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SntryPACS Server

Dicom Conformance Statement

Version 1.0

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1 Introduction

This document is a DICOM Conformance Statement for QStar's SntryPACS system. It is intended to provide the stack-holder with the knowledge of how to integrate DICOM modalities with this product. It details the DICOM Service Classes, Information Objects and Communication Protocols which are supported by this product.

SntryPACS provides image storage as both an SCU and an SCP. Query/Retrieve services are implemented as an SCP. Optionally storage commitments, MPPS are supported.

1.1 Reference

ARC-NEMA Digital Imaging and Communication in Medicine, DICOM 3.0

1.2 Definitions

- **Association Establishment** - An Association Establishment is the first phase of communication between two DICOM Application Entities. The AEs use the Association Establishment to negotiate how data will be encoded and the type of data to be exchanged.
- **Called Application Entity Title** - The Called AE Title defines the intended receiver of an Association.
- **Calling Application Entity Title** - The Calling AE Title defines the requestor of an Association.
- **DICOM Message Service Element (DIMSE)** - A DIMSE defines the services and protocols utilized by an Application Entity to exchange messages.
- **Information Object Definition (IOD)** - An IOD is a data model which is an abstraction of real-world information. This data model defines the nature and attributes relevant to the class of real-world objects represented.
- **Service Class Provider (SCP)** - A Service Class Provider plays the "server" role to perform operations and invoke notifications during an Association. An example of a Storage Service Class Provider would be an image storage device. In this case, the image storage device is storing the image that was sent by a Service Class User.
- **Service Class User (SCU)** - A Service Class User plays the "client" role to invoke operations and perform notifications during an Association. An example of a Storage Service Class User would be an image acquisition device. In this case, the image acquisition device will create and send a DICOM image by requesting that a Service Class Provider store that image.
- **Service Object Pair (SOP) Class** - A SOP Class is defined by the union of information Object Definition and a set of DIMSE Services. A DICOM Application Entity may support one or more SOP Classes. Each SOP Class is uniquely identified by a SOP Class UID.

- **SOP Instance** - A specific occurrence of an information Object.
- **Transfer Syntax** - The Transfer Syntax is a set of encoding rules that allow DICOM Application Entities to negotiate the encoding techniques (e.g. data element structure, byte ordering, compression) they are able to support. The Transfer Syntax is negotiated during Association Negotiation.
- **Unique identifier (UID)** - A Unique identifier is a globally unique, ISO compliant, ASCII- numeric string. It guarantees uniqueness across multiple countries, sites, vendors and equipment.

1.3 Acronyms, Abbreviations and Symbols

- ACC American College of Cardiology
- ACR American College of Radiology
- ASCII American Standard Code for Information Interchange
- AE Application Entity
- ANSI American National Standards institute
- CEN TC251 Comite European de Normalization - Technical Committee 251 - Medical Informatics
- DICOM Digital Imaging and Communications in Medicine
- DIMSE DICOM Message Service Element
- DIMSE-C DICOM Message Service Element - Composite
- DIMSE-N DICOM Message Service Element - Normalized
- HIS Hospital information System
- HL7 Health Level 7
- IE Information Entity
- IOD Information Object Definition
- ISO International Standards Organization
- NEMA National Electrical Manufacturers Association
- OSI Open Systems Interconnection
- PDU Protocol Data Unit

- RIS Radiology information System
- SCP Service Class Provider

2 Implementation Model

SntryPACS is a multiple application entities provides storage, echo and query /retrieve services. Storage server AE provides image storage and echo verification services. Query/Retrieve AE provides query and image retrieval services.

2.1 Application Data Flow Diagram

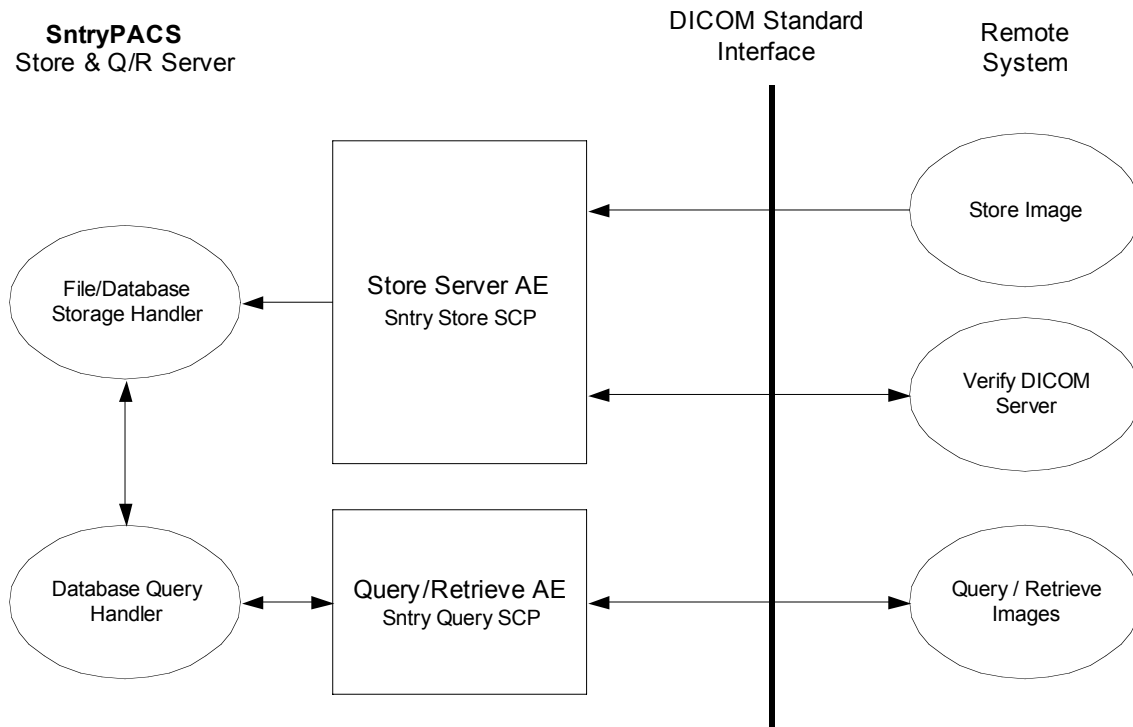


Figure: Implementation model of SntryPACS Store, Q/R DICOM Services

2.2 Functional Definition of Application Entities

SntryPACS is a multi platform application that waits for SCUs to connect. It will accept associations with Presentation Contexts for SOP Classes of the Storage and Query/Retrieve service classes. It will receive images on these Presentation Contexts and write them to files in the format specified in PS 3.10.

SntryPACS also stores information in its own internal database about each image sent that will allow users to then query and retrieve the images.

2.3 Sequencing of Real World Activity

Not applicable.

3 Application Entity Specifications

3.1 SntryPACS DICOM Server Application Entity

SntryPACS provides Standard Conformance to the following DICOM V3.0 SOP Classes.

SOP Class Name	SOP Class UID
Verification	1.2.840.10008.1.1

Table 1: Verification SOP Class Supported by SntryPACS Store Server AE – SCP

SOP Class Name	SOP Class UID
CR Image Storage	1.2.840.10008.5.1.4.1.1.1
CT Image Storage	1.2.840.10008.5.1.4.1.1.2
MR Image Storage	1.2.840.10008.5.1.4.1.1.4
NM Image Storage	1.2.840.10008.5.1.4.1.1.20
US Image Storage	1.2.840.10008.5.1.4.1.1.6.1
US Multi Image Storage	1.2.840.10008.5.1.4.1.1.3.1
SC Image Storage	1.2.840.10008.5.1.4.1.1.7
RT Image Storage	1.2.840.10008.5.1.4.1.1.481.1
RT Dose Storage	1.2.840.10008.5.1.4.1.1.481.2
RT Structure Set Storage	1.2.840.10008.5.1.4.1.1.481.3
RT Treatment Record Storage	1.2.840.10008.5.1.4.1.1.481.4
RT Plan Storage	1.2.840.10008.5.1.4.1.1.481.5
X-Ray Angiographic Image Storage	1.2.840.10008.5.1.4.1.1.12.1
X-Ray Radiofluoroscopic Image Storage	1.2.840.10008.5.1.4.1.1.12.2
X-Ray Angiographic Bi-Plane Image Storage	1.2.840.10008.5.1.4.1.1.12.3
Standalone Overlay Storage	1.2.840.10008.5.1.4.1.1.8
Standalone Curve Storage	1.2.840.10008.5.1.4.1.1.9
Standalone Modality LUT Storage	1.2.840.10008.5.1.4.1.1.10
Standalone VOI LUT Storage	1.2.840.10008.5.1.4.1.1.11
Positron Emission Tomography (PET) Storage	1.2.840.10008.5.1.4.1.1.128
PET Curve Storage	1.2.840.10008.5.1.4.1.1.129
Digital Xray (DX) Presented Image Storage	1.2.840.10008.5.1.4.1.1.1.1
Digital Xray (DX) Processed Image Storage	1.2.840.10008.5.1.4.1.1.1.1.1
Digital Mammography (MG) Presented Image Storage	1.2.840.10008.5.1.4.1.1.1.2
Digital Mammography (MG) Processed Image Storage	1.2.840.10008.5.1.4.1.1.1.2.1
Digital Intra-Oral (IO) Presented Image Storage	1.2.840.10008.5.1.4.1.1.1.3
Digital Intra-Oral (IO) Processed Image Storage	1.2.840.10008.5.1.4.1.1.1.3.1
Visible Light Endoscopy (ES) Image Storage	1.2.840.10008.5.1.4.1.1.77.1.1
Visible Light Microscopy (GM) Image Storage	1.2.840.10008.5.1.4.1.1.77.1.2
Visible Light Slide Microscopy (SM) Image Storage	1.2.840.10008.5.1.4.1.1.77.1.3
Visible Light Photography (XC) Image Storage	1.2.840.10008.5.1.4.1.1.77.1.4

Table 2: Storage SOP Classes Supported by SntryPACS Store Server AE – SCP & SCU

SOP Class Name	SOP Class UID
Patient Root Query/Retrieve Info. Model – FIND	1.2.840.10008.5.1.4.1.2.1.1
Patient Root Query/Retrieve Info Model – MOVE	1.2.840.10008.5.1.4.1.2.1.2
Study Root Query/Retrieve Info Model – FIND	1.2.840.10008.5.1.4.1.2.2.1
Study Root Query/Retrieve Info Model – MOVE	1.2.840.10008.5.1.4.1.2.2.2
Patient/Study Only Query Retrieve Info. Model – FIND	1.2.840.10008.5.1.4.1.2.3.1
Patient/Study Only Query Retrieve Info. Model – MOVE	1.2.840.10008.5.1.4.1.2.3.2

Table 3: Query / Retrieve SOP Classes Supported by SntryPACS Query/Retrieve Server AE – SCP & SCU

3.1.1 Association Establishment Policies

3.1.1.1 General

The maximum accepted PDU size is 16,384 bytes.

3.1.1.2 Number of Associations

Maximum number of simultaneous associations defaults to 10. This is configurable at run time. Although there is no inherent limit to the number of associations, there are limits imposed by the host computers operating system and current available resources on the host computer.

3.1.1.3 Asynchronous Nature

Asynchronous operations are not supported. A request for asynchronous transfer is rejected.

3.1.1.4 Implementation Identifying Information

SntryPACS uses the following implementation identification information:

Implementation class UID: 1.2.826.0.1.3680043.2.914

Implementation version name: EdgePACS_1.0

3.1.2 Association Initiation By Real-World Activity

3.1.2.1 Real-World Activity - Storage

3.1.2.1.1 ASSOCIATED REAL-WORLD ACTIVITY – STORAGE

SntryPACS will send images that have previously been stored. This send is only initiated by a separate SCU sending SntryPACS a MOVE command.

3.1.2.1.2 PRESENTATION CONTEXT TABLE – STORAGE

SOP Class Name	SOP Class UID
Implicit VR Little Endian	1.2.840.10008.1.2
Explicit VR Little Endian	1.2.840.10008.1.2.1
Explicit VR Big Endian	1.2.840.10008.1.2.2
JPEG Baseline	1.2.840.10008.1.2.4.50
JPEG Lossy Extended Huffman Encoding	1.2.840.10008.1.2.4.51
JPEG Lossless Huffman Encoding	1.2.840.10008.1.2.4.57
JPEG Lossless, First Order Prediction, Huffman Encoding	1.2.840.10008.1.2.4.70
RLE Lossless	1.2.840.10008.1.2.5

Table 4: Transfer Syntaxes for Storage

SntryPACS store AE supports all Table 2 SOP class and all Table 4 transfer syntaxes from SCU.

3.1.2.1.2.1 SOP Specific Conformance – Storage

SntryPACS conforms to Storage Service Class as SCU.

3.1.2.1.3 TRANSFER SYNTAX SELECTION POLICIES – STORAGE

Currently, SntryPACS will only initiate an association for the specific SOP class and transfer syntax of the particular image file to be stored.

3.1.3 Association Acceptance Policy

When SntryPACS accepts an association, it will receive any images transmitted on that association and store the images disk in the local file system in the format specified by PS 3.10. SntryPACS places no limitation on who may connect to it.

3.1.3.1 Real-World Activity - Verification

3.1.3.1.1 ASSOCIATED REAL-WORLD ACTIVITY - VERIFICATION

SntryPACS will respond to Verification requests to provide an SCU with the ability to determine if SntryPACS is receiving requests.

3.1.3.1.2 PRESENTATION CONTEXT TABLE – VERIFICATION

The default transfer syntax of SntryPACS is Implicit VR Little Endian 1.2.840.10008.1.2.

It also support all the SOP class specified in Table 2 and transfer syntaxes specified in table 4.

3.1.3.1.2.1 SOP Specific Conformance - Verification

SntryPACS provides standard conformance to DICOM V3.0 Verification Service Class.

3.1.3.1.3 PRESENTATION CONTEXT ACCEPTANCE CRITERION - VERIFICATION

SntryPACS will always accept a Presentation Context for the Verification SOP Class with the DICOM Default Transfer Syntax.

3.1.3.1.4 TRANSFER SYNTAX SELECTION POLICIES - VERIFICATION

SntryPACS supports only the Implicit VR Little Endian transfer syntax for Verification.

3.1.3.2 Real-World Activity - Storage

3.1.3.2.1 ASSOCIATED REAL-WORLD ACTIVITY - STORAGE

When a C-Store operation is invoked, the image will be stored on the disk in the working directory of SntryPACS. SntryPACS will also store some header information about each image in a database that will be used by another process running on the same server. SntryPACS will issue a failure status if it is unable to store the image on the disk.

3.1.3.2.2 PRESENTATION CONTEXT TABLE – STORAGE

Any of the Presentation Contexts of Table 2 and Table 4 are supported for storage.

3.1.3.2.2.1 SOP Specific Conformance - Storage

SntryPACS conforms to the SOP's of the Service Class at Level 2(Full). No elements are discarded or coerced by SntryPACS. In the event of a successful C-STORE operation, the image has successfully been written to disk as standard local file. As such, it may be accessed in the same manner as any other local file of the running operating system.

SntryPACS will never delete a file which it has received (options tools are provided to manage storage).

A successful C-STORE response does not mean that SntryPACS has stored a valid DICOM Composite Information Object and it does not perform any validation of the data beyond the DICOM Command.

If the C-STORE was unsuccessful, then application will return C000 as the status code.

3.1.3.2.3 PRESENTATION CONTEXT ACCEPTANCE CRITERION - STORAGE

SntryPACS will accept multiple Presentation Contexts on an association, provided that all of these Presentation Contexts specify the same Abstract Syntax. The acceptable Presentation Contexts that SntryPACS may accept are specified in Tables 3 & 4. The first acceptable Presentation Context (other than Verification) determines the Abstract Syntax which will be used for the association. Later Proposed Presentation Contexts may be accepted if they have the same Abstract Syntax and allow a different Transfer Syntax.

2.1.3.2.4 Transfer Syntax Selection Policies - Storage

SntryPACS supports all transfer syntaxes listed in Table 4. The selection policy is user configurable.

3.1.3.3 Real-World Activity - Find

3.1.3.3.1 ASSOCIATED REAL-WORLD ACTIVITY - FIND

Will respond to query requests sent to it from an SCU.

3.1.3.3.2 PRESENTATION CONTEXT TABLE - FIND

The Presentation Contexts shown in Table 5 will be accepted by SntryPACS.

SOP Class	Transfer Syntax	Role Ext	Negotiation
All Table 3	FIND All Table 4	SCP	None

Table 5: Acceptable Presentation Contexts for FIND

3.1.3.3.2.1 SOP Specific Conformance - Find

SOP classes are implemented via DIMSE C-FIND service as defined in PS 3.7.

SntryPACS supports all mandatory search keys.

Description	Tag
Patient Name	(0x0010,0x0010)
Patient ID	(0x0010,0x0020)

Table 6: Patient level attributes

Description	Tag
Study Instance UID	(0x0020,0x000D)
Study Date	(0x0008,0x0020)
Study Time	(0x0008,0x0010)
Modalities In Study	(0x0008, 0x0061)

Table 7: Study level attributes

Description	Tag
Series Instance UID	(0x0020,0x000E)

Table 8: Series level attributes

Description	Tag
SOP Instance UID	(0x0008,0x0018)
Image Number	(0x0020,0x0013)

Table 9: Patient level attributes

Service Status	Further Meaning	Protocol Codes
Refused	Out of resources	A700
Failed	Unable to process	C001
Cancel	Terminated by Cancel Request	FE00
Success	Success	0000

Table 10: FIND status codes

3.1.3.3.3 PRESENTATION CONTEXT ACCEPTANCE CRITERION - FIND

SntryPACS will accept multiple Presentation Contexts on an association, provided that all of these Presentation Contexts specify the same Abstract Syntax. The acceptable Presentation Contexts that application may accept are specified in Table 4. The first acceptable Presentation Context determines the Abstract Syntax, which will be used for the association. Later Proposed Presentation Contexts may be accepted if they have the same Abstract Syntax and allow a different Transfer Syntax.

3.1.3.3.4 TRANSFER SYNTAX SELECTION POLICIES - FIND

SntryPACS supports all only the default transfer syntax of Implicit VR Little Endian.

3.1.3.4 Real-World Activity - Move

3.1.3.4.1 ASSOCIATED REAL-WORLD ACTIVITY - MOVE

Will respond to retrieve requests sent to it from an SCU.

3.1.3.4.2 PRESENTATION CONTEXT TABLE – MOVE

The Presentation Contexts shown in Table 11 will be accepted by SntryPACS.

SOP Class	Transfer Syntax	Role Ext	Negotiation
All Table 3	MOVE All Table 3	SCP	None

Table 11: Acceptable Presentation Contexts for MOVE

3.1.3.4.2.1 SOP Specific Conformance - Move

SntryPACS will attempt to establish an association with the move destination specified in the Move request. One or more of the Presentation Contexts listed in Table 4.

SntryPACS will return of the following status codes to a Move request.

Service Status	Further Meaning	Protocol Codes
Refused	Out of resources	A701
Refused	Unable to perform storage	A702
Failed	Unknown destination	A801
Failed	SOP Class does not match identifier Cancel Terminated by Cancel Request	FE00
Success	Success	0000

Table 12: MOVE status codes

3.1.3.4.3 PRESENTATION CONTEXT ACCEPTANCE CRITERION - MOVE

SntryPACS will accept multiple Presentation Contexts on an association, provided that all of these Presentation Contexts specify the same Abstract Syntax. The acceptable Presentation Contexts that SntryPACS may accept are specified in Table 11. The first acceptable Presentation Context determines the Abstract Syntax, which will be used for the association. Later Proposed Presentation Contexts may be accepted if they have the same Abstract Syntax and allow a different Transfer Syntax.

3.1.3.4.4 TRANSFER SYNTAX SELECTION POLICIES - MOVE

By default, SntryPACS sends the images using the transfer syntax that was used when the image was originally stored.

4 Communication Profiles

4.1 Supported Communication Stacks

SntryPACS provides DICOM V3.0 TCP/IP Network Communication Support as defined in PS 3.8.

4.2 TCP/IP Stack

TCP/IP stack is inherited from the operating system.

4.2.1 Physical Media Support

SntryPACS is indifferent to the physical medium over which TCP/IP executes; it inherits this from the running operating system upon which it executes.

5 Extensions / Specializations / Privatizations

Not applicable.

6 Configuration

6.1 AE Title / Presentation Address Mapping

Local AE title is configurable. This information is easily configurable through the configuration user interface or through a regular text editor.

TCP/IP port is configurable.

7 Support of Extended Character Sets

No extended character sets are supported.



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