

syngo® Workflow MLR VB30C

DICOM Conformance Statement

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Conformance Statement Overview

The **syngo® Workflow MLR** provides conformance to following services:

- Providing a Worklist to the Modality (MWL)
- Receiving Performed Procedure Step update messages from the Modality (MPPS)
- Triggering the forwarding of prior studies from the PACS to a third DICOM node (C-MOVE)
- Report content might be retrieved from **syngo® Workflow MLR** via a private service defined by MITRA (Report Management)

These services are distributed over three Application Entities:

1. MWL and Report Management AE
2. MPPS AE
3. Retrieve AE

The table below depicts the DICOM capability of the **syngo® Workflow MLR** in more detail:

SOP Class Name	SOP Class UID	SCU	SCP
Verification			
Verification SOP Class	1.2.840.10008.1.1	No	Yes
Workflow Management			
Modality Worklist Information Model - FIND	1.2.840.10008.5.1.4.31	No	Yes
Modality Performed Procedure Step SOP class	1.2.840.10008.3.1.2.3.3	No	Yes
Private Report Management			
MITRA Report Management	1.2.840.113532.3500.8	No	Yes
Retrieve			
Patient Root Query/Retrieve Information Model - MOVE	1.2.840.10008.5.1.4.1.2.1.2	Yes	No
Study Root Query/Retrieve Information Model - MOVE	1.2.840.10008.5.1.4.1.2.2.2	Yes	No

Table 1: Overview about supported DICOM services and roles

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Document and Release History

Document History

Version	Date of Issue	Author	Change & Reason of Change/Change Request/CHARM
R 1.0	2008-03-11	J. Müller	based on R 1.0 V30B, only version changed to VB30C released after online review

History of released Versions

Version	Release Date	Product Version
R 1.0	2008-03-11	VB30C

1 Introduction

1.1 General

The Conformance Statement describes the DICOM interface for the Siemens **syngo® Workflow MLR** in terms of part 2 of [1].

1.2 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.

1.3 Remarks

DICOM, by itself, does not guarantee interoperability. However, the Conformance Statement facilitates a first-level validation for interoperability between different applications supporting the same DICOM functionality as SCU and SCP, respectively.

This Conformance Statement is not intended to replace validation with other DICOM equipment to ensure proper exchange of information intended.

The scope of this Conformance Statement is to facilitate communication with Siemens and other vendors' Medical equipment. The Conformance Statement should be read and understood in conjunction with the DICOM 3.0 Standard [1]. However, by itself it is not guaranteed to ensure the desired interoperability and a successful interconnectivity.

The user should be aware of the following important issues:

- The comparison of different conformance statements is the first step towards assessing interconnectivity between Siemens and non-Siemens equipment.
- Test procedures should be defined and tests should be performed by the user to validate the connectivity desired. DICOM itself and the conformance parts do not specify this.
- The standard will evolve to meet the users' future requirements. Siemens is actively involved in developing the standard further and therefore reserves the right to make changes to its products or to discontinue its delivery.

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

1.4 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:

ACR	American College of Radiology
AE	DICOM Application Entity
ASCII	American Standard Code for Information Interchange
CSE	Customer Service Engineer
DB	Database
DCS	DICOM Conformance Statement
DSA	Digital Subtraction Angiography
IIDC	Image-Intensifier Distortion Correction
IOD	DICOM Information Object Definition
ISO	International Standard Organization
NEMA	National Electrical Manufacturers Association
O	Optional Key Attribute
PDU	DICOM Protocol Data Unit
R	Required Key Attribute
RIS	Radiology Information System
RWA	Real-World Activity
SCU	DICOM Service Class User (DICOM client)
SCP	DICOM Service Class Provider (DICOM server)
SOP	DICOM Service-Object Pair
U	Unique Key Attribute
UTF-16	Unicode Transformation Format-16 (used internally by Microsoft Windows)
WC	Wildcard

1.5 References

- [1] Digital Imaging and Communications in Medicine (DICOM), NEMA PS 3.1-3.15, 2007
- [2] IHE Radiology Framework, Vol. I - III
- [3] DCS "syngo® Imaging – syngo® Studio (Advanced) Workplace"
- [4] DCS "syngo® Imaging – syngo® Data Manager"
- [5] DCS "syngo® Workflow SLR"
- [6] DCS "syngo® Dynamics" (client and server)
- [7] DCS "syngo® Imaging XS"

All SIEMENS DICOM Conformance Statements are online available under following link:

www.siemens.com/dicom

1.6 Structure

This Conformance Statement is subdivided into multiple Parts, which relate to individual documents needed to declare Conformance according to the requirements of “Part 2 - Conformance” of the DICOM Standard.

Those parts are:

- “Network Conformance Statement” for Network related Services:
 - Modality Worklist and *Private MITRA Report Management* – Provider (includes Verification as Provider)
 - Modality Performed Procedure Step – Provider (includes Verification as Provider)
 - Retrieve – User
- A general Appendix.

1.7 Scope and Field

syngo® Suite offers advanced RIS, PACS, and Processing in a comprehensive package for all imaging needs in radiology and cardiology and comprises syngo® Workflow, syngo® Dynamics and syngo® Imaging.

- syngo® Workflow drives the radiological workflow from order entry to image and report distribution.
- syngo® Dynamics is a multi-modality, dynamic image review, diagnosis and archiving system for cardiology, general imaging and OB/GYN.
- syngo® Imaging XS is a scalable solution that gives access to the world of digital image management.
- syngo® Imaging is a modular, scalable PACS solution for highest customer demands with focus on workflow, speed and usability (syngo® Imaging consists of two DICOM-speaking components, the syngo® Data Manger and the syngo® Studio Workplace).

This document just describes the DICOM conformance of the syngo® Workflow MLR.

The **syngo® Workflow MLR** acts as SCP for the DICOM Worklist, DICOM MPPS and private Report Management services, furthermore **syngo® Workflow MLR** acts as SCU for DICOM Retrieval (C-Move) .

Please note that the DICOM Conformance of the other components/products of the **syngo® Suite** is described in separate documents:

- **syngo® Imaging** – **syngo® Studio** (Advanced) Workplace (see [3])
- **syngo® Imaging** – **syngo® Data Manager** (see [4])
- **syngo® Workflow SLR** (see [5])
- **syngo® Dynamics** (client and server) (see [6])
- **syngo® Imaging XS** (see [7])

1.8 Additional information

As above described, the **syngo® Suite** consist of mainly three DICOM – speaking components.

The figure below gives an overview about the capabilities of the different parts:

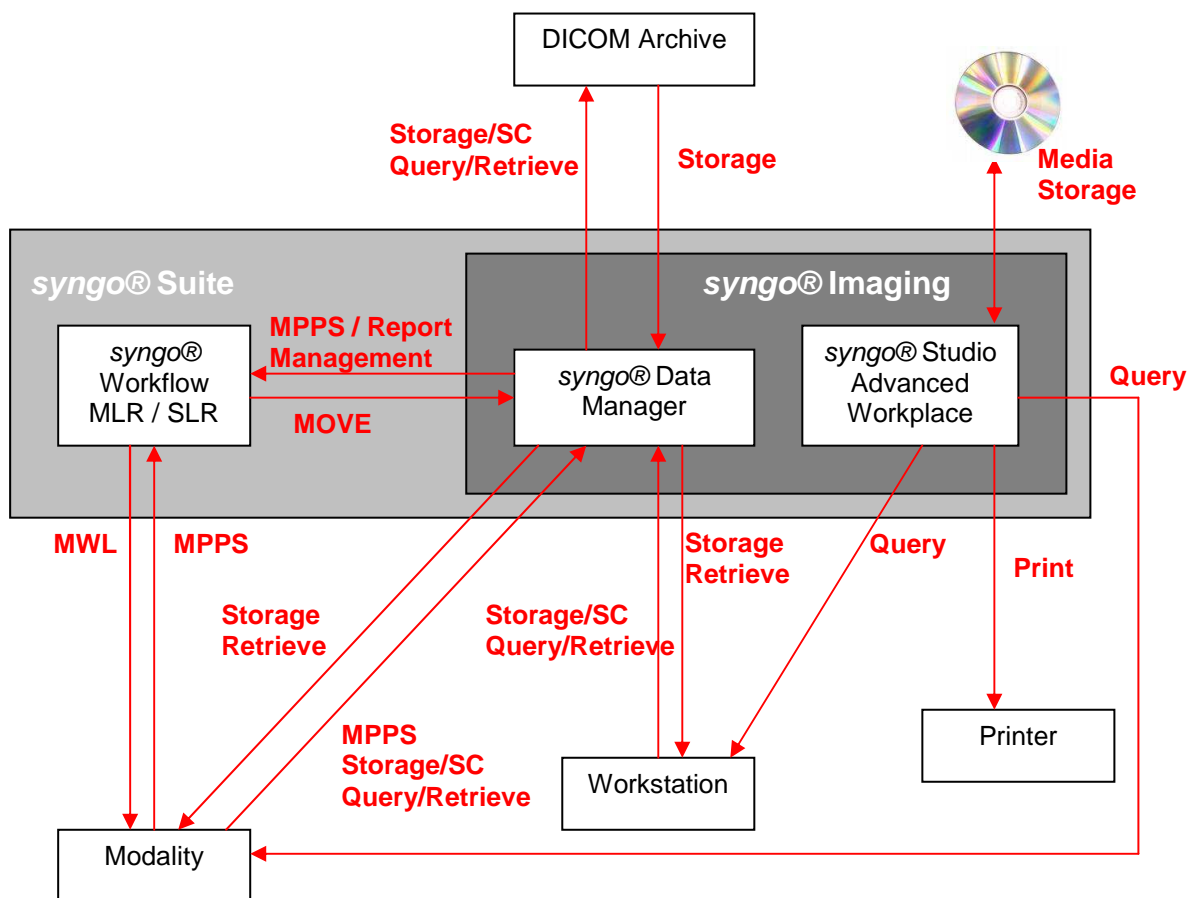


Figure 1: Overview about DICOM capabilities of syngo® Suite (with syngo® Imaging)

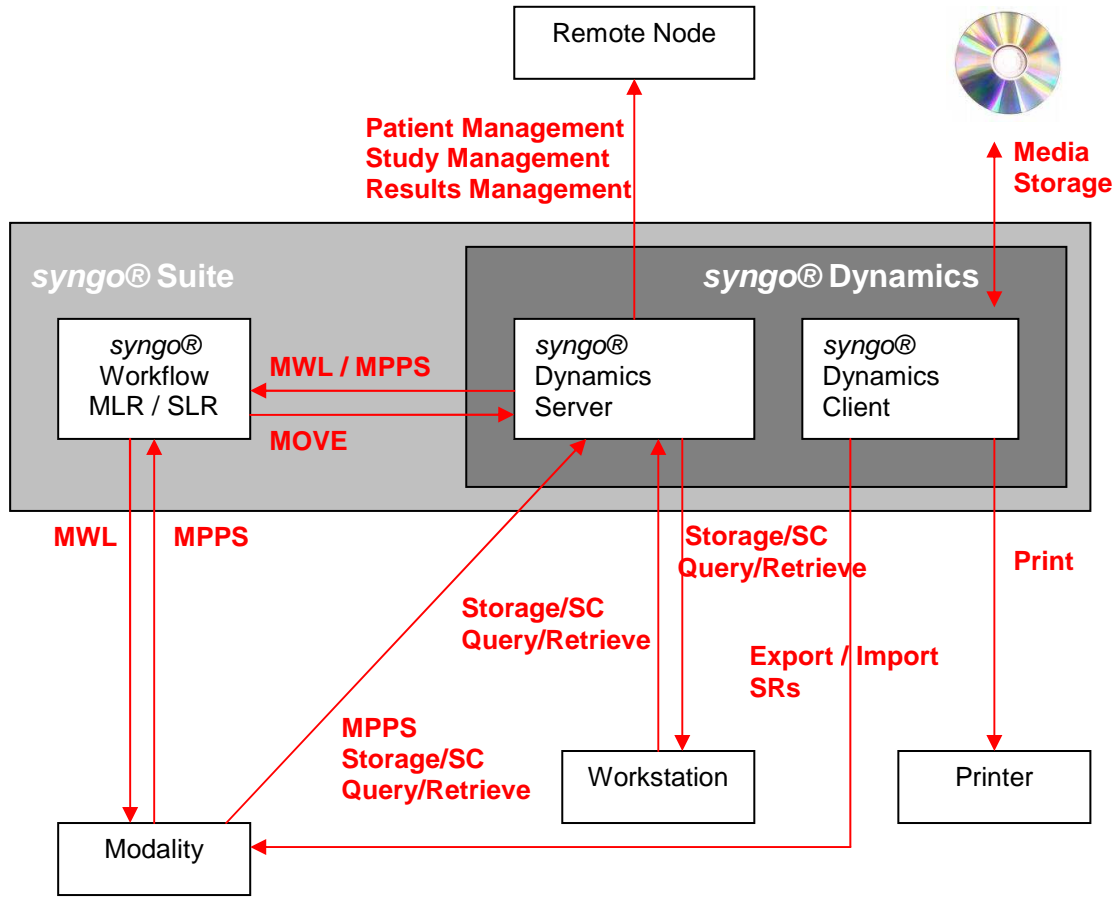


Figure 2: Overview about DICOM capabilities of syngo® Suite (with syngo® Dynamics)

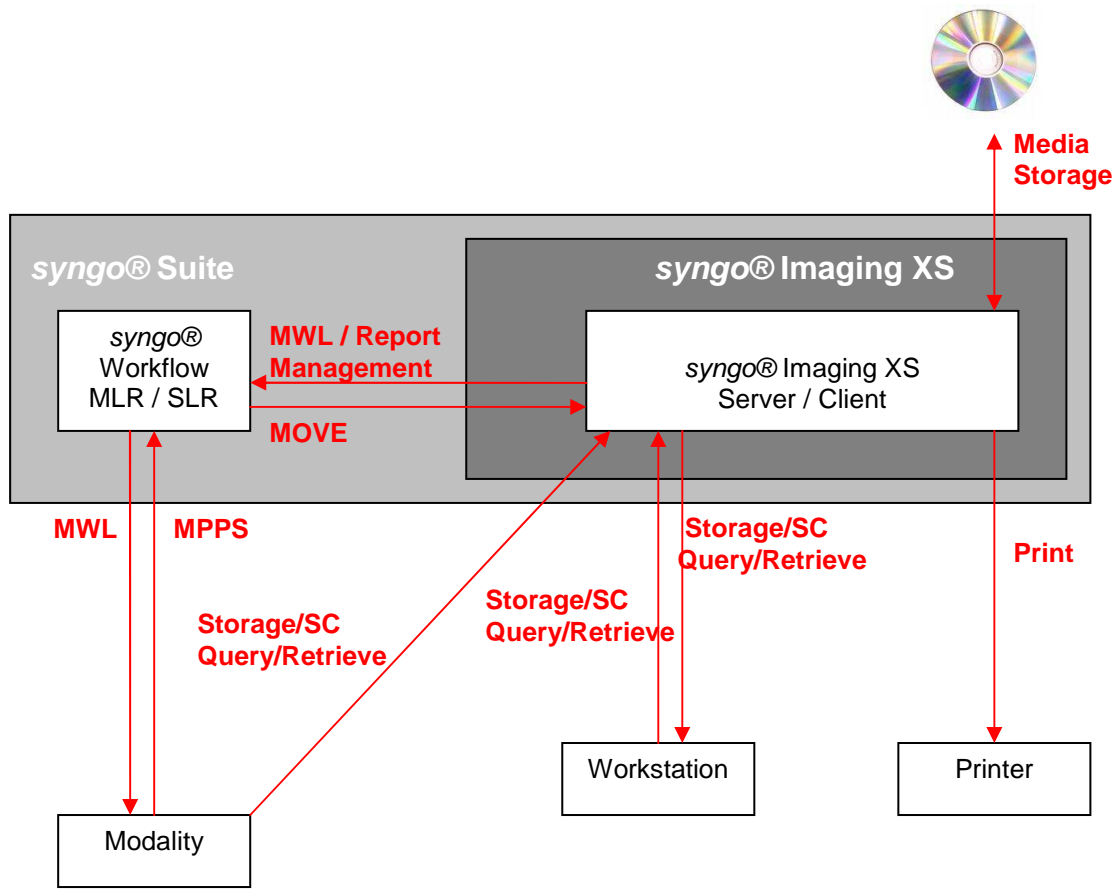


Figure 3: Overview about DICOM capabilities of syngo® Suite (with syngo® Imaging XS)

2 Networking

2.1 Implementation Models

2.1.1 Application Data Flow

The **syngo® Workflow MLR** DICOM network implementation acts as SCP for the DICOM Modality Worklist (C-Find) DICOM network service and the private MITRA Report Management service.

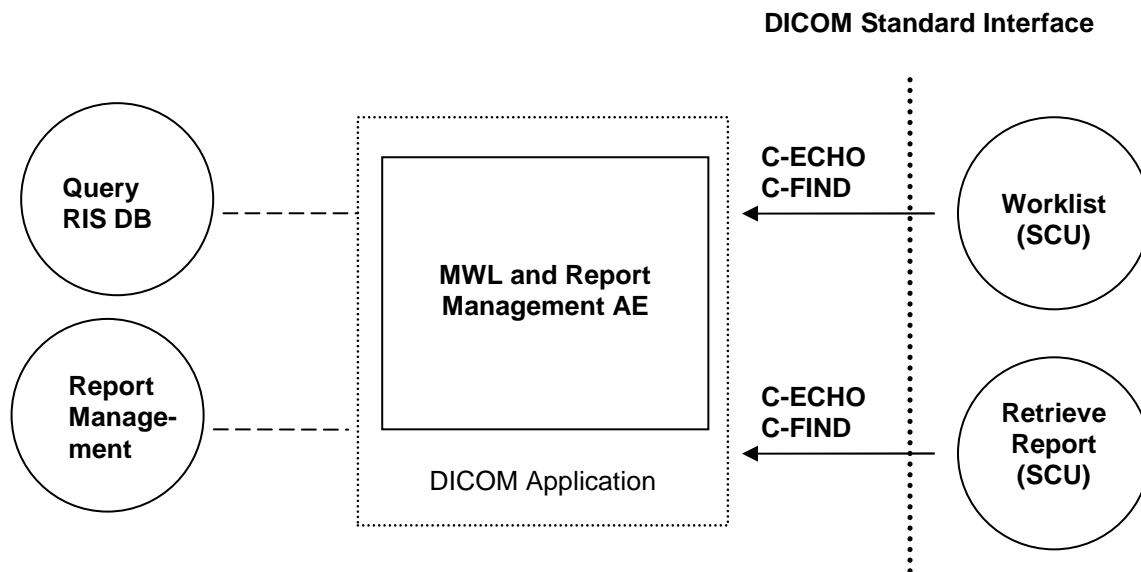


Figure 4: Application Data Flow Diagram – Worklist and Report Management SCP

The MWL and Report Management AE of **syngo® Workflow MLR** accepts Verification requests and accepts associations requests for Modality Worklist and Report Management from SCUs and responds to these queries by returning the set of matching responses.

The **syngo® Workflow MLR** DICOM application acts as SCP for the Modality Performed Procedure Step Service Class.

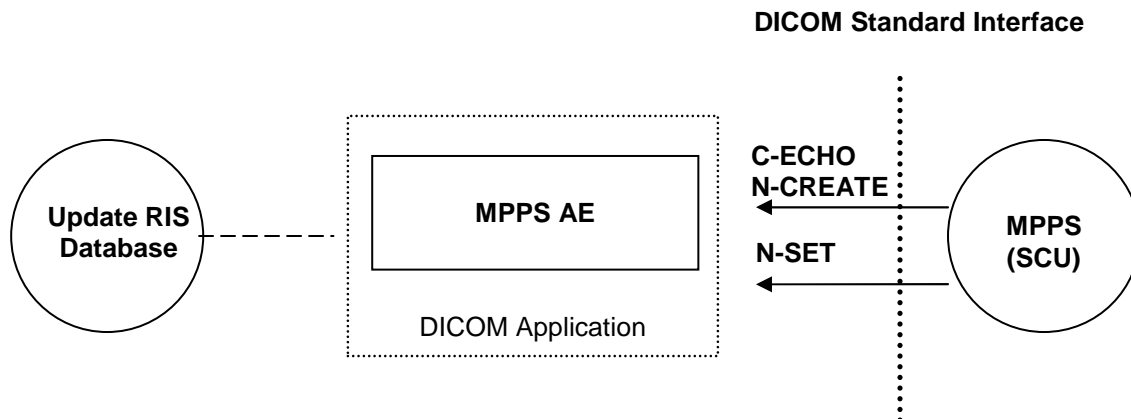


Figure 5: Application Data Flow Diagram – MPPS SCP

The MPPS AE of **syngo® Workflow MLR** accepts association requests for Modality Performed Procedure Steps from MPPS SCUs and responds to N-Create and N-Set requests from these SCUs. When an N-Create or N-Set is received **syngo® Workflow MLR** engages the update of the internal related procedure.

The **syngo® Workflow MLR** DICOM network implementation acts as SCU for the retrieve network service.

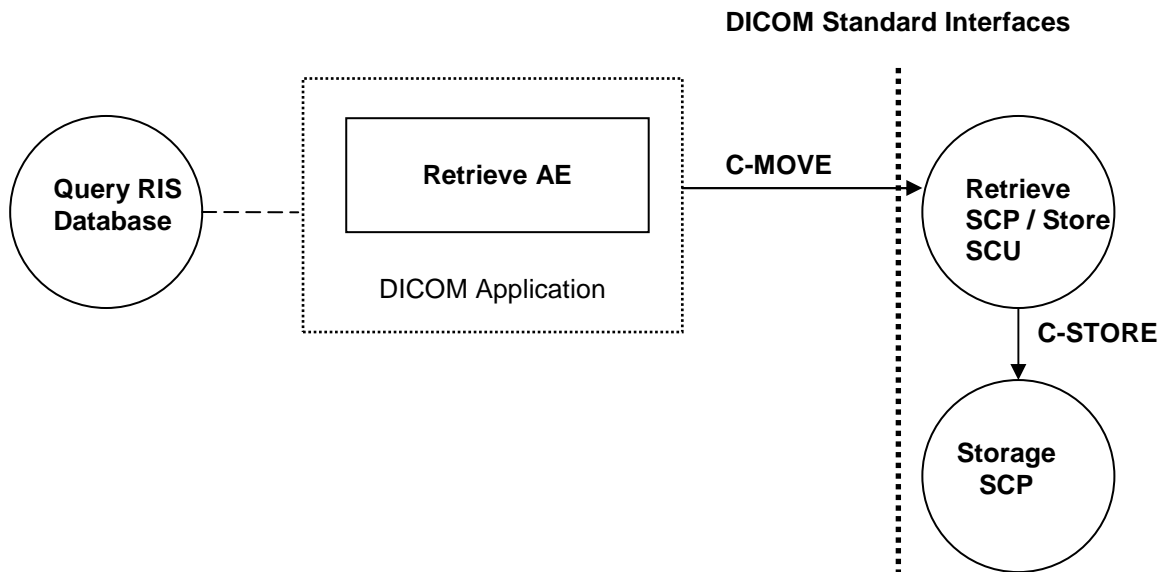


Figure 6: Application Data Flow Diagram – Retrieve SCU

The Retrieve AE of **syngo® Workflow MLR** opens an association for C-Move requests to an SCP in order to trigger the SCU to forward the referenced objects to a third destination (Storage SCP). Therefore the Retrieve SCP, now acting as Storage SCU, opens a second association to the Storage SCP for transferring the objects.

2.1.2 Functional Definitions of Application Entities

2.1.2.1 Functional Definition of Modality Worklist and Report Management AE

The Modality Worklist and Report Management SCP of **syngo® Workflow MLR** is operating as background daemon process. It is started automatically during system startup and waits for association requests until the system is shut down.

As an SCP for Report Management (Private SOP Class) **syngo® Workflow MLR** answers to report requests issued via the C-Find service.

In addition this AE is also acting as Verification SCP and therefore responds to incoming C-Echo-Requests.

Further information regarding the complete syngo® Suite:

The **syngo® Data Manager** acting as a Report Management SCU for instance caches all reports. Reports are only fetched from **syngo® Workflow MLR** when no reports for the patient are found in the **syngo® Data Manager** cache and

- when the SDM receives a schedule for the patient (HL7 ORM message), or
- when the SDM receives an unsolicited report for the patient (HL7 ORU message), or
- when the SDM receives a report query from the **syngo® Studio Workplace**

Then all reports for the patient are fetched.

Usually the **syngo® Data Manager** is actively notified by the **syngo® Workflow MLR** about new or updated reports via HL7 messages. Fetching reports from RIS via DICOM actively triggered by the **syngo® Data Manager** is only applied if no appropriate reports are found in the local report cache.

2.1.2.2 Functional Definition of MPPS AE

The MPPS SCP of **syngo® Workflow MLR** is operating as background daemon processes. It is started automatically during system startup and waits for association requests until the system is shut down.

The **syngo® Workflow MLR** acting as SCP for the MPPS service is waiting for N-CREATE and N-SET requests from a remote DICOM Application Entity.

Furthermore **syngo® Workflow MLR** acting as Verification SCP responds to incoming C-Echo-Requests from a remote DICOM Application Entity.

2.1.2.3 Functional Definition of Retrieve AE

The Retrieve SCU of **syngo® Workflow MLR** is operating as background daemon processes. It is started automatically during system startup and waits for tasks until the system is shut down.

The Retrieve SCU of **syngo® Workflow MLR** is checking the RIS database periodically if a request is found to perform a CMOVE operation. If such a request is found **syngo® Workflow MLR** instructs via the C-Move operation the remote AE to transfer referenced SOP Instances to another AE (destination AE) using the C-STORE operation.

2.1.3 Sequencing of Real-World Activities

The sequencing between a connected modality and **syngo® Workflow MLR** is shown in the following sequence diagram:

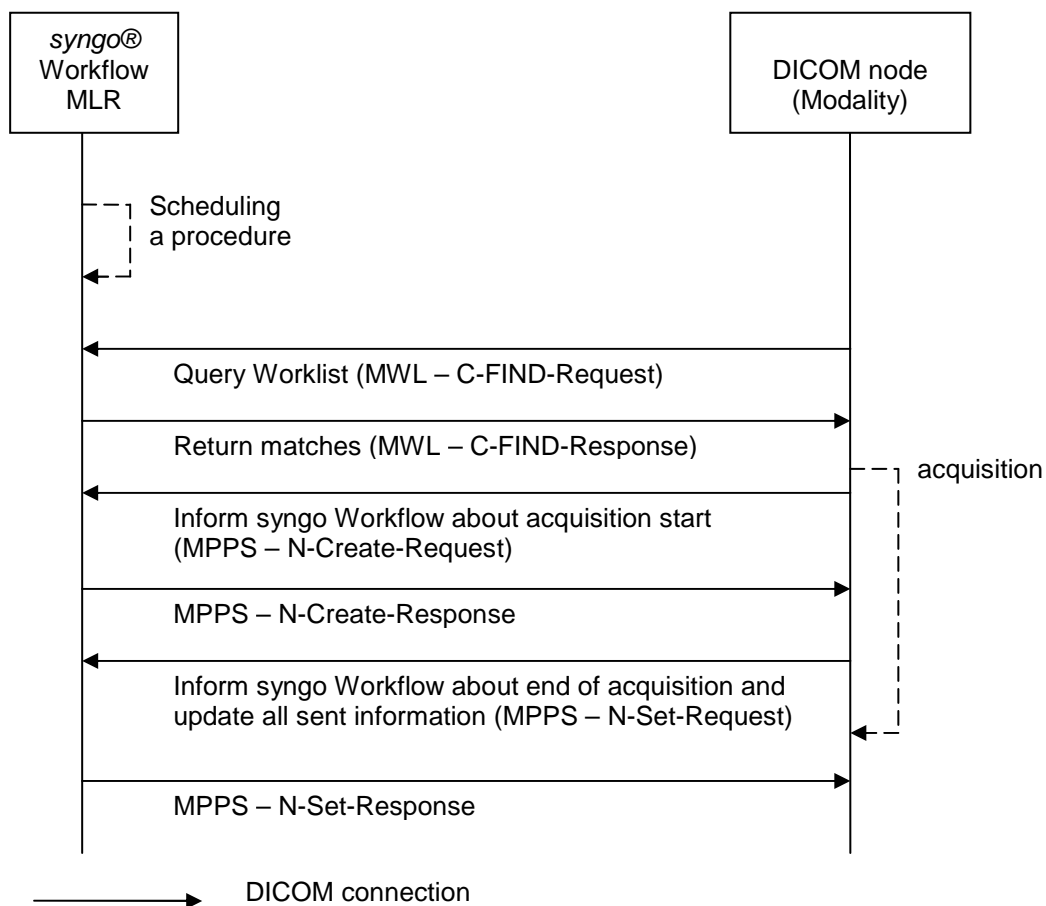


Figure 7: Sequence diagram for MWL and MPPS capable modalities connected to MLR

syngo® Workflow MLR provides report content via the private MITRA Report Management service, the sequencing is shown in the following diagram:

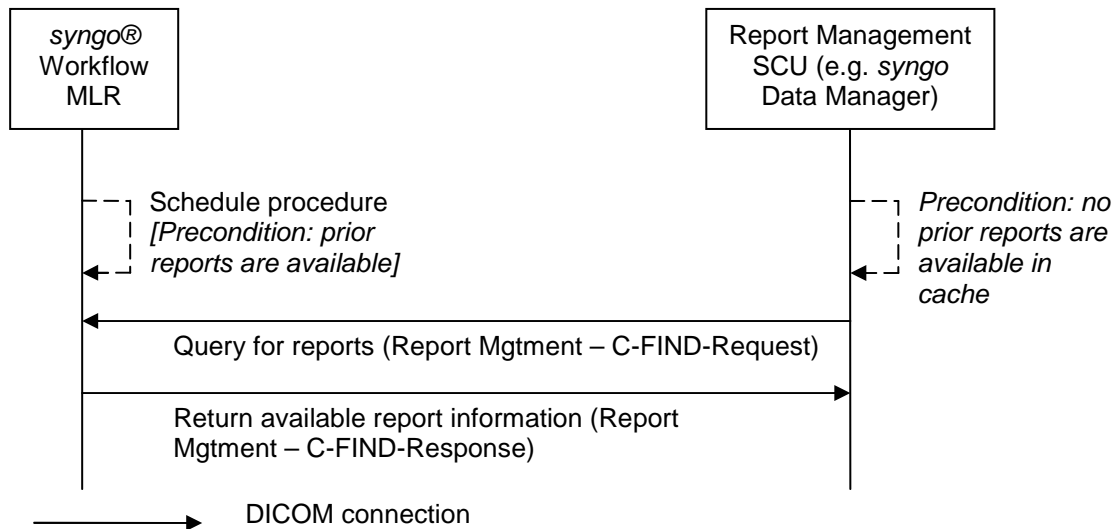


Figure 8: Diagram for retrieving report information via MITRA Report Management service

In case Follow-Ups are scheduled at **syngo® Workflow MLR** (including syngo® Chorus feature), available priors are transferred via the below described communication shown below in more detail:

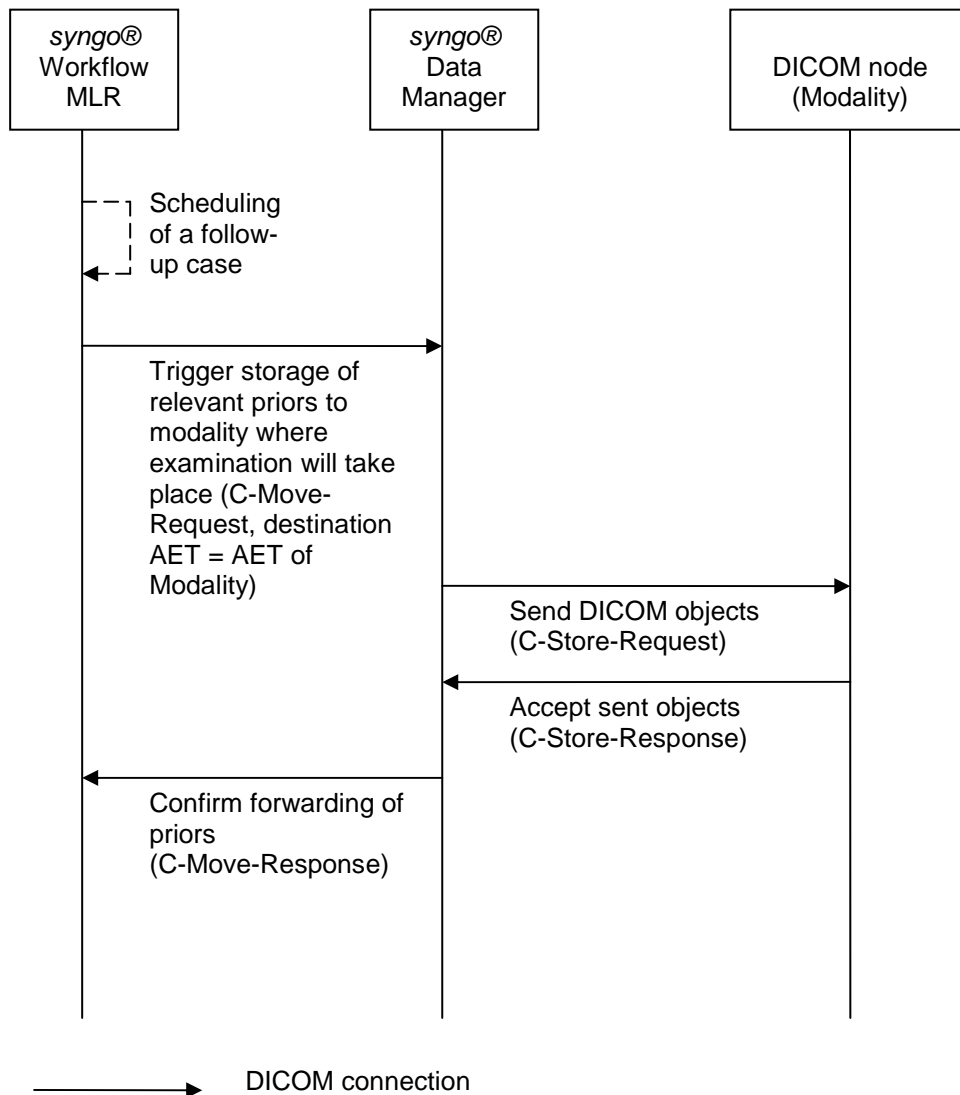


Figure 9: Sequence diagram for syngo Chorus: forwarding of priors to modality

2.2 AE Specifications

2.2.1 Modality Worklist and Report Management AE

2.2.1.1 SOP Classes

The **syngo® Workflow MLR** Modality Worklist and Report Management AE provide Standard Conformance to the following DICOM V3.0 SOP Classes as mentioned more detailed below:

SOP Class Name	SOP Class UID	SCU	SCP
Verification			
Verification SOP Class	1.2.840.10008.1.1	No	Yes
Workflow Management			
Modality Worklist Information Model - FIND	1.2.840.10008.5.1.4.31	No	Yes
Private Report Management			
MITRA Report Management	1.2.840.113532.3500.8	No	Yes

Table 2: Supported SOP Classes by Worklist and Report Management AE

2.2.1.2 Association Policies

2.2.1.2.1 General

Application Context Name	1.2.840.10008.3.1.1.1
---------------------------------	------------------------------

Table 3: Application Context Name – MWL and Report Mgmtment AE

2.2.1.2.2 Number of Associations

The AE accepts multiple associations from different remote DICOM AEs at a time (max. default: 10). There may be several concurrent associations active and processed in parallel.

Maximum number of simultaneous associations	10	<i>configurable</i>
--	-----------	---------------------

Table 4: Number of Associations – MWL and Report Mgmtment AE

2.2.1.2.3 Asynchronous Nature

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

2.2.1.2.4 Implementation Identifying Information

The **syngo® Workflow MLR** DICOM software provides a single Implementation Class UID and Version Name:

Implementation Class UID	1.3.12.2.1107.5.8
Implementation Version Name	IWM_VB30

Table 5: Implementation Class UID and Version Name

2.2.1.3 Association Initiation Policy

The AE does not initiate associations.

2.2.1.4 Association Acceptance Policy

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

- DIMSE C-ECHO
- DIMSE C-FIND

service operations.

2.2.1.4.1 Activity “Receive Echo”

2.2.1.4.1.1 Description and Sequencing of Activities

The **syngo® Workflow MLR** receiving process will accept an association; receive a verification request and responds to it.

2.2.1.4.1.2 Accepted Presentation Contexts

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

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Ext. Neg.
Name	UID	Name List	UID List		
Verification Service class	1.2.840.10008.1.1	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	SCP	None

Table 6: Accepted Presentation Contexts – Receive Echo

2.2.1.4.1.3 SOP Specific Conformance Statement for Verification SOP Class

The **syngo® Workflow MLR** DICOM application provides standard conformance to the DICOM Verification Service Class and accepts any Application Entity Title from the SCU.

2.2.1.4.2 Activity “Receive MWL query from a remote Node”

2.2.1.4.2.1 Description and Sequencing of Activities

The associated Real-World activity is a C-Find request received by the **syngo® Workflow MLR**.

After accepting an association from a remote DICOM AE, **syngo® Workflow MLR** receives the Worklist requests via the open association and queries the database. For each match a response is sent to the requesting node.

2.2.1.4.2.2 Accepted Presentation Contexts

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

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Ext. Neg.
Name	UID	Name List	UID List		
Modality WorklistInformation Model - FIND	1.2.840.10008.5.1.4.31	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	SCP	None

Table 7: Accepted Presentation Contexts – Receive Worklist Request

The transfer syntax priority order for the Modality Worklist and Report Management AE is:

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

2.2.1.4.2.3 SOP Specific Conformance Statement for MWL SOP Class

The **syngo® Workflow MLR** DICOM application returns one of the following status codes within the Worklist response:

Service Status	Status Code	Meaning
Success	0000H	Matching is complete
Pending	FF00H	Matches are continuing
Pending	FF01H	Matches are continuing. Warning that one or more option Keys are not supported.
Refused	A700H	Out of Ressources (0000,0902) Or Match Overflow (default limit 500 matches)
Failed	C001H	Unable to process (special (0000,0902) no license, internal error or database error
Cancel	FE00H	

Table 8: Status codes returned for Worklist Request

The following table shows the supported attributes. Additional fields can be configured; existing DB fields can be assigned to other tags if data format does match.

Attribute	Tag	Comment
Patient's Name	(0010,0010)	
Patient ID	(0010,0020)	required, DICOM does not allow WC but <i>syngo</i> Workflow MLR supports it. It is up to the modality or to the user not to use it.
Patient Birth Date	(0010,0030)	
Patient's Sex	(0010,0040)	
Confidentiality constraint on patient data	(0040,3001)	always returned with zero length
Patient's Size	(0010,1020)	
Patient's Weight	(0010,1030)	
Patient's Address	(0010,1040)	
Patient State	(0038,0500)	always returned with zero length
Pregnancy Status	(0010,21C0)	
Medical Alerts	(0010,2000)	
Contrast Allergies	(0010,2110)	
Special Needs	(0038,0050)	
Referenced Patient Sequence	(0008,1120)	always returned with zero length
Institution Name	(0008,0080)	
Admission ID	(0038,0010)	
Issuer of Admission ID	(0038,0011)	
Current Patient Location	(0038,0300)	
Accession Number	(0008,0050)	
Requesting Physician	(0032,1032)	

Attribute	Tag	Comment
Referring Physician's Name	(0008,0090)	
Referenced Study Sequence	(0008,1110)	
Scheduled Performing Physician's Name	(0040,0006)	
Scheduled Procedure Step Sequence	(0040,0100)	
>Scheduled Station AE Title	(0040,0001)	
>ScheduleId Procedure Step Start Date	(0040,0002)	
>ScheduleId Procedure Step Start Time	(0040,0003)	
>Modality	(0008,0060)	
>Scheduled Procedure Step Description	(0040,0007)	
>Scheduled Protocol Code Sequence	(0040,0008)	
>>Code Value	(0008,0100)	
>>Coding Scheme Version	(0008,0103)	
>>Coding Scheme Designator	(0008,0102)	
>>Code Meaning	(0008,0104)	
>Scheduled Station Name	(0040,0010)	
>Scheduled Procedure Step Location	(0040,0011)	
>Pre-Medication	(0040,0012)	
>Scheduled Procedure Step ID	(0040,0009)	
Requested Procedure ID	(0040,1001)	
Reason for Requested Procedure	(0040,1002)	
Requested Procedure Description	(0032,1060)	
Requested Procedure Code Sequence	(0032,1064)	
>>Code Value	(0008,0100)	
>>Coding Scheme Version	(0008,0103)	
>>Coding Scheme Designator	(0008,0102)	
>>Code Meaning	(0008,0104)	
Study Instance UID	(0020,000D)	
Requested Procedure Priority	(0040,1003)	
Patient Transport Arrangements	(0040,1004)	
Admitting Diagnosis Description	(0008,1080)	

Table 9: Supported attributes of Worklist request

Note: If the Worklist request contains a filled "Scheduled Protocol Code Sequence "(0040, 0008) than "Scheduled Procedure Step Description "(0040, 0007) is sent back empty (If one attribute of the two mentioned ones is filled, then the other one will be responded empty).

2.2.1.4.3 Activity “Respond to Reports Management queries”

2.2.1.4.3.1 Description and Sequence of Activity

The **syngo® Workflow MLR** acts as SCP for the private MITRA Report Management query. An external device may query as a SCU for the content of reports.

2.2.1.4.3.2 Proposed Presentation Contexts

The **syngo® Workflow MLR** DICOM software will propose Presentation Contexts as shown in the following table:

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Ext. Neg.
Name	UID	Name List	UID List		
MITRA Report Management	1.2.840.113532.3.500.8	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	SCP	None

Table 10: Proposed Presentation Contexts – Reports Management SCP

2.2.1.4.3.3 SOP Specific Conformance Statement to the private Report Management SOP class

All attributes from the table below are included in the response - independent of whether they have been queried or not.

It is configurable separately for every Query SCU, whether the “Patient Name” (0010, 0010) is sent in DICOM format (including carets) or in the internally used **syngo® Workflow MLR** format (formatted HIS / RIS Patient Name).

Attribute Name	Attribute Tag	Usage SCU
Patient’s Name	(0010,0010)	supplied value
Patient ID	(0010,0020)	supplied value
Accession Number	(0008,0050)	
Requested Procedure ID	(0040,1001)	
Study Instance UID	(0020,000D)	
Requested Procedure Description	(0032,1060)	
Requested Procedure Code Sequence	(0032,1064)	
>Code Value	(0008,0100)	
>Coding Scheme Designator	(0008,0102)	
>Code Meaning	(0008,0104)	
Requesting Physician Name	(0032,1032)	
Referring Physician Name	(0008,0090)	
Reason for Study	(0032,1030)	
Patient Birth Date	(0010,0030)	
Patient Sex	(0010,0040)	
Patient Weight	(0010,1030)	

Attribute Name	Attribute Tag	Usage SCU
Confidentiality Constraint on Patient Data Description	(0040,3001)	
Pregnancy Status	(0010,21C0)	
Medical Alerts	(0010,2000)	
Contrast Allergies	(0010,2110)	
Study Description	(0008,1030)	
Study Date	(0008,0020)	
Study Time	(0008,0030)	
Record Date	(4008,0100)	
Record Time	(4008,0101)	
Interpretation Recorder	(4008,0102)	
Transcription Date	(4008,0108)	
Transcription Time	(4008,0109)	
Interpretation Transcriber	(4008,010A)	
Interpretation Author	(4008,010C)	
Approver Sequence	(4008,0111)	
> Approval Date	(4008,0112)	
> Approval Time	(4008,0113)	
> Physicians Appr.	(4008,0114)	
Interpretation Text	(4008,0115)	
Interpretation ID	(4008,0200)	
Interpretation Type	(4008,0210)	
Interpretation Status ID	(4008,0212)	

Figure 10: Attributes for Report Content Query

2.2.2 MPPS AE

2.2.2.1 SOP Classes

The **syngo® Workflow MLR** DICOM AEs provides Standard Conformance to the following DICOM V3.0 SOP Class as below described in more detail:

SOP Class Name	SOP Class UID	SCU	SCP
MPPS			
Modality Performed Procedure Step SOP class	1.2.840.10008.3.1.2.3.3	No	Yes

Table 11: Supported SOP Classes by MPPS AE

2.2.2.2 Association Establishment Policies

2.2.2.2.1 General

Application Context Name	1.2.840.10008.3.1.1.1
--------------------------	-----------------------

Table 12: Application Context Name – MPPS AE

2.2.2.2.2 Number of Associations

The AE accepts multiple associations from different remote DICOM AEs at a time (max. default: 10). There may be several concurrent associations active and processed in parallel.

Maximum number of simultaneous associations	10	<i>configurable</i>
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Table 13: Number of Associations – MPPS AE

2.2.2.2.3 Asynchronous Nature

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

2.2.2.2.4 Implementation Identifying Information

Refer to 2.2.1.2.4.

2.2.2.3 Association Initiation Policy

The AE does not initiate associations.

2.2.2.4 Association Acceptance Policy

The syngo® Workflow MLR DICOM application attempts to accept a new association for

- DIMSE N-CREATE/N-SET (MPPS)

service operations.

2.2.2.4.1 Activity “Receive MPPS”

2.2.2.4.1.1 Description and Sequence of Activity

The associated Real-World activity is a MPPS N-CREATE or MPPS N-SET request received by syngo® Workflow MLR. After accepting an association from a remote DICOM AE, syngo® Workflow MLR receives the N-SET or N-CREATE via the open association and stores the data into the database.

2.2.2.4.1.2 Accepted Presentation Contexts

The syngo® Workflow MLR DICOM application will accept Presentation Contexts as shown below.

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Ext. Neg.
Name	UID	Name List	UID List		
Modality Performed Procedure Step	1.2.840.10008.3.1.2.3.3	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	SCP	None

Table 14: Accepted Presentation Contexts - Receive MPPS

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

The transfer syntax priority order for MPPS SCP is:

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

2.2.2.4.1.3 SOP-Specific Conformance Statement for MPPS SOP classes

The following table depicts the status codes, that might be returned by syngo® Workflow MLR.

Service Status	Status Code	Meaning
Success	0000H	Matching is complete
Refused	A700H	Out of Ressources (0000,0902)
Failed	C001H	Unable to process (special (0000,0902) no license, internal error or database error)
Cancel	FE00H	

Table 15: Supported Status Codes for MPPS response

The "Table 16: Supported attributes of MPPS services" shows the supported MPPS attributes. The column N-SET is according to DICOM MPPS N-SET. The values not allowed at N-SET are taken by **syngo® Workflow MLR** when provided at N-CREATE request. I.e. these parameters cannot be updated by MPPS N-SET. The data is only viewable and cannot be modified by a **syngo® Workflow MLR** Client user.

Scheduled Procedures and Performed Procedures have an arbitrary relation of m-to-n. There is no 1-to-1, 1-to-m or n-to-1 relation in general. I.e. for one scheduled procedure syngo® Workflow MLR may show several PPS (in a separate window) - and these PPS may be related to any number of other scheduled procedures.

For further information refer to the IHE Framework [2] or have a look at following figure:

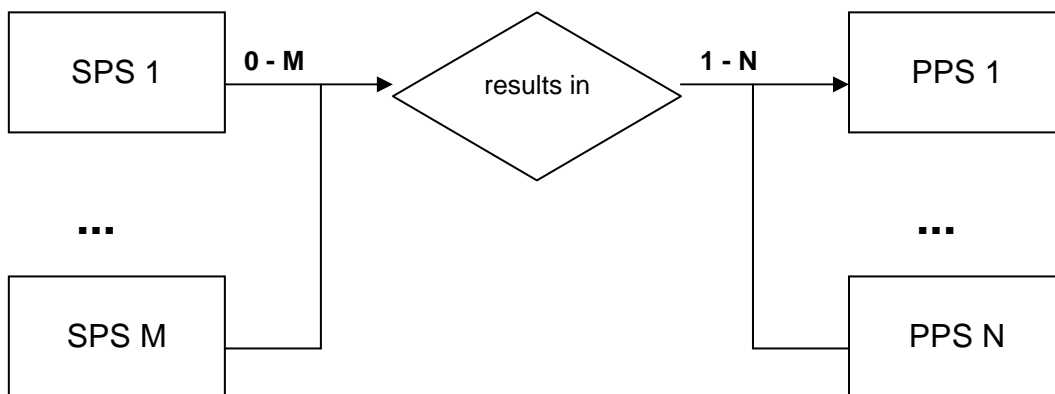


Figure 11: SPS-PPS-Relationship

2.2.2.4.1.4 Restrictions:

Unscheduled Case (0 SPS – 1 PPS):

syngo® Workflow MLR does not support the registration of Emergency patients via MPPS Unscheduled Case. If the patient is not found, the MPPS data is not inserted into the database. But nevertheless a status of "success" is responded to the remote AET.

Group Case (M SPS – 1 PPS):

In the group case, no exposure dose data is inserted into the database, a warning is written into the log file.

The table below provides an indication regarding which attributes are supported and stored for further processing:

Attribute	Tag	N-SET	Comment
PPS ID	(0040,0253)	no	table "mpps"
Performed Station AET	(0040,0241)	no	table "mpps"
Performed Station Name	(0040,0242)	no	table "mpps"
Performed Location	(0040,0243)	no	table "mpps"
PPS Start Date	(0040,0244)	no	table "mpps"
PPS Start Time	(0040,0245)	no	table "mpps"
PPS Status	(0040,0252)	yes	table "mpps"
PPS End Date	(0040,0250)	yes	table "mpps"
PPS End Time	(0040,0251)	yes	table "mpps"
Modality	(0008,0060)	no	table "mpps"
Total Time of Fluoroscopy	(0040,0300)	yes	table "mpps"
Total Number of Exposures	(0040,0301)	yes	table "mpps"
Entrance Dose	(0040,0302)	yes	used, if (0040,8302) is empty, converted to mGy
Entrance Dose in mGy	(0040,8302)	yes	table "mpps"; conversion from µGy to mGy is configurable
Distance Source to Detector	(0018,1110)	yes	table "mpps"
Distance Source to Entrance	(0040,0306)	yes	table "mpps"
Exposed Area	(0040,0303)	yes	table "mpps"
Image Area	(0018,115E)	yes	table "mpps"
PPS Description	(0040,0254)	yes	table "mpps"
PPS Type Description	(0040,0255)	yes	table "mpps"
PPS Code Sequence	(0008,1032)	yes	table "mpps"
PPS Discontinuation Reason	(0040,0281)	yes	table "mpps"
Performed Protocol Code Seq.	(0040,0260)	yes	table "mpps"
Comments on Radiation Dose	(0040,0310)	yes	table "mpps"
Comments on PPS	(0040,0280)	yes	table "mpps"
Performed Protocol Code Sequence	(0040,0260)	yes	table „exam_protocol_steps“
>Code Value	(0008,0100)	yes	field code
>Coding Scheme Designator	(0008,0102)	yes	field designator

Attribute	Tag	N-SET	Comment
>Coding Scheme Version	(0008,0103)	yes	field version
>Code Meaning	(0008,0104)	yes	field meaning
Performed Series Sequence	(0040,0340)	yes	table „series“
>Protocol Name	(0018,1030)	yes	field series_descr (for follow up relevant series)
>Series Instance UID	(0020,000E)	yes	field series_ins_uid
>Series Description	(0008,103E)	yes	field series_descr
>Retrieve AE Title	(0008,0054)	yes	field retrieve_aet
Exposure Dose Sequence	(0040,030E)	yes	table „mpps_exposure_dose“
>Radiation Mode	(0018,115A)	yes	field radiation_mode
>KVp	(0018,0060)	yes	field kvp
>X-ray Tube Current in µA	(0018,8151)	yes	field x_ray
>Exposure Time	(0018,1150)	yes	field exposure_time
>Filter Type	(0018,1160)	yes	field filter_type
>Filter Material	(0018,7050)	yes	field filter_material
Performed Procedure Step Discontinuation Reason Code Sequence	(0040,0281)	yes	tables „mpps“ and „examination4“
>Code Value	(0008,0100)	yes	fields mpps_cancel_reason and cancel_reason
Billing Supplies and Devices Sequence	(0040,0324)	yes	table „materials“
>Billing Item Sequence	(0040,0296)	yes	
>>Code Value	(0008,0100)	yes	field mat_code
>>Code Meaning	(0008,0104)	yes	field comment
>Quantity Sequence	(0040,0293)	yes	
>>Quantity	(0040,0294)	yes	fields quantity, consumed, consumed_bill
>>Measuring Units Sequence	(0040,0295)	yes	
>>>Code Meaning	(0008,0104)	yes	unit

Table 16: Supported attributes of MPPS services

The N-CREATE-RQ sent by the MPPS SCU has to provide the “Affected SOP Instance UID” (0000, 1000), the identical value has to be sent by the MPPS SCU within the N-SET-RQ in the “Requested SOP Instance UID” (0000, 1001). Otherwise the N-SET-RQ will be rejected by **syngo® Workflow MLR**.

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

2.2.3 Retrieve AE

The Retrieve SCU requests the remote SCP to move the identified images over a different storage association to either the Retrieve SCU or another remote DICOM node.

2.2.3.1 SOP Classes

The **syngo® Workflow MLR** provides Standard Conformance to the following DICOM V3.0 SOP Classes:

SOP Class Name	SOP Class UID	SCU	SCP
Patient Root Query/Retrieve Information Model - MOVE	1.2.840.10008.5.1.4.1.2.1.2	Yes	No
Study Root Query/Retrieve Information Model - MOVE	1.2.840.10008.5.1.4.1.2.2.2	Yes	No

Table 17: Supported Retrieve SOP classes

2.2.3.2 Association Establishment Policies

2.2.3.2.1 General

Application Context Name	1.2.840.10008.3.1.1.1
---------------------------------	------------------------------

Table 18: Application Context Name – Retrieve AE

2.2.3.2.2 Number of Associations

The AE accepts multiple associations from different remote DICOM AEs at a time (max. default: 10). There may be several concurrent associations active and processed in parallel.

Maximum number of simultaneous associations	10	<i>configurable</i>
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Table 19: Number of Associations – Retrieve AE

2.2.3.2.3 Asynchronous Nature

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

2.2.3.2.4 Implementation Identifying Information

Refer to 2.2.1.2.4.

2.2.3.3 Association Initiation Policy

The **syngo® Workflow MLR** initiates associations while processing the service operations and internal messages as shown below:

Operation or Real Word Activity	Association for
Trigger storage of DICOM objects	C-MOVE

Table 20: Operation or Real World Activity triggering Retrieve associations

2.2.3.3.1 Activity “Trigger forwarding of special series to modalities for follow-up examinations”

2.2.3.3.1.1 Description and Sequence of Activity

A follow-up is scheduled for a syngo Chorus capable modality. Therefore **syngo® Data Manager** C-MOVE SCU sends the C-MOVE request to a remote AE (in a syngo Chorus environment this is syngo Imaging). The AET of the modality is put into the C-MOVE-Request as destination target.

2.2.3.3.1.2 Proposed Presentation Contexts

The **syngo® Workflow MLR** DICOM application will propose Presentation Contexts as shown below:

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Ext. Neg.
Name	UID	Name List	UID List		
Patient Root Query/Retrieve – Move	1.2.840.10008.5.1.4.1.2.1.2	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
Study Root Query/Retrieve – Move	1.2.840.10008.5.1.4.1.2.2	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

Table 21: Proposed Presentation Contexts - Trigger Move

2.2.3.3.1.3SOP Specific Conformance Statement to Retrieve SOP classes

The following combinations of Query Model and Retrieve Level are supported by **syngo® Workflow MLR**. The used model and level are dynamically decided based on following criteria:

Query Model	Retrieve Level	Conditions
Patient Root	Patient	Used, if only "Patient ID" (0010,0020) is present
Study Root	Study	Used, if "Patient ID" (0010,0020) and "Study Instance UID" (0020,000D) are present
Study Root	Series	Used, if "Patient ID" (0010,0020), "Study Instance UID" (0020,000D) and Series Instance UID (0020,000E) are present
Study Root	Image	Used, if "Patient ID" (0010,0020), "Study Instance UID" (0020,000D), Series Instance UID (0020,000E) and "SOP Instance UID" (0008,0018) are present

Table 22: Supported Retrieve level

The C-MOVE SCU interprets the following status codes in a special way. If other codes are received they are considered to be failures of some kind.

Service	Status Meaning	Protocol Codes	Related Fields
Success	Suboperations complete - No failures or Warning	0000H	(0000,1020) (0000,1021) (0000,1022) (0000,1023)
Canceled	Suboperations terminated due to Cancel Indication	FE00H	(0000,1020) (0000,1021) (0000,1022) (0000,1023)
Warning	Suboperations Complete - One or more failures	B000H	(0000,1020) (0000,1021) (0000,1022) (0000,1023)
Pending	Suboperations are continuing	FF00H	(0000,1020) (0000,1021) (0000,1022) (0000,1023)

Table 23: C-MOVE SCU status codes

2.3 Network Interfaces

2.3.1 Physical Network Interface

The *syngo® Workflow MLR* DICOM application supports a single network interface. One of the following network interfaces has to be available:

Network Interface	Comment
Ethernet 10baseT	n.a.
Ethernet 100baseT	n.a.
Ethernet Gigabit	n.a.

Table 24: Network interfaces

2.3.2 Additional Protocols

Not applicable.

2.4 Configuration

2.4.1 AE Title/Presentation Address Mapping

The string can be up to 16 characters and must not contain any extended characters. Only 7-bit ASCII characters (excluding Control Characters) are allowed according to DICOM Standard.

2.4.1.1 Local DICOM AE Title

The **syngo® Workflow MLR** DICOM application provides three Application Entities.

The title for all Application Entities can be configured in the **syngo® Workflow MLR** Server Web Administration (SWA).

The port number for the SCP Application Entities is configurable in the **syngo® Workflow MLR** SWA.

The default port number for

- Worklist and Report Management AE: 1024
- MPPS AE: 1025

2.4.1.2 Remote DICOM AE Title

All configured AET need to comply with the DICOM requirements for Application Entity Titles.

All SCUs requesting an association need to be configured within **syngo® Workflow MLR**, otherwise the association is rejected by **syngo® Workflow MLR**.

2.4.2 Parameters

Following table lists some configuration parameters and their default values:

Parameter	Configurable	Default Value
General		
Time-out waiting for acceptance or rejection Response to an Association Open Request (Application Level timeout)	yes	240 sec
Time-out waiting for response to TCP/IP connect request. (Low-level timeout)	Yes	240 sec
Time-out waiting for acceptance of a TCP/IP message over network. (Low-level timeout)	Yes	60 sec
Time-out for waiting for data between TCP/IP packets. (Low-level timeout)	Yes	60 sec
Max. pending connections	Yes	5
Max PDU size (receiving)	Yes	28672
Max PDU size (sending)	Yes	28672

Table 25: Parameter List

3 Support of Extended Character Sets

3.1 Character Sets for syngo® Workflow MLR

The **syngo® Workflow MLR** DICOM application supports the ISO 8859 Latin 1 (ISO-IR 100) character set.

4 Extensions / Specializations / Privatizations

4.1 Standard Extended / Specialized / Private SOPs

Please refer to 2.2.1.4.3.

4.2 Private Transfer Syntaxes

Not applicable.