



MediPlus™ PACS&RIS
Version 2.6

DICOM 3.0 Conformance Statement

June 2007
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Conformance Statement Overview

The MediPlus™ PACS (MediPACS) provides storage, distribution and viewing (through MediView that is integrated into MediPACS) of medical images and reports within and outside of a clinical area. MediPACS can receive and archive medical images from various types of modalities and/or external systems. It provides export to CD/DVD and print to hardcopy device mechanisms and supports sending images across to other systems. Additionally it provides various functionalities for medical reporting (text, voice etc...) and has integration with a well-known voice-to-text tool. MediRIS adds MWL functionalities to overall system.

Table of Network Services

SOP Class Name	SCU	SCP
Verification		
Verification	Yes	Yes
Transfer		
Computed Radiography Image Storage	Yes	Yes
Digital Intra-oral X-Ray Image Storage – For Presentation	Yes	Yes
Digital Intra-oral X-Ray Image Storage – For Processing	Yes	Yes
VL Slide-Coordinates Microscopic Image Storage	Yes	Yes
VL Photographic Image Storage	Yes	Yes
VL Endoscopic Image Storage	Yes	Yes
VL Microscopic Image Storage	Yes	Yes
CT Image Storage	Yes	Yes
US Multi-frame Image Storage	Yes	Yes
MR Image Storage	Yes	Yes
US Image Storage	Yes	Yes

Secondary Capture Image Storage	Yes	Yes
RT Image Storage	Yes	Yes
X-Ray Radio fluoroscopic Image Storage	Yes	Yes
X-Ray Angiographic Image Storage	Yes	Yes
Digital Mammography X-Ray Image Storage – For Presentation	Yes	Yes
Digital Mammography X-Ray Image Storage – For Processing	Yes	Yes
Digital X-Ray Image Storage – For Presentation	Yes	Yes
Digital X-Ray Image Storage – For Processing	Yes	Yes
Nuclear Medicine Image Storage	Yes	Yes
Grayscale Softcopy Presentation State Storage	Yes	Yes
Query/Retrieve		
Study Root Query/Retrieve Information Model – FIND	Yes	Yes
Study Root Query/Retrieve Information Model – MOVE	Yes	Yes
Workflow Management		
Storage Commitment Push Model	Yes	Yes
Modality Worklist Find	Yes	Yes
Modality Performed Procedure Steps	Yes	Yes

Table of UID Values

UID Value	UID NAME	Category
1.2.840.10008.5.1.4.1.1.1	Computed Radiography Image Storage	Transfer
1.2.840.10008.5.1.4.1.1.1.3	Digital Intra-oral X-Ray Image Storage – For Presentation	Transfer

1.2.840.10008.5.1.4.1.1.1.3.1	Digital Intra-oral X-Ray Image Storage – For Processing	Transfer
1.2.840.10008.5.1.4.1.1.77.1.3	VL Slide-Coordinates Microscopic Image Storage	Transfer
1.2.840.10008.5.1.4.1.1.77.1.4	VL Photographic Image Storage	Transfer
1.2.840.10008.5.1.4.1.1.77.1.1	VL Endoscopic Image Storage	Transfer
1.2.840.10008.5.1.4.1.1.77.1.2	VL Microscopic Image Storage	Transfer
1.2.840.10008.5.1.4.1.1.2	CT Image Storage	Transfer
1.2.840.10008.5.1.4.1.1.3.1	US Multi-frame Image Storage	Transfer
1.2.840.10008.5.1.4.1.1.4	MR Image Storage	Transfer
1.2.840.10008.5.1.4.1.1.6.1	US Image Storage	Transfer
1.2.840.10008.5.1.4.1.1.7	Secondary Capture Image Storage	Transfer
1.2.840.10008.5.1.4.1.1.481.1	RT Image Storage	Transfer
1.2.840.10008.5.1.4.1.1.12.2	X-Ray Radiofluoroscopic Image Storage	Transfer
1.2.840.10008.5.1.4.1.1.12.1	X-Ray Angiographic Image Storage	Transfer
1.2.840.10008.5.1.4.1.1.1.2	Digital Mammography X-Ray Image Storage – For Presentation	Transfer
1.2.840.10008.5.1.4.1.1.1.2.1	Digital Mammography X-Ray Image Storage – For Processing	Transfer
1.2.840.10008.5.1.4.1.1.1.1	Digital X-Ray Image Storage – For Presentation	Transfer
1.2.840.10008.5.1.4.1.1.1.1.1	Digital X-Ray Image Storage – For Processing	Transfer
1.2.840.10008.5.1.4.1.1.20	Nuclear Medicine Image Storage	Transfer
1.2.840.10008.5.1.4.1.1.11.1	Grayscale Softcopy Presentation State Storage	Transfer
1.2.840.10008.5.1.4.1.2.2.1	Study Root Query/Retrieve Information Model – FIND	Query/Retrieve
1.2.840.10008.5.1.4.1.2.2.2	Study Root Query/Retrieve Information Model – MOVE	Query/Retrieve
1.2.840.10008.1.20.1	Storage Commitment Push Model	Workflow Management
1.2.840.10008.3.1.2.3.3	Modality Worklist Find	Workflow Management
1.2.840.10008.3.1.2.3.3	Modality Performed Procedure Steps	Workflow Management

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Introduction

Medical imaging devices claiming conformance to the DICOM 3.0 standard must indicate in sufficient detail the service classes and information objects, as defined by the Standard, to which they conform. This document details the conformance of the MediPlus™ Medical Systems MediPlus series Nuclear Medicine products to the DICOM 3.0 standard.

The MediPlus DICOM Modality Worklist and Performed Procedure Step product is implemented in accordance with the IHE Technical Framework.

Revision History

Version	Date	Description
2.6	June 07, 2007	Initial revision

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.

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.

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 between MediPACS and other DICOM compliant products. The Conformance Statement should be read and understood in conjunction with the DICOM Standard. 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 MediPACS and other DICOM conformant equipment.
- Test procedures should be defined to validate the desired level of connectivity

Terms and Definitions

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

Abbreviations

AE	DICOM Application Entity
AET	Application Entity Title
DICOM	Digital Imaging and Communications in Medicine
DVD	Digital Versatile Disc Recordable
CD	Compact Disk
FSC	File-Set Creator
FSR	File-Set Reader
FSU	File-Set Updater
IOD	Information Object Definition
IP	Internet Protocol
PACS	Picture Archiving and Communication System
SC	Service Class
SCP	Service Class Provider
SCU	Service Class User
Service Class User	Service Object Pair
TCP	Transmission Control Protocol
UID	Unique Identifier
VR	Value Representation
Q/R	Query/Retrieve
MWL	Modality Worklist

References

- [1] Digital Imaging and Communications in Medicine (DICOM), NEMA PS 3.1- 3.16, 2001

Networking

Implementation Model

Application Data Flow

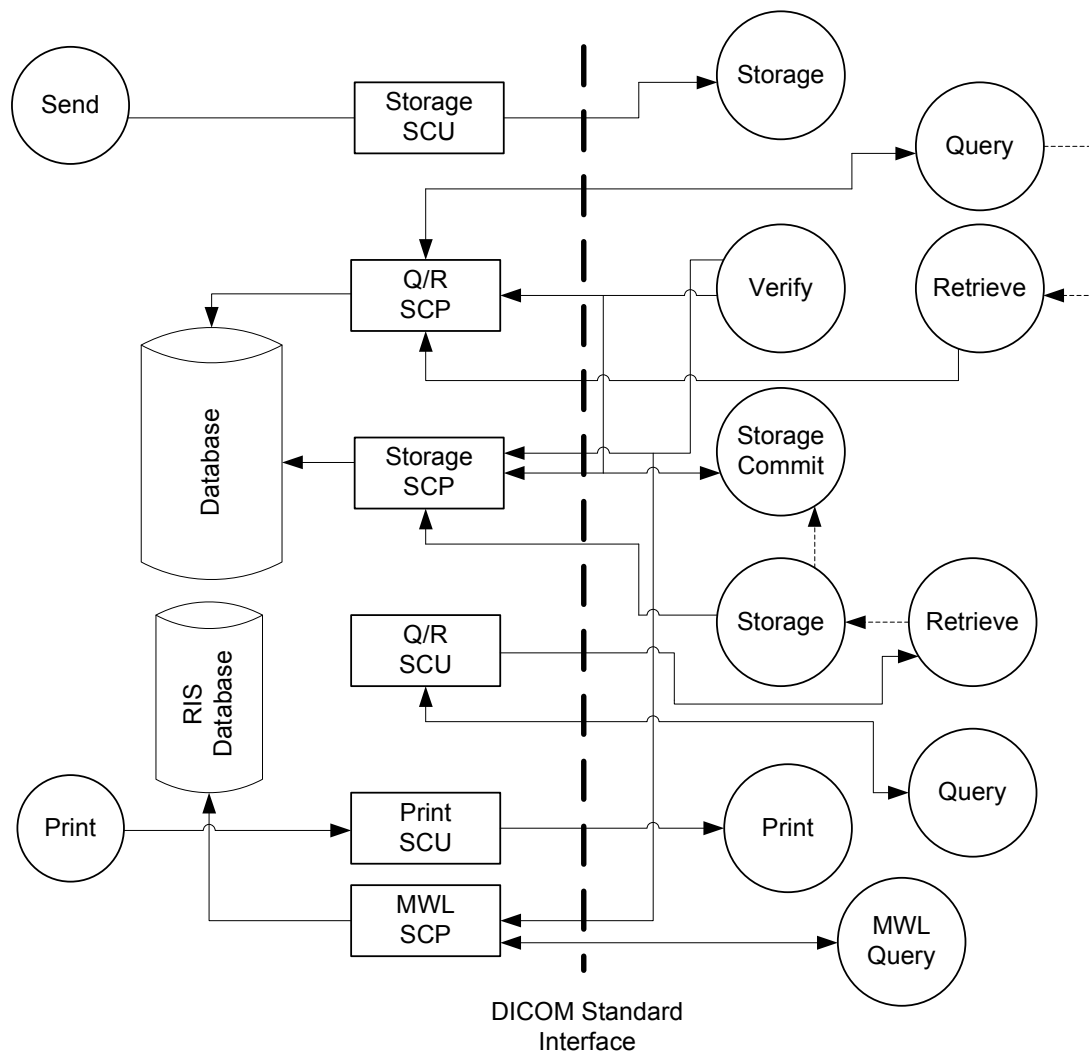


Figure 4-1 Application Data Flow Diagram

- MediPACS replies on communication tests from remote applications.
- MediPACS allows remote applications to send medical images to it.
- MediPACS allows remote applications to commit storage of sent medical images.

- MediPACS can send medical images to a remote application.
- MediPACS can fetch medical images from remote applications.
- MediPACS allows remote applications to query the patient database and retrieve images.
- MediPACS can print medical images through MediView.
- MediPACS can write medical images to CD/DVD.
- MediPACS can view medical images through MediView.
- MediPACS contains five different Application Entities (AE), Storage SCP, Storage SCU, Q/R SCU, Q/R SCP, Storage Commitment SCU, Storage Commitment SCP, MPPSSCP and Print SCU.
- MediRIS contains one AE, MWL SCP and MPPSSCP.

Functional Definition of AEs

Storage SCP AE

Storage SCP AE is responsible for receiving medical images. There can be any number of Storage SCP AEs with their own AE titles. A Storage SCP AE can receive images from a remote application entity. A Storage SCP AE also supports verification of the DICOM communication from a remote AE and Storage Commitment of images.

Storage SCU AE

Storage SCU AE is responsible for sending medical images to remote applications. There is only one Storage SCU AE. Sending is initiated by the followings:

- Retrieve operation from a remote Q/R SCP
- From MediPACS by user command

Storage Commitment SCP

The Storage Commitment AE implements the DICOM Storage Commitment Service Class as an SCP

Storage Commitment SCU

The Storage Commitment AE implements the DICOM Storage Commitment Service Class as an SCU.

Query/Retrieve SCP AE

Q/R SCP AE is responsible for receiving queries and sending images to a remote AE. There can be one or more Q/R SCP AEs with their own AE titles. When the Q/R SCP AE receives a query it will search in the patient database for information matching the conditions in the request message. It will search both on-line and in the archive. It returns any found information to the requesting remote AE. When the Q/R SCP AE receives a retrieve request it will search for images in the patient database identified by the conditions in the request message. If any images are found the Q/R SCP AE will trigger Storage SCU AE and send the images to the requested destination AE.

Query/Retrieve SCU AE

Q/R SCU is responsible for querying and retrieving medical images from a remote AE. There is only one Q/R SCU AE.

Print SCU AE

Print SCU AE is responsible for sending medical images to DICOM printers. It is connected to the MediView. There is only one Print SCU AE per MediView client that supports DICOM printing. User selects a DICOM printer from a provided list and starts adding images to print panel by using provided mechanisms. User triggers the print command when he or she done with adding images to print panel.

MWL SCP

MWL SCP is the AE responsible for handling requests for worklists from external devices. The MWL SCP AE is connected to the MediRIS. There can be one or more MWL SCP AEs, each with its own AE title. When the MWL SCP AE receives a query (C-FIND request) it will search in the MediRIS database for information matching the conditions in the request message.

Modality Performed Procedure Step SCP

The Modality Performed Procedure Step AE implements the DICOM MPPS Service Class as an SCP.

Sequencing of Real-World Activities

The only sequencing constraint is a SOP Instance must be received by the Storage SCP AE before Storage Commitment.

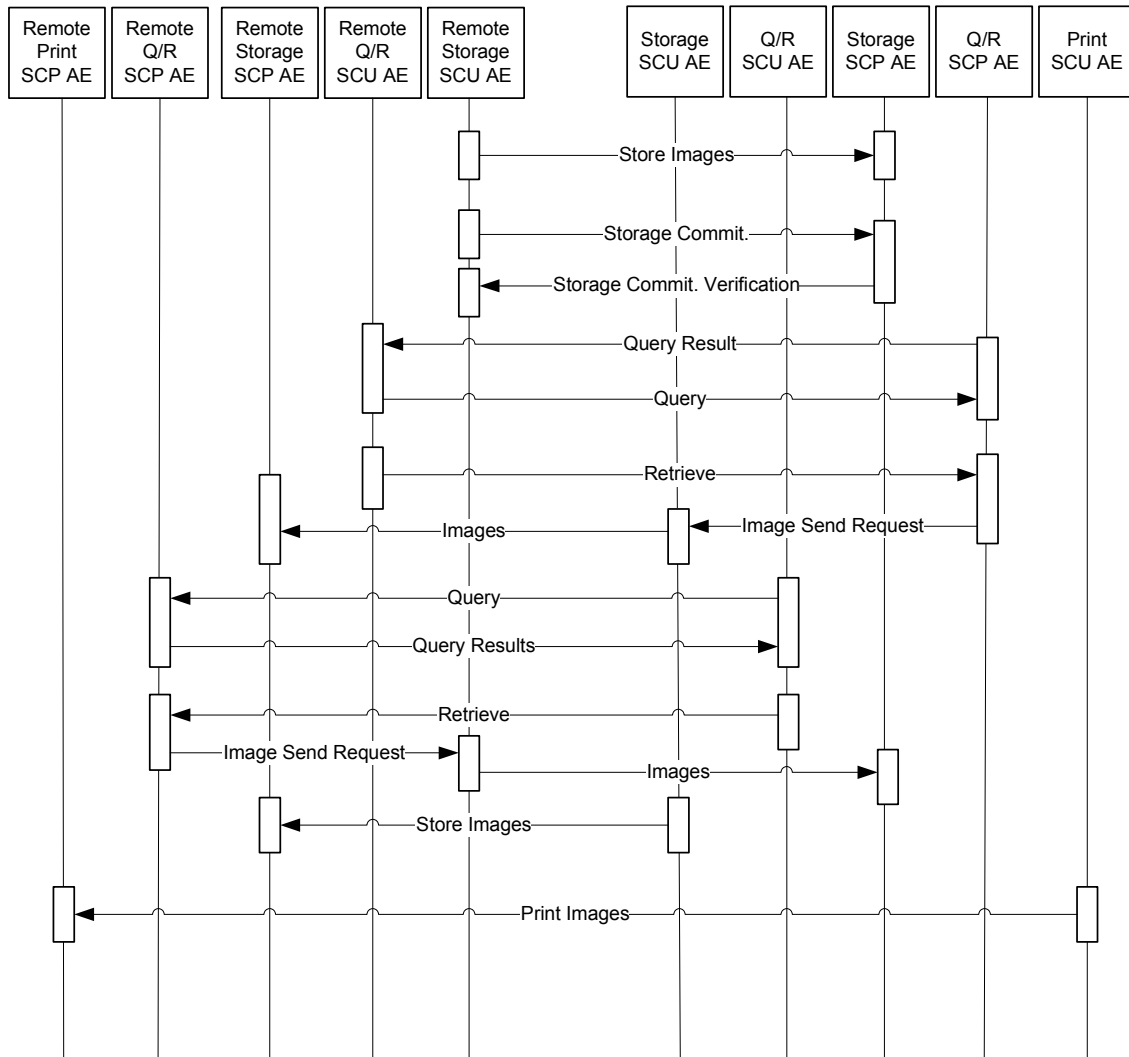


Figure 4-2 Application Data Flow Diagram

AE Specifications

Storage SCP AE Specification

SOP Classes

Storage SCP AE provides Standard Conformance to the SOP Classes listed in the table below.

Table of SOP Classes for Storage SCP AE

SOP Class Name	SOP Class UID	SCU	SCP
Verification	1.2.840.10008.1.1	Yes	Yes
CT Image Storage	1.2.840.10008.5.1.4.1.1.2	Yes	Yes
PET Image Storage	1.2.840.10008.5.1.4.1.1.128	Yes	Yes
MR Image Storage	1.2.840.10008.5.1.4.1.1.4	Yes	Yes
US Image Storage	1.2.840.10008.5.1.4.1.1.6.1	Yes	Yes
US Multi-frame Storage	1.2.840.10008.5.1.4.1.1.3.1	Yes	Yes
Computed Radiography Image Storage	1.2.840.10008.5.1.4.1.1.1	Yes	Yes
Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7	Yes	Yes
X-Ray Angiographic Image Storage	1.2.840.10008.5.1.4.1.1.12.1	Yes	Yes
X-Ray Radio fluoroscopic Image Storage	1.2.840.10008.5.1.4.1.1.12.2	Yes	Yes
Nuclear Medicine Image Storage	1.2.840.10008.5.1.4.1.1.20	Yes	Yes
RT Image Storage	1.2.840.10008.5.1.4.1.1.481.1	Yes	Yes
VL Endoscopic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.1	Yes	Yes
VL Microscopic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.2	Yes	Yes
VL Slide-Coordinates Microscopic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.3	Yes	Yes
VL Photographic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.3	Yes	Yes
Digital X-Ray Image Storage - For Presentation	1.2.840.10008.5.1.4.1.1.1.1	Yes	Yes
Digital X-Ray Image Storage - For Processing	1.2.840.10008.5.1.4.1.1.1.1.1	Yes	Yes
Digital Mammography X-Ray Image Storage - For Presentation	1.2.840.10008.5.1.4.1.1.1.2	Yes	Yes
Digital Mammography X-Ray Image	1.2.840.10008.5.1.4.1.1.1.2.1	Yes	Yes

Storage - For Processing			
Digital Intra-oral X-Ray Image Storage - For Presentation	1.2.840.10008.5.1.4.1.1.1.3	Yes	Yes
Digital Intra-oral X-Ray Image Storage - For Processing	1.2.840.10008.5.1.4.1.1.1.3.1	Yes	Yes
Storage Commitment Push Model	1.2.840.10008.1.20.1	Yes	Yes

Association Policies

General

The Storage SCP AE will never initiate Associations; it only accepts Association Requests from external DICOM AEs. The Storage SCP AE will accept Associations for Verification, Storage and Storage Commitment Push Model Service requests.

The DICOM standard Application Context Name for DICOM 3.0 is always accepted:

Table of DICOM Application Context

Application Context Name	1.2.840.10008.3.1.1.1
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Number of Associations

The Storage SCP AE can support multiple simultaneous Associations requested by remote AEs. Configurable and highly depends on current licensing.

Asynchronous Nature

The Storage SCP AE does not support asynchronous communication.

Implementation Identifying Information

Table of DICOM Implementation Class and Version for Storage SCP AE

Implementation Class UID	1.2.826.0.1.3680043.8.214.3.10
Implementation Version Name	MediPlus_318

Association Initiation Policy

Activity - Send Storage Commitment Notification over new Association

Description and Sequencing of Activities

The Storage SCP AE will always initiate a new Association for sending back Storage Commitment Push Model Notification (N-EVENT-REPORT). An Association Request is sent to the partner AE that sent the Storage Commitment Push Model request and upon successful negotiation of the required Presentation Context the outstanding N-EVENT-REPORT is sent. If there are multiple outstanding N-EVENT-REPORTs to be sent to a single partner AE then the Storage SCP AE will send them always over separate Associations. The Association will be released when the N-EVENT-REPORT for the partner AE has been sent.

Proposed Presentation Contexts

The Storage SCP AE will propose Presentation Contexts as shown in the following table:

Table of Proposed Presentation Contexts by Storage SCP AE

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name List	UID List		
Verification	1.2.840.10008.1.1	Implicit VR Little Endian	1.2.840.10008.1.2	BOTH	None
Storage Commitment Push Model	1.2.840.10008.1.20.1	Explicit VR Little Endian	1.2.840.10008.1.2.1	SCP	None

SOP Specific Conformance

Specific Conformance for Verification SOP Class

Standard conformance is provided to the DICOM Verification Service Class as an SCU. The Verification Service as an SCU is actually only supported as a diagnostic service tool for network communication issues. It can be used to test whether Associations can actually be opened with a remote AE that is issuing Storage Commitment Push Model requests.

Specific Conformance for Storage Commitment SOP Classes

The associated Activity with the Storage Commitment Push Model service is the communication by the Storage SCP AE to remote AEs that it has committed to permanently store Composite SOP Instances that have been sent to it. It thus allows remote AEs to determine whether the Storage SCP AE has taken responsibility for the archiving of specific SOP Instances so that they can be flushed from the remote AE system.

Association Acceptance Policy

Activity - Receive Images and Storage Commitment Requests

Description and Sequencing of Activities

A remote AE, acting as a Storage SCU, establishes an association with the Storage SCP AE that accepts these Associations for the purpose of receiving supported SOP Class Instances and Storage Commitment requests. In the default configuration any Calling and Called AET will be accepted. But if the Called AET does not correspond to the actual Storage SCP AET, only a Presentation Context for the Verification SOP Class will be accepted and the SCU can only verify the DICOM Association, but cannot invoke any other related DICOM service. When an association has been established the Sequencing of Real-World Activities is as described in Section 4.1.2.5.

The Storage SCP AE may reject Association attempts as shown in the table below. The Result, Source and Reason / Diag columns represent the values returned in the corresponding fields of an ASSOCIATE-RJ PDU (see PS 3.8, Section 9.3.4).

Table of Association Rejection Reasons

Result	Source	Reason/Diag	Description
2 – rejected transient	provider	2 – local limit exceeded	The (configurable) maximum number of simultaneous associations has been reached. An association request with the same parameters may succeed at a later time.
1 – rejected permanent	user	2 –application context name not supported	The Association request contained an unsupported Application Context Name. An association request with the same

			parameters will NOT succeed at a later time.
1 – rejected permanent	user	3 – calling AE title not recognized	The Association request contained an unrecognized Calling AE Title. An association request with the same parameters will NOT succeed at a later time unless configuration changes are made.

Accepted Presentation Contexts

Table of Accepted Presentation Contexts for Storage SCP AE

Abstract Syntax		Transfer Syntax		Role	Ext. Neg.
Name	UID	Name List	UID List		
Verification	1.2.840.10008.1.1	Implicit VR Little Endian	1.2.840.10008.1 .2	SCP	None
CT Image Storage	1.2.840.10008.5.1.4.1.1.2	Transfer Syntaxes for Image Storage Services		SCP	None
PET Image Storage	1.2.840.10008.5.1.4.1.1.128	Transfer Syntaxes for Image Storage Services		SCP	None
MR Image Storage	1.2.840.10008.5.1.4.1.1.4	Transfer Syntaxes for Image Storage Services		SCP	None
US Image Storage	1.2.840.10008.5.1.4.1.1.6.1	Transfer Syntaxes for Image Storage Services		SCP	None
US Multi-frame Storage	1.2.840.10008.5.1.4.1.1.3.1	Transfer Syntaxes for Image Storage Services		SCP	None

Abstract Syntax		Transfer Syntax		
Computed Radiography Image Storage	1.2.840.10008.5.1.4.1.1.1	Transfer Syntaxes for Image Storage Services	SCP	None
Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7	Transfer Syntaxes for Image Storage Services	SCP	None
X-Ray Angiographic Image Storage	1.2.840.10008.5.1.4.1.1.12.1	Transfer Syntaxes for Image Storage Services	SCP	None
X-Ray Radiofluoroscopic Image Storage	1.2.840.10008.5.1.4.1.1.12.2	Transfer Syntaxes for Image Storage Services	SCP	None
Nuclear Medicine Image Storage	1.2.840.10008.5.1.4.1.1.20	Transfer Syntaxes for Image Storage Services	SCP	None
RT Image Storage	1.2.840.10008.5.1.4.1.1.481.1	Transfer Syntaxes for Image Storage Services	SCP	None
VL Endoscopic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.1	Transfer Syntaxes for Image Storage Services	SCP	None
VL Microscopic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.2	Transfer Syntaxes for Image Storage Services	SCP	None
VL Slide-Coordinates Microscopic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.3	Transfer Syntaxes for Image Storage Services	SCP	None

Abstract Syntax		Transfer Syntax		
VL Photographic Image Storage	1.2.840.10008.5.1.4.1.1.77.1. 3	Transfer Syntaxes for Image Storage Services	SCP	None
Digital X-Ray Image Storage - For Presentation	1.2.840.10008.5.1.4.1.1.1.1	Transfer Syntaxes for Image Storage Services	SCP	None
Digital X-Ray Image Storage - For Processing	1.2.840.10008.5.1.4.1.1.1.1.1	Transfer Syntaxes for Image Storage Services	SCP	None
Digital Mammography X-Ray Image Storage - For Presentation	1.2.840.10008.5.1.4.1.1.1.2	Transfer Syntaxes for Image Storage Services	SCP	None
Digital Mammography X-Ray Image Storage - For Processing	1.2.840.10008.5.1.4.1.1.1.2.1	Transfer Syntaxes for Image Storage Services	SCP	None
Digital Intra- oral X-Ray Image Storage - For Presentation	1.2.840.10008.5.1.4.1.1.1.3	Transfer Syntaxes for Image Storage Services	SCP	None

Abstract Syntax		Transfer Syntax		
Digital Intra-oral X-Ray Image Storage - For Processing	1.2.840.10008.5.1.4.1.1.1.3.1	Transfer Syntaxes for Image Storage Services	SCP	None
Storage Commitment Push Model	1.2.840.10008.1.20.1	Transfer Syntaxes for Non-Image Storage Services	SCP	None

Table of Accepted Transfer Syntaxes for Non-Image Storage Services

Name	UID
Implicit VR Little Endian	1.2.840.10008.1.2
Explicit VR Little Endian	1.2.840.10008.1.2.1

Table of Accepted Transfer Syntaxes for Image Storage Services

Implicit VR Little Endian	1.2.840.10008.1.2
Explicit VR Little Endian	1.2.840.10008.1.2.1
JPEG Baseline	1.2.840.10008.1.2.4.50
JPEG Extended	1.2.840.10008.1.2.4.51
JPEG Lossless, Non-Hierarchical	1.2.840.10008.1.2.4.57
JPEG Lossless, Non-Hierarchical, First-Order Prediction	1.2.840.10008.1.2.4.70
JPEG-LS Lossless Image Compression	1.2.840.10008.1.2.4.80
JPEG-LS Lossy (Near-Lossless) Image	1.2.840.10008.1.2.4.81
JPEG 2000 Image Compression (Lossless Only)	1.2.840.10008.1.2.4.90

JPEG 2000 Image Compression	1.2.840.10008.1.2.4.91
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SOP Specific Conformance

Specific Conformance for Verification SOP Class

The Storage SCP AE provides standard conformance to the DICOM Verification Service Class as a SCP. The status code for the C-ECHO is described in the following table:

Table of C-Echo Response Status Handling Behavior

Service Status	Further Meaning	Error Code	Behavior
Success	Success	0000	The C-ECHO request is accepted

Specific Conformance for Storage SOP Classes

The associated Activity with the Storage service is the storage of medical DICOM data received over the network on a designated storage repository. The Storage SCP AE will return a failure status if it is unable to store the received instance(s).

The Storage SCP AE does not have any dependencies on the number of Associations used to send images to it. Images belonging to more than one Study or Series can be sent over a single or multiple Associations. Images belonging to a single Study or Series can also be sent over different Associations. There is no limit on either the number of SOP Instances or the maximum amount of total SOP Instance data that can be transferred over a single Association.

The Storage SCP AE is configured to retain the original DICOM data in DICOM Part 10 compliant file format. Private and SOP Class Extended Elements are maintained in the DICOM format files. In addition received images' Meta elements (patient, study, serie and image info) are stored in a database to support query and retrieval requests and also allow updating of Patient, Study, and Series in formation by user input.

The behavior for handling duplicate SOP Instances is configurable via administration interface. The default behavior is to replace the original image with the new one.

Storage SCP AE C-STORE Response

Table of Storage SCP C-STORE Response Status

Service Status	Further Meaning	Error Code	Behavior
Success	Success	0000	The Composite SOP Instance was successfully received, verified, and stored in the system repository.
Error	Processing Failure	0110	This status is returned due to internal errors such as a processing failure response from the internal database or a file system operation. The appropriate Status will be sent in the C-STORE Response.
Warning	Coercion of Data Elements	B000	This status is returned if one or more Attribute values were coerced/modified on reception. Image transmission is considered successful. The appropriate SUCCESS Status will be sent in the C-STORE Response.
Warning	Data Set does not match SOP class	B007	This status is returned if the C-STORE Request specifies Attributes that are not specific as part of the Storage SOP class. Image transmission is considered successful. The appropriate SUCCESS Status will be sent in the C-STORE Response.

Storage SCP AE Storage Service Communication Failure Reasons

Table of Storage SCP Service Communication Failure Reasons

Exception	Reason
Timeout expiry for an expected DICOM Message Request (DIMSE level timeout). I.e. The Storage SCP AE is waiting for the next C-STORE Request on an open Association but the timer expires.	The Association is aborted by issuing a DICOM A-ABORT. If some Composite SOP Instances have already been successfully received then they are maintained in the database. They are not automatically discarded because of a later failure.
Timeout expiry for an expected DICOM PDU or TCP/IP packet (Low-level timeout). I.e. The Storage SCP AE is waiting for the next C-STORE Data Set PDU but the timer expires.	The Association is aborted by issuing a DICOM A-ABORT. If a C-STORE Data Set has not been fully received then the data already received is discarded. If some Composite SOP Instances have already been successfully received over the Association then they are maintained in the database.
Association aborted by the SCU or the network layers indicate communication loss (i.e. low-level TCP/IP socket closure)	If some Composite SOP Instances have already been successfully received then they are maintained in the database. They are not automatically discarded because of a later failure.

Specific Conformance for Storage Commitment SOP Class

The associated Activity with the Storage Commitment Push Model service is the communication by the Storage SCP AE to remote AEs that it has committed to permanently store Composite SOP Instances that have been sent to it. It thus allows remote AEs to determine whether the Query/Retrieve SCP has taken responsibility for the archiving of specific SOP Instances so that they can be flushed from the remote AE system.

The Storage SCP AE takes the list of Composite SOP Instance UIDs specified in a Storage Commitment Push Model N-ACTION Request and checks if they are present in the database. As long as the Composite SOP Instance UIDs are present in the database, the Storage SCP AE will consider those Composite SOP Instance UIDs to be successfully archived. The Storage SCP AE does not require the Composite SOP Instances to actually be successfully written to archive media in order to commit to responsibility for maintaining these SOP Instances. Once

the Storage SCP AE has checked for the existence of the specified Composite SOP Instances, it will then attempt to send the Notification request (N-EVENT-REPORT-RQ). The Storage SCP AE will request a new Association with the remote AE that made the original N-ACTION Request.

The Storage SCP AE will support Storage Commitment Push Model requests for SOP Instances of any of the Storage SOP Classes that are also supported by the Storage SCP AE:

Table of Supported Referenced SOP Classes in Storage Commitment Push Model N-ACTION Requests

Supported Referenced SOP Class
CT Image Storage
PET Image Storage
MR Image Storage
US Image Storage
US Multi-frame Storage
Computed Radiography Image Storage
Secondary Capture Image Storage
X-Ray Angiographic Image Storage
X-Ray Radiofluoroscopic Image Storage
Nuclear Medicine Image Storage
RT Image Storage
VL Endoscopic Image Storage
VL Microscopic Image Storage
VL Slide-Coordinates Microscopic Image Storage
VL Photographic Image Storage
Digital X-Ray Image Storage - For Presentation
Digital X-Ray Image Storage - For Processing
Digital Mammography X-Ray Image Storage - For Presentation

Supported Referenced SOP Class
Digital Mammography X-Ray Image Storage - For Processing
Digital Intra-oral X-Ray Image Storage - For Presentation
Digital Intra-oral X-Ray Image Storage - For Processing

The Storage SCP AE will return the following Status Code values in N-ACTION Responses:

Table of Storage SCP N-ACTION Response Status

Service Status	Further Meaning	Error Code	Behavior
Success	Success	0000	The SCP has successfully received the Storage Commitment Push Model N-ACTION Request and can process the commitment request for the indicated SOP Instances.
Error	Processing Failure	0110	Indicates that the Storage Commitment Push Model N-ACTION Request cannot be parsed or fully processed due to a database or system failure.
Error	Missing Attribute	0120	Indicates that the Storage Commitment Push Model N-ACTION Request cannot be processed because a required attribute is missing from the N-ACTION Request Data Set.
Error	Missing Attribute Value	0121	Indicates that the Storage Commitment Push Model N-ACTION Request cannot be processed because a Type 1 attribute in the N-ACTION Request Data Set does not specify a value.

The Storage SCP AE will exhibit the following Behavior according to the Status Code value returned in an N-EVENT-REPORT Response from a destination Storage Commitment Push Model SCU:

Table of Storage SCP N-EVENT Report Response Status Handling Behaviour

Service Status	Further Meaning	Error Code	Behavior
Success	Success	0000	The SCU has successfully received the Storage Commitment Push Model N-EVENT-REPORT Request.
Warning	Processing Failure	0110	Transmission of Storage Commitment Push Model N-EVENT REPORT Request is considered successful.
*	*	Any Other Code	This is treated as a permanent Failure.

The table below shows the Storage SCP behaviour in case of communication failure:

Table of Storage SCP AE Storage Commitment Push Model Communication Failure Behaviour

Exception	Behavior
Timeout expiry for an expected DICOM Message Request (DIMSE level timeout). I.e. The Storage SCP AE is waiting for the next N-ACTION Request on an open Association but the timer expires.	The Association is aborted by issuing a DICOM A-ABORT. If some Composite SOP Instances have been successfully received over the same Association via the Storage Service then they are maintained in the database. They are not automatically discarded because of a later Storage Commitment messaging failure. Any previously received Storage Commitment Push Model N-ACTION Requests will still be fully processed.

Exception	Behavior
Timeout expiry for an expected DICOM PDU or TCP/IP packet (Low-level timeout).	The Association is aborted by issuing a DICOM A-ABORT. If some Composite SOP Instances have been successfully received over the same Association via the Storage Service then they are maintained in the database. They are not automatically discarded because of a later Storage Commitment messaging failure. Any previously received Storage Commitment Push Model N-ACTION Requests will still be fully processed.
Association A-ABORTed by the SCU or the network layers indicate communication loss (i.e. low-level TCP/IP socket closure).	The TCP/IP socket is closed. If some Composite SOP Instances have been successfully received over the same Association via the Storage Service then they are maintained in the database. They are not automatically discarded because of a later Storage Commitment messaging failure. Any previously received Storage Commitment Push Model N-ACTION Requests will still be fully processed.

Storage SCU AE Specification

SOP Classes

Storage SCU AE provides Standard Conformance to the SOP Classes listed in the table below:

Table of SOP Classes for Storage SCU AE

SOP Classes	SOP Class UID	SCU	SCP
Verification	1.2.840.10008.1.1	Yes	No
CT Image Storage	1.2.840.10008.5.1.4.1.1.2	Yes	No
PET Image Storage	1.2.840.10008.5.1.4.1.1.128	Yes	No
MR Image Storage	1.2.840.10008.5.1.4.1.1.4	Yes	No
US Image Storage	1.2.840.10008.5.1.4.1.1.6.1	Yes	No
US Multi-frame Storage	1.2.840.10008.5.1.4.1.1.3.1	Yes	No
Computed Radiography Image Storage	1.2.840.10008.5.1.4.1.1.1	Yes	No
Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7	Yes	No
X-Ray Angiographic Image Storage	1.2.840.10008.5.1.4.1.1.12.1	Yes	No
X-Ray Radiofluoroscopic Image Storage	1.2.840.10008.5.1.4.1.1.12.2	Yes	No
Nuclear Medicine Image Storage	1.2.840.10008.5.1.4.1.1.20	Yes	No
RT Image Storage	1.2.840.10008.5.1.4.1.1.481.1	Yes	No
VL Endoscopic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.1	Yes	No
VL Microscopic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.2	Yes	No
VL Slide-Coordinates Microscopic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.3	Yes	No
VL Photographic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.3	Yes	No
Digital X-Ray Image Storage - For Presentation	1.2.840.10008.5.1.4.1.1.1.1	Yes	No
Digital X-Ray Image Storage - For Processing	1.2.840.10008.5.1.4.1.1.1.1.1	Yes	No
Digital Mammography X-Ray Image Storage - For Presentation	1.2.840.10008.5.1.4.1.1.1.2	Yes	No
Digital Mammography X-Ray Image Storage - For Processing	1.2.840.10008.5.1.4.1.1.1.2.1	Yes	No

SOP Classes	SOP Class UID	SCU	SCP
Digital Intra-oral X-Ray Image Storage - For Presentation	1.2.840.10008.5.1.4.1.1.1.3	Yes	No
Digital Intra-oral X-Ray Image Storage - For Processing	1.2.840.10008.5.1.4.1.1.1.3.1	Yes	No

Association Establishment Policies

General

The Storage SCU AE can only form Associations when requested to do so by the Local User, the Q/R SCP AE. The Storage SCU AE can only request the opening of an Association. It cannot accept requests to open Associations from external Application Entities. The DICOM standard Application Context Name for DICOM 3.0 is always proposed:

Table of DICOM Application Contexts for Storage SCU AE

Application Context Name	1.2.840.10008.3.1.1.1
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Number of Associations

The Storage SCU AE can support multiple simultaneous Associations requested by remote AEs. Configurable and highly depends on current licensing.

Asynchronous Nature

The Storage SCU AE does not support asynchronous communication (multiple outstanding transactions over a single association). All association requests must be completed and acknowledged before a new operation can be initiated.

Implementation Identifying Information

Table of DICOM Implementation Class and Version for Storage SCU AE

Implementation Class UID	1.2.826.0.1.3680043.8.214.3.10
Implementation Version Name	MediPlus_318

Association Initiation Policy

Activity – Send Images Requested by an Remote AE

Description and Sequencing of Activity

The Storage SCU AE will initiate a new Association when the user or the Q/R SCP AE invokes the Storage SCU AE to transmit images. The user will issue such a command whenever patients, studies, series or instances are selected on the user interface and it is requested to send them to a remote AE. The Q/R SCP AE and the Storage SCP AE will do this whenever a valid C-MOVE Request is received. An Association Request is sent to the specified Destination AE and upon successful negotiation of the required Presentation Context the image transfer is started. All the indicated images are transmitted in a single association. The association will be released when all the images have been sent. If an error occurs during transmission over an open association then the image transfer is halted.

Proposed Presentation Contexts

Table of Proposed Presentation Contexts by Storage SCU AE

Abstract Syntax		Transfer Syntax		Role	Ext. Neg.
Name	UID	Name List	UID List		
Verification	1.2.840.10008.1.1	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
CT Image Storage	1.2.840.10008.5.1.4.1.1.2	Storage SCU Transfer Syntaxes		SCU	None
PET Image Storage	1.2.840.10008.5.1.4.1.1.128	Storage SCU Transfer Syntaxes		SCU	None
MR Image Storage	1.2.840.10008.5.1.4.1.1.4	Storage SCU Transfer Syntaxes		SCU	None
US Image Storage	1.2.840.10008.5.1.4.1.1.6.1	Storage SCU Transfer Syntaxes		SCU	None

Abstract Syntax		Transfer Syntax		
US Multi-frame Storage	1.2.840.10008.5.1.4.1.1.3.1	Storage SCU Transfer Syntaxes	SCU	None
Computed Radiography Image Storage	1.2.840.10008.5.1.4.1.1.1	Storage SCU Transfer Syntaxes	SCU	None
Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7	Storage SCU Transfer Syntaxes	SCU	None
X-Ray Angiographic Image Storage	1.2.840.10008.5.1.4.1.1.12.1	Storage SCU Transfer Syntaxes	SCU	None
X-Ray Radiofluoroscopic Image Storage	1.2.840.10008.5.1.4.1.1.12.2	Storage SCU Transfer Syntaxes	SCU	None
Nuclear Medicine Image Storage	1.2.840.10008.5.1.4.1.1.20	Storage SCU Transfer Syntaxes	SCU	None
RT Image Storage	1.2.840.10008.5.1.4.1.1.481.1	Storage SCU Transfer Syntaxes	SCU	None
VL Endoscopic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.1	Storage SCU Transfer Syntaxes	SCU	None

Abstract Syntax		Transfer Syntax		
VL Microscopic Image Storage	1.2.840.10008.5.1.4.1.1.77.1. 2	Storage SCU Transfer Syntaxes	SCU	None
VL Slide- Coordinates Microscopic Image Storage	1.2.840.10008.5.1.4.1.1.77.1. 3	Storage SCU Transfer Syntaxes	SCU	None
VL Photographic Image Storage	1.2.840.10008.5.1.4.1.1.77.1. 3	Storage SCU Transfer Syntaxes	SCU	None
Digital X- Ray Image Storage - For Presentation	1.2.840.10008.5.1.4.1.1.1.1	Storage SCU Transfer Syntaxes	SCU	None
Digital X- Ray Image Storage - For Processing	1.2.840.10008.5.1.4.1.1.1.1.1	Storage SCU Transfer Syntaxes	SCU	None
Digital Mammograp hy X-Ray Image Storage - For Presentation	1.2.840.10008.5.1.4.1.1.1.2	Storage SCU Transfer Syntaxes	SCU	None

Abstract Syntax		Transfer Syntax		
Digital Mammography X-Ray Image Storage - For Processing	1.2.840.10008.5.1.4.1.1.1.2.1	Storage SCU Transfer Syntaxes	SCU	None
Digital Intra-oral X-Ray Image Storage - For Presentation	1.2.840.10008.5.1.4.1.1.1.3	Storage SCU Transfer Syntaxes	SCU	None
Digital Intra-oral X-Ray Image Storage - For Processing	1.2.840.10008.5.1.4.1.1.1.3.1	Storage SCU Transfer Syntaxes	SCU	None

Table of Storage SCU Transfer Syntaxes

Implicit VR Little Endian	1.2.840.10008.1.2
Explicit VR Little Endian	1.2.840.10008.1.2.1
JPEG Baseline	1.2.840.10008.1.2.4.50
JPEG Extended	1.2.840.10008.1.2.4.51
JPEG Lossless, Non-Hierarchical	1.2.840.10008.1.2.4.57
JPEG Lossless, Non-Hierarchical, First-Order Prediction	1.2.840.10008.1.2.4.70
JPEG-LS Lossless Image Compression	1.2.840.10008.1.2.4.80
JPEG-LS Lossy (Near-Lossless) Image	1.2.840.10008.1.2.4.81

JPEG 2000 Image Compression (Lossless Only)	1.2.840.10008.1.2.4.90
JPEG 2000 Image Compression	1.2.840.10008.1.2.4.91

SOP Specific Conformance for Verification SOP Class

The Storage SCU AE provides standard conformance to the Verification SOP Class as an SCU. The Verification Service as an SCU is actually only supported as a diagnostic service tool for network communication issues.

SOP Specific Conformance for Storage SOP Classes

Composite DICOM SOP Instances are maintained as DICOM Part 10 compliant files in the patient database. The entire set of tags received with the image will be saved in patient database; this includes all Private and SOP Extended Elements. When a SOP Instance is selected for sending, its content will be sent as it was originally received.

Table of Storage SCU AE C-STORE Response Status Handling Behavior

Service Status	Further Meaning	Error Code	Behavior
Success	Success	0000	The SCP has successfully stored the transferred SOP Instance.
Refused	Out of Resources	A700	These status codes are treated as a permanent Failure.
Error	Data Set does not match SOP Class	A900	
Error	Cannot Understand	C000	
Error	Processing Failure	0110	
Warning	Coercion of Data Elements	B000	These status codes are treated as a successful store.
Warning	Dataset does not match SOP	B007	
Warning	Elements Discarded	B006	

Service Status	Further Meaning	Error Code	Behavior
*	*	Any Other	This status code is treated as a permanent Failure.

Table of Storage SCU AE Communication Failure Behaviour

Exception	Behavior
Timeout expiry for an expected DICOM Message Response (DIMSE level timeout).	It is continued transferring the next DICOM object.
Timeout expiry for an expected DICOM PDU or TCP/IP packet (Low level timeout).	It is continued transferring the next DICOM object.
Association A-ABORTed by the SCP or the network layers indicate communication loss (i.e. low-level TCP/IP socket closure)	The TCP/IP socket is closed and the Association released.

Association Acceptance Policy

The Storage SCU AE does not accept Associations.

Q/R SCP Application Entity Specification

SOP Classes

Table of SOP Classes FOR Q/R SCP AE

SOP Class Name	SOP Class UID	SCU	SCP
Study Root Q/R - FIND	1.2.840.10008.5.1.4.1.2.2.1	Yes	Yes
Study Root Q/R - MOVE	1.2.840.10008.5.1.4.1.2.2.2	Yes	Yes

Association Establishment Policy

General

The Query/Retrieve SCP AE can both accept and propose Association Requests. The Query/Retrieve Server AE will accept Association Requests for the Verification and Query/Retrieve Services. It will propose Associations for Verification and Storage Services. The DICOM standard application context name for DICOM 3.0 is always accepted and proposed:

Table of DICOM Application Context Name for Query/Retrieve SCP AE

Application Context Name	1.2.840.10008.3.1.1.1
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4.2.3.2.2 Number of Associations

Q/R SCP can support multiple simultaneous Associations requested by remote AEs. Number is highly depends on current licensing that user holds.

Asynchronous Nature

Q/R SCP does not support asynchronous communication.

Implementation Identifying Information

Table of DICOM Implementation Class and Version for Q/R SCP AE

Implementation Class UID	1.2.826.0.1.3680043.8.214.3.10
Implementation Version Name	MediPlus_318

Association Initiation Policy

Activity - Send Images Requested by an External Peer AE

Description and Sequencing of Activities

The Q/R SCP AE will initiate a new Association when a valid C-MOVE Request has been performed by a remote AE. The Q/R SCP AE will send the Association Request to the

specific C-MOVE destination, and upon successful negotiation of the required Presentation Context the image transfer is started. In all cases an attempt will be made to transmit all the indicated images in a single Association but this may not always be possible. The Association will be released when all the images have been sent. If an error occurs during transmission over an open Association then the image transfer is halted.

Proposed Presentation Contexts

Table of Proposed Presentation Contexts by the Q/R SCP AE

Abstract Syntax		Transfer Syntax		Role	Ext. Neg.
Name	UID	Name List	UID List		
Verification	1.2.840.10008.1.1	Implicit VR Little Endian	1.2.840.10008.1 .2	SCP	None
CT Image Storage	1.2.840.10008.5.1.4.1.1.2	Q/R SCP Transfer Syntaxes		SCP	None
PET Image Storage	1.2.840.10008.5.1.4.1.1.128	Q/R SCP Transfer Syntaxes		SCP	None
MR Image Storage	1.2.840.10008.5.1.4.1.1.4	Q/R SCP Transfer Syntaxes		SCP	None
US Image Storage	1.2.840.10008.5.1.4.1.1.6.1	Q/R SCP Transfer Syntaxes		SCP	None
US Multi-frame Storage	1.2.840.10008.5.1.4.1.1.3.1	Q/R SCP Transfer Syntaxes		SCP	None
Computed Radiography Image Storage	1.2.840.10008.5.1.4.1.1.1	Q/R SCP Transfer Syntaxes		SCP	None

Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7	Q/R SCP Transfer Syntaxes	SCP	None
X-Ray Angiographic Image Storage	1.2.840.10008.5.1.4.1.1.12.1	Q/R SCP Transfer Syntaxes	SCP	None
X-Ray Radiofluoroscopic Image Storage	1.2.840.10008.5.1.4.1.1.12.2	Q/R SCP Transfer Syntaxes	SCP	None
Nuclear Medicine Image Storage	1.2.840.10008.5.1.4.1.1.20	Q/R SCP Transfer Syntaxes	SCP	None
RT Image Storage	1.2.840.10008.5.1.4.1.1.481.1	Q/R SCP Transfer Syntaxes	SCP	None
VL Endoscopic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.1	Q/R SCP Transfer Syntaxes	SCP	None
VL Microscopic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.2	Q/R SCP Transfer Syntaxes	SCP	None
VL Slide- Coordinates Microscopic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.3	Q/R SCP Transfer Syntaxes	SCP	None
VL Photographic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.3	Q/R SCP Transfer Syntaxes	SCP	None

Digital X-Ray Image Storage - For Presentation	1.2.840.10008.5.1.4.1.1.1.1	Q/R SCP Transfer Syntaxes	SCP	None
Digital X-Ray Image Storage - For Processing	1.2.840.10008.5.1.4.1.1.1.1.1	Q/R SCP Transfer Syntaxes	SCP	None
Digital Mammography X-Ray Image Storage - For Presentation	1.2.840.10008.5.1.4.1.1.1.2	Q/R SCP Transfer Syntaxes	SCP	None
Digital Mammography X-Ray Image Storage - For Processing	1.2.840.10008.5.1.4.1.1.1.2.1	Q/R SCP Transfer Syntaxes	SCP	None
Digital Intra- oral X-Ray Image Storage - For Presentation	1.2.840.10008.5.1.4.1.1.1.3	Q/R SCP Transfer Syntaxes	SCP	None
Digital Intra- oral X-Ray Image Storage - For Processing	1.2.840.10008.5.1.4.1.1.1.3.1	Q/R SCP Transfer Syntaxes	SCP	None

Table of Q/R SCP Transfer Syntaxes

Implicit VR Little Endian	1.2.840.10008.1.2
Explicit VR Little Endian	1.2.840.10008.1.2.1
JPEG Baseline	1.2.840.10008.1.2.4.50
JPEG Extended	1.2.840.10008.1.2.4.51
JPEG Lossless, Non-Hierarchical	1.2.840.10008.1.2.4.57
JPEG Lossless, Non-Hierarchical, First-Order Prediction	1.2.840.10008.1.2.4.70
JPEG-LS Lossless Image Compression	1.2.840.10008.1.2.4.80
JPEG-LS Lossy (Near-Lossless) Image	1.2.840.10008.1.2.4.81
JPEG 2000 Image Compression (Lossless Only)	1.2.840.10008.1.2.4.90
JPEG 2000 Image Compression	1.2.840.10008.1.2.4.91

SOP Specific Conformance

Specific Conformance for Image SOP Classes

When a SOP Instance is selected, its contents will be exported as it was originally received unless some of the Patient demographic and Study information Elements were altered.

Table of Q/R SCP AE C-STORE Response Status Handling Behavior

Service Status	Further Meaning	Error Code	Behavior
Success	Success	0000	This status code is treated as successful operation.
Refused	Out of Resources	A700	These status codes are treated as a permanent Failure.
Warning	Cannot Understand	C000	These status codes are treated as a permanent Failure.

Service Status	Further Meaning	Error Code	Behavior
Warning	Coercion of Data Elements	B000	This status code is treated as successful operation.
Warning	Dataset does not match SOP	B007	This status code is treated as successful operation.
Warning	Elements Discarded	B006	This status code is treated as successful operation.
Warning	Attribute List Error	0107	This status code is treated as successful operation.
Warning	Attribute Value Out of Range	0116	This status code is treated as successful operation.
*	*	Any Other	This status code is treated as a permanent Failure.

Table of Q/R SCP AE Communication Failure Behaviour

Exception	Behavior
Timeout expiry for an expected DICOM Message Response (DIMSE level timeout).	The Association is aborted by issuing a DICOM A-ABORT. The appropriate Status will be sent in the C-MOVE Response.
Timeout expiry for an expected DICOM PDU or TCP/IP packet (Low level timeout).	The Association is aborted by issuing a DICOM A-ABORT. The appropriate Status will be sent in the C-MOVE Response.
Association A-ABORTed by the SCP or the network layers indicate communication loss (i.e. low-level TCP/IP socket closure)	The TCP/IP socket is closed and the Association released.

Association Acceptance Policy

Activity - Handling Query and Retrieval Requests

Description and Sequencing of Activities

The Q/R SCP AE accepts Associations only if they have valid Presentation Contexts. If none of the requested Presentation Contexts are accepted then the Association Request itself is rejected. It can be configured to only accept Associations from certain Application Entities. If Q/R SCP AE receives a query (C-FIND) request then the response(s) will be sent over the same Association used to send the C-FIND-Request. If Q/R SCP AE receives retrieval (C-MOVE) request then the responses will be sent over the same Association used to send the C-MOVE-Request. The Q/R SCP AE will send the requested SOP Instances to the C-MOVE Destination over a newly created Association and report in the C-MOVE-Response any success or failure status of each attempt to send a Composite SOP Instance.

When an association has been established the Sequencing of Real-World Activities is as described in Section 4.1.3(Sequencing of Real-World Activities). The Q/R SCP AE may reject Association attempts as shown in the table below. The Result, Source and Reason / Diag columns represent the values returned in the corresponding fields of an ASSOCIATE-RJ PDU (see PS 3.8, Section 9.3.4).

Table of Association Rejection Reasons

Result	Source	Reason/Diag	Description
2 – rejected transient	provider	2 – local limit exceeded	The (configurable) maximum number of simultaneous associations has been reached. An association request with the same parameters may succeed later time.
1 – rejected permanent	user	2 – application context name not supported	The Association request contained an unsupported Application Context Name. An association request with the same parameters will NOT succeed at a later time.

Result	Source	Reason/Diag	Description
1 – rejected permanent	user	3 – calling AE title not recognized	The Association request contained an unrecognized Calling AE Title. An association request with the same parameters will NOT succeed at a later time unless configuration changes are made.

Accepted Presentation Contexts

Table of Accepted Presentation Contexts for Q/R SCP AE

Abstract Syntax		Transfer Syntax		Role	Ext. Neg.
Name	UID	Name List	UID List		
Verification	1.2.840.10008.1.1	Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None
Study Root Q/R Information Model – FIND	1.2.840.10008.5.1.4.1.2.2.1	Implicit VR Little Endian	1.2.840.10008.1.2	SCP	Relational queries
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
Study Root Q/R Information Model – MOVE	1.2.840.10008.5.1.4.1.2.2.2	Implicit VR Little Endian	1.2.840.10008.1.2	SCP	Relational queries
		Explicit VR Little Endian	1.2.840.10008.1.2.1		

SOP Specific Conformance

Specific Conformance for Verification SOP Class

Q/R SCP provides standard conformance to the DICOM Verification Service Class as a SCP.

Table of C-Echo Response Status Handling Behavior

Service Status	Further Meaning	Error Code	Behavior
Success	Success	0000	The C-ECHO request is accepted

Specific Conformance for Query SOP Classes

The Q/R SCP supports hierarchical and relational queries. There are no attributes always returned by default. Only those attributes requested in the query identifier are returned. Query responses always return values from the patient database. Exported SOP Instances are always updated with the latest values kept in the database prior to export. Thus, a change in Patient demographic information will be contained in both the C-FIND Responses and any Composite SOP Instances exported to a C-MOVE Destination AE.

Patient Root Information Model: All required search keys on each of the four levels (Patient, Study, Series, and Image) are supported. However, the Patient ID (0010, 0020) key must have at least a partial value if the Patient's Name (0010, 0010) is not present in a Patient Level query.

Study Root Information Model: All the required search keys on each of the three levels (Study, Series, and Image) are supported. If no partial values are specified for Study attributes then either the Patient ID (0010, 0020) key or the Patient's Name (0010, 0010) must have at least a partial value specified.

Patient/Study Only Information Model: All the required search keys on the Patient and Study levels are supported. The Patient ID (0010, 0020) key must be at least partially stated if the Patient's Name (0010, 0010) is not present in a Patient Level query.

Table of Study Root C-FIND SCP Supported Elements

Attribute Name	Tag	VR	Types of Matching
Study Level			
Study Date	(0008,0020)	DA	R
Study Time	(0008,0030)	TM	R
Accession Number	(0008,0050)	SH	S,*
Patient Name	(0010,0010)	PN	S,*
Patient ID	(0010,0020)	LO	S
Study ID	(0020,0010)	SH	S
Study Instance UID	(0020,000D)	UI	S,L
Modalities in Study	(0008,0061)	PN	S,*
Referring Physician's Name	(0008,0090)	CS	S,*
Patient's Birth Date	(0010,0030)	DA	R
Patient's Sex	(0010,0040)	CS	S
Number of Study Related Series	(0020,1206)	IS	
Number of Study Related Instances	(0020,1208)	IS	
Series Level			
Modality	(0008,0060)	CS	S
Series Number	(0020,0011)	IS	S
Series Instance UID	(0020,000E)	UI	S,L
Number of Series Related Instances	(0020,1209)	IS	
Series Description	(0008,103E)	LO	S,*
Request Attribute Sequence	(0040, 0275)	SQ	
>Requested Procedure ID	(0040,1001)	SH	S
>Scheduled Procedure Step ID	(0040,0009)	SH	S,*

Composite Object Instance Level			
Instance Number	(0020,0013)	IS	S
SOP Instance UID	(0008,0018)	UI	S,L
SOP Class UID	(0008,0016)	UI	S,L
Image Specific Level			
Rows	(0028,0010)	US	
Columns	(0028,0011)	US	
Bits Allocated	(0028,0100)	US	
Number of Frames	(0028,0008)	IS	

C-FIND SCP Supported Elements for Presentation State

Presentation Label	(0070,0080)	CS	
Presentation Description	(0070,0081)	LO	
Presentation Creation Date	(0070,0082)	DA	
Presentation Creation Time	(0070,0083)	TM	
Presentation Creator's Name	(0070,0084)	PN	
Referenced Series Sequence			
>Series Instance UID	(0020,000E)	UI	
>Referenced Image Sequence			
>>Referenced SOP Class UID	(0008,1150)	UI	
>>Referenced SOP Instance UID	(0008,1155)	UI	

Table of Q/R SCP C-FIND Response Status

Service Status	Further Meaning	Error Code	Behavior
Success	Success	0000	Matching is complete. No final identifier is supplied
Error	Processing Failure	0110	This status is returned due to internal errors such as a processing failure response on a query of the internal database. The appropriate Status will Be sent in the C-FIND Response.
Cancel	Matching terminated due to Cancel Request	FE00	The C-FIND SCU sent a Cancel Request. This has been acknowledged and the search for matches has been halted.
Pending	Matches are continuing and current match is supplied	FF00	Indicates that the search for further matches is continuing. This is returned when each successful match is returned and when further matches are forthcoming.

Specific Conformance for Query SOP Classes

Exported SOP Instances are always updated with the latest values kept in the database prior to export.

Table of Q/R SCP C-MOVE Response Status

Service Status	Further Meaning	Error Code	Behavior
Success	Success	0000	Matching is complete. No final identifier is supplied
Error	Processing Failure	0110	This status is returned due to internal errors such as a processing failure response on a query of the internal database. The appropriate Status will be sent in the C-MOVE Response.
Error	Unable to per-	A702	C-STORE sub-operations cannot be performed due to failure of an Association Request or a C-STORE Request.

Service Status	Further Meaning	Error Code	Behavior
	form sub-operations		
Error	Move Destination unknown	A801	The Destination Application Entity named in the C-MOVE Request is Unknown to Query/Retrieve SCP AE.
Error	Identifier does not match SOP Class	A900	The C-MOVE identifier contains invalid Elements or values, or is missing mandatory Elements or values for the specified SOP Class or retrieval level.
Error	Unable to process	Cxxx	The Move Destination AET is missing in the C-MOVE Request.
Pending	Matches are continuing and current match is supplied	FF00	Indicates that the search for further matches is continuing. This is returned when each successful match is returned and when further matches are forthcoming.

Table of Q/R SCP Service Communication Failure Behavior

Exception	Behavior
Timeout expiry for an expected DICOM Message Request (DIMSE level timeout).	The Association is aborted by issuing a DICOM A-ABORT.
Timeout expiry for an expected DICOM PDU or TCP/ IP packet (Low-level timeout). I.e. The	The Association is aborted by issuing a DICOM A-ABORT.

Query/Retrieve Server AE is waiting for the next message PDU but the timer expires.	
Association aborted by the SCU or the network layers indicate communication loss (i.e. low-level TCP/IP socket closure)	TCP/IP socket closed.

Query-SCU Application Entity Specification

SOP Classes

The QUERY-SCU AE provides Standard Conformance to the following SOP Classes:

SOP Class Name	SOP Class UID	SCU	SCP
Verification	1.2.840.10008.1.1	Yes	No
Study Root Q/R Information Model - FIND	1.2.840.10008.5.1.4.1.2.2.1	Yes	No

Association Establishment Policies

General

The Q/R SCU AE forms Associations when requested to do so by the user. The Q/R SCU AE can only request the opening of an Association. It cannot accept requests to open Associations from external Application Entities.

The DICOM standard Application Context Name is always proposed:

Application Context Name	1.2.840.10008.3.1.1.1
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Number of Associations

Only one association at a time can be handled by the QUERY-SCU AE. An association must be completed before a new operation can be initiated.

Asynchronous Nature

The Q/R SCU AE does not support asynchronous communication.

Implementation Identifying Information

Implementation Class UID	1.2.826.0.1.3680043.8.214.3.10
Implementation Version Name	MediPlus_318

Association Initiation Policy**Activity – Send Query Requests to an External Peer AE****Description and Sequencing of Activity**

The Q/R SCU AE will initiate a new Association when the user performs the query action. An Association Request is sent to the specified Q/R SCP AE and upon successful negotiation of the required Presentation Context the query is started. The result messages are transmitted in the same association.

Proposed Presentation Contexts*Table of Proposed Presentation Contexts by the Q/R SCU AE*

Abstract Syntax		Transfer Syntax		Role	Ext. Neg.
Name	UID	Name	UID		
Verification	1.2.840.10008.1.1	Implicit VR	1.2.840.10008.1.2	SCU	None
		Little Endian			
		Explicit VR	1.2.840.10008.1.2.1		
		Little Endian			
Study Root Q/R Information Model - FIND	1.2.840.10008.5.1.4.1.2.2.1	Implicit VR	1.2.840.10008.1.2	SCU	None
		Little Endian			
		Explicit VR	1.2.840.10008.1.2.1		
		Little Endian			

Specific Conformance for Verification SOP Class

Q/R SCU provides standard conformance to the DICOM Verification Service Class as a SCU.

Table of C-Echo Response Status Handling Behavior

Service Status	Further Meaning	Error Code	Behavior
Success	Success	0000	The C-ECHO request is accepted

SOP Specific Conformance for Query SOP Classes

The Query SCU AE provides standard conformance to the supported C-FIND SOP Classes.

Association Acceptance Policy

The Query SCU AE does not accept Associations.

Retrieve-SCU Application Entity Specification

SOP Classes

The Retrieve SCU AE provides Standard Conformance to the following SOP Classes.

SOP Class Name	SOP Class UID	SCU	SCP
Verification	1.2.840.10008.1.1	Yes	No
Study Root Q/R Information Model - MOVE	1.2.840.10008.5.1.4.1.2.2.2	Yes	No

Association Establishment Policies

General

The Retrieve SCU AE forms Associations when requested to do so by the user. The Retrieve SCU AE can only request the opening of an Association. It cannot accept requests to open Associations from external Application Entities.

The DICOM standard Application Context Name is always proposed:

Application Context Name	1.2.840.10008.3.1.1.1
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Number of Associations

For each C-MOVE request one association to the C-MOVE Destination AE is established by the Retrieve SCU AE.

Asynchronous Nature

The Retrieve SCU AE does not support asynchronous communication.

Implementation Identifying Information

Implementation Class UID	1.2.826.0.1.3680043.8.214.3.10
Implementation Version Name	MediPlus_318

Association Initiation Policy***Activity – Send Retrieve Requests to a Remote AE*****Description and Sequencing of Activities**

The Retrieve SCU AE will initiate a new Association when the user performs the retrieve action. An Association Request is sent to the specified Retrieve SCU AE and upon successful negotiation of the required Presentation Context the retrieve is started. The response messages are transmitted in the same association. For transferring the requested SOP Instances the Retrieve SCU AE has to establish an Association with the Storage SCP AE.

Proposed Presentation Contexts***Table of Proposed Presentation Contexts by the Retrieve SCU AE***

Abstract Syntax	Transfer Syntax		Role	Ext.	
Name	UID	Name	UID	Neg.	
Verification	1.2.840.10008.1.1	Implicit VR	1.2.840.10008.1.2	SCU	None
		Little Endian			
		Explicit VR	1.2.840.10008.1.2		
		Little Endian	.1		
Study Root Q/R	1.2.840.10008.5.1.4.1.2.2.	Implicit VR	1.2.840.10008.1.2	SCU	None

Information	2	Little Endian			
Model - MOVE		Explicit VR	1.2.840.10008.1.2		
		Little Endian	.1		

SOP Specific Conformance for Verification SOP Class

The Retrieve SCU AE provides standard conformance to the Verification SOP Class as an SCU. The Verification Service as an SCU is actually only supported as a diagnostic service tool for network communication issues.

SOP Specific Conformance for Retrieve SOP Classes

Retrieve SCU AE provides standard conformance to the supported C-MOVE SOP Classes.

Association Acceptance Policy

The Retrieve SCU AE does not accept Associations.

Print-SCU Application Entity Specification

SOP Classes

Table of SOP Classes for Print SCU AE

SOP Class Name	SOP Class UID	SCU	SCP
Verification	1.2.840.10008.1.1	Yes	No
Basic Grayscale Print Management Meta	1.2.840.10008.5.1.1.9	Yes	No

Association Establishment Policies

General

The Print SCU AE forms Associations when requested to do so by the user. The Print SCU AE can only request the opening of an Association. It cannot accept requests to open Associations from external Application Entities.

The DICOM standard Application Context Name is always proposed:

Application Context Name	1.2.840.10008.3.1.1.1
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Number of Associations

For each print request one association to the Print Destination AE is established by the Print SCU AE.

Asynchronous Nature

The Print SCU AE does not support asynchronous communication.

Implementation Identifying Information

Table of DICOM Implementation Class and Version for All

Implementation Class UID	1.2.826.0.1.3680043.8.214.3.10
Implementation Version Name	MediPlus_318

Association Initiation Policy***Activity – Send Print Requests to a Remote AE*****Description and Sequencing of Activity**

The Print SCU AE will initiate a new Association when the user invokes the Print SCU AE to print images.

Proposed Presentation Contexts

Table of SOP Classes for Print SCU AE

Abstract Syntax		Transfer Syntax		Role	Ext. Neg.
Name	UID	Name	UID		
Verification	1.2.840.10008.1.1	Implicit VR	1.2.840.10008.1.2	SCU	None
		Little Endian			
		Explicit VR	1.2.840.10008.1.2		
		Little Endian	.1		

Abstract Syntax		Transfer Syntax			
Basic Grayscale Print Management Meta	1.2.840.10008.1.1.9	Implicit VR	1.2.840.10008.1.2	SCU	None
		Little Endian			
		Explicit VR	1.2.840.10008.1.2		
		Little Endian	.1		

AE Specification

Worklist AE Specification

MWL SCP Application Entity provides Standard Conformance to the following SOP Classes:

Table of SOP Classes for MWL SCP AE

SOP Class Name	SOP Class UID	SCU	SCP
Modality Worklist Information Model - FIND	1.2.840.10008.5.1.4.31	No	Yes
Modality Performed Procedure Step	1.2.840.10008.3.1.2.3.3	No	Yes

Association Policy

General

MWL SCP AE can both accept and propose Association Requests. The Query/Retrieve SCP AE will accept Association Requests for the Verification and Query/Retrieve Services. It will propose Associations for Verification and Storage Services.

The DICOM standard application context name for DICOM 3.0 is always accepted and proposed:

Table of DICOM Application Context

Application Context Name	1.2.840.10008.3.1.1.1
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Number of Associations

MWL SCP can support multiple simultaneous Associations.

Asynchronous Nature

MWL SCP does not support asynchronous communication.

Implementation Identifying Information

Table of DICOM Implementation Class and Version for MWL SCP AE

Implementation Class UID	1.2.826.0.1.3680043.8.214.3.10
Implementation Version Name	MediPlus_318

Association Initiation Policy

The Modality Worklist Server AE does not initiate Associations.

Association Acceptance Policy

Activity – Remote AE requests MWL query

Description and Sequencing of Activities

The MWL SCP AE accepts Associations only if they have valid Presentation Contexts. If none of the requested Presentation Contexts are accepted then the Association Request itself is rejected. It can be configured to only accept Associations from certain Application Entities. MWL SCUs query the MWL SCP AE the queries run against the MWL items in the local RIS database. The MWL SCP AE may reject Association attempts as shown in the table below. The Result, Source and Reason / Diag columns represent the values returned in the corresponding fields of an ASSOCIATE-RJ PDU (see PS 3.8, Section 9.3.4).

Table of Association Rejection Reasons

Result	Source	Reason	Description
2 - rejected transient	provider	2 - local- limit exceeded	The (configurable) maximum number of simultaneous associations has been reached. An association request with the same parameters may succeed at a later time.
1 - rejected permanent	user	2- application context name not supported	The Association request contained an unsupported Application Context Name. An association request with the same parameters will NOT succeed at a later time.

1 - rejected permanent	user	3 – calling AE title not recognized	The Association request contained an unrecognized Calling AE Title. An association request with the same parameters will NOT succeed at a later time unless configuration changes are made.
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Accepted Presentation Contexts

Table of Accepted Presentation Contexts for MWL SCP AE

Abstract Syntax		Transfer Syntax		Role	Ext. Neg.
Name	UID	Name List	UID List		
Modality Worklist Information Model - FIND	1.2.840.10008.5.1.4.31	Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1		

SOP Specific Conformance for MWL SOP Class

There are no attributes always returned by default. Only those attributes requested in the query identifier are returned.

Table of WML SCP C-Find Response Status

Service Status	Further Meaning	Error Code	Behavior
Success	Matching is Complete	0000	Success.
Error	Processing Failure	0110	This is treated as a permanent Failure. The appropriate Status will be sent in the C-FIND Response.
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.
Pending	Matching is continuing	FF00	This status is returned with each matching response.

Table of MWL C-FIND SCP Supported Elements

Attribute Name	Tag	VR	Types of Matching
Specific Character Set	(0008,0005)	CS	NONE
Scheduled Procedure Step			
Scheduled Procedure Step Sequence	(0040,0100)	SQ	
>Scheduled station AE title	(0040,0001)	AE	S
>Scheduled Procedure Step Start Date	(0040,0002)	DA	S,R
>Scheduled Procedure Step Start Time	(0040,0003)	TM	S,R
>Modality	(0008,0060)	CS	S
>Scheduled Performing Physician's Name	(0040,0006)	PN	S,*
>Scheduled Procedure Step ID	(0040,0009)	SH	
>Scheduled Procedure Code Sequence	(0040,0008)	SQ	
>>Code Value	(0008,0100)	SH	S
>>Coding Scheme Designator	(0008,0102)	SH	S,*
>>Code Meaning	(0008,0104)	LO	S
> Scheduled Procedure Step Description	(0040,0007)	LO	
Requested Procedure Description	(0032,1060)	LO	
Requested Procedure Code Sequence	(0032,1064)	SQ	
>Code Value	(0008,0100)	SH	
>Coding Scheme Designator	(0008,0102)	SH	
>Code Meaning	(0008,0104)	LO	
Requested Procedure ID	(0040,1001)	SH	
Study Instance UID	(0020,000D)	UI	
>Referenced SOP Class UID	(0008,1150)	UI	
>Referenced SOP Instance UID	(0008,1155)	UI	
Accession Number	(0008,0050)	SH	S,*

Requesting Physician	(0032,1032)	PN	S
Referring Physician's Name	(0008,0090)	PN	S,*
Visit Identification			
Admission ID	(0038,00100)	UN	S
Visit Status			
Current Patient Location	(0038,0300)	LO	
Visit Relationship			
Referenced Patient Sequence	(0008,1120)	SQ	
>Referenced SOP Class UID	(0008,1150)	UI	
>Referenced SOP Instance UID	(0008,1155)	UI	
Patient Identification			
Patient's Name	(0010,0010)	PN	S,*
Patient ID	(0010,0020)	LO	S
Patient Demographic			
Patients Birth Date	(0010,0030)	DA	R
Patient's Sex	(0010,0040)	CS	S
Confidentiality constraint on patient data	(0040,3001)	LO	
Patient Medical			
Patient State	(0038,0500)	LO	
Pregnancy Status	(0010,21C0)	US	
Medical Alerts	(0010,2000)	LO	
Additional Patient History	(0010,21B0)	LT	
Contrast Allergies	(0010,2110)	LO	
Patient Weight	(0010,1030)	DS	
Special Needs	(0038,0050)	LO	

Types of Matching:

The types of Matching supported by the C-FIND SCP. An "S" indicates the identifier attribute uses Single Value Matching, an "R" indicates Range Matching, an "*" indicates wildcard matching, a "U" indicates Universal Matching. "NONE" indicates that no matching is supported, but that values for this Element are requested to be returned.

Modality Performed Procedure Step (MPPS) AE Specifications

Table of Accepted Presentation Contexts for MPPS SCP AE

Abstract Syntax		Transfer Syntax		Role	Ext. Neg.
Name	UID	Name List	UID List		
Modality Performed Procedure Step	1.2.840.1008.3.1.2.3.3	Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None

SOP Specific Conformance for Modality Performed Procedure Step

The MediMPPSSCP provides standard conformance to the DICOM Modality Performed Procedure Step service class. The MediMPPSSCP accepts both DIMSE N-CREATE and DIMSE N-SET messages for creating and updating Performed Procedure Step information. The following DICOM attributes are required by the Pro MediMPPSSCP for Modality Performed Procedure Step DIMSE N-CREATE messages:

Attribute Name	Tag	Type
Scheduled Step Attribute Sequence	(0040,0270)	SQ
> Study Instance UID	(0020,000D)	UI
Performed Procedure Step Start Date	(0040,0244)	DA
Performed Procedure Step Start Time	(0040,0245)	TM
Performed Procedure Step Status	(0040,0252)	CS

Any other DICOM attributes, although not required, will be accepted. The following DICOM attributes are required by the Pro MediMPPSSCP for Modality Performed Procedure Step DIMSE N-SET messages:

Attribute Name	Tag	Type
Performed Procedure Step Start Date	(0040,0244)	DA
Performed Procedure Step Start Time	(0040,0245)	TM
Performed Procedure Step End Date *	(0040,0250)	DA
Performed Procedure Step End Time *	(0040,0251)	TM
Performed Procedure Step Status	(0040,0252)	CS

Presentation Context Acceptance Criterion for Modality Performed Procedure Step

The MediMPPSSCP will only accept a presentation context for the Modality Performed Procedure Step SOP Class with Implicit VR Little Endian transfer syntax.

NETWORK INTERFACES

Physical Network Interface

MediPACS is indifferent to the physical medium over which TCP/IP executes; it inherits this from the OS.

Configuration

AE Title/Presentation Address Mapping

Local AE Titles

The local AE Titles and TCP ports are configurable through web interface.

Remote AE Title

Remote AE Titles, TCP/IP Addresses and ports can be configured through web interface.

Media Storage

Implementation Model

Application Data Flow

The Offline-Media Application Entity exports DICOM objects from MediPACS to CD/DVD Storage medium. It is associated with the Real-World Activity “Write Patient CD/DVD”. “Write Patient CD/DVD” is performed upon user request for selected patients.

Functional Definition of AEs

Functional Definition of Offline-Media Application Entity

Activation of the “Write Patient CD/DVD” will pass the currently selected patients to the Offline-Media Application Entity. The SOP Instances associated with the selection will be collected into one “Write Patient CD/DVD” job. The contents of each “Write Patient CD/DVD” job will be written to a single CD/DVD media.

Sequencing of Real-World Activities

At least one patient must exist and be selected before the Offline-Media Application Entity can be invoked.

File Meta Information Options

The implementation information written to the File Meta Header in each file is:

Table of DICOM Implementation Class and Version for Media Storage

Implementation Class UID	1.2.826.0.1.3680043.8.214.3.10
Implementation Version Name	MediPlus_318

Support of Character Sets

MediPACS supports ISO_IR 100 (ISO 8859-1 Latin 1) as an extended character set.

Security

Security Profiles

None supported.

Association Level Security

MediPACS can be configured to accept Association Requests from only a limited list of Calling AE Titles.

Application Level Security

MediPACS web require user authentication in order to access to the user interface functionalities.