DICOM Conformance Statement

Syngo MobileViewer VA11A

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1   DICOM Conformance Statement Overview

Syngo MobileViewer conforms to the DICOM Standard and supports the network services as described in Table 1.

SOP Classes	SOP Class UID	User of Service (SCU)	Provider of Service (SCP)
Storage			
Computed Radiography Image Storage	1.2.840.10008.5.1.4.1.1.1	No	Yes
Digital X-Ray Image Storage - For Presentation	1.2.840.10008.5.1.4.1.1.1.1	No	Yes
Digital X-Ray Image Storage – For Processing	1.2.840.10008.5.1.4.1.1.1.1.1	No	Yes
CT Image Storage	1.2.840.10008.5.1.4.1.1.2	No	Yes
MR Image Storage	1.2.840.10008.5.1.4.1.1.4	No	Yes
Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7	No	Yes
Encapsulated PDF Storage SOP Class	1.2.840.10008.5.1.4.1.1.104.1	No	Yes
Positron Emission Tomography Image Storage	1.2.840.10008.5.1.4.1.1.128	No	Yes
Query/Retrieve			
Study Root Q/R - Information Model - FIND	1.2.840.10008.5.1.4.1.2.2.1	Yes	No
Study Root Q/R - Information Model - MOVE	1.2.840.10008.5.1.4.1.2.2.2	Yes	No

Table 1: Network Services

2   Table of Contents

3 Introduction

The Conformance Statement describes the DICOM interface for the Siemens Syngo MobileViewer in terms of part 2 of the DICOM Standard [1].

3.1 Audience

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

3.2 Remarks

The scope of this DICOM Conformance Statement is to facilitate integration between Syngo MobileViewer and other DICOM products.

The Conformance Statement should be read and understood in conjunction with the DICOM Standard [1]. DICOM by itself does not guarantee interoperability.

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

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

- The comparison of conformance statements is the first step towards assessing interconnectivity and interoperability between Syngo MobileViewer and other DICOM conformant equipment.

- Test procedures should be defined and executed to validate the required level of interoperability with specific compatible DICOM equipement, as established by the healthcare facility.

3.3 Definitions, Terms and Abbreviations

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

Additional Abbreviations and terms are as follows:

AE	DICOM Application Entity
ASCII	American Standard Code for Information Interchange
DCS	DICOM Conformance Statement
DICOM	Digital Imaging and Communications in Medicine
IOD	DICOM Information Object Definition
ISO	International Standard Organization
n. a.	not applicable
NEMA	National Electrical Manufacturers Association
O	Optional Key Attribute
R	Required Key Attribute
R	Required Key Attribute
SCU	DICOM Service Class User (DICOM client)
SCP	DICOM Service Class Provider (DICOM Server)
SOP	DICOM Service-Object Pair

UID   Unique Identifier
UTF-8   Unicode Transformation Format-8

3.4   References

[1] NEMA PS3 / ISO 12052, Digital Imaging and Communications in Medicine (DICOM) Standard, National Electrical Manufacturers Association, Rosslyn, VA, USA (available free at http://www.dicomstandard.org/)

[2] Integrating the Healtcare Enterprise – IHE Radiology Technical Framework – http://www.ihe.net

4   Networking

4.1   Implementation Model

Syngo MobileViewer is a client-server based product, which provides access to rendered medical image data on mobile Apple devices, like iPhone, iPad and Mac.
Image data includes 2D images as well as volumetric data. The image data is retrieved from one or many configured DICOM nodes, such as from PACS or VNA, and cached on the Syngo MobileViewer server. Connections to these DICOM sources can be configured and stored.

4.1.1   Application Data Flow

The following figures provide a functional overview of the Syngo MobileViewer Application Entities (AE). Relationships are shown between user-invoked activities and the associated real-world activities provided by DICOM service providers.
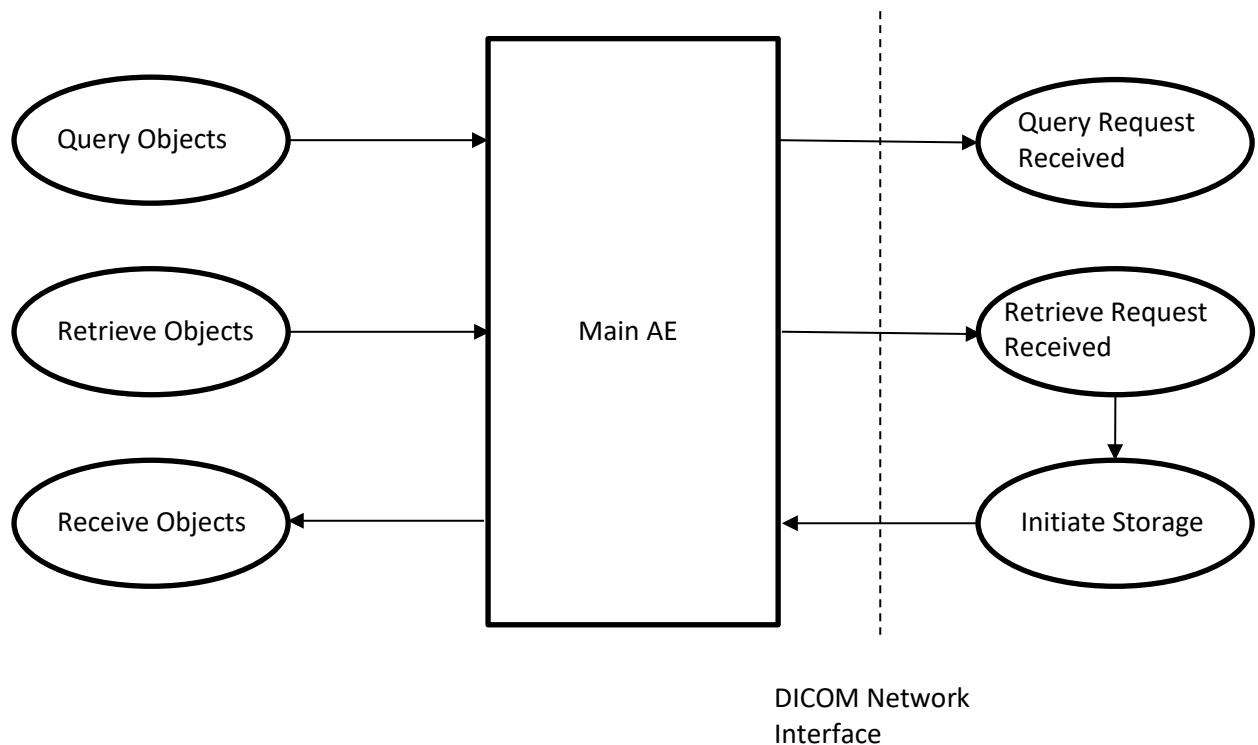

Figure 1: Functional Overview

4.1.2 Functional Definitions of Application Entities

The SCU components of the Application Entity are invoked upon requests from the user interface on the client devices.

The SCP components of the Application Entity of the Syngo MobileViewer operate as background server processes. They start as soon as the system is powered up and wait for association requests. Upon accepting an association with a negotiated Presentation Context, they start to receive and process the requests described in the following sections.

4.1.2.1 Functial Definition of Main AE

Main AE sends a C-FIND request to the remote SCP after the user entered his query criteria and initiated the query. The remote SCP returns a list of responses matching the user defined criteria, which are displayed to the user. The user can select instances and start retrieving any of the responses or to issue another query. Main AE supports the Study Root Query Model.

After selection of instances Main AE issues, a C-MOVE request for the select instances to the remote SCP and waits for the remote SCP to initiate a C-STORE request to send the selected instances.
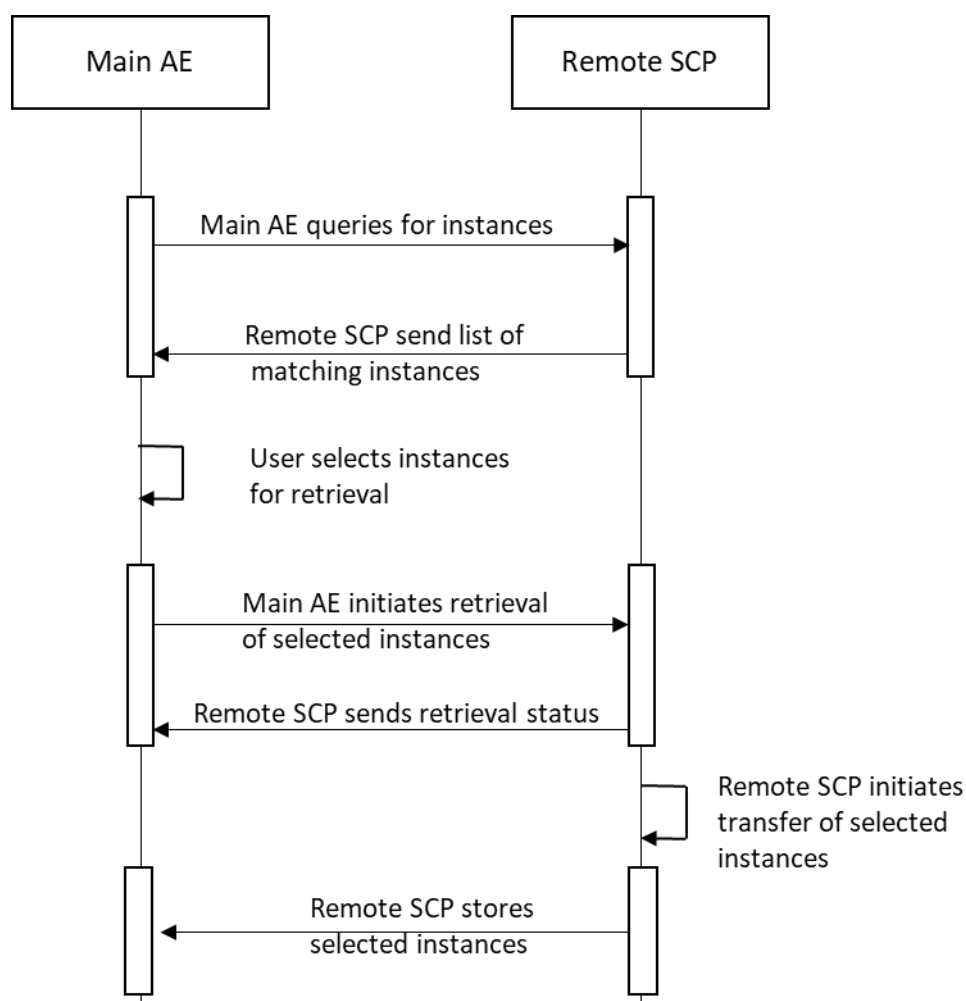
4.1.3 Sequencing of Real-World Activities

Figure 2: Sequencing of Real-World Activities

4.2 Application Entity Specification

This section outlines the specifications for each of the Application Entities that are part of the Syngo MobileViewer.

4.2.1 Main AE Specification

Main AE sends a C-FIND request to the remote SCP after the user entered his query criteria and initiated the query. The remote SCP returns a list of instances matching the selected with defined data, which are displayed to the user. The user can decide to start retrieving any of the responses or to issue another query. Main AE supports the Study Root Query Model.

After selection of instances Main AE issues, a C-MOVE request for the select instances to the remote SCP and waits for the remote SCP to send the selected instances

4.2.1.1 SOP Classes

Main AE provides standard conformance to the SOP Classes listed in Table 1 of the Overview Sections

4.2.1.2 Association Policies

Association acceptance and establishment policies are described below for Syngo MobileViewer.

4.2.1.2.1 General
Application Context Name: 1.2.840.10008.3.1.1.1

4.2.1.2.2 Number of Associations
There is no upper limit on the number of simultaneous associations Syngo MobileViewer can make. Syngo MobileViewer services many users and each request can create one or more associations. The number of simultaneous active associations is limited only by the specifications of the machine running Syngo MobileViewer and by the limits of performance on the network to which it is attached.
Syngo MobileViewer can be configured to re-use associations. Reusing associations is an optimization to minimize the number of simultaneous operations and minimize the number of association requests generated by the server to the PACS.

4.2.1.2.3 Asynchronous Nature
The Query / Retrieve function does support multiple outstanding transactions to the defined AE. Only one outstanding synchronous operation is permitted over each association, of which many can exist both as SCU or as SCP.

4.2.1.2.4 Implementation Identifying Information
Currently, the Syngo MobileViewer DICOM uses the ubuntu ctn package version 3.2.0 to support DICOM functionality.

4.2.1.3 Association Initiation Policy

Main AE can initiate Association to query remote DICOM Nodes for instances using C-FIND and to retrieve selected instances.

4.2.1.3.1 Activity Query Objects

4.2.1.3.1.1 Description and Sequencing of Activities

The Main AE of Syngo MobileViewer opens an association to a remote node in order to issue C-FIND requests. This is initiated by a user at the client device.

4.2.1.3.1.2 Proposed Presentation Context

The Main AE of Syngo Mobile Viewer will propose Presentation Contexts as shown in Table 2 below

Presentation Context Table				
Abstract Syntax		**Transfer Syntax**		**Role**
Name	*UID*	*Name List*	*UID List*	
Study Root Query/Retrieve Information Model - FIND	1.2.840.10008.5.1.4.1.2.2.1	Implicit VR Little Endian	1.2.840.10008.1.2	SCU

Table 2: Presentation Context

4.2.1.3.1.3 SOP specific Conformance for SOP classes

Main AE provides standard Conformance to the Study Root Query/Retrieve Information Model – FIND. Not all attributes might be available to select in the app.

Table 2 lists the attributes supported in the C-FIND request:

Attribute Name	Attribute Tag	Query Matching Key	Query Return Key
Patient' s Name	(0010, 0010)	Y	Y
Patient ID	(0010, 0020)	Y	Y
Patient's Birth Date	(0010, 0030)	Y	Y
Patient' s Sex	(0010, 0040)	Y	Y
Study Date	(0008,0020)	Y	Y
Modalities in Study	(0008,0061)	Y	Y

Table 3: Supported Query Keys

4.2.1.3.2 Activity Retrieve Objects

4.2.1.3.2.1 Description and Sequencing of Activities

After selecting instances to be retrieved Main AE opens an association to a remote node in order to issue C-Move request for the selected instances.

4.2.1.3.2.2 Proposed Presentation Context

The Main AE of syngo Mobile Viewer will propose Presentation Contexts as shown in Table below

Presentation Context Table				
Abstract Syntax		**Transfer Syntax**		
Name	*UID*	*Name List*	*UID List*	**Role**
Study Root Query/Retrieve Information Model - MOVE	1.2.840.10008.5.1.4.1.2.2.2	Implicit VR Little Endian	1.2.840.10008.1.2	SCU

Table 4: Presentation Context

4.2.1.3.2.3 SOP specific Conformance for SOP classes

Main AE provides standard Conformance to the Study Root Query/Retrieve Information Model – MOVE.

4.2.1.4 Association Acceptance Policy

4.2.1.4.1 Activity Receive Objects

4.2.1.4.1.1 Description and Sequencing of Activities

Main AE accepts C-STORE requests for all the supported SOP Classes. Images are stored into the Syngo MobileViewer database as soon as they are received. After an image is stored into the database, Syngo MobileViewer sends a successful C-STORE response back to the sender.

4.2.1.4.1.2 Accepted Presentation Contexts

Accepted Presentation Context for supported SOP Classes				
Abstract Syntax		**Transfer Syntax**		Role
Name	*UID*	*Name List*	*UID List*	
Computed Radiography Image Storage	1.2.840.10008.5.1.4.1.1.1	Implicit VR Little Endian Non-Explicit VR Big Endian	1.2.840.10008.1.2 1.2.840.10008.1.2.2	SCU
Digital X-Ray Image Storage – For Processing	1.2.840.10008.5.1.4.1.1.1.1.1			
CT Image Storage MR Image Storage	1.2.840.10008.5.1.4.1.1.2	------------------------------- JPEG2000LosslessOnly JPEG2000TransferSyntax	------------------------------- 1.2.840.10008.1.2.4.90 1.2.840.10008.1.2.4.91	
MR Image Storage	1.2.840.10008.5.1.4.1.1.4	JPEGLossless: Non-hierar-chical-1stOrderPrediction	1.2.840.10008.1.2.4.70	
Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7	JPEGLossless: Non-hierar-chical: Process14	1.2.840.10008.1.2.4.57	
			1.2.840.10008.1.2.4.50	

		JPEGBaseline (1.2.840.10008.1.2.4.50)		
Encapsulated PDF Storage SOP Class	1.2.840.10008.5.1.4.1.1.104.1	JPEGBaseline (1.2.840.10008.1.2.4.50)		
Positron Emission Tomography Image Storage	1.2.840.10008.5.1.4.1.1.128			

Table 5 Accepted Presentation Contexts

4.2.1.4.1.3 SOP specific Conformance for SOP classes

Main AE provides standard Conformance to the Storage SOP Classes listed in Table 1 of the Overview.

Syngo MobileViewer's Store SCP is promiscuous and does not reject associations from unknown AETs or IPs. Syngo MobileViewer will accept storage requests, but if the stored SOP instance is not one that was solicited by Syngo MobileViewer then the instance is discarded, and a warning is issued in the logs.

The following table lists communication failures for the Store Activity of Main AE

Code	Name	Severity	Description
a700	Refused: out of recourses	Failure	Application out of memory, file system or database write error (e.g. full)
a800	Refused: SOP class not supported	Failure	Received C-STORE-RQ for non-storage SOP class
a900	Error: data set does not match SOP class	Failure	SOP class or instance UID in C-STORE-RQ does not match UIDs in the dataset
c000	Error: cannot understand	Failure	Received dataset without SOP class or instance UID; received Presentation State that failed systax check; internal application error

Table 6 Error Codes for STORE commands

4.3 Network Interfaces

4.3.1 Physical Network Interface

Syngo MobileViewer is independent to the physical medium over which TCP/IP executes; it inherits this from the OS system upon which it executes.

4.3.2 Additional Protocols

N/A.

4.3.3 IPv4 and IPv6 Support

Currently only IPv4 networks are supported (no support for IPv6).

4.4 Configuration

4.4.1 AE Title / Presentation Address Mapping

Syngo MobileViewer maps Application Entity Titles to host name and port number via an internal configuration method. The IP address for the host name is determined using standard system calls.
The AE Titles, hostnames and port numbers can be changed with the configuration utility
Associations for unknown/untrusted partners will be rejected for all SCP services

5 Media Interchange

N/A

6 Support of Extended Character Sets

Syngo MobileViewer supports the following UNICODE character sets enabling the display of DICOM data (of e.g., Patient names):

- 7-bit ASCII
- Latin alphabet no1 (IR100), no 2 (IR101), no 3 (IR109), no 4 (IR 110)
- Unicode UTF-8

7 Security

Please refer to Syngo MobileViewer Product and Solution Security Whitepaper for network information, definition of port numbers and their services / functions as well as allowed services through the network running on the device.