SQ	<b>S</b> equences <b>M</b> atching
SV	<b>S</b> ingle <b>V</b> alue <b>M</b> atching
UID	<b>U</b> nique <b>I</b> Dentifier, string unique in the whole network
WC	<b>W</b> ild <b>C</b> ard <b>M</b> atching

## 0.2 References

- [1] Digital Imaging and Communications in Medicine (DICOM), NEMA PS 3.1-15

# 1 Implementation Model

IWM DICOM Interface is implemented to support two DICOM Application Entities (AE) as SCP which receive associations (BMWL and MPPS) from remote Application Entities.

IWM DICOM Interface does not initiate associations to remote Application Entities.

IWM acts as an Information System to support radiological workflow and to archive documentation data (e.g. exposure data from MPPS and radiological reports which are provided with C-FIND).

## 1.1 Application Data Flow Diagram

The application sasdl is a Basic Modality Worklist SCP as well as a Verification SCP.

This application is started automatically and will be invoked automatically via network.

A remote Application Entity (AE) initiates an association for the DICOM Worklist Service Class to the AE of sasdl.

Upon acceptance of the association by sasdl the remote AE transmits DICOM Worklist Requests to sasdl.

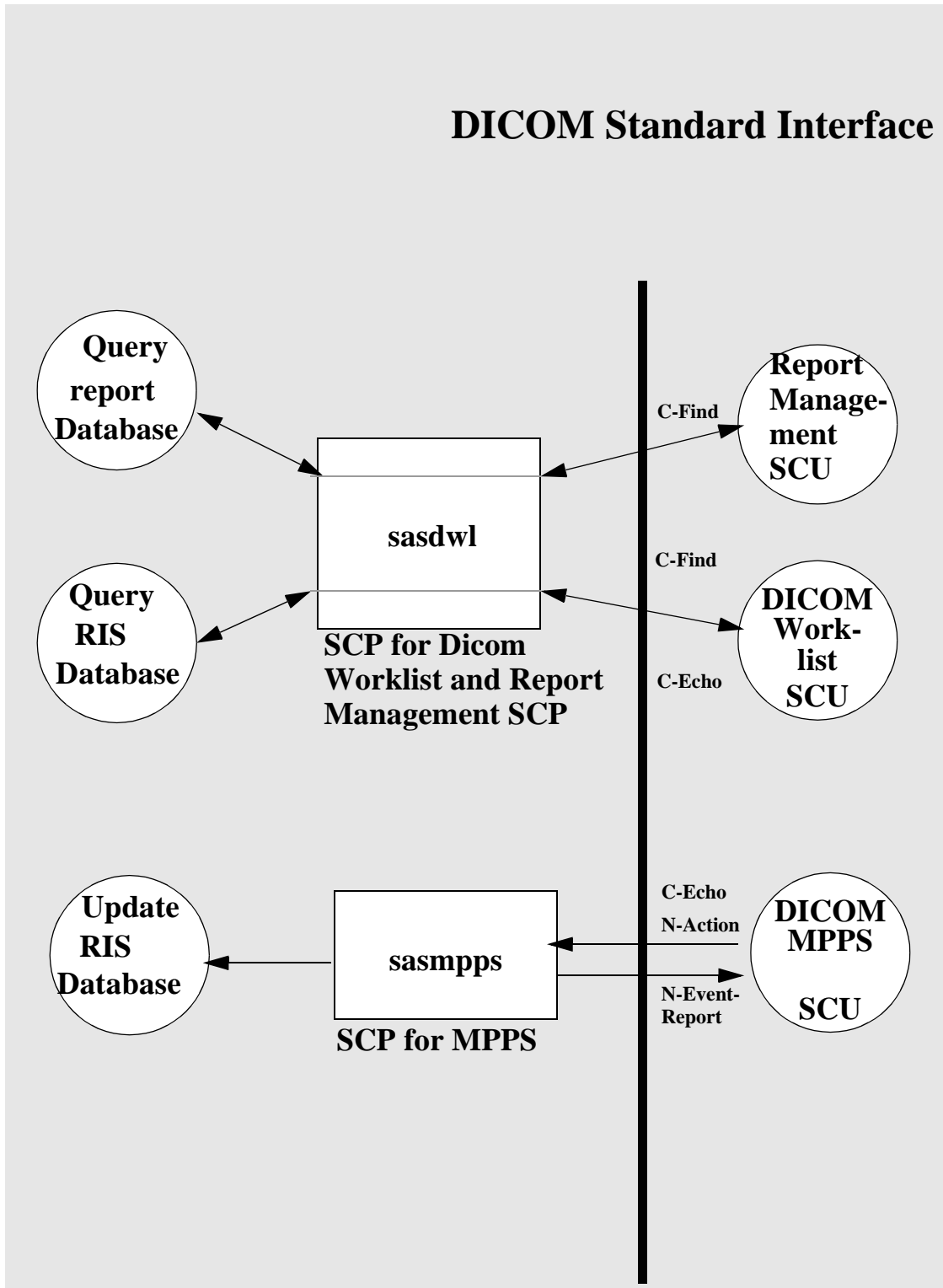
In case of a Worklist request the response of sasdl only contains the requested attributes.

In addition sasdl acts as a Report Management SCP (a report provider). This is a private SOP class not defined by DICOM but by MITRA.

The application sasmpps is a SCP of Modality Performed Procedure Step and a Verification SCP.

Verification SCP: A remote AE initiates an association for the DICOM Verification Service Class to the AE of sasdl or sasmpps. Upon acceptance of the association the Verification response is sent to the remote AE.

*Figure 1: IWM Server Application Data Flow Diagram*



## 1.2 Functional Definitions of Application Entities

All components of IWM DICOM Interface are operating as background daemon processes. They are started automatically during system startup and wait for tasks until the system is shut down.

The process sasdlw acting as SCP is waiting for association requests from a remote DICOM client. The Application Entity Title and the Port Number the SCP is listening on are taken from the local configuration.

As an SCP for Report Management (private SOP Class - i.e. not defined in DICOM) this process answers report requests as well. In addition sasdlw is a Verification SCP.

sasmpps acting as SCP is waiting for N-CREATE and N-SET requests from a remote DICOM Application Entity. The Application Entity Title and the Port Number sasmpps is listening to are taken from the local configuration. In addition sasmpps acts as a Verification SCP.

## 1.3 Sequencing of Real World Activities

IWM is capable of scheduling Studies and Procedure Steps. This information is provided to modalities by the use of the DICOM Modality Worklist SCP Service Class. Application Entity Specifications

IWM provides Standard Conformance to Modality Worklist Information Model - FIND as SCP:

## 1.4 Association Establishment Policies

### 1.4.1 General

The AETs, port numbers, hostname and net address of IWM are configurable.

### 1.4.2 Number of Associations

sasdlw and sasmpps accept multiple associations from different remote DICOM AEs at a time (max default 10). There may be several concurrent associations active and processed in parallel.

### 1.4.3 Asynchronous Nature

This version of software does not support asynchronous communication (multiple outstanding transactions over a single association).

### 1.4.4 Implementation Identifying Information

IWM provides an Implementation Class UID of "1.3.12.2.1107.5.8.5"

and an Implementation Version Name of "MagicSAS\_1.0"

## 1.5 Association Initiation Policy

IWM does not initiate a new association.

## 1.6 Association Acceptance Policy

IWM accepts a new association for

- o DIMSE-C-Echo
- o DIMSE-C-Find
- o DIMSE-N-Create
- o DIMSE-N-Set

service operations.

### 1.6.1 Real-World Activity - Receive Echo

#### 1.6.1.1 Associated Real-World Activity - respond to echo request

The associated Real-World activity is a C-Echo response by sasdl.

#### 1.6.1.2 Accepted Presentation Contexts

IWM will accept Presentation Contexts as shown in the following table.

*Table 1: Verification SCP Presentation Contexts of MagicStore*

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Ex- tended Negoti- ation
Name	UID	Name List	UID List		
Verification Service class	1.2.840.10008.1.1	DICOM Implicit VR Little Endian Transfer Syntax	1.2.840.10008.1.2	SCP	None
		DICOM Explicit VR Big Endian Transfer Syntax,	1.2.840.10008.1.2.1		
		DICOM Explicit VR Little Endian Transfer Syntax	1.2.840.10008.1.2.2		

#### 1.6.1.3 SOP Specific Conformance to the Verification SOP Class

The DICOM IWM provides standard conformance to the DICOM Verification Service Class and accepts any Application Entity Title from the SCU.

## 1.6.2 Real-World Activity - Receive Modality Worklist Query from a remote Node

### 1.6.2.1 Associated Real-World Activity - respond to find request

The associated Real-World activity is a C-Find request received by the daemon process sasdl. After accepting an association from a remote DICOM AE, sasdl receives the requests via the open association and queries the database. For each match a result message is sent to the requesting node.

### 1.6.2.2 Accepted Presentation Contexts

The Siemens IWM will accept Presentation Contexts as shown in the following table.

*Table 2: Query SCP Presentation Contexts of IWM*

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Ex- tended Negoti- ation
Name	UID	Name List	UID List		
Modality Worklist- Information Model - FIND	1.2.840.10008.5.1. 4.31	DICOM Implicit VR Little Endian Transfer Syntax	1.2.840.10008.1.2	SCP	None
		DICOM Explicit VR Big Endian Transfer Syntax,	1.2.840.10008.1.2.2		
		DICOM Explicit VR Little Endian Transfer Syntax	1.2.840.10008.1.2.1		

### 1.6.2.3 SOP Specific Conformance Statement

- o The DICOM IWM Modality Worklist returns one of the following status codes:
  - Success (0000):  
Matching is complete
  - Pending (FF00):  
Matches are continuing.
  - Pending (FF01):  
Matches are continuing.Warning that one or more Optional Keys were not supported.
  - Refused (A700):  
Out of Resources (0000,0902) or Match Overflow (default limit 500 matches)
  - Failed (C001)  
Unable to process (special (0000,0902) no license, internal error or database error)
  - Cancel (FE00)

#### 1.6.2.3.1 Modality Worklist C-Find SOP Class Specific Conformance Statement

The following table shows the supported attributes.

Attribute	Tag	Matching	Comment
Patient's Name	(0010,0010)	WC, SV	
Patient ID	(0010,0020)	WC, SV	required
Patient Birth Date	(0010,0030)	DR, SV	
Patient's Sex	(0010,0040)	SV, EV	
Confidentiality constraint on patient data	(0040,3001)		always returned with zero length
Patient's Size	(0010,1020)	WC, DR	
Patient's Weight	(0010,1030)	WC, DR	
Patient's Address	(0010,1040)	WC	
Patient State	(0038,0500)		always returned with zero length
Pregnancy Status	(0010,21C0)	WC, EV	
Medical Alerts	(0010,2000)	WC, SV	
Contrast Allergies	(0010,2110)	WC, SV	
Special Needs	(0038,0050)		always returned with zero length
Referenced Patient Sequence	(0008,1120)		always returned with zero length
Institution Name	(0008,0080)	WC, SV	
Admission ID	(0038,0010)	WC, SV	
Current Patient Location	(0038,0300)	WC, SV	
Accession Number	(0008,0050)	SV	
Requesting Physician	(0032,1032)	WC, SV	
Referring Physician's Name	(0008,0090)	WC, SV	
Referenced Study Sequence	(0008,1110)		always returned with zero length
Scheduled Performing Physician's Name	(0040,0006)	WC, SV	
Scheduled Procedure Step Sequence	(0040,0100)	SQ, one item	
>Scheduled Station AE Title	(0040,0001)	SV	
>Scheduled Procedure Step Start Date	(0040,0002)	DR, SV	
>Scheduled Procedure Step Start Time	(0040,0003)	DR, SV	
>Modality	(0008,0060)	SV, DT	
>Scheduled Procedure Step Description	(0040,0007)	WC, SV	
>Scheduled Protocol Code Sequence	(0040,0008)	SQ	
>>Code Value	(0008,0100))		

Attribute	Tag	Matching	Comment
>>Coding Scheme Version	(0008,0103))		
>>Coding Scheme Designator	(0008,0102))		
>>Code Meaning	(0008,0104)		
>Scheduled Station Name	(0040,0010))	WC, SV	
>Scheduled Procedure Step Location	(0040,0011)	WC, SV	
>Scheduled Procedure Step ID	(0040,0009)	WC, SV	
Requested Procedure ID	(0040,1001)	WC, SV	
Reason for Requested Procedure	(0040,1002)	WC, SV	
Requested Procedure Description	(0032,1060)	DR	
Requested Procedure Code Sequence	(0032,1064)	SQ	
>Code Value	(0008,0100)	WC, SV	
>Coding Scheme Version	(0008,0103))		
>Coding Scheme Designator	(0008,0102))		
>Code Meaning	(0008,0104)	WC, SV	
Study Instance UID	(0020,00D)	SV	
Requested Procedure Priority	(0040,1003)	SV, EV	
Patient Transport Arrangements	(0040,1004)	SV	
Admitting Diagnosis Description	(0008,1080)	WC, SV	

If C-FIND request comes with (0040,0008) than (0040,0007) is sent back empty.

## 1.6.3 Real-World Activity - Receive MPPS Request from a remote node

### 1.6.3.1 Associated Real-World Activity - save MPPS data

The associated Real-World activity is a MPPS N-CREATE or MPPS N-SET request received by the daemon process sasmpms. After accepting an association from a remote DICOM AE, sasmpms receives the N-SET or N-CREATE via the open association and stores the data.

### 1.6.3.2 Accepted Presentation Contexts

The Siemens IWM will accept Presentation Contexts as shown in the following table.

*Table 3: MPPS SCP Presentation Contexts of IWM*

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Ex- tended Negoti- ation
Name	UID	Name List	UID List		
MPPS Information Model	1.2.840.10008.3.1.2.3.3	DICOM Implicit VR Little Endian Transfer Syntax	1.2.840.10008.1.2	SCP	None
		DICOM Explicit VR Big Endian Transfer Syntax,	1.2.840.10008.1.2.2		
		DICOM Explicit VR Little Endian Transfer Syntax	1.2.840.10008.1.2.1		

### 1.6.3.3 SOP Specific Conformance Statement

- o The DICOM IWM MPPs returns one of the following status codes:
  - Success (0000):  
Matching is complete
  - Refused (A700):  
Out of Resources (0000,0902)
  - Failed (C001)  
Unable to process (special (0000,0902) no license, internal error or database error)
  - Cancel (FE00)

#### 1.6.3.3.1 MPPS SOP Class Specific Conformance Statement

The following table shows the supported MPPS attributes. The column N-SET is according to DICOM MPPS N-SET. The values not allowed at N-SET are taken by IWM when provided at N-CREATE request.

Attribute	Tag	N-SET	Comment
PPS ID	(0040, 0253)	no	
Performed Station AET	(0040,0241)	no	
Performed Station Name	(0040,0242)	no	
Performed Location	(0040,0243)	no	
PPS Start Date	(0040,0244)	no	
PPS Start Time	(0040,0245)	no	
PPS Status	(0040,0252)	yes	
PPS End Date	(0040,0250)	yes	

Attribute	Tag	N-SET	Comment
PPS End Time	(0040,0251)	yes	
Modality	(0008,0060)	no	
Total Time of Fluoroscopy	(0040,0300)	yes	
Total Number of Exposures	(0040,0301)	yes	
Distance Source To Detector	(0018,1110)	yes	
Distance Source To Entrance	(0040,0306)	yes	
Entrance Dose	(0040,0302)	yes	
Exposed Area	(0040,0303)	yes	
Image Area Dose Product	(0018,115E)	yes	
PPS Description	(0040,0254)	yes	
PPS Type Description	(0040,0255)	yes	
PPS Code Sequence	(0008,1032)	yes	
PPS discontinuation reason	(0040,0281)	yes	
Performed Protocol Code Seq.	(0040,0260)	yes	
Comments on Radiation Dose	(0040,0310)	yes	
Comments on PPS	(0040,0280)	yes	

N-CREATE has to provide (0000,1000) Affected SOP Instance UID, N-SET has to provide (0000,1001) Requested SOP Instance UID and has to be given identical by SCU.

(0020,000D) Study Instance UID or (0008, 1110) Referenced Study Sequence (and there (0008,1155) Referenced SOP Instance UID) and optionally (configurable) SPS ID (0040,0009) is used to identify Scheduled Procedure Steps related to current PPS.

### 1.6.4 Presentation Context Acceptance Criterion

There is no limit on the number of presentation contexts accepted. In case IWM runs out of resources, it will reject the association request.

### 1.6.5 Transfer Syntax Selection Policies

The Siemens IWM supports

- the Implicit VR Little Endian, Explicit VR Little Endian, Explicit VR Big Endian transfer syntaxes

The transfer syntax priority order for MPPS SCP is:

- Explicit VR Big Endian
- Explicit VR Little Endian
- Implicit VR Little Endian

---

## 2 Communication Profiles

### 2.1 Supported Communication Stacks

Siemens IWM provides DICOM TCP/IP Network Communication Support as defined in Part 8 of the DICOM Standard.

#### 2.1.1 OSI Stack

not supported.

#### 2.1.2 TCP/IP Stack

Siemens MagicStore uses the TCP/IP stack from SLES 8.

##### 2.1.2.1 Physical Media Support

IWM is independent of the physical medium over which TCP/IP executes. This feature is inherent in SLES 8 operating system used on IWM Server.

#### 2.1.3 Point-to-Point Stack

not supported.

## 3 Privatizations

### 3.1 Private SOP Classes

IWM provides conformance to the following private SOP Classes as an SCP:

*Table 4: Private SOP Classes as SCP*

SOP Class	SOP Class UID
MITRA Report Management	1.2.840.113532.3500.8

#### 3.1.1 IWM as Report Provider

IWM acts as SCP to respond to DICOM C-FIND requests. An external device may query as an SCU for reports.

##### 3.1.1.1 SOP Specific Conformance Report Provider

All attributes from table are included in the response - independent of which attributes are in the query.

For (0010, 0010) it is configurable for each SCU if DICOM-Format with carets or a formatted HIS / RIS Patient Name (which is used internally by IWM) shall be used for query.

*Table 5: IWM as Report Provider*

Attribute	Tag	Match Key	Comment
Patient ID	(0010, 0020)	SV	required
Patient's Name	(0010, 0010)	SV	required if configured
Accession Number	(0008, 0050)	SV	
Requested Procedure ID	(0040, 1001)	SV	
Study Instance UID	(0020, 000D)		
procedure descr.	(0032,1060)		
proc. code sequence	(0032,1064)		
>code value	(0008,0100)		
>coding scheme designator	(0008,0102)		
>code meaning	(0008,0104)		

*Table 5: IWM as Report Provider*

<b>Attribute</b>	<b>Tag</b>	<b>Match Key</b>	<b>Comment</b>
requesting physician	(0032,1032)		
referring physician	(0008,0090)		
reason	(0032,1030)		
Patient Birth Date	(0010, 0030)		
Patient Sex	(0010,0040)		
Patient Weight	(0010,1030)		
Patient VIP	(0040,3001)		
Pregnancy Status	(0010,21C0)		
Medical Alerts	(0010,2000)		
Contrast Allergies	(0010,2110)		
Study Description	(0008,1030)		
Study Date	(0008, 0020)		
Study Time	(0008, 0030)		
Record Date	(4008, 0100)		
Record Time	(4008, 0101)		
Interpretation Recorder	(4008, 0102)		
Transcription Date	(4008, 0108)		
Transcription Time	(4008, 0109)		
Interpretation Transcriber	(4008, 010A)		
Interpretation Author	(4008,010C)		
Approver Sequence	(4008,0111)		
> Approval Date	(4008,0112)		
> Approval Time	(4008,0113)		
> Physicians Appr.	(4008,0114)		
Interpretation Text	(4008,0115)		
Interpretation ID	(4008, 0200)		
Interpretation Type	(4008,0210)		

*Table 5: IWM as Report Provider*

<b>Attribute</b>	<b>Tag</b>	<b>Match Key</b>	<b>Comment</b>
Interpretation Status ID	(4008,0212)	SV	If "APPROVED" is given in request, only validated reports are sent.

## **3.2 Private Transfer Syntaxes**

None.

---

## 4 Configuration

BMWL SCP (and Report Management SCP) is to be configured with one AET, MPPS SCP with another. The SCUs for both (MPPS and BMWL) must be configured on IWM Server with their AET. Else a SCU is not allowed to connect to IWM Server.

The hostname of IWM Server, the own AETs (BMWL and MPPS) and ports are configurable. The ports are >1024.

## **5 Support of Extended Character Sets**

The Siemens DICOM application supports the ISO 8859 Latin 1 (ISO-IR 100) character set.

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