SIEMENS

syngo Workflow SLR
VA31A

SYNGO

DICOM Conformance Statement

Rev 8.0

03 June 2011

1 Conformance Statement Overview

Siemens *syngo*® Workflow SLR (SLR) is a suite of applications that implement a full-featured Radiology Information System (RIS). SLR includes features typically associated with a RIS, including interfaces to various Hospital Information Systems, Patient Tracking, Results Reporting, Film Tracking, Management Reporting, PACS Integration, etc. The SLR GUI-based client application runs on a Windows 98/NT/2000/XP platform; the server platform is Digital Unix, IBM's AIX or Red Hat Linux.

As part of PACS Integration SLR supports several DICOM Service Classes, using the MergeCOM-3 Advanced Toolkit for DICOM encoding/decoding, to provide the following capabilities:

1. Allowing Modalities to query for work lists of procedures to be performed and for patient and procedure demographics. SLR processes these queries by directly accessing the Patient/Procedure database, which is automatically updated with appropriate data through the normal operations of the RIS.
2. Updating the SLR database in response to Procedure Step transactions initiated by Modalities as they perform examinations. Relevant data contained in these transactions may be viewed using the GUI client.
3. Forwarding of MPPS transactions to PACS AEs if so configured
4. Allowing *syngo* Workflow SLR users to query studies and request the movement of studies from a PACS Archive to another DICOM Application Entity from within appropriate workflows of the *syngo* Workflow SLR applications.

Networking Service Classes	User of Service	Provider of Service
Workflow		
Modality Worklist	No	Yes
Modality Performed Procedure Step	Yes	Yes
Query/Retrieve		
Patient Root Q/R – FIND	Yes	No
Patient Root Q/R – MOVE	Yes	No
Study Root Q/R – FIND	Yes	No
Study Root Q/R – MOVE	Yes	No
Patient Study Only – FIND	Yes	No
Patient Study Only – MOVE	Yes	No

EDITION Notice

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2 Introduction

2.1 Revision History

Document Version	Revision Date	Revision Author	Revision Description
R0.1	10/2/00	A. Belden	Initial Draft
R0.2	1/11/01	A. Belden	Initial Version
R1.0	6/19/01	A. Belden	Update for IHE and NOVIUS Radiology 26
R1.1	6/20/02	A. Belden	Update for NOVIUS Radiology 26.1
R1.2	3/14/03	A. Belden	Update for case-insensitive patient name matching
R1.3	5/1/04	A. Belden	Update for NOVIUS Radiology 26.2 and to use new DICOM Conformance Statement template
R2.0	2/18/05	A. Belden	Update for NOVIUS Radiology 270
R3.0	2/18/05	A. Belden	Update for *syngo* Workflow SLR 280
R4.0	8/12/08	A. Belden	Update for *syngo* Workflow SLR 300
R5.0	12/16/08	M. Ryan	Update for *syngo* Workflow SLR 30B
R5.1	08/10/10	A. Belden	Update for *syngo* Workflow SLR VA31A
R6.0	08/18/10	M.Ryan	Released
R7.0	09/22/10	M. Ryan	Released
R7.1	04/8/11	M. Ryan	Update the DICOM tags for Scheduled Station AET, Scheduled Procedure Step Start Date, and Scheduled Procedure Step Start Time per charm 27610
R8.0	06/03/11	M. Ryan	Released

2.2 Audience

The audience for this Conformance Statement consists of those who would be involved in the integration of *syngo* Workflow SLR with complementary products, e.g. Acquisition Modalities, PACS. All that is required of the reader is a working knowledge of the DICOM Standard. Experience and familiarity with DICOM Conformance Statements is helpful but not required.

2.3 Remarks

The fact that a product has a DICOM Conformance Statement that is complementary to that of - *syngo* Workflow SLR, e.g. specifies support for MWL or MPPS as SCU, Query/Retrieve as SCP, etc., does not in and of itself guarantee interoperability between said product and *syngo* Workflow SLR. The comparison of Conformance Statements is a step to determining interoperability but other steps are required including:

1. Analysis of interoperability requirements of communicating applications
2. Creation of a Test Plan to verify interoperability
3. Execution of the Test Plan

DICOM is an evolving standard, constantly being amended and augmented. In consideration of this fact *syngo* Workflow SLR reserves the right to make changes to its DICOM implementation as it sees fit to keep abreast of these changes.

2.4 Definitions and Abbreviation

There are a variety of terms and abbreviations used in the document that are defined in the DICOM Standard. Additional abbreviations and terms are as follows:

- DICOMSRV - DICOM MWL and MPPS application
- GUI Client - *syngo* Workflow SLR's Visual Basic application providing views into the *syngo* Workflow SLR Database, reporting function, tracking function, etc.
- Portal - s*yngo* Workflow SLR's Radiologist's Portal, a web-based reporting and Protocoling application.
- HIS - Hospital Information System
- IHE - Integrating the Healthcare Enterprise, an initiative sponsored by RSNA and HIMSS to foster vendor interoperability
- MWL - Modality Worklist
- MPPS - Modality Performed Procedure Step
- *syngo* Workflow SLR Database - The database that indexes procedures, orders and patients
- SLR - *syngo* Workflow SLR
- PACSINFO - DICOM Query SCU application
- PACSMOVE - DICOM Retrieve SCU application
- Procedure Tracking - The monitoring of the states a Radiology procedure inhabits during its Lifetime
- SPS - Scheduled Procedure Step
- SCU – Service Class Uuser
- SCP – Service Class Provider
- AE – Application Entity

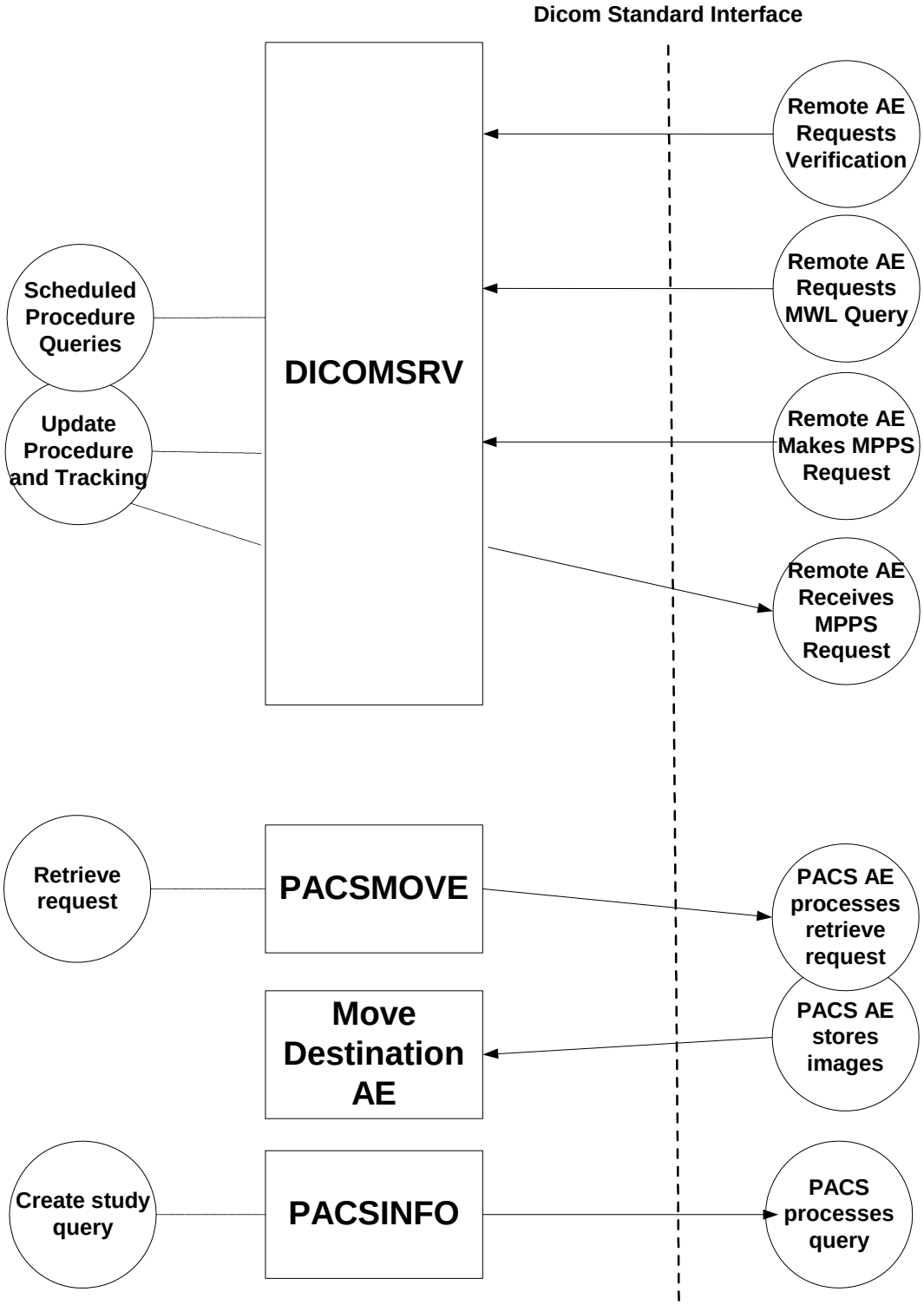
2.5 References

CPT 2009 Professional Edition, American Medical Association, 2008
IHE Technical Framework Revision 9.0, ACC/HIMSS/RSNA, June 27, 2008
DICOM Standard Parts 1 – 18, National Electrical Manufacturers Association, 2009

3 Networking

3.1 Implementation Model

3.1.1 Application Data Flow


Dicom Standard Interface
Remote AE Requests Verification
Remote AE Requests MWL Query
Remote AE Makes MPPS Request
Remote AE Receives MPPS Request
Scheduled Procedure Queries
Update Procedure and Tracking
DICOMSRV
Retrieve request
PACSMOVE
PACS AE processes retrieve request
Move Destination AE
PACS AE stores images
Create study query
PACSINFO
PACS processes query

- The DICOMSRV application provides access to Scheduled Procedure data and supports updating of the RIS database as procedures are performed and the forwarding of MPPS messages to configured AEs. The various flows in the diagram above are described as follows
    - DICOMSRV accepts associations for Verification from Verification SCUs and responds automatically with Success status
    - DICOMSRV accepts Association Requests for Modality Worklist from MWL SCUs and responds to queries from these SCUs. When a query is received DICOMSRV engages in local real-world activity *Scheduled Procedure Queries.* This results in a set of matching responses that DICOMSRV returns to the MWL SCU.
    - DICOMSRV accepts Association Requests for Modality Performed Procedure Step from MPPS SCUs and responds to N-CREATE and N-SET Requests from these SCUs. When an N-CREATE or N-SET is received DICOMSRV engages in local real-world activity *Update Procedure and Tracking.* This results in updates to the SLR Database per the contents of the received message. DICOMSRV then returns N-SET or N-CREATE status to the MPPS SCU.
    - DICOMSRV will make Association Requests for Modality Performed Procedure Step to configured MPPS SCPs that will be relayed MPPS messages that DICOMSRV has received. This relaying is part of local real-world activity *Update Procedure and Tracking.*
- The PACSMOVE application allows SLR users and automated processes to request movement of studies from one Application Entity to another. Related flows are described as follows:
    - When a user or an automated process makes a request that the contents of a study be moved, PACSMOVE engages in local real-world activity *Retrieve request.* This results in the sending of a DICOM C-MOVE Request to a local PACS AE.
    - On reception of a C-MOVE Request the PACS AE engages in remote real-world activity *PACS AE processes retrieve request* to process the request. The PACS AE will then engage in real-world activity *PACS AE stores images* to store the contents of the study(s) referenced in the C-MOVE Request to the Move Destination AE
- The PACSINFO application allows SLR users and automated processes to query a PACS for study information. The flow in the diagram can be described as follows:
    - When a local user or an automated process requests that a query for studies be done PACSINFO engages in local real-world activity, *Create study query.* This results in formatting and sending of a DICOM C-Find request to the PACS AE and waiting for all responses.

3.1.2 Functional Definition of Aes

3.1.2.1 Functional Definition of DICOMSRV Application Entity

DICOMSRV is a background process running on a Unix (AIX, Digital Unix or Linux) server. A single instance of DICOMSRV is started at System boot but multiple instances may be running at any one time as a result of forking of additional processes. The application may be started/restarted interactively via a command-line utility. In addition, there is a monitoring process that may be configured to restart the application automatically should it crash. Events are logged to application-specific log files with a time stamp. Multiple logging levels are supported. The following are always logged:

- The AE Title of the remote AE when the Association is created
- The status of each DICOM Service Request
- Any updates to the SLR Database

Logging can also be configured to dump the contents of all DICOM Service and Association messages that are received or sent by any of the SLR DICOM applications including DICOMSRV. In addition, the Mergecom-3 DICOM toolkit used by the SLR DICOM applications supports the ability to dump incoming and outgoing tcp packets to a capture file and provides an application to analyze these files.

DICOMSRV will listen for connection requests at its configured Presentation Address. This application is an implementation of a concurrent server; it forks a new process for each connection request it receives. Each forked process exists for the life of a single association and then exits. DICOMSRV will accept Presentation Contexts for the Modality Worklist, Modality Performed Procedure Step and Verification SOP Classes. Validation of DICOM Service Request messages is configurable using command-line parameters and may return Failure status in the event of an invalid Service Request according to the specifications in the standard. Upon receipt of a Verification Request DICOMSRV will respond with a successful Verification response. When a MWL query is received DICOMSRV will query the SLR database for a list of Scheduled Procedure Steps matching the query and will return a pending C-Find response for each match. Reception of MPPS N-Create or N-Set Request may result in updates to various tables in the SLR database and may result in changes to the tracking status of the Requested Procedure(s) referenced within the message. If an MPPS is received containing a Patient ID in a configured range and no Accession Number this is detected an IHE Trauma case and results in on-the-fly creation of a registration and order allowing the MPPS to match and permitting normal access to the procedure using all RIS applications. In all other cases in which an MPPS message contains non-matching demographic data is received, this occurrence is logged, an exception document generated and an entry added to an exception table in the database.

3.1.2.2 Functional Definition of PACSMOVE Application Entity

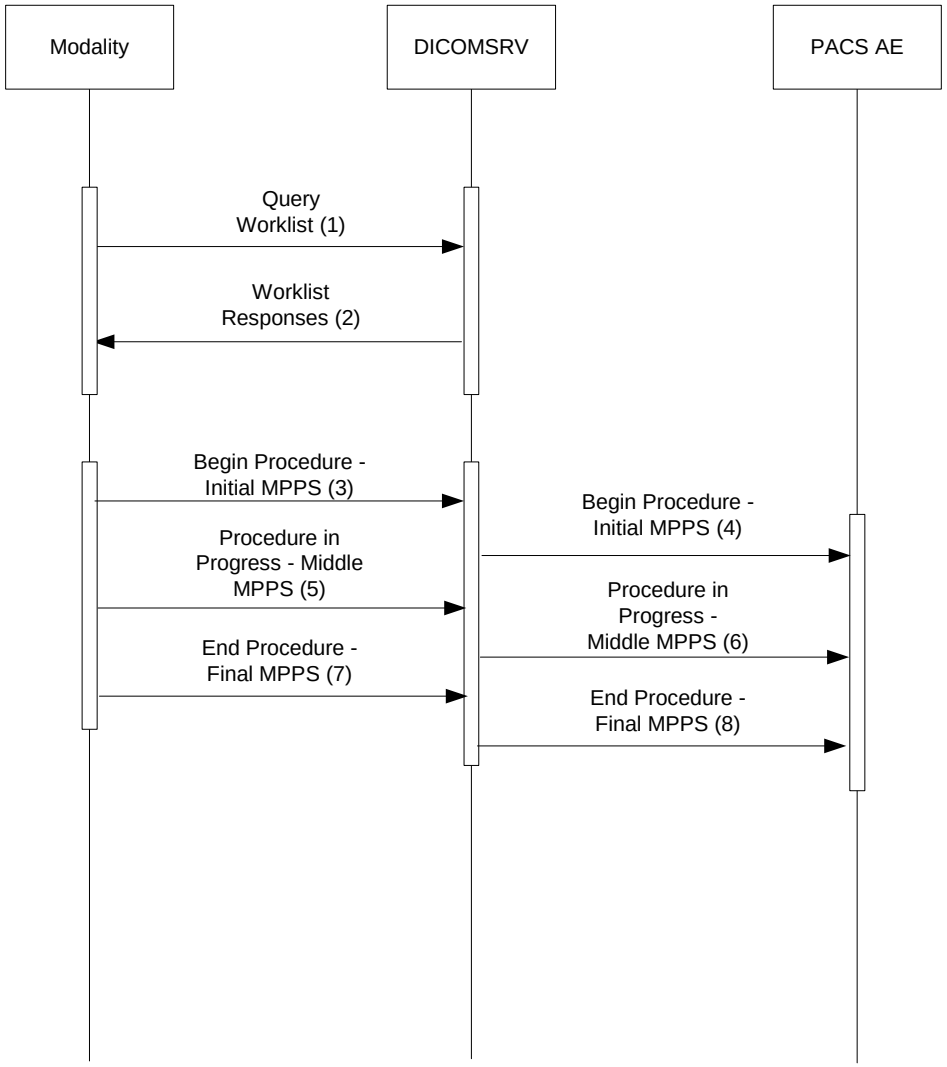
The PACSRQST process will use the API of BEA MessageQ, an inter-process communication library, to wait for *Move Study* requests posted by SLR users or by scripts that are run when certain events occur. When a *Move Study* request is received the PACSRQST job will distribute the request to one of the configured Worker processes. The PACSMOVE worker process will create an association to a PACS AE specified in the request or configured as the default AE for this purpose. The worker process will use the study UID and Patient Id associated with the specified procedure in the SLR database to construct a C-Move Request. The Worker will send the C-Move request to the PACS AE and wait for pending and final responses. The status of the Retrieve is written to an audit log file. There is limited retry capability in the event of failure of the Retrieve Request.

3.1.2.3 Functional Definition of PACSINFO Application Entity

The PACSINFO job will wait for *Query Study* requests using BEA MessageQ. When a *Query Study* request is received, the PACSINFO job will create an association to the PACS AE configured for this purpose or specified in the request and use the contents of the request to format a C-FIND Request that it then sends to the remote AE. The job will wait for the pending and final responses. If a user generated the request then the responses will be returned to that user and displayed using the GUI client application. If a script generated the request then the

responses may result in updates to the SLR database. The status of the query is written to an audit log file. There is no retry capability for *Query Study* requests.

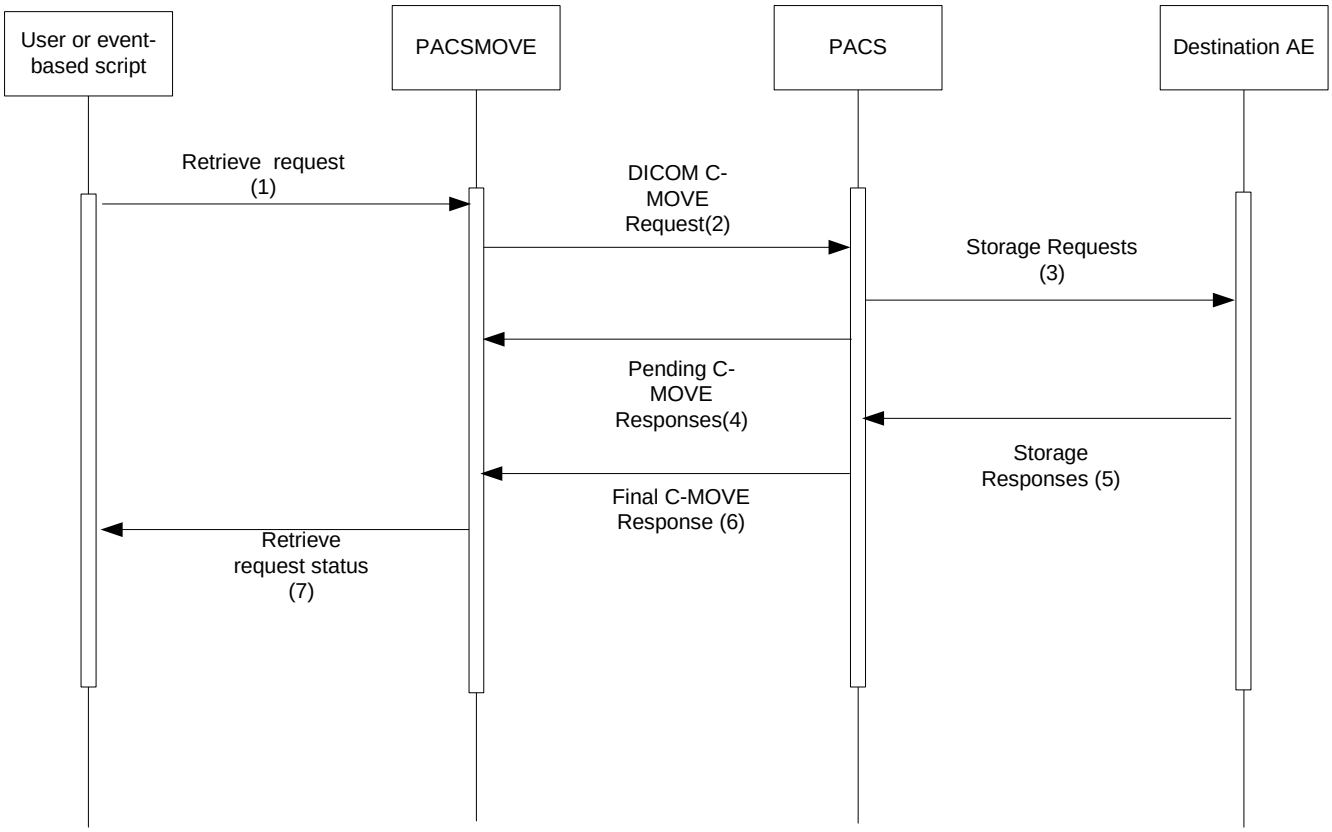
3.1.3 Sequencing of Real World Activities



Under normal circumstances the sequencing depicted above applies:

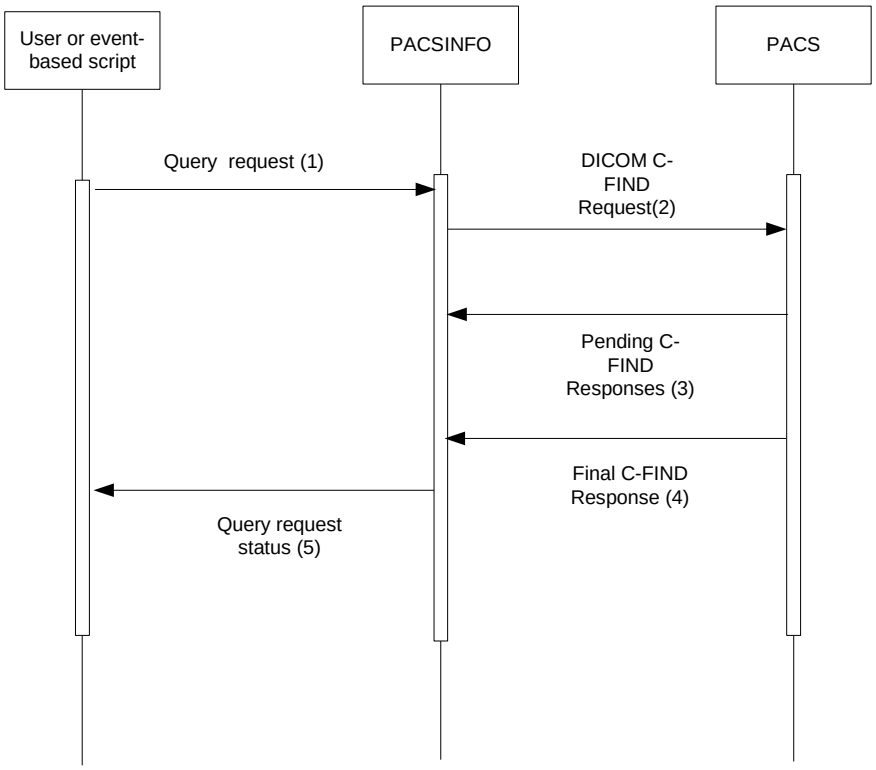
1. The Modality queries for a work list of Scheduled Procedure Steps
2. DICOMSRV searches its database and returns matches to the query
3. The Modality begins performance of a Procedure Step and sends the MPPS N-CREATE
4. DICOMSRV relays the N-CREATE to configured PACS Aes
5. The Modality sends 0 or more N-SET INPROGRESS messages to update the MPPS
6. DICOMSRV relays each of the N-SET IN PROGRESS messages to configured PACS Aes
7. The Modality completes or discontinues the procedure and sends the MPPS N-SET with status of COMPLETED or DISCONTINUED
8. DICOMSRV relays the N-SET DISCONTINUED or COMPLETED message to configured PACS Aes

The workflow above is not the only one possible. For example, in a Trauma or unscheduled flow there may be no worklist query prior to the performance of the procedure and the sending of MPPS messages. The flow would also be altered if the Modality did not support both Modality Worklist and MPPS. The Description and Sequencing of Activities and the SOP Specific Conformance sections below for the respective Real World Activities provide additional detail.



Under normal circumstances the sequencing depicted above applies:

1. A user or script generates a request to move a study or studies
2. The PACSMOVE application generates a DICOM C-MOVE Request to the configured PACS AE
3. The PACS generates C-STORE Requests that satisfy the Move request to the destination AE specified in the Move request
4. Periodically as images are stored to the destination AE the PACS generates pending C-MOVE responses to PACSMOVE
5. The Destination AE sends a storage response for each store request received from the PACS
6. The PACS sends the final C-MOVE response to PACSMOVE after all images have been stored to the Destination AE
7. PACSMOVE returns final status to the user of the retrieve request if the request originated from a user



Under normal circumstances the sequencing depicted above applies:

1. Query for studies generated by a user or automated script.
2. PACSINFO creates a DICOM C-FIND Request based on the request received and sends it to the PACS
3. The PACS returns C-FIND Responses with pending status containing matches to the query
4. The PACS returns the final C-FIND Response to PACSINFO
5. PACSINFO returns a list of matches to the application user or to the script that generated the query request

3.2 AE Specifications

3.2.1 DICOMSRV AE Specification

This application provides Standard Conformance to the following DICOM V3.0 SOP Classes:

3.2.1.1 SOP Classes

Table 1 – SOP Classes for AE DICOMSRV

SOP Class Name	SOP Class UID	SCU	SCP
Verification	1.2.840.10008.1.1	No	Yes
Modality Worklist	1.2.840.10008.5.1.4.31	No	Yes
Modality Performed Procedure Step	1.2.840.10008.3.1.2.3.3	Yes	Yes

3.2.1.2 Association Policies

3.2.1.2.1 General

The Application Context Name for DICOM 3.0 is the only Application Context proposed.

Table 2 – DICOM application context

Application Context Name	1.2.840.10008.3.1.1.1

3.2.1.2.2 Number of associations

DICOMSRV will support as many simultaneous associations as SCP as are requested by Workflow SCUs to the limit supported by the underlying Operating System

3.2.1.2.3 Asynchronous nature

Asynchronous communication (multiple outstanding transactions over a single association) is not supported.

3.2.1.2.4 Implementation Identifying Information

Table 3 – DICOM Implementation Class and Version for DICOMSRV

Implementation Class UID	1.2.840.113696.1
Implementation Version Name	SLR_310

3.2.1.3 Association Initiation Policy

3.2.1.3.1 Activity – Update Procedure and Tracking

3.2.1.3.1.1 Description and Sequencing of Activities

When MPPS messages are received by DICOMSRV from MPPS SCUs these messages will be forwarded to Aes configured to be sent such requests

3.2.1.3.1.2 Proposed Presentation Contexts

Table 4 – Proposed Presentation Contexts for Modality Performed Procedure Step SOP Class

Presentation Context Table					
Abstract Syntax		**Transfer Syntax**		**Role**	**Extended Negotiation**
Name	**UID**	**Name List**	**UID List**		
Modality Performed Procedure Step SOP Class	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	SCU	None

3.2.1.3.1.3 SOP Specific Conformance for Modality Performed Procedure Step SOP Class

DICOMSRV shall include the exact attributes in the N-CREATEs and N-SETs that it transmits as are received from the Acquisition Modality in the original messages. The MPPS messages are sent to remote Aes immediately after the originals from the Acquisition Modalities are processed.

3.2.1.4 Association Acceptance Policy

DICOMSRV will accept associations for the MWL, MPPS and Verification SOP Classes as an SCP. The job runs in the background and forks a new process for each connection request from a Remote AE

3.2.1.4.1 Activity – Remote AE Requests MWL Query

3.2.1.4.1.1 Description and Sequencing of Activities

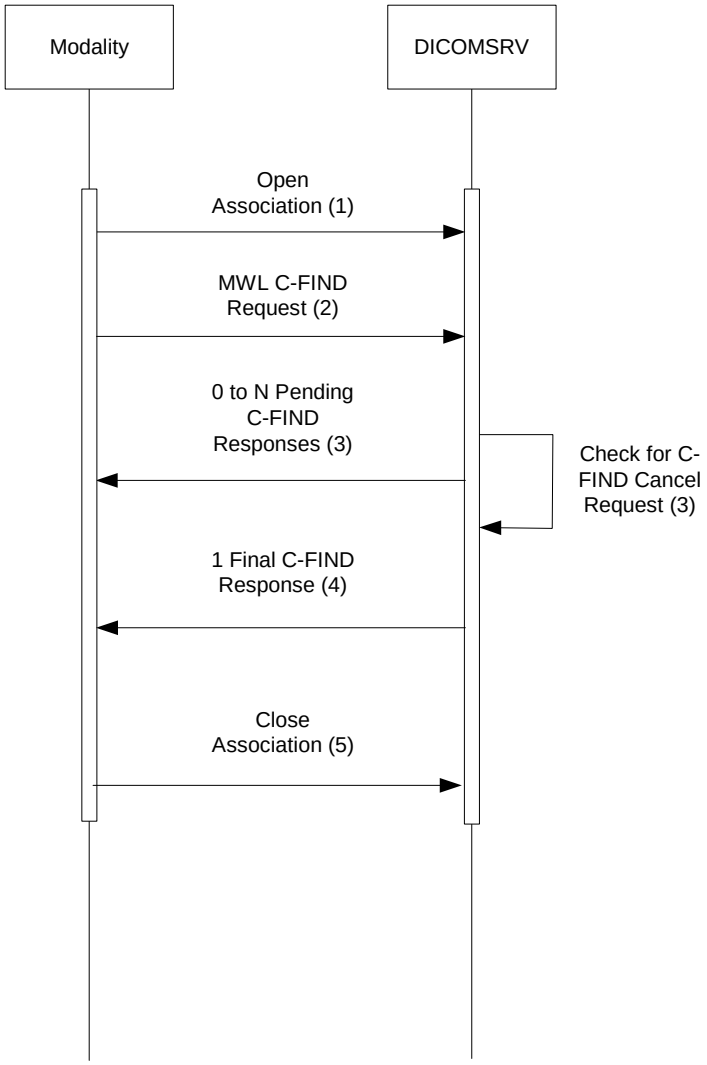
Before *syngo* Workflow SLR can include patient and order information in response to a Modality Worklist query, the patient must be registered in SLR and an order must exist for that patient in the SLR database. Registration and an order are also required for SLR to update its database in response to receipt of MPPS messages. The exception to this rule is several of the Trauma cases detailed within the IHE Technical Framework. Registration and order information is typically interfaced to SLR from a HIS. There is a mapping between the Universal Service ID contained in the HL7 Order messages and 1 or more Requested Procedures within the SLR database. This mapping is configured when the RIS is installed and is maintained thereafter by hospital staff. Though DICOM allows for a 1 to n mapping between Requested Procedure and Scheduled Procedure Steps (the unit of measure for Modality Worklist – an MWL query returns a list of Scheduled Procedure Steps), in the SLR implementation this relation is 1 to 1. SLR's registration and order entry applications can also be used for register patients and create orders.

Orders created within SLR will typically be interfaced to the HIS and to one or more PACS if so configured. Patient registrations created within SLR are generally not interfaced to the HIS.

SLR removes SPSs and thus Requested Procedures from eligibility for inclusion on work lists on a per Application Entity basis when a Requested Procedure is either cancelled or reaches a configured procedure tracking status. Procedures at tracking status 'Begin Procedure' or any preceding step are eligible by default. This status can either be set interactively using the SLR Patient Tracking application (called 'Patient' Tracking rather than Procedure Tracking for historical reasons) or automatically as the result of reception of an MPPS message if so configured.

When configured with applicable protocol codes, users can employ the *Portal Radiologist* application to specify and save protocols for specific MRI procedures to be performed on certain Siemens MRI acquisition modalities. Speak to Siemens sales representatives to see which models support this capability. The saved protocol codes are transferred to the MWL SCU in the Scheduled Protocol Code Sequence (0040, 0008). In addition, the Referenced Study Sequence (0008, 1110) can be used to hold the Study Instance UID of a previous identical procedure whose protocol is to be used for the current procedure.

Figure 1 Sequencing Diagram for Activity: Configured AE Requests MWL Query



The figure above is a possible sequence of messages between a Modality Worklist SCU and DICOMSRV.

1. The Modality opens an Association with DICOMSRV for the purpose of querying a Worklist of Procedure Steps
2. The Modality sends an MWL C-FIND query to DICOMSRV
3. DICOMSRV queries its database using the attributes from the C-FIND Request and returns 0 to N Pending C-FIND responses depending on matches returned from the database. DICOMSRV checks for a C-FIND Cancel Request after a configured number of responses are sent. If a Cancel is received then no further Pending responses are sent.
4. DICOMSRV sends the final C-FIND response
5. The Modality closes the Association

3.2.1.4.1.2 Accepted Presentation Contexts

Table 5 – Acceptable Presentation Contexts for AE DICOMSRV and Real-World Activity 'Remote AE Requests MWL Query'

Presentation Context Table					
Abstract Syntax		**Transfer Syntax**		**Role**	**Extended Negotiation**
Name	**UID**	**Name List**	**UID List**		
Modality Worklist Information 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

3.2.1.4.1.3 Presentation context acceptance criterion

Depending on configuration, DICOMSRV may or may not accept multiple Presentation Contexts containing the same Abstract Syntax. The default setting is to accept only a single Presentation Context for a given Abstract Syntax.

3.2.1.4.1.4 Transfer syntax selection policy

Transfer Syntaxes in addition to the default Implicit VR Little Endian may be configured for a given Abstract Syntax using Merge's configuration files. When this is done, the first Transfer Syntax encountered in the configuration file, which matches a Transfer Syntax offered for a given Presentation Context, will be selected as the accepted Transfer Syntax for that Presentation Context.

3.2.1.4.1.5 SOP specific conformance for Modality Worklist SOP Class

DICOMSRV does not support matching on any optional matching key attributes.
DICOMSRV supports case-insensitive matching on the following Person Name Value Representation elements:

Patient Name (0010, 0010)

DICOMSRV does not support fuzzy semantic matching of patient names.
DICOMSRV supports optional return key attributes as described in the table below.
DICOMSRV supports matching as specified in the Modality Worklist SOP class with the following restrictions:

1. A configurable date range will be applied to all queries that do not supply a value for Scheduled Procedure Step Start Date (0040,0002) with the exception of queries from AEs configured for Historical Matching. This date range effectively determines the set of eligible Scheduled Procedure Steps for all queries that do not supply their own date or date range.
2. Any query containing a partial value for Scheduled Performing Physician's Name (0040, 0006) will return no matching responses, as this field is not managed by *syngo* Workflow SLR.

3. A query containing a partial value for Patient Name (0010, 0010) that includes a wild card will return no matching responses if the first 3 characters of the last name are not present

Table 6 – Modality Worklist Optional Return Keys supported

Description/Module	Tag	Remark
Scheduled Procedure Step		
>Scheduled Protocol Code Sequence	(0040, 0008)	The attributes of this sequence will be valued if a protocol has been specified in the Portal Radiologist Check Request application for the procedure related to the current Modality Worklist response. This only applies for procedures to be performed on Siemens MR Chorus acquisition modality. See the conformance statement of this product for the version of MR Chorus that supports this feature. See the Controlled Terminology section for more detail
>>Code Value	(0008, 0100)	
>>Coding Scheme Designator	(0008, 0102)	
>>Coding Scheme Version	(0008, 0103)	
>>Code Meaning	(0008, 0104)	
>Comments on the Scheduled Procedure Step	(0040, 0400)	This attribute will be valued with the text of a protocol if the query contains a value for Accession Number (0008,0050) and if the site has defined a protocol for the specific Procedure Type identified by the Accession Number. This is the text-based legacy implementation for transmitting protocols to acquisition modalities
Requested Procedure		
Reason for the Requested Procedure	(0040, 1002)	

Requested Procedure Comments	(0040, 1400)	
Imaging Service Request		
Reason for the Imaging Service Request	(0040,2001)	
Imaging Service Request Comments	(0040,2400)	
Requesting Service	(0032,1033)	
Issuing Date of Imaging Service Request	(0040,2004)	
Issuing Time of Imaging Service Request	(0040,2005)	
Placer Order Number / Imaging Service Request	(0040,2016)	
Filler Order Number / Imaging Service Request	(0040,2017)	
Order entered by	(0040,2008)	
Order Enterer's Location	(0040,2009)	
Visit Identification		
Admission Id	(0038,0010)	
Visit Status		
Patient's Institution Residence	(0038,0400)	
Visit Admission		
Referring Physician's Name	(0008,0090)	
Referring Physician's Address	(0008,0092)	
Referring Physician's Phone Numbers	(0008,0094)	
Admitting Diagnosis Description	(0008,1080)	
Admitting Date	(0038,0020)	
Admitting Time	(0038,0021)	
Patient Identification		
Issuer of Patient ID	(0010,0021)	
Patient Demographic		

Occupation	(0010,2180)	
Patient's Address	(0010,1040)	
Country of Residence	(0010,2150)	
Patient's Telephone Numbers	(0010,2154)	
Ethnic Group	(0010,2160)	
Patient's Religious Preference	(0010,21F0)	
Patient Comments	(0010,4000)	
Patient Medical		
Smoking Status	(0010,21A0)	
Last Menstrual Date	(0010,21D0)	

DICOMSRV returns C-FIND response statuses as specified below.

Table 7 – MWL C-FIND Response Status Reasons

Service Status	Further Meaning	Error Code	Reasons
Success	Matching is complete	0000	The response status code and meaning are logged in the job log file.
Failure	Out of resources	A700	If the number of matches exceeds a configurable maximum this error code is returned. An error comment describing the error is also returned. The response status code and meaning are logged in the job log file.
	Unable to process	C000	This status is returned due to internal errors within DICOMSRV such as a processing failure response on a query of the SLR database. The response status code and meaning are logged in the job log file.
Canceled	Matching terminated due to cancel request	FE00	This status is returned if a Cancel Request is received from the SCU during the processing of a Modality Worklist request. The response status code and meaning are logged in the job log file.
Pending	Matching is continuing	FF00	The status is returned with each matching response. A message is logged for each pending response.

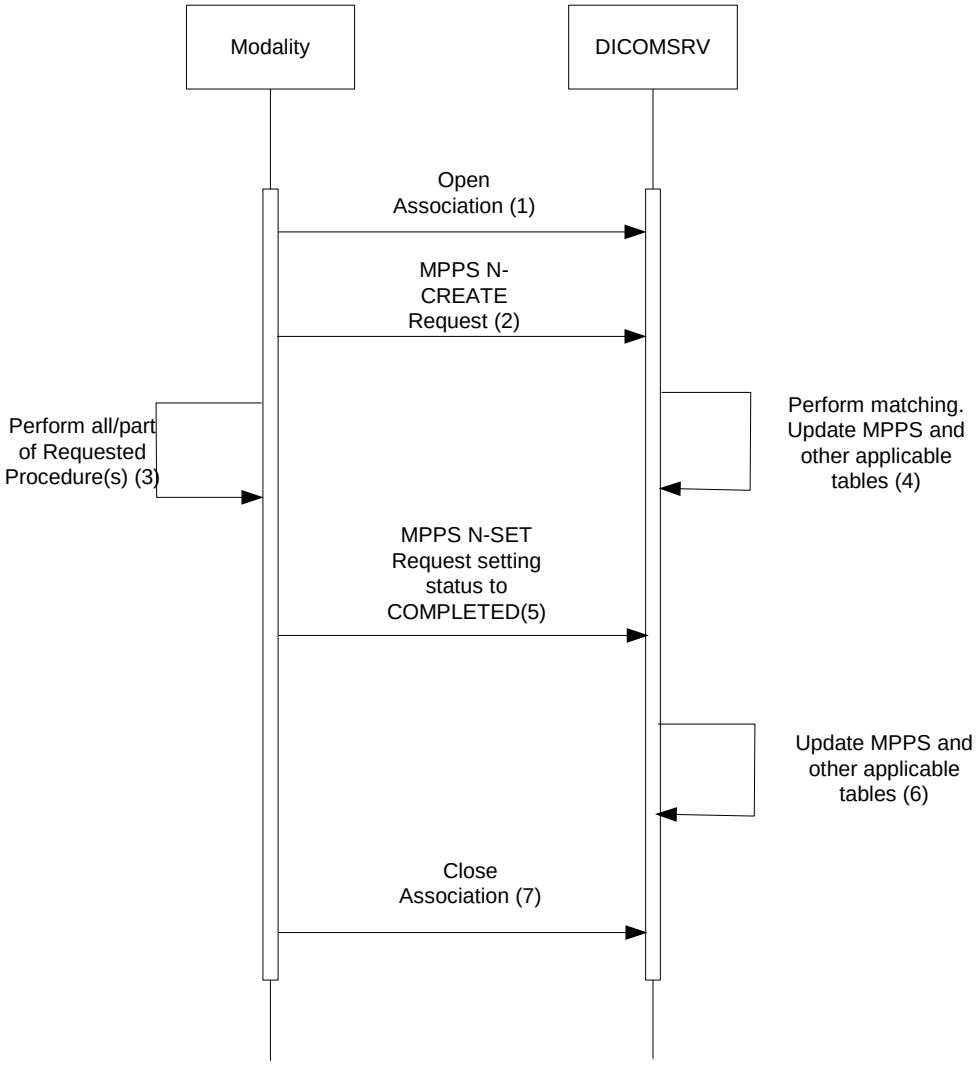
3.2.1.5 Activity – Remote AE Makes Procedure Step Request

When a configured remote AE sends a conformant association request including one of the Modality Performed Procedure Step Presentation Contexts in the table below then DICOMSRV will accept the Association.

3.2.1.5.1.1 Description and Sequencing of Activities

As mentioned above, DICOMSRV is started at system boot time and is thus ready to process MPPS messages at any time thereafter. The sequencing diagram below specifies a common flow of messages related to this activity. Prior to this sequence of messages it is necessary that orders have been received from the HIS interface or created via SLR Ordering and Scheduling application. Attributes from the orders and created procedures, usually queried using MWL, will be included in the MPPS messages the Modality sends to DICOMSRV. Key attributes in the MPPS N-CREATE and N-SET, specified below, are extracted and matched against values in the SLR database. A match allows full update of all applicable SLR database tables.

Figure 2 Sequencing Diagram for Activity: Remote AE Makes Procedure Step Request



The figure above is a possible sequence of messages and events for the Remote AE Makes Procedure Step Request activity.

1. The Modality opens an Association to update DICOMSRV using MPPS
2. The Modality sends an N-CREATE Request to indicate that it is performing one or more Requested Procedures
3. The Modality performs all or part of the procedure(s)
4. DICOMSRV stores the MPPS and executes the matching algorithm described in the conformance section below. If a successful match is found then updates to various tables per the N-CREATE are performed. See Table 9 – Supported N-SET/N-CREATE Attributes for MPPS. In the matching case, tracking status of the procedure(s) referenced in the MPPS is updated if so configured
5. The Modality sends an N-SET setting the status of the MPPS to COMPLETED
6. DICOMSRV stores the MPPS If the N-CREATE for this step matched then updates are performed as specified in step 4

7. The Modality closes the Association

DICOMSRV also supports the first 5 of the 6 IHE Trauma use cases. Cases 1, 2 and 4 are transparent to the MPPS SCU and follow the normal flow. In case 3, the patient upon whom a given procedure must be immediately performed has been registered on the HIS and has a valid Patient ID but has no order specifying the applicable procedure. DICOMSRV recognizes this case when an MPPS N-CREATE is received with a matching Patient ID and zero-length Accession Number (0008,0050). If the MPPS SCU is configured for support of IHE Trauma cases, DICOMSRV will order a default procedure based on configuration. A user may change the procedure using SLR Patient Tracking application. This change is implemented as a procedure cancel and reorder.

In case 5, there is no existing registration or order for a patient on whom a procedure must be immediately performed. Values are entered on the Modality identifying the patient and procedure. DICOMSRV recognizes this case when an MPPS N-CREATE is received containing a Patient ID within a configured range. This range will never contain Patient IDs created in the normal flow. If the MPPS SCU is configured for support of IHE Trauma cases, DICOMSRV will register the patient with the Patient ID provided and will order a procedure as described above.

3.2.1.5.1.2 Accepted Presentation Contexts

Table 8 – Acceptable Presentation Contexts for AE DICOMSRV and Real-World Activity 'Configured AE Makes Procedure Step Request'

Presentation Context Table					
Abstract Syntax		**Transfer Syntax**		**Role**	**Extended Negotiation**
Name	**UID**	**Name List**	**UID List**		
Modality Performed Procedure Step SOP Class	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

3.2.1.5.1.3 SOP specific conformance for Modality Performed Procedure Step SOP Class

Table 9 Lists all MPPS attributes, whether they may be created by N-CREATE and updated by N-SET and what parts of the SLR database they are used to update. All MPPS messages and thus their attributes are stored for the configurable Purge Period described below. The 'Database Updates' column considers updates separate from the storage of MPPS messages. If no value is present this indicates that there are is no update to the database associated with the given element.

Table 9 – Supported N-SET/N-CREATE Attributes for MPPS

Attribute Name	Tag	N-Create	N-Set	Database Updates
SOP Common Module				
Specific Character Set	(0008,0005)	Y	N	
Performed Procedure Step Relationship Module				
Scheduled Step Attribute Sequence	(0040,0270)	Y	N	Y
>Study Instance UID	(0020,000D)	Y	N	Overwrite existing value if different from received value
>Referenced Study Sequence	(0008,1110)	Y	N	
>>Referenced SOP Class UID	(0008,1150)	Y	N	
>>Referenced SOP Instance UID	(0008,1155)	Y	N	
>Accession Number	(0008,0050)	Y	N	
>Placer Order Number/Imaging Service Request	(0040,2006)	Y	N	
>Filler Order Number/Imaging Service Request	(0040,2007)	Y	N	
>Requested Procedure ID	(0040,1001)	Y	N	
>Requested Procedure Description	(0032,1060)	Y	N	
>Scheduled Procedure Step ID	(0040,0009)	Y	N	
>Scheduled Procedure Step Description	(0040,0007)	Y	N	
>Scheduled Protocol Code Sequence	(0040,0008)	Y	N	
>>Code Value	(0008,0100)	Y	N	
>>Coding Scheme designator	(0008,0102)	Y	N	
>>Code Meaning	(0008,0104)	Y	N	
Patient Name	(0010,0010)	Y	N	
Patient ID	(0010,0020)	Y	N	
Patient’s Birth Date	(0010,0030)	Y	N	
Patient’s Sex	(0010,0040)	Y	N	
Referenced Patient Sequence	(0008,1120)	Y	N	
>Referenced SOP Class UID	(0008,1150)	Y	N	

Attribute Name	Tag	N-Create	N-Set	Database Updates
>Referenced SOP Instance UID	(0008,1155)	Y	N	
Performed Procedure Step Information				
Performed Procedure Step ID	(0040,0253)	Y	N	
Performed Station AE Title	(0040,0241)	Y	N	
Performed Station Name	(0040,0242)	Y	N	
Performed Location	(0040,0243)	Y	N	
Performed Procedure Step Start Date	(0040,0244)	Y	N	
Performed Procedure Step Start Time	(0040,0245)	Y	N	
Performed Procedure Step Status	(0040,0252)	Y	Y	
Performed Procedure Step Description	(0040,0254)	Y	Y	
Performed Procedure Type Description	(0040,0255)	Y	Y	
Procedure Code Sequence	(0008,1032)	Y	Y	
>Code Value	(0008,0100)	Y	Y	
>Coding Scheme Designator	(0008,0102)	Y	Y	
>Code Meaning	(0008,0104)	Y	Y	
Performed Procedure Step End Date	(0040,0250)	Y	Y	
Performed Procedure Step End Time	(0040,0251)	Y	Y	
Comments on the Performed Procedure Step	(0040, 0280)	Y	Y	
Image Acquisition Results				
Modality	(0008,0060)	Y	N	
Study ID	(0020,0010)	Y	N	

Attribute Name	Tag	N-Create	N-Set	Database Updates
Performed Protocol Code Sequence	(0040,0260)	Y	Y	If SLR has been configured with applicable protocol codes relevant for certain Siemens MRI devices and if this attribute is valued with configured codes, then these codes will be stored in the SLR database and may be used as the basis for protocoling future procedures
>Code Value	(0008,0100)	Y	Y	
>Coding Scheme Designator	(0008,0102)	Y	Y	
>Code Meaning	(0008,0104)	Y	Y	
Performed Series Sequence	(0040,0340)	Y	Y	Y
>Performing Physician's Name	(0008,1050)	Y	Y	Y
>Protocol Name	(0018,1030)	Y	Y	
>Operator's Name	(0008,1070)	Y	Y	If automatic procedure tracking is enabled, stored in current and historical procedure tables to indicate who tracked the procedure
>Series Instance UID	(0020,000E)	Y	Y	
>Series Description	(0008,103E)	Y	Y	
>Retrieve AE Title	(0008,0054)	Y	Y	
Referenced Image Sequence	(0008,1140)	Y	Y	
>>Referenced SOP Class UID	(0008,1150)	Y	Y	
>>Referenced SOP Instance UID	(0008,1155)	Y	Y	
>Referenced Standalone SOP Instance Sequence	(0040,0220)	Y	Y	
>>Referenced SOP Class UID	(0008,1150)	Y	Y	

Attribute Name	Tag	N-Create	N-Set	Database Updates
>>Referenced SOP Instance UID	(0008,1155)	Y	Y	
Radiation Dose				
Anatomic Structure, Space or Region Sequence	(0008,2229)			
>Code Value	(0008,0100)	Y	Y	
>Coding Scheme Designator	(0008,0102)	Y	Y	
>Code Meaning	(0008,0104)	Y	Y	
Total Time of Fluoroscopy	(0040,0300)	Y	Y	Stored in Technique table
Total Number of Exposures	(0040,0301)	Y	Y	Stored in Technique table
Distance Source to Detector	(0018,1110)	Y	Y	Stored in Technique table
Distance Source to Entrance	(0040,0306)	Y	Y	Stored in Technique table
Entrance Dose	(0040,0302)	Y	Y	Stored in Technique table
Entrance Dose in mGy	(0040,8302)	Y	Y	
Exposed Area	(0040,0303)	Y	Y	Stored in Technique table
Image Area Dose Product	(0018,115E)	Y	Y	Stored in Technique table
Comments on Radiation Dose	(0040,0310)	Y	Y	Stored in Technique table
Exposure Dose Sequence	(0040,030E)			
>Radiation Mode	(0018,115A)			Stored in Technique table
>KVp	(0018,0060)			Stored in Technique table
>X-ray Tube Current in µA	(0018,8151)			Stored in Technique table
>Exposure Time	(0018,1150)			Stored in Technique table
>Filter Type	(0018,1160)			Stored in Technique table
>Filter Material	(0018,7050)			Stored in Technique table
Billing and Material Management Code				

Attribute Name	Tag	N-Create	N-Set	Database Updates
Billing Procedure Step Sequence				
>Code Value	(0008,0100)	Y	Y	
>Coding Scheme Designator	(0008,0102)	Y	Y	
>Code Meaning	(0008,0104)	Y	Y	
Film Consumption Sequence	(0040,0321)	Y	Y	
> Number of Films	(2100,0170)	Y	Y	
> Medium Type	(2000,0030)	Y	Y	
> Film Size ID	(2010,0050)	Y	Y	
Billing Supplies and Devices Sequence	(0040,0384)	Y	Y	
>Billing Item Sequence	(0040,0296)	Y	Y	
>>Code Value	(0008,0100)	Y	Y	Updates Supply table if Coding Scheme Designator for Billing Item Sequence is NOVIUS_SUPPLY and the Code Value is a value from this Code Set
>>Coding Scheme Designator	(0008,0102)	Y	Y	
>>Code Meaning	(0008,0104)	Y	Y	
>Quantity Sequence	(0040,0293)	Y	Y	
>>Quantity	(0040,0294)	Y	Y	
>>Measuring Units Sequence	(0040,0295)	Y	Y	
>>>Code Value	(0008,0100)	Y	Y	
>>>Coding Scheme Designator	(0008,0102)	Y	Y	
>>>Code Meaning	(0008,0104)	Y	Y	

The list below details the behavior of DICOMSRV on occurrence of certain MPPS events and with respect to the coercion of attributes and duration of storage of MPPS messages:

- **Reception of a New MPPS Instance** – The MPPS message is stored in the database. If the Patient ID (0020, 0010) is in the range specified for the IHE Trauma case 3 and there is no Accession Number (0008, 0050) in the request then an on-the-fly patient registration and

order is created. If there is a matching Patient Id but no Accession Number in the request (IHE Trauma Case 3) then an order is created based on configuration. Otherwise, DICOMSRV will extract the Patient ID and as many Accession Numbers as there are items in the Scheduled Step Attribute Sequence (0040,0270) from the N-CREATE and try to match these values against the Patient Medical Record Number and one or more Accession Numbers in the SLR database. If a non-matching N-CREATE is received, it and any following N-SETs will be marked as exceptions. These exceptions can be reconciled using SLR's Exception Resolution application. Otherwise, DICOMSRV will:

  - Update its database with values contained in the N-CREATE per Table 9 above.
  - Update the tracking status of each referenced procedure if so configured .

- **Update of MPPS to 'DISCONTINUED' or 'COMPLETED' –** The N-SET is stored in the database. If the preceding N-CREATE matched then the following is done:
  - The attribute values in the N-SET will be used to update the SLR database per Table 9 above.
  - Update the tracking status of each referenced procedure if so configured. .
- **Coercion of Attributes –** DICOMSRV will coerce attributes as specified in Table 25. This coercion may occur when a given step is set to the 'IN PROGRESS' or 'COMPLETED' or 'DISCONTINUED'
- **Storage Duration for MPPS messages –** MPPS messages are purged from the SLR database after a configurable period of time has elapsed since the step has been set to a final state or was last updated.

Table 10 – MPPS N-CREATE/N-SET Response Status Reasons

Service Status	Further Meaning	Error Code	Reasons
Success	Successful completion of the N-SET or N-CREATE Request	0000	The response status code and meaning are logged in the job log file.
Failure	Processing Failure	0110	Internal error within DICOMSRV. The response status code and meaning are logged in the job log file.
	Duplicate SOP Instance	0111	This status is returned when the SCU has attempted to N-CREATE a SOP Instance that has already been created. The response status code and meaning are logged in the job log file
	No such SOP Instance	0112	Status returned when the SCU is trying to SET a SOP instance which has not been created. The response status code and meaning are logged in the job log file

	Missing Attribute	0120	This status is returned if an attribute required to be sent in the N-CREATE or required to be sent before completion of the Procedure Step has not been sent. The response status code and meaning are logged in the job log file.

3.2.1.5.2 Activity – Remote AE Requests Verification

3.2.1.5.2.1 Description and Sequencing of Activities

A remote AE sends an Echo Request to verify that DICOMSRV is awake and listening. DICOMSRV responds with success status as long as the request can be parsed.

3.2.1.5.2.2 Accepted Presentation Contexts

Table 11 – Acceptable Presentation Contexts for AE DICOMSRV and Real-World Activity Configured AE Requests Verification

Presentation Context Table					
Abstract Syntax		**Transfer Syntax**		**Role**	**Extended Negotiation**
Name	**UID**	**Name List**	**UID List**		
Verification SOP 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

3.2.1.5.2.3 SOP specific conformance

DICOMSRV provides Standard conformance to the DICOM Verification service class.

3.2.1.5.2.4 Presentation context acceptance criterion

Depending on configuration, DICOMSRV may or may not accept multiple Presentation Contexts containing the same Abstract Syntax. The default setting is to accept only a single Presentation Context for a given Abstract Syntax.

3.2.1.5.2.5 Transfer syntax selection policy

Transfer Syntaxes in addition to the default Implicit VR Little Endian may be configured for a given Abstract Syntax using Merge's configuration files. When this is done, the first Transfer Syntax encountered in the configuration file, which matches a Transfer Syntax offered for a given

Presentation Context, will be selected as the accepted Transfer Syntax for that Presentation Context.

3.2.2 PACSMOVE AE Specification

This application provides Standard Conformance to the following DICOM V3.0 SOP Classes:

3.2.2.1 SOP Classes

Table 12 – SOP Classes for AE PACSMOVE

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
Patient/Study only Query/Retrieve Information Model – MOVE	1.2.840.10008.5.1.4.1.2.3.2	Yes	No

3.2.2.2 Association Policies

3.2.2.2.1 General

The Application Context Name for DICOM 3.0 is the only Application Context proposed.

Table 13 – DICOM application context

Application Context Name	1.2.840.10008.3.1.1.1

3.2.2.2.2 Number of associations

PACSMOVE will support a single association for each instance of itself that is configured to run

3.2.2.2.3 Asynchronous nature

Asynchronous communication (multiple outstanding transactions over a single association) is not supported.

3.2.2.2.4 Implementation Identifying Information

Table 14 – DICOM Implementation Class and Version for PACSMOVE

Implementation Class UID	1.2.840.113696.1
Implementation Version Name	SLR_310

3.2.2.3 Association Initiation Policy

3.2.2.3.1 Activity – Retrieve Request

3.2.2.3.1.1 Description and Sequencing of Activities

Users can initiate requests to move images from various points in the SLR Client. Requests can also be made when certain events occur or at specific times based on configuration. The system-generated requests are usually related to preloading of images. The first step in the process is a request from one of the flows above to the Route Request queue. The PACSRQST job will read the message from the queue, validate its contents, and, barring error, send it to the Route Move queue. One of the PACSMOVE Worker processes picks up the request. The Worker will create an association to the configured PACS Archive AE. It will then formulate the C-Move request, send it to PACS Archive AE, and wait for final response.

3.2.2.3.1.2 Proposed Presentation Contexts

Table 15 – Proposed Presentation Contexts for Query/Retrieve MOVE SOP Classes

Presentation Context Table					
Abstract Syntax		**Transfer Syntax**		**Role**	**Extended Negotiation**
Name	**UID**	**Name List**	**UID List**		
Patient Root Query/Retrieve Information Model – MOVE SOP Class	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 Information Model – MOVE SOP Class	1.2.840.10008.5.1.4.1.2.2.2	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
Patient/Study only Query/Retrieve Information Model	1.2.840.10008.5.1.4.1.2.3.2	Implicit VR Little Endian Explicit VR Little Endian	1.2.840.10008.1.2 1.2.840.10008.1.2	SCU	None

– MOVE SOP Class		Explicit VR Big Endian	.1 1.2.840.10008.1.2.2		

3.2.2.3.1.3 SOP Specific Conformance for Query/Retrieve – MOVE SOP Classes

Only patient and study level retrieve requests are supported
C-MOVE requests are never canceled.

3.2.2.4 Association Acceptance Policy

PACSMOVE does not accept Association Requests

3.2.3 PACSINFO AE Specification

This application provides Standard Conformance to the following DICOM V3.0 SOP Classes:

3.2.3.1 SOP Classes

Table 16 – SOP Classes for AE PACSINFO

SOP Class Name	SOP Class UID	SCU	SCP
Patient Root Query/Retrieve Information Model – FIND	1.2.840.10008.5.1.4.1.2.1.1	Yes	No
Study Root Query/Retrieve Information Model – FIND	1.2.840.10008.5.1.4.1.2.2.1	Yes	No
Patient/Study only Query/Retrieve Information Model – FIND	1.2.840.10008.5.1.4.1.2.3.1	Yes	No

3.2.3.2 Association Policies

3.2.3.2.1 General

The Application Context Name for DICOM 3.0 is the only Application Context proposed.

Table 17 – DICOM application context

Application Context Name	1.2.840.10008.3.1.1.1

3.2.3.2.2 Number of associations

PACSINFO will support a single association for each instance of itself that is configured to run

3.2.3.2.3 Asynchronous nature

Asynchronous communication (multiple outstanding transactions over a single association) is not supported.

3.2.3.2.4 Implementation Identifying Information

Table 18 – DICOM Implementation Class and Version for PACSMOVE

Implementation Class UID	1.2.840.113696.1
Implementation Version Name	SLR_310

3.2.3.3 Association Initiation Policy

3.2.3.3.1 Activity – Create Study Query

3.2.3.3.1.1 Description and Sequencing of Activities

Users can initiate requests to query studies from various points in the SLR Client. Requests can also be made when certain events occur or at specific times based on configuration. The system-generated requests are usually related to detecting the presence of studies on one or more local PACS. The first step in the process is a request from one of the flows above to a queue configured for study queries. One of the PACSINFO jobs will read a message from the queue, create an Association with the specified remote AE and send the query. The job will then read responses to the query until a final response is received. It will then either return the responses to the user on our client application that formulated the query or possibly update the SLR database depending on the contents of the responses.

3.2.3.3.1.2 Proposed Presentation Contexts

Table 19 – Proposed Presentation Contexts for Query/Retrieve – FIND SOP Classes

Presentation Context Table					
Abstract Syntax		**Transfer Syntax**		**Role**	**Extended Negotiation**
Name	**UID**	**Name List**	**UID List**		
Patient Root Query/Retrieve Information Model – FIND SOP	1.2.840.10008.5.1.4.1.2.1.1	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	SCU	None

Class			1.2.840.10008.1.2.2		
Study Root Query/Retrieve Information Model – FIND SOP Class	1.2.840.10008.5.1.4.1.2.2.1	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
Patient/Study only Query/Retrieve Information Model – FIND SOP Class	1.2.840.10008.5.1.4.1.2.3.1	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

3.2.3.3.1.3 SOP Specific Conformance for Query/Retrieve – FIND SOP Classes

PACSINFO does not support any optional matching keys; optional return keys are listed in the table below.
Only patient and study level keys are queried.
Once sent, queries are never canceled.
PACSINFO does not support Relational Queries or Extended Negotiation.
Unexpected attributes returned in a C-FIND response (those not requested) are ignored.
Specific Character Set (0008,0005) will not be included in any C-FIND request. If this attribute is included in any pending response with a value other than 'ISO-IR 6' (default character set) or 'ISO-IR 100' a warning message will be logged and the response will be ignored.

Table 20 – Optional Return Keys

Name	Tag
Patient Level	
Referenced Patient Sequence	(0008,1120)
Patient's Birth Date	(0010,0030)
Patient's Birth Time	(0010,0032)
Patient's Sex	(0010,0040)
Other Patient's ID's	(0010,1000)
Other Patient's Names	(0010,1001)
Ethnic Group	(0010,2160)
Patient Comments	(0010,4000)
Number of Patient Related Studies	(0020,1200)
Number of Patient Related Series	(0020,1202)
Number of Patient Related Instances	(0020,1204)

Study Level	
Modalities In Study	(0008,0061)
Referring Physician's Name	(0008,0090)
Study Description	(0008,1030)
Procedure Code Sequence	(0008,1032)
>Code Value	(0008,0100)
>Coding Scheme Designator	(0008,0102)
>Coding Scheme Version	(0008,0103)
>Code Meaning	(0008,0104)
Name of Physician(s) Reading Study	(0008,1060)
Admitting Diagnoses Description	(0008,1080)
Referenced Study Sequence	(0008,1110)
Patient's Age	(0010,1010)
Patient's Size	(0010,1020)
Patient's Weight	(0010,1030)
Occupation	(0010,2180)
Additional Patient History	(0010,21B0)
Other Study Numbers	(0020,1070)
Number of Study Related Series	(0020,1206)
Number of Study Related Instances	(0020,1208)
Interpretation Author	(4008,010C)

3.2.3.4 Association Acceptance Policy

PACSINFO does not accept Association Requests

3.3 Physical Network Interfaces

3.3.1 Supported Communication Stacks

3.3.1.1 TCP/IP Stack

The *syngo* Workflow DICOM applications are implemented using the TCP/IP stack supplied with the Operating System.

3.3.2 Physical Media

The *syngo* Workflow DICOM applications are indifferent to the physical medium over which TCP/IP executes.

3.3.3 Additional Protocols

If DNS support exists on the local network, then DNS is used for address resolution.. If DNS is not supported then the hostnames and addresses are configured in the local hosts file.

3.4 Configuration

3.4.1 AE Title/Presentation Address mapping

The AE Title of PACSMOVE, PACSINFO and DICOMSRV may be configured using the Merge configuration files. The port that DICOMSRV listens on may also be configured in this way. The IP Address of the SLR server is picked by the site and may be changed by a Field Engineer.

3.4.1.1 Local AE Titles

Table 21 – AE Title configuration table

Application Entity	Default AE Title	Default TCP/IP Port
DICOMSRV	Must be configured	2200
PACSMOVE	Must be configured	Not Applicable
PACSINFO	Must be configured	Not Applicable

3.4.1.2 Remote AE Title/Presentation Address Mapping

The AE Titles, host names, port numbers and supported Presentation Contexts of remote Application Entities to which one of the SLR DICOM applications may connect are configured in the Merge application configuration, mergecom.app.

3.4.2 Parameters

DICOMSRV configuration parameters related to DICOM communications are below.

Table 22 – Configuration Parameters table

Parameter	**Configurable**	**Default Value**
General Parameters		
Time-out waiting for a reply to an Association Open Request	Yes	30 Seconds

Parameter	Configurable	Default Value
ARTIM Timeout – The number of seconds to use as a timeout waiting for association request or waiting for the peer to shut down an association.	Yes	30 Seconds
Time-out waiting for response to TCP/IP connect() request.	Yes	15 Seconds
Time-out waiting for data between TCP/IP packets. (Low-level timeout)	Yes	15 Seconds
Time-out waiting for a response to a DIMSE Request	Yes	30 Seconds
Time-out waiting for the next DIMSE Request	Yes	30 Seconds
Debugging Capabilities		
Dump DIMSE Messages	Yes	Off
Dump Association Messages	Yes	Off
Network Capture	Yes	Off. This option when set to 'On' will capture incoming and outbound tcp/ip packets in a file suited for analysis by the MergeDPM utility The option is configured in mergecom.pro
Tcp/Ip Settings		
Tcp/Ip Send Buffer	Yes	65536 Bytes
Tcp/Ip Receive Buffer	Yes	65536 Bytes
PacketFilter	Yes	On. This option enables running of tcpdump utility from the command line to capture tcp packet headers/contents
DICOMSRV Parameters		
Maximum PDU size the AE can recieve	Yes	65536 Bytes
Maximum PDU size the AE can send	No	The lower of the value above and the max PDU size specified by the Remote AE in the Association

Parameter	Configurable	Default Value
		Request
Validation of DICOM Service Messages	Yes	Validate messages and log validation errors. Do not automatically return error for all validation errors
Patient ID Prefix – for multi-entity sites a prefix of 1 or more characters may be configured for each entity. These prefixes are added to the front of patient ids, based on the hospital the patient record is associated with, when used in DICOM service messages	Yes	None
Accession Number Prefix – for multi-entity sites a prefix of 1 or more characters may be configured for each entity. These prefixes are added to the front of Accession Numbers, based on the hospital the procedure record is associated with, when used in DICOM service messages	Yes	None
Modality Worklist Parameters		
Tracking Status of procedure that removes the procedure from worklist eligibility	Yes, by Application Entity	BEGIN PROCEDURE
Maximum Date Range – Range for scheduled date attribute of procedures that may be included in MWL responses	Yes	3 days (if a MWL query contains a date range larger than this value then no pending responses will be returned)
Historical Query – allows querying of older procedures. Useful when scanning films for acquisition of archive or when splitting of studies is done post-acquisition of images	Yes, by Application Entity	N (off)
Procedure Coding Scheme – Coding scheme used for Requested Procedure Code Sequence.	Yes, may be CPT for CPT coding scheme, DTL_SVC_CD for the configured detail service code scheme, SIEMENS_RIS for Siemens internal coding scheme or USER_CD for a user-defined	CPT

Parameter	Configurable	Default Value
	coding scheme	
Scheduled Protocol Code Sequence	Yes	
Left/Right indicator – controls whether the left/right indicator is prepended to the Scheduled Procedure Step description or not	Yes	No
Protocol Document Identifier – Identifies protocol document for legacy protocoling implementation. Used to transmit protocol in free text format.	Yes	None
Cancel check frequency – number of MWL pending responses to send between checks for a C-CANCEL-FIND-RQ	Yes	50
Supported Transfer Syntaxes	Yes	Explicit VR Little Endian Implicit VR Little Endian Explicit VR Big Endian
Modality Performed Procedure Step Parameters		
Generate charges based on supplies specified in MPPS transactions	Yes	No
Purge Period for MPPS transactions in final state	Yes	30 days
IHE Trauma Support	Yes	false
IHE Patient ID Range – range of patient ids to use for IHE Trauma cases	Yes	None
IHE Doctor Number – doctor number to use for orders generated for Trauma cases	Yes	None
IHE Priority – priority of orders created for IHE Trauma cases	Yes	None
IHE Item – item from procedure catalog to use for IHE Trauma orders	Yes	None
IHE Department – department to use for IHE Trauma orders	Yes	None
IHE Patient Class – patient class to use for IHE Trauma registrations	Yes	None
IHE Procedure Number – procedure number to use for IHE Trauma orders	Yes	None
IHE Tech Initials – technologist's initials to use for IHE Trauma orders	Yes	None
Status to automatically track procedures to for a given AE on receipt of matching N-CREATE	Yes, by Application Entity	None

Parameter	Configurable	Default Value
Status to automatically track procedures to for a given AE on receipt of matching N-SET COMPLETED	Yes, by Application Entity	None
Status to automatically track procedures to for a given AE on receipt of matching N-SET DISCONTINUED	Yes, by Application Entity	None
Supported Transfer Syntaxes	Yes	Explicit VR Little Endian Implicit VR Little Endian Explicit VR Big Endian
PACSMOVE Parameters - See DICOMSRV Parameters		
Query/Retrieve – C-MOVE SOP Classes		
Archive AE – default archive to send C-MOVE Request to	Yes	None
Retry Limit on failure of C-MOVE Request	No	5
Retry Delay	No	5 minutes
PACSINFO Parameters – See DICOMSRV Parameters		
Archive AE – default archive to send C-FIND Request to	Yes	None

4 Media Storage

None of the *syngo* Workflow SLR DICOM applications support Media Storage

5 Support of Extended Character Sets

The *syngo* Workflow SLR DICOM applications support the following character sets in addition to the default:

ISO_IR 100

6 Security

The *syngo* Workflow SLR DICOM applications do not support any specific security measures

7 Annexes

7.1 Created SOP Instances

syngo Workflow does not create SOP instances as such though it does relay MPPS SOP Instances created by MPPS SCUs and sent to SLR.

7.2 Used Fields in received IOD by Application

Table 23 Attributes in MPPS IOD used by *syngo* Workflow applications

Attribute Name	Tag	Database Updates
SOP Common Module		
Performed Procedure Step Relationship Module		
Scheduled Step Attribute Sequence	(0040,0270)	
>Accession Number	(0008,0050)	These attributes need to match values in the SLR database so other data contained in MPPS messages e.g. Dose and Materials data, can update the database and be displayed by the SLR application as described below
Patient ID	(0010,0020)	
Performed Procedure Step Information		
Performed Station AE Title	(0040,0241)	This attribute is used by the MPPSSRV application as a key into the DICOM Device database to determine if the procedure referenced by the MPPS message should automatically be tracked to a specified step
Image Acquisition Results		
>Operator's Name	(0008,1070)	Can be displayed by SLR application
Radiation Dose		
Distance Source to Detector	(0018,1110)	Values for these attributes are stored in the SLR Database
Exposed Area	(0040,0303	
Image Area Dose Product	(0018,115E)	
Entrance Dose	(0040,0302)	
Distance Source to Detector	(0018,1110)	
Comments on Radiation Dose	(0040,0310)	
Total Number of Exposures	(0040,0301)	Values for these attributes are stored in the database and can be displayed at various points within the client application
Distance Source to Entrance	(0040,0306)	
Total Time of Fluoroscopy	(0040,0300)	

Exposure Dose Sequence	(0040,030E)	
>Radiation Mode	(0018,115A)	
>KVp	(0018,0060)	
>X-ray Tube Current in uA	(0018,8151)	
>Exposure Time	(0018,1150)	
>Filter Type	(0018,1160)	
>Filter Material	(0018,7050)	
Billing and Material Management Code		
Billing Supplies and Devices Sequence	(0040,0384)	Values of these elements are used to update the supply table in the SLR database.
>Billing Item Sequence	(0040,0296)	
>>Code Value	(0008,0100)	
>>Coding Scheme Designator	(0008,0102)	
>>Code Meaning	(0008,0104)	
>Quantity Sequence	(0040,0293)	
>>Quantity	(0040,0294)	
>>Measuring Units Sequence	(0040,0295)	
>>>Code Value	(0008,0100)	
>>>Coding Scheme Designator	(0008,0102)	
>>>Code Meaning	(0008,0104)	

7.3 Attribute Mapping

The table below displays the common mapping between HL7 attributes used in order and ADT transactions and those supplied in Modality Worklist. The table is just a guide; individual sites may vary. Empty cells indicate that there is no mapping for the specific attribute

Table 24 HL7/Modality Worklist Attribute Mapping

DICOM Attribute	DICOM Tag	HL7 Attribute Name	HL7 Segment	Notes
Scheduled Procedure Step				
Scheduled Procedure Step Sequence	(0040,0100)			
> Scheduled Station AET	(0040,0001)			*SYNGO WORKFLOW* generated
> Scheduled Procedure Step Start Date	(0040,0002)	Quantity/Timing	ORM OBR:27	SLR generated
> Scheduled Procedure Step Start Time	(0040,0003)	Quantity/Timing	ORM OBR:27	SLR generated
> Modality	(0008,0060)			SLR generated
> Scheduled Performing Physician's Name	(0040,0006)	Technician	ORM OBR:34	
> Scheduled Procedure Step Description	(0040,0007)			SLR generated
>Scheduled Station Name	(0040,0010)			SLR generated
>Scheduled Procedure Step Location	(0040,0011)			SLR generated
>Scheduled Protocol Code Sequence	(0040, 0008)			
>>Code Value	(0008, 0100)			SLR generated
>>Coding Scheme Designator	(0008, 0102)			SLR generated
>>Code Meaning	(0008, 0104)			SLR generated
> Pre-Medication	(0040,0012)			SLR generated
> Scheduled Procedure Step ID	(0040,0009)			SLR generated

> Requested Contrast Agent	(0032,1070)			SLR generated
>Scheduled Procedure Step Status	(0040,0020)			SLR generated
>Comments on the Scheduled Procedure Step	(0040, 0400)			SLR generated
Requested Procedure				
Requested Procedure ID	(0040,1001)			SLR generated
Requested Procedure Description	(0032,1060)			SLR generated
Requested Procedure Code Sequence	(0032,1064)			
>Code Value	(0008, 0100)	Universal Service Id	ORM OBR:4	The value in the HL7 attribute is mapped to one or more procedure codes in the SLR database. The mapping is configurable
>Coding Scheme Designator	(0008, 0102)	Universal Service Id	ORM OBR:4	Maps to a site-defined Coding Scheme, the CPT Coding Scheme or the SLR internal Coding Scheme
>Code Meaning	(0008, 0104)			SLR generated
Study Instance UID	(0020,000D)			SLR generated
Referenced Study Sequence	(0008,1110)			
>Referenced SOP Class UID	(0008,1150)			SLR generated
>Referenced SOP Instance UID	(0008,1155)			SLR generated

Requested Procedure Priority	(0040,1003)		ORM OBR:27	
Patient Transport Arrangements	(0040,1004)		ORM OBR:30	
Reason for the Requested Procedure	(0040, 1002)			SLR generated
Imaging Service Request				
Accession Number	(0008,0050)			SLR generated
Requesting Physician	(0032,1032)		ORM OBR:16	
Referring Physician's Name	(0008,0090)		ORM PV1:8	
Reason for the Imaging Service Request	(0040,2001)	Reason for Study	ORM OBR:31	
Order Entered By	(0040,2008)	Entered By	ORM ORC:10	
Order Enterer’s Location	(0040,2009)	Entering Organization	ORM ORC:17	
Visit Identification				
Admission ID	(0038,0010)		ADT PID:3	
Admitting Diagnosis Description	(0008,1080)		ADT DG1:4	
Admitting Diagnoses Code Sequence	(0008,1084)			
>Code Value	(0008, 0100)		ADT DG1:3	
>Coding Scheme Designator	(0008, 0102)		ADT DG1:2	
>Code Meaning	(0008, 0104)			
Patient Identification				
Patient's Name	(0010,0010		ADT	

	)		PID:5	
Patient ID	(0010,0020)		ADT PID:3	
Patient Demographics				
Patients Birth Date	(0010,0030)		ADT PID:7	
Patient's Sex	(0010,0040)		ADT PID:8	
Patient's Weight	(0010,1030)		ADT OBX:5	
Ethnic Group	(0010,2160)		ADT PID:10	
Patient Comment	(0010,4000)		ORM NTE:3	
Patient Medical				
Patient State	(0038,0500)	Danger Code	ORM OBR:12	
Pregnancy Status	(0010,21C0)	Filler Field 1	ORM OBR:20	
Medical Alerts	(0010,2000)	Allergen Code/Mnemonic/Description	ADT AL1:3	
Allergies	(0010,2110)	Allergen Code/Mnemonic/Description	ADT AL1:3	
Last Menstrual Date	(0010,21D0)	Filler Field 1	ORM OBR:20	

7.4 Coerced/Modified Fields

Table 25 Coerced Fields for Modality Performed Procedure Step

Attribute Name	Tag	Coercion Conditions
Performed Procedure Step Relationship Module		

Scheduled Step Attribute Sequence	(0040,0270)	
>Accession Number	(0008,0050)	Procedure Step has been placed in the Exception queue due to failure to match SLR database. User enters a corrected value for Accession number through the SLR Exception Resolution application
>Study Instance Uid	(0020,000D)	In MPPS group case e.g. multiple procedures ordered on RIS, a single MPPS performed on Acquisition Modality, the value of this element will be used to update the SLR database such that the Accession Numbers originally created on the RIS for each procedure are each associated with the value of this element. This value is the Study Instance UID created by the Acquisition Modality.
Patient ID	(0010,0020)	Procedure Step has been placed in the Exception queue due to failure to match SLR database. User enters a corrected value for Patient ID through the SLR Exception Resolution application

7.5 Data Dictionaries

The *syngo* Workflow DICOM applications do not use any private attributes.

7.6 Controlled Terminology

SLR's usage of Coding Schemes is specified in the table below. This table lists the Coding Schemes used by SLR for attributes it originates.

Table 26 – *syngo* Workflow Controlled Terminology Usage

SOP Class/Service	Attribute Name	Tag	Baseline Context Id	Coding Scheme	Remarks
Scheduled Procedure Step Module					
MWL/ C-FIND	>Scheduled Protocol Code Sequence	(0040,0008)	None	Site configurable	SLR may be configured with protocol codes that have meaning to certain Siemens MRI devices. If protocols are created in the *Portal Radiologist* application for a given procedure, they will

					then be transmitted in this sequence in applicable MWL responses. The coding scheme and its contents are proprietary to Siemens. If no such protocol as described above is saved for a given procedure then the encoding for this element may be configured with the coding schemes described below for Requested Procedure Code Sequence
Requested Procedure Module					
	Requested Procedure Code Sequence	(0032,1064)	None	CPT, SIEMENS_RIS (site configured), DTL_SVC_CD (site configured) or USER_CD (site supplied)	At the option of the site, SLR may be configured to associate CPT, SLR site-configurable codes or site-supplied codes with the various procedures represented in their Item master file. The configured procedure code will be passed in this attribute

7.7 Greyscale Standard Display Function

syngo Workflow DICOM applications do not support the Greyscale Standard Display Function

7.8 Standard Extended/Specialized/Private SOPs

syngo Workflow DICOM applications do not support any private SOP Classes.

7.9 Private Transfer Syntaxes

SLR DICOM applications do not employ any Private Transfer Syntaxes.