DICOM Conformance Statement

syngo MI Applications VB23

Supported Products:

Symbia S, T
Symbia Evo, Intevo
Symbia.net

SIEMENS Healthineers

1 Conformance Statement Overview

Table 1: Network Services

SOP Classes	SOP Class UID	User of Service (SCU)		Provider of Service (SCP)	
Verification					
Verification	1.2.840.10008.1.1	Yes		Yes	
Transfer (Image SOP Class)					
		Create	**Send**	**Store**	**Display**
CR Image Storage	1.2.840.10008.5.1.4.1.1.1	No	Yes	Yes	Yes
CT Image Storage	1.2.840.10008.5.1.4.1.1.2	Yes	Yes	Yes	Yes
Enhance CT Image Storage	1.2.840.10008.5.1.4.1.1.2.1	No	Yes	Yes	Yes
DX Image Storage for Presentation	1.2.840.10008.5.1.4.1.1.1.1	No	Yes	Yes	Yes
DX Image Storage for Processing	1.2.840.10008.5.1.4.1.1.1.1.1	No	Yes	Yes	Yes
Digital MG Image Storage for Presentation	1.2.840.10008.5.1.4.1.1.1.2	No	Yes	Yes	Yes
Digital MG Image Storage for Processing	1.2.840.10008.5.1.4.1.1.1.2.1	No	Yes	Yes	Yes
Digital Intra-oral X-Ray Image Storage for Presentation	1.2.840.10008.5.1.4.1.1.1.3	No	Yes	Yes	Yes
Digital Intra-oral X-Ray Image Storage for Processing	1.2.840.10008.5.1.4.1.1.1.3.1	No	Yes	Yes	Yes
MR Image Storage	1.2.840.10008.5.1.4.1.1.4	No	Yes	Yes	Yes
Enhanced MR Image Storage	1.2.840.10008.5.1.4.1.1.4.1	No	Yes	Yes	Yes
Enhanced MR Colored Image Storage	1.2.840.10008.5.1.4.1.1.4.3	No	Yes	Yes	Yes
X-Ray 3D Angiographic Image Storage	1.2.840.10008.5.1.4.1.1.12.1	No	Yes	Yes	Yes
Breast Tomosynthesis Image Storage	1.2.840.10008.5.1.4.1.1.13.1.3	No	Yes	Yes	Yes
NM Image Storage	1.2.840.10008.5.1.4.1.1.20	Yes	Yes	Yes	Yes
PET Image Storage	1.2.840.10008.5.1.4.1.1.128	Yes	Yes	Yes	Yes
RT Dose Storage	1.2.840.10008.5.1.4.1.1.481.2	No	Yes	Yes	Yes
RT Image Storage	1.2.840.10008.5.1.4.1.1.481.1	No	Yes	Yes	Yes
SC Image Storage	1.2.840.10008.5.1.4.1.1.7	Yes	Yes	Yes	Yes
Multiframe Single Bit SC Image Storage	1.2.840.10008.5.1.4.1.1.7.1	No	Yes	Yes	Yes

Multiframe Grayscale Byte SC Image Storage	1.2.840.10008.5.1.4.1.1.7.2	No	Yes	Yes	Yes
Multiframe Grayscale Word SC Image Storage	1.2.840.10008.5.1.4.1.1.7.3	No	Yes	Yes	Yes
Multiframe True Color SC Image Storage	1.2.840.10008.5.1.4.1.1.7.4	Yes	Yes	Yes	Yes
US Image (retired)	1.2.840.10008.5.1.4.1.1.6	No	Yes	Yes	Yes
US Multiframe Image (retired)	1.2.840.10008.5.1.4.1.1.3	No	Yes	Yes	Yes
US Multiframe Image Storage	1.2.840.10008.5.1.4.1.1.3.1	No	Yes	Yes	Yes
US Image Storage	1.2.840.10008.5.1.4.1.1.6.1	No	Yes	Yes	Yes
X-Ray RadioFluoroscopic Image Storage	1.2.840.10008.5.1.4.1.1.12.2	No	Yes	Yes	Yes
X-Ray Angiographic Image Storage	1.2.840.10008.5.1.4.1.1.12.1	No	Yes	Yes	Yes
Segmentation Storage	1.2.840.10008.5.1.4.1.1.66.4	No	Yes	Yes	Yes
Transfer (Non-image SOP Class)					
MR Spectroscopy Storage	1.2.840.10008.5.1.4.1.1.4.2	No	Yes	Yes	Yes
Grayscale Softcopy Presentation State Storage	1.2.840.10008.5.1.4.1.1.11.1	No	Yes	Yes	Yes
RT Structure Set Storage	1.2.840.10008.5.1.4.1.1.481.3	No	Yes	Yes	Yes
RT Plan Storage	1.2.840.10008.5.1.4.1.1.481.5	No	Yes	Yes	Yes
RT Ion Plan Storage	1.2.840.10008.5.1.4.1.1.481.8	No	Yes	Yes	Yes
RT Ion Beams Treatment Record Storage	1.2.840.10008.5.1.4.1.1.481.9	No	Yes	Yes	Yes
RT Brachy Treatment Record Storage	1.2.840.10008.5.1.4.1.1.481.6	No	Yes	Yes	Yes
RT Treatment Summary Record Storage	1.2.840.10008.5.1.4.1.1.481.7	No	Yes	Yes	Yes
12-lead ECG Waveform Storage	1.2.840.10008.5.1.4.1.1.9.1.1	No	Yes	Yes	Yes
Ambulatory ECG Waveform Storage	1.2.840.10008.5.1.4.1.1.9.1.3	No	Yes	Yes	Yes
Basic Voice Audio Waveform Storage	1.2.840.10008.5.1.4.1.1.9.4.1	No	Yes	Yes	Yes
Cardiac Electrophysiology Waveform Storage	1.2.840.10008.5.1.4.1.1.9.3.1	No	Yes	Yes	Yes
General ECG Waveform Storage	1.2.840.10008.5.1.4.1.1.9.1.2	No	Yes	Yes	Yes
Hemodynamic Waveform Storage	1.2.840.10008.5.1.4.1.1.9.2.1	No	Yes	Yes	Yes
RAW Data Storage	1.2.840.10008.5.1.4.1.1.66	No	Yes	Yes	Yes

Spatial Registration Storage	1.2.840.10008.5.1.4.1.1.66.1	No	Yes	Yes	Yes
Spatial Fiducials Storage	1.2.840.10008.5.1.4.1.1.66.2	No	Yes	Yes	Yes
Surface Segmentation Storage	1.2.840.10008.5.1.4.1.1.66.5	No	Yes	Yes	Yes
Basic Text SR	1.2.840.10008.5.1.4.1.1.88.11	No	Yes	Yes	Yes
Enhanced SR	1.2.840.10008.5.1.4.1.1.88.22	No	Yes	Yes	Yes
Comprehensive SR	1.2.840.10008.5.1.4.1.1.88.33	No	Yes	Yes	Yes
Procedure Log	1.2.840.10008.5.1.4.1.1.88.40	No	Yes	Yes	Yes
Mammography CAD SR	1.2.840.10008.5.1.4.1.1.88.50	No	Yes	Yes	Yes
Key Object Selection Document	1.2.840.10008.5.1.4.1.1.88.59	No	Yes	Yes	Yes
Chest CAD SR	1.2.840.10008.5.1.4.1.1.88.65	No	Yes	Yes	Yes
X-Ray Radiation Dose SR	1.2.840.10008.5.1.4.1.1.88.67	No	Yes	Yes	Yes
Radiopharmaceutical Radiation Dose SR	1.2.840.10008.5.1.4.1.1.88.68	Yes	Yes	Yes	Yes
Encapsulated PDF	1.2.840.10008.5.1.4.1.1.104.1	No	Yes	Yes	Yes
Transfer (Private SOP Class)					
syngo Non-Image Storage	1.3.12.2.1107.5.9.1	Yes	Yes		
Storage Commitment					
Storage Commitment Push Model SOP Class	1.2.840.10008.1.20.1	Yes	No		
Worklist Management					
Modality Worklist Information Model - FIND	1.2.840.10008.5.1.4.31	Yes	No		
Modality Performed Procedure Step SOP Class	1.2.840.10008.3.1.2.3.3	Yes	No		
Query/Retrieve					
Patient Root Q/R Information Model - FIND	1.2.840.10008.5.1.4.1.2.1.1	Yes	Yes		
Patient Root Q/R - Information Model - MOVE	1.2.840.10008.5.1.4.1.2.1.2	Yes	Yes		
Patient Root Q/R - Information Model - GET	1.2.840.10008.5.1.4.1.2.1.3	Yes (See Note 1)	Yes		
Study Root Q/R - Information Model - FIND	1.2.840.10008.5.1.4.1.2.2.1	Yes	Yes		
Study Root Q/R - Information Model - MOVE	1.2.840.10008.5.1.4.1.2.2.2	Yes	Yes		

Study Root Q/R - Information Model - GET	1.2.840.10008.5.1.4.1.2.2.3	Yes (See Note 1)	Yes
Patient/Study Only Q/R - Information Model FIND	1.2.840.10008.5.1.4.1.2.2.1	Yes	Yes
Patient/Study Only Q/R - Information Model MOVE	1.2.840.10008.5.1.4.1.2.3.2	Yes	Yes
Patient/Study Only Q/R - Information Model GET	1.2.840.10008.5.1.4.1.2.3.3	Yes (See Note 1)	Yes
Print Management			
Basic Grayscale Print Management Meta SOP Class	1.2.840.10008.5.1.1.9	Yes	No
Print Job	1.2.840.10008.5.1.1.14	Yes	No
Presentation LUT	1.2.840.10008.5.1.1.23	Yes (for Grayscale)	No

Note 1: The DICOM C GET Service is supported in addition by *syngo* Study Transfer application.

Note 2: The *syngo* MI Apps does not support any of the compression transfer syntaxes for NM or PT.

Note 3: The syngo MI Apps generally uses SNOMED RT (SRT) codes even though the current version of the DICOM standard uses SNOMED CT (SCT) codes as coding scheme designator.

Note 4: The *syngo* MI Apps stores Patient State in the Acquisition Context Module using 20040112 version of Context ID3101, so the cardiac stress code is stored with Coding Scheme (0008,0102) as "DCM" and Code Value (0008,0100) as "109091".

Note 5: The *syngo* MI Apps stores "Encore2" in Manufacturer's Model Name (0008,1090) for all NM images acquired from Symbia products.

Table 2: Media Services

Media Storage Application Profile	Write Files (FSC or FSU)	Read Files (FSR)
Compact Disk - Recordable		
General Purpose on CD-R and DVD	Yes (see Note 1)	Yes
Basic Cardiac X-Ray on CD-R	Yes (see Note 2)	Yes
1024 X-Ray on CD-R	Yes	Yes
DVD		
1024 X-Ray on DVD	Yes	Yes
General Purpose DVD with JPEG	Yes	Yes
BD		
General Purpose on BD	Yes	Yes
General Purpose BD with JPEG	Yes	Yes
USB (Note 3)		
General Purpose on USB	Yes	Yes
General Purpose USB with JPEG	Yes	Yes

Note 1: with uncompressed setting.

Note 2: with "resize" (512x512) active and only cine multi-frames included.

Note 3: Browser support for the USB needs to be configured in the *syngo* local service page else USB will act as offline device.

Table 3: Implementation Identifying Information

Name	Value
Application Context Name	1.2.840.100008.3.1.1.1
Implementation Class UID	1.3.12.2.1107.5.1.4
Implementation Version Name	SIEMENS_S5VC51A

2 Table of Contents

3 Introduction

This document is applicable to *syngo* MI Apps VB23.

3.1 Audience

This document is intended for hospital staff, health system integrators, software designers or implementers. It is assumed that the reader has a working understanding of DICOM.

3.2 Remarks

The scope of this DICOM Conformance Statement is to facilitate integration between *syngo* and other DICOM products. The Conformance Statement should be read and understood in conjunction with the DICOM Standard [1]. DICOM by itself does not guarantee interoperability.

The Conformance Statement does, however, facilitate a first-level comparison for interoperability between different applications supporting compatible DICOM functionality.

This Conformance Statement is not supposed to replace validation with other DICOM equipment to ensure proper exchange of intended information. In fact, the user should be aware of the following important issues:

- The comparison of conformance statements is the first step towards assessing interconnectivity and interoperability between *syngo* and other DICOM conformant equipment.
- Test procedures should be defined and executed to validate the required level of interoperability with specific compatible DICOM equipment, as established by the healthcare facility.

syngo has participated in an industry-wide testing program sponsored by Integrating the Healthcare Enterprise (IHE) [2] The IHE Integration Statement for *syngo*, together with the IHE Technical Framework, may facilitate the process of validation testing.

Siemens Healthineers reserves the right to modify the design and specifications contained herein without prior notice. Please contact your local Siemens Healthineers representative for the most recent product information.

3.3 Definitions, Terms and Abbreviations

Definitions, terms, and abbreviations used in this document are defined within the different parts of the DICOM standard.

Additional Abbreviations and terms are as follows:

AE	DICOM Application Entity
AET	Application Entity Title
ASCII	American Standard Code for Information Interchange
BD/BD-R	Blu Ray Disk/Blu Ray Disk Recordable
CD/CD-R	Compact Disk/Compact Disk Recordable
CSE	Customer Service Engineer
DB	Database
DCS	DICOM Conformance Statement
DVD	Digital Versatile Disk
DICOM	Digital Imaging and Communications in Medicine
FIPS	Federal Information Processing Standard
FSC	File Set Creator
FSR	File Set Reader

FSU	File Set Updater
GSDF	Grayscale Standard Display Function
IHE	Integrating the Healthcare Enterprise
IOD	DICOM Information Object Definition
ISO	International Standard Organization
MPPS	Modality Performed Procedure Step
n. a.	not applicable
NEMA	National Electrical Manufacturers Association
O	Optional Key Attribute
PDU	DICOM Protocol Data Unit
R	Required Key Attribute
SCU	DICOM Service Class User (DICOM client)
SCP	DICOM Service Class Provider (DICOM Server)
SOP	DICOM Service-Object Pair
SPS	Scheduled Procedure Step
SR	Structured Report
SSL	Secure Sockets Layer
TLS	Transport Layer Security
TFT	Thin Film Transistor (Display)
TID	Template ID
U	Unique Key Attribute
UID	Unique Identifier
USB	Universal Serial Bus
UTF-8	Unicode Transformation Format-8
VR	Value Representation

3.4 References

[1] Digital Imaging and Communications in Medicine (DICOM) Standard, available free at http://medical.nema.org/, NEMA PS 3[a]

[2] IHE Radiology Technical Framework, Vol. I-IV, available free at http://www.ihe.net/Technical_Framework

1. [a] The DICOM Standard is under continuous maintenance, the current official version is available at http://dicom.nema.org

4 Networking

4.1 Implementation Model

syngo can query remote nodes, retrieve, and store selected instances from that node. Furthermore, it can also receive DICOM objects from remote nodes and answer to query/retrieve requests from remote nodes.

Using the Modality Worklist service, *syngo* can query a HIS/RIS for scheduled procedures. Performed procedure status and other procedure data can be returned to the HIS/RIS using the Modality Performed Procedure Step (MPPS) Service. Furthermore, printing of color and grayscale images is supported.

4.1.1 Verification

The *syngo* DICOM Service Tool application requests Verification to proof the ability of a re-mote DICOM application to respond to DICOM messages.

The other direction – responding to Verification requests from remote applications – is handled by the Storage SCP application.

4.1.2 Storage

The *syngo* DICOM implementation can initiate associations for Storage of DICOM Composite Information Objects to Remote AEs and to receive and respond to associations for Storage from Remote AEs.

4.1.3 Storage Commitment

The *syngo* DICOM implementation can initiate requests for Storage Commitment Push (for previously sent DICOM Composite Information Objects) to Remote AEs and is able to receive and respond to Storage Commitment requests from Remote AEs.

4.1.4 Query/Retrieve

The *syngo* DICOM application supports the Query/Retrieve services in a SCP role. Via the user interface, *syngo* supports Query/Retrieve as SCU to retrieve IODs to the local database.

4.1.5 Print

The *syngo* DICOM implementation can initiate associations as Print Management SCU for printing of composed film-sheets with one or more DICOM Print AE.

4.1.6 Workflow

syngo will issue automated “broad” worklist queries and interactive “narrow” worklist queries as DICOM Modality Worklist SCU. The status of the procedure started and performed is communicated via MPPS, which is also supported in SCU role only. Radiation Dose information is also sent via MPPS.

4.1.6.1 Application Data Flow Diagram

The division of *syngo* into the separate DICOM Application Entities represents a somewhat arbitrary partitioning of functionality. To this document, they are organized in this manner to detail their independent logical functionality.

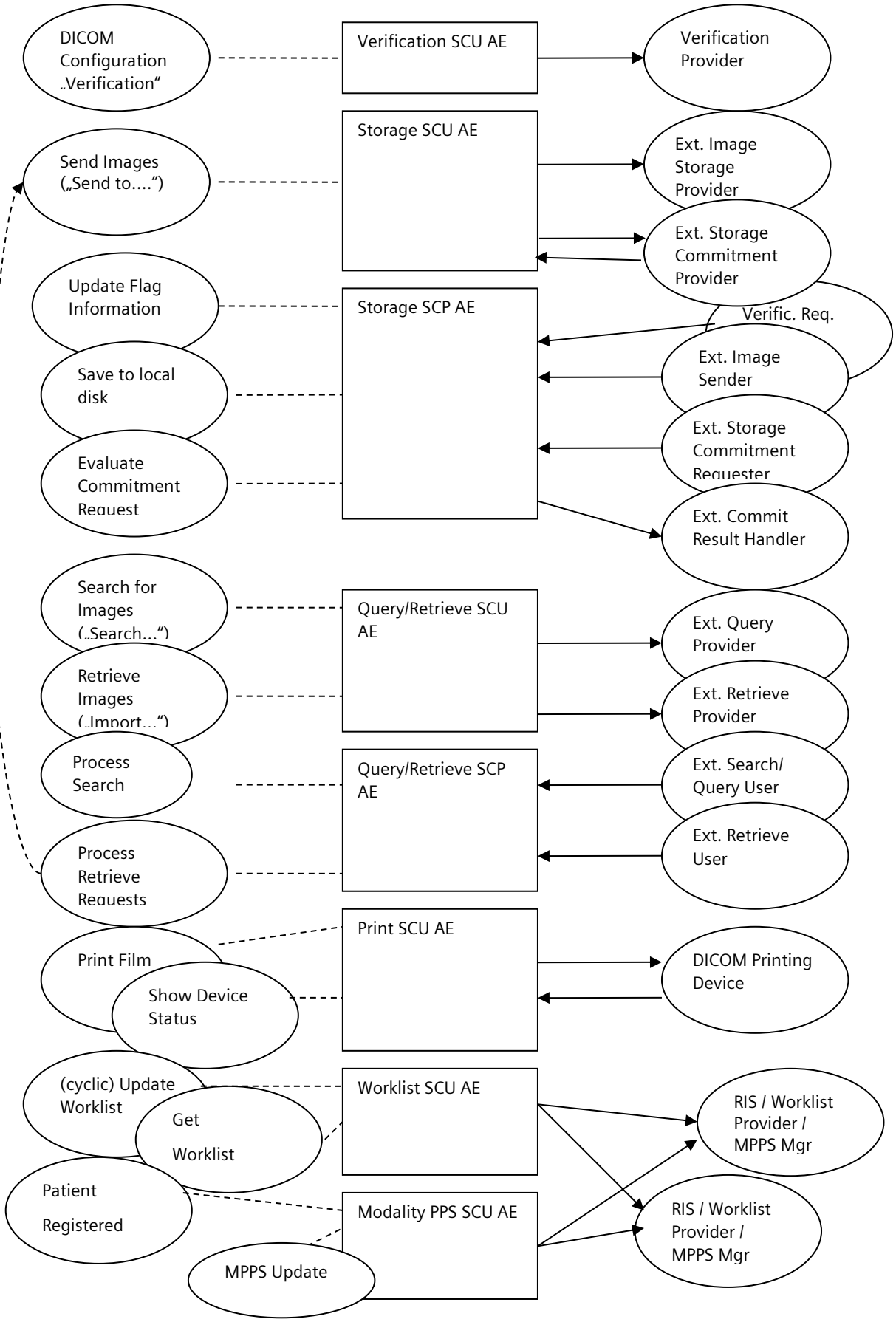


Figure 1: *syngo* DICOM Data Flow Diagram

- The *syngo* DICOM Service Tool application opens an association when a "verification" of a remote application is requested during a configuration session. This can be done when entering new data to configure a remote application or to verify existing configuration data.

- The Storage SCU AE can send Composite SOP Instances and automatically request Storage Commitment for sent SOP Instances, if configured.

The Storage SCU AE also handles incoming commitment status N-EVENT messages.

- The Storage SCP AE can receive incoming DICOM images and add them to the local database. It can respond to external Storage and Verification Requests as a Service Class Provider (SCP) for C-STORE and C-ECHO requests. The Storage SCP AE autonomously handles incoming Storage Commitment requests in SCP role and checks commitment status based on the local database and sends back the related commitment status in N-EVENT-REPORT messages.

The Storage SCP AE supports Composite SOP instances as indicated in “Conformance Statement Overview”.

- The Query part of the Query/Retrieve SCU AE uses C-FIND to search a DICOM Database for Patient Study and Series information.

The Retrieve part of the Query/Retrieve SCU AE uses C-MOVE to initiate a DICOM transfer of composite objects to the local database.

- The Query SCP AE runs autonomously in the background and responds to incoming C-FIND requests based on the matches in the local database and supports retrieve of supported SOP Instances from the local database to a known retrieve destination.

- The Print SCU sends previously compiled, complete (virtual) film-sheets in 1:1 image mode (page mode) to the printer. The printer status is cyclically monitored by sending Status re-quests and/or awaiting asynchronous events.

- The Worklist SCU AE runs autonomously for cyclic “broad” query and issues C-FIND Worklist model requests. It can be manually triggered for most recent data. A “broad” query with user input can be triggered separately.

- The MPPS AE uses N-CREATE when registering an Acquisition patient and updates via N-SET with each run. The user can close MPPS interactively (triggers “final N-SET”).

4.1.7 Functional Definitions of Application Entities

The DICOM Service Tool application opens an association to an application on the remote node and sends a Verification message to verify that the remote application can respond to DICOM messages.

4.1.7.1 Functional Definition of Verification-SCU AE

The *syngo* DICOM Service Tool application opens an association when a "verification" of a remote application is requested during a configuration session. This can be done when entering new data for remote application configuration or to verify existing configuration data.

4.1.7.2 Sequencing of Real-World Activities

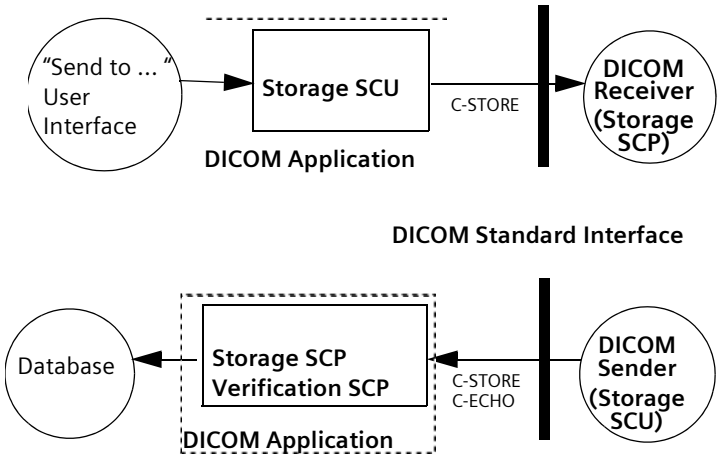
Newly entered data must be saved first, before a “verification” of these data is possible.

4.1.8 Storage

The *syngo* DICOM Application Entity both originates associations for Storage of DICOM Composite Information Objects in Remote Application Entities and accepts association requests for Storage from Remote Application Entities.

4.1.8.1 Application Data Flow Diagram

The *syngo* DICOM network implementation acts as SCU and SCP for the CSTORE DICOM network service and as SCP for the C-ECHO DICOM network service.
The product target operating system is Windows 10



4.1.8.2 Functional Definitions of Application Entities

The *syngo* Storage SCU is invoked by the job control interface that is responsible for processing network archival tasks. The job consists of data describing the composite image objects selected for storage and the destination. An association is negotiated with the destination application entity and the image data is transferred using the C-STORE DIMSE-Service. Status of the transfer is reported to the job control interface.

The Storage SCP component of the *syngo* DICOM application is operating as background server process. The process starts when the machine is powered on and waits for Storage association requests. Upon accepting an association with a negotiated Presentation Context, it starts to receive the Composite Image Objects and imports them to local database.

4.1.8.3 Sequencing of Real-World Activities

Prior to sending of SOP Instances the *syngo* Storage application can invoke processing and resizing features to prepare image pixel contents into convenient formats for certain multi-vendor environments.

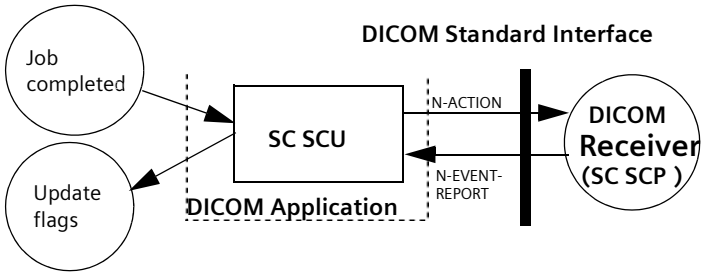
4.1.9 Storage Commitment

The Storage Commitment service class defines an application-level class of service which facilitates the commitment to storage. It performs an additional task of commitment of composite objects apart from the network-based storage of images as defined by the Storage Service class. The *syngo* DICOM implementation supports the Storage Commitment Push Model as SCU.

4.1.9.1 Application Data Flow Diagram

The Biograph Horizon DICOM network implementation acts as SCU for the Storage Commitment Push Model Service using the Storage Commitment Service Class.

The product target operating system is Windows 10.



4.1.9.2 Functional Definitions of Application Entities

With each successfully completed send job, the *syngo* DICOM Application will populate the Storage Commitment Push Model Action Information from the SOP Instances sent. Then a Storage Commit Request is triggered, if configured. Depending on configuration, the *syngo* DICOM application will keep the association open for responses with a configurable time-out or closes the association and expects responses on a different association that must be established by the remote Storage Commitment SCP.

The commitment status derived from the related trigger response will be indicated in the related Status Flags of the related entity. It is possible to create triggers ("auto rules") from this event.

The Transaction UIDs of the pending commitment request are kept "open" (Job-status is "waiting") for a configurable time (default: 1h). If the "open time" for a pending commitment request has elapsed w/o a related response from the provider, the Transaction UID is removed, and the related entities are indicated as "commit failed".

Open Transaction UIDs of pending commitment requests are discarded after a reboot of the system. The related entities are indicated as "commit failed".

The Verification SCP is included in the Storage SCP.

The Storage Commitment SCP is running in background and is ready to receive requests when the system is started. Storage Commitment will be checked and returned against the SOP Classes received and kept in the local Storage of *syngo*. The response will either be sent "on same" (association not closed by requester) or "on separate" association (requester closed association consecutive to positive request status).

4.1.9.3 Sequencing of Real-World Activities

The Storage Commitment trigger is automatically derived from the successful completion of a Send Job.

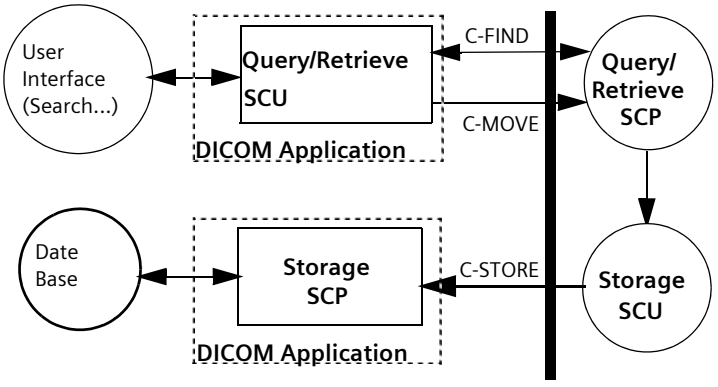
4.1.10 Query/Retrieve

The query/retrieve service class defines an application-level class of services which facilitates the management of images and patient data against the well-defined information model of DICOM and allows a DICOM AE to retrieve images from a remote DICOM node or to request a remote DICOM AE to initiate a transfer of images to another DICOM AE. The DICOM query/retrieve application supports the query/retrieve services to act as SCU and SCP.

4.1.10.1 Application Data Flow Diagram

The *syngo* DICOM network implementation acts as SCU and SCP for the query/ retrieve network service.

The product target operating system is Windows 10.



4.1.10.2 Functional Definitions of Application Entities

The *syngo* DICOM Query/Retrieve SCU requests the remote Query/Retrieve SCP to perform a search and match to the keys specified in the request to display the results in the system's user interface. Depending on user action

(Import) the *syngo* Query/Retrieve DICOM SCU sends a C-MOVE DIMSE service to initiate a C-STORE sub-operation on the SCP to start an im-age transfer from remote Storage SCU (running on Query/Retrieve SCP) to the system's Storage SCP.

The *syngo* DICOM Query/Retrieve SCP responds to C-FIND DIMSE services from remote SCU applications. Depending on further remote request, a C-GET or a C-MOVE involves the system's DICOM Query/Retrieve SCP application to initiate a C-STORE association to send image objects to a remote Storage SCP.

All components of the DICOM Query/Retrieve SCP application are operating as background server processes. The processes start when the machine is powered on and then respond to queries based on the records stored in its database.

4.1.10.3 Sequencing of Real-World Activities

Retrieve of images is only possible if a result from a previous "Search..." operation exists, and those entities can be selected for "Import".

The Query application will not "per se" request information on IMAGE level. The user can select a series and request image level information with the "Image List" function.

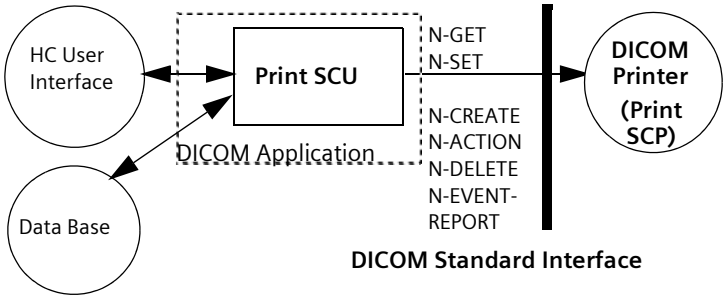
4.1.11 Print

The Print Management Service Classes define an application-level class of services which facilitate the printing of images on a hardcopy medium. The print management SCU and print management SCP are peer DICOM print management application entities. The DICOM print application supports the print management DIMSE services to act as SCU.

4.1.11.1 Application Data Flow Diagram

The *syngo* DICOM network implementation acts as SCU for the print management network service.

The product target operating system is Windows 10.



4.1.11.2 Functional Definitions of Application Entities

The Print SCU is invoked by the user interface to setup film-sheet layout and whenever an image is ready to be printed on film. The Print SCU will hold and maintain all data needed to compile a complete film-sheet from the data (images, layout, configuration) received. Whenever a film-sheet is ready to print, the related data is used to supply the Information to the SOP Classes of the Print Management Service Class. A queue is maintained, to intermediately store several film-sheets in case of resource problems on printer. The SCU will only supply and require the mandatory SOP Classes of the Print Management Service Class.

4.1.11.3 Sequencing of Real-World Activities

N/A

4.1.12 Worklist

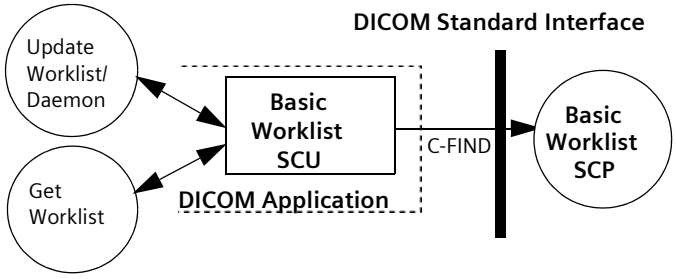
The Basic Worklist Service Class defines an application-level class of service which facilitates the transfer of worklists from the information system to the imaging modality. The worklist is queried by the AE and supplies the

SCU with the scheduled tasks, which must be performed on the modality. The DICOM worklist application supports the worklist service as SCU.

4.1.12.1 Application Data Flow Diagram

The *syngo* DICOM network implementation acts as SCU for the Basic Worklist Service using the Modality Worklist SOP Class.

The product target operating system is Windows 10.



Note*:* It is configurable to get the worklist updates either automatically (in a configurable time interval) or manually (initiated by the user). There are two kinds of query the user can do: broad worklist query (all jobs for the own modality or own application entity) and patient-based worklist query (where more search keys can be given, including Patient Name and Patient ID).

4.1.12.2 Functional Definitions of Application Entities

The worklist SCU (“broad query”) is invoked from the patient browser user interface or by timer to request the worklist from a remote Information System (Modality Worklist Class SCP). The worklist SCP responses to the C-FIND query and scheduled imaging service requests (scheduled procedure steps) and patient demographic information will be “pulled” from the information system to the *syngo* modality. All information retrieved will be held in the scheduling database for usage during Patient Registration procedure.

Furthermore, the patient-based Query dialog from the patient browser allows to enter specific matching criteria ("narrow query") for the worklist query. With the response data the Patient Registration dialog can be populated according to availability within the worklist response identifier.

4.1.12.3 Sequencing of Real-World Activities

The “narrow” (interactive) Worklist Query requires that sufficient matching keys or a unique matching key are/is entered before the query is issued. Only then a single response can be expected to complete the registration dialog.

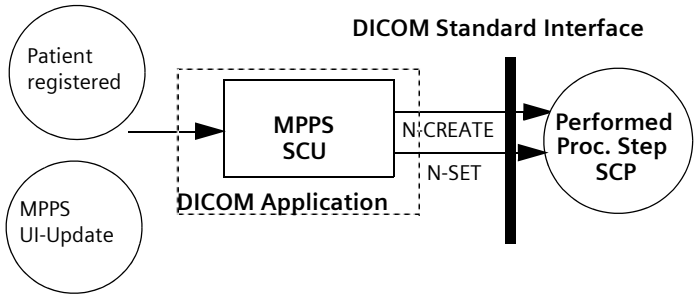
An MPPS N-CREATE message is sent when a patient is registered. For procedure steps registered as "emergency" cases the MPPS N-CREATE is withheld until it is set to complete.

4.1.13 Modality Performed Procedure Step

The Modality Performed Procedure Step service class defines an application-level class of service which facilitates the transfer of billing and radiation dose information from the imaging modality to the information system. The performed procedure step is created and set by the AE and supplies the SCP with the information about a real-world procedure which is performed on the modality. The DICOM Modality Performed Procedure Step application supports the MPPS service as SCU.

4.1.13.1 Application Data Flow Diagram

The *syngo* DICOM network implementation acts as SCU for the performed procedure step network service. The target operating system is Windows 10.



4.1.13.2 Functional Definitions of Application Entities

With registering a Patient (i.e., a Scheduled Procedure Step from Worklist), the *syngo* DICOM application will create an MPPS Instance and communicate it to the MPPS Manager (SCP). It is configurable to set the states of all related MPPS to "Completed" when a patient is closed. Furthermore, a manual update can be performed with the MPPS user interface. From the user interface it is possible to set the state of the MPPS to “Completed” or “Discontinued”. After that the DICOM application will no longer allow updates on the related MPPS Instance.

syngo will not only allow a "1:1 -relationship" of Scheduled Procedure Steps and Performed Procedure Steps, but also supports the "simple group-case" (grouping several SPS of the same Requested Procedure), "complex group-case" (grouping several SPS from different Requested Procedures) and "append case" from the respective IHE-scenarios.

syngo will support creation of “unscheduled cases” by allowing MPPS Instances to be communicated for locally registered Patients.

4.1.13.3 Sequencing of Real-World Activities

N/A

4.2 AE Specifications

This section outlines the specifications for each of the Application Entities that are part of *syngo*.

4.2.1 Verification AE Specification

4.2.1.1 SOP Classes

For SOP Classes supported, please refer to “Table 1 - Network Services” section "Verification" of the “Conformance Statement Overview”.

4.2.1.2 Association Policy

4.2.1.2.1 General

The *syngo* DICOM Service Tool application attempts to open an association for verification request whenever the "verification" function is activated during network configuration of a remote DICOM application.

4.2.1.2.2 Number of Associations

The *syngo* DICOM Service Tool application initiates one association at a time to request verification.

4.2.1.2.3 Asynchronous Nature

The *syngo* DICOM software does not support asynchronous communication (multiple outstanding transactions over a single association).

4.2.1.2.4 Implementation Identifying Information

For Implementation Identifying Information please refer to “Table 3 - Implementation Identifying Information” in the “Conformance Statement Overview”.

4.2.1.3 Association Initiation Policy

4.2.1.3.1 Activity – Verification

The Verification SCU C-ECHO request is initiated by Service and Configuration SW whenever "Verification" is requested. If an association to a remote Application Entity is successfully established, Verification with the configured AET is requested via the open association. If the C-ECHO Response from the remote Application contains a status other than "Success" this will be indicated in the service environment and the association is closed.

4.2.1.3.1.1 Proposed Presentation Contexts

The *syngo* DICOM application will propose Presentation Contexts as shown in the following table:

Table 4 Presentation Context for Verification SOP Class

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
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
		Explicit VR Big Endian	1.2.840.10008.1.2.2		

4.2.1.3.1.2 SOP specific Conformance for SOP classes

The Application conforms to the definition of the Verification SCU in accordance with the DICOM Standard.

4.2.1.4 Association Acceptance Policy

The Verification SCP is part of the Storage SCP.

4.2.2 Storage AE Specification

The *syngo* Storage service class user applications and service class provider applications use one AE when initiating/receiving associations to/from remote DICOM nodes.

4.2.2.1 SOP Classes

For SOP Classes supported, please refer to “Table 1 - Network Services”, sections “Transfer” and “Workflow Management”.

4.2.2.2 Association Policy

4.2.2.2.1 General

The DICOM Storage application will be triggered by the transfer job queue or by an external retrieve request. An association request is sent to the destination AE, and, upon successful negotiation of a Presentation Context, the transfer is started. Depending on configuration, processing, or resizing can be applied to the images prior to being sent.
With a Send Job successfully completed, the *syngo* DICOM application will generate the Storage Commitment Action Information which references to all Instances of the processed job. The Commit Request is sent over a single opened association. *syngo* will wait for Status responses of the Storage Commitment Request. If the Provider accepts the Storage Commitment with Success Status, the generated Transaction UID, together with study identification data and a timestamp, is kept. Depending on configuration, the association is closed or kept open for a con-figured time range. If the association is closed immediately, the response is expected on a different association which is the default setting. Multiple Storage Commitment Requests can be pending.
The default PDU size from *syngo* will be 515KB.

4.2.2.2.2 Number of Associations

The *syngo* DICOM application initiates several associations at a time, one for each destination to which a transfer request is being processed in the active job queue list.

The number of simultaneous DICOM associations can be configured via the Service-UI. The dialog can be found in "Configuration / DICOM / General".

4.2.2.2.3 Asynchronous Nature

The *syngo* DICOM software supports asynchronous communication (multiple outstanding trans-actions over a single association).

syngo supports sending/receiving of the DICOM objects in asynchronous mode during network transfers. The asynchronous mode allows the user to specify a window size i.e., Max Operations Invoked and Max Operations Performed for both SCU and SCP. The window size defines, the number of request messages can be sent/received over an association before a response message is required to be received.

Note: As this is optional configuration, the asynchronous communication configuration features can be enabled through the service UI in Configuration / DICOM / General for the local machine, and in DICOM/Network Nodes page for Remote machines.

4.2.2.2.4 Implementation Identifying Information

For Implementation Identifying Information please refer to “Table 3: Implementation Identifying Information” in the “Conformance Statement Overview”.

4.2.2.3 Association Initiation Policy

If a job with network destination gets active in the job list or a retrieve sub-operation is processed, the *syngo* DICOM application attempts to initiate a new association for

- DIMSE C-STORE to send images and with successful status and
- N-ACTION DIMSE for the Storage Commitment Push Model Service Class to request commitment.

4.2.2.3.1 Activity – Send

The associated Real-World activities are:

The C-STORE request is triggered by a job with network destination or the processing of an ex-ternal C-MOVE retrieve request. If the process successfully establishes an association to a re-mote Application Entity, it will transfer each image one after another via the open association. Processing features and resizing of the pixel matrix can be applied

as part of the transfer. If the C-STORE Response from the remote Application contains a status other than "Success" or "Warning", the association is aborted.
With success status for the previous transfer, the *syngo* Storage application sends the commit request (N-ACTION-RQ) message and waits for acceptance of this request (N-ACTION-RSP). After receiving this, the transaction is marked as "waiting".
Depending on a configuration value, the association will then be closed or kept open. In the first case, there is another configurable timeout giving the number of hours (h) and minutes (m) (by default 1h:0m) to wait for the corresponding commit response (N-EVENT-REPORT). In the second case, this time is the (also configurable) time-out for the association being kept open. In both cases, if the commit response (N-EVENT-REPORT) does not arrive within the configured time-out, the transaction will be marked as failed.
If the commit response (N-EVENT-REPORT) received has the status of "complete - failure exists", the transaction is marked as failed, else the transaction is marked as "completed". In both cases, a status message is shown to the user.

4.2.2.3.1.1 Proposed Presentation Contexts

The *syngo* DICOM application will propose Storage SCU Presentation Contexts as shown in the following table. Kindly refer Table 1 in chapter 1 "Conformance Statement Overview".

Table 5: Proposed Presentation Contexts for Storage

Abstract Syntax	Transfer Syntax		Role	Extended Negotiation
Description	Name List	UID List		
Any image SOP Class detailed in "Table 1 - Network Services" section „Transfer (Image SOP Class) ".	JPEG Lossy Extended *1	1.2.840.10008.1.2.4.51	SCU	None
	JPEG Lossless, Process 14 (selection value 1)	1.2.840.10008.1.2.4.70		
	JPEG Lossy Baseline (Process 1) *1	1.2.840.10008.1.2.4.50		
	Explicit VR Little Endian	1.2.840.10008.1.2.1		
	Explicit VR Big Endian	1.2.840.10008.1.2.2		
	Implicit VR Little Endian	1.2.840.10008.1.2		
	RLE *2	1.2.840.10008.1.2.5		
	JPEG LS LOSSLESS *2	1.2.840.10008.1.2.4.80		
Any Non-image SOP Class detailed in "Table 1 - Network Services" section „Transfer (Non-image SOP Class) ".	Explicit VR Little Endian	1.2.840.10008.1.2.1	SCU	None
	Explicit VR Big Endian	1.2.840.10008.1.2.2		
	Implicit VR Little Endian	1.2.840.10008.1.2		
Private SOP Class as detailed in Chapter "Table 1 - Network Services" section „Transfer (Private SOP Class) ".	Explicit VR Little Endian	1.2.840.10008.1.2.1	SCU	None
	Explicit VR Big Endian	1.2.840.10008.1.2.2		
	Implicit VR Little Endian	1.2.840.10008.1.2		
Storage Commitment SOP Class as detailed in "Table 1 - Network Services" section "Workflow Management".	Explicit VR Little Endian	1.2.840.10008.1.2.1	SCU	None
	Explicit VR Big Endian	1.2.840.10008.1.2.2		
	Implicit VR Little Endian	1.2.840.10008.1.2		

*1: The Transfer Syntax used is strongly influenced by the fact of "how was the accepted Transfer Syntax at the time when the Instance was received". e.g., the Instances received with JPEG Lossy Transfer Syntaxes will not be converted and can only be sent out with the same Transfer Syntax.

*2: During transfer of 'X-Ray 3D Angiographic Image Storage' which has IMAGE Type tag (0008, 0008) value contains '4D_DSA' and transfer of syntax of the sending images are RLE or JPEG LS LOSSLESS, then the sending images are send as it is without modification in the PIXEL data.

Note:

1. The proposed Transfer Syntax is highly restricted for images stored internally in lossy com-pressed format. E.g., instances received with JPEG Loss Transfer Syntaxes will not be converted and can only be sent out with the same Transfer Syntax.

2. The compression is only supported for images with pixel representation (0028, 0103) equal to 0 (=unsigned)

The "MOVE destinations" must be configured as Storage destinations. This would include the configuration of Transfer Syntax capabilities.

Not all the listed transfer syntaxes will be proposed all the time. For some abstract syntaxes only a list of uncompressed (UC) transfer syntaxes (one or more) will be proposed, for other abstract syntaxes also JPEG Lossless (LL) syntax will be proposed and/or a list of JPEG Lossy (LY) transfer syntaxes. The contents of this lists are configurable, e.g., UC could be configured to contain only Implicit Little Endian for instance.

Depending on the real-world activity initiating the C-STORE, we have the following behaviors:

- if the C-STORE is initiated by a user, a configuration parameter called Quality Factor(Q) will be used to decide which transfer syntax lists will be proposed. Q can take values between 0 and 100. If Q=0, only UC will be proposed. If Q = 100, UC and LL will be proposed. Else UC and LY will be proposed.

- if the C-STORE is initiated by the C-MOVE SCP, there is another configuration parameter called Compression Types Supported (CTS) which will be used to decide what transfer syntaxes are proposed. CTS can take integer values. If CTS=0 or CTS > 3, UC will be proposed. If CTS=1, UC and LY will be proposed. If CTS = 2, UC and LL will be proposed. If CTS >= 3, UC, LL and LY will be proposed.

The compression types of JPEG lossy and JPEG lossless are parameters, which are part of the Application Entity Properties configuration (storage checked). It can be reached via the Service-UI: Configuration / DICOM / Network nodes.

4.2.2.3.1.2 SOP specific Conformance for SOP classes

syngo can send images in different formats. In a destination specific service level configuration, it can be configured if images are sent original, resized (512x512 8 bit, 1024x1024 12 bit) and/or processed.
For association and DIMSE level time-outs, please refer to section Configuration (Parameters) of this document.

4.2.2.3.1.2.1 Specialized Information Object Definitions

The DICOM images sent by *syngo* DICOM application conform to the DICOM IOD definitions (Standard extended IODs). But they will contain additional private elements, which must be discarded by a DICOM system when modifying the image.

The DICOM nodes are responsible for data consistency when modifying images. All unknown private attributes must be removed upon modification!

4.2.2.3.1.2.2 Data Dictionary of applied private IOD Attributes

Please refer to "Standard Extended/Specialized/Private SOP Classes" in the Annex for a list of possible private IOD attributes.

4.2.2.3.1.3 SOP specific Conformance - Request Commitment

Storage Commitment is supported for all the SOP Classes detailed in Chapter "Table 1 - Network Services" section "Workflow Management".

The Referenced Study Component Sequence is not supported.

Storage Media File-Set ID and UID Attributes will not be supported in the commitment request (N-ACTION primitive) invoked by the Storage Commitment SCU.

4.2.2.4 Association Acceptance Policy

The *syngo* DICOM application attempts to accept a new association for

- DIMSE C-ECHO
- DIMSE C-STORE

service operations. Any Information Object transmitted on that association will be checked for conformance and stored in the database if check was successful.

4.2.2.4.1 Activity – Update Flag Information

After sending a Storage Commitment Request *syngo* either waits on the same association or, being configured to receive response on a separate association, closes the association and waits for an association request from the Storage Commitment SCP that wants to send the results.

Any incoming Notification will be checked for validity, that is, if the related Transaction UID is still part of the Pending Request Queue.

If the Notification is valid the related Instances are marked with the reported status. The over-all Commit Status of the higher Information Entities in the *syngo* database is derived from propagation of the States of all sub-ordinate Image entities included in a study.

The Status Flags directly affected by Storage Commitment results and indicated in the different entities of the Patient Browser list can be one of.

- "AC" or "SC" - Successful Commitment, "A" means archived to configured Archive destination, whereas "S" means sent to any other destination.
- "Af" of "Sf" - Commitment failed.
- "A?" or "S?" - Commitment request is sent, response is pending.

In case of failure the user must repeat the transfer of images to the Archive destination. Another Storage Commitment will be performed after sending is completed successfully.

Note: The flags A (Archived) and S (Sent) respectively only indicate the receipt of the images by remote AE. They do not indicate successful storage in the intended archive. The data may be lost if it is deleted by the sender e.g., by an auto delete mechanism and if it cannot be stored by the receiver.

Advice the service technician always to use 'storage commitment' if supported by sender and receiver of data.

Source of danger: Misleading/misinterpretation of the flags AC/SC

Flags "AC"/ "SC" depict receipt and storage on hard disk on the receiver side which may be not sufficient to fulfill the regulatory requirements of long-term archiving.

Consequence: Loss of data within the required period for retention.

Remedy: Sending data with the attributes AC or SC via network indicates a safe data transfer but does not fulfill the regulatory requirements of long-term archiving. Objects with the "commit-ted" flag may be deleted by the user. Observe the regulatory requirements regarding the archiving procedure.

4.2.2.4.1.1 Accepted Presentation Contexts

The *syngo* DICOM application will accept Storage Commitment Presentation Contexts as shown in the following table:

Table 6: Accepted Presentation Contexts

Abstract Syntax	Transfer Syntax		Role	Extended Negotiation
Description	Name List	UID List		
1.2.840.10008.1.20.1 Storage Commitment Push Model	Explicit VR Little Endian Explicit VR Big Endian Implicit VR Little Endian	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.2	SCP	None

4.2.2.4.1.2 SOP specific Conformance for SOP classes

If the Commitment response (N-EVENT-REPORT) received has the status of “complete - failure exists”, the transaction is marked as failed, else the transaction is marked as “completed”. In both cases, a message is shown to the user.

The related status flags are set for the committed images in the local database.

The *syngo* DICOM application will not support the Storage Media File Set ID attributes.

4.2.3 Storage Commitment AE Specification

4.2.3.1 SOP Classes

For SOP Classes supported, please refer to “Table 1 - Network Services” section "Storage Commitment" of the Conformance Statement Overview.

4.2.3.2 Association Policy

4.2.3.2.1 General

The *syngo* DICOM application will accept any number of verification or storage SOP classes that are referred to above. There is no limit on the number of presentation contexts accepted except for the DICOM limit. If the Siemens DICOM application runs out of resources, it will reject the association request.
When "trusted host functionality" is enabled syngo will only accept Associations from known hosts with a known AET. Hosts and AETs must be entered in "Local *Service*" by a Siemens CSE.
The default PDU size from *syngo* will be 515KB.

4.2.3.2.2 Number of Associations

The Siemens *syngo* DICOM application can accept multiple associations at a time. It can handle up to 10 associations in parallel.

The number of simultaneous DICOM associations can be configured via the Service-UI. The dialog can be found in "Configuration / DICOM / General".

4.2.3.2.3 Asynchronous Nature

The *syngo* DICOM software supports asynchronous communication (multiple outstanding trans-actions over a single association)

syngo supports sending/receiving of the DICOM objects in asynchronous mode during network transfers. The asynchronous mode allows the user to specify a window size i.e., Max Operations Invoked and Max Operations Performed for both SCU and SCP. The window size defines, the number of request messages can be sent/received over an association before a response message is required to be received.

Note: As this is optional configuration, the asynchronous communication configuration features can be enabled through the service UI in Configuration / DICOM / General for the local machine, and in DICOM/Network Nodes page for Remote machines.

4.2.3.2.4 Implementation Identifying Information

For Implementation Identifying Information please refer to Table 3 in “Conformance Statement Overview”.

4.2.3.3 Association Initiation Policy

If the result from a previously accepted Storage Commitment request is evaluated, the *syngo* DICOM application attempts to initiate a new association for

- N-ACTION DIMSE to request commitment or a
- N-EVENT-REPORT DIMSE to respond to a received storage commitment request and the association was closed by the remote system prior to response.

4.2.3.3.1 Activity – Return Commitment Request

When *syngo* Storage SCP AE received a Storage Commitment request it tries to send the response back on the same association. When the association is not open anymore it will initiate an association to send the Storage Commitment response (N-EVENT-REPORT) to the SCU.

4.2.3.3.1.1 Proposed Presentation Contexts

The *syngo* DICOM application will propose Storage SCP Presentation Contexts for returning Storage Commitment results as shown in the following table:

Table 7: Proposed Presentation Context for Storage Commitment Request

Abstract Syntax Description	Transfer Syntax Name List	 UID List	Role	Extended Negotiation
Storage Commitment SOP Class as detailed in "Table 1 - Network Services" section "Workflow Management". 1.2.840.10008.1.20.1	Explicit VR Little Endian Explicit VR Big Endian Implicit VR Little Endian	1.2.840.10008.1.2.1 1.2.840.10008.1.2.2 1.2.840.10008.1.2	SCP	None

4.2.3.3.1.2 SOP specific Conformance for SOP classes

Storage Media File-Set ID and UID Attributes will not be supported in the N-EVENT-REPORT primitive invoked by the Storage SCP.

4.2.3.4 Association Acceptance Policy

The *syngo* DICOM application attempts to accept a new association for

1. DIMSE C-ECHO for incoming Verification requests
2. DIMSE C-STORE for external image senders request storage of instances
3. DIMSE N-ACTION for external systems requesting Storage Commitment
4. DIMSE N-EVENT-REPORT for receiving commitment result from a previous request.

4.2.3.4.1 Activity – Save to local disk

The *syngo* DICOM application will accept an association and will receive SOP Instances according to the listed presentation contexts on that association and will store the images to the local hard disk if the conformance check is performed successfully.

Upon successful receiving a C-STORE-RQ, the *syngo* DICOM receiver performs a plausibility test on the received image and available system resources. If this test succeeds, it returns the Status SUCCESS, otherwise one of the following status codes is returned and the association is aborted:

Table 8: Status Codes "Save to Local Disk"

Code	Meaning
A700	Refused: This error status indicates a lack of Resources (e.g., not enough disk space) on the *syngo* modality.
A900	Invalid Dataset: An error occurred while processing the image, which makes it impossible to proceed. The image will not be stored, and the association is aborted.
0110	Processing Error: An error occurred while processing the image, which makes it impossible to proceed. Association is aborted.

Note: The image will be saved after sending the response. If during this operation an error occurs, the association will be aborted. This implies that a C-STORE-RSP with status SUCCESS does not mean that the image was successfully stored into the database.

4.2.3.4.1.1 Accepted Presentation Contexts

The *syngo* DICOM application will accept Presentation Contexts as shown in the following table. Kindly refer Table 1 in "Conformance Statement Overview" for details:

Table 9: Presentation Context Table "Save to Local Disk"

Abstract Syntax	Transfer Syntax		Role	Extended Negotiation
Description	**Name List**	**UID List**		
Any image SOP Class detailed in "Table 1 - Network Services" section „Transfer (Image SOP Class) ".	JPEG Lossy Extended (Process 2 & 4)	1.2.840.10008.1.2.4.51	SCP	None
	JPEG Lossless, Process 14 (selection value 1)	1.2.840.10008.1.2.4.70		
	JPEG Lossless, Process 14, Non-HIER	1.2.840.10008.1.2.4.57		
	JPEG Lossy Baseline (Process 1)	1.2.840.10008.1.2.4.50		
	RLE Lossless	1.2.840.10008.1.2.5		
	Explicit VR Little Endian	1.2.840.10008.1.2.1		
	Explicit VR Big Endian	1.2.840.10008.1.2.2		
	Implicit VR Little Endian	1.2.840.10008.1.2		
	JPEG 2000 Lossless	1.2.840.10008.1.2.4.90		
	JPEG 2000 Lossy	1.2.840.10008.1.2.4.91		
	JPEG LS LOSSLESS	1.2.840.10008.1.2.4.80		
Any non-image SOP Class detailed in "Table 1 - Network Services" section „Transfer (Non-image SOP Class) ".	Explicit VR Little Endian Explicit VR Big Endian Implicit VR Little Endian	1.2.840.10008.1.2.1 1.2.840.10008.1.2.2 1.2.840.10008.1.2	SCP	None
Private SOP Class as detailed in Chapter "Table 1 - Network Services" section „Transfer (Private SOP Class) ".	Explicit VR Little Endian Explicit VR Big Endian Implicit VR Little Endian	1.2.840.10008.1.2.1 1.2.840.10008.1.2.2 1.2.840.10008.1.2	SCP	None

Note:

1.US Image Storage and US Multiframe Image Storage are converted to US Images/US Multi-frame images before storing them into the local database. The conversion creates new images, which implies new UIDs.

2.With RLE Lossless Transfer Syntax and JPEG Lossless, Process 14, Non-HIER Transfer Syntax the DICOM application will decompress the image before storing it into the database.

3.JPEG 2000 decompression supported only for import in connection with COSMOS workplace.

4.Private attributes in sequence items will be removed during import into *syngo*.

5.Receiving of Enhanced CT and Enhanced MR images with concatenated data is not supported. This is realized by checking the Concatenation UID (Tag ID: 0020, 9161) of Multi-Frame Functional Group, which will be set for Concatenated data.

6.After receiving the images of type Multi-frame Single Bit Secondary Capture Image, Multi-frame Grayscale Byte Secondary Capture Image, Multi-frame Grayscale Word Secondary Capture Image and Multi-frame True Color Secondary Capture Image, the SOP class UID of received image is changed and stored as Secondary Capture Image (1.2.840.10008.5.1.4.1.1.7).

The SOP Class UID will be stored as private attribute and while sending it SOP Class UID will be updated back to original.

7. During receiving of the images 'X-Ray 3D Angiographic Image Storage which has IMAGE Type tag (0008, 0008) value contains '4D_DSA' and transfer of syntax of the received images are RLE or JPEG LS LOSSLESS, then the received images are stored as it. The received images are not decompressed.

4.2.3.4.1.2 SOP specific Conformance for SOP classes

The *syngo* application conforms to the Full Storage Service Class at Level 2.

Any Explicit VR Transfer Syntax is preferred to be used by the Storage SCU when sending Composite Image Instances to the *syngo* DICOM application.

If an image instance is received that is identified by a SOP Instance UID which is already used by an Instance stored in database, then the actual received image will be discarded. The existing In-stance is not superseded.

The order of preference in accepting Transfer Syntaxes within Presentation Contexts or Presentation Contexts with single Transfer Syntaxes is:

Table 10: Order of Preference Transfer Syntax

Order	DICOM Transfer Syntax
1	JPEG Lossy Extended
2	JPEG Lossless hierarchical
3	JPEG Lossy Baseline
4	RLE Lossless
5	Explicit VR Little Endian
6	Explicit VR Big Endian
7	Implicit VR Little Endian
8	JPEG 2000 Lossy
9	JPEG 2000 Lossless
10	JPEG Lossless Non-hierarchical
11	JPEG LS LOSSLESS

With RLE Lossless, JPEG 2000 Lossy and JPEG 2000 Lossless Transfer Syntax the *syngo* DI-COM application will decompress the image before storing it into the database.

With Implicit VR Little Endian Transfer Syntax, the *syngo* DICOM application will remove any Private Attributes not known to the application. Decision on removal of a Private Element is done if there is NO entry in the attribute-dictionary of the *syngo* DICOM application.

Therefore, any Explicit VR Transfer Syntax shall preferably be used by the Storage SCU's when sending Composite Image Instances to the *syngo* DICOM application.

The following sections will differentiate the attribute contents required for Image Viewing. The *syngo* DICOM application supports more formats for Storage of Images than for Viewing.

4.2.3.4.1.3 Image Pixel Attribute Acceptance Criterion for Grayscale Images

The *syngo* Multi-Modality Viewing application accepts the MONOCHROME1 and MONO-CHROME2 photometric interpretation pixel format and graphic overlay with unsigned integer and 8 or 16 bits allocated. Accepted values:

Pixel plane

1. samples per pixel (attribute 0028, 0002) = 1
2. photometric interpretation (attribute 0028,0004) = "MONOCHROME1"
3. photometric interpretation (attribute 0028,0004) = "MONOCHROME2"
4. pixel representation (attribute 0028, 0103) = 0
5. bits allocated (attribute 0028, 0100) = 8, 16
6. bits stored (attribute 0028,0101) = 8, 10, 12, 14, 15, 16
7. high bit (attribute 0028,0102) = 7, 9, 11
8. only aspect ratio 1:1 is supported.

Overlay plane

9. overlay type (attribute 60xx, 0040) = "G"
10. bits allocated (attribute 60xx, 0100) = 16
11. bit position (attribute 60xx, 0102) = 12, 13, 14, 15 (only bits above high bit permitted)
12. Graphic Overlay will be shifted to fill Overlay Planes from Bit 12 and consecutive.

Overlay plane

13. Overlay Type (60xx,0040) = "G"
14. Bits Allocated (60xx,0100) = 1
15. Bit Position (60xx,0102) = 0
16. Overlay Data (60xx,3000) = supported

The *syngo* Multi-Modality Viewing application accepts also the MONOCHROME1 and MONO-CHROME2 photometric interpretation pixel format with binary 2's complement integer and 16 bits allocated. Accepted values:

Pixel plane

- samples per pixel (attribute 0028, 0002) = 1
- photometric interpretation (attribute 0028,0004) = "MONOCHROME1"

- photometric interpretation (attribute 0028,0004) = “MONOCHROME2”
- pixel representation (attribute 0028, 0103) = 1 (signed)
- bits allocated (attribute 0028, 0100) = 16
- bits stored (attribute 0028,0101) = 16
- high bit (attribute 0028,0102) = 15
- only aspect ratio 1:1 is supported

Overlay plane

- overlay type (attribute 60xx, 0040) = “G”
- bits allocated (attribute 60xx, 0100) = 1
- bit position (attribute 60xx, 0102) = 0
- overlay data (attribute 60xx, 3000) = supported
- For MOD LUT, both the linear LUT (Rescale Slope/Intercept) and the MOD LUT SQ are supported and considered when pixel data is displayed. However, there are two limitations. The MOD LUT SQ will be ignored in the following cases:
- 8-Bit signed pixels
- the pixel format is changed by the MOD LUT (e.g., 8bit -> 16bit)

If the MOD LUT SQ contains multiple LUTs, then only the first one is used.

For VOI LUT, both the linear LUT (Window Center/Width) and the VOI LUT SQ are sup-ported (VOI LUT SQ with 8- or 16-bit LUT data)

But if both, a VOI LUT SQ and a linear MOD LUT, are specified within one image, then the value for Rescale Slope is restricted to 1.

If the VOI LUT SQ contains multiple LUTs, then only the first one is used by default. The other VOI LUTs is selectable.

Only Rectangular and Circular Shutter Shape is supported in this version. Images containing other Shutter Shapes will be displayed w/o shutter.

4.2.3.4.1.4 Image Pixel Attribute Acceptance Criterion for Color Images Viewing

The *syngo* Multi-Modality Viewing application supports the RGB color image description with the unsigned integer 24-bit color image plane pixel format. Accepted values:

- samples per pixel (attribute 0028, 0002) = 3
- photometric interpretation (attribute 0028,0004) = “RGB”
- pixel representation (attribute 0028, 0103) = 0
- bits allocated (attribute 0028, 0100) = 8
- bits stored (attribute 0028,0101) = 8
- high bit (attribute 0028,0102) = 7
- planar configuration (attribute 0028,0006) = 0 (pixel interleave) or 1 (plane interleave).

The *syngo* Multi-modality Viewing application supports the “Palette Color” color image description with the unsigned integer and 2’s complement pixel format. Accepted values:

- samples per pixel (attribute 0028, 0002) = 1
- photometric interpretation (attribute 0028,0004) = “PALETTE COLOR”
- pixel representation (attribute 0028, 0103) = 0
- bits allocated (attribute 0028, 0100) = 8 and bits stored (attribute 0028,0101) = 8
- bits allocated (attribute 0028, 0100) = 16 and bits stored (attribute 0028,0101) = 16

- high bit (attribute 0028,0102) = 7, 15
- Both 8-bit and 16-bit palettes are supported, but NO Segmented Palette Color LUTs.

The *syngo* Multi-modality Viewing application supports the YBR color image description with the unsigned integer pixel format. Accepted values:

- samples per pixel (attribute 0028, 0002) = 3
- photometric interpretation (attribute 0028,0004) = "YBR_FULL" or "YBR_FULL_422"
- pixel representation (attribute 0028, 0103) = 0
- bits allocated (attribute 0028, 0100) = 8 and bits stored (attribute 0028,0101) = 8
- high bit (attribute 0028,0102) = 7

If *syngo* software is making any persistent changes on a YBR image, the resulting new image will be saved with Photometric Interpretation = "RGB".

4.2.3.4.2 Activity – Evaluate Commit Request

4.2.3.4.2.1 Sequencing of Activity

When receiving a Storage Commitment request the DICOM application will perform the necessary steps to check the received list Instances against the local database.

4.2.3.4.2.2 Accepted Presentation Context

The DICOM application will accept Storage Commitment Presentation Contexts as shown in the following table:

Table 11: Proposed Presentation Context for Storage Commitment Request

Abstract Syntax	Transfer Syntax		Role	Extended Negotiation
Description	Name List	UID List		
Storage Commitment SOP Class detailed in "Table 1 - Network Services" section "Workflow Management".	Explicit VR Little Endian Explicit VR Big Endian Implicit VR Little Endian	1.2.840.10008.1.2.1 1.2.840.10008.1.2.2 1.2.840.10008.1.2	SCP	None

4.2.3.4.2.3 SOP specific Conformance

The Storage SCP AE will return success for images that are stored in the local database and failure for images that are not. However, the committed images can later be deleted by the user at the without notice!

Note: Storage Media File-Set ID and UID Attributes will not be supported in the N-EVENT-REPORT primitive invoked by the Storage Commitment SCP.

4.2.4 Query/Retrieve AE Specification

The Query/Retrieve SCU requests that the remote SCP performs a match of all keys specified in the request against the information in its database and the identified images will be moved over a different (C-MOVE) storage association.

The Query/Retrieve SCP responds to queries based on the records of its database and images will be sent to the requesting SCU or to a different storage destination.

4.2.4.1 SOP Classes

For SOP Classes supported, please refer to "Table 1 - Network Services" section "Query/Retrieve" in "Conformance Statement Overview"

4.2.4.2 Association Policy

4.2.4.2.1 General

With the "Search..." function the query data can be entered and the DICOM Query/Retrieve ap-plication is initiated. An initial query request will be sent out to one remote node that can be selected from a list of configured Query Providers. Depending on the replies to the initial request, sub-sequent query requests are issued to gather further data for lower information level entities. The results compiled from the response data will be displayed to the user. Upon request (Import), the retrieval of selected items is initiated.

When "trusted host" functionality is enabled *syngo* will only accept Associations from known hosts with a known AET. Hosts and AETs have to be entered in "Local Service" by a Siemens CSE.

The default PDU size from *syngo* will be 515KB.

4.2.4.2.2 Number of Associations

The *syngo* DICOM application initiates several associations at a time.

For Query it initiates a new association to the remote node and issues the C-FIND request to retrieve all the requested patient and study information matching the search criteria. All the subsequent calls for C-FIND to obtain information on sub-studies and sub-series run in parallel i.e., multiple associations are being initiated to the remote node for C-FIND requests.

For the Retrieve request (C-MOVE) only one association is initiated per destination.

The Siemens *syngo* DICOM application can accept multiple associations at a time. It can handle up to 10 associations in parallel.

The number of simultaneous DICOM associations can be configured via the Service-UI. The dialog can be found in "Configuration / DICOM / General".

4.2.4.2.3 Asynchronous Nature

The *syngo* DICOM software does not support asynchronous communication (multiple outstanding transactions over a single association).

4.2.4.2.4 Implementation Identifying Information

For Implementation Identifying Information please refer to Table 3 in "Conformance Statement Overview".

4.2.4.3 Association Initiation Policy

- The *syngo* DICOM application will request associations for the following DIMSE-C operations as SCU:

Table 12 - Supported DIMSE-C Operations - Query/Retrieve SCU

Supported DIMSE operations	Cancel Request supported
C-FIND	yes
C-MOVE	n. a.

Extended negotiation (relational query) is not supported for the above listed services.

4.2.4.3.1 Activity – Search for Images (Search)

The associated Real-World activity is to fill out a query form with search data and pass it as queries to the network application which issues a C-FIND over a previously built association. The remote SCP will respond with related data entries that will be passed to a browser application. When data transfer is finished the association is closed.

4.2.4.3.1.1 Proposed Presentation Contexts

The *syngo* DICOM Query application will propose Presentation Contexts as shown in the following table.

Table 13: Proposed Presentation Contexts - Search

Abstract Syntax		Transfer Syntax			
Name	**UID**	**Name List**	**UID List**	**Role**	**Extended Negotiation**
Patient Root Query/Retrieve Model - FIND	1.2.840.10008.5.1.4.1.2.1.1	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
		Explicit VR Big Endian	1.2.840.10008.1.2.2		
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
Study Root Query/Retrieve Model - FIND	1.2.840.10008.5.1.4.1.2.2.1	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
		Explicit VR Big Endian	1.2.840.10008.1.2.2		
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
Patient/Study Only Query/Retrieve Model - FIND	1.2.840.10008.5.1.4.1.2.3.1	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
		Explicit VR Big Endian	1.2.840.10008.1.2.2		
		Explicit VR Little Endian	1.2.840.10008.1.2.1		

Within the DICOM network configuration it is configurable which of the two query models (or both) are to be used by the *syngo* DICOM Query SCU application for each node. If both Abstract Syntaxes are configured, the Find SCU will use the Patient Root Model only for C-FIND requests on PATIENT level. For all other levels it will use the Study Root model.

4.2.4.3.1.2 SOP specific Conformance for SOP classes

The *syngo* DICOM Query/Retrieve SCU supports hierarchical queries with all mandatory search keys. The interactive querying of attributes on IMAGE level is not supported by the Query SCU, hence retrieval of individual Objects is possible. The following table describes the search keys for the different query models that the SCU supports. Matching is either wildcard, which means that the user can supply a string containing wildcards, or universal, which means that the attribute is requested as return value.

Table 14: C-FIND RQ Search Keys

Attribute name	**Tag**	**Type**	**Matching**	**User input**	**Return value displayed**
Patient level[2]					
Patient name	(0010,0010)	R	Wildcard[c]	Enter value	yes
Patient ID	(0010,0020)	U / R	Wildcard[c]	Enter value	yes
Patient's birth date	(0010,0030)	O	Single Value	Enter value	yes

[2] Only for Patient Root or Patient Study Only information model

Attribute name	Tag	Type	Matching	User input	Return value displayed
Patient's sex	(0010,0040)	O	Single Value	Enter value	yes
Number of Patient related studies	(0020,1200)	O	Universal (NULL)	-	yes[d]
Number of Patient relates series	(0020,1202)	O	Universal (NULL)	-	no
Number of Patient related instances	(0020,1204)	O	Universal (NULL)	-	no
Study level					
Patient name[e]	(0010,0010)	R	Wildcard[c]	Enter value	yes
Patient ID	(0010,0020)	U / R	Wildcard[c]	Enter value	yes
Patient's birth date[e]	(0010,0030)	O	Single Value	Enter value	yes
Patient's sex[e]	(0010,0040)	O	Single Value	Enter value	yes
Study Instance UID	(0020,000D)	U	Single Value	-	no
Study ID	(0020,0010)	R	Wildcard[c]	enter value[d]	yes
Study date	(0008,0020)	R	Range	Enter value	yes
Study time	(0008,0030)	R	Range	Enter value	yes
Accession number	(0008,0050)	R	Wildcard	Enter value	yes
Study description	(0008,1030)	O	Wildcard[c]	Enter value	yes
Referring physician's name	(0008,0090)	O	Wildcard[c]	Enter value	yes
Name of physician reading study	(0008,1060)	O	Wildcard[c]	Enter value	yes
Modalities in Study	(0008,0061)	O	Single Value	Enter value	yes
Number of Patient related Studies	(0020,1200)	O	Universal (NULL)	-	no
Number of Patient related Series	(0020,1202)	O	Universal (NULL)	-	no
Number of Patient related Instances	(0020,1204)	O	Universal (NULL)	-	no
Number of Study related Series	(0020,1206)	O	Universal (NULL)	-	yes[f]

Attribute name	Tag	Type	Matching	User input	Return value displayed
Number of Study related Instances	(0020,1208)	O	Universal (NULL)	-	no
Series level					
Series instance UID	(0020,000E)	U	Single Value	Enter value	yes
Series number	(0020,0011)	R	Single Value	Enter value	yes
Modality	(0008,0060)	R	Single Value	Enter value	yes
Series date	(0008,0021)	O	Universal (NULL)	-	yes
Series time	(0008,0031)	O	Universal (NULL)	-	yes
Series Description	(0008,103E)	O	Wildcard[c]	Enter value	yes
Body Part Examined	(0018,0015)	O	Single Value	Enter value	yes
Performing Physician's Name	(0008,1050)	O	Wildcard[c]	Enter value	yes
Request Attributes Sequence	(0040,0275)	O	-	-	yes
>Requested Procedure ID	(0040,1001)	O	Wildcard[c]	Enter value	yes
>Scheduled Procedure Step ID	(0040,0009)	O	Wildcard[c]	Enter value	yes
Performed Procedure Step Start Date	(0040,0244)	O	Range	Enter value	yes
Performed Procedure Step Start Time	(0040,0245)	O	Range	Enter value	yes
Number of Series related Instances	(0020,1209)	O	Universal (NULL)	-	yes
Instance Availability	(0008,0056)	O	Universal (NULL)		
Image Level					
SOP Instance UID	(0008,0018)	U	Single Value	-	no
Instance Number	(0020,0013)	R	Universal (NULL)	-	yes
SOP Class UID	(0008,0016)	O	Universal (NULL)	-	no
Image Comments	(0020,4000)	O	Universal (NULL)	-	yes

Attribute name	Tag	Type	Matching	User input	Return value displayed
Number of Frames	(0028,0008)	O	Universal (NULL)	-	yes
Content Date	(0008,0023)	O	Universal (NULL)	-	yes
Content Time	(0008,0033)	O	Universal (NULL)	-	yes

U = Unique Key, **R** = Required Key, **O** = Optional Key, **-** = not supported or applicable

The *syngo* Search application supports a

- DIMSE C-FIND-CANCEL

if the user wishes to cancel a running Query request via the *syngo* user interface (“Cancel” button while a “Search...” is active).

The Find SCU interprets following status codes:

Table 8: Status Codes “Search”

Service Status	Meaning	Error Codes	Related Fields
Refused	Out of Resources	A700	(0000,0902)
Failed	Identifier does not match SOP Class	A900	(0000,0901) (0000,0902)
	Unable to process	Cxxx	(0000,0901) (0000,0902)
Cancel	Matching terminated due to Cancel request	FE00	None
Success	Matching is complete - No final Identifier is supplied	0000	None
Pending	Matches are continuing - Current Match is supplied and any Optional Keys were supported in the same manner as Required Keys	FF00	Identifier
	Matches are continuing - Warning that one or more Optional Keys were not supported for existence and/or matching for this identifier	FF01	Identifier

4.2.4.3.2 Activity – Retrieve Images (Import...)

When selecting a data entry in the Query UI and activating the "Import" function, a retrieval re-quest is passed to the *syngo* DICOM application which issues a C-MOVE service according to the Patient Root or Study Root query model. (The Storage Service Class Conformance Statement describes the C-STORE service, which is generated by processing the C-MOVE service.)

The received image data are processed as described in the Storage class SCP descriptions.

The *syngo* DICOM application will always insert the own Storage SCP AE as “Move Destination”.

4.2.4.3.2.1 Proposed Presentation Contexts

The *syngo* Server DICOM application will propose Presentation Contexts as shown in the following table:

Table 96: Proposed Presentation Contexts – Import

Abstract Syntax		Transfer Syntax			
Name	**UID**	**Name List**	**UID List**	**Role**	**Extended Negotiation**
Query/Retrieve Model Patient Root – MOVE	1.2.840.10008.5.1.4.1.2.1.2	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
		Explicit VR Big Endian	1.2.840.10008.1.2.2		
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
Query/Retrieve Model Study Root – MOVE	1.2.840.10008.5.1.4.1.2.2.2	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
		Explicit VR Big Endian	1.2.840.10008.1.2.2		
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
Query/Retrieve Model Patient/Study Only – MOVE	1.2.840.10008.5.1.4.1.2.3.2	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
		Explicit VR Big Endian	1.2.840.10008.1.2.2		
		Explicit VR Little Endian	1.2.840.10008.1.2.1		

Note: C-MOVE Extended Negotiation will not be supported by the SCU.

4.2.4.3.2.2 SOP specific Conformance for SOP classes

All required keys will be provided in the retrieve request identifier, as defined in DICOM Standard.

The Move SCU interprets following status codes:

Table 17: C-MOVE RSP (response) Status Codes

Service Status	**Meaning**	**Protocol Codes**	**Related Fields**
Refused	Out of Resources - Unable to calculate number of matches	A701	(0000,0902)
	Out of Resources - Unable to perform sub operations	A702	(0000,1020) (0000,1021) (0000,1022) (0000,1023)
	Move destination unknown	A801	(0000,0902)
Failed	Identifier does not match SOP Class	A900	(0000,0901) (0000,0902)
	Unable to process	Cxxx	(0000,0901) (0000,0902)
Cancel	Sub-operations terminated due to Cancel Indication	FE00	(0000,1020) (0000,1021) (0000,1022) (0000,1023)

Warning	Sub-operations Complete - One or more Failures of Warnings	B000	(0000,1020) (0000,1021) (0000,1022) (0000,1023)
Success	Sub-operations Complete - No Failures or Warning	0000	(0000,1020) (0000,1021) (0000,1022) (0000,1023)
Pending	Sub-operations are continuing	FF00	(0000,1020) (0000,1021) (0000,1022) (0000,1023)

4.2.4.4 Association Acceptance Policy

The *syngo* DICOM application will accept associations for the following DIMSE-C operations as SCP:

- C-FIND
- C-GET
- C-MOVE
- C-FIND-CANCEL
- C-GET-CANCEL
- C-MOVE-CANCEL

Extended negotiation - which is relational query or retrieve - is not supported for the above listed services.
The *syngo* DICOM application does support multiple C-FIND requests over the same association, while multiple C-MOVE or C-GET operations are not supported over the same association.

4.2.4.4.1 Activity – Process Search Requests

The Query SCP AE will respond to incoming query requests from a SCU with the query model Patient Root, Study Root and Patient/Study Only. Relational retrieve operation is not supported. The content records of the local database are used to match the incoming query keys and fill the related return keys. With a C-FIND-CANCEL request the running query can be canceled at any time.

Multiple C-FIND requests over the same association are supported.

4.2.4.4.1.1 Accepted Presentation Contexts

The *syngo* DICOM application will accept Presentation Contexts as shown in the following table:

Table 18: Accepted Presentation Contexts - Process Search Requests

Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	**UID**	**Name List**	**UID List**		
Patient Root Query/Retrieve Model - FIND Study Root Query/Retrieve Model - FIND	1.2.840.10008.5.1.4.1.2.1.1	Implicit VR Little Endian	1.2.840.10008.1.2	SCP	See Note
		Explicit VR Big Endian	1.2.840.10008.1.2.2		
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
		Implicit VR Little Endian	1.2.840.10008.1.2	SCP	See Note

Patient Root Query/Retrieve Model - FIND Study Root Query/Retrieve Model - FIND	1.2.840.10008.5.1.4.1.2.2.1	Explicit VR Big Endian	1.2.840.10008.1.2.2		
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
Patient Root Query/Retrieve Model - FIND	1.2.840.10008.5.1.4.1.2.3.1	Implicit VR Little Endian	1.2.840.10008.1.2	SCP	See Note
		Explicit VR Big Endian	1.2.840.10008.1.2.2		
		Explicit VR Little Endian	1.2.840.10008.1.2.1		

Note: C-FIND Extended Negotiation will not be supported by the SCP.

The order of preference in accepting a Transfer syntax is:

1. Explicit VR Little Endian
2. Explicit VR Big Endian
3. Implicit VR Little Endian

4.2.4.4.1.2 SOP specific Conformance for SOP classes

The *syngo* DICOM Query/Retrieve SCP supports hierarchical queries for all mandatory and optional search keys.

The syntactical component structure of the attribute (0010,0010) Patients Name is defined as follows (see [DICOM], Part 5, Definition of PN, Person Name):

<single byte group> =<ideographic group>=<phonetic group>

The Query/Retrieve SCP replies to queries for “Patient Name” as follows:

1. Matching of Patients Name attribute (0010, 0010) is done case insensitive.
2. If a search string matches the complete value of a Patient’s Name in the database, a match will be returned.
3. If a search string matches an individual group (single byte, ideographic or phonetic) of a Patient’s Name in the database, a match will be returned.
4. If a search string matches two consecutive groups of a data base object’s Patients Name, a match will be returned.
5. Redundant group separators “=” or component separators “^” are treated as insignificant for matching.
6. Leading and trailing blanks within a component or a group of Patient’s Name are treated as insignificant for matching.

Except for attribute Patient’s Name (0010,0010) any queries for text string attributes will be treated case sensitive.

The Find SCP will not differentiate "?" and "*", thus "?abc*" will be treated as "*abc*".

If the value for the patient-level unique key "Patient ID" is not known, it will be returned with zero length. The attribute “Image Comments” will not be included in the C-FIND-RSP, if it is not set in the DB, even if it was requested as return key in the related C-FIND-RQ.

Usage of Storage Media File-Set ID, Retrieve AE Title with C-FIND-RSP message:

- The Storage Media File-Set ID - if available - can be returned at Study/Series/Image Level. Only on Image Level, the values of ONLINE, NEARLINE or OFFLINE are returned to indicate the Storage Location of the related Instance.
- The Retrieve AE Title - if available - can only be returned at Image Level (for Patient Root and Study Root models) or Study Level (for Patient/Study Only model).

Relational Queries are not supported.

A remote DICOM AE can cancel the running query by sending a C-FIND-CANCEL. Matches are possibly continuing (more C-FIND response with status PENDING) until the cancel operation takes effect and query matching has completed.

The supported attributes on the various query levels of the three supported information models are listed in the following table.

Table 19: Query/Retrieve SCP Supported Attributes

Attribute name	Tag	PR	SR	PSo	Matching
Patient Level (PR or PSo) or Study Level (SR)					
Patient Name	(0010,0010)	R	R	R	Single value, Wildcard, universal
Patient ID	(0010,0020)	U	R	U	Single Value, Wildcard, universal
Patient's Birth Date	(0010,0030)	O	O	O	Single Value, Range, universal
Patient's Birth Time	(0010,0032)	O	O	O	Single Value, Range, universal
Patient's Sex	(0010,0040)	O	O	O	Single Value, Wildcard, universal
Ethnic Group	(0010,2160)	O	-	O	Single Value, Wildcard, universal
Patient Comments	(0010,4000)	O	O	O	Wildcard, universal
Number of Patient related Studies	(0020,1200)	O	O	O	universal
Number of Patient related Series	(0020,1202)	O	O	O	universal
Number of Patient related Instances	(0020,1204)	O	O	O	universal
Study Level					
Study Instance UID	(0020,000D)	U	U	U	Single Value, List of UIDs
Study ID	(0020,0010)	R	R	R	Single Value, Wildcard, universal
Study Date	(0008,0020)	R	R	R	Single Value, Range, universal
Study Time	(0008,0030)	R	R	R	Single Value, Range, universal
Accession Number	(0008,0050)	R	R	R	Single Value, Wildcard, universal
Referring Physician's Name	(0008,0090)	O	O	O	Single Value, Wildcard, universal
Study Description	(0008,1030)	O	O	O	Single Value, Wildcard, universal
Admitting Diagnosis Description	(0008,1080)	O	O	O	Single Value, Wildcard, universal
Patient's Age	(0010,1010)	O	O	O	Single Value, Wildcard, universal

Patient's Size	(0010,1020)	O	O	O	Single Value, universal
Patient's Weight	(0010,1030)	O	O	O	Single Value, universal
Occupation	(0010,2180)	O	O	O	Single Value, Wildcard, universal
Additional Patient History	(0010,21B0)	O	O	O	Wildcard, universal
Name of Physician reading the Study	(0008,1060)	O	O	O	Single Value, Wildcard, universal
Modalities in Study	(0008,0061)	O	O	O	Multiple values, universal
Number of Study Related Series	(0020,1206)	O	O	O	universal
Number of Study Related Instances	(0020,1208)	O	O	O	universal
Series Level					
Series Instance UID	(0020,000E)	U	U	-	Single Value, List of UIDs
Series Number	(0020,0011)	R	R	-	Single Value, universal
Modality	(0008,0060)	R	R	-	Single Value, Wildcard, universal
Laterality	(0020,0060)	O	O	-	Single Value, Wildcard, universal
Body Part Examined	(0018,0015)	O	O	-	Single Value, Wildcard, universal
Patient Position	(0018,5100)	O	O	-	Single Value, Wildcard, universal
Smallest Pixel Value in Series	(0028,0108)	O	O	-	Single Value, universal
Largest Pixel Value in Series	(0028,0109)	O	O	-	Single Value, universal
Protocol Name	(0018,1030)	O	O	-	Single Value, Wildcard, universal
Series Date	(0008,0021)	O	O	-	Single Value, Range, universal
Series Time	(0008,0031)	O	O	-	Single Value, Range, universal
Series Description	(0008,103E)	O	O	-	Single Value, Wildcard, universal
Operator's Name	(0008,1070)	O	O	-	Single Value, Wildcard, universal
Performing Physician's name	(0008,1050)	O	O	-	Single Value, Wildcard, universal
Performed Procedure Step Start Date	(0040,0244)	O	O	-	universal

Performed Procedure Step Start Time	(0040,0245)	O	O	-	universal
Number of Series related Instances	(0020,1209)	O	O	-	universal
Image or SR Document Level					
SOP Instance UID	(0008,0018)	U	U	-	Single Value, List of UIDs
Image Number	(0020,0013)	R	R	-	Single Value, universal
Content Date	(0008,0023)	O	O	-	Single Value, Range, universal
Content Time	(0008,0033)	O	O	-	Single Value, Range, universal
Modality	(0008,0060)	O	O	-	Single Value, Wildcard, universal
Image Comments	(0020,4000)	O	O	-	universal
Referenced Request Sequence	(0040,A370)	O	O	-	Sequence matching
>Accession Number	((0008,0050)	O	O	-	Single value, universal
>Requested Procedure ID	(0040,1000)	O	O	-	Single value, universal
Concept Name Code Sequence	(0040,A043)	O	O	-	Sequence matching
>Code Value	(0008,0100)	O	O	-	Single Value, Wildcard, universal
>Coding Scheme Designator	(0008,0102)	O	O	-	Single Value, Wildcard, universal
>Coding Scheme Version	(0008,0103)	O	O	-	Single Value, Wildcard, universal
>Code Meaning	(0008,0104)	O	O	-	Single Value, Wildcard, universal
Template Identifier	(0040, DB00)	O	O	-	Single Value, Wildcard, universal
Completion Flag	(0040, A491)	O	O	-	Single Value, Wildcard, universal
Verification Flag	(0040, A493)	O	O	-	Single Value, Wildcard, universal
>Verifying Organization	(0040, A027)	O	O	-	Single Value, Wildcard, universal
>Verifying Date Time	(0040, A030)	O	O	-	Single Value, Range, universal

>Verifying Observer Name	(0040, A075)	O	O	-	Single Value, Wildcard, universal
>Verifying Observer Identification Code Sequence	(0040, A088)	O	O	-	Sequence matching
>>Code Value	(0008,0100)	O	O	-	Single Value, Wildcard, universal
>>Coding Scheme Designator	(0008,0102)	O	O	-	Single Value, Wildcard, universal
>>Coding Scheme Version	(0008,0103)	O	O	-	Single Value, Wildcard, universal
>>Code Meaning	(0008,0104)	O	O	-	Single Value, Wildcard, universal

PR = Patient Root Model, **SR** = Study Root Model, **PSo** = Patient/Study Only Model

U = Unique Key, **R** = Required Key, **O** = Optional Key, **-** = not supported or applicable

The "Process Search Requests" activity can return the following status codes:

Table 20: Status Codes Process Search Request

Service Status	Meaning	Protocol Codes	Related Fields
Refused	Out of Resources	A700	(0000,0902)
Failed	Identifier does not match SOP Class	A900	(0000,0901) (0000,0902)
	Unable to process	C001	(0000,0901) (0000,0902)
Cancel	Matching terminated due to Cancel request	FE00	None
Success	Matching is complete - No final Identifier is supplied	0000	None
Pending	Matches are continuing - Current Match is supplied and any Optional Keys were supported in the same manner as Required Keys	FF00	Identifier
	Matches are continuing - Warning that one or more Optional Keys were not supported for existence and/or matching for this identifier	FF01	Identifier

4.2.4.4.2 Activity – Process Retrieve Requests

The associated activity is to respond to retrieve requests initiated from a foreign SCU. Relational retrieve operation is not supported.

Multiple C-GET or C-MOVE requests over the same association are not supported.

4.2.4.4.2.1 Accepted Presentation Contexts

The *syngo* DICOM application will accept Presentation Contexts as shown in the following table:

Table 10: Proposed Presentation Contexts - Process Retrieve Requests

Abstract Syntax	Transfer Syntax	Role	

Name	UID	Name List	UID List		Extended Negotiation
Patient Root Query/Retrieve Model - GET	1.2.840.10008.5.1.4.1.2.1.3	Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None
		Explicit VR Big Endian	1.2.840.10008.1.2.2		
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
Study Root Query/Retrieve Model - GET	1.2.840.10008.5.1.4.1.2.2.3	Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None
		Explicit VR Big Endian	1.2.840.10008.1.2.2		
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
Patient/Study Only Query/Retrieve Model - GET	1.2.840.10008.5.1.4.1.2.3.3	Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None
		Explicit VR Big Endian	1.2.840.10008.1.2.2		
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
Patient Root Query/Retrieve Model - MOVE	1.2.840.10008.5.1.4.1.2.1.2	Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None
		Explicit VR Big Endian	1.2.840.10008.1.2.2		
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
Study Root Query/Retrieve Model - MOVE	1.2.840.10008.5.1.4.1.2.2.2	Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None
		Explicit VR Big Endian	1.2.840.10008.1.2.2		
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
Patient/Study Only Query/Retrieve Model - MOVE	1.2.840.10008.5.1.4.1.2.3.2	Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None
		Explicit VR Big Endian	1.2.840.10008.1.2.2		
		Explicit VR Little Endian	1.2.840.10008.1.2.1		

Note: C-GET Extended Negotiation will be NOT supported by the SCP.

The order of preference in accepting a Transfer syntax is:

1. Explicit VR Little Endian
2. Explicit VR Big Endian
3. Implicit VR Little Endian

4.2.4.4.2.2 SOP specific Conformance for SOP classes

Relational retrieve operation is not supported.

All unique keys must be supplied according to the selected Query/Retrieve Level. The related tables in the C-FIND SCP section will give information about "U" marked key attributes.

The C-STORE can only be performed to AEs that are configured in *syngo*.

The “Process Retrieve Requests” activity can return the following status codes:

Table 22: Status Codes "Process Retrieve Requests"

Service Status	Meaning	Protocol Codes	Related Fields
Refused	Out of Resources - Unable to calculate number of matches	A701	(0000,0902)
	Out of Resources - Unable to perform sub operations	A702	(0000,1020) (0000,1021) (0000,1022) (0000,1023)
Failed	Identifier does not match SOP Class	A900	(0000,0901) (0000,0902)
	Unable to process	C001	(0000,0901) (0000,0902)
Cancel	Sub-operations terminated due to Cancel Indication	FE00	(0000,1020)
Warning	Sub-operations Complete - One or more Failures of Warnings	B000	(0000,1020) (0000,1021) (0000,1022) (0000,1023)
Success	Sub-operations Complete - No Failures or Warning	0000	(0000,1020) (0000,1021) (0000,1022) (0000,1023)
Pending	Sub-operations are continuing	FF00	(0000,1020) (0000,1021) (0000,1022) (0000,1023)

4.2.5 Print Specification

4.2.5.1 SOP Classes

For SOP Classes supported, please refer to section “Print Management” in chapter 1 “Conformance Statement Overview”.

4.2.5.2 Association Policy

4.2.5.2.1 General

Whenever a film-sheet is completely set up and printed by command or automated rule, the job is prepared for processing. As soon as the queue is ready to process the job, it is activated and worked according to the processing data. The Print application will initiate an association to the print destination and process the printing.

The default PDU size from *syngo* will be 515KB.

4.2.5.2.2 Number of Associations

The *syngo* DICOM application initiates one association at a time for each different print device configured.

4.2.5.2.3 Asynchronous Nature

The *syngo* DICOM print application does not support asynchronous communication (multiple outstanding transactions over a single association).

4.2.5.2.4 Implementation Identifying Information

For Implementation Identifying Information please refer to Table 3 in "Conformance Statement Overview".

4.2.5.3 Association Initiation Policy

Triggered by the Print job queue the Print Management SCU establishes an association by using the DICOM association services. An N-GET request determines the printer status prior to printing. If the printer status is "normal", the print job is started.

After the last film is printed from queue, the Print application will leave open the association for another 60 seconds. If a new film job is ready for printing within this time-limit, the job will be im-mediately processed over the still open association. If there is no new job, the association is closed.

During the "idle-time" (no open association to printer) the Print application will issue a cyclic cam-era status request (using N-GET of the Printer SOP Class) every 5 minutes.

4.2.5.3.1 Activity – Print Film

The film sheet is internally processed, converted to a Standard/1-1 page and then the page im-age is sent. Status is controlled by awaiting any N-EVENT message through the transfer until the last image or film-sheet is sent.

If the response from the remote application contains a status other than Success or Warning the association is aborted.

4.2.5.3.1.1 Proposed Presentation Contexts

The *syngo* DICOM application will propose Presentation Contexts as shown in the following table:

Table 23: Presentation Context - Print Film

Presentation Context Table					
Abstract Syntax		**Transfer Syntax**		**Role**	**Extended Negotiation**
Name	**UID**	**Name List**	**UID List**		
Basic Grayscale Print Management Meta SOP Class	1.2.840.10008.5.1.1.9	Implicit VR Little Endian Explicit VR Little Endian Explicit VR Big Endian	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.2	SCU	None
Basic Film Session SOP Class	1.2.840.10008.5.1.1.1	Implicit VR Little Endian Explicit VR Little Endian Explicit VR Big Endian	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.2	SCU	None
Basic Film Box SOP Class	1.2.840.10008.5.1.1.2	Implicit VR Little Endian Explicit VR Little Endian Explicit VR Big Endian	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.2	SCU	None
Basic Grayscale	1.2.840.10008.5.1.1.4	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None

Image Box SOP Class		Explicit VR Little Endian Explicit VR Big Endian	1.2.840.10008.1.2.1 1.2.840.10008.1.2.2		
Printer SOP Class	1.2.840.10008.5.1.1.16	Implicit VR Little Endian Explicit VR Little Endian Explicit VR Big Endian	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.2	SCU	None
Print Job SOP Class	1.2.840.10008.5.1.1.14	Implicit VR Little Endian Explicit VR Little Endian Explicit VR Big Endian	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.2	SCU	None
Presentation LUT SOP Class	1.2.840.10008.5.1.1.23	Implicit VR Little Endian Explicit VR Little Endian Explicit VR Big Endian	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.2	SCU	None

4.2.5.3.1.2 SOP specific Conformance for SOP classes – Meta SOP Classes

The *syngo* DICOM print management SCU conforms to the DICOM Basic Grayscale Print Management Meta SOP Class.

The application uses a setting platform to define the properties of the connected DICOM SCP, e.g.:

maximum number of print jobs in the queue

maximum number of print copies

supported film sizes of the connected DICOM SCP

supported film formats of the DICOM SCP

lookup table definition.

The printing is only suspended in the case of a failure return status of the SCP.

4.2.5.3.1.3 Basic Film Session SOP Class

The Basic Film Session information object definition describes all the user-defined parameters, which are common for all the films of a film session. The Basic Film Session refers to one or more Basic Film Boxes that are printed on one hardcopy printer.
The *syngo* DICOM print management SCU supports the following DIMSE Service elements for the Basic Film Session SOP Class as SCU:
N-CREATE
N-DELETE
The Basic Film Session SOP Class N-CREATE-RQ (SCU) uses the following attributes:

Table 24: Used Basic Film Session N-CREATE_RQ Attributes

Attribute name	Tag	Usage SCU	Supported Values
Number of Copies	(2000,0010)	U	1

Medium Type	(2000,0030)	U	BLUE FILM CLEAR FILM PAPER
Film Destination	(2000,0040)	U	MAGAZINE PROCESSOR

The number of copies sent to the DICOM printer is always 1, the job is sent n times for n copies.

The Affected SOP Instance UID received with N-CREATE-RSP message will be kept internally and used for later requests (e.g., N-DELETE-RQ) on the Basic Film Session - see table below:

Table 25: Attributes of N-DELETE-RQ on Basic Film Session SOP Class

Attribute name	Tag	Source of information
Requested SOP Instance UID	(0000,1000) -> (0000,1001)	Affected SOP Instance UID of N-CREATE-RSP on Basic Film Session

The N-DELETE-RQ on the Basic Film Session SOP Class is used to delete the complete Basic Film Session SOP Instance hierarchy.

The Basic Film Session SOP class interprets the following status codes (from N-CREATE-RSP, N-DELETE-RSP messages):

Table 26: Basic Film Session SOP status

Service Status	Meaning	Protocol Codes
Failure	Film session SOP instances hierarchy does not contain film box SOP instances	C600
	Unable to create print job, print queue is full	C601
	Image size is larger than images box size	C603
Warning	Memory allocation not supported	B600
	Film session printing is not supported	B601
	Film box does not contain image box (empty page)	B602
Success	Film belonging to the film session are accepted for printing	0000

4.2.5.3.1.4 Basic Film Box SOP Class

The Basic Film Box information object definition describes all the user defined parameter of one film of the film session. The Basic Film Box information description defines the presentation parameters which are common for all images on a given sheet of film.

The Basic Film Box refers to one or more Image Boxes.

Supported Service Elements as SCU are:

- N-CREATE
- N-ACTION
- N-DELETE

The Basic Film Box SOP class N-CREATE-RQ message uses following attributes (the used values for each attribute depend on the DICOM Printer configuration within the *syngo* DICOM print management SCU):

Table 27: Basic Film Box N-CREATE Attributes

Attribute Name	Tag	Usage SCU	Supported Values
Image Display Format	(2010,0010)	M	STANDARD\1,1
Referenced Film Session Sequence	(2010,0500)	M	n. a.
> Referenced SOP Class UID	(0008,1150)	M	1.2.840.10008.5.1.1.1
> Referenced SOP Instance UID	(0008,1155)	M	
Film Orientation	(2010,0040)	M	PORTRAIT
Film Size ID	(2010,0050)	M	8INX10IN, 10INX12IN, 10INX14IN, 11INX14IN,, 14INX14IN, 14INX17IN, 24CMX24CM, 24CMX30CM
Magnification Type	(2010,0060)	M	BILINEAR, CUBIC, NONE, REPLICATE
Max Density	(2010,0130)	U	> 0
Min Density	(2010,0120)	U	50 > value > 0
Illumination	(2010,015E)	U	> 0 Required if Presentation LUT is present.
Reflective Ambient Light	(2010,0160)	U	> 0 Required if Presentation LUT is present.
Referenced Presentation LUT Sequence	(2050,0500)	U	

M = Mandatory**, U =** User Option

The N-CREATE-RSP message from the Print SCP includes the Referenced Image Box Sequence with SOP Class/Instance UID pairs which will be kept internally and used for the subsequent Basic Image Box SOP Class N-SET-RQ messages.

When all Image Boxes (including parameters) for the film-sheet have been set, the DICOM print manager will issue a N-ACTION-RQ message with the SOP Instance UID of the Basic Film Box and the Action Type ID of 1.

The affected SOP Instance UID received with N-CREATE-RSP message will be kept internally and used for later requests (e.g., N-DELETE-RQ) on the Basic Film Box - see below:

Table 28: Attributes of N_DELETE_RQ on Basic Film Session SOP Class

Attribute name	Tag	Source of information

Requested SOP Instance UID	(0000,1000) -> (0000,1001)	Affected SOP Instance UID of N-CREATE-RSP on Basic Film Box

The Basic Film Box SOP class interprets the following status codes:

Table 29: Basic Film Box SOP Codes

Service Status	Meaning	Error Codes
Failure	Unable to create print job, print queue is full	C601
	Image size is larger than images box size	C603
Warning	Film box does not contain image box (empty page)	B603
	Requested MinDensity or MaxDensity outside of Printer's operating range	B605
Success	Film accepted for printing	0000

4.2.5.3.1.5 Basic Grayscale Image Box SOP Class

The Basic Grayscale Image Box information object definition is the presentation of an image and image related data in the image area of a film. The Basic Grayscale Image Box information de-scribes the presentation parameters and image pixel data, which apply to a single image of a sheet of film.

The Grayscale Image Box SOP Class uses only the N-SET-RQ with the following attributes:

Table 30: Basic Grayscale Image Box N-SET Attributes

Attribute name	Tag	Usage SCU	Supported Values
Image Position	(2020,0010)	M	1
Basic Grayscale Image Sequence	(2020,0110)	M	n.a.
>Samples Per Pixel	(0028,0002)	M	1
>Photometric Interpretation	(0028,0004)	M	MONOCHROME2
>Rows	(0028,0010)	M	<Printer/Film config>
>Columns	(0028,0011)	M	<Printer/Film config>
>Pixel Aspect Ratio	(0028,0034)	M	(1:1)
>Bits Allocated	(0028,0100)	M	8,16
>Bits Stored	(0028,0101)	M	8,12
>High Bit	(0028,0102)	M	7,11
>Pixel Representation	(0028,0103)	M	0
>Pixel Data	(7FE0,0010)	M	

M = Mandatory

The Grayscale Image Box SOP class interprets following status codes:

Table 31: Basic Grayscale Image Box SOP Status

Service Status	Meaning	Protocol Codes
Failure	Image contains more pixel than printer can print in Image box	C603
	Insufficient memory in printer to store the image	C605
Warning	Requested MinDensity or MaxDensity outside of printer's operating range	B605
Success		0000

4.2.5.3.1.6 Presentation LUT SOP Class

The Presentation LUT tailors image hardcopy printing for specific modalities, applications, and us-er preferences.

The output of the Presentation LUT is Presentation Values (P-Values). P-Values are approximately related to human perceptual response. They are intended to facilitate common input for hardcopy. P-Values are intended to be independent of the specific class or characteristics of the hardcopy device.

The Presentation LUT SOP Class uses only the N-CREATE-RQ with the following attributes:

Table 32: Presentation LUT N_CREATE Attribute

Attribute name	Tag	Usage SCU	Supported Values
Presentation LUT Shape	(2050,0020)	U	IDENTITY

U = User Option

The affected SOP Instance UID received with N-CREATE-RSP message will be kept internally and is used for later requests on the Basic Film Box (N-CREATE-RQ) and on the Presentation LUT (N-DELETE-RQ) - see below:

Table 33: Attributes of N_DELETE_RQ on Presentation LUT SOP Class

Attribute name	Tag	Source of information
Requested SOP Instance UID	(0000,1000) -> (0000,1001)	Affected SOP Instance UID of N-CREATE-RSP on Presentation LUT

The Presentation LUT SOP class interprets the following status codes:

Table 34: Attributes of N_DELETE_RQ on Presentation LUT SOP Class

Service Status	Meaning	Protocol Codes
Warning	Requested Min Density or Max Density outside the HCD's operating range. HCD will use its respective minimum or maximum density value instead.	B605
Success	Presentation LUT successfully created	0000

4.2.5.3.1.7 Printer SOP Class

The Printer SOP Class allows to monitor the status of the hardcopy printer in a synchronous and an asynchronous way.

The SCU uses the mandatory N-EVENT Report DIMSE service to monitor the changes of the printer status in an asynchronous way.

The following returned information is supported:

Table 35: Used Printer N-EVENT Report Attributes

Event type name	Event	Attributes	Tag	Usage SCU
Normal	1			
Warning	2	Printer Status Info	(2110,0020)	U
Failure	3	Printer Status Info	(2110,0020)	U

U = User Option

Table 36: Mandatory Printer N-GET-RSP, N-EVENT-REPORT-RQ attributes

Attribute name	Tag	Usage SCP	supported values
Printer Status	(2110,0010)	M	NORMAL FAILURE WARNING
Printer Status Info	(2110,0020)	M	See tables in Annex for details.

M = Mandatory

Note: For a detailed description on how syngo reacts on different printer status messages, please refer to the Annex section.

4.2.5.3.1.8 Print Job SOP Class

The Print Job SOP Class allows to monitor the execution of the print process.

The *syngo* DICOM Print Management application supports the optional N-EVENT-REPORT DIMSE Service to receive the changes of the Print Job Status in an asynchronous way.

It can receive Events from the Print SCP asynchronously:

N-EVENT-REPORT

Note: The underlying *syngo* DICOM Print AE does not support receiving of N-EVENT-REPORT messages from camera during open print sessions. This is typically configurable in the camera setup.

The following information is supported:

Table 37: Used Print Job N-EVENT Report Attributes

Event-type Name	Event	Attributes	Tag	Usage SCU
Normal	1	Execution Status Info	(2100,0030)	U
		Print Job ID	(2100,0010)	-- (Print Queue Management SOP Class not supported)
		Film Session Label	(2000,0050)	U

		Printer Name	(2110,0030)	U
Printing	2	Execution Status Info	(2100,0030)	U
		Print Job ID	(2100,0010)	-- (Print Queue Management SOP Class not supported)
		Film Session Label	(2000,0050)	U
		Printer Name	(2110,0030)	U
Done	3	Execution Status Info	(2100,0030)	U
		Print Job ID	(2100,0010)	-- (Print Queue Management SOP Class not supported)
		Film Session Label	(2000,0050)	U
		Printer Name	(2110,0030)	U
Failure	4	Execution Status Info	(2100,0030)	U
		Print Job ID	(2100,0010)	-- (Print Queue Management SOP Class not supported)
		Film Session Label	(2000,0050)	U
		Printer Name	(2110,0030)	U

U = User Option

Note: For a detailed description on how *syngo* reacts on different printer status messages, please refer to the Annex section.

4.2.5.3.1.9 Activity - Show Device Status

With no printing activity ongoing ("idle time"), the *syngo* DICOM Print SCU application will cyclically request the printer status to update the related printer state in the Printing UI.

4.2.5.3.1.10 Proposed Presentation Context

The *syngo* DICOM application will propose Presentation Contexts as shown in the following table:

Table 38 - Presentation Context Table "Show Device Status"

Presentation Context Table					
Abstract Syntax		**Transfer Syntax**		**Role**	**Extended Negotiation**
Name	**UID**	**Name List**	**UID List**		
Printer SOP Class	1.2.840.10008.5.1.1.16	Implicit VR Little Endian Explicit VR Little Endian Explicit VR	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.2	SCU	None

		Big Endian			

4.2.5.3.1.11 SOP Specific Conformance

The Printer SOP Class allows to monitor the status of the hardcopy printer in a synchronous and an asynchronous way.

The Print SCU AE application will cyclically "ask" the Printer (SCP) for its status synchronously:

N-GET as SCU

The following information is supported:

Table 39 - Used Printer N-EVENT Report Attributes

Event-type Name	Event	Attributes	Tag	Usage SCU
Normal	1			
Warning	2	Printer Status Info	(2110,0020)	U
Failure	3	Printer Status Info	(2110,0020)	U

U = User Option

4.2.5.4 Association Acceptance Policy

N/A

4.2.6 Modality Worklist AE Specification

The Modality Worklist SCU (patient registration in conjunction with the network application) requests that the remote SCP performs a match of all keys specified in the query against the information in its worklist database.

4.2.6.1 SOP Classes

For SOP Classes supported, please refer to section „Workflow Management" in "Conformance Statement Overview"

4.2.6.2 Association Policy

4.2.6.2.1 General

It is possible to configure a cyclic update of the modality Scheduler DB through a background worklist request with date/time and modality information.

In addition, the user can request worklist update with "Update Worklist". No duplicate entries will be added in the Scheduler DB. Entries are uniquely identified by the Study Instance UID (0020,000D) for the Requested Procedure and the SPS ID (0040,009) in the SPS Sequence (0040,0100).

An interactive worklist query can be issued with search criteria entered in the patient-based Query dialog from the patient browser.

The default PDU size from *syngo* will be 515KB.

4.2.6.2.2 Number of Associations

The *syngo* DICOM application initiates one association at a time to query worklist entry data.

4.2.6.2.3 Asynchronous Nature

The *syngo* DICOM software does not support asynchronous communication (multiple outstanding transactions over a single association).

4.2.6.2.4 Implementation Identifying Information

For Implementation Identifying Information please refer to Table 3 in "Conformance Statement Overview".

4.2.6.3 Association Initiation Policy

The *syngo* DICOM application will cyclically query the worklist provider and by request from the patient registration interface. It establishes an association by using the

- C-FIND with Worklist information model

It is possible to configure multiple worklist providers but only one can be active at a time. The active worklist provider can be selected in the user settings.

4.2.6.3.1 Activity – (cyclic) Update Worklist

A network application will perform worklist queries with the C-FIND request at regular intervals. In addition, it can be triggered by immediate request. The received worklist items will be compared with the contents of the local Scheduler DB. New items will be inserted into Scheduler DB.

After each broad query, all Requested Procedures / Scheduled Procedure Steps that were canceled or rescheduled to another modality at the RIS will be automatically removed from the Scheduler DB if:

1. the Examination of this procedure has not been started or finished yet, and

2. the corresponding configuration item "Automatic removal of canceled/rescheduled Request" was checked in the Service UI under DICOM/HIS-RIS Node.

No automatic clean-up of the Scheduler DB is performed after a Patient-based Query since the worklist received - due to restricted search criteria - does not correspond to the list of all currently scheduled procedures for the modality.

4.2.6.3.1.1 Proposed Presentation Contexts

The *syngo* DICOM application will propose Presentation Contexts as shown in the following table:

Table 40 - Presentation Context "Update Worklist"

Presentation Context Table – "Update Flag Information"				
Abstract Syntax	**Transfer Syntax**		**Role**	**Extended Negotiation**
Description	**Name List**	**UID List**		
1.2.840.10008.5.1.4.31 Modality Worklist Information Model - FIND	Explicit VR Little Endian Explicit VR Big Endian Implicit VR Little Endian	1.2.840.10008.1.2.1 1.2.840.10008.1.2.2 1.2.840.10008.1.2	SCU	None

4.2.6.3.1.2 SOP specific Conformance for SOP classes

Search Key Attributes for the Worklist C-FIND

The *syngo* DICOM worklist SCU supports "broad worklist queries" with all required search keys. The following table describes the "broad query" search keys that the SCU supports.

Table 41 - Supported Broad Worklist Query Search Key Attributes

Attribute Name	Tag	Matching	Query Value

		Key Type	
Scheduled Procedure Step			
Scheduled Procedure Step Sequence	(0040,0100)	R	
>Scheduled Station AE Title (It depends on user configuration (Options->Configuration-> Patient Registration) if the "own AET" is provided or not. Use the "HIS/RIS" tab card for configuration.)	(0040,0001)	R	<own AET> or <zero length>
>Schedule Procedure Step Start Date (It depends on user configuration (Options->Configuration-> Patient Registration) if the actual Date with a full-time range or an interactive input dialog for date/time specification is used.)	(0040,0002)	R	<act. Date>-<act. Date> or range from UI
>Schedule Procedure Step Start Time (It depends on user configuration (Options->Configuration-> Patient Registration) if the actual Date with a full-time range or an interactive input dialog for date/time specification is used.)	(0040,0003)	R	00.00-235959.00 or range from UI
>Modality (It depends on user configuration (Options->Configuration-> Patient Registration) if the "own Modality" is provided or not. Use the "HIS/RIS" tab card for configuration.)	(0008,0060)	R	<zero length> or <own Modality>

R = Required

Return Key Attributes of the Worklist C-FIND

The *syngo* DICOM Worklist SCU supports worklist queries with return key attributes of all types. The following table describes the return keys that the SCU supports.

An "x" in the UI column will indicate the attribute is displayed in the user interface. The display is influenced by the related configuration.

A tag in the IOD column will indicate that the related attribute is included into the SOP Instances of the IODs created during processing of this worklist request.

A tag in the MPPS column will indicate that the related attribute is included into the SOP Instances of the MPPS objects created during processing of this worklist request. (See also the tables "Attributes used for the Performed Procedure Step N-CREATE" and "Attributes used for the Per-formed Procedure Step N-SET".)

Table 42 - Basic Worklist C-FIND-RSP Return Key Attributes

Attribute Name	Tag	Return Key Type	UI	IOD	MPPS
SOP Common					
Specific Character Set	(0008,0005)	1C	-	(0008,0005)	(0008,0005)
Scheduled Procedure Step					
Scheduled Procedure Step Sequence	(0040,0100)	1			
>Modality	(0008,0060)	1	x	(0008,0060)	(0008,0060)
>Requested Contrast Agent	(0032,1070)	2C	x		
>Scheduled Station AE Title	(0040,0001)	1	x		(0040,0241)

("Scheduled Station AE Title" is taken as default for "Performed Station AE Title")					
>Scheduled Procedure Step Start Date	(0040,0002)	1	x		
>Scheduled Procedure Step Start Time	(0040,0003)	1	x		
>Scheduled Procedure Step End Date	(0040,0004)	3	-		
>Scheduled Procedure Step End Time	(0040,0005)	3	-		
>Scheduled Performing Physician's Name ("Scheduled Performing Physician's Name" is taken as default for "Performing Physician's Name")	(0040,0006)	1	x	(0008,1050)	(0008,1050)
>Scheduled Procedure Step Description ("Scheduled Procedure Step Description" is taken as default for "Performed Procedure Step Description")	(0040,0007)	1C	x	(0040,0007) (0040,0254)	(0040,0007) (0040,0254)
>Scheduled Protocol Code Sequence (Universal Sequence Match) ("Scheduled Protocol Code Sequence" is taken as default for "Performed Protocol Code Sequence")	(0040,0008)	1C	-	(0040,0008) (0040,0260)	(0040,0008) (0040,0260)
>>Code Value	(0008,0100)	1C	x		
>>Coding Scheme Designator	(0008,0102)	1C	x		
>>Coding Scheme Version	(0008,0103)	3	x		
>>Code Meaning	(0008,0104)	3	x		
>Scheduled Procedure Step ID ("Scheduled Procedure Step ID" is taken as default for "Performed Procedure Step ID")	(0040,0009)	1	x	(0040,0009) (0040,0253)	(0040,0009) (0040,0253)
>Scheduled Station Name	(0040,0010)	2	x		
>Scheduled Procedure Step Location ("Scheduled Procedure Step Location" is taken as default for "Performed Location")	(0040,0011)	2	x		(0040,0243)
>Pre-Medication	(0040,0012)	2C	x		
>Scheduled Procedure Step Status	(0040,0020)	3	x		
>Comments on the Scheduled	(0040,0400)	3	-		

Procedure Step					
Requested Procedure					
Referenced Study Sequence (universal Sequence Match)	(0008,1110)	2	-	(0008,1110)	(0008,1110)
>Referenced SOP Class UID	(0008,1150)	1C	-		
>Referenced SOP Instance UID	(0008,1155)	1C	-		
Study Instance UID	(0020,000D)	1	-	(0020,000D)	(0020,000D)
Requested Procedure Description	(0032,1060)	1C	x	(0032,1060)	(0032,1060)
Requested Procedure Code Sequence (universal Sequence Match) ("Requested Procedure Code Sequence" is taken as default for "Procedure Code Sequence")	(0032,1064)	1C	-	(0008,1032) (0032,1064)	(0008,1032)
>Code Value	(0008,0100)	1C	x		
>Coding Scheme Designator	(0008,0102)	1C	x		
>Coding Scheme Version	(0008,0103)	3	x		
>Code Meaning	(0008,0104)	3	x		
Requested Procedure ID ("Requested Procedure ID" is taken as default for "Study ID")	(0040,1001)	1	x	(0040,1001) (0020,0010)	(0040,1001) (0020,0010)
Reason for the Requested Procedure	(0040,1002)	3	-	(0040,1002)	
Requested Procedure Priority	(0040,1003)	2	x		
Patient Transport Arrangements	(0040,1004)	2	-		
Requested Procedure Location	(0040,1005)	3	-		
Confidentiality Code	(0040,1008)	3	-		
Reporting Priority	(0040,1009)	3	-		
Names of intended Recipients of Results	(0040,1010)	3	-	(0008,1048)	
Requested Procedure Comments	(0040,1400)	3	x		
Imaging Service Request					
Accession Number	(0008,0050)	2	x	(0008,0050)	(0008,0050)
Referring Physician's Name	(0008,0090)	2	x	(0008,0090)	
Requesting Physician	(0032,1032)	2	x	(0032,1032) (0008,1048)	
Requesting Service	(0032,1033)	3	x	(0032,1033)	
Issuing Date of Imaging Service Request	(0040,2004)	3	-		

Issuing Time of Imaging Service Request	(0040,2005)	3	-		
Placer Order Number / Imaging Service Request (Old tag (0040,2006) is retired and not used.)	(0040,2016)	3	-		(0040,2016)
Filler Order Number / Imaging Service Request (Old tag (0040,2007) is retired and not used.)	(0040,2017)	3	-		(0040,2017)
Order entered by ...	(0040,2008)	3	-		
Order Enterer's location	(0040,2009)	3	-		
Order Callback Phone Number	(0040,2010)	3	-		
Imaging Service Request Comments	(0040,2400)	3	x		
Visit Identification					
Institution Name	(0008,0080)	3	x	(0008,0080)	
Institution Address	(0008,0081)	3	-		
Institution Code Sequence (universal Sequence Match)	(0008,0082)	3	-		
>Code Value	(0008,0100)	1C	-		
>Coding Scheme Designator	(0008,0102)	1C	-		
>Coding Scheme Version	(0008,0103)	3	-		
>Code Meaning	(0008,0104)	3	-		
Admission ID	(0038,0010)	2	x		
Issuer of Admission ID	(0038,0011)	3	-		
Visit Status					
Visit Status ID	(0038,0008)	3	-		
Current Patient Location	(0038,0300)	2	x		
Patient's Institution Residence	(0038,0400)	3	-		
Visit Comments	(0038,4000)	3	-		
Visit Relationship					
Referenced Study Sequence (universal Sequence Match)	(0008,1110)	3	-		
>Referenced SOP Class UID	(0008,1150)	1C	-		
>Referenced SOP Instance UID	(0008,1155)	1C	-		
Referenced Patient Sequence (universal Sequence Match)	(0008,1120)	2	-		(0008,1120)
>Referenced SOP Class UID	(0008,1150)	1C	-		
>Referenced SOP Instance UID	(0008,1155)	1C	-		
Visit Admission					

Referring Physician's Name	(0008,0090)	2	x	(0008,0090)	
Admitting Diagnosis Description	(0008,1080)	3	x	(0008,1080)	
Patient Identification					
Patient's Name	(0010,0010)	1	x	(0010,0010)	(0010,0010)
Patient ID	(0010,0020)	1	x	(0010,0020)	(0010,0020)
Issuer of Patient ID	(0010,0021)	3	-	(0010,0021)	
Other Patient IDs	(0010,1000)	3	x	(0010,1000)	
Other Patient Names	(0010,1001)	3	x	(0010,1001)	
Patient's Birth Name	(0010,1005)	3	-	(0010,1005)	
Patient's Mother's Birth Name	(0010,1060)	3	-	(0010,1060)	
Medical Record Locator	(0010,1090)	3	-	(0010,1090)	
Patient Demographic					
Patient's Birth Date	(0010,0030)	2	x	(0010,0030)	(0010,0030)
Patient's Birth Time	(0010,0032)	3	-	(0010,0032)	
Patient's Sex	(0010,0040)	2	x	(0010,0040)	(0010,0040)
Patient's Insurance Plan Code Sequence (universal Sequence Match)	(0010,0050)	3	-	(0010,0050)	
>Code Value	(0008,0100)	1C	-		
>Coding Scheme Designator	(0008,0102)	1C	-		
>Coding Scheme Version	(0008,0103)	3	-		
>Code Meaning	(0008,0104)	3	-		
Patient's Age	(0010,1010)	3	x	(0010,1010)	
Patient's Size	(0010,1020)	3	x	(0010,1020)	
Patient's Weight	(0010,1030)	2	x	(0010,1030)	
Patient's Address	(0010,1040)	3	x	(0010,1040)	
Military Rank	(0010,1080)	3	x	(0010,1080)	
Branch of Service	(0010,1081)	3	-	(0010,1081)	
Country of Residence	(0010,2150)	3	-	(0010,2150)	
Region of Residence	(0010,2152)	3	-	(0010,2152)	
Patient's Telephone Numbers	(0010,2154)	3	-	(0010,2154)	
Ethnic Group	(0010,2160)	3	x	(0010,2160)	
Occupation	(0010,2180)	3	-	(0010,2180)	
Patient's Religious Preference	(0010,21F0)	3	-	(0010,21F0)	
Patient Comments	(0010,4000)	3	x	(0010,4000)	
Patient Data Confidentiality Constraint Description	(0040,3001)	2	x	(0040,3001)	

Patient Medical					
Medical Alerts	(0010,2000)	2	x	(0010,2000)	
Contrast Allergies	(0010,2110)	2	x	(0010,2110)	
Pregnancy Status	(0010,21C0)	2	x	(0010,21C0)	
Smoking Status	(0010,21A0)	3	x	(0010,21A0)	
Last Menstrual Date	(0010,21D0)	3	x	(0010,21D0)	
Additional Patient History	(0010,21B0)	3	x	(0010,21B0)	
Special Needs	(0038,0050)	2	x	(0038,0050)	
Patient State	(0038,0500)	2	x	(0038,0500)	
Patient Relationship					
Referenced Study Sequence (universal Sequence Match)	(0008,1110)	3	-		
>Referenced SOP Class UID	(0008,1150)	1C	-		
>Referenced SOP Instance UID	(0008,1155)	1C	-		
Referenced Visit Sequence (universal Sequence Match)	(0008,1125)	3	-		
>Referenced SOP Class UID	(0008,1150)	1C	-		
>Referenced SOP Instance UID	(0008,1155)	1C	-		
Referenced Patient Alias Sequence (universal Sequence Match)	(0038,0004)	3	-		
>Referenced SOP Class UID	(0008,1150)	1C	-		
>Referenced SOP Instance UID	(0008,1155)	1C	-		

The Worklist SCU interprets the following status codes:

Table 43 - Status Codes "Update Worklist"

Service Status	Meaning	Error Codes	Related Fields
Refused	Out of Resources	A700	(0000,0902)
Failed	Identifier does not match SOP Class	A900	(0000,0901) (0000,0902)
	Unable to process	Cxxx	(0000,0901) (0000,0902)
Cancel	Matching terminated due to Cancel request	FE00	None
Success	Matching is complete - No final Identifier is supplied	0000	None
Pending	Matches are continuing - Current Match is supplied and any Optional Keys were supported in the same manner as Required Keys	FF00	Identifier
	Matches are continuing - Warning that one or more Optional Keys were not supported for existence and/or matching for this identifier	FF01	Identifier

4.2.6.3.2 Activity – Get Worklist

With "Get Worklist" in the patient-based Worklist Query dialog, the entered attributes are used to form a worklist request identifier. The response data is used to fill the Patient Registration dialog. The response data are additionally placed in the Scheduler Database.

4.2.6.3.2.1 Proposed Presentation Context

This Activity will propose the same Presentation Context as with “Update Worklist”. Please see related table 41

4.2.6.3.2.2 SOP Specific Conformance for SOP Classes

The *syngo* DICOM worklist SCU supports “narrow worklist queries” with all required search keys. The following tables describe the “narrow query” search keys that the SCU supports.

Table 44: Patient Based "Narrow Query" Search Key Attributes

Attribute Name	Tag	Matching Key Type	Query Value
Scheduled Procedure Step			
Scheduled Procedure Step Sequence	(0040,0100)	R	
>Scheduled Performing Physician’s Name	(0040,0006)	R	Input from UI or <zero length>
Requested Procedure			
Requested Procedure ID	(0040,1001)	O	Input from UI or <zero length>
Imaging Service Request			
Accession Number	(0008,0050)	O	Input from UI or <zero length>
Referring Physician’s Name	(0008,0090)	O	Input from UI or <zero length>
Visit Status			
Current Patient Location	(0038,0300)	O	Input from UI or <zero length>
Patient Identification			
Patient’s Name	(0010,0010)	R	Input from UI or <zero length>
Patient ID	(0010,0020)	R	Input from UI or <zero length>

R = Required Key**, O =** Optional Key

The Return Key Attribute handling and supported Status Codes are identical to the “Update Worklist” activity.

Status Codes of the Worklist C-FIND

The worklist SCU interprets following status codes:

4.2.6.4 Association Acceptance Policy

N/A

4.2.7 Modality Performed Procedure Step AE Specification SOP Classes SOP Classes

The Modality Performed Procedure Step SCU (Patient Registration and MPPS UI) provide information about a performed real-world Procedure to a remote SCP (Information System).

4.2.7.1 SOP Classes

For SOP Classes supported, please refer to section "Workflow Management" in "Conformance Statement Overview".

4.2.7.2 Association Policy

4.2.7.2.1 General

The creation of MPPS Instance is done automatically by *syngo* whenever a patient is registered for image acquisition through the Patient Registration dialog.

Further updates on the MPPS data can be done interactively from the related MPPS user interface. The MPPS "Complete" or "Discontinued" states can be set from user interface.

The default PDU size from *syngo* will be 515KB.

4.2.7.2.2 Number of Associations

The *syngo* DICOM application initiates one association at a time to create or set the MPPS instance.

4.2.7.2.3 Asynchronous Nature

The *syngo* DICOM software does not support asynchronous communication (multiple outstanding transactions over a single association).

4.2.7.2.4 Implementation Identifying Information

For Implementation Identifying Information please refer to Table 3 in "Conformance Statement Overview".

4.2.7.3 Association Initiation Policy

The *syngo* DICOM application will notify a RIS (MPPS Manager) about the status of a procedure while it is performed. It establishes an association by using the

- N-CREATE DIMSE according to the CREATE Modality Performed Procedure Step SOP Instance operation or a
- N-SET DIMSE to update the contents and state of the MPPS according to the SET Modality Performed Procedure Step Information operation.

It is possible to configure multiple MPPS providers but only one can be active at a time. The active MPPS provider can be selected in the user settings.

4.2.7.3.1 Activity – Patient Registered

A patient is registered by the Patient Registration "Exam" action. From this event the trigger to create a MPPS Instance is derived. The related Instance is then immediately communicated to the configured RIS system. An association is established and the MPPS Instance is sent.

4.2.7.3.1.1 Proposed Presentation Contexts

The *syngo* DICOM application will propose Presentation Contexts as shown in the following table:

Table 45: Proposed Presentation Contexts

Presentation Context Table – "Update Flag Information"				
Abstract Syntax	**Transfer Syntax**		**Role**	**Extended Negotiation**
Description	**Name List**	**UID List**		
1.2.840.10008.3.1.2.3.3 Modality Performed Procedure Step	Explicit VR Little Endian Explicit VR Big Endian Implicit VR Little Endian	1.2.840.10008.1.2.1 1.2.840.10008.1.2.2 1.2.840.10008.1.2	SCU	None

4.2.7.3.1.2 SOP specific Conformance for SOP classes

Attributes for the Performed procedure Step N-CREATE

The Siemens *syngo* DICOM Modality Performed Procedure Step SCU informs the remote SCP when the examination of a scheduled procedure step will be performed (i.e., the patient is registered). The N-CREATE message is sent when the examination is started with successful registration of the patient data. The following table describes the supported attributes of a N-CREATE message.

Table 46: Performed Procedure Step N-CREATE Attributes

Attribute Name	Tag	Type	Value
SOP Common			
Specific Character Set	(0008,0005)	1C	from MWL or created
Performed Procedure Step Relationship			
Scheduled Step Attribute Sequence	(0040,0270)	1	
>Study Instance UID	(0020,000D)	1	from MWL or created
>Referenced Study Sequence	(0008,1110)	2	from MWL or <zero length>
>>Referenced SOP Class UID	(0008,1150)	1C	
>>Referenced SOP Instance UID	(0008,1155)	1C	
>Accession Number	(0008,0050)	2	from MWL or user input
>Placer Order Number/Imaging Service Request	(0040,2016)	3	from MWL or <zero length>
>Filler Order Number/Imaging Service Request	(0040,2017)	3	from MWL or <zero length>
>Requested Procedure ID	(0040,0001)	2	from MWL or user input
>Requested Procedure Description	(0032,1060)	2	from MWL or <zero length>
>Scheduled Procedure Step ID	(0040,0009)	2	from MWL or <zero length>
>Scheduled Procedure Step Description	(0040,0007)	2	from MWL or <zero length>
>Scheduled Protocol Code Sequence	(0040,0008)	2	from MWL or <zero length>
>>Code Value	(0008,0100)	1C	
>>Coding Scheme Designator	(0008,0102)	1C	
>>Coding Scheme Version	(0008,0103)	3	

>>Code Meaning	(0008,0104)	3	
Patient's Name	(0010,0010)	2	from MWL or user input
Patient ID	(0010,0020)	2	from MWL or user input
Patient's Birth Date	(0010,0030)	2	from MWL or user input
Patient's Sex	(0010,0040)	2	from MWL or user input
Referenced Patient Sequence	(0008,1120)	2	from MWL or <zero length>
>Referenced SOP Class UID	(0008,1150)	1C	
>Referenced SOP Instance UID	(0008,1155)	1C	
Performed Procedure Step Information			
Performed Procedure Step ID	(0040,0253)	1	From SPS ID or created
Performed Station AE Title	(0040,0241)	1	own AE Title
Performed Station Name	(0040,0242)	2	own hostname
Performed Location	(0040,0243)	2	from SPS location or <zero length>
Performed Procedure Step Start Date	(0040,0244)	1	created
Performed Procedure Step Start Time	(0040,0245)	1	created
Performed Procedure Step Status	(0040,0252)	1	"IN PROGRESS"
Performed Procedure Step Description	(0040,0254)	2	from SPS Description or <zero length>
Performed Procedure Type Description	(0040,0255)	2	<zero length>
Procedure Code Sequence	(0008,1032)	2	from Requested Procedure Code or <zero length>
>Code Value	(0008,0100)	1C	
>Coding Scheme Designator	(0008,0102)	1C	
>Coding Scheme Version	(0008,0103)	3	
>Code Meaning	(0008,0104)	3	
Performed Procedure Step End Date	(0040,0250)	2	<zero length>
Performed Procedure Step End Time	(0040,0251)	2	<zero length>
Comments on the Performed Procedure Steps	(0040,0280)	3	<zero length>
Image Acquisition Results			
Modality	(0008,0060)	1	XA
Study ID	(0020,0010)	2	from Requested Procedure ID or created
Performed Protocol Code Sequence	(0040,0260)	2	from Scheduled Protocol Code Sequence or <zero length>
>Code Value	(0008,0100)	1C	
>Coding Scheme Designator	(0008,0102)	1C	
>Coding Scheme Version	(0008,0103)	3	
>Code Meaning	(0008,0104)	3	

Performed Series Sequence	(0040,0340)	2	
>Performing Physician's Name	(0008,1050)	2C	from MWL or user input
>Operator's Name	(0008,1070)	2C	User input
>Series Instance UID	(0020,000E)	1C	created
>Series Description	(0008,103E)	2C	<zero length>
>Retrieve AE Title	(0008,0054)	2C	<zero length>
>Protocol Name	(0018,1030)	1C	from organ program
>Referenced Image Sequence	(0008,1140)	2C	<zero length>
>Referenced Non-Image Composite SOP Instance Sequence	(0040,0220)	2C	<zero length>
Radiation Dose			
Anatomic Structure, Space or Region Sequence	(0008,2229)	3	<zero length>
Total Time of Fluoroscopy	(0040,0300)	3	<zero length>
Total Number of Exposures	(0040,0301)	3	<zero length>
Distance Source to Detector	(0018,1110)	3	<zero length>
Distance Source to Entrance	(0040,0306)	3	<zero length>
Entrance Dose	(0040,0302)	3	<zero length>
Entrance Dose in mGy	(0040,8302)	3	<zero length>
Exposed Area	(0040,0303)	3	<zero length>
Image and Fluoroscopy Area Dose Product	(0018,115E)	3	<zero length>
Comments on Radiation Dose	(0040,0310)	3	<zero length>
Exposure Dose Sequence	(0040,030E)	3	<zero length>
Billing and Material Management Code			
Billing Procedure Step Sequence	(0040,0320)	3	<zero length>
Film Consumption Sequence	(0040,0321)	3	
>Number of Films	(2100,0170)	3	<zero length>
>Medium Type	(2000,0030)	3	<zero length>
>Film Size ID	(2010,0050)	3	<zero length>
Billing Supplies and Devices Sequence	(0040,0324)	3	
>Billing Item Sequence	(0040,0296)	3	<zero length>
>Quantity Sequence	(0040,0293)	3	
>>Quantity	(0040,0294)	3	<zero length>
>>Measuring Units Sequence	(0040,0295)	3	<zero length>

The Performed Procedure Step SCU interprets the following N-CREATE status codes:

Table 47 - Status Codes "Patient Registered"

Service Status	Meaning	Error Codes (0000.0900)
Failure	Processing Failure	0110
	No such attribute	0105
	Invalid attribute value	0106
	Duplicate SOP Instance	0111
	No such SOP Instance	0112
	No such SOP Class	0118
	Class Instance conflict	0119
	Missing attribute	0120
	Missing attribute value	0121
	Resource limitation	0213
Success	MPPS Instance created	0000

4.2.7.3.2 Activity – MPPS Update

With the MPPS UI the status of the MPPS Instance can be set to “COMPLETED” or “DISCON-TINUED”. During performance of the procedure the status will remain “IN PROGRESS”.

4.2.7.3.2.1 Proposed Presentation Contexts

For "MPPS Update" the same Presentation Contexts as with “Patient registered” are proposed.

4.2.7.3.2.2 SOP specific Conformance for SOP classes

Attributes for the Performed procedure Step N-SET

The Siemens *syngo* DICOM Modality Performed Procedure Step SCU informs the remote SCP about the performed examination and its status. The N-SET message is sent after each acquisition (status "IN PROGRESS") and per finished examination (finished status “COMPLETED” or in-complete status “DISCONTINUED”). The following table describes the supported attributes of a N-SET message.

Table 48 - Performed Procedure Step N-SET Attributes

Attribute Name	Tag	Type	Value
Performed Procedure Step Information			
Performed Procedure Step Status	(0040,0252)	3	"IN PROGRESS" during procedure, “COMPLETED” or “DISCONTINUED” for final N-SET
Performed Procedure Step Description	(0040,0254)	3	from SPS Description or user input
Procedure Code Sequence	(0008,1032)	3	from Requested Procedure
>Code Value	(0008,0100)	1C	
>Coding Scheme Designator	(0008,0102)	1C	

>Coding Scheme Version	(0008,0103)	3	
>Code Meaning	(0008,0104)	3	
Performed Procedure Step End Date	(0040,0250)	1	created
Performed Procedure Step End Time	(0040,0251)	1	created
Comments on the Performed Procedure Steps	(0040,0280)	3	user input
Image Acquisition Results			
Performed Protocol Code Sequence	(0040,0260)	3	from Scheduled Protocol Code Sequence
>Code Value	(0008,0100)	1C	
>Coding Scheme Designator	(0008,0102)	1C	
>Coding Scheme Version	(0008,0103)	3	
>Code Meaning	(0008,0104)	3	
Performed Series Sequence	(0040,0340)	1	
>Performing Physician's Name	(0008,1050)	2C	from MWL or user input
>Protocol Name	(0018,1030)	1C	from related SOP Instance
>Operator's Name	(0008,1070)	2C	user input
>Series Instance UID	(0020,000E)	1C	from related SOP Instance
>Series Description	(0008,103E)	2C	from related SOP Instance
>Retrieve AE Title	(0008,0054)	2C	
>Referenced Image Sequence	(0008,1140)	2C	Series related SOP Instances as items
>>Referenced SOP Class UID	(0008,1150)	1C	
>>Referenced SOP Instance UID	(0008,1155)	1C	
>Referenced Standalone SOP Instance Sequence	(0040,0220)	2C	<zero length>
Radiation Dose			
Total Time of Fluoroscopy	(0040,0300)	3	
Total Number of Exposures	(0040,0301)	3	
Entrance Dose in mGy	(0040,8302)	3	accumulated over complete procedure step
Image and Fluoroscopy Area Dose Product	(0018,115E)	3	accumulated over complete procedure step (dGy*cm2)
Exposure Dose Sequence	(0040,030E)	3	on item for each irradiation event (acquisition or fluoro)
>Radiation Mode	(0018,115A)	3	"PULSED"
>KVP	(0018,0060)	3	peak KV used for this event (KV)

>X-ray Tube Current in µA	(0018,8151)	3	tube current used for this event
>Exposure Time	(0018,1150)	3	time of x-ray in ms for this event
>Comments on Radiation Dose	(0040,0310)	3	additional acquisition specific information (Entrance Dose, Dose Area Product, X-Ray Filter, etc.) as text
Comments on Radiation Dose	(0040,0310)	3	user input
Billing and Material Management Code			
Film Consumption Sequence	(0040,0321)	3	
>Number of Films	(2100,0170)	3	
>Medium Type	(2000,0030)	3	
>Film Size ID	(2010,0050)	3	

The Performed Procedure Step SCU interprets the following N-SET status codes:

Table 49 - Status Codes "MPPS Update"

Service Status	Meaning	Error Codes (0000.0900)
Failure	Processing Failure: Performed Procedure Step Object may no longer be updated.	0110
	No such attribute	0105
	Invalid attribute value	0106
	No such SOP Instance	0112
	Invalid Object instance	0117
	No such SOP Class	0118
	Class Instance conflict	0119
	Missing attribute value	0121
	Resource limitation	0213
Success	MPPS Instance set	0000

Performed Procedure Step ID without MPPS option:

Handling of Performed Procedure Step ID in cases where:

- MPPS is not configured or
- Unscheduled case

The attribute “Performed Procedure Step ID” (0040,0235) will be encoded based on "YYYYMMDDHHMMSS". This date and time are based on the time when the first image is acquired. The "Performed Procedure Step ID" stays the same for all acquired or derived images if the patient is re-registered. A re-registered patient with a new study or new series within the existing study will get a newly assigned "Performed Procedure Step ID".

4.2.7.4 Association Acceptance Policy

N/A

4.3 Communication Profiles

4.3.1 Supported Communication Stacks

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

The product target operating system is Windows 10.

4.3.1.1 OSI Stack

Not supported.

4.3.1.2 TCP/IP Stack

The syngo DICOM application uses the TCP/IP stack from the Windows 10 system. It uses the MergeCOM-3 subroutine library from Merge Technologies Inc. that is based on a Berkeley socket interface.

4.3.1.2.1 API

The *syngo* DICOM application uses the MergeCOM library that is based on a TCP/IP socket interface.

4.3.1.2.2 Physical Media Support

The *syngo* DICOM application is indifferent to the physical medium over which TCP/IP executes. It inherits it from the target operating system upon which it executes.

4.3.1.3 Point-to-Point Stack

Not supported.

4.4 Network Interfaces

4.4.1 Physical Network Interface

The DICOM Interface of *syngo* provides DICOM TCP/IP Network Communication Support and uses the TCP/IP protocol stack from the operating system. It uses the MergeCOM subroutine library. All available Ethernet interfaces are supported.

4.4.2 Additional Protocols

N.A

4.4.3 IPv4 and IPv6 Support

syngo supports the transfer of the DICOM images over the network nodes and workstations using IPv4 and optionally IPv6 protocols using Transfer/Send to features.

Exporting of the images to a network shared folder using Export to offline feature using IPv4 and optionally using IPv6 protocols.

4.5 Configuration

4.5.1 AE Title / Presentation Address Mapping

4.5.2 Local AE Titles

According to the DICOM Standard, the AET string can be up to 16 characters long and must not contain any extended characters, only 7-bit ASCII characters (excluding Control Characters).

Note: The current implementation of *syngo* does not allow Spaces and special characters (like &<> ") in the AE title string.

Change of the default AE Titles chosen by the system can be performed in the Service UI under "Configuration / DICOM / General" item - first page.

Table 50 - Default AET Characteristics

Application Entity	Default AE Title	TCP/IP Port
Verification SCU	RANDOM_STR RANDOM_STR_S	-
Verification SCP		2762(fixed) 104 (fixed)
Storage SCU		-
Storage SCP		2762(fixed) 104 (fixed)
Query/Retrieve SCU		-
Query/Retrieve SCP		2762(fixed) 104 (fixed)
Print SCU	RANDOM_STR	-
Worklist SCU	RANDOM_STR	-
MPPS SCU		-

Port 2762 is used for Secure DICOM Communication and Port 104 is used for Unsecure DICOM Communication. There are two AET for Storage SCP, Verification SCP and Query/Retrieve SCP. RANDOM_STR denotes the random AET value is randomly generated. RANDOM_STR_S denotes random Aet value for Secure DICOM communication.

4.5.3 Remote AE Titles

When "trusted host functionality" is enabled, all external AE Titles must be configured to be able to communicate with *syngo*.

For each remote AE the following data and capabilities can be configured:

Table 51 - Remote AE Configuration Items

Remote AE configuration item	Comment
Host Name	As defined in the network domain. This has to be configured also for any DICOM AE that wishes to connect to SCP services of *syngo*.
TCP/IP address	As defined in the network domain. This has to be configured also for any DICOM AE that wishes to connect to SCP services of *syngo*.
Logical Name	Name for the AE used in the user interfaces of the *syngo* applications.
AE Title	AET, as provided by network administration
Port Number	Port Number, as provided by network administration
If **Storage** Service support is checked	
Transfer Syntax	Selection of uncompressed transfer Syntaxes supported by remote AE
Compression	Selection of additional compression Syntaxes supported for remote AE
Default Node	"First default"/" second default"/ ["no default"] - activating this feature will show "Send to <logical name>" in the Transfer tool menu for quick access.

Preference Node	When checked, the remote AE will be assigned to a keyboard shortcut key.
Archive Node	When checked, sending to remote AET will set status of a(archived), else s(sent) is indicated.
Default Archive	When checked, the remote AE will be listed as default archive in User interfaces.
Graphics in Pixel Data	When checked, the DICOM overlay will not be encoded in attribute (60xx,3000) Overlay Data, but masked in the "unused bits" of the pixel data (only for uncompressed transfer syntaxes). For backwards compatibility with legacy AE.
Select SC node	Select a previously configured node as target for Storage Commitment when sending DICOM objects to the configured AE. Default is the same node as to which the Objects are sent.
Select SC AET	Select AET that corresponds to the above selected node that receives the Storage Commitment request. Default is the above specified "AE Title".
SC Result in same association	When checked the *syngo* DICOM application will await the Storage Commitment N-EVENT-REPORT on the same association. Default is "not checked" (= different association).
SC result timeout	Timeout in hours and minutes to wait at the open association. Default: 01:00 (hour:minutes).
If **Storage Commitment** Service support is checked	
n. a.	The related Storage Commitment configuration is either in the Storage section of the same AET or different AET (in case the current AET is only Storage Commitment Provider).
If **Query** Service support is checked	
provides DICOM Query model	The Query models supported by this AET can be selected. When possible, the STUDY ROOT model should preferably be configured
If **Retrieve** Service support is checked	
n. a.	Checking Retrieve support for an AET is the only needed configuration item. This will allow access to the "Import" feature in the Query result browser.
If **Modality Worklist** Service support is checked	
Query Waiting time	The time to wait for the C-FIND-RSP after sending the C-FIND-RQ (default 20 sec.)
Max Query Match Number	The maximum number of entries accepted in one worklist (default is 200)
Query Interval	The time between two C-FIND-RQ to the Hospital Information system (default is 60 min, minimum is 3 min, maximum is 1440 min i.e., 24 hours)
Automatic removal of canceled/rescheduled Requests	Checking this item will remove all unused entries from the scheduler list prior to inserting the worklist responses with each query.

4.5.4 Parameters

System parameters can be changed in the Service UI under "Configuration / DICOM / General" item.

Table 52 - General Parameter Settings and Timeouts

Time-out Values				
Parameter	**Default**	**Min**	**Max**	**Comment**

	Value[sec]	[sec]	[sec]	
Accepting/Rejecting an Association Request	60	15	600	Wait for an Association Request or wait for a Peer to shut down the Association
Association Open Request	60	15	600	Wait for a reply to an Association Accept Request
Association Close Request	60	15	600	Wait for a reply to an Association Release Request
Accepting a Message over Network	60	15	600	Wait for a Network Write to be accepted
Waiting for Data between TCP/IP Packets	60	15	600	Wait for Data between TCP/IP packets
Response from Remote Node for Storage/Query/Retrieve	600	15	600	Time between Service Request and Service Response
Accept network connect	60	15	600	
General Transfer Setting				
Simultaneous DICOM associations	10	1	10	Number of simultaneous associations running.
Maximum PDU Size	515kByte	4kByte	1MByte	Proposed PDU size, each selectable value is doubled from previous, starting with 4kB. Additionally for optimization for some networks 28kByte are provided.

5 Media Interchange

The following "Offline Media Application Profiles (incl. private extensions)" are supported by *syngo* archive options.

Table 53 - Supported Application Profiles

Application Profile
Basic Cardiac
1024 Extended Cardiac
General Purpose CDR

5.1 Implementation Model

5.1.1 Application Data Flow Diagram

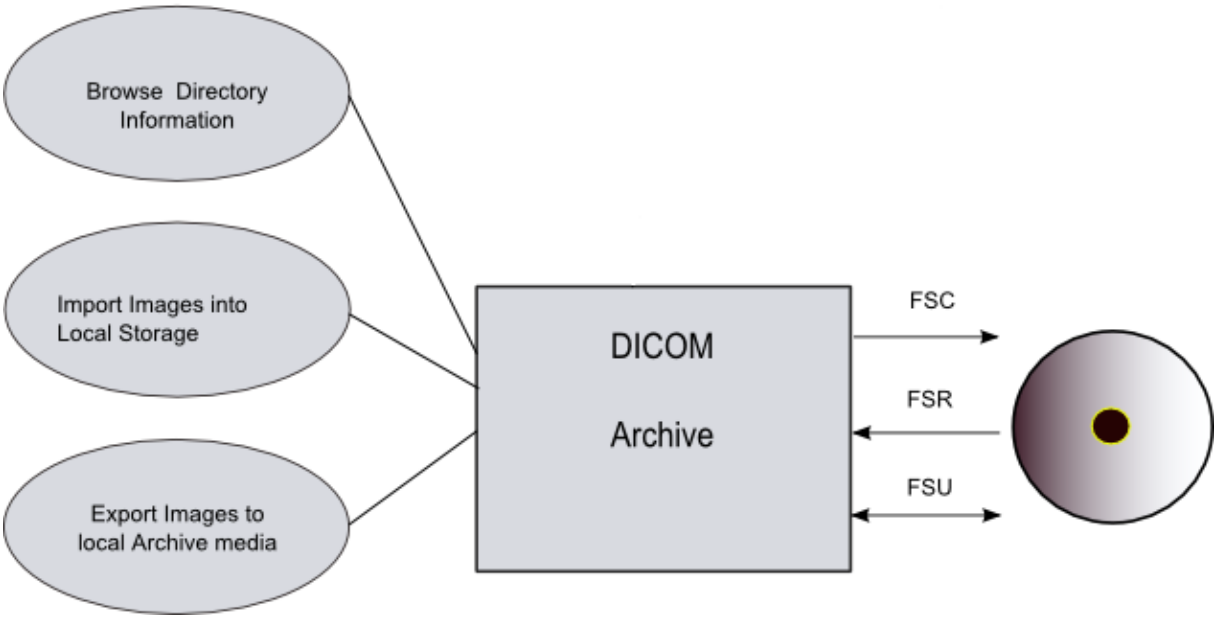


Figure 2: Application Data Flow DICOM Archive

The DICOM archive application will serve as an interface to the CD-R/DVD/BD/USB offline medium device.

The DICOM Archive application will support the 120mm CD-R, DVD and BD-R medium.

The FSU role will update new SOP Instances only to media with pre-existing File-sets conforming to the Application Profiles supported.

The contents of the DICOMDIR will temporarily be stored in Archive-Database.

5.1.2 Functional Definition of AEs

The *syngo* DICOM Offline Media Storage application consists of the DICOM Archive application entity serving all interfaces to access offline media. The DICOM Archive application is capable of

- creating a new File-set onto an unwritten medium (Export to...)
- updating an existing File-set by writing new SOP Instances onto the medium (Export to...)
- importing SOP Instances from the medium onto local storage
- reading the File-set's DICOMDIR information temporarily into database and pass it to display applications.

5.1.3 Physical Media and Formats

The PRI-SYNGO-CD Profile requires the 120mm CD-R physical media with the ISO/IEC 9660 Media Format, as defined in DICOM standard

The PRI-SYNGO-DVD Profile requires the 120mm DVD physical media with the UDF 2.01 Media Format, as defined in DICOM Standard.

The PRI-SYNGO-BD Profile requires the 120mm BD-R physical media with the UDF 2.5 Media-Format, as defined in DICOM standard.

The PRI-SYNGO-USB Profile requires the USB of any size. There is no size limit to the USB de-vice.

5.1.4 Activities

5.1.4.1 Description and Sequencing of Activity FSR

The DICOM Archive application will not perform transfers until the Directory information of the DICOMDIR is completely read in and displayed in the Browser.

5.1.4.2 Implementation Identifying Information

For Implementation Identifying Information please refer to "Table 3 - Implementation Identifying Information" in "Conformance Statement Overview".

5.2 AE Specifications

5.2.1 DICOM Archive – Specification

The DICOM Archive provides Standard conformance to Media Storage Service Class (Inter-change Option).

Details are listed in following Table:

Table 54: Application Profiles, Activities, and Roles for DICOM Archive

Application Profiles Supported	Real-World Activity	Role	SC Option
PRI-SYNGO-CD PRI-SYNGO-DVD PRI-SYNGO-BD PRI-SYNGO-USB *3 AUG-GEN-CD AUG-CTMR-CD *1 AUG-XA1K-CD *1	Browse Directory Information	FSR	Interchange
	Import into local Storage	FSR	Interchange
	Export to local archive media	FSC, FSU	Interchange
STD-GEN-CD STD-GEN-DVD STD-GEN-BD STD-GEN-USB *3 STD-CTMR-CD STD-XABC-CD STD-XA1K-CD	Browse Directory Information	FSR	Interchange
	Import into local Storage	FSR	Interchange

STD-US-zz-yF-xxxxxx *23			

*1 – With no Private SOP Class used, the PRI-SYNGO-CD/DVD/BD-R/USB profile definitions are appropriate to describe the augmentation of the related STD Profiles

*2 – All the combinations of the following values for xx, yF and xxxxxx are supported: yF={SF|MF}, xx={ID|SC|CC},xxxxxx={|CDR|DVD|BD-R}

*3 – The USB Support is possible when the USB is enabled with Browser support in the Local service page.

5.2.1.1 File Meta Information for the Application Entity

The Source Application Entity Title is set by configuration and is same as used for Storage provider.

5.2.1.2 Activities of DICOM Archive

5.2.1.2.1 Activity "Browse Directory Information"

The DICOM Archive application acts as FSR using the interchange option when requested to read the media directory.

The DICOM archive application will read the DICOMDIR and insert those directory entries that are valid for the application profiles supported, into a local database. The database can then be used for browsing media contents.

Note: Icon Image Sequence is also supported in DICOMDIR. But only those Icon Images with Bits Allocated (0028,0100) equal to 8 and size of 64x64 or 128x128 pixels are imported into database and are visible in the Browser.

5.2.1.2.1.1 Media Storage Application Profile

See "Table 54 - Application profiles, Activities, and Roles for DICOM Archive" in section 3.2.1 for the Application Profiles listed that invoke this Application Entity for the Browse Directory Information activity.

5.2.1.2.2 Activity: Import into local Storage

The DICOM Archive application acts as FSR using the interchange option when being requested to read SOP Instances from the medium into the local storage.

The SOP Instance(s) selected from the media directory will be copied into the local storage. Only SOP Instances, that are valid for the application profile supported and are listed as supported by the Storage SCP Conformance section (Network DCS, 5.1.3), can be retrieved from Media Storage.

For media conforming to the STD-GEN-xxx Profile the following SOP Classes will be supported as FSR:

Table 55 - STD-GEN-xxx Profile Supported SOP Classes

Information Object Definition	SOP Class UID	Transfer Syntax UID
CR Image	1.2.840.10008.5.1.4.1.1.1	Explicit VR Little Endian Uncompressed 1.2.840.10008.1.2.1
CT image	1.2.840.10008.5.1.4.1.1.2	Explicit VR Little Endian Uncompressed 1.2.840.10008.1.2.1
Enhanced CT Image	1.2.840.10008.5.1.4.1.1.2.1	Explicit VR Little Endian Uncompressed 1.2.840.10008.1.2.1

DX Image-For Processing	1.2.840.10008.5.1.4.1.1.1.1.1	Explicit VR Little Endian Uncompressed 1.2.840.10008.1.2.1
DX Image-For Presentation	1.2.840.10008.5.1.4.1.1.1.1	Explicit VR Little Endian Uncompressed 1.2.840.10008.1.2.1
IOX Image-For Processing	1.2.840.10008.5.1.4.1.1.1.3.1	Explicit VR Little Endian Uncompressed 1.2.840.10008.1.2.1
IOX Image-For Presentation	1.2.840.10008.5.1.4.1.1.1.3	Explicit VR Little Endian Uncompressed 1.2.840.10008.1.2.1
MG Image-For Processing	1.2.840.10008.5.1.4.1.1.1.2.1	Explicit VR Little Endian Uncompressed 1.2.840.10008.1.2.1
MG Image-For Presentation	1.2.840.10008.5.1.4.1.1.1.2	Explicit VR Little Endian Uncompressed 1.2.840.10008.1.2.1
MR Image	1.2.840.10008.5.1.4.1.1.4	Explicit VR Little Endian Uncompressed 1.2.840.10008.1.2.1
Enhanced MR Image	1.2.840.10008.5.1.4.1.1.4.1	Explicit VR Little Endian Uncompressed 1.2.840.10008.1.2.1
MR Spectroscopy Image	1.2.840.10008.5.1.4.1.1.4.2	Explicit VR Little Endian Uncompressed 1.2.840.10008.1.2.1
Enhanced Colored MR Image	1.2.840.10008.5.1.4.1.1.4.3	Explicit VR Little Endian Uncompressed 1.2.840.10008.1.2.1
Grayscale Softcopy Presentation State Storage	1.2.840.10008.5.1.4.1.1.11.1	Explicit VR Little Endian Uncompressed 1.2.840.10008.1.2.1
X-Ray 3D Angiographic Image Storage	1.2.840.10008.5.1.4.1.1.13.1.1	Explicit VR Little Endian Uncompressed 1.2.840.10008.1.2.1
Breast Tomosynthesis Image	1.2.840.10008.5.1.4.1.1.13.1.3	Explicit VR Little Endian Uncompressed 1.2.840.10008.1.2.1
NM Image	1.2.840.10008.5.1.4.1.1.20	Explicit VR Little Endian Uncompressed 1.2.840.10008.1.2.1
PET Image	1.2.840.10008.5.1.4.1.1.128	Explicit VR Little Endian Uncompressed 1.2.840.10008.1.2.1
RT Dose	1.2.840.10008.5.1.4.1.1.481.2	Explicit VR Little Endian Uncompressed 1.2.840.10008.1.2.1
RT Image	1.2.840.10008.5.1.4.1.1.481.1	Explicit VR Little Endian Uncompressed 1.2.840.10008.1.2.1
RT Plan	1.2.840.10008.5.1.4.1.1.481.5	Explicit VR Little Endian Uncompressed 1.2.840.10008.1.2.1

RT Structure Set	1.2.840.10008.5.1.4.1.1.481.3	Explicit VR Little Endian Uncompressed 1.2.840.10008.1.2.1
RT Beams Treatment Record	1.2.840.10008.5.1.4.1.1.481.4	Explicit VR Little Endian Uncompressed 1.2.840.10008.1.2.1
RT Brachy Treatment Record	1.2.840.10008.5.1.4.1.1.481.6	Explicit VR Little Endian Uncompressed 1.2.840.10008.1.2.1
RT Treatment Summary Record	1.2.840.10008.5.1.4.1.1.481.7	Explicit VR Little Endian Uncompressed 1.2.840.10008.1.2.1
RT Ion Plan	1.2.840.10008.5.1.4.1.1.481.8	Explicit VR Little Endian Uncompressed 1.2.840.10008.1.2.1
RT Ion Beams Treatment Record	1.2.840.10008.5.1.4.1.1.481.9	Explicit VR Little Endian Uncompressed 1.2.840.10008.1.2.1
Secondary Capture Image	1.2.840.10008.5.1.4.1.1.7	Explicit VR Little Endian Uncompressed 1.2.840.10008.1.2.1
Multi-frame Single Bit Secondary Capture Image	1.2.840.10008.5.1.4.1.1.7.1	Explicit VR Little Endian Uncompressed 1.2.840.10008.1.2.1
Multi-frame Grayscale Byte Secondary Capture Image	1.2.840.10008.5.1.4.1.1.7.2	Explicit VR Little Endian Uncompressed 1.2.840.10008.1.2.1
Multi-frame Grayscale Word Secondary Capture Image	1.2.840.10008.5.1.4.1.1.7.3	Explicit VR Little Endian Uncompressed 1.2.840.10008.1.2.1
Multi-frame True Color Secondary Capture Image	1.2.840.10008.5.1.4.1.1.7.4	Explicit VR Little Endian Uncompressed 1.2.840.10008.1.2.1
Ultrasound Image (retired)	1.2.840.10008.5.1.4.1.1.6	Explicit VR Little Endian Uncompressed 1.2.840.10008.1.2.1
Ultrasound Image	1.2.840.10008.5.1.4.1.1.6.1	Explicit VR Little Endian Uncompressed 1.2.840.10008.1.2.1
Ultrasound Multi-frame Image (retired)	1.2.840.10008.5.1.4.1.1.3	Explicit VR Little Endian Uncompressed 1.2.840.10008.1.2.1
Ultrasound Multi-frame Image	1.2.840.10008.5.1.4.1.1.3.1	Explicit VR Little Endian Uncompressed 1.2.840.10008.1.2.1
X-Ray Angiographic Image	1.2.840.10008.5.1.4.1.1.12.1	Explicit VR Little Endian Uncompressed 1.2.840.10008.1.2.1

X-Ray Radiofluoroscopic Image	1.2.840.10008.5.1.4.1.1.12.2	Explicit VR Little Endian Uncompressed 1.2.840.10008.1.2.1
12-lead ECG Waveform Storage	1.2.840.10008.5.1.4.1.1.9.1.1	Explicit VR Little Endian Uncompressed 1.2.840.10008.1.2.1
Ambulatory ECG Waveform Storage	1.2.840.10008.5.1.4.1.1.9.1.3	Explicit VR Little Endian Uncompressed 1.2.840.10008.1.2.1
Basic Voice Audio Waveform Storage	1.2.840.10008.5.1.4.1.1.9.4.1	Explicit VR Little Endian Uncompressed 1.2.840.10008.1.2.1
Cardiac Electrophysiology Waveform Storage	1.2.840.10008.5.1.4.1.1.9.3.1	Explicit VR Little Endian Uncompressed 1.2.840.10008.1.2.1
General ECG Waveform Storage	1.2.840.10008.5.1.4.1.1.9.1.2	Explicit VR Little Endian Uncompressed 1.2.840.10008.1.2.1
Hemodynamic Waveform Storage	1.2.840.10008.5.1.4.1.1.9.2.1	Explicit VR Little Endian Uncompressed 1.2.840.10008.1.2.1
CSA Non-Image	1.3.12.2.1107.5.9.1	Explicit VR Little Endian Uncompressed 1.2.840.10008.1.2.1
RAW Data Storage	1.2.840.10008.5.1.4.1.1.66	Explicit VR Little Endian Uncompressed 1.2.840.10008.1.2.1
Spatial Registration Storage	1.2.840.10008.5.1.4.1.1.66.1	Explicit VR Little Endian Uncompressed 1.2.840.10008.1.2.1
Spatial Fiducials Storage	1.2.840.10008.5.1.4.1.1.66.2	Explicit VR Little Endian Uncompressed 1.2.840.10008.1.2.1
Segmentation Storage	1.2.840.10008.5.1.4.1.1.66.4	Explicit VR Little Endian Uncompressed 1.2.840.10008.1.2.1
Surface Segmentation Storage	1.2.840.10008.5.1.4.1.1.66.5	Explicit VR Little Endian Uncompressed 1.2.840.10008.1.2.1
Basic Text SR	1.2.840.10008.5.1.4.1.1.88.11	Explicit VR Little Endian Uncompressed 1.2.840.10008.1.2.1
Enhanced SR	1.2.840.10008.5.1.4.1.1.88.22	Explicit VR Little Endian Uncompressed 1.2.840.10008.1.2.1
Comprehensive SR	1.2.840.10008.5.1.4.1.1.88.33	Explicit VR Little Endian Uncompressed 1.2.840.10008.1.2.1
Mammography CAD SR	1.2.840.10008.5.1.4.1.1.88.50	Explicit VR Little Endian Uncompressed 1.2.840.10008.1.2.1
Key Object Selection	1.2.840.10008.5.1.4.1.1.88.59	Explicit VR Little Endian Uncompressed 1.2.840.10008.1.2.1

Document		
Chest CAD SR	1.2.840.10008.5.1.4.1.1.88.65	Explicit VR Little Endian Uncompressed 1.2.840.10008.1.2.1
Procedure Log	1.2.840.10008.5.1.4.1.1.88.40	Explicit VR Little Endian Uncompressed 1.2.840.10008.1.2.1
X-Ray Radiation Dose SR	1.2.840.10008.5.1.4.1.1.88.67	Explicit VR Little Endian Uncompressed 1.2.840.10008.1.2.1
Radiopharmaceutical Radiation Dose SR	1.2.840.10008.5.1.4.1.1.88.68	Explicit VR Little Endian Uncompressed 1.2.840.10008.1.2.1
Encapsulated PDF	1.2.840.10008.5.1.4.1.1.104.1	Explicit VR Little Endian Uncompressed 1.2.840.10008.1.2.1

5.2.1.2.2.1 Media Storage Application Profile

See "Table 54 - Mapping of Application Profiles Supported" in section 3.2.1 for the Application Profiles listed that invoke this Application Entity for the Import into Local Storage activity.

5.2.1.2.3 Activity: Export to local Archive Media

The DICOM Archive application acts as FSU (for media with existing DICOM file-set) or FSC (media not initialized) using the interchange option when requested to copy SOP Instances from the local storage to local Archive Medium.

The DICOM Archive application will receive a list of SOP Instances to be copied to the local archive medium. According to the state of the medium inserted (new medium, Medium with DICOM file-set) the validity of the SOP Instances according to the applicable profile is checked. Only valid SOP Instances are accepted.

The DICOM Archive application will not finalize the medium.

With the resizing feature of the *syngo* DICOM application, a copy of images in Cardiac Format (512x512, 8Bit) can be written onto medium.

5.2.1.2.3.1 Media Storage Application Profile

See "Table 54 - Mapping of Application Profiles Supported" in section 3.2.1 for the Application Profiles listed that invoke this Application Entity for the Export to Local Archive Media activity.

5.3 Class and Profile Identification

This document defines an Application Profile Class for "*syngo*® speaking[a]" modalities or applications. The identifier for this class shall be PRI-SYNGO. This class is intended to be used for inter-change of extended and private Information Objects via CD-R offline media between dedicated acquisition or workstation modalities build from a common *syngo* architecture. The specific application profiles in this class are shown in Table below:

Table 56 – Application Profile for Media Support in *syngo*

Application Profile	Identifier	Description
"*syngo* speaking" System on CD-R"	PRI-SYNGO-CD	Handles interchange of Composite SOP Instances and privately defined SOP Instances (Siemens Non-Image IOD)

"*syngo* speaking" System on DVD R	PRI_SYNGO_DVD	Handles interchange of Composite SOP Instances and privately defined SOP Instances (Siemens Non-Image IOD)
"*syngo* speaking" System on BD R	PRI_SYNGO_BD	Handles interchange of Composite SOP Instances and privately defined SOP Instances (Siemens Non-Image IOD)
"*syngo* speaking" System on USB (If Browser support is configured in Local service page of *syngo*)	PRI_SYNGO_USB	Handles interchange of Composite SOP Instances and privately defined SOP Instances (Siemens Non-Image IOD)

5.4 Augmented and Private Application Profiles

N.A

5.5 Media Configuration

5.5.1 Auto -Labeling

Please refer to most recent Service / Configuration documentation of *syngo* for activating the au-to-labeling of CD media to avoid the label inquiry dialog when using automatic media export. The auto-labeling can be activated with the "Viewer on CD" feature being implicitly checked or not.

6 Transformations of DICOM to CDA

N/A

7 Support of Extended Character Sets

The *syngo* DICOM application supports the following character sets as defined in the four tables below:

Table 57: Single-Byte Character Sets without Code Extension

Character Set Description	Defined Term	ISO registration number	Character Set
Default repertoire	none	ISO_IR 6	ISO 646:
Latin alphabet No. 1	ISO_IR 100	ISO_IR 100	Supplementary set
		ISO_IR 6	ISO 646:
Latin alphabet No. 2	ISO_IR 101	ISO_IR 101	Supplementary set
		ISO_IR 6	ISO 646
Latin alphabet No. 3	ISO_IR 109	ISO_IR 109	Supplementary set
		ISO_IR 6	ISO 646
Latin alphabet No. 4	ISO_IR 110	ISO_IR 110	Supplementary set
		ISO_IR 6	ISO 646
Cyrillic	ISO_IR 144	ISO_IR 144	Supplementary set
		ISO_IR 6	ISO 646
Arabic	ISO_IR 127	ISO_IR 127	Supplementary set
		ISO_IR 6	ISO 646
Greek	ISO_IR 126	ISO_IR 126	Supplementary set
		ISO_IR 6	ISO 646
Hebrew	ISO_IR 138	ISO_IR 138	Supplementary set
		ISO_IR 6	ISO 646
Latin alphabet No. 5	ISO_IR 148	ISO_IR 148	Supplementary set
		ISO_IR 6	ISO 646
Japanese	ISO_IR 13	ISO_IR 13	JIS X 0201: Katakana
		ISO_IR 14	JIS X 0201: Romaji

Table 58: Single-Byte Characters Sets with Code Extension

Character Set Description	Defined Term	Standard for Code Extension	ESC sequence	ISO registration number	Character Set
Default repertoire	ISO 2022 IR 6	ISO 2022	ESC 02/08 04/02	ISO-IR 6	ISO 646
Latin alphabet No.1	ISO 2022 IR 100	ISO 2022	ESC 02/13 04/01	ISO-IR 100	Supplementary set
		ISO 2022	ESC 02/08 04/02	ISO-IR 6	ISO 646
Latin alphabet No.2	ISO 2022 IR 101	ISO 2022	ESC 02/13 04/02	ISO-IR 101	Supplementary set
		ISO 2022	ESC 02/08 04/02	ISO-IR 6	ISO 646
Latin alphabet No.3	ISO 2022 IR 109	ISO 2022	ESC 02/13 04/03	ISO-IR 109	Supplementary set
		ISO 2022	ESC 02/08 04/02	ISO-IR 6	ISO 646
Latin alphabet No.4	ISO 2022 IR 110	ISO 2022	ESC 02/13 04/04	ISO-IR 110	Supplementary set
		ISO 2022	ESC 02/08 04/02	ISO-IR 6	ISO 646
Cyrillic	ISO 2022 IR 144	ISO 2022	ESC 02/13 04/12	ISO-IR 144	Supplementary set
		ISO 2022	ESC 02/08 04/02	ISO-IR 6	ISO 646
Arabic	ISO 2022 IR 127	ISO 2022	ESC 02/13 04/07	ISO-IR 127	Supplementary set
		ISO 2022	ESC 02/08 04/02	ISO-IR 6	ISO 646
Greek	ISO 2022 IR 126	ISO 2022	ESC 02/13 04/06	ISO-IR 126	Supplementary set
		ISO 2022	ESC 02/08 04/02	ISO-IR 6	ISO 646
Hebrew	ISO 2022 IR 138	ISO 2022	ESC 02/13 04/08	ISO-IR 138	Supplementary set
		ISO 2022	ESC 02/13 04/02	ISO-IR 6	ISO 646
Latin alphabet No. 5	ISO 2022 IR 148	ISO 2022	ESC 02/13 04/13	ISO-IR 148	Supplementary set
		ISO 2022	ESC 02/13 04/02	ISO-IR 6	ISO 646
Japanese	ISO 2022 IR 13	ISO 2022	ESC 02/13 04/09	ISO-IR 13	JIS X 0201: Katakana
		ISO 2022	ESC 02/13 04/10	ISO-IR 14	JIS X 0201-1976: Romaji

Table 59: Multi-Byte Character Set without Code Extension

Character Set Description	Defined Term	ISO registration number	Character Set
Unicode	ISO_IR 192	ISO 10646	Unicode in UTF-8
Chinese	GB18030	GB18030	GB 18030-2000 (China Association for Standardization)

Table 60: Multi-Byte Character Sets with Code Extension

Character Set Description	Defined Term	Standard for Code Extension	ESC sequence	ISO registration number	Character Set
Japanese	ISO 2022 IR 87	ISO 2022	ESC 02/04 04/02	ISO-IR 87	JIS X 0208: Kanji
	ISO 2022 IR 159	ISO 2022	ESC 02/04 02/08 04/04	ISO-IR 159	JIS X 0212: Supplementary Kanji set
Chinese[1)]	ISO 2022 IR 58	ISO 2022	ESC 02/04 04/01	ISO-IR 58	GB2312-80 (China Association for Standardization)

1) This Character Set is an extension of DICOM for the Chinese language.

When there is a mismatch between the Specific Character Set tag (0008,0005) and the characters in an IOD received by the system, then the following measures are taken to make the char-acters DICOM conform:

- Try to import with ISO_IR 100. If ISO_IR 100 fails, convert each illegal character to a '?'.

There are now three categories of character sets which have to be differentiated because of their different encoding formats:

- Conventional ISO character sets: ISO_IR 6, ISO 2022 IR 6, ISO_IR 100, etc., encoded in ISO 2022
- ISO_IR 192 encoded in UTF-8
- GB18030 encoded in GB18030

It is not possible to recognize the following mismatches automatically on receiving or importing:

- An attribute value is encoded in ISO_IR 192 ←→ (0008,0005) contains a conventional ISO character set as primary character set
- An attribute value is encoded in GB18030 ←→ (0008,0005) contains a conventional ISO character set as primary character set
- An attribute value is encoded in ISO 2022 ←→ (0008,0005) contains ISO_IR 192
- An attribute value is encoded in ISO 2022←→(0008,0005) contains GB18030

An IOD that contains one of the above-mentioned inconsistencies is not DICOM conformant. As these kinds of inconsistencies cannot be recognized by the system, the IOD will not be rejected but the character data might be corrupted.

Older versions of *syngo* do not support the newly introduced character sets ISO_IR 192 and GB18030 and their special encodings. That means, an IOD which contains one of these new character sets in (0008,0005) will be rejected by an older *syngo* system.

8 Attribute Confidentiality Profiles

N/A

9 Security

syngo conforms to the IHE Basic Security Integration Profile that is used for the DICOM Communication.
syngo allows the use of either a conventional (non-secure) DICOM communication or a secure DICOM communication. For secure DICOM communication *syngo* application uses Transport Layer Protocol (Protocol version TLS v1.2 is enabled by default and the protocol versions TLS Protocol v1.1 and TLS v1.0 are disabled by default). Following features are supported for the secure DICOM communication. The port in which syngo acts as SCP for secure DICOM communication is 2762 (fixed). The port in which *syngo* acts as SCP for unsecure DICOM communication is 104 (fixed). By default, unsecure mode is not available.

- The following security profile are done in *syngo* using TLS protocols.
- Secure authentication of node
- Integrity and confidentiality of transmitted data.
- Generation of audit trail records access control and user authentication.

9.1 Security Profiles

syngo conforms to the Basic TLS Transport Connection Profile.

syngo initiates the TLS connections and accepts TLS connections with Storage commitment. *syngo* provides a configuration panel by which local systems can configure the certificate that needs to bind for DICOM communication. Secure communication is a "mode of operation" of *syngo* supported by the implementation of the DICOM Basic TLS Secure Transport Connection Profile. This functionality will be used by the nodes that can authenticate each other before they exchange DICOM information. For secure communication the TLS protocol is used which pro-vides message authentication, integrity and confidentiality. *syngo* supports TLS Protocol v1.2 by default and TLS Protocol v1.1 and TLS Protocol v1.0 are disabled by default. By enabling the service configuration disabled protocols TLS Protocol v1.1 and TLS Protocol v1.0 are enabled and used for secure DICOM communication.

syngo supports X.509 certificates. The type of X.509 certificates that are supported in *syngo* are

1) Self-Signed certificate
2) Certificate for which chain building (Trusted chain building, Trusted CA) is possible.

The following TLS certification checks will be done (TLS Handshake). The machine (either server or client) that will send its certificate will:

- Choose the certificate according to Common Name (CN), if the *syngo* self-signed is used. If customer specific certificate needs to be used, then Serial Number of the certificate is used for choosing the certificate.

The server verifies

- that the client certificate is X.509 certificate which in not tampered with
- that the client certificate is in the list of trusted certificates (Trust Chain Building)
- that the client certificate is not in the revoked list.
- that the client certificate is not expired (present time is between "Valid From" and "Valid To" fields of X.509 certificate)
- that the client certificate has the correct purpose (at least the client authentication purpose).
- The client verifies
- that the server certificate is a X.509 certificate which is not tampered with
- that the server certificate is in the list of trusted certificates (Trust Chain Building)
- that the server certificate is not in the revoked list.
- that the server certificate is not expired (present time is between "Valid From" and "Valid To" fields of X.509 certificate)
- that the server certificate has the correct purpose (at least the server authentication purpose).

In addition, the following validation is done at *syngo* side

1) 'Direct certificate validation' for self-signed certificate, i.e. the self-signed certificate of the remote node must be present in the 'Trusted Root Certificate' Store Certificate received from peer have multiple X.509 certificates within the TLS Handshake.

2) *syngo* can receive X.509 certificate chain (Full certificate chain, Partial certificate chain or only End certificate) in the TLS handshake from peer. For all the cases for successful Trust chain Building all the certificates shall be installed in the Windows certificate Store of the Local Machine. i.e., All the intermediates must be imported to Intermediate Certificate Authorities→Certificates and the root certificate must be imported to the Trusted Root Certificates→Certificates.

The X.509 certificate imported and used for DICOM communication must

1. have purpose set for Client and Server Authentication.
2. be exportable to generate the certificate file and private key file.

If intermediate and root X.509 certificates are present, then the intermediate certificate must be imported to Intermediate Certificate Authorities→Certificates. The root certificate must be imported to the Trusted Root Certificates→Certificates.

By default, *syngo* communicates with the cipher suites defined by Windows. By default, with the *syngo* installations following SCHANNEL registries are set with the following values. Based on these values the *syngo* supported suites are decided.

CIPHERS REGISTRIES

HKLM\SYSTEM\CurrentControlSet\Control\SecurityProviders\SCHANNEL\Ciphers\triple DES 168\Enabled with value 0x0

HKLM\SYSTEM\CurrentControlSet\Control\SecurityProviders\SCHANNEL\Ciphers\AES 128\Enabled with value 0xFFFFFFFF

HKLM\SYSTEM\CurrentControlSet\Control\SecurityProviders\SCHANNEL\Ciphers\AES 256\Enabled with value 0xFFFFFFFF

HASHES REGISTRIES

HKLM\SYSTEM\CurrentControlSet\Control\SecurityProviders\SCHANNEL\Hashes\SHA\Enabled with value 0x0

HKLM\SYSTEM\CurrentControlSet\Control\SecurityProviders\SCHANNEL\Hashes\SHA256\Enabled with value 0xFFFFFFFF

HKLM\SYSTEM\CurrentControlSet\Control\SecurityProviders\SCHANNEL\Hashes\SHA384\Enabled with value 0xFFFFFFFF

KEY EXCHANGE ALGORITHM

HKLM\SYSTEM\CurrentControlSet\Control\SecurityProviders\SCHANNEL\KeyExchangeAlgorithms\PKCS\Enabled with value 0x0

HKLM\SYSTEM\CurrentControlSet\Control\SecurityProviders\SCHANNEL\KeyExchangeAlgorithms\Diffie-Hellman\Enabled with value 0xFFFFFFFF

HKLM\SYSTEM\CurrentControlSet\Control\SecurityProviders\SCHANNEL\KeyExchangeAlgorithms\ECDH\Enabled with value 0xFFFFFFFF

In addition, the PROTOCOLS registries entries are set with the following values with *syngo* installation.

HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Control\SecurityProviders\SCHANNEL\Protocols\TLS 1.0\Client\Enabled 0x0 (*syngo* acting as SCU)

HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Control\SecurityProviders\SCHANNEL\Protocols\TLS 1.0\Server\Enabled 0x0 (*syngo* acting as SCP)

HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Control\SecurityProviders\SCHANNEL\Protocols\TLS 1.1\Client\Enabled 0x0 (*syngo* acting as SCU)

HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Control\SecurityProviders\SCHANNEL\Protocols\TLS 1.1\Server\Enabled 0x0 (*syngo* acting as SCP)

HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Control\SecurityProviders\SCHANNEL\Protocols\TLS 1.2\Client\Enabled 0xFFFFFFFF (*syngo* acting as SCU)

HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Control\SecurityProviders\SCHANNEL\Protocols\TLS 1.2\Server\Enabled 0xFFFFFFFF (*syngo* acting as SCP)

NOTE:

1) For disabling the weaker ciphers, Hashes, Key exchange algorithms and protocols the registry entry 'Enabled' for the corresponding ciphers, Hashes, Key exchange algorithms and protocols in windows SCHANNEL (HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Control\SecurityProviders\SCHANNEL)

must be set as 0x0. The value other than 0xffffffff / 0xFFFFFFFF for 'Enabled' registry will be considered as Disabled.

2) In addition, for disabling Protocols TLS v1.0, TLS v1.1 and TLS v1.2 TLS the Windows SCHANNEL registry 'DisabledbyDefault' for the protocol registry entry must be set to 0x00000001. If this registry is set to 0x0 then it is considered as enabled.

3) The Ciphers (Triple DES, AES 128 and AES 256), Hashes (SHA, SHA 256, SHA 384), Key Exchange algorithms (PKCS, Diffie-Hellman, ECDH) and Protocols (TLS v1.2, TLS v1.1 and TLS v1.0) are proposed for DICOM secure communication based on the configuration. The other protocols, Hashes, Key Exchange algorithms and ciphers are not checked and proposed.

   With the *syngo* installation, the weaker cipher suites which are supported earlier will not be supported. i.e. the cipher suites TLS_RSA_WITH_AES_128_CBC_SHA and TLS_RSA_WITH_3DES_EDE_CBC_SHA. This will have an interoperability issue to older *syngo* systems / systems that is using these cipher suites only. In order to overcome this interoperability, issue a single configuration is provided in the service page to enable/disable the Hashes, Ciphers, Key Exchange algorithms and Protocols.

4) Support for NULL Cipher (TLS_RSA_WITH_NULL_SHA) is not there. The secure communication is FIPS mode enabled.

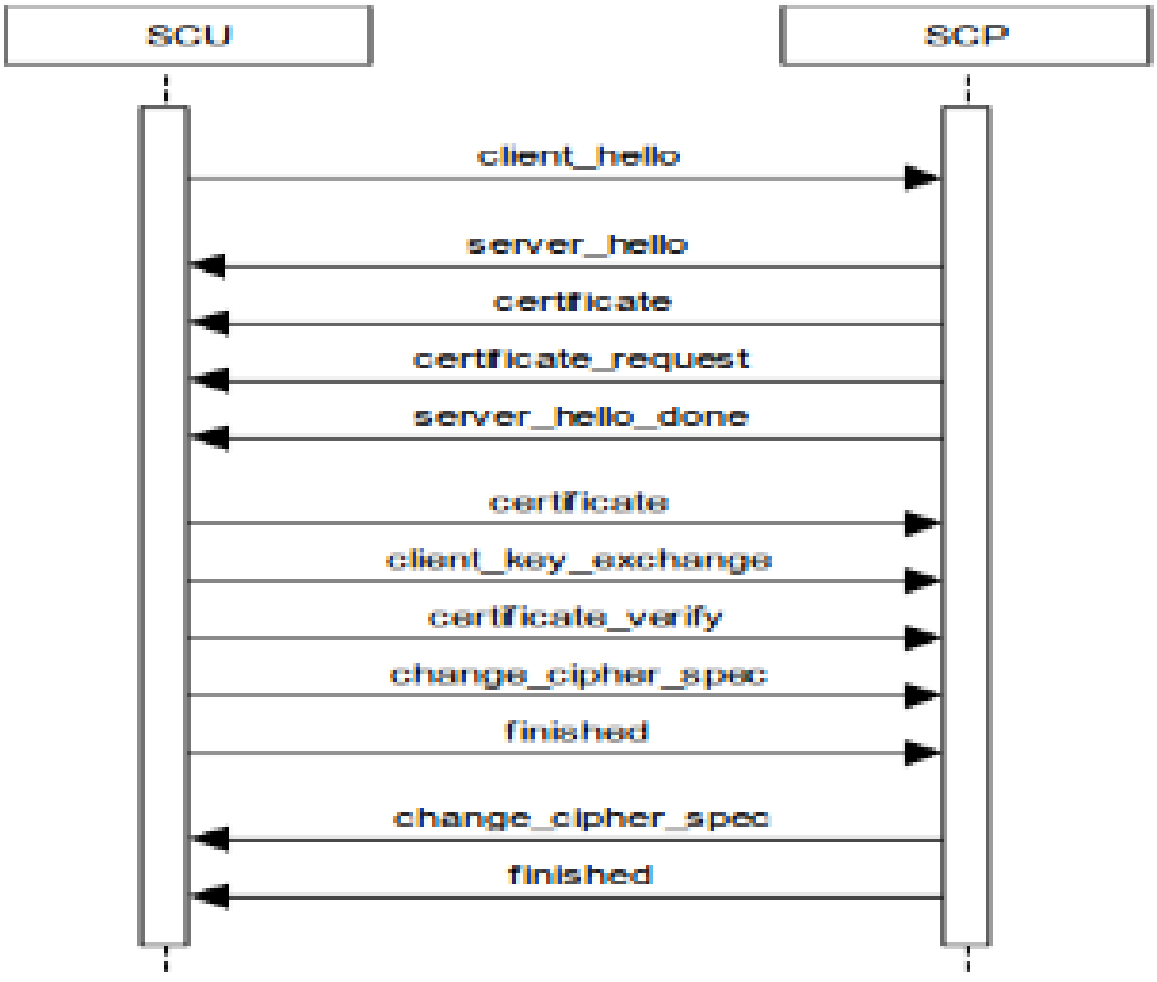


Figure 3: TLS Handshake Message Protocol

9.2 Association Level Security

N/A

9.3 Application-Level Security

Application-Level Confidentiality Profiles address the following aspects of security Data Confidentiality at the application layer.

These Profiles are targeted toward creating a special purpose, de-identified version of an already existing Data Set. This profile is not intended to replace the original SOP Instance from which the de-identified SOP Instance is created. The de-identified SOP Instances are useful, for example, in creating teaching or research files, performing clinical trials, or submission to registries where the identity of the patient and other individuals is required to be protected.

9.3.1 Data minimization workflow (De-identifier)

syngo provides a functionality to export the DICOM data to configured offline directories (Local Path / Network path / USB). The minimized data can be exported where the Patient Identification parameters like Patient Name, Patient ID etc., are removed or replaced as per the Table below.

Table 61 – DICOM Attributes Behavior when Export Offline with "Personal identifier Minimized"

Attribute Name	DICOM Tag	Value Representation	Type	Value
Patient's Name	(0010,0010)	PN	2	Dummy Name – User specific
Patient ID	(0010,0020)	LO	2	"Anonymous" – Hard coded value
Patient's Birth Date	(0010,0030)	DA	2	empty
Patient's Birth Time	(0010,0032)	TM	2	removed
Patient's sex	(0010,0040)	CS	2	Other (O)
Other Patient IDs	(0010,1000)	LO	3	removed
Other Patient Names	(0010,1001)	PN	3	removed
Patient's Birth Name	(0010,1005)	PN	3	removed
Patient's Address	(0010,1040)	LO	3	removed
Patient's Mother's Birth Name	(0010,1060)	PN	3	removed
Patient's Telephone Numbers	(0010,2154)	SH	3	removed
SOP Instance UID	(0008,0018)	UI	1	new value to be generated
Referenced Patient Sequence	(0008,1120)	SQ	3	removed
Instance Creator UID	(0008,0014)	UI	3	removed
Accession Number	(0008,0050)	SH	2	empty
Institution Name	(0008,0080)	LO	3	removed
Institution Address	(0008,0081)	ST	3	removed
Referring Physician's Name	(0008,0090)	PN	2	empty
Referring Physician's Address	(0008,0092)	ST	3	removed
Referring Physician's Telephone Numbers	(0008,0094)	SH	3	removed

Station Name	(0008,1010)	SH	3	removed
Study Description	(0008,1030)	LO	3	removed
Series Description	(0008,103E)	LO	3	removed
Institutional Department Name	(0008,1040)	LO	3	removed
Physician(s) of Record	(0008,1048)	PN	3	removed
Performing Physician(s) Name	(0008,1050)	PN	3	removed
Name of Physician(s) Reading Study	(0008,1060)	PN	3	removed
Operators' Name	(0008,1070)	PM	3	removed
Admitting Diagnoses Description	(0008,1080)	LO	3	removed
Referenced SOP Instance UID	(0008,1155)	UI	1c	new value to be generated
Related Series Sequence	(0008,1250)	SQ	3	new value to be generated
Derivation Description	(0008,2111)	ST	3	new value to be generated
Patient's Age	(0010,1010)	AS	3	removed
Patient's Size	(0010,1020)	DS	3	removed
Patient's Weight	(0010,1030)	DS	3	removed
Medical Record Locator	(0010,1090)	LO	3	removed
Ethnic Group	(0010,2160)	SH	3	removed
Occupation	(0010,2180)	SH	3	removed
Additional Patient's History	(0010,21B0)	LT	3	removed
Patient Comments	(0010,4000)	LT	3	removed
Device Serial Number	(0018,1000)	LO	3	removed
Protocol Name	(0018,1030)	LO	3	removed
Study Instance UID	(0020,000D)	UI	1	new value to be generated
Series Instance UID	(0020,000E)	UI	1	new value to be generated
Study ID	(0020,0010)	SH	2	empty
Frame of Reference UID	(0020,0052)	UI	1	new value to be generated
Synchronization Frame of Reference UID	(0020,0200)	UI	1	new value to be generated
Image Comments	(0020,4000)	LT	3	removed
Request Attribute Sequence	(0040,0275)	SQ	3	removed
UID	(0040, A124)	UI	1c	new value to be generated
Content Sequence	(0040, A730)	SQ	1c	new value to be generated
Storage Media File-set	(0088,0140)	UI	1	new value to be generated

UID				
Referenced Frame of Reference UID	(3006,0024)	UI	1c	new value to be generated
Related Frame of Referenced UID	(3006,00C2)	UI	1c	new value to be generated
3D registration Matrix Data Info	(0029, 1010)	OB	n/a	XML file contents (UID value referred needs to be updated with new value)

syngo provides two type of data minimization Default profile and Service profile. A modality registry configuration 'DISABLE_OFFLINE_SERVICE_ANONYMIZATION' is provided to select the type of data minimization. By default, the value of the registry is 1 and hence Default profile is used.

In Default profile, the data integrity and consistency are maintained for the new value generated for the DICOM attribute of VR type UI. i.e., For example, if the new value is set for the Study Instance UID and if the value is referred in Frame of Reference UID the value must be reused. This ensures the consistency of the data. In Service profile, the data integrity is not maintained.

Note: *syngo* prefers for Default profile.

10 Annexes

10.1 SIEMENS Private Non-Image IOD

For encoding binary data-streams not representing image data, Siemens has created a private “Non-Image IOD” according to the rules governed by the DICOM Standard. The following section will roll-out the definition of this Private IOD. It can be communicated with Network Storage Service and Offline Media Storage Services.

The Siemens “Non-Image IOD” is identified by a private Non-Image Storage SOP Class UID of

„1.3.12.2.1107.5.9.1“

10.1.1 Siemens Non-Image IOD – E-R Model

The E-R model in A.1.2 depicts those components of the DICOM Information Model which directly refer to the Siemens Non-Image IOD. The Frame of Reference IE, Overlay IE, Modality Lookup-Table IE, VOI Lookup-Table IE and Curve IE are not components of the Siemens Non-Image IOD.

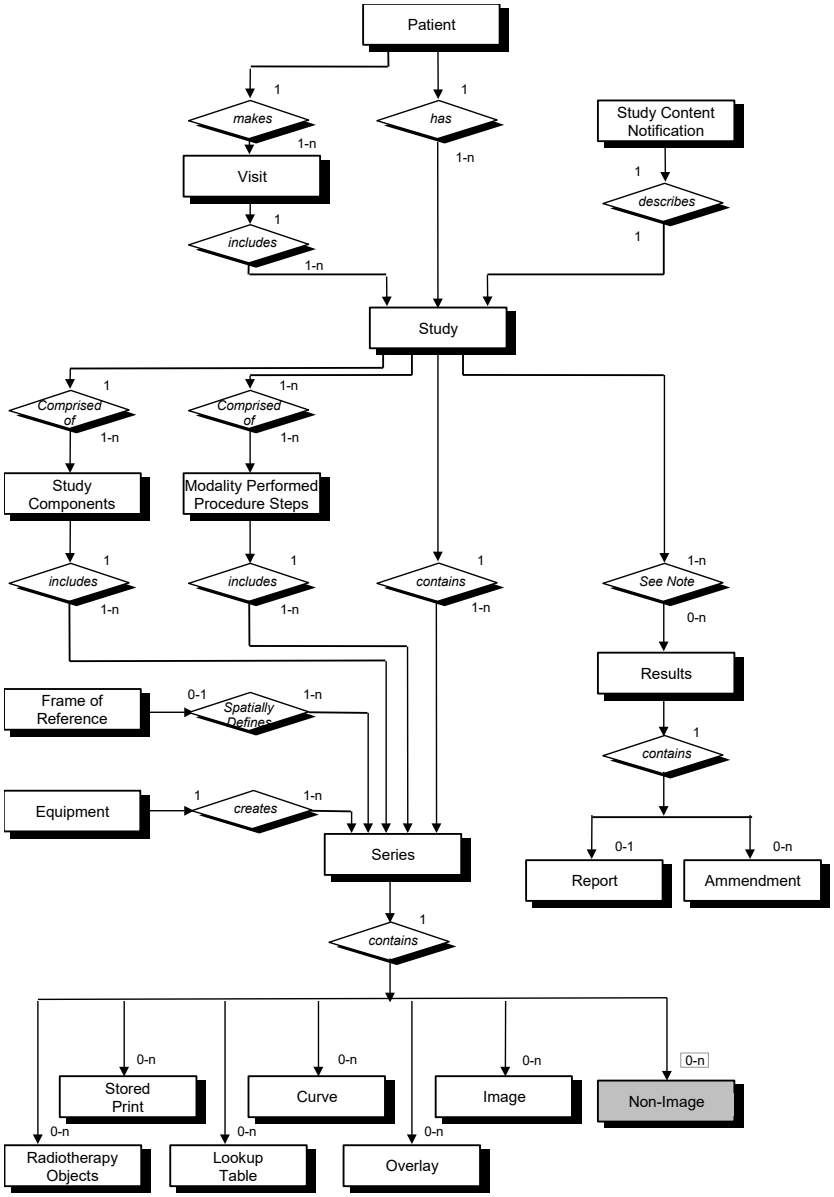


Figure 4: Siemens Non-Image IOD – E-R Model

10.1.2 Siemens Non-Image IOD - Module Table

Table 62 - Siemens Non-Image IOD - Module Table

IE	Module	Reference	Usage
Patient	Patient	[1] PS3.3 C.7.1.1	M
Study	General Study	[1] PS3.3 C.7.2.1	M
	Patient Study	[1] PS3.3 C.7.2.2	U
Series	General Series	[1] PS3.3 C.7.3.1	M
Equipment	General Equipment	[1] PS3.3 C.7.5.1	U
CSA	CSA Image Header	A.2.1	U
	CSA Series Header	A.2.2	U
	MEDCOM Header	A.2.3	U
	CSA Non-Image	A.1.3.1	M
	SOP Common	[1] PS3.3 C.12.1	M

10.1.3 Siemens Non-Image IOD – Modules

10.1.3.1 CSA Non-Image Module

Table 63: Private IOD Attributes Describing CSA Non-Images

Attribute Name	Tag	Owner	Type	Notes
Image Type	(0008,0008)	-	3	Image identification characteristics.
Acquisition Date	(0008,0022)	-	3	The date the acquisition of data that resulted in this data set started.
Acquisition Time	(0008,0032)	-	3	The time the acquisition of data that resulted in this data set started.
Conversion Type	(0008,0064)	-	3	Describes the kind of image conversion. Defined Terms: DV = Digitized Video, DI = Digital Interface, DF = Digitized Film, WSD = Workstation.
Referenced Image Sequence	(0008,1140)	-	3	A sequence which provides reference to a set of Image SOP Class/Instance identifying other images significantly related to this data set. Encoded as sequence of items: (0008,1150) and (0008,1155).
Derivation Description	(0008,2111)	-	3	A text description of how this data set was derived.
Source Image Sequence	(0008,2112)	-	3	A Sequence which identifies the set of Image SOP Class/Instance pairs of the Images which were used to derive this data set. Zero or more Items may be included in this Sequence. Encoded as sequence of items: (0008,1150) and (0008,1155).

Patient Position	(0018,5100)	-	3	Patient position descriptor relative to the equipment.
Acquisition Number	(0020,0012)	-	3	A number identifying the single continuous gathering of data over a period of time which resulted in this data set.
Image Number	(0020,0013)	-	3	A number that identifies this data set.
Frame of Reference UID	(0020,0052)	-	3	Uniquely identifies the frame of reference for a Series.
Image Comments	(0020,4000)	-	3	User-defined comments about the image.
Quality Control Image	(0028,0300)	-	3	Indicates whether or not this image is a quality control or phantom image. If this Attribute is absent, then the image may or may not be a quality control or phantom image. Enumerated Values: YES, NO.
Burned in Annotation	(0028,0301)	-	3	Indicates whether or not image contains sufficient burned in annotation to identify the patient and date the image was acquired. If this Attribute is absent, then the image may or may not contain burned in annotation. Enumerated Values: YES, NO.
Lossy Image Compression	(0028,2110)	-	3	Specifies whether an Image has undergone lossy compression. Enumerated Values: 00 = Image has NOT been subjected to lossy compression, 01 = Image has been subjected to lossy compression.
Lossy Image Compression Ratio	(0028,2112)	-	3	Describes the approximate lossy compression ratio(s) that have been applied to this image. May be multi valued if successive lossy compression steps have been applied.
CSA Data Type	(0029,xx08)	SIEMENS CSA NON-IMAGE	1	CSA Data identification characteristics. Defined Terms: BSR REPORT = Study Report Data 3D EDITOR 3D FLY PATH = Fly Through Data 3D FLY VRT = Fly Through Data 3D FUSION MATRIX = Fusion Data RAW DATA NUM 4 = NUMARIS/ Raw Data RAW DATA SOM 5 = SOMARIS/ Raw Data RT3D CONFIG = InSpaceIS Data SPEC NUM 4 = NUMARIS/4 Spectroscopy
CSA Data Version	(0029,xx09)	SIEMENS CSA NON-IMAGE	3	Version of CSA Data Info (0029,xx10) format and CSA Non-Image Data (7FE1,xx10) format.
CSA Data Info	(0029,xx10)	SIEMENS CSA NON-IMAGE	3	Information to describe the CSA Data (7FE1,xx10).
CSA Data	(7FE1,xx10)	SIEMENS CSA	2	Binary data as byte stream.

		NON-IMAGE		

10.2 Siemens Standard Extended Modules

Table 64: Siemens Standard Extended Modules

IE	Module	Reference	Usage	Note
Image	CSA Image Header	8.2.1	U	private GG information
	CSA Series Header	8.2.2	U	
	MEDCOM Header	8.2.3	U	private *syngo* information
	MEDCOM OOG	8.2.4	U	if object graphics is attached to image

10.2.1 CSA Image Header Module

Table 65: Private IOD Attributes describing CSA Image Header

Attribute Name	Tag	Owner	Type	Notes
CSA Image Header Type	(0029,xx08)	SIEMENS CSA HEADER	1	CSA Image Header identification characteristics. Defined Terms: NUM 4 = NUMARIS/4 SOM 5 = SOMARIS/5
CSA Image Header Version	(0029,xx09)	SIEMENS CSA HEADER	3	Version of CSA Image Header Info (0029,xx10) format.
CSA Image Header Info	(0029,xx10)	SIEMENS CSA HEADER	3	Manufacturer model dependent information.

10.2.2 CSA Series Header Module

Table 66: Private IOD Attributes Describing CSA Series Header

Attribute Name	Tag	Owner	Type	Notes
CSA Series Header Type	(0029,xx18)	SIEMENS CSA HEADER	1	CSA Series Header identification characteristics. Defined Terms: NUM 4 = NUMARIS/4
CSA Series Header Version	(0029,xx19)	SIEMENS CSA HEADER	3	Version of CSA Series Header Info (0029,xx20) format.
CSA Series Header Info	(0029,xx20)	SIEMENS CSA HEADER	3	Manufacturer model dependent information.

10.2.3 MEDCOM Header Module

Table 67: Private IOD Attributes describing MEDCOM Header

Attribute Name	Tag	Owner	Type	Notes
MedCom Header Type	(0029,xx08)	SIEMENS MEDCOM HEADER	1C	MedCom Header identification characteristics. Defined Terms: MEDCOM 1 (Required if MedCom Header Info (0029,xx10) present.)
MedCom Header Version	(0029,xx09)	SIEMENS MEDCOM HEADER	2C	Version of MedCom Header Info (0029,xx10) format. (Required if MEDCOM Header Info (0029,xx10) present.)
MedCom Header Info	(0029,xx10)	SIEMENS MEDCOM HEADER	3	Manufacturer model dependent information. The value of the attribute MedCom Header Info (0029,xx10) can be build up in each user defined format.
MedCom History Information	(0029,xx20)	SIEMENS MEDCOM HEADER	3	MedCom defined Patient Registration history information. See A.2.3.1.
Application Header Sequence	(0029,xx40)	SIEMENS MEDCOM HEADER	3	Sequence of Application Header items. Zero or more items are possible.
>Application Header Type	(0029,xx41)	SIEMENS MEDCOM HEADER	1C	Application Header identification characteristics. Required, if Sequence is sent.
>Application Header ID	(0029,xx42)	SIEMENS MEDCOM HEADER	3	Identification of an application header
>Application Header Version	(0029,xx43)	SIEMENS MEDCOM HEADER	3	Version of CSA Series Header Info (0029,xx44) format.
>Application Header Info	(0029,xx44)	SIEMENS MEDCOM HEADER	3	Application dependent information.
Workflow Control Flags	(0029,xx50)	SIEMENS MEDCOM HEADER	3	Eight free definable flags.
Archive Management Flag Keep Online	(0029,xx51)	SIEMENS MEDCOM HEADER	3	Flag to control remote archive management system to keep the image always online (also when already archived). Enumerated Values: 00 = remote control not required 01 = keep image online
Archive Management Flag Do Not Archive	(0029,xx52)	SIEMENS MEDCOM HEADER	3	Flag to control remote archive management system not to archive the related image. Enumerated Values: 00 = remote control not required 01 = don't archive image
Image Location Status	(0029,xx53)	SIEMENS MEDCOM HEADER	3	Image location status to control retrieving. Defined Terms: ONLINE = retrieving has to be done as usual, NEARLINE = move request to SCP and delay according to value of Estimated Retrieve Time (0029,xx54),

				OFFLINE = invoking a retrieve operation initiates an operator request, INVALID = invoking a retrieve operation would always result in an error.
Estimated Retrieve Time	(0029,xx54)	SIEMENS MEDCOM HEADER	3	Estimated retrieve time in seconds. A value less than zero (< 0) indicates location is OFFLINE or INVALID.
Data Size of Retrieved Images	(0029,xx55)	SIEMENS MEDCOM HEADER	3	Data size of images in MByte.
Siemens Link Sequence	(0029,xx70)	SIEMENS MEDCOM HEADER	3	Sequence of link items. Each item identify the location of one missing tag. One or more items can be included in this sequence.
Referenced Tag	(0029,xx71)	SIEMENS MEDCOM HEADER	1	The referenced tag. The value of this tag is in the Child Data Object (CDO). Currently it is always Pixel Data (7FE0,0010).
Referenced Tag Type	(0029,xx72)	SIEMENS MEDCOM HEADER	1	The Value Representation (type) of the missing tag (e.g. OW). Enumerated values are all DICOM defined Value Representations.
Referenced Value Length	(0029,xx73)	SIEMENS MEDCOM HEADER	1	The length of the referenced tag value in bytes.
Referenced Object Device Type	(0029,xx74)	SIEMENS MEDCOM HEADER	1	The Device Type that stores the Child Data Object (CDO) with the referenced tag value. Currently it should be "SHMEM". In future, "SDM", "LOID" or "FILE" are also imaginable. Defined Terms are SHMEM = Shared Memory SDM = Series Data Management LOID = Database FILE
Referenced Object Device Location	(0029,xx75)	SIEMENS MEDCOM HEADER	2	The Location of the device that stores the Child Data Object (CDO) with the referenced tag value. For the "SHMEM" case, it is the shared memory directory. Can be empty, then the default directory will be taken. In future, for "SDM" this will be the SDM_ID, for FILE it will be the directory name and for "LOID" it will be the database name.
Referenced Object ID	(0029,xx76)	SIEMENS MEDCOM HEADER	1	The ID of the object that contains the Child Data Object (CDO) with the referenced tag value. In case of "SHMEM" it is the shared memory ID. In future, for "SDM" this will be a Sirius OID, for "FILE" the file name, for "DB" the LOID.
Series Work Flow Status	(0029,xx60)	SIEMENS MEDCOM HEADER2	3	*syngo* Patient Browser specific flags used for clinical work: • com = completed • rea = read ver = verified

10.2.3.1 MEDCOM History Information

The value of the attribute MEDCOM History Information (0029,xx20) is defined in the following way:

Table 68: CT Image IOD Modules

Part	Name	Type	Bytes	Notes
Header	Identifier	string	32	Always “CSA HISTORY”
	Version	string	32	e.g., “V1.10”
n Items	Class Name	string	64	
	Modification String	string	1024	

10.2.4 MEDCOM OOG Module

The table in this section contains private IOD Attributes that describe MEDCOM Object Oriented Graphics (OOG). This module is used whenever object graphics is drawn on the image and need to be stored as graphic object properties. Given the condition that the module contents were not removed by other modalities, the graphic objects remain re-animatable if such an image was transferred and is then retrieved back

Table 69 - MEDCOM OOG Module

Attribute Name	Tag	Owner	Type	Notes
MedCom OOG Type	(0029,xx08)	SIEMENS MEDCOM OOG	1	MEDCOM Object Oriented Graphics (OOG) identification characteristics. Defined Terms: MEDCOM OOG 1 MEDCOM OOG 2
MedCom OOG Version	(0029,xx09)	SIEMENS MEDCOM OOG	3	Version of MEDCOM OOG Info (0029,xx10) format.
MedCom OOG Info	(0029,xx10)	SIEMENS MEDCOM OOG	3	MEDCOM Object Oriented Graphics (OOG) data.

The graphics objects are also fully drawn in the Image Overlay Plane for compatibility with other products, which do not support the MedCom OOG module. Any system not supporting the Med-Com OOG module shall remove the OOG module and its contents when modifying the image overlay plane content.

10.2.5 *syngo* Report Data

The module contains private IOD Attributes that describe *syngo* reports. This module is used when *syngo* report data are added to DICOM SR and DICOM SC objects.

Table 70 - *syngo* Report Data

Attribute Name	Tag	Owner	Type	Notes
syngo Report Type	(0029,xx08)	SIEMENS CSA REPORT	1	*syngo* report characteristics, e.g. report creating application. Defined Terms: CT_LUNGCARE MR_ARGUS

				This attribute value will be used to identify the corresponding application during generic extension DLL management. A restricted character set is used: only A-Z and underscore are supported.
syngo Report Version	(0029,xx09)	SIEMENS CSA REPORT	3	Version of *syngo* Report Data (0029,xx10) format.
syngo Report Data	(0029,xx10)	SIEMENS CSA ENVELOPE	3	A representation of DICOM SR Attribute Content Sequence (0040,A730). This includes the document relationship and document content. This data will typically be represented using an XML encoding according to a Siemens private scheme.
syngo Report Presentation	(0029,xx11)	SIEMENS CSA ENVELOPE	3	A representation of the recommended presentation for the *syngo* Report Data (0029,xx10). This presentation will typically be encoded in XSLT.
SR Variant	(0029,xx15)	SIEMENS CSA REPORT		DICOM SR variant. Enumerated Values: 0 = Basic Text SR (1.2.840.10008.5.1.4.1.1.88.11) 1 = Enhanced SR (1.2.840.10008.5.1.4.1.1.88.22) 2 = Comprehensive SR (1.2.840.10008.5.1.4.1.1.88.33) 3 = Mammography CAD SR (1.2.840.10008.5.1.4.1.1.88.50) 4 = Key Object Selection Document (1.2.840.10008.5.1.4.1.1.88.59) 5 = Chest CAD SR (1.2.840.10008.5.1.4.1.1.88.65) 6 = X-Ray Radiation Dose SR (1.2.840.10008.5.1.4.1.1.88.67) 7 = Procedure Log (1.2.840.10008.5.1.4.1.1.88.40) 8 = Radiopharmaceutical Radiation Dose SR

				(1.2.840.10008.5.1.4.1.1.88.68)
SC SOP Instance UID	(0029,xx17)	SIEMENS CSA REPORT	3	DICOM SOP Instance UID of *syngo* based SC Image representing the *syngo* report object. This UID will be used to identify the Resulting SC object after SR to SC conversion.

10.2.6 *syngo* Report Info

The module *syngo* Report Info contains all DICOM SR attributes except the Contents Sequence (0040,A730). This module is only used during SR to SC conversion.

10.3 Registry of DICOM Data Elements

Table 71 - Registry of DICOM Data Elements

Tag	Private Owner Code	Name	VR	VM
(0029,xx08)	SIEMENS CSA NON-IMAGE	CSA Data Type	CS	1
(0029,xx09)	SIEMENS CSA NON-IMAGE	CSA Data Version	LO	1
(0029,xx10)	SIEMENS CSA NON-IMAGE	CSA Data Info	OB	1
(0029,xx08)	SIEMENS CSA HEADER	CSA Image Header Type	CS	1
(0029,xx09)	SIEMENS CSA HEADER	CSA Image Header Version	LO	1
(0029,xx10)	SIEMENS CSA HEADER	CSA Image Header Info	OB	1
(0029,xx18)	SIEMENS CSA HEADER	CSA Series Header Type	CS	1
(0029,xx19)	SIEMENS CSA HEADER	CSA Series Header Version	LO	1
(0029,xx20)	SIEMENS CSA HEADER	CSA Series Header Info	OB	1
(0029,xx08)	SIEMENS CSA REPORT	*syngo* Report Type	CS	1
(0029,xx09)	SIEMENS CSA REPORT	*syngo* Report	LO	1
(0029,xx15)	SIEMENS CSA REPORT	SR Variant	US	1
(0029,xx17)	SIEMENS CSA REPORT	SC SOP Instance UID	UI	1
(0029,xx10)	SIEMENS CSA ENVELOPE	*syngo* Report Data	OB	1
(0029,xx11)	SIEMENS CSA ENVELOPE	*syngo* Report Presentation	OB	1
(0029,xx08)	SIEMENS MEDCOM HEADER	MedCom Header Type	CS	1
(0029,xx09)	SIEMENS MEDCOM HEADER	MedCom Header Version	LO	1
(0029,xx10)	SIEMENS MEDCOM HEADER	MedCom Header Info	OB	1
(0029,xx20)	SIEMENS MEDCOM HEADER	MedCom History Information	OB	1
(0029,xx40)	SIEMENS MEDCOM HEADER	Application Header Sequence	SQ	1
(0029,xx41)	SIEMENS MEDCOM HEADER	Application Header Type	CS	1
(0029,xx42)	SIEMENS MEDCOM HEADER	Application Header ID	LO	1
(0029,xx43)	SIEMENS MEDCOM HEADER	Application Header Version	LO	1
(0029,xx44)	SIEMENS MEDCOM HEADER	Application Header Info	OB	1
(0029,xx50)	SIEMENS MEDCOM HEADER	Workflow Control Flags	LO	8

(0029,xx51)	SIEMENS MEDCOM HEADER	Arch. Management Flag Keep Online	CS	1
(0029,xx52)	SIEMENS MEDCOM HEADER	Arch. Mgmnt Flag Do Not Archive	CS	1
(0029,xx53)	SIEMENS MEDCOM HEADER	Image Location Status	CS	1
(0029,xx54)	SIEMENS MEDCOM HEADER	Estimated Retrieve Time	DS	1
(0029,xx55)	SIEMENS MEDCOM HEADER	Data Size of Retrieved Images	DS	1
(0029,xx70)	SIEMENS MEDCOM HEADER	Siemens Link Sequence	SQ	1
(0029,xx71)	SIEMENS MEDCOM HEADER	Referenced Tag	AT	1
(0029,xx72)	SIEMENS MEDCOM HEADER	Referenced Tag Type	CS	1
(0029,xx73)	SIEMENS MEDCOM HEADER	Referenced Value Length	UL	1
(0029,xx74)	SIEMENS MEDCOM HEADER	Referenced Object Device Type	CS	1
(0029,xx75)	SIEMENS MEDCOM HEADER	Referenced Object Device Location	OB	1
(0029,xx76)	SIEMENS MEDCOM HEADER	Referenced Object ID	OB	1
(0029,xx60)	SIEMENS MEDCOM HEADER2	Series Workflow Status	LO	1
(0029,xx08)	SIEMENS MEDCOM OOG	MedCom OOG Type	CS	1
(0029,xx09)	SIEMENS MEDCOM OOG	MedCom OOG Version	LO	1
(0029,xx10)	SIEMENS MEDCOM OOG	MedCom OOG Info	OB	1
(7FE1,xx10)	SIEMENS CSA NON-IMAGE	CSA Data	OB	1

10.4 Standard Extensions of all SOP Classes

Table 72 - Data Dictionary of all DICOM IOD Attributes with Extended DICOM Standard Definitions

Attribute Name	Tag	Private Creator	Type	Notes
Image Type	(0008,0008)	-	1	see A.4.1 additional Defined Terms: Defined Terms for value 3: OTHER Defined Terms for value 4: CSA 3D EDITOR CSA 3D FLY PATH CSA 3D FLY VRT CSA 3D FUSION CSA AVERAGE CSA BLACK IMAGE CSA RESAMPLED CSA MIP CSA MPR CSA MPR CURVED CSA MPR THICK

				CSA SSD CSA SUBTRACT CT_SOM4 * SHS *
Patient Position	(0018,5100)	-	2C	see A.4.2 additional Defined Terms for the Magnetom© Open: HLS HLP FLS FLP HLDL HLDR FLDL FLDR

All SOP classes may contain additional type 3 attributes which DICOM standard defines in a different DICOM IOD or DICOM SOP class (attributes from Normalized SOP classes).

This is the case for example for

- Rescale Slope (0028,1053)
- Rescale Intercept (0028,1052)
- which are also used in the MR IOD.

10.4.1 Image Type

The Image Type (0008,0008) attribute identifies important image identification characteristics. These characteristics are:

1. Pixel Data Characteristics:

• is the image an ORIGINAL Image; an image whose pixel values are based on original or source data, or

• is the image a DERIVED Image; an image whose pixel values have been derived in some manner from the pixel value of one or more other images.

2. Patient Examination Characteristics:

• is the image a PRIMARY Image; an image created as a direct result of the Patient examination, or

• is the image a SECONDARY Image; an image created after the initial Patient examination.

3. Modality Specific Characteristics (SOP Specific Characteristics).

4. Implementation specific identifiers; other implementation specific identifiers shall be documented in an implementation's conformance claim.

The Image Type attribute is multi-valued and shall be provided in the following manner:

• Value 1 shall identify the Pixel Data Characteristics; Enumerated Values for the Pixel Data Characteristics are:

• ORIGINAL = identifies an Original Image

• DERIVED = identifies a Derived Image

• Value 2 shall identify the Patient Examination Characteristics; Enumerated Values for the Patient Examination Characteristics are:

• PRIMARY = identifies a Primary Image

- SECONDARY = identifies a Secondary Image
- Value 3 shall identify any Image IOD specific specialization, the following terms are defined in addition to the DICOM standard definitions:
- OTHER = is also used for converted non-Axial and non-Localizer CT images
- MPR = for 3D MPR images
- PROJECTION IMAGE = for 3D MIP and SSD images
- Value 4 which are implementation specific, the following terms are defined in addition to the DI-COM standard definitions:
- original *syngo* generated data set types:

CSA 3D EDITOR = object created by 3D Editor

CSA 3D FLY PATH = object created by Fly Through Path

CSA 3D FLY VRT = object created by Fly Through Volume Rendering Technique

CSA 3D FUSION = object created by Fusion

CSA AVERAGE = image was created by Average

CSA BLACK IMAGE = SC Image with black pixels, only graphics information is of interest

CSA RESAMPLED = derived image created by zooming or panning original image

CSA REPORT = *syngo* reporting (documentation of diagnosis)

CSA RESULT = *syngo* reporting (postprocessing results)

CSA MIP = image created by Maximum Intensity Projection

CSA MIP THIN = image created by Maximum Intensity Projection

CSA MPR = image created by Multi Planar Reconstruction

CSA MPR CURVED = image created by Multi Planar Reconstruction

CSA MPR THICK = image created by Multi Planar Reconstruction

CSA MPR THIN = image created by Multi Planar Reconstruction

CSA SSD = SC Image as Shaded Surface Display

CSA SUBTRACT = image was created by Subtraction

- Converted images

CT_SOM4 NONE = converted SOMARIS image

CT_SOM4 CONV = converted SOMARIS Convolution Kernel file

CT_SOM4 DART = converted SOMARIS Dental Artificial image

CT_SOM4 DEVA = converted SOMARIS Dental Evaluation image

CT_SOM4 DGRA = converted SOMARIS Dental Graphics image

CT_SOM4 DMEA = converted SOMARIS Dynamic Measurement image

CT_SOM4 DPAN = converted SOMARIS Dental Panorama image

CT_SOM4 DPAR = converted SOMARIS Dental Paraxial image

CT_SOM4 EBT = converted SOMARIS Evolution image

CT_SOM4 HIS = converted SOMARIS Histogram Graphics image

CT_SOM4 HISC = converted SOMARIS Histogram Graphics image

CT_SOM4 MUL = converted SOMARIS Multiscan image

CT_SOM4 OEVA = converted SOMARIS Osteo Evaluation image

CT_SOM4 OTOM = converted SOMARIS Osteo Tomogram image

CT_SOM4 OTOP = converted SOMARIS Osteo Topogram image

CT_SOM4 PLOT = converted SOMARIS Plot image

CT_SOM4 QUAL = converted SOMARIS Quality image

CT_SOM4 R2D = converted SOMARIS 2D Rebuild image

CT_SOM4 R3D = converted SOMARIS 3D Rebuild image

CT_SOM4 R3DE = converted SOMARIS 3D Rebuild image

CT_SOM4 RMAX = converted SOMARIS Maximum Intensity Projection image

CT_SOM4 RMIN = converted SOMARIS Minimum Intensity Projection image

CT_SOM4 ROT = converted SOMARIS Rotation Mode image

CT_SOM4 RRAD = converted SOMARIS Radiographic Projection image

CT_SOM4 RVIT = converted SOMARIS Vessel Image Tool image

CT_SOM4 RVRT = converted SOMARIS Volumetric Rendering image

CT_SOM4 SAVE = converted SOMARIS Evolution Screen Save image

CT_SOM4 SCAN = converted SOMARIS Standard Mode image

CT_SOM4 SEQ = converted SOMARIS Sequence Mode image

CT_SOM4 SER = converted SOMARIS Serial Mode image

CT_SOM4 SIN = converted SOMARIS Sinogram image

CT_SOM4 SINC = converted SOMARIS Sinogram image

CT_SOM4 SPI = converted SOMARIS Spiral Mode image

CT_SOM4 STA = converted SOMARIS Static Mode image

CT_SOM4 TAB = converted SOMARIS Correction Table image

CT_SOM4 TOP = converted SOMARIS Topogram image

CT_SOM4 GTOP = converted SOMARIS Topo Graphics image

CT_SOM4 PEVG = converted SOMARIS Pulmo Evaluation image

CT_SOM4 PEVI = converted SOMARIS Pulmo Evaluation image

CT_SOM4 PUL = converted SOMARIS Pulmo Respiration image

CT_SOM4 PROT = converted SOMARIS Protocol image

CT_SOM4 TEXT = converted SOMARIS Text image

CT_SOM4 ICD = converted SOMARIS Interventional Cine image

SHS DENT = converted MagicView Dental Tomogram image

SHS DPAN = converted MagicView Dental Panorama image

SHS DPAR = converted MagicView Dental Paraxial image

SHS 3D_CURVED = converted MagicView image

SHS 3D_MIP = converted MagicView Maximum Intensity Projection image

SHS 3D_MPR = converted MagicView Multi Planar Reconstruction image

SHS 3D_SSD = converted MagicView Shaded Surface Display image

SHS 3D_VRT = converted MagicView Volumetric Rendering image

10.4.2 Patient Position

The Patient Position attribute (0018,5100) defines the patient position relative to the equipment.

The Defined Terms for this value were extended for the MAGNETOM OPEN product. Here the patient is not positioned HeadFirst/FeetFirst when facing the front of the imaging equipment but HeadLeft or FeetLeft.

the new values are:

- HLS (Head left - Supine)
- HLP (Head left - Prone)
- FLS (Feet left - Supine)
- FLP (Feet left - Prone)
- HLDL (Head left - Decubitus left)
- HLDR (Head left - Decubitus right)
- FLDL (Feet left - Decubitus left)
- FLDR (Feet left - Decubitus right)

10.5 Private Non-Image SOP Class

The *syngo* MI Apps will create numerical data that cannot be correlated to an individual image in-stance and therefore need to be stored in separate instance(s). This is necessary to correlate the information in the right level of the DICOM data model hierarchy. Since there is no fitting DICOM SOP Class definition, SIEMENS has created a private “Non-Image IOD” to contain numerical da-ta heaps to be managed within a DICOM structure. Please see previous chapters of the Appen-dix for IOD definition.

10.6 DICOM Print SCU – Detailed Dtatus Displays

The following tables document the behavior of the *syngo* MI DICOM Print AE in response to messages received for the printer SOP class and the print job SOP class.

Definitions of camera symbols:

- Idle: Camera is installed and ready; idle icon is displayed.
- Interact: The user must react in near future, but not immediately.

Example: A camera was low in 8x10 clear sheets: LOW 8x10 CLR was sent by n-event-report.

- Queue Stopped: The user must react immediately. Either the camera needs immediate interaction, or a job has been aborted.

Example: A camera is out of 8x10 clear sheets, or camera is down, or a film job is aborted.

Note: different camera symbols are displayed according to the Printer Status Info.

10.6.1 Common Status Information

Table 73 - “Common Status Info Evaluation”

Printer Status Info/ **Execution Status Info**	**Description**	**Message string visible in ‘Status Bar’**	**Other action for UI/** **‘Camera symbol’**
NORMAL	Camera is ready	Camera is ready	<None>/idle
BAD RECEIVE MGZ	There is a problem with the film receive magazine. Films from the printer cannot be transported into the magazine.	Problem with receive magazine.	<None>/interact

BAD SUPPLY MGZ	There is a problem with the film supply magazine. Films from this magazine cannot be transported into the printer.	Problem with supply magazine.	<None>/interact
CALIBRATING	Printer is performing self-calibration; it is expected to be available for normal operation shortly.	Self-calibration. Please wait.	<None>/idle
CALIBRATION ERR	An error in the printer calibration has been detected, quality of processed films may not be optimal.	Problem in calibration. Film quality may not be optimal.	<None>/interact
CHECK CHEMISTRY	A problem with the processor chemicals has been detected, quality of processed films may not be optimal.	Problem with chemistry. Film quality may not be optimal.	<None>/interact
CHECK SORTER	There is an error in the film sorter	Error in film sorter.	<None>/interact
CHEMICALS EMPTY	There are no processing chemicals in the processor, films will not be printed and processed until the processor is back to normal.	Camera chemistry empty. Please check.	<None>/interact
CHEMICALS LOW	The chemical level in the processor is low, if not corrected, it will probably shut down soon.	Camera chemistry low. Please check.	<None>/interact
COVER OPEN	One or more printer or processor covers, drawers, doors are open.	Camera cover, drawer or door open.	<None>/interact
ELEC CONFIG ERR	Printer configured improperly for this job.	Camera configured improperly for this job. Queue stopped.	Queue for this camera will be STOPPED/ Queue stopped
ELEC DOWN	Printer is not operating due to some unspecified electrical hardware problem.	Camera electrical hardware Problem.	<None>/interact
ELEC SW ERROR	Printer not operating for some unspecified software error.	Camera software problem. Queue stopped.	Queue for this camera will be STOPPED/ Queue stopped
EMPTY 8X10	The 8x10 inch film supply magazine is empty.	8x10 film supply empty.	<None>/interact
EMPTY 8X10 BLUE	The 8x10 inch blue film supply magazine is empty.	8x10 blue film supply empty.	<None>/interact
EMPTY 8X10 CLR	The 8x10 inch clear film supply magazine is empty.	8x10 clear film supply empty.	<None>/interact
EMPTY 8X10 PAPR	The 8x10 inch paper supply magazine is empty.	8x10 paper supply empty.	<None>/interact
EMPTY 10X12	The 10x12 inch film supply magazine is empty.	10x12 film supply empty.	<None>/interact
EMPTY 10X12 BLUE	The 10x12 inch blue film supply magazine is empty.	10x12 blue film supply empty.	<None>/interact
EMPTY 10X12 CLR	The 10x12 inch clear film supply magazine is empty.	10x12 clear film supply empty.	<None>/interact

EMPTY 10X12 PAPR	The 10x12 inch paper supply magazine is empty.	10x12 paper supply empty.	<None>/interact
EMPTY 10X14	The 10x14 inch film supply magazine is empty.	10x14 film supply empty.	<None>/interact
EMPTY 10X14 BLUE	The 10x14 inch blue film supply magazine is empty.	10x14 blue film supply empty.	<None>/interact
EMPTY 10X14 CLR	The 10x14 inch clear film supply magazine is empty.	10x14 clear film supply empty.	<None>/interact
EMPTY 10X14 PAPR	The 10x14 inch paper supply magazine is empty.	10x14 paper supply empty.	<None>/interact
EMPTY 11X14	The 11x14 inch film supply magazine is empty.	11x14 film supply empty.	<None>/interact
EMPTY 11X14 BLUE	The 11x14 inch blue film supply magazine is empty.	11x14 blue film supply empty.	<None>/interact
EMPTY 11X14 CLR	The 11x14 inch clear film supply magazine is empty.	11x14 clear film supply empty.	<None>/interact
EMPTY 11X14 PAPR	The 11x14 inch paper supply magazine is empty.	11x14 paper supply empty.	<None>/interact
EMPTY 14X14	The 14x14 inch film supply magazine is empty.	14x14 film supply empty.	<None>/interact
EMPTY 14X14 BLUE	The 14x14 inch blue film supply magazine is empty.	14x14 blue film supply empty.	<None>/interact
EMPTY 14X14 CLR	The 14x14 inch clear film supply magazine is empty.	14x14 clear film supply empty.	<None>/interact
EMPTY 14X14 PAPR	The 14x14 inch paper supply magazine is empty.	14x14 paper supply empty.	<None>/interact
EMPTY 14X17	The 14x17 inch film supply magazine is empty.	14x17 film supply empty.	<None>/interact
EMPTY 14X17 BLUE	The 14x17 inch blue film supply magazine is empty.	14x17 blue film supply empty.	<None>/interact
EMPTY 14X17 CLR	The 14x17 inch clear film supply magazine is empty.	14x17 clear film supply empty.	<None>/interact
EMPTY 14X17 PAPR	The 14x17 inch paper supply magazine is empty.	14x17 paper supply empty.	<None>/interact
EMPTY 24X24	The 24x24 inch film supply magazine is empty.	24x24 film supply empty.	<None>/interact
EMPTY 24X24 BLUE	The 24x24 inch blue film supply magazine is empty.	24x24 blue film supply empty.	<None>/interact
EMPTY 24X24 CLR	The 24x24 inch clear film supply magazine is empty.	24x24 clear film supply empty.	<None>/interact
EMPTY 24X24 PAPR	The 24x24 inch paper supply magazine is empty.	24x24 paper supply empty	<None>/interact
EMPTY 24X30	The 24x30 inch film supply magazine is empty.	24x30 film supply empty.	<None>/interact
EMPTY 24X30 BLUE	The 24x30 inch blue film supply magazine is empty.	24x30 blue film supply empty.	<None>/interact
EMPTY 24X30 CLR	The 24x30 inch clear film supply magazine is empty.	24x30 clear film supply empty.	<None>/interact
EMPTY 24X30 PAPR	The 24x30 inch paper supply magazine is empty.	24x30 paper supply empty.	<None>/interact

EMPTY A4 PAPR	The A4 paper supply magazine is empty.	A4 paper supply empty	<None>/interact
EMPTY A4 TRANS	The A4 transparency supply magazine is empty.	A4 transparency supply empty.	<None>/interact
EXPOSURE FAILURE	The exposure device has failed due to some unspecified reason.	Exposure device has failed.	<None>/interact
FILM JAM	A film transport error has occurred, and a film is jammed in the printer or processor.	Film jam.	<None>/interact
FILM TRANSP ERR	There is a malfunction with the film transport, there may or may not be a film jam.	Film transport problem.	<None>/interact
FINISHER EMPTY	The finisher is empty.	Finisher is empty.	<None>/interact
FINISHER ERROR	The finisher is not operating due to some unspecified reason	Finisher problem.	<None>/interact
FINISHER LOW	The finisher is low on supplies.	Finisher low.	<None>/interact
LOW 8X10	The 8x10 inch film supply magazine is low.	8x10 film supply low.	<None>/interact
LOW 8X10 BLUE	The 8x10 inch blue film supply magazine is low.	8x10 blue film supply low.	<None>/interact
LOW 8X10 CLR	The 8x10 inch clear film supply magazine is low.	8x10 clear film supply low.	<None>/interact
LOW 8X10 PAPR	The 8x10 inch paper supply magazine is low.	8x10 paper supply low.	<None>/interact
LOW 10X12	The 10x12 inch film supply magazine is low.	10x12 film supply low.	<None>/interact
LOW 10X12 BLUE	The 10x12 inch blue film supply magazine is low.	10x12 blue film supply low.	<None>/interact
LOW 10X12 CLR	The 10x12 inch clear film supply magazine is low.	10x12 clear film supply low.	<None>/interact
LOW 10X12 PAPR	The 10x12 inch paper supply magazine is low.	10x12 paper supply low.	<None>/interact
LOW 10X14	The 10x14 inch film supply magazine is low.	10x14 film supply low.	<None>/interact
LOW 10X14 BLUE	The 10x14 inch blue film supply magazine is low.	10x14 blue film supply low.	<None>/interact
LOW 10X14 CLR	The 10x14 inch clear film supply magazine is low.	10x14 clear film supply low.	<None>/interact
LOW 10X14 PAPR	The 10x14 inch paper supply magazine is low.	10x14 paper supply low.	<None>/interact
LOW 11X14	The 11x14 inch film supply magazine is low.	11x14 film supply low.	<None>/interact
LOW 11X14 BLUE	The 11x14 inch blue film supply magazine is low.	11x14 blue film supply low.	<None>/interact
LOW 11X14 CLR	The 11x14 inch clear film supply magazine is low.	11x14 clear film supply low.	<None>/interact
LOW 11X14 PAPR	The 11x14 inch paper supply magazine is low.	11x14 paper supply low.	<None>/interact
LOW 14X14	The 14x14 inch film supply magazine is low.	14x14 film supply low.	<None>/interact

LOW 14X14 BLUE	The 14x14 inch blue film supply magazine is low.	14x14 blue film supply low.	<None>/interact
LOW 14X14 CLR	The 14x14 inch clear film supply magazine is low.	14x14 clear film supply low.	<None>/interact
LOW 14X14 PAPR	The 14x14 inch paper supply magazine is low.	14x14 paper supply low.	<None>/interact
LOW 14X17	The 14x17 inch film supply magazine is low.	14x17 film supply low.	<None>/interact
LOW 14X17 BLUE	The 14x17 inch blue film supply magazine is low.	14x17 blue film supply low.	<None>/interact
LOW 14X17 CLR	The 14x17 inch clear film supply magazine is low.	14x17 clear film supply low.	<None>/interact
LOW 14X17 PAPR	The 14x17 inch paper supply magazine is low.	14x17 paper supply low.	<None>/interact
LOW 24X24	The 24x24 inch film supply magazine is low.	24x24 film supply low.	<None>/interact
LOW 24X24 BLUE	The 24x24 inch blue film supply magazine is low.	24x24 blue film supply low.	<None>/interact
LOW 24X24 CLR	The 24x24 inch clear film supply magazine is low.	24x24 clear film supply low.	<None>/interact
LOW 24X24 PAPR	The 24x24 inch paper supply magazine is low.	24x24 paper supply low.	<None>/interact
LOW 24X30	The 24x30 inch film supply magazine is low.	24x30 film supply low.	<None>/interact
LOW 24X30 BLUE	The 24x30 inch blue film supply magazine is low.	24x30 blue film supply low.	<None>/interact
LOW 24X30 CLR	The 24x30 inch clear film supply magazine is low.	24x30 clear film supply low.	<None>/interact
LOW 24X30 PAPR	The 24x30 inch paper supply magazine is low.	24x30 paper supply low.	<None>/interact
LOW A4 PAPR	The A4 paper supply magazine is low.	A4 paper supply low.	<None>/interact
LOW A4 TRANS	The A4 transparency supply magazine is low.	A4 transparency supply low.	<None>/interact
NO RECEIVE MGZ	The film receive magazine is not available.	Film receiver not available.	<None>/interact
NO RIBBON	The ribbon cartridge needs to be replaced.	Replace ribbon cartridge.	<None>/interact
NO SUPPLY MGZ	The film supply magazine is not available.	Film supply not available.	<None>/interact
CHECK PRINTER	The printer is not ready at this time, operator intervention is required to make the printer available.	Check camera.	<None>/interact
CHECK PROC	The processor is not ready at this time, operator intervention is required to make the printer available.	Check processor.	<None>/interact
PRINTER DOWN	The printer is not operating due to some unspecified reason.	Camera down.	<None>/interact
PRINTER INIT	The printer is not ready at this time, it is expected to become	Camera initializing.	<None>/Idle

	available without intervention. For example, it may be in a normal warm-up state.		
PRINTER OFFLINE	The printer has been disabled by an operator or service person.	Camera off-line.	<None>/interact
PROC DOWN	The processor is not operating due to some unspecified reason.	Processor down.	<None>/interact
PROC INIT	The processor is not ready at this time, it is expected to become available without intervention. For example, it may be in a normal warm-up state.	Processor initializing.	<None>/Idle
PROC OVERFLOW FL	Processor chemicals are approaching the overflow full mark.	Processor chemicals near overflow.	<None>/interact
PROC OVERFLOW HI	Processor chemicals have reached the overflow full mark.	Processor chemicals overflow.	<None>/interact
QUEUED	Print job in Queue	--	<None>/Idle
RECEIVER FULL	The film receive magazine is full.	Receiver full.	<None>/interact
REQ MED NOT INST	The requested film, paper, or other media supply magazine is installed in the printer but may be available with operator intervention.	Install media supply.	<None>/interact
REQ MED NOT AVAI	The requested film, paper, or other media requested is not available on this printer.	Media supply not available on this camera. Queue stopped. Change camera.	Queue for this camera will be STOPPED/ Queue stopped
RIBBON ERROR	There is an unspecified problem with the print ribbon.	Error with print ribbon.	<None>/interact
SUPPLY EMPTY	The printer is out of film.	Camera out of film.	<None>/interact
SUPPLY LOW	The film supply is low.	Film supply low.	<None>/interact
UNKNOWN	There is an unspecified problem.	Unspecified problem with camera.	<None>/interact

10.6.2 Additional Status Information – AGFA printers

Table 74 - "Additional Agfa Printer Status Info Evaluation"

Printer Status Info/ Execution Status Info	**Description**	**Message string visible in 'Status Bar'**	**Other action for UI/ 'Camera symbol'**
WARMING UP	Printer is in the warm-up stage. Spooling of print jobs to disk is still possible.	Camera is warming up.	<None>/idle
OFFLINE	OFFLINE Printer is switched off-line. Spooling of print jobs to disk is still possible.	Camera is switched off-line.	<None>/interact
NONE	General printer warning, no specific information is available. Spooling of print jobs to disk is still possible.	--	<None>/idle

10.6.3 Additional Status Information – Kodak PACS Link (formerly Imation)

Table 75 - "Additional Kodak PACS Link (Imation) Printer Status Info Evaluation"

Printer Status Info/ Execution Status Info	Description	Message string visible in 'Status Bar'	Other action for UI/ 'Camera symbol'
SUPPLY MGZ ERR	The supply magazine has an error.	Film supply has an error.	<None>/interact

10.6.4 Additional Status Information – Kodak 1901

Table 76 - "Additional Kodak 190 Printer Status Info Evaluation"

Printer Status Info/ Execution Status Info	Description	Message string visible in 'Status Bar'	Other action for UI/ 'Camera symbol'
PRINTER STOPPED	The printer has stopped.	Camera has stopped.	<None>/interact
FATAL ERROR	Fatal Error.	Fatal Error. Queue stopped.	Queue for this camera will be STOPPED/ Queue stopped

10.6.5 Additional Status Information – Kodak 2180/1120

Table 77 - "Additional Kodak 2180/1120 Printer Status Info Evaluation"

Printer Status Info/ Execution Status Info	Description	Message string visible in 'Status Bar'	Other action for UI/ 'Camera symbol'
PRINTER NOT RDY	Printer not ready.	Camera not ready.	<None>/interact
CHECK PROCESSOR	Check processor.	Check processor.	<None>/interact
NO TONER	No toner.	No toner.	<None>/interact
FATAL	Fatal Error.	Fatal Error. Queue stopped.	Queue for this camera will be STOPPED/ Queue stopped

10.6.6 Additional Status Information – Codonics

Table 78 - "Additional Codonics Printer Status Info Evaluation"

Printer Status Info/ Execution Status Info	Description	Message string visible in 'Status Bar'	Other action for UI/ 'Camera symbol'
STANDARD	Printer is ready.	Camera is ready.	<None>/Normal
LOAD A-SIZE	Load A-Size media.	Load A-Size media.	<None>/interact

LOAD A-DVPAPER	Load A-Size black and white paper.	Load A-Size black and white paper.	<None>/interact
LOAD A-CVPAPER	Load A-Size color paper.	Load A-Size color paper.	<None>/interact
LOAD A-CVTRANS	Load A-Size transparencies.	Load A-Size transparencies.	<None>/interact
LOAD A4-SIZE	Load A4-Size media.	Load A4-Size media.	<None>/interact
LOAD A4-DVPAPER	Load A4-Size black and white paper.	Load A4-Size black and white paper.	<None>/interact
LOAD A4-CVPAPER	Load A4-Size color paper.	Load A4-Size color paper.	<None>/interact
LOAD A4-CVTRANS	Load A4-Size transparencies.	Load A4-Size transparencies.	<None>/interact
LOAD LA-SIZE	Load LA-Size media.	Load LA-Size media.	<None>/interact
LOAD LA-DVPAPER	Load LA-Size black and white paper.	Load LA-Size black and white paper.	<None>/interact
LOAD LA-CVPAPER	Load LA-Size color paper.	Load LA-Size color paper.	<None>/interact
LOAD LA-CVTRANS	Load LA-Size transparencies.	Load LA-Size transparencies.	<None>/interact
LOAD LA4-SIZE	Load LA4-Size media.	Load LA4-Size media.	<None>/interact
LOAD LA4-DVPAPER	Load LA4-Size black and white paper.	Load LA4-Size black and white paper.	<None>/interact
LOAD LA4-CVPAPER	Load LA4-Size color paper.	Load LA4-Size color paper.	<None>/interact
LOAD LA4-CVTRANS	Load LA4-Size transparencies.	Load LA4-Size transparencies.	<None>/interact
LOAD XLA-SIZE	Load XLA-Size media.	Load XLA-Size media.	<None>/interact
LOAD XLA-DVPAPER	Load XLA-Size black and white paper.	Load XLA-Size black and white paper.	<None>/interact
LOAD XLA-CVPAPER	Load XLA-Size color paper.	Load XLA-Size color paper.	<None>/interact
LOAD XLA-CVTRANS	Load XLA-Size transparencies.	Load XLA-Size transparencies.	<None>/interact
LOAD XLA4-SIZE	Load XLA4-Size media.	Load XLA4-Size media.	<None>/interact
LOAD XLA4-DVPAPER	Load XLA4-Size black and white paper.	Load XLA4-Size black and white paper.	<None>/interact
LOAD XLA4-CVPAPER	Load XLA4-Size color paper.	Load XLA4-Size color paper.	<None>/interact
LOAD XLA4-CVTRANS	Load XLA4-Size transparencies.	Load XLA4-Size transparencies.	<None>/interact
LOAD XLW-SIZE	Load XLW-Size media.	Load XLW-Size media.	<None>/interact
LOAD XLW-DVPAPER	Load XLW-Size black and white paper.	Load XLW-Size black and white paper.	<None>/interact
LOAD XLW-CVPAPER	Load XLW-Size color paper.	Load XLW-Size color paper.	<None>/interact
LOAD 8X10-SIZE	Load 8x10 media.	Load 8x10 media.	<None>/interact

LOAD 8X10-DVFILM	Load XLW-Size black and white film.	Load XLW-Size black and white film.	<None>/interact
SUPPLY MISSING	The film supply magazine specified for this job is not available.	Film supply not available.	<None>/interact
RIBBON MISSING	Ribbon is missing.	Ribbon is missing.	<None>/interact
RIBBON EMPTY	Ribbon is empty.	Ribbon is empty.	<None>/interact
TOP COVER OPEN	Top cover of printer is open.	Top cover of camera is open.	<None>/interact

10.6.7 Additional DICOM Execution Status Information

Table 79 - "Additional DICOM Execution Status Info Evaluation"

Printer Status Info/ Execution Status Info	**Description**	**Message string visible in 'Status Bar'**	**Other action for UI/ 'Camera symbol'**
INVALID PAGE DES	The specified page layout cannot be printed, or other page description errors have been detected.	Film Job cannot be printed on this camera. Queue stopped. Please redirect film job.	Queue for this camera will be STOPPED/ Queue stopped
INSUFFICIENT MEMORY	There is not enough memory available to complete this job.	Not enough memory available in camera. Queue stopped. Please continue queue or change camera.	Queue for this camera will be STOPPED/ Queue stopped
NONE	General printer warning, no specific information is available. Spooling of print jobs to disk is still possible.	--	<None>/Idle

10.6.8 Additional DICOM Execution Status Information

Printer Status Info and Execution Status Info are defined terms and can therefore be extended or reduced by camera manufacturers. Therefore, *syngo* shall be flexible.

If any other printer status info or execution status info is received, *syngo* will react as shown in the following table:

Table 80 - Additional DICOM Execution Status Information

Printer Status / Execution	**Printer / Execution Status Info**	**Description**	**Message string visible in the HCD status bar**	**Other action for *syngo* / camera symbol**
WARNING	<any other>	<not defined status info>	Camera info: <status info>	<None>/Interact
FAILURE	<any other>	<not defined status info>	Camera info: <status info> Queue stopped.	Queue for this camera will be STOPPED/ Queue stopped

10.7 NM/PT Standard Extended SOP Class

The following tables list the private IOD attributes which are encoded by *syngo* MI Apps in a DICOM standard where the Private Creator ID is "Siemens MED NM" except when noted.

Table 81 – Private IOD Attributes in NM SOP Class

Tag	VR	VM	Attribute Name	Note
(0019,00A1)	SS	1	Number of phases	
(0019,00A5)	SS	1-n	Number of repeats per phase	
(0019,00A6)	SS	1-n	Cycles per repeat	
(0019,00A7)	SL	1-n	Repeat start time	
(0019,00A8)	SL	1-n	Repeat stop time	
(0019,00A9)	SL	1-n	Effective repeat time	
(0019,00AA)	SS	1-n	Acquired cycles per repeat	
(0019,0016)	SS	1	Number of Views	
(0019,0093)	SL	1-n	Phase start time	
(0023,0001)	US	1	DICOM Reader flag	
(0029,0008)	CS	1	Modality Image Header Type	Siemens CSA HEADER
(0029,0009)	LO	1	Modality Image Header Version	Siemens CSA HEADER
(0029,0010)	OB	1	Modality Image Header Info	Siemens CSA HEADER
(0033,0010)	FL	n	COR Data for Detector 1	
(0033,0011)	FL	n	COR Data for Detector 2	
(0033,0014)	FL	n	MHR Y-Shift 1	
(0033,0015)	FL	n	MHR Y-Shift 2	
(0033,0018)	FL	n	NCO Data 1	
(0033,0019)	FL	n	NCO Data 2	
(0033,0020)	FL	1	Bed Correction Angle	
(0033,0021)	FL	1	Gantry Correction Angle	
(0033,0022)	SS	n	Bed U/D Correction Data	
(0033,0023)	SS	n	Gantry L/R Correction Data	
(0033,0024)	FL	1	Back projection angle head 1	
(0033,0025)	FL	1	Back projection angle head 2	
(0033,0028)	SL	1	Number of point sources used for NCO and MHR	
(0033,0029)	FL	1	Crystal thickness	
(0033,0030)	LO	1	Preset name used for acquisition	
(0033,0031)	FL	1	Camera config angle	
(0033,0032)	LO	1	Crystal type Startburst or not	
(0033,0033)	SL	1	Gantry step for COIN acquisitions	
(0033,0034)	FL	1	Bed step for whole body or Coin acquisitions	
(0033,0035)	FL	1	Weight factor table for coincidence acquisitions	
(0033,0036)	FL	1	Transaxial acceptance width for coincidence	

(0033,0037)	SL	1	Starburst flags	
(0033,0038)	FL	1	Pixel scale factor	
(0035,0000)	LO	1	Specialized tomo type	
(0035,0001)	LO	1	Energy window type	
(0035,0002)	SS	1	Start and end row illuminated by wind position	
(0035,0003)	LO	1	Blank scan image for profile	
(0035,0004)	SS	1	Repeat number of the original dynamic SPECT	
(0035,0005)	SS	1	Phase number of the original dynamic SPECT	
(0035,0006)	LO	1	Siemens Profile 2 Image Sub type	
(0037,0000)	OW	n	Flood correction Matrix Det 1	
(0037,0080)	OW	n	Flood correction Matrix Det 2	
(0039,0000)	LT	1	Toshiba CBF activity results	
(0039,0001)	LT	1	Related CT Series Instance UID	
(0041,0001)	SL	1	Whole Body Tomo Position Index	
(0041,0002)	SL	1	Whole Body Tomo Number of Positions	
(0041,0003)	FL	1	Horizontal Table Position of CT scan	
(0041,0004)	FL	1	Effective Energy of CT Scan	
(0041,0005)	FD	1-n	Long Linear Drive Information for Detector 1	
(0041,0006)	FD	1-n	Long Linear Drive Information for Detector 2	
(0041,0007)	FD	1-n	Trunnion Information for Detector 1	
(0041,0008)	FD	1-n	Trunnion Information for Detector 2	
(0041,0009)	FL	1	Broad Beam Factor	
(0041,000A)	FD	1	Original Whole body Position	
(0041,000B)	FD	1	Whole body Scan Range	
(0041,0010)	FL	1-3	Effective Emission Energy	
(0041,0011)	FL	1-n	Gated Frame Duration	
(0043,0001)	FL	1-n	Detector View Angle	
(0043,0002)	FD	1-16	FOV Transformation Matrix	
(0043,0003)	FL	1-n	View Dependent Y shift MHR for Detector 1	
(0043,0004)	FL	1-n	View Dependent Y shift MHR for Detector 2	
(0045,0001)	LO	1-n	Planar Processing String	
(0055,0003)	SL	1	View Start Time	
(0055,0004)	SS	1	Prompt window width for Coincidence	
(0055,0005)	SS	1	Random window width for Coincidence	
(0055,007E)	FL	1-n	Collimator thickness	
(0055,007F)	FL	1-n	Collimator angular resolution	
(0055,00C0)	SS	1-n	Useful Field of View	
(0057,0001)	LO	1	*syngo* MI DICOM original image type	
(0057,0002)	FL	1	Dose calibration factor	
(0057,0003)	LO	1	Units	
(0057,0004)	LO	1	Decay correction	

(0057,0005)	FL	N	Radio nuclide half life	
(0057,0006)	FL	1	Rescale intercept	
(0057,0007)	FL	1	Rescale Slope	
(0057,0008)	FL	n	Frame reference time	
(0057,0009)	SL	1	Number of Radiopharmaceutical information seq	
(0057,000A)	FL	n	Decay factor	
(0057,000B)	LO	1	Counts source	
(0057,000C)	FL	n	Radionuclide positron fraction	
(0057,000E)	US	1-n	Trigger Time of CT Slice	
(0057,000F)	SS	1	QSPECT Compliant Flag	
(0061,0001)	FL	1-n	X Principal Ray Offset – Detector 1	
(0061,0002)	FL	1-n	X Principal Ray Offset – Detector 2	
(0061,0005)	FL	1-n	Y Principal Ray Offset – Detector 1	
(0061,0006)	FL	1-n	Y Principal Ray Offset – Detector 2	
(0061,0009)	FL	1-n	X Principal Ray Angle	
(0061,000A)	FL	1-n	Y Principal Ray Angle	
(0061,000B)	FL	1-n	X Short Focal Length	
(0061,000C)	FL	1-n	Y Short Focal Length	
(0061,000D)	FL	1-n	X Long Focal Length	
(0061,000E)	FL	1-n	Y Long Focal Length	
(0061,000F)	FL	1-n	X Focal Scaling	
(0061,0010)	FL	1-n	Y Focal Scaling	
(0061,0011)	FL	1-n	X Motion Correction Shift – Detector 1	
(0061,0012)	FL	1-n	X Motion Correction Shift – Detector 2	
(0061,0015)	FL	1-n	Y Motion Correction Shift – Detector 1	
(0061,0016)	FL	1-n	Y Motion Correction Shift – Detector 2	
(0061,0019)	FL	1	X Heart Center	
(0061,001A)	FL	1	Y Heart Center	
(0061,001B)	FL	1	Z Heart Center	
(0061,001C)	LO	1	Image Pixel Content Type	
(0061,001D)	SS	1	Auto Save Corrected Series	
(0061,001E)	LT	1	Distorted Series Instance UID	
(0061,0021)	SS	1-n	Recon Range	
(0061,0022)	LO	1	Recon Orientation	
(0061,0023)	FL	1-n	Recon Selected Angular Range	
(0061,0024)	FL	1	Recon Transverse Angle	
(0061,0025)	FL	1	Recon Sagittal Angle	
(0061,0026)	FL	1	Recon X Mask Size	
(0061,0027)	FL	1	Recon Y Mask Size	
(0061,0028)	FL	1	Recon X Image Center	
(0061,0029)	FL	1	Recon Y Image Center	

(0061,002A)	FL	1	Recon Z Image Center	
(0061,002B)	FL	1	Recon X Zoom	
(0061,002C)	FL	1	Recon Y Zoom	
(0061,002D)	FL	1	Recon Threshold	
(0061,002E)	FL	1	Recon Output Pixel Size	
(0061,002F)	LO	1-n	Scatter Estimation Method	
(0061,0030)	LO	1-n	Scatter Estimation Method Mode	
(0061,0031)	FL	1-n	Scatter Estimation Lower Window Weights	
(0061,0032)	FL	1-n	Scatter Estimation Upper Window Weights	
(0061,0033)	LO	1-n	Scatter Estimation Window Mode	
(0061,0034)	LO	1-n	Scatter Estimation Filter	
(0061,0035)	LO	1-n	Recon Raw Tomo Input UID	
(0061,0036)	LO	1	Recon CT Input UID	
(0061,0037)	FL	1	Recon Z Mask Size	
(0061,0038)	FL	1	Recon X Mask Center	
(0061,0039)	FL	1	Recon Y Mask Center	
(0061,003A)	FL	1	Recon Z Mask Center	
(0061,003B)	FL	1	First Slice Index	
(0061,003C)	LT	1	Non Image UID	
(0061,003D)	LT	1	Non Image Series UID	
(0061,003E)	LT	1-2	Non Image Associated Parent Series UID	
(0061,003F)	FL	1-n	Original Bin Time	
(0061,0051)	LT	1	Raw Tomo Series UID	
(0061,0052)	LT	1	Low Res CT Series UID	
(0061,0053)	LT	1	High Res CT Series UID	
(0061,0054)	FL	1-4	Vector Map Offset	
(0061,0055)	FL	1-2	Collimator Hole Length	
(0061,0056)	FL	1-2	Collimator Entry Hole Diameter	
(0061,0057)	FL	1-2	Collimator Exit Hole Diameter	
(0061,0058)	FL	1-2	Collimator Front Padding Distance	
(0061,0059)	FL	1-2	Collimator Back Spacing Distance	
(0061,005A)	FL	1-2	Collimator Mean Hole Area	
(0061,005B)	FL	1-2	Collimator Field of View	
(0061,005C)	FL	1-2	Collimator Septal Penetration	
(0061,005D)	FL	1-2	Collimator Sensitivity	
(0061,005E)	FL	1-2	Crystal Depth of Interaction	
(0061,005F)	FL	1-2	Crystal Intrinsic Resolution	
(0061,0060)	FL	1-n	IQSPECT Heart Offset Detector 1	
(0061,0061)	FL	1-n	IQSPECT Heart Offset Detector 2	
(0061,0062)	LT	1	Recon Output Type	
(0061,0067)	LT	1	Attenuation Correction Temporal Relationship	

(0061,0068)	LT	1	Attenuation Correction Source	
(0061,006E)	LT	1	Recon Method	
(0061,006F)	FL	2	Reconstruction Angle	
(0061,0070)	LT	1	Reconstruction Algorithm	
(0061,0071)	FD	16	CT Transformation Matrix	
(0061,0076)	FL	1-n	QC Motion Vectors	
(0061,007A)	FD	1	Assay Dose	
(0061,007B)	DT	1	Assay Date Time	
(0061,007C)	FD	1	Effective Dose	
(0061,007D)	FD	1	Residual Dose	
(0061,007E)	DT	1	Residual Dose Date Time	
(0061,0080)	LT	1	Recon Parameters Block	
(0061,0081)	LT	1	Legacy Corrected Series UID	
(0061,0082)	LT	1	Legacy Corrected Image UID	
(0061,0083)	FL	1-2	Collimator Septal Thickness	
(0061,0085)	DT	1-n	View Start Times	
(0061,0086)	SL	1-n	View Pause Durations	
(0061,0088)	DT	1	Injection Date Time	
(0061,0089)	DT	1	Effective Dose Date Time	
(0061,008A)	FD	1	Sensitivity Calibration Distance (Detector 1)	
(0061,008B)	FD	1	Sensitivity Calibration Distance (Detector 2)	
(0061,008C)	LO	1	UTC Offset (Time zone offset)	
(0061,008D)	SS	1	PET Data Flag	
(0063, 0001)	FL	1-n	System Sensitivity for Det 1	
(0063, 0002)	FL	1-n	System Sensitivity for Det 2	
(0063, 0003)	FL	1-n	Assay Dose Sensitivity for Det 1	
(0063, 0004)	FL	1-n	Assay Dose Sensitivity for Det 2	
(0063, 0005)	FL	1-n	Residual Dose Sensitivity for Det 1	
(0063, 0006)	FL	1-n	Residual Dose Sensitivity for Det 2	
(0063, 0007)	FL	1-n	Count Loss for Det 1	
(0063, 0008)	FL	1-n	Count Loss for Det 2	
(0063, 0009)	FD	1-n	Volume Sensitivity Factor	
(0063, 000A)	LO	1-n	Volume Sensitivity Version	
(0063, 000B)	FD	1-n	Volume Sensitivity Factor Volume	
(0063, 000C)	LO	1-n	Source IDs	
(0063, 000D)	FL	1-n	Broad Quant Volume Array	
(0063, 000E)	LO	1-n	Broad Quant Organ Names	
(0063, 000F)	SS	1-n	Broad Quant Zone Values	
(0063, 0010)	FL	1-n	Broad Quant Zone Stats	
(0063, 0011)	FL	1-n	Isotope Half Life	
(0063, 0012)	DT	1	System Sensitivity Datetime	

(0063, 0013)	DT	1	Assay Sensitivity Datetime	
(0063, 0014)	DT	1	Residual Sensitivity Datetime	
(7FE3,0014)	OW	n	Minimum pixel in frame	
(7FE3,0015)	OW	n	Maximum pixel in frame	
(7FE3,0029)	OW	1	Number of R-Waves in frame	

Table 82 – Private IOD Attributes in PET SOP Class

Tag	VR	VM	Attribute Name	Note
(0029,0018)	CS	1	Modality Image Header Type	Siemens CSA HEADER
(0029,0019)	LO	1	Modality Image Header Version	Siemens CSA HEADER
(0029,0020)	OB	1	Modality Image Header Info	Siemens CSA HEADER
(0061,0026)	FL	1	Recon X Mask Size	
(0061,0027)	FL	1	Recon Y Mask Size	
(0061,0035)	UI	1-n	Raw TOMO UID	
(0061,0036)	UI	1	CT UID	
(0061,0037)	FL	1	Recon Z Mask Size	
(0061,0038)	FL	1	Recon X Mask Center	
(0061,0039)	FL	1	Recon Y Mask Center	
(0061,003A)	FL	1	Recon Z Mask Center	
(0061,0053)	UI	1	High Res CT Series UID	
(0061,0062)	LT	1	Recon Output Type	
(0061,0067)	LT	1	Attenuation Correction Temporal Relationship	
(0061,0068)	LT	1	Attenuation Correction Source	
(0061,006E)	LT	1	Recon Method	
(0061,006F)	FL	2	Reconstruction Angle	
(0061,0070)	LT	1	Reconstruction Algorithm	
(0061,007A)	FD	1	Assay Dose	
(0061,007B)	DT	1	Assay Date Time	
(0061,007C)	FD	1	Effective Dose	
(0061,007D)	FD	1	Residual Dose	
(0061,007E)	DT	1	Residual Dose Date Time	
(0061,0087)	SL	1	Reconstruction Performance Range	
(0061,0088)	DT	1	Injection Date Time	
(0061,0089)	DT	1	Effective Dose Date Time	
(0061,008C)	LO	1	UTC Offset (Time zone offset)	
(0061,008D)	SS	1	PET Data Flag	
(0071,0022)	DT	1	Decay Correction Date Time	Siemens MED PT
(0071,0023)	FD	1-16	Transformation Matrix	Siemens MED PT

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