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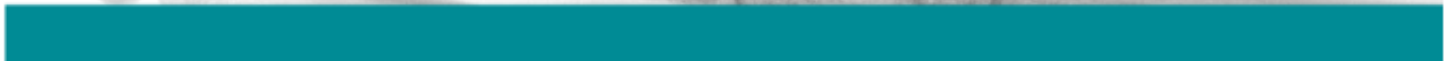
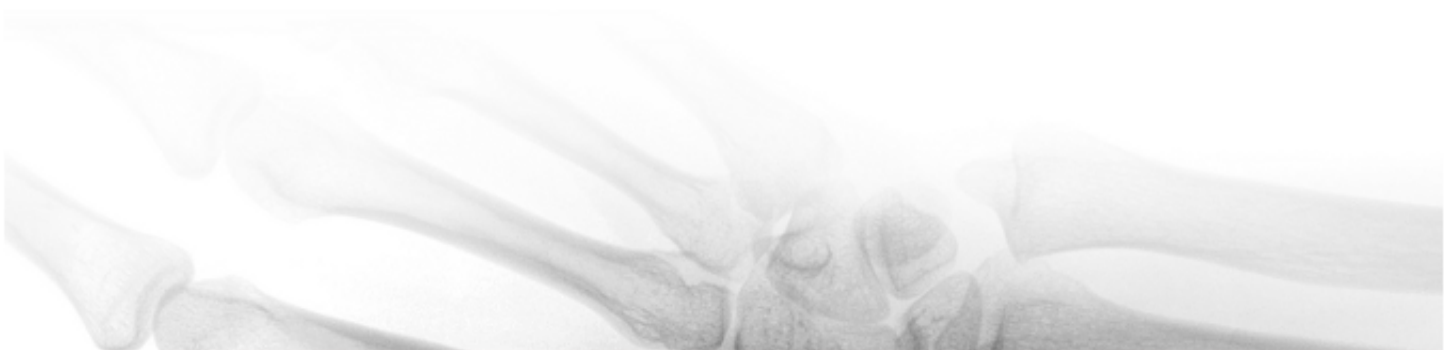
DICOM 3.0 Conformance Statement

synedra AIM - product family

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Homepage: www.synedra.com

AIM Release: 3.1 "Artemis"



Conformance Statement Overview

The synedra AIM product family is based on a storage facility, a client viewing and reporting workstation that allows connectivity to DICOM modalities and other health care information systems.

synedra AIM:

- stores images/data and modality performed procedure steps;
- manages the online storage of the images/data;
- commits storage of images/data;
- allows access to images via queries based on standard query models;
- sends images/data that are requested;
- views images/data to a user;
- prints images/data to a printer based on a user request;
- provides access to order information for modality worklist requests;
- notifies other modalities about available images;
- acts as a performed procedure step manager;
- exports data to external media, using DICOMDIR;

Table 1 shows the supported SOP classes and the role (service class user (SCU) or service class provider (SCP)) that is supported by synedra AIM.

SOP Classes	User of Service (SCU)	Provider of Service (SCP)
<i>Transfer</i>		
All services of the Storage Service Class	Yes	Yes
<i>Storage Commitment</i>		
Storage Commitment Push Model	No	Yes
<i>Query/Retrieve</i>		
Study Root Information Model - FIND	No	Yes
Study Root Information Model - MOVE	No	Yes
Patient Root Information Model - FIND	No	Yes
Patient Root Information Model - MOVE	No	Yes
<i>Workflow Management</i>		
Modality Worklist Information Model - FIND	No	Yes
<i>Modality Performed Procedure Step</i>		
Modality Performed Procedure Step - CREATE/SET	Yes	Yes
<i>Instance Availability Notification</i>		
Instance Availability Notification	Yes	Yes
<i>Print Management</i>		
Basic Grayscale Print Management Meta SOP Class	Yes	No
Basic Color Print Management Meta SOP Class	Yes	No

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1. Introduction

1.1. Revision History

Revision Number	Date	Author	Reason for Change
0.9.1	13/02/2006	KSchu	First draft of the 'new' DICOM-Conformance-Statement for synedra AIM
0.9.2	10/08/2006	KSchu	Adaption for the new release (Atlas)
Atlas.01	14/09/2006	TPe/KSchu	Final version for the Atlas release
Atlas.02	16/10/2006	KSchu	Adaptations for some small extensions (worklist)
Atlas.03	02/11/2006	KSchu	Fixed some misleading information for the worklist response
Prometheus.01	05/03/2007	ADo	Adaption for the new release (AIM Version Prometheus)
Bellerophon.01	04/01/2008	KSchu	Adaptions for the new release (AIM Version 2.4 Bellerophon)
Kalypso.01	06/05/2008	KSchu	Adaptions for the new release (AIM Version 2.5 Kalypso)
Andromeda.01	27/08/2008	RLi	Added information about printing
Andromeda.02	31/10/2008	ADo	Adaptions for the new release (AIM Version 2.6 Andromeda)
Perseus.01	16/04/2009	KSchu	Adaptions for the new release (AIM Version 2.7 Perseus)
Kronos.01	29/10/2009	JSi	Adaptions for the new release (AIM Version 2.8 Kronos)
Athene.01	29/07/2010	JSi	Adaptions for the new release (AIM Version 2.9 Athene)
Pegasos.01	16/06/2011	JSi	Adaptions for the new release (AIM Version 3.0 Pegasos)
Artemis.01	23/11/2011	JSi	Adaptions for the new release (AIM Version 3.1 Artemis)

Table 1.1. Revision History

1.2. Purpose / Audience of this Document

This document is the DICOM 3.0 Conformance Statement for the synedra AIM product family.

The user of this document is involved with system integration and/or software design. We assume that the user is familiar with the terminology and concepts that are used in the DICOM 3.0 standard.

Readers not familiar with DICOM 3.0 terminology should first read the appropriate parts of the DICOM standard itself, prior to read this conformance statement.

1.3. Remarks

The use of this DICOM Conformance Statement and the corresponding DICOM Standard is intended to facilitate communication with other DICOM modalities, but it is not sufficient to guarantee, by itself successful interoperability. The implementer should also consider the following issues:

1.3.1. Integration

The integration of any device into an overall system is beyond the scope of the DICOM 3.0. The user is responsible for analyzing the requirements of any non synedra AIM application that needs to be integrated. Comparison of DICOM Conformance statements is a first step for achieving interoperability.

1.3.2. Validation

Before any clinical use, test procedures needed to be defined and the test should be performed, to validate the desired connectivity.

1.3.3. Future Evolution

The DICOM Standard is evolving to achieve best adaption to future clinical needs. synedra reserves the right to change its products or to discontinue its delivery if changes in the DICOM Standard require this.

1.4. Definitions, Terms and Abbreviations

Appreviation	Description
AE	Application Entity
DICOM	Digital Imaging and Communications in Medicine
PPSM	Performed Procedure Step Manager
SCP	Service Class Provider
SCP	Service Class User

Table 1.2. Abbreviations

1.5. References

[DICOM Homepage](http://dicom.nema.org/)¹

¹ <http://dicom.nema.org/>

2. Networking Conformance Statement

2.1. Implementation Model

2.1.1. Application Data Flow Diagram

The Application Flow Diagrams in Figure 2.1 show all data flows into and from the synedra AIM for the DicomServer.

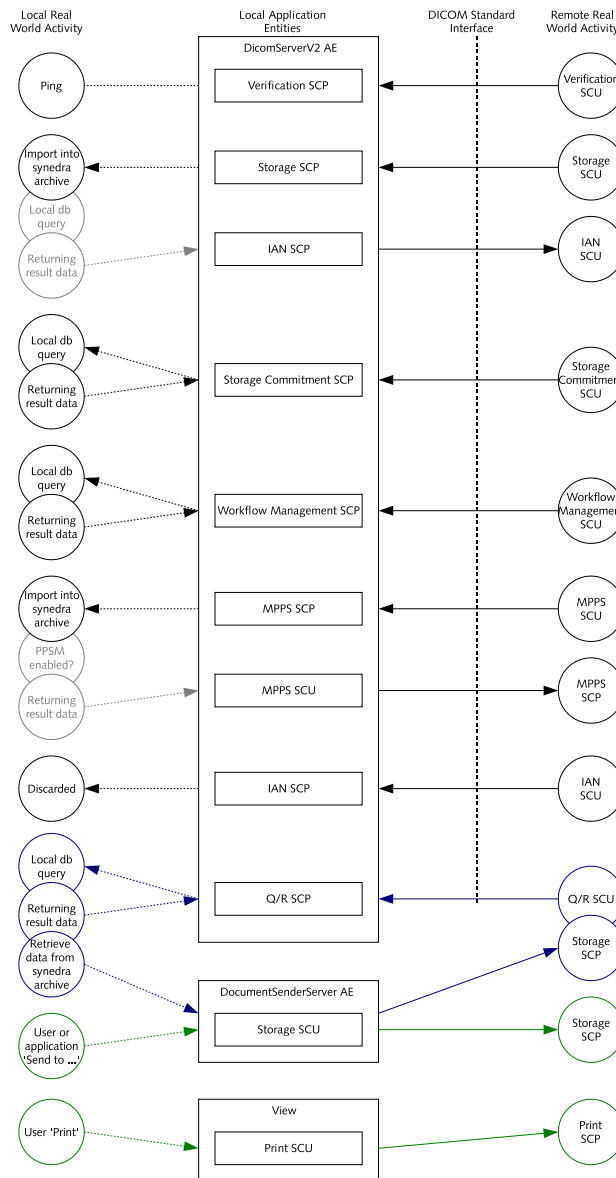


Figure 2.1. Application Flow Diagram

2.2. Functional Definitions of Applications

2.2.1. Functional Definitions of DicomServer

The DicomServer is the new main-backend-application for the DICOM communication. The DicomServer can handle

- Verification as a SCP
- Storage as a SCP
- Storage Commitment as a SCP
- Worklist-Queries as a SCP
- Query/Retrieve as a SCP
- Instance Availability Notification as a SCP and a SCU
- Modality Performed Procedure Steps as a SCP and a SCU

1. Notes

No association initialization are made directly by the DicomServer, except for 'asynchronous' Storage Commitment.

The DicomServer is only responsible for the managing part for Q/R. The sending of data due to requests are handled via the DocumentSenderServer

2.2.2. Functional Definitions of DocumentSenderServer

The DocumentSenderServer is responsible for the outgoing communication. Only

- Storage as a SCU

is provided by this AE.

2.2.3. Functional Definitions of View

View is responsible for printing data.

- Basic Grayscale Print Management Meta SOP Class
- Basic Color Print Management Meta SOP Class

is provided by this AE.

2.2.4. Sequencing of Real World Activities

Not applicable.

2.3. Application Entity Specification

2.3.1. Storage AE Specification

See Figure 2.1 Page 3 for the application flow diagram for storage.

2.3.1.1. SOP Classes

synedra AIM provides Standard Conformance to the following DICOM 3.0 SOP Classes:

SOP Class Name	SOP Class UID	SCU	SCP
Verification SOP Class	1.2.840.10008.1.1	No	Yes
Stored Print Storage	1.2.840.10008.5.1.1.27	Yes	Yes
Hardcopy Grayscale Image Storage SOP Class	1.2.840.10008.5.1.1.29	Yes	Yes
Hardcopy Color Image Storage SOP Class	1.2.840.10008.5.1.1.30	Yes	Yes
Computed Radiography Image Storage	1.2.840.10008.5.1.4.1.1.1	Yes	Yes
Digital X-Ray Image Storage - For Presentation	1.2.840.10008.5.1.4.1.1.1.1	Yes	Yes
Digital X-Ray Image Storage - For Processing	1.2.840.10008.5.1.4.1.1.1.1.1	Yes	Yes

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SOP Class Name	SOP Class UID	SCU	SCP
Digital Mammography XRay Image Storage - For Presentation	1.2.840.10008.5.1.4.1.1.1.2	Yes	Yes
Digital Mammography XRay Image Storage - For Processing	1.2.840.10008.5.1.4.1.1.1.2.1	Yes	Yes
Digital Intra-oral X-Ray Image Storage - For Presentation	1.2.840.10008.5.1.4.1.1.1.3	Yes	Yes
Digital Intra-oral X-Ray Image Storage - For Processing	1.2.840.10008.5.1.4.1.1.1.3.1	Yes	Yes
CT Image Storage	1.2.840.10008.5.1.4.1.1.2	Yes	Yes
Enhanced CT Image Storage	1.2.840.10008.5.1.4.1.1.2.1	Yes	Yes
Ultrasound Multi-frame Image Storage (retired)	1.2.840.10008.5.1.4.1.1.3	Yes	Yes
Ultrasound Multi-frame Image Storage	1.2.840.10008.5.1.4.1.1.3.1	Yes	Yes
MR Image Storage	1.2.840.10008.5.1.4.1.1.4	Yes	Yes
Enhanced MR Image Storage	1.2.840.10008.5.1.4.1.1.4.1	Yes	Yes
MR Spectroscopy Storage	1.2.840.10008.5.1.4.1.1.4.2	Yes	Yes
Nuclear Medicine Image Storage (retired)	1.2.840.10008.5.1.4.1.1.5	Yes	Yes
Ultrasound Image Storage (retired)	1.2.840.10008.5.1.4.1.1.6	Yes	Yes
Ultrasound Image Storage	1.2.840.10008.5.1.4.1.1.6.1	Yes	Yes
Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7	Yes	Yes
Multi-frame Single Bit Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7.1	Yes	Yes
Multi-frame Grayscale Byte Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7.2	Yes	Yes
Multi-frame Grayscale Word Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7.3	Yes	Yes
Multi-frame True Color Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7.4	Yes	Yes
Standalone Overlay Storage	1.2.840.10008.5.1.4.1.1.8	Yes	Yes
Standalone Curve Storage	1.2.840.10008.5.1.4.1.1.9	Yes	Yes
Waveform Storage (Draft)	1.2.840.10008.5.1.4.1.1.9.1	Yes	Yes
12-lead ECG Waveform Storage	1.2.840.10008.5.1.4.1.1.9.1.1	Yes	Yes
General ECG Waveform Storage	1.2.840.10008.5.1.4.1.1.9.1.2	Yes	Yes
Ambulatory ECG Waveform Storage	1.2.840.10008.5.1.4.1.1.9.1.3	Yes	Yes
Hemodynamic Waveform Storage	1.2.840.10008.5.1.4.1.1.9.2.1	Yes	Yes
Cardiac Electrophysiology Waveform Storage	1.2.840.10008.5.1.4.1.1.9.3.1	Yes	Yes
Basic Voice Audio Waveform Storage	1.2.840.10008.5.1.4.1.1.9.4.1	Yes	Yes
Standalone Modality LUT Storage	1.2.840.10008.5.1.4.1.1.10	Yes	Yes
Standalone VOI LUT Storage	1.2.840.10008.5.1.4.1.1.11	Yes	Yes
Grayscale Softcopy Presentation State Storage SOP Class	1.2.840.10008.5.1.4.1.1.11.1	Yes	Yes
Color Softcopy Presentation State Storage	1.2.840.10008.5.1.4.1.1.11.2	Yes	Yes
Pseudo Color Softcopy Presentation State Storage	1.2.840.10008.5.1.4.1.1.11.3	Yes	Yes
Blending Softcopy Presentation State Storage	1.2.840.10008.5.1.4.1.1.11.4	Yes	Yes
X-Ray Angiographic Image Storage	1.2.840.10008.5.1.4.1.1.12.1	Yes	Yes
Enhanced XA Image Storage	1.2.840.10008.5.1.4.1.1.12.1.1	Yes	Yes
X-Ray Radiofluoroscopic Image Storage	1.2.840.10008.5.1.4.1.1.12.2	Yes	Yes
Enhanced XRF Image Storage	1.2.840.10008.5.1.4.1.1.12.2.1	Yes	Yes
X-Ray Angiographic Bi-Plane Image Storage (retired)	1.2.840.10008.5.1.4.1.1.12.3	Yes	Yes
Nuclear Medicine Image Storage	1.2.840.10008.5.1.4.1.1.20	Yes	Yes

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SOP Class Name	SOP Class UID	SCU	SCP
Raw Data Storage	1.2.840.10008.5.1.4.1.1.66	Yes	Yes
Spatial Registration Storage	1.2.840.10008.5.1.4.1.1.66.1	Yes	Yes
Spatial Fiducials Storage	1.2.840.10008.5.1.4.1.1.66.2	Yes	Yes
Real World Value Mapping Storage	1.2.840.10008.5.1.4.1.1.67	Yes	Yes
VL Image Storage (retired)	1.2.840.10008.5.1.4.1.1.77.1	Yes	Yes
VL Endoscopic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.1	Yes	Yes
Video Endoscopic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.1.1	Yes	Yes
VL Microscopic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.2	Yes	Yes
Video Microscopic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.2.1	Yes	Yes
VL Slide-Coordinates Microscopic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.3	Yes	Yes
VL Photographic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.4	Yes	Yes
Video Photographic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.4.1	Yes	Yes
Ophthalmic Photography 8 Bit Image Storage	1.2.840.10008.5.1.4.1.1.77.1.5.1	Yes	Yes
Ophthalmic Photography 16 Bit Image Storage	1.2.840.10008.5.1.4.1.1.77.1.5.2	Yes	Yes
Stereometric Relationship Storage	1.2.840.10008.5.1.4.1.1.77.1.5.3	Yes	Yes
VL Multi Frame Image Storage (retired)	1.2.840.10008.5.1.4.1.1.77.2	Yes	Yes
SR Text Storage (Draft)	1.2.840.10008.5.1.4.1.1.88.1	Yes	Yes
SR Audio Storage (Draft)	1.2.840.10008.5.1.4.1.1.88.2	Yes	Yes
SR Detail Storage (Draft)	1.2.840.10008.5.1.4.1.1.88.3	Yes	Yes
SR Comprehensive Storage (Draft)	1.2.840.10008.5.1.4.1.1.88.4	Yes	Yes
Basic Text SR	1.2.840.10008.5.1.4.1.1.88.11	Yes	Yes
Enhanced SR	1.2.840.10008.5.1.4.1.1.88.22	Yes	Yes
Comprehensive SR	1.2.840.10008.5.1.4.1.1.88.33	Yes	Yes
Procedure Log Storage	1.2.840.10008.5.1.4.1.1.88.40	Yes	Yes
Mammography CAD SR	1.2.840.10008.5.1.4.1.1.88.50	Yes	Yes
Key Object Selection Document	1.2.840.10008.5.1.4.1.1.88.59	Yes	Yes
Chest CAD SR	1.2.840.10008.5.1.4.1.1.88.65	Yes	Yes
XRay Radiation Dose SR	1.2.840.10008.5.1.4.1.1.88.67	Yes	Yes
Encapsulated PDF Storage	1.2.840.10008.5.1.4.1.1.104.1	Yes	Yes
Positron Emission Tomography Image Storage	1.2.840.10008.5.1.4.1.1.128	Yes	Yes
Standalone PET Curve Storage	1.2.840.10008.5.1.4.1.1.129	Yes	Yes
RT Image Storage	1.2.840.10008.5.1.4.1.1.481.1	Yes	Yes
RT Dose Storage	1.2.840.10008.5.1.4.1.1.481.2	Yes	Yes
RT Structure Set Storage	1.2.840.10008.5.1.4.1.1.481.3	Yes	Yes
RT Beams Treatment Record Storage	1.2.840.10008.5.1.4.1.1.481.4	Yes	Yes
RT Plan Storage	1.2.840.10008.5.1.4.1.1.481.5	Yes	Yes
RT Brachy Treatment Record Storage	1.2.840.10008.5.1.4.1.1.481.6	Yes	Yes
RT Treatment Summary Record Storage	1.2.840.10008.5.1.4.1.1.481.7	Yes	Yes

Table 2.1. SOP Classes for Storage AE

2.3.1.2. Association Establishment Policies

2.3.1.2.1. General

The user action of 'Send to destination' or a trigger event of an external application will activate the DICOM Storage. An association request is sent to the requested destination. If the association is successfully negotiated and contains the required Presentation Contexts the transfer of the data will start. The default PDU size will be 16KB.

2.3.1.2.2. Number of Associations

The synedra AIM initiates one association for one user request. ¹

The synedra AIM is able to accept more than one association at a time. The default configuration for the Di-comServer is 20 connections at a time, but this value can be changed and the limitation is set only by the hardware of the machine. ²

2.3.1.2.3. Asynchronous Nature

The synedra AIM does not support asynchronous communication.

2.3.1.2.4. Implementation Identifying Information

Implementation Class UID	1.3.6.1.4.1.24930.6.1005
Implementation Version Name	synedra AIM

Table 2.2. Implementation Identifying Information

2.3.1.3. Association Initiating Policy

If a send job is performed, synedra AIM attempts to initiate a new association for

- DIMSE C-STORE

service operations

2.3.1.3.1. Real World Activity - Send

The associated real world activity is a C-STORE operation. This operation can be initiated

- by the user, via selecting one or more studies (series/image) in the synedra View or the synedra Control and a destination AE where the data should be sent to or
- by an external C-MOVE request or
- by an internal data send event.

The start of this operation will now initiate the following steps in synedra AIM

- Initiation of an association by the DocumentSenderServer, with all required abstract and transfer syntaxes
- Export of the data that should be sent from synedra Archive file system to a local disk
- Merge of the dynamically changeable data stored in the database into the files
- Initiating a C-STORE for every image/data that should be sent
- Any other status than 'Success' will abort the association

¹ This implies that it is possible that the synedra AIM opens more than one association to a single destination, if this is allowed by the destination.

² While multiple connections are allowed, we strongly advice to not send images out of one study over different associations at the same time. This can result in a very slow import rate or errors.

- The association will be closed after successful store of the last image/data

2.3.1.3.2. Proposed Presentation Contexts - Send

The synedra AIM will propose Presentation Contexts as shown in the following table

Abstract Syntax		Transfer Syntax		Role	Ext. Neg.
Name	UID	Name	UID		
Any SOP Class from Table 2.1 Page 4 except 'Verification SOP Class' can possibly be proposed.		Any Transfer Syntax from Table 2.4 Page 8 may be presented.		SCU	None

Table 2.3. Possibly Proposed Presentation Contexts - Storage

Important Notes

- The proposed Presentation Context that is used to initiate a new association depends on the image/data that should be send over that association. Only the needed Abstract Syntaxes are proposed.
- The same holds for the Transfer Syntax. Only the that Transfer Syntaxes are proposed that where originally used to store the data in the synedra Archive (Implicit VR Little Endian is always presented).
- Table 2.4 Page 8 shows the complete list of Transfer syntaxes that can possibly be presented.
- If the negotiation result in a different Transfer Syntax than the originally used Syntax, the data will be converted into the negotiated Syntax.
- The Transfer Syntaxes available with extended configuration from Table 2.4 Page 8 are usually not used. Extended testing is required if one of those Syntaxes is needed.
- It is not always possible to convert any Transfer Syntax into any other Syntax.
- Not all Transfer Syntaxes from the extended configuration can be viewed with synedra View or any other viewer
- Avoid using the Transfer Syntaxes from the extended configuration without needing them

Name	UID	Remark
Implicit VR Little Endian	1.2.840.10008.1.2	Always presented
Explicit VR Little Endian	1.2.840.10008.1.2.1	Default configuration
JPEG Baseline (Process 1): Default Transfer Syntax for Lossy JPEG 8 Bit Image Compression	1.2.840.10008.1.2.4.50	Default configuration
JPEG Lossless, Non-Hierarchical, First-Order Prediction (Process 14 [Selection Value 1]): Default Transfer Syntax for Lossless JPEG Image Compression	1.2.840.10008.1.2.4.70	Default configuration
Explicit VR Big Endian	1.2.840.10008.1.2.2	Extended configuration
JPEG Extended (Process 2 & 4): Default Transfer Syntax for Lossy JPEG 12 Bit Image Compression (Process 4 only)	1.2.840.10008.1.2.4.51	Extended configuration
JPEG Extended (Process 3 & 5) (Retired)	1.2.840.10008.1.2.4.52	Extended configuration
JPEG Spectral Selection, Non-Hierarchical (Process 6 & 8) (Retired)	1.2.840.10008.1.2.4.53	Extended configuration
JPEG Spectral Selection, Non-Hierarchical (Process 7 & 9) (Retired)	1.2.840.10008.1.2.4.54	Extended configuration
JPEG Full Progression, Non-Hierarchical (Process 10 & 12) (Retired)	1.2.840.10008.1.2.4.55	Extended configuration
JPEG Full Progression, Non-Hierarchical (Process 11 & 13) (Retired)	1.2.840.10008.1.2.4.56	Extended configuration

Name	UID	Remark
JPEG Lossless, Non-Hierarchical (Process 14)	1.2.840.10008.1.2.4.57	Extended configuration
JPEG Lossless, Non-Hierarchical (Process 15) (Retired)	1.2.840.10008.1.2.4.58	Extended configuration
JPEG Extended, Hierarchical (Process 16 & 18) (Retired)	1.2.840.10008.1.2.4.59	Extended configuration
JPEG Extended, Hierarchical (Process 17 & 19) (Retired)	1.2.840.10008.1.2.4.60	Extended configuration
JPEG Spectral Selection, Hierarchical (Process 20 & 22) (Retired)	1.2.840.10008.1.2.4.61	Extended configuration
JPEG Spectral Selection, Hierarchical (Process 21 & 23) (Retired)	1.2.840.10008.1.2.4.62	Extended configuration
JPEG Full Progression, Hierarchical (Process 24 & 26) (Retired)	1.2.840.10008.1.2.4.63	Extended configuration
JPEG Full Progression, Hierarchical (Process 25 & 27) (Retired)	1.2.840.10008.1.2.4.64	Extended configuration
JPEG Lossless, Hierarchical (Process 28) (Retired)	1.2.840.10008.1.2.4.65	Extended configuration
JPEG Lossless, Hierarchical (Process 29) (Retired)	1.2.840.10008.1.2.4.66	Extended configuration
JPEG-LS Lossless Image Compression	1.2.840.10008.1.2.4.80	Extended configuration
JPEG-LS Lossy (Near-Lossless) Image Compression	1.2.840.10008.1.2.4.81	Extended configuration
RLE Lossless	1.2.840.10008.1.2.5	Extended configuration
Deflated Explicit VR Little Endian	1.2.840.10008.1.2.1.99	Extended configuration
JPEG 2000 Image Compression (Lossless Only)	1.2.840.10008.1.2.4.90	Extended configuration
JPEG 2000 Image Compression	1.2.840.10008.1.2.4.91	Extended configuration
MPEG2 Main Profile @ Main Level	1.2.840.10008.1.2.4.100	Extended configuration

Table 2.4. Available Transfer Syntaxes

SOP Specific Conformance for SOP Classes

The synedra AIM provides standard conformance to the DICOM Storage Classes as an SCU.

However we do not check incoming data for consistency of the data for the used SOP Class. Thus it is possible that the synedra AIM tries to send data that has been stored in synedra AIM that is not conform with the DICOM Standard.

Any sending attempt will be logged in the log-file(s) of the DocumentSenderServer. It depends how the sending was initial started how the synedra AIM reacts on errors. A user request and a C-MOVE request will try to send the data once and will return the error code to the caller that can decide whether the operation should be repeated or not. For automatic sending usually a retry is implemented that tries to send the data 10³ times before stopping if all attempts return an error.

Presentation context Presenting Rules

The synedra AIM presents only the Presentation Contexts that are required for sending the selected data.

Transfer Syntax Presenting Rules

The synedra AIM presents only the Transfer syntaxes that are required for sending the data as stored in the archive. We always present also Implicit VR Little Endian.

2.3.1.4. Association Acceptance Policy

The synedra AIM tries to accept associations for

- DIMSE C-ECHO

³ The exact number can be configured. 10 is the default configuration but there may be more or less tries in case of errors.

- DIMSE C-STORE

service operations.

Calling AE, called AE and the callers host will be verified against the configuration. Not configured combinations will not be accepted.

2.3.1.4.1. Real World Activity - Receive

The associated real world operation is a C-STORE operation. This operation can be initiated by any modality that tries to open a DICOM association to the listen port of the DicomServer. A receive will lead to the following steps in the synedra AIM

- Initiating of an association by an arbitrary modality
- Negotiating of the association with the configured Abstract and Transfer Syntaxes
- Receiving of the transmitted image/data
- Check of the consistency of the data (details see later)
- Returning status 'Success' after successful importing the data to the synedra Archive.
- In case of problems while importing the data we return 'Error'
- The association will be closed after a close request

2.3.1.4.2. Accepted Presentation Contexts - Receive

The following Presentation Contexts will be accepted by the synedra AIM.

Abstract Syntax		Transfer Syntax		Role	Ext. Neg.
Name	UID	Name	UID		
Any SOP Class from Table 2.1 Page 4 can be accepted.		Any Transfer Syntax from Table 2.4 Page 8 may be accepted.		SCU	None

Table 2.5. Accepted Presentation Contexts - Storage

Important Notes

- It depends on the configuration which Transfer Syntax is accepted
- To ensure a certain Presentation Context to be accepted the modality should present this the Abstract Syntax with only the needed Transfer Syntax (for DICOM compatibility it is required that this Abstract Syntax is also presented with Implicit VR Little Endian in different Presentation Context)
- Table 2.4 Page 8 shows a list of all possibly accepted Transfer Syntaxes. In a normal configuration there are only the first 4 Transfer Syntaxes involved
- Avoid using Transfer Syntaxes from the extended configuration part of Table 2.4 Page 8 if there is no need for it
- Not all Presentation Contexts are images, thus can not be viewed

SOP Specific Conformance Statement - Receiving

synedra AIM provides standard conformance to the DICOM Storage Classes as an SCP.

We do not remove or modify any private tags stored in the data.

After successful receiving a C-STORE-RQ, the DicomServer performs a plausibility test on the received data and also on the connection data. After successfully performed tests the image/data will be stored in the synedra Archive. Is this successful we return the status SUCCESS, otherwise one of the following error codes are returned an the association will be aborted

- Refused (A700)

This error status indicate that there is a lack of resources in the synedra AIM. The reason for this can be

- An invalid configuration of the modality (eg. host and AE title)
- A problem during importing to the synedra AIM (eg. to less resources)

- Error (C000)

This error status indicate that there is some inconsistency problem in the image/data that should be imported. In most cases there is some kind of difference in the patient data compared to previously imported images of the same study/series.

- Error (A900)

This error indicate that the store request is invalid due to missing/invalid attributes.

The image is 'visible' in the synedra AIM after returning the SUCCESS to the modality.

If an object instance is received that is already stored in the database and the consistency is valid the old images is updated by the new received one.

Presentation Context Acceptance Rules

synedra AIM will accept any number of Presentation Contexts of the above mentioned type as long as the DICOM Standard limit is not reached.

Transfer Syntax Acceptance Rules

Due to the high grad of configurability only the rules for a default configured synedra AIM are noted here.

We accept the Transfer Syntaxes in the following order (topmost is preferred against next most and so on)

1. JPEG Lossless, Non-Hierarchical, First-Order Prediction (Process 14 [Selection Value 1]): Default Transfer Syntax for Lossless JPEG Image Compression
2. JPEG Baseline (Process 1): Default Transfer Syntax for Lossy JPEG 8 Bit Image Compression
3. Explicit VR Little Endian
4. Implicit VR Little Endian

synedra AIM usually does not convert any Transfer Syntax to another Syntax. Images/data are stored as received. But we can not guarantee that behaviour for the future.

synedra AIM does usually not remove any private tags during import.⁴

2.3.2. Storage Commitment AE Specification

See Figure 2.1 Page 3 for the application flow diagram for Storage Commitment.

2.3.2.1. SOP Classes

synedra AIM provide Standard Conformance to the following DICOM 3.0 SOP Classes:

SOP Class Name	SOP Class UID	SCU	SCP
Verification SOP Class	1.2.840.10008.1.1	No	Yes
Storage Commitment Push Model	1.2.840.10008.1.20.1	No	Yes

Table 2.6. SOP Classes for Modality Worklist Information Model AE

⁴ Private tags have to follow the rules of the DICOM v3.0 standard.

2.3.2.2. Association Establishment Policies

2.3.2.2.1. Number of Associations

The synedra AIM is able to accept more than one association at a time. The default configuration for the DicomServer is 20 connections at a time, but this value can be changed and the limitation is set only by the machine.

2.3.2.2.2. Asynchronous Nature

It depends on the exact configuration of the system whether we allow asynchronous communication or we deny it. When allowed the response to the request is sent directly after receiving the request.

2.3.2.3. Association Initiating Policy

If asynchronous response is enabled we initiate a new association for

- DIMSE N-EVENT-REPORT

service operations.

2.3.2.4. Association Acceptance Policy

The synedra AIM tries to accept associations for

- DIMSE C-ECHO
- DIMSE N-ACTION

service operations.

2.3.2.4.1. Real World Activity - Storage Commitment

The associated real world operation is a N-ACTION request from a modality that will be answered with a N-EVENT-REPORT. This operation can be initiated by any modality that tries to open a DICOM association to the listen port of the DicomServer. A Storage Commitment will start the following sub operations in the synedra AIM

- Initiating of an association by an arbitrary modality
- Negotiating of the association with the required Abstract and Transfer Syntaxes
- Receive of the N-ACTION request that contains the list of SOP Instance UIDs
- Querying of the database and preparation of the result set
- Returning 'Success' for the receiving of the request
- For synchronous response
 - Returning a N-EVENT-REPORT containing the result
- For asynchronous response
 - Requesting a new association to the AE that performs the query. (host/port need to be configured in the db), with the Abstract and Transfer syntax needed
 - Returning a N-EVENT-REPORT containing the result
 - Sending a close request for the association
 - Close the association
- Closing the association on peer request

Notes

In case of an asynchronous response the requester association and the response association are decoupled and closing one does not effect the other.

2.3.2.4.2. Accepted Presentation Contexts - Storage Commitment

The following Presentation contexts will be accepted by the synedra AIM.

Abstract Syntax		Transfer Syntax		Role	Ext. Neg.
Name	UID	Name	UID		
Storage Commitment Push Model	1.2.840.10008.1.20.1	Any Transfer Syntax from Table 2.8 Page 13 may be accepted.		SCU/SCP	None

Table 2.7. Accepted Presentation Contexts - Storage Commitment

SOP Specific Conformance Statement - Storage Commitment

The synedra AIM provides standard conformance to the DICOM Storage Commitment Class as an SCP.

After successfully receiving the N-ACTION request, we directly respond with a N-ACTION success. After performing the needed queries in the db we respond (synchron or asynchron) with the result of the Storage Commitment. Possible errors are

- Failure (0110) - Processing Failure
There was an internal error in the synedra AIM. The request could not be performed
- Failure (0120) - Missing Attributes
Required information for processing is not available in the request
- Failure (0106) - Invalid Attribute Values
Required information is invalid in the request

The result of the response to our sending of the results should also be a SUCCESS.

Presentation Context Acceptance Rules

The synedra AIM will accept any number of Presentation Context of the above mentioned types as long as there are no limitations from the DICOM Standard.

Transfer Syntax Selection Rules

For Modality Worklist Information Model we select can select on of the transfer syntaxes from Table 2.8 Page 13. Note that it depends on the exact configuration what Transfer syntax are available on the synedra AIM.

Implicit VR Little Endian is always possible to select independent of the configuration.

Name	UID	Remark
Implicit VR Little Endian	1.2.840.10008.1.2	Always presented
Explicit VR Little Endian	1.2.840.10008.1.2.1	Default configuration
Explicit VR Big Endian	1.2.840.10008.1.2.2	Extended configuration

Table 2.8. Available Transfer Syntaxes

2.3.3. Modality Worklist Information Model AE Specification

See Figure 2.1 Page 3 for the application flow diagram for Modality Worklist Information Model.

2.3.3.1. SOP Classes

synedra AIM provide Standard Conformance to the following DICOM 3.0 SOP Classes:

SOP Class Name	SOP Class UID	SCU	SCP
Verification SOP Class	1.2.840.10008.1.1	No	Yes
Modality Worklist Information Model	1.2.840.10008.5.1.4.31	No	Yes

Table 2.9. SOP Classes for Modality Worklist Information Model AE

2.3.3.2. Association Establishment Policies

2.3.3.2.1. Number of Associations

The synedra AIM is able to accept more than one association at a time. The default configuration for the DicomServer is 20 connections at a time, but this value can be changed and the limitation is set only by the machine.

2.3.3.2.2. Asynchronous Nature

The synedra AIM does not support asynchronous communication within this context.

2.3.3.3. Association Initiating Policy

Not used in this context.

2.3.3.4. Association Acceptance Policy

The synedra AIM tries to accept associations for

- DIMSE C-ECHO
- DIMSE C-FIND

service operations.

2.3.3.4.1. Real World Activity - Modality Worklist Information Model

The associated real world operation is a C-FIND operation. This operation can be initiated by any modality that tries to open a DICOM association to the listen port of the DicomServer. A Modality Worklist Information Model query will lead to the following steps in the synedra AIM.

- Initiating of an association by an arbitrary modality
- Negotiating of the association with the required Abstract and Transfer Syntaxes
- Receive of the C-FIND request with query parameter
- Performing the query within the synedra AIM and preparation of the result
- Returning the result of the search
- In case of problems with the query or while performing the query we return 'Error'
- The association will be closed after a close request

2.3.3.4.2. Accepted Presentation Contexts - Modality Worklist Information Model

The following Presentation contexts will be accepted by the synedra AIM.

Abstract Syntax		Transfer Syntax		Role	Ext. Neg.
Name	UID	Name	UID		
Modality Worklist Information Model	1.2.840.10008.5.1.4.31	Any Transfer Syntax from Table 2.8 Page 13 may be accepted.		SCP	None

Table 2.10. Accepted Presentation Contexts - Modality Worklist Information Model

SOP Specific Conformance Statement - Modality Worklist Information

The synedra AIM provides standard conformance to the DICOM Modality Worklist Information Model Class as an SCP.

The C-FIND request for the Modality Worklist Information Model should contain the information provided by Table 2.11 Page 15. Any other information within the request will not be evaluated by the synedra AIM.

Attribute Name	Tag	Type
Scheduled Procedure Step Sequence	(0040,0100)	R
> Modality	(0008,0060)	O
> Scheduled Station AE Title	(0040,0001)	R ^a
> Scheduled Procedure Step Start Date	(0040,0002)	R ^b

^a If not provided it is possible to enforce by configuration (not as default) to use the Calling AE as the Scheduled Station AE Title

^b It is possible to enforce by configuration to use the current date for the Scheduled Procedure Step Start Date

Table 2.11. Modality Worklist Information Model - C-FIND Request Attributes

The C-FIND response provide the the information listed in Table 2.12 Page 15.

Attribute Name	Tag
Specific Character Set ^a	(0008,0005)
Accession Number	(0008,0050)
Referring Physician's Name	(0008,0090)
Patients Name	(0010,0010)
Patient ID	(0010,0020)
Patients Birth Date	(0010,0030)
Patients Sex	(0010,0040)
Patients Size	(0010,1020)
Patients Weight	(0010,1030)
Study Instance UID	(0020,000D)
Requesting Physician	(0032,1032)
Requested Procedure Description	(0032,1060)
Admission ID	(0038,0010)
Current Patient Location	(0038,0300)
Scheduled Procedure Step Sequence	(0040,0100)
> Modality	(0008,0060)
> Scheduled Station AE Title	(0040,0001)
> Scheduled Procedure Start Date	(0040,0002)
> Scheduled Procedure Start Time	(0040,0003)
> Scheduled Performing Physicians Name	(0040,0006)
> Scheduled Procedure Step Description	(0040,0007)
> Scheduled Protocol Code Sequence	(0040,0008)

Attribute Name	Tag
> > Code Value	(0008,0100)
> > Code Scheme Designator	(0008,0102)
> > Code Meaning	(0008,0104)
> Scheduled Procedure Step ID	(0040,0009)
> Scheduled Station Name	(0040,0010)
> Scheduled Procedure Step Location	(0040,0011)
Requested Procedure ID	(0040,1001)
Reason for the Requested Procedure	(0040,1002)
Requested Procedure Comments	(0040,1400)

^aThe Specific Character Set always contains the fixed value: ISO_IR 100

Table 2.12. Modality Worklist Information Model - C-FIND Response Attributes

Notes

The response does always contain the tags mentioned. But it is not possible to ensure that always all tags also contain values (The values the synedra AIM provide via Modality Worklist Information Model are usually driven by an external KIS/RIS-system that is not controlled by synedra AIM).

Presentation Context Acceptance Rules

The synedra AIM will accept any number of Presentation Context of the above mentioned types as long as there are no limitations from the DICOM Standard.

Transfer Syntax Selection Rules

For Modality Worklist Information Model we select can select on of the transfer syntaxes from Table 2.8 Page 13. Note that it depends on the exact configuration what Transfer syntax are available on the synedra AIM.

Implicit VR Little Endian is always possible to select independent of the configuration.

2.3.4. Query/Retrieve AE Specification

See figure Figure 2.1 Page 3 for the application flow diagram for Query/Retrieve SOP Classes

2.3.4.1. SOP Classes

synedra AIM provide Standard Conformance to the following DICOM 3.0 SOP Classes:

SOP Class Name	SOP Class UID	SCU	SCP
Verification SOP Class	1.2.840.10008.1.1	No	Yes
Patient Root Query/Retrieve Model - FIND	1.2.840.10008.5.1.4.1.2.1.1	No	Yes
Patient Root Query/Retrieve Model - MOVE	1.2.840.10008.5.1.4.1.2.1.2	No	Yes
Study Root Query/Retrieve Model - FIND	1.2.840.10008.5.1.4.1.2.2.1	No	Yes
Study Root Query/Retrieve Model - MOVE	1.2.840.10008.5.1.4.1.2.2.2	No	Yes

Table 2.13. Accepted Presentation Contexts - Query/Retrieve

2.3.4.2. Association Establishment Policies

2.3.4.2.1. General

The user action 'Search' will activate the DICOM Study Root Query/Retrieve Model -FIND. The user action 'Retrieve' will activate the Study Root Query/Retrieve Model - MOVE. The association request to send the

requested data is the same as already described in chapter 'Storage AE Specification' especially the subparts for 'Send'.

2.3.4.2.2. Number of Associations

The synedra AIM is able to accept more than one association at a time. The default configuration for the DicomServer is 20 connections at a time, but this value can be changed and the limitation is set only by the machine.

The synedra AIM initiates one association for one MOVE request.⁵

2.3.4.2.3. Asynchronous Nature

The synedra AIM does not support asynchronous communication. Any request will synchronous return after returning the required results.

2.3.4.3. Association Initiating Policy

If a MOVE request require the sending of data the synedra AIM attempts to initiate as note in chapter 'Storage AE Specification' especially the subparts for 'Send'.

2.3.4.4. Association Acceptance Policy

The synedra AIM tries to accept associations for

- DIMSE C-ECHO
- DIMSE C-FIND
- DIMSE C-MOVE

service operations.

2.3.4.4.1. Real World Activity - Search

The associated real world operation is a C-FIND operation. This operation can be initiated by any modality that tries to open a DICOM association to the listen port of the DicomServer. A search will lead to the following steps in the synedra AIM.

- Initiating of an association by an arbitrary modality
- Negotiating of the association with the configured Abstract and Transfer Syntaxes
- Receiving of the request
- Querying the DB for the data
- Returning the results of the search
- In case of problems while querying we return 'Error'
- The association will be closed after a close request

Notes

Any query in the synedra AIM needs a 'user'-authentication to prevent illegal access. For a search request the calling AE (and the calling host) is connected to a real user by configuration. The results for the queries are the same as the user would get with the set permissions.

⁵ It is possible that the synedra AIM initiates more than one association to a single destination if there are more than one requests to perform at the same time.

2.3.4.4.2. Accepted Presentation Contexts - Search

The following Presentation contexts will be accepted by the synedra AIM.

Abstract Syntax		Transfer Syntax		Role	Ext. Neg.
Name	UID	Name	UID		
Study Root Query/Retrieve Model - FIND	1.2.840.10008.5.1.4.1.2.2.1	Any Transfer Syntax from Table 2.8 Page 13	may be accepted.	SCP	None
Patient Root Query/Retrieve Model - FIND	1.2.840.10008.5.1.4.1.2.1.1	Any Transfer Syntax from Table 2.8 Page 13	may be accepted.	SCP	None

Table 2.14. Accepted Presentation Contexts - Study/Patient Root Query/Retrieve Model - FIND

SOP Specific Conformance Statement - Find

The synedra AIM provides standard conformance to the Query/Retrieve SOP Class as an SCP.

The C-FIND request for the Study Root Query/Retrieve Model - FIND should always contain the information listed in Page 18. For Query Retrieve Level STUDY request also the attributes noted in Table 2.18 Page 19 are required. The STUDY response contains the attributes noted in Table 2.19 Page 19 For Query Retrieve Level SERIES see Table 2.20 Page 20 for the required tags for the request in Table 2.21 Page 20 for the attributes in the response. For Query Retrieve Level IMAGE see Table 2.22 Page 20 for the required response tags and Table 2.23 Page 21 for the response attributes.

The C-FIND request for the Patient Root Query/Retrieve Model - FIND should always contain the information listed in Table 2.15 Page 18 For Query Retrieve Level PATIENT requests also the attributes noted in Table 2.16 Page 18 are required. The PATIENT response contains all the attributes noted in Table 2.17 Page 18

For the matching of the attributes we support all kinds of matching suggested in the DICOM standard part 4 (see chapter C.2.2.2 for details). Any attribute not listed for the corresponding query model will not be evaluated by synedra AIM.

Attribute Name	Tag	Type
Query Retrieve Level	(0008,0052)	R

Table 2.15. Study/Patient Root Query/Retrieve - FIND Request: Common Attributes

Attribute Name	Tag	Type
Patients Name	(0010,0010)	O
Patient ID	(0010,0020)	R

Table 2.16. Patient Root Query/Retrieve Model - FIND Request: Attributes for Query Retrieve Level PATIENT

Attribute Name	Tag
Specific Character Set ^a	(0008,0005)
Query Retrieve Level ^b	(0008,0052)
Instance Availability ^c	(0008,0056)
Patients Name	(0010,0010)
Patient ID	(0010,0020)
Patients Birth Date	(0010,0030)
Patients Sex	(0010,0040)
Number of Patient Related Studies	(0020,1200)
Number of Patient Related Series	(0020,1202)

Networking Conformance Statement

Attribute Name	Tag
Number of Patient Related Instances	(0020,1204)

^aFixed value: ISO_IR 100

^bFixed value: STUDY

^cFixed value: ONLINE

Table 2.17. Patient Root Query/Retrieve Model - FIND Response: Attributes for Query Retrieve Level PATIENT

Attribute Name	Tag	Type
Study Date	(0008,0020)	O
Study Time	(0008,0030)	O
Accession Number	(0008,0050)	O
Study Description	(0008,1030)	O
Modalities In Study	(0008,0061)	O
Referring Physicians Name	(0008,0090)	O
Patients Name	(0010,0010)	R
Patient ID	(0010,0020)	O
Patients Birth Date	(0010,0030)	O
Patients Sex	(0010,0040)	O
Study Instance UID	(0020,000D)	O
Study ID	(0020,0010)	O

Table 2.18. Patient/Study Root Query/Retrieve Model - FIND Request: Attributes for Query Retrieve Level STUDY

Attribute Name	Tag
Specific Character Set ^a	(0008,0005)
Study Date	(0008,0020)
Study Time	(0008,0030)
Accession Number	(0008,0050)
Query Retrieve Level ^b	(0008,0052)
Instance Availability	(0008,0056)
Modalities in Study	(0008,0061)
Institution Name	(0008,0080)
Referring Physicians Name	(0008,0090)
Study Description	(0008,1030)
Institutional Department Name	(0008,1040)
Patients Name	(0010,0010)
Patient ID	(0010,0020)
Patients Birth Date	(0010,0030)
Patients Sex	(0010,0040)
Study Instance UID	(0020,000D)
Study ID	(0020,0010)
Number of Study Related Series	(0020,1206)
Number of Study Related Instances	(0020,1208)

^aFixed value: ISO_IR 100

^bFixed value: STUDY

Table 2.19. Patient/Study Root Query/Retrieve Model - FIND Response: Attributes for Query Retrieve Level STUDY

Networking Conformance Statement

Attribute Name	Tag	Type
Modality	(0008,0060)	O
Study Instance UID	(0020,000D)	R
Series Instance UID	(0020,000E)	O
Series Number	(0020,0011)	O
Performed Procedure Step Start Date	(0040,0244)	O
Performed Procedure Step Start Time	(0040,0245)	O
Request Attributes Sequence	(0040,0275)	O
> Requested Procedure ID	(0040,1001)	R
> Scheduled Procedure Step ID	(0040,0009)	R

Table 2.20. Patient/Study Root Query/Retrieve Model - FIND Request: Attributes for Query Retrieve Level SERIES

Attribute Name	Tag
Specific Character Set ^a	(0008,0005)
Study Date	(0008,0020)
Study Time	(0008,0030)
Accession Number	(0008,0050)
Query Retrieve Level ^b	(0008,0052)
Instance Availability	(0008,0056)
Modality	(0008,0060)
Institution Name	(0008,0080)
Referring Physicians Name	(0008,0090)
Study Description	(0008,1030)
Institutional Department Name	(0008,1040)
Series Description	(0008,103E)
Patients Name	(0010,0010)
Patient ID	(0010,0020)
Patients Birth Date	(0010,0030)
Patients Sex	(0010,0040)
Study Instance UID	(0020,000D)
Series Instance UID	(0020,000E)
Study ID	(0020,0010)
Series Number	(0020,0011)
Number Of Series Related Instances	(0020,1209)
Performed Procedure Step Start Date	(0040,0244)
Performed Procedure Step Start Time	(0040,0245)
Request Attributes Sequence	(0040,0275)
> Requested Procedure ID	(0040,1001)
> Scheduled Procedure Step ID	(0040,0009)

^aFixed value: ISO_IR 100

^bFixed value: SERIES

Table 2.21. Patient/Study Root Query/Retrieve Model - FIND Response: Attributes for Query Retrieve Level SERIES

Attribute Name	Tag	Type
SOP Class UID	(0008,0016)	O

Attribute Name	Tag	Type
SOP Instance UID	(0008,0018)	O
Study Instance UID	(0020,000D)	R
Series Instance UID	(0020,000E)	R
Instance Number	(0020,0013)	O

Table 2.22. Patient/Study Root Query/Retrieve Model - FIND Request: Attributes for Query Retrieve Level IMAGE

Attribute Name	Tag
Specific Character Set ^a	(0008,0005)
SOP Class UID	(0008,0016)
SOP Instance UID	(0008,0018)
Study Date	(0008,0020)
Study Time	(0008,0030)
Accession Number	(0008,0050)
Query Retrieve Level ^b	(0008,0052)
Instance Availability	(0008,0056)
Modality	(0008,0060)
Institution Name	(0008,0080)
Referring Physicians Name	(0008,0090)
Study Description	(0008,1030)
Institutional Department Name	(0008,1040)
Series Description	(0008,103E)
Patients Name	(0010,0010)
Patient ID	(0010,0020)
Patients Birth Date	(0010,0030)
Patients Sex	(0010,0040)
Study Instance UID	(0020,000D)
Series Instance UID	(0020,000E)
Study ID	(0020,0010)
Series Number	(0020,0011)
Instance Number	(0020,0013)
Number Of Frames	(0028,0008)
Rows	(0028,0010)
Columns	(0028,0011)
Bits Allocated	(0028,0100)

^aFixed value: ISO_IR 100^bFixed value: IMAGE

Table 2.23. Patient/Study Root Query/Retrieve Model - FIND Response: Attributes for Query Retrieve Level IMAGE

If the synedra AIM was able to process the request we will return SUCCESS with the resultset. In case of processing errors we will respond with the following error codes

- Refused (A700)

This error status can indicate one of the following problems:

- A system shutdown is in progress (This is a very rare event)

- The authentication of the AE (host + user context) failed.

As noted above, it is required to configure each AE and the host for the AE to a query user for authentication

- A general problem was encountered (eg. to less resources)
- Refused (A900)

This error indicate that there are missing or invalid parameter within the request

Presentation Context Acceptance Rules

The synedra AIM will accept any number of Presentation Context of the above mentioned types as long as there are no limitations from the DICOM Standard.

Transfer Syntax Selection Rules

For Modality Worklist Information Model we select can select on of the transfer syntaxes from Table 2.8 Page 13. Note that it depends on the exact configuration what Transfer syntax are available on the synedra AIM.

Implicit VR Little Endian is always possible to select independent of the configuration.

2.3.4.4.3. Real World Activity - Retrieve

The associated real world operation is a C-MOVE operation. This operation can be initiated by any modality that tries to open a DICOM association to the listen port of the DicomServer. A retrieve will lead to the following steps in the synedra AIM.

- Initiating of an association by an arbitrary modality
- Negotiating of the association with the configured Abstract and Transfer Syntaxes
- Receiving of the request
- Querying the db for the data
- Opening a new association to the receiver AE
- Sending the requested data over the new association
- Closing the new association
- Returning Success of the request association
- If there where errors in between we will return Error and close the association
- The association will be closed after a close request

Notes

Any query in the synedra AIM needs a 'user'-authentication to prevent illegal access. For a search request the calling AE (and the calling host) is connected to a real user by configuration. The results for the queries are the same as the user would get with the set permissions.

The synedra AIM does explicitly NOT use the destination AE in die MOVE request to determine the receiver of the requested data. The destination has to be set via configuration for the requester AE, to prevent unauthorized access to data.

The rules for the new association are described in chapter 'Storage AE Specification' (Send)

2.3.4.4.4. Accepted Presentation Contexts - Retrieve

The following Presentation contexts will be accepted by the synedra AIM.

Abstract Syntax		Transfer Syntax		Role	Ext. Neg.
Name	UID	Name	UID		
Patient Root Query/Retrieve Model - MOVE	1.2.840.10008.5.1.4.1.2.2.1	Any Transfer Syntax from Table 2.8 Page 13 may be accepted.		SCP	None
Study Root Query/Retrieve Model - MOVE	1.2.840.10008.5.1.4.1.2.2.2	Any Transfer Syntax from Table 2.8 Page 13 may be accepted.		SCP	None

Table 2.24. Accepted Presentation Contexts - Study Root Query/Retrieve Model - MOVE

SOP Specific Conformance Statement - Modality Worklist Information

The synedra AIM provides standard conformance to the DICOM Modality Worklist Information Model Class as an SCP.

The C-MOVE request for the Patient/Study Root Query/Retrieve Model - MOVE should always contain the information listed in Table 2.25 Page 23 For Query Retrieve Level PATIENT request the attributes noted in Table 2.26 Page 23 are required. For Query Retrieve Level STUDY request the attributes noted in Table 2.27 Page 23 are required. For Query Retrieve Level SERIES request the attributes noted in Table 2.28 Page 23 are required. For Query Retrieve Level IMAGE request the attributes noted in Table 2.29 Page 23 are required. Any other attributes not listed for the query retrieve level are not evaluated by the synedra AIM.

Attribute Name	Tag	Type
Query Retrieve Level	(0008,0052)	R

Table 2.25. Patient/Study Root Query/Retrieve Model - MOVE Request: Common Attributes

Attribute Name	Tag	Type
Patient ID	(0010,0020)	R

Table 2.26. Patient Root Query/Retrieve Model - MOVE Request: Attributes for Query Retrieve Level PATIENT

Attribute Name	Tag	Type
Study Instance UID	(0020,000D)	R

Table 2.27. Patient Root Query/Retrieve Model - MOVE Request: Attributes for Query Retrieve Level STUDY

Attribute Name	Tag	Type
Study Instance UID	(0020,000D)	R
Series Instance UID	(0020,000E)	R

Table 2.28. Patient Root Query/Retrieve Model - MOVE Request: Attributes for Query Retrieve Level SERIES

Attribute Name	Tag	Type
SOP Instance UID	(0008,0018)	R
Study Instance UID	(0020,000D)	R
Series Instance UID	(0020,000E)	R

Table 2.29. Patient Root Query/Retrieve Model - MOVE Request: Attributes for Query Retrieve Level IMAGE

If the synedra AIM was able to process the request we will return SUCCESS within the requester association. In case of processing errors we will respond with the following error codes

- Refused (A702)

This error status indicate that the synedra AIM encountered a problem while processing.

- Error (A900)

This error status indicate some parameters in the request are missing or invalid.

Presentation Context Acceptance Rules

The synedra AIM will accept any number of Presentation Context of the above mentioned types as long as there are no limitations from the DICOM Standard.

Transfer Syntax Selection Rules

For Modality Worklist Information Model we select can select on of the transfer syntaxes from Table 2.8 Page 13. Note that it depends on the exact configuration what Transfer syntax are available on the synedra AIM.

Implicit VR Little Endian is always possible to select independent of the configuration.

2.3.5. Image Availability Notification AE Specification

See Figure 2.1 Page 3 for the application flow diagram for Image Availability Notification.

2.3.5.1. SOP Classes

synedra AIM provide Standard Conformance to the following DICOM 3.0 SOP Classes:

SOP Class Name	SOP Class UID	SCU	SCP
Verification SOP Class	1.2.840.10008.1.1	No	Yes
Instance Availability Notification	1.2.840.10008.5.1.4.33	Yes	Yes

Table 2.30. Accepted Presentation Contexts - Image Availability Notification

2.3.5.2. Association Establishment Policies

2.3.5.2.1. General

Any instance import to the synedra AIM will trigger a delayed Instance Availability Notification, any Modality can send an IAN to the synedra AIM.

2.3.5.2.2. Number of Associations

The synedra AIM is able to accept more than one association at a time. The default configuration for the DicomServer is 20 connections at a time, but this value can be changed and the limitation is set only by the machine.

The synedra AIM initiates one association for one N-CREATE request.

2.3.5.2.3. Asynchronous Nature

The synedra AIM does not support asynchronous communication. Any request will synchronous return after returning the required results.

2.3.5.3. Association Initiating Policy

If there is data available that should be sent to the IAN destination, the synedra AIM open exactly one association for each N-CREATE request.

2.3.5.3.1. Real World Activity - Send IAN

The associated real world operation is a N-CREATE operation. This operation will be initiated by the DicomServer that needs to inform a IAN destination about some new available instances in the synedra AIM. A 'send IAN' will lead to the following steps in the synedra AIM.

- Querying the DB for the data, the following steps are only executed if data is available
- Initiating an association to the IAN destination with the required abstract and transfer syntaxes
- Send the N-CREATE request
- Close the Association

2.3.5.3.2. Proposed Presentation Contexts - Send IAN

The following Presentation contexts will be proposed by the synedra AIM.

Abstract Syntax		Transfer Syntax		Role	Ext. Neg.
Name	UID	Name	UID		
Instance Availability Notification	1.2.840.10008.5.1.4.33	Any Transfer Syntax from Table 2.8 Page 13 may be accepted.		SCU	None

Table 2.31. Proposed Presentation Contexts - Instance Availability Notification

SOP Specific Conformance Statement - Image Availability Notification

The synedra AIM provides standard conformance to the DICOM Instance Availability Notification SOP Class as an SCU.

The N-CREATE request will contain the information listed in Table 2.32 Page 25

Attribute Name	Tag
Study Instance UID	(0020,000D)
Referenced Series Sequence	(0008,1115)
> Referenced SOP Sequence	(0008,1140)
>> SOPClassUID	(0008,0016)
>> SOPInstanceUID	(0008,0018)
>> InstanceAvailability	(0008,0056) ^a
>> RetrieveAETitle	(0008,0054)
>> StorageMediaFileSetID	(0088,0130) ^b
>> StorageMediaFileSetUID	(0088,0140) ^c
> Referenced Performed Procedure Step Sequence	(0008,1111)
>> Referenced SOP Class UID	(0008,1150)
>> Referenced SOP Instance UID	(0008,1155)

^aFixed value: ONLINE

^bFixed value: synedra AIM

^cFixed value: 1.3.6.1.4.1.24930.7

Table 2.32. Instance Availability Notification - Send IAN attributes

2.3.5.4. Association Acceptance Policy

The synedra AIM tries to accept associations for

- DIMSE C-ECHO
- DIMSE N-CREATE

service operations.

2.3.5.4.1. Real World Activity - Receive IAN

The associated real world operation is a N-CREATE operation. This operation can be initiated by any modality that tries to open a DICOM association to the listen port of the DicomServer. A 'receive IAN' will lead to the following steps in the synedra AIM

- Initiating of an association by an arbitrary modality
- Negotiating of the association with the configured Abstract and Transfer Syntaxes
- Receiving of the IAN
- Logging the IAN
- Discarding the IAN
- Returning status 'Success'
- The association will be closed after a close request

2.3.5.4.2. Accepted Presentation Contexts - Receive IAN

The following Presentation contexts will be accepted by the synedra AIM.

Abstract Syntax		Transfer Syntax		Role	Ext. Neg.
Name	UID	Name	UID		
Instance Availability Notification	1.2.840.10008.5.1.4.33	Any Transfer Syntax from Table 2.8 Page 13 may be accepted.		SCP	None

Table 2.33. Accepted Presentation Contexts - Instance Availability Notification

SOP Specific Conformance Statement - Image Availability Notification

The synedra AIM provides standard conformance to the DICOM Instance Availability Notification SOP Class as an SCP.

The synedra AIM does only a logging of the incoming an IAN. The required information for this logging is stated in table 2.33. Any other information will be ignored.

Attribute Name	Tag
Study Instance UID	(0020,000D)
Referenced Series Sequence	(0008,1115)
> Referenced SOP Sequence	(0008,1140)
> > SOPClassUID	(0008,0016)
> > SOPInstanceUID	(0008,0018)

Table 2.34. Instance Availability Notification - Receive IAN attributes

2.3.6. Modality Performed Procedure Step AE Specification

See Figure 2.1 Page 3 for the application flow diagram for Modality Performed Procedure Step.

2.3.6.1. SOP Classes

synedra AIM provide Standard Conformance to the following DICOM 3.0 SOP Classes:

SOP Class Name	SOP Class UID	SCU	SCP
Verification SOP Class	1.2.840.10008.1.1	No	Yes

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

Table 2.35. Accepted Presentation Contexts - Modality Performed Procedure Step

2.3.6.2. Association Establishment Policies

2.3.6.2.1. General

Any modality can initiate a send of a Modality Performed Procedure Step. If the synedra AIM is configured to act as a Performed Procedure Step Manager, the synedra AIM forward these messages to the configured modalities.

2.3.6.2.2. Number of Associations

The synedra AIM is able to accept more than one association at a time. The default configuration for the DicomServer is 20 connections at a time, but this value can be changed and the limitation is set only by the machine.

The synedra AIM initiates one association for one N-CREATE / N-SET request.

2.3.6.2.3. Asynchronous Nature

The synedra AIM does not support direct asynchronous communication. Any request will synchronous return after returning the required results.

If synedra AIM act as an PPSM, the forwarding of the messages to an arbitrary destination will be detached from the receive of the original request.

2.3.6.3. Association Initiating Policy

If there is a MPPS request available that should be forwarded, the synedra AIM open exactly one association for each N-CREATE / N-SET request.

2.3.6.3.1. Real World Activity - Send MPPS

The associated real world operation is a N-CREATE or N-SET operation. This operation will be initiated by the DicomServer that needs to forward a MPPS to a modality. A 'send MPPS' will lead to the following steps in the synedra AIM.

- Initiating an association to the MPPS destination with the required abstract and transfer syntaxes
- Send the N-CREATE / N-SET request
- Close the Association

2.3.6.3.2. Proposed Presentation Contexts - Send MPPS

The following Presentation contexts will be proposed by the synedra AIM.

Abstract Syntax		Transfer Syntax		Role	Ext. Neg.
Name	UID	Name	UID		
Modality Performed Procedure Step SOP Class	1.2.840.10008.3.1.2.3.3	Any Transfer Syntax from Table 2.8 Page 13 may be accepted.		SCU	None

Table 2.36. Proposed Presentation Contexts - Modality Performed Procedure Step

SOP Specific Conformance Statement - Receive MPPS

The synedra AIM provides standard conformance to the DICOM Modality Performed Procedure Step SOP Class as an SCU. The synedra AIM acts as a forwarder for the N-CREATE / N-SET requests. Thus we do not change,

add or remove any content of the messages. Refer to the conformance statement of the modality that sends the original MPPS for the attributes that are send via MPPS.

2.3.6.4. Association Acceptance Policy

The synedra AIM tries to accept associations for

- DIMSE C-ECHO
- DIMSE N-CREATE / N-SET

service operations.

2.3.6.4.1. Real World Activity - Receive MPPS

The associated real world operation is a N-CREATE / N-SET operation. This operation can be initiated by any modality that tries to open a DICOM association to the listen port of the DicomServer. A 'receive MPPS' will lead to the following steps in the synedra AIM

- Initiating of an association by an arbitrary modality
- Negotiating of the association with the configured Abstract and Transfer Syntaxes
- Receiving of the N-CREATE or N-SET
- Storing of the data
- Returning status 'Success'
- The association will be closed after a close request

2.3.6.4.2. Accepted Presentation Contexts - Receive MPPS

The following Presentation contexts will be accepted by the synedra AIM.

Abstract Syntax		Transfer Syntax		Role	Ext. Neg.
Name	UID	Name	UID		
Modality Performed Procedure Step SOP Cl.	1.2.840.10008.3.1.2.3.3	Any Transfer Syntax from Table 2.8 Page 13 may be accepted.		SCP	None

Table 2.37. Accepted Presentation Contexts - Modality Performed Procedure Step

SOP Specific Conformance Statement - Send MPPS

The synedra AIM provides standard conformance to the DICOM Modality Performed Procedure Step SOP Class as an SCP.

The synedra AIM stores any N-CREATE / N-SET as is. The attributes stated in table 2.38 are required for proper referencing the N-CREATE request. The attributes stated in table 2.39 are required for storing the N-SET request. Any other information available in the datasets will be saved but not used.

Attribute Name	Tag
Patients Name	(0010,0010)
Patient ID	(0010,0020)
Patients Birth Date	(0010,0030)
Patients Sex	(0010,0040)
Performed Procedure Step Start Date	(0040,0244)
Performed Procedure Step Start Time	(0040,0245)

Attribute Name	Tag
Performed Procedure Step Status	(0040,0252)
Scheduled Step Attributes Sequence	(0040,0270)
> Study Instance UID	(0020,000D)
> Scheduled Procedure Step ID	(0040,0009)
> Requested Procedure ID	(0040,1001)

Table 2.38. Modality Performed Procedure Step - N-CREATE attributes

Attribute Name	Tag
Performed Procedure Step Status	(0040,0252)

Table 2.39. Modality Performed Procedure Step - N-SET attributes

2.3.7. Print Management AE Specification

See Figure 2.1 Page 3 for the application flow diagram for Print Management.

2.3.7.1. SOP Classes

synedra AIM provide Standard Conformance to the following DICOM 3.0 SOP Classes:

SOP Class Name	SOP Class UID	SCU	SCP
Basic Grayscale Print Management Meta SOP Class	1.2.840.10008.5.1.1.9	Yes	No
Basic Color Print Management Meta SOP Class	1.2.840.10008.5.1.1.18	Yes	No
Presentation LUT SOP Class	1.2.840.10008.5.1.1.23	Yes	No

Table 2.40. Accepted Presentation Contexts - Print Management

2.3.7.2. Association Establishment Policies

2.3.7.2.1. General

Whenever the user invokes the print functionality in synedra AIM, a separate association to the specified DICOM printer will be established.

2.3.7.2.2. Number of Associations

The number of associations established is equal to the number of print jobs still running. There is no preset limit.

The synedra AIM initiates one association per print request.

2.3.7.2.3. Asynchronous Nature

synedra AIM does not support asynchronous communication (multiple outstanding transactions over a single Association), however synedra AIM will establish the association synchronously but perform the actual printing asynchronously in the background so as to not block the application for the user.

2.3.7.3. Association Initiating Policy

When the user invokes the print functionality in synedra AIM, an association to the specified DICOM printer will be established.

2.3.7.3.1. Real World Activity - Printing

The Flow Chart in Figure 2.2 shows the possible flow of control when printing.

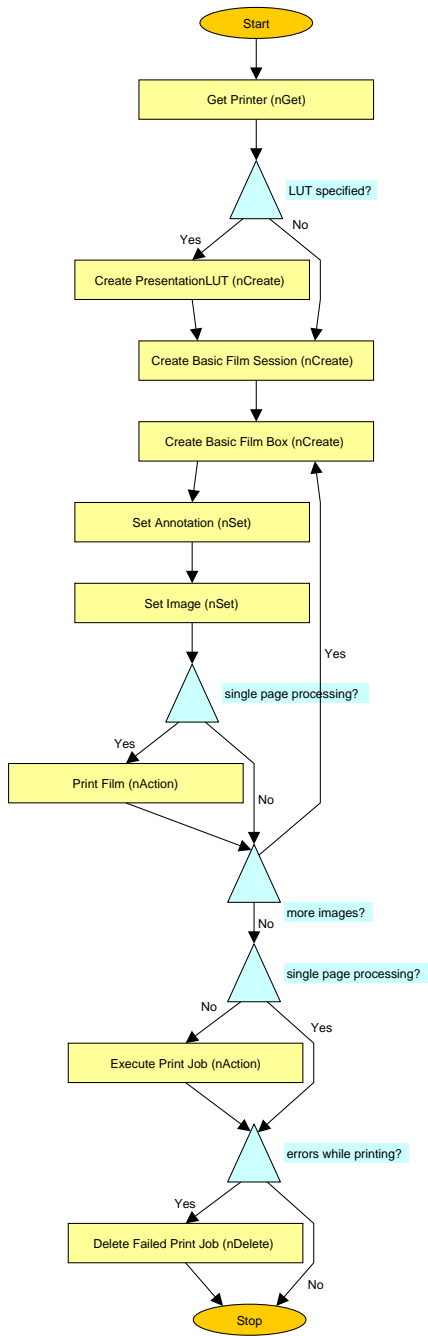


Figure 2.2. Print Flow Diagram

If using Print SCPs which do not support N-EXECUTE for Basic Film Sessions it is required that single page processing is turned on in the configuration. This will print the each film box separately.

2.3.7.3.2. Proposed Presentation Contexts - Printing

The following Presentation contexts will be proposed by the synedra AIM.

Abstract Syntax		Transfer Syntax		Role	Ext. Neg.
Name	UID	Name	UID		
Basic Grayscale Print Management Meta SOP Class	1.2.840.10008.5.1.1.9	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None

Abstract Syntax		Transfer Syntax		Role	Ext. Neg.
Name	UID	Name	UID		
Presentation LUT SOP Class	1.2.840.10008.5.1.1.23	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None

Table 2.41. Proposed Presentation Contexts - Printing

2.3.7.3.3. Common SOP Specific Conformance for all Print SOP Classes

The general behavior of Print Management AE during communication failure is to abort the current print job and display an error message to the user.

The general behavior of Print Management AE if receiving a non-success response is to abort the current print job and display an error message to the user.

The general behavior of Print Management AE is to fill all the required tags as specified by the DICOM V3.0 Standard, 2008. Optional tags will not be filled, except when explicitly specified below.

2.3.7.3.4. SOP Specific Conformance for the Printer SOP Class

Print Management AE supports the following DIMSE operations and notifications for the Printer SOP Class:

- N-GET. The status code reported in the N-GET response is required to indicate success (0000). Otherwise printing will be aborted. The Printer Status (2110,0010) and Printer Status Info (2110,0020) attributes in the response are ignored.
- N-EVENT-REPORT. N-EVENT-REPORT requests can be received at any time during an association. They will always be responded to successfully, but are otherwise ignored.

2.3.7.3.5. SOP Specific Conformance for the Basic Film Session SOP Class

Print Management AE supports the following DIMSE operations and notifications for the Basic Film Session SOP Class:

- N-CREATE. The N-CREATE request will contain the Number of Copies (2000,0010) and the Print Priority (2000,0020) attributes.
- N-ACTION. The N-ACTION request will be used to print the complete film session, if single page processing is not used. It will contain the Action Type Print and no optional attributes.
- N-DELETE. The N-DELETE request will be used to delete a film session in case any error occurs while printing.

2.3.7.3.6. SOP Specific Conformance for the Basic Film Box SOP Class

Print Management AE supports the following DIMSE operations and notifications for the Basic Film Box SOP Class:

- N-CREATE. The N-CREATE request will always contain the Film Orientation (2010,0040) and the Film Size ID (2010,0050) attributes. It will contain the Referenced Presentation LUT Sequence (2050,0500) attribute, if a LUT was selected by the user.
- N-ACTION. The N-ACTION request will be used to print a single sheet, if single page processing is used. It will contain the Action Type Print and no optional attributes.

2.3.7.3.7. SOP Specific Conformance for the Basic Grayscale Image Box SOP Class

Print Management AE supports the following DIMSE operations and notifications for the Basic Grayscale Image Box SOP Class:

- N-SET. The N-SET request will contain the Requested Image Size (2020,0030) attribute, if the original size print option was chosen by the user.

2.3.7.3.8. SOP Specific Conformance for the Basic Color Image Box SOP Class

Print Management AE supports the following DIMSE operations and notifications for the Basic Color Image Box SOP Class:

- N-SET. The N-SET request will contain the Requested Image Size (2020,0030) attribute, if the original size print option was chosen by the user.

2.3.7.3.9. SOP Specific Conformance for the Presentation LUT SOP Class

Print Management AE supports the following DIMSE operations and notifications for the Presentation LUT SOP Class:

- N-CREATE. The N-CREATE request will always contain the Presentation LUT Sequence (2050,0010) attribute.

3. Communication Profiles

3.1. Supported Communication Stacks

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

3.1.1. OSI Stack

Not supported.

3.1.2. TCP/IP Stack

The synedra AIM uses the TCP/IP stack of the operating system upon which is executed.

3.1.2.1. Physical Media Support

The synedra AIM is independent of the physical medium over which TCP/IP is executed.

3.1.3. Point-to-Point Stack

Not supported.

4. Extensions/Privatizations/Specializations

4.1. Standard Extended/Specialized/Private SOPs

Not applicable.

4.2. Private Transfer Syntaxes

Not applicable.

5. Configuration

The configuration of the synedra AIM DICOM services are stored on servers. Only support personal (with password) can change the configuration.

5.1. AE Title Address Mapping

The AE title of the synedra AIM DICOM services is configurable. The default for the DocumentSenderServer is SYNEDRA_AIM. The default port for the communication with the DicomServer is 11317 but can also be changed via configuration.

All remote systems that to communicate with the synedra AIM have to be configured. For external sytems that act as pure SCU systems the following information is needed:

- The AE title
- The host name

For systems that can also act as SCPs the following information is additionally needed:

- Destination host
- Destination port

5.2. Configurable Parameters

The synedra AIM does not offer any change of the DICOM communication parameters.

6. Support of Extended Character Sets

The synedra AIM DICOM application supports the ISO 8859 Latin 1 (ISO_IR 100) character set.