

Merge Universal Viewer

9.2

PACS Gateway DICOM Conformance Statement

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Chapter 1. Conformance Statement Overview

This document describes the DICOM v3.0 implementation supported by Merge Universal Viewer PACS Gateway. It documents conformance aspects required to interoperate with other DICOM v3.0 conformant devices.

Merge Universal Viewer PACS Gateway is an application that allows medical data to be sent between two DICOM data sources. The application exposes a DICOM endpoint (C-STORE SCP) to which external PACS can push DICOM data which will then be uploaded to Merge Universal Viewer through a secure Web service and eventually it is transferred to the target destination data source through DICOM communication by Merge Universal Viewer.

Supported Networking DICOM Service (SOP) Classes:

Table 1 – Network Services

SOP Classes	User of Service (SCU)	Provider of Service (SCP)
Transfer		
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
Digital Mammography X-Ray Image Storage - For Presentation 1.2.840.10008.5.1.4.1.1.1.2	No	Yes
Digital Mammography X-Ray Image Storage - For Processing 1.2.840.10008.5.1.4.1.1.1.2.1	No	Yes
Digital Intra-oral X-Ray Image Storage - For Presentation 1.2.840.10008.5.1.4.1.1.1.3	No	Yes
Digital Intra-oral X-Ray Image Storage - For Processing 1.2.840.10008.5.1.4.1.1.1.3.1	No	Yes
CT Image Storage 1.2.840.10008.5.1.4.1.1.2	No	Yes
Enhanced CT Image Storage 1.2.840.10008.5.1.4.1.1.2.1	No	Yes
Legacy Converted Enhanced CT Image Storage 1.2.840.10008.5.1.4.1.1.2.2	No	Yes

SOP Classes	User of Service (SCU)	Provider of Service (SCP)
Ultrasound Multi-frame Image Storage (Retired) 1.2.840.10008.5.1.4.1.1.3	No	Yes
Ultrasound Multi-frame Image Storage 1.2.840.10008.5.1.4.1.1.3.1	No	Yes
MR Image Storage 1.2.840.10008.5.1.4.1.1.4	No	Yes
Enhanced MR Image Storage 1.2.840.10008.5.1.4.1.1.4.1	No	Yes
MR Spectroscopy Storage 1.2.840.10008.5.1.4.1.1.4.2	No	Yes
Enhanced MR Color Image Storage 1.2.840.10008.5.1.4.1.1.4.3	No	Yes
Legacy Converted Enhanced MR Image Storage 1.2.840.10008.5.1.4.1.1.4.4	No	Yes
Nuclear Medicine Image Storage (Retired) 1.2.840.10008.5.1.4.1.1.5	No	Yes
Ultrasound Image Storage (Retired) 1.2.840.10008.5.1.4.1.1.6	No	Yes
Ultrasound Image Storage 1.2.840.10008.5.1.4.1.1.6.1	No	Yes
Enhanced US Volume Storage 1.2.840.10008.5.1.4.1.1.6.2	No	Yes
Photoacoustic Image Storage 1.2.840.10008.5.1.4.1.1.6.3	No	Yes
Secondary Capture Image Storage 1.2.840.10008.5.1.4.1.1.7	No	Yes
Multi-frame Single Bit Secondary Capture Image Storage 1.2.840.10008.5.1.4.1.1.7.1	No	Yes
Multi-frame Grayscale Byte Secondary Capture Image Storage 1.2.840.10008.5.1.4.1.1.7.2	No	Yes
Multi-frame Grayscale Word Secondary Capture Image Storage 1.2.840.10008.5.1.4.1.1.7.3	No	Yes
Multi-frame True Color Secondary Capture Image Storage 1.2.840.10008.5.1.4.1.1.7.4	No	Yes
12-lead ECG Waveform Storage 1.2.840.10008.5.1.4.1.1.9.1.1	No	Yes

SOP Classes	User of Service (SCU)	Provider of Service (SCP)
General ECG Waveform Storage 1.2.840.10008.5.1.4.1.1.9.1.2	No	Yes
Ambulatory ECG Waveform Storage 1.2.840.10008.5.1.4.1.1.9.1.3	No	Yes
General 32-bit ECG Waveform Storage 1.2.840.10008.5.1.4.1.1.9.1.4	No	Yes
Hemodynamic Waveform Storage 1.2.840.10008.5.1.4.1.1.9.2.1	No	Yes
Cardiac Electrophysiology Waveform Storage 1.2.840.10008.5.1.4.1.1.9.3.1	No	Yes
Basic Voice Audio Waveform Storage 1.2.840.10008.5.1.4.1.1.9.4.1	No	Yes
General Audio Waveform Storage 1.2.840.10008.5.1.4.1.1.9.4.2	No	Yes
Arterial Pulse Waveform Storage 1.2.840.10008.5.1.4.1.1.9.5.1	No	Yes
Respiratory Waveform Storage 1.2.840.10008.5.1.4.1.1.9.6.1	No	Yes
Multi-channel Respiratory Waveform Storage 1.2.840.10008.5.1.4.1.1.9.6.2	No	Yes
Routine Scalp Electroencephalogram Waveform Storage 1.2.840.10008.5.1.4.1.1.9.7.1	No	Yes
Electromyogram Waveform Storage 1.2.840.10008.5.1.4.1.1.9.7.2	No	Yes
Electrooculogram Waveform Storage 1.2.840.10008.5.1.4.1.1.9.7.3	No	Yes
Sleep Electroencephalogram Waveform Storage 1.2.840.10008.5.1.4.1.1.9.7.4	No	Yes
Body Position Waveform Storage 1.2.840.10008.5.1.4.1.1.9.8.1	No	Yes
Waveform Presentation State Storage 1.2.840.10008.5.1.4.1.1.9.100.1	No	Yes
Waveform Acquisition Presentation State Storage 1.2.840.10008.5.1.4.1.1.9.100.2	No	Yes
Grayscale Softcopy Presentation State Storage 1.2.840.10008.5.1.4.1.1.11.1	No	Yes

SOP Classes	User of Service (SCU)	Provider of Service (SCP)
Color Softcopy Presentation State Storage 1.2.840.10008.5.1.4.1.1.11.2	No	Yes
Pseudo-Color Softcopy Presentation State Storage 1.2.840.10008.5.1.4.1.1.11.3	No	Yes
Blending Softcopy Presentation State Storage 1.2.840.10008.5.1.4.1.1.11.4	No	Yes
XA/XRF Grayscale Softcopy Presentation State Storage 1.2.840.10008.5.1.4.1.1.11.5	No	Yes
Grayscale Planar MPR Volumetric Presentation State Storage 1.2.840.10008.5.1.4.1.1.11.6	No	Yes
Compositing Planar MPR Volumetric Presentation State Storage 1.2.840.10008.5.1.4.1.1.11.7	No	Yes
Advanced Blending Presentation State Storage 1.2.840.10008.5.1.4.1.1.11.8	No	Yes
Volume Rendering Volumetric Presentation State Storage 1.2.840.10008.5.1.4.1.1.11.9	No	Yes
Segmented Volume Rendering Volumetric Presentation State Storage 1.2.840.10008.5.1.4.1.1.11.10	No	Yes
Multiple Volume Rendering Volumetric Presentation State Storage 1.2.840.10008.5.1.4.1.1.11.11	No	Yes
Variable Modality LUT Softcopy Presentation State Storage 1.2.840.10008.5.1.4.1.1.11.12	No	Yes
X-Ray Angiographic Image Storage 1.2.840.10008.5.1.4.1.1.12.1	No	Yes
Enhanced XA Image Storage 1.2.840.10008.5.1.4.1.1.12.1.1	No	Yes
X-Ray Radiofluoroscopic Image Storage 1.2.840.10008.5.1.4.1.1.12.2	No	Yes
Enhanced XRF Image Storage 1.2.840.10008.5.1.4.1.1.12.2.1	No	Yes
X-Ray Angiographic Bi-Plane Image Storage (Retired) 1.2.840.10008.5.1.4.1.1.12.3	No	Yes
X-Ray 3D Angiographic Image Storage 1.2.840.10008.5.1.4.1.1.13.1.1	No	Yes
X-Ray 3D Craniofacial Image Storage 1.2.840.10008.5.1.4.1.1.13.1.2	No	Yes

SOP Classes	User of Service (SCU)	Provider of Service (SCP)
Breast Tomosynthesis Image Storage 1.2.840.10008.5.1.4.1.1.13.1.3	No	Yes
Breast Projection X-Ray Image Storage - For Presentation 1.2.840.10008.5.1.4.1.1.13.1.4	No	Yes
Breast Projection X-Ray Image Storage - For Processing 1.2.840.10008.5.1.4.1.1.13.1.5	No	Yes
Intravascular Optical Coherence Tomography Image Storage - For Presentation 1.2.840.10008.5.1.4.1.1.14.1	No	Yes
Intravascular Optical Coherence Tomography Image Storage - For Processing 1.2.840.10008.5.1.4.1.1.14.2	No	Yes
Nuclear Medicine Image Storage 1.2.840.10008.5.1.4.1.1.20	No	Yes
Parametric Map Storage 1.2.840.10008.5.1.4.1.1.30	No	Yes
Raw Data Storage 1.2.840.10008.5.1.4.1.1.66	No	Yes
Spatial Registration Storage 1.2.840.10008.5.1.4.1.1.66.1	No	Yes
Spatial Fiducials Storage 1.2.840.10008.5.1.4.1.1.66.2	No	Yes
Deformable Spatial Registration Storage 1.2.840.10008.5.1.4.1.1.66.3	No	Yes
Segmentation Storage 1.2.840.10008.5.1.4.1.1.66.4	No	Yes
Surface Segmentation Storage 1.2.840.10008.5.1.4.1.1.66.5	No	Yes
Tractography Results Storage 1.2.840.10008.5.1.4.1.1.66.6	No	Yes
Label Map Segmentation Storage 1.2.840.10008.5.1.4.1.1.66.7	No	Yes
Height Map Segmentation Storage 1.2.840.10008.5.1.4.1.1.66.8	No	Yes
Real World Value Mapping Storage 1.2.840.10008.5.1.4.1.1.67	No	Yes
Surface Scan Mesh Storage 1.2.840.10008.5.1.4.1.1.68.1	No	Yes

SOP Classes	User of Service (SCU)	Provider of Service (SCP)
Surface Scan Point Cloud Storage 1.2.840.10008.5.1.4.1.1.68.2	No	Yes
VL Endoscopic Image Storage 1.2.840.10008.5.1.4.1.1.77.1.1	No	Yes
Video Endoscopic Image Storage 1.2.840.10008.5.1.4.1.1.77.1.1.1	No	Yes
VL Microscopic Image Storage 1.2.840.10008.5.1.4.1.1.77.1.2	No	Yes
Video Microscopic Image Storage 1.2.840.10008.5.1.4.1.1.77.1.2.1	No	Yes
VL Slide-Coordinates Microscopic Image Storage 1.2.840.10008.5.1.4.1.1.77.1.3	No	Yes
VL Photographic Image Storage 1.2.840.10008.5.1.4.1.1.77.1.4	No	Yes
Video Photographic Image Storage 1.2.840.10008.5.1.4.1.1.77.1.4.1	No	Yes
Ophthalmic Photography 8 Bit Image Storage 1.2.840.10008.5.1.4.1.1.77.1.5.1	No	Yes
Ophthalmic Photography 16 Bit Image Storage 1.2.840.10008.5.1.4.1.1.77.1.5.2	No	Yes
Stereometric Relationship Storage 1.2.840.10008.5.1.4.1.1.77.1.5.3	No	Yes
Ophthalmic Tomography Image Storage 1.2.840.10008.5.1.4.1.1.77.1.5.4	No	Yes
Wide Field Ophthalmic Photography Stereographic Projection Image Storage 1.2.840.10008.5.1.4.1.1.77.1.5.5	No	Yes
Wide Field Ophthalmic Photography 3D Coordinates Image Storage 1.2.840.10008.5.1.4.1.1.77.1.5.6	No	Yes
Ophthalmic Optical Coherence Tomography En Face Image Storage 1.2.840.10008.5.1.4.1.1.77.1.5.7	No	Yes
Ophthalmic Optical Coherence Tomography B-scan Volume Analysis Storage 1.2.840.10008.5.1.4.1.1.77.1.5.8	No	Yes
VL Whole Slide Microscopy Image Storage 1.2.840.10008.5.1.4.1.1.77.1.6	No	Yes
Dermoscopic Photography Image Storage 1.2.840.10008.5.1.4.1.1.77.1.7	No	Yes

SOP Classes	User of Service (SCU)	Provider of Service (SCP)
Lensometry Measurements Storage 1.2.840.10008.5.1.4.1.1.78.1	No	Yes
Autorefraction Measurements Storage 1.2.840.10008.5.1.4.1.1.78.2	No	Yes
Keratometry Measurements Storage 1.2.840.10008.5.1.4.1.1.78.3	No	Yes
Subjective Refraction Measurements Storage 1.2.840.10008.5.1.4.1.1.78.4	No	Yes
Visual Acuity Measurement Storage 1.2.840.10008.5.1.4.1.1.78.5	No	Yes
Spectacle Prescription Reports Storage 1.2.840.10008.5.1.4.1.1.78.6	No	Yes
Ophthalmic Axial Measurements Storage 1.2.840.10008.5.1.4.1.1.78.7	No	Yes
Intraocular Lens Calculations Storage 1.2.840.10008.5.1.4.1.1.78.8	No	Yes
Macular Grid Thickness and Volume Report Storage 1.2.840.10008.5.1.4.1.1.79.1	No	Yes
Ophthalmic Visual Field Static Perimetry Measurements Storage 1.2.840.10008.5.1.4.1.1.80.1	No	Yes
Ophthalmic Thickness Map Storage 1.2.840.10008.5.1.4.1.1.81.1	No	Yes
Corneal Topography Map Storage 1.2.840.10008.5.1.4.1.1.82.1	No	Yes
Basic Text SR Storage 1.2.840.10008.5.1.4.1.1.88.11	No	Yes
Enhanced SR Storage 1.2.840.10008.5.1.4.1.1.88.22	No	Yes
Comprehensive SR Storage 1.2.840.10008.5.1.4.1.1.88.33	No	Yes
Comprehensive 3D SR Storage 1.2.840.10008.5.1.4.1.1.88.34	No	Yes
Extensible SR Storage 1.2.840.10008.5.1.4.1.1.88.35	No	Yes
Procedure Log Storage 1.2.840.10008.5.1.4.1.1.88.40	No	Yes

SOP Classes	User of Service (SCU)	Provider of Service (SCP)
Mammography CAD SR Storage 1.2.840.10008.5.1.4.1.1.88.50	No	Yes
Key Object Selection Document Storage 1.2.840.10008.5.1.4.1.1.88.59	No	Yes
Chest CAD SR Storage 1.2.840.10008.5.1.4.1.1.88.65	No	Yes
X-Ray Radiation Dose SR Storage 1.2.840.10008.5.1.4.1.1.88.67	No	Yes
Radiopharmaceutical Radiation Dose SR Storage 1.2.840.10008.5.1.4.1.1.88.68	No	Yes
Colon CAD SR Storage 1.2.840.10008.5.1.4.1.1.88.69	No	Yes
Implantation Plan SR Storage 1.2.840.10008.5.1.4.1.1.88.70	No	Yes
Acquisition Context SR Storage 1.2.840.10008.5.1.4.1.1.88.71	No	Yes
Simplified Adult Echo SR Storage 1.2.840.10008.5.1.4.1.1.88.72	No	Yes
Patient Radiation Dose SR Storage 1.2.840.10008.5.1.4.1.1.88.73	No	Yes
Planned Imaging Agent Administration SR Storage 1.2.840.10008.5.1.4.1.1.88.74	No	Yes
Performed Imaging Agent Administration SR Storage 1.2.840.10008.5.1.4.1.1.88.75	No	Yes
Enhanced X-Ray Radiation Dose SR Storage 1.2.840.10008.5.1.4.1.1.88.76	No	Yes
Waveform Annotation SR Storage 1.2.840.10008.5.1.4.1.1.88.77	No	Yes
Content Assessment Results Storage 1.2.840.10008.5.1.4.1.1.90.1	No	Yes
Microscopy Bulk Simple Annotations Storage 1.2.840.10008.5.1.4.1.1.91.1	No	Yes
Encapsulated PDF Storage 1.2.840.10008.5.1.4.1.1.104.1	No	Yes
Encapsulated CDA Storage 1.2.840.10008.5.1.4.1.1.104.2	No	Yes

SOP Classes	User of Service (SCU)	Provider of Service (SCP)
Encapsulated STL Storage 1.2.840.10008.5.1.4.1.1.104.3	No	Yes
Encapsulated OBJ Storage 1.2.840.10008.5.1.4.1.1.104.4	No	Yes
Encapsulated MTL Storage 1.2.840.10008.5.1.4.1.1.104.5	No	Yes
Positron Emission Tomography Image Storage 1.2.840.10008.5.1.4.1.1.128	No	Yes
Legacy Converted Enhanced PET Image Storage 1.2.840.10008.5.1.4.1.1.128.1	No	Yes
Enhanced PET Image Storage 1.2.840.10008.5.1.4.1.1.130	No	Yes
Basic Structured Display Storage 1.2.840.10008.5.1.4.1.1.131	No	Yes
CT Defined Procedure Protocol Storage 1.2.840.10008.5.1.4.1.1.200.1	No	Yes
CT Performed Procedure Protocol Storage 1.2.840.10008.5.1.4.1.1.200.2	No	Yes
Protocol Approval Storage 1.2.840.10008.5.1.4.1.1.200.3	No	Yes
XA Defined Procedure Protocol Storage 1.2.840.10008.5.1.4.1.1.200.7	No	Yes
XA Performed Procedure Protocol Storage 1.2.840.10008.5.1.4.1.1.200.8	No	Yes
Inventory Storage 1.2.840.10008.5.1.4.1.1.201.1	No	Yes
RT Image Storage 1.2.840.10008.5.1.4.1.1.481.1	No	Yes
RT Dose Storage 1.2.840.10008.5.1.4.1.1.481.2	No	Yes
RT Structure Set Storage 1.2.840.10008.5.1.4.1.1.481.3	No	Yes
RT Beams Treatment Record Storage 1.2.840.10008.5.1.4.1.1.481.4	No	Yes
RT Plan Storage 1.2.840.10008.5.1.4.1.1.481.5	No	Yes

SOP Classes	User of Service (SCU)	Provider of Service (SCP)
RT Brachy Treatment Record Storage 1.2.840.10008.5.1.4.1.1.481.6	No	Yes
RT Treatment Summary Record Storage 1.2.840.10008.5.1.4.1.1.481.7	No	Yes
RT Ion Plan Storage 1.2.840.10008.5.1.4.1.1.481.8	No	Yes
RT Ion Beams Treatment Record Storage 1.2.840.10008.5.1.4.1.1.481.9	No	Yes
RT Physician Intent Storage 1.2.840.10008.5.1.4.1.1.481.10	No	Yes
RT Segment Annotation Storage 1.2.840.10008.5.1.4.1.1.481.11	No	Yes
RT Radiation Set Storage 1.2.840.10008.5.1.4.1.1.481.12	No	Yes
C-Arm Photon-Electron Radiation Storage 1.2.840.10008.5.1.4.1.1.481.13	No	Yes
Tomotherapeutic Radiation Storage 1.2.840.10008.5.1.4.1.1.481.14	No	Yes
Robotic-Arm Radiation Storage 1.2.840.10008.5.1.4.1.1.481.15	No	Yes
RT Radiation Record Set Storage 1.2.840.10008.5.1.4.1.1.481.16	No	Yes
RT Radiation Salvage Record Storage 1.2.840.10008.5.1.4.1.1.481.17	No	Yes
Tomotherapeutic Radiation Record Storage 1.2.840.10008.5.1.4.1.1.481.18	No	Yes
C-Arm Photon-Electron Radiation Record Storage 1.2.840.10008.5.1.4.1.1.481.19	No	Yes
Robotic Radiation Record Storage 1.2.840.10008.5.1.4.1.1.481.20	No	Yes
RT Radiation Set Delivery Instruction Storage 1.2.840.10008.5.1.4.1.1.481.21	No	Yes
RT Treatment Preparation Storage 1.2.840.10008.5.1.4.1.1.481.22	No	Yes
Enhanced RT Image Storage 1.2.840.10008.5.1.4.1.1.481.23	No	Yes

SOP Classes	User of Service (SCU)	Provider of Service (SCP)
Enhanced Continuous RT Image Storage 1.2.840.10008.5.1.4.1.1.481.24	No	Yes
RT Patient Position Acquisition Instruction Storage 1.2.840.10008.5.1.4.1.1.481.25	No	Yes
RT Beams Delivery Instruction Storage 1.2.840.10008.5.1.4.34.7	No	Yes
RT Brachy Application Setup Delivery Instruction Storage 1.2.840.10008.5.1.4.34.10	No	Yes
Hanging Protocol Storage 1.2.840.10008.5.1.4.38.1	No	Yes
Color Palette Storage 1.2.840.10008.5.1.4.39.1	No	Yes
Generic Implant Template Storage 1.2.840.10008.5.1.4.43.1	No	Yes
Implant Assembly Template Storage 1.2.840.10008.5.1.4.44.1	No	Yes
Implant Template Group Storage 1.2.840.10008.5.1.4.45.1	No	Yes

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Chapter 3. Introduction

Merge Universal Viewer PACS Gateway (subsequently referred to as "the application") is an application that allows medical data to be sent between two DICOM data sources over HTTPS and WSS. It always interacts with the Merge Universal Viewer (subsequently referred to as "MUV") user domain it is associated with. The application exposes a DICOM endpoint (C-STORE SCP) to which external PACS can push DICOM data. In this scenario the application acts as a DICOM C-STORE SCP when receiving DICOM data for one of its configured local AE titles from a DICOM SCU. It also receives data from MUV server over websocket and sends to local external PACS. In this scenario it acts as a DICOM C-STORE SCU.

Once the data is stored into the application successfully, it is uploaded to MUV through a secure Web service. Upon the data being uploaded successfully, MUV sends the data to a target DICOM data source through DICOM communication by MUV.

3.1. Audience

This document is written for the people that need to understand how the application will integrate into their healthcare facility. This includes both those responsible for overall imaging network policy and architecture, as well as integrators who need to have a detailed understanding of the DICOM features of the product. This document contains some basic DICOM definitions so that any reader may understand how this product implements DICOM features. However, integrators are expected to fully understand all the DICOM terminology, how the tables in this document relate to the product's functionality, and how that functionality integrates with other devices that support compatible DICOM features.

3.2. Remarks

The scope of this DICOM Conformance Statement is to facilitate integration between the application and other DICOM products. The Conformance Statement should be read and understood in conjunction with the DICOM Standard. 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 different Conformance Statements is just the first step towards assessing interconnectivity and interoperability between the product and other DICOM conformant equipment.
- Test procedures should be defined and executed to validate the required level of interoperability with specific compatible DICOM equipment, as established by the healthcare facility.

3.3. Definitions

Informal definitions are provided for the following terms used in this Conformance Statement. The DICOM Standard is the authoritative source for formal definitions of these terms.

Abstract Syntax – the information agreed to be exchanged between applications, generally equivalent to a Service/Object Pair (SOP) Class. Examples: Verification SOP Class, Modality Worklist Information Model Find SOP Class, Co Accepted Presentation Imputed Radiography Image Storage SOP Class.

Application Entity (AE) – an end point of a DICOM information exchange, including the DICOM network or media interface software; i.e., the software that sends or receives DICOM information objects or messages. A single device may have multiple Application Entities.

Application Context – the specification of the type of communication used between *Application Entities*. Example: DICOM network protocol.

Application Entity Title – the externally known name of an Application Entity, used to identify a DICOM application to other DICOM applications on the network.

Association – a network communication channel set up between Application Entities.

Attribute – a unit of information in an object definition; a data element identified by a *tag*. The information may be a complex data structure (Sequence), itself composed of lower level data elements. Examples: Patient ID (0010,0020), Accession Number (0008,0050), Photometric Interpretation (0028,0004), Procedure Code Sequence (0008,1032).

Information Object Definition (IOD) – the specified set of *Attributes* that comprise a type of data object; does not represent a specific instance of the data object, but rather a class of similar data objects that have the same properties. The *Attributes* may be specified as Mandatory (Type 1), Required but possibly unknown (Type 2), or Optional (Type 3), and there may be conditions associated with the use of an Attribute (Types 1C and 2C). Examples: MR Image IOD, CT Image IOD, Print Job IOD.

Joint Photographic Experts Group (JPEG) – a set of standardized image compression techniques, available for use by DICOM applications.

Media Application Profile – the specification of DICOM information objects and encoding exchanged on removable media (e.g., CDs)

Module – a set of *Attributes* within an *Information Object Definition* that are logically related to each other. Example: Patient Module includes Patient Name, Patient ID, Patient Birth Date, and Patient Sex.

Negotiation – first phase of Association establishment that allows Application Entities to agree on the types of data to be exchanged and how that data will be encoded.

Presentation Context – the set of DICOM network services used over an Association, as negotiated between Application Entities; includes Abstract Syntaxes and Transfer Syntaxes.

Security Profile – a set of mechanisms, such as encryption, user authentication, or digital signatures, used by an *Application Entity* to ensure confidentiality, integrity, and/or availability of exchanged DICOM data

Service Class Provider (SCP) – role of an Application Entity that provides a DICOM network service; typically, a server that performs operations requested by another Application Entity (Service Class User). Examples: Picture Archiving and Communication System (image storage SCP, and image query/retrieve SCP), Radiology Information System (modality worklist SCP).

Service Class User (SCU) – role of an Application Entity that uses a DICOM network service; typically, a client. Examples: imaging modality (image storage SCU, and modality worklist SCU), imaging workstation (image query/retrieve SCU)

Service/Object Pair (SOP) Class – the specification of the network or media transfer (service) of a particular type of data (object); the fundamental unit of DICOM interoperability specification. Examples: Ultrasound Image Storage Service, Basic Grayscale Print Management.

Service/Object Pair (SOP) Instance – an information object; a specific occurrence of information exchanged in a SOP Class. Examples: a specific x-ray image.

Tag – a 32-bit identifier for a data element, represented as a pair of four digit hexadecimal numbers, the “group” and the “element”. If the “group” number is odd, the tag is for a private (manufacturer-specific) data element. Examples: (0010,0020) [Patient ID], (07FE,0010) [Pixel Data], (0019,0210) [private data element]

Transfer Syntax – A set of encoding rules that allow Application Entities to unambiguously negotiate the encoding techniques (e.g., Data Element structure, byte ordering, compression) they are able to support, thereby allowing these Application Entities to communicate. Examples: JPEG Baseline, Explicit VR Little Endian.

Unique Identifier (UID) – a globally unique “dotted decimal” string that identifies a specific object or a class of objects; an ISO-8824 Object Identifier. Examples: Study Instance UID, SOP Class UID, SOP Instance UID.

Value Representation (VR) – the format type of an individual DICOM data element, such as text, an integer, a person’s name, or a code. DICOM information objects can be transmitted with either explicit identification of the type of each data element (Explicit VR), or without explicit identification (Implicit VR); with Implicit VR, the receiving application must use a DICOM data dictionary to look up the format of each data element.

3.4. Basics of DICOM Communication

This section describes terminology used in this Conformance Statement for the non-specialist. The key terms used in the Conformance Statement are highlighted in *italics* below. This section is not a substitute for training about DICOM, and it makes many simplifications about the meanings of DICOM terms.

Two *Application Entities* (devices) that want to communicate with each other over a network using DICOM protocol must first agree on several things during an initial network “handshake”. One of the two devices must initiate an *Association* (a connection to the other device), and ask if specific services, information, and encoding can be supported by the other device (*Negotiation*).

DICOM specifies a number of network services and types of information objects, each of which is called an *Abstract Syntax* for the Negotiation. DICOM also specifies a variety of methods for encoding data, denoted *Transfer Syntaxes*. The Negotiation allows the initiating Application Entity to propose combinations of Abstract Syntax and Transfer Syntax to be used on the Association; these combinations are called *Presentation Contexts*. The receiving Application Entity accepts the Presentation Contexts it supports.

For each Presentation Context, the Association Negotiation also allows the devices to agree on *Roles* – which one is the *Service Class User* (SCU - client) and which is the *Service Class Provider* (SCP - server). Normally the device initiating the connection is the SCU, i.e., the client system calls the server, but not always.

The Association Negotiation finally enables exchange of maximum network packet (*PDU*) size, security information, and network service options (called *Extended Negotiation* information). The Application Entities, having negotiated the Association parameters, may now commence exchanging data. Common data exchanges include queries for worklists and lists of stored images, transfer of image objects and analyses (structured reports), and sending images to film printers. Each exchangeable unit of data is formatted by the sender in accordance with the appropriate *Information Object Definition*, and sent using the negotiated Transfer Syntax. There is a Default Transfer Syntax that all systems must accept, but it may not be the most

efficient for some use cases. Each transfer is explicitly acknowledged by the receiver with a *Response Status* indicating success, failure, or that query or retrieve operations are still in process.

Two Application Entities may also communicate with each other by exchanging media (such as a CD-R). Since there is no Association Negotiation possible, they both use a *Media Application Profile* that specifies “pre-negotiated” exchange media format, Abstract Syntax, and Transfer Syntax.

3.5. Abbreviations

AE	Application Entity
AET	Application Entity Title
IPv4	Internet Protocol version 4
PACS	Picture Archiving and Communication System
TCP/IP	Transmission Control Protocol/Internet Protocol
PCL	Proposed Context List

3.6. References

NEMA PS3 – Digital Imaging and Communications in Medicine (DICOM) Standard 2025a, available free at <http://medical.nema.org/>.

Chapter 4. Networking

This section describes the networking related services of the application.

4.1. Implementation Model

4.1.1. Application Data Flow

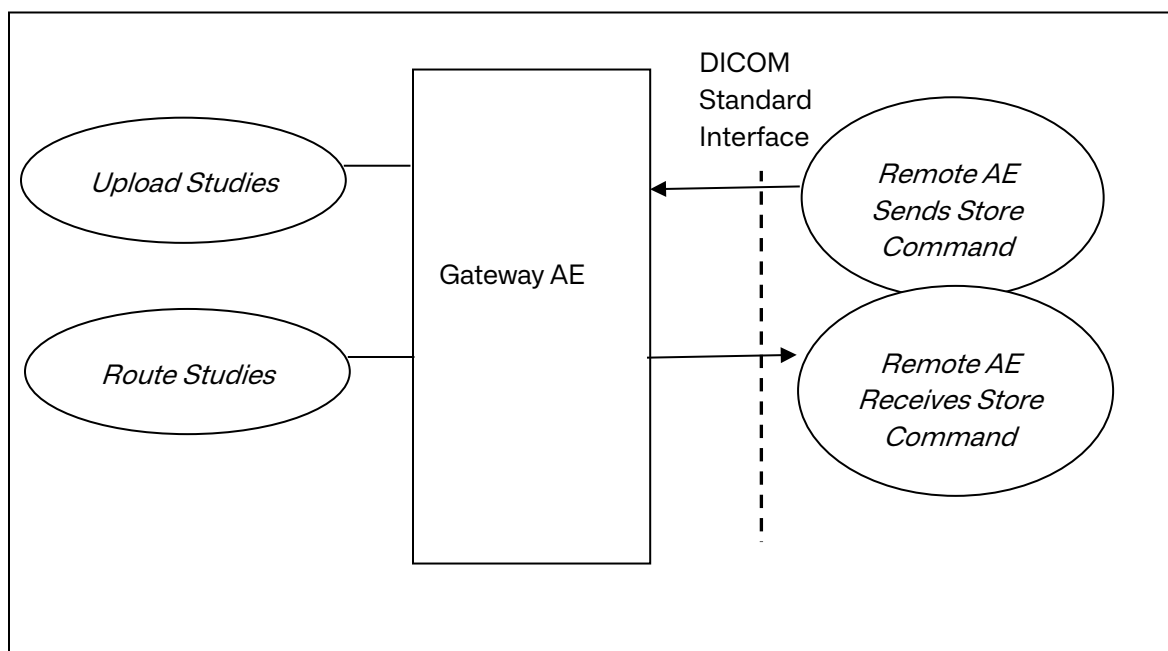


Figure 1 – Gateway AE Data Flow

The Gateway AE uploads DICOM studies received from external PACS to MUV server, and also routes studies received from MUV server to destination PACS.

4.1.2. Functional Definition of AE's

The application exposes a single Gateway AE.

4.1.2.1. Functional Definition of Gateway AE

4.1.2.1.1. Upload Studies

When an external PACS is invoked to upload studies to MUV server, the Gateway AE receives a message to request that an association is started with a DICOM SCP device that is locally configured on the application. If the association request is successful, the external PACS sends the instances of the studies to the Gateway AE. Upon data recipient, the data will be stored on the application temporary until it has been uploaded to MUV successfully.

4.1.2.1.2. Route Studies

When MUV server routes studies to a PACS Gateway installed in a remote site, the Gateway AE of that PACS Gateway is activated to forward received instances to the destination PACS. For each received instance that needs to be routed, an association request is sent to the destination PACS. Upon successful negotiation of the association, the storage request will be sent for the instance.

4.1.3. Sequencing of Real World Activities

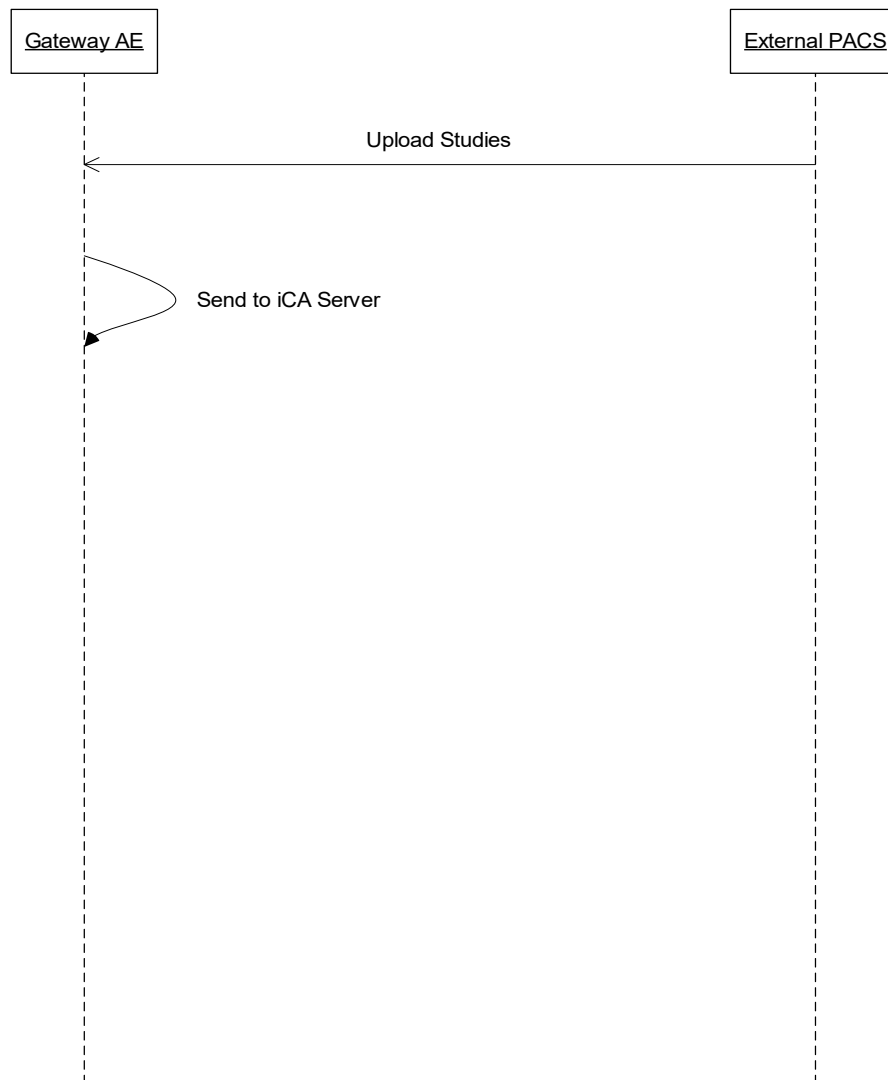


Figure 2 – Real-World Activity Sequencing for Uploading Studies

In the scenario of uploading studies, the application receives DICOM C-STORE commands from an external PACS and then uploads to MUV server.

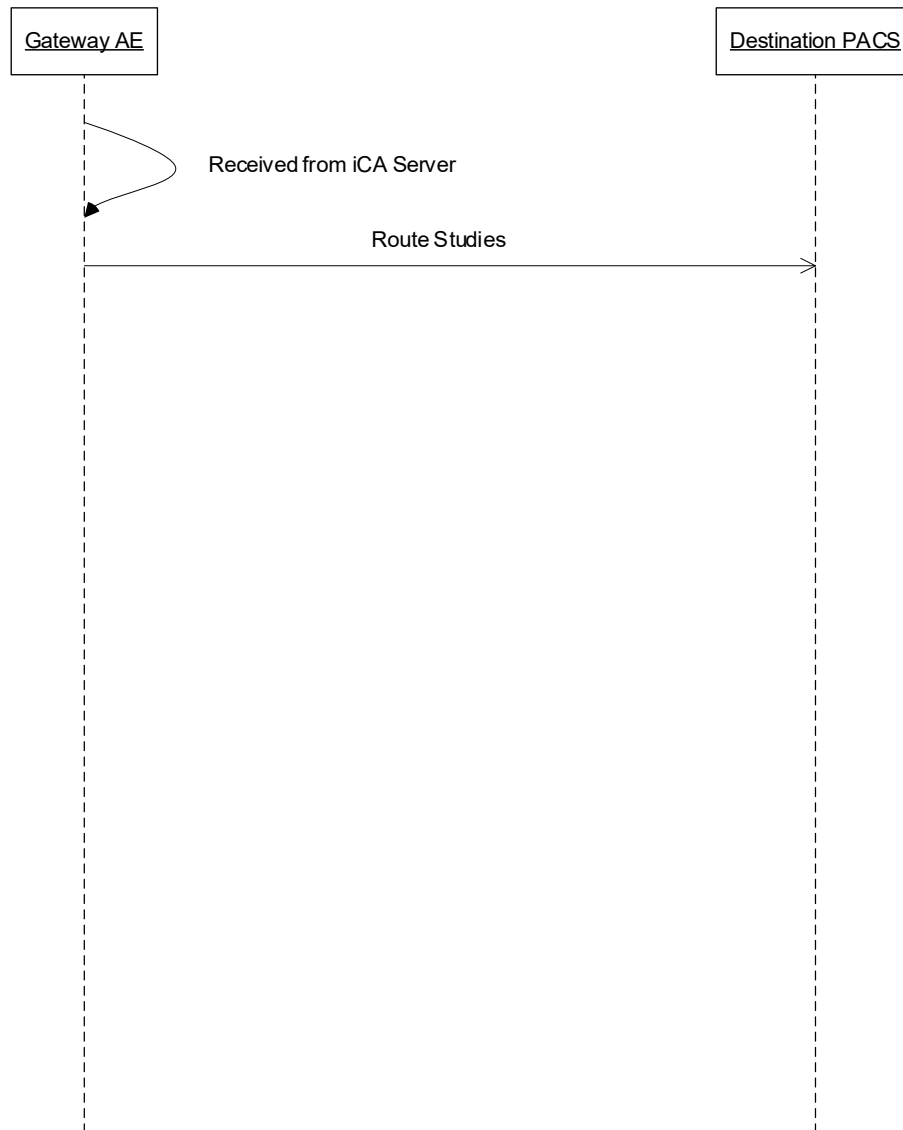


Figure 3 – Real-World Activity Sequencing for Routing Studies

In the scenario of routing studies, the application receives data from MUV server, and then forwards them to the destination PACS by sending DICOM C-STORE commands to it.

4.2. AE Specifications

4.2.1. Gateway Application Entity Specification

4.2.1.1. SOP Classes

The application provides Standard Conformance to the following SOP Classes.

SOP Class UID	SOP Class Name	SCU	SCP
Verification			
1.2.840.10008.1.1	Verification	No	Yes
Transfer			
All storage classes listed under “Transfer” section of Table 1 in section Chapter 1	See Table 1	See Table 1	See Table 1

4.2.1.2. Association Policies

4.2.1.2.1. General

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

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

4.2.1.2.2. Number of Associations

The Gateway AE can accept any number of associations simultaneously.

4.2.1.2.3. Asynchronous Nature

The Gateway AE does not support asynchronous operations and will not perform asynchronous window negotiation.

4.2.1.2.4. Implementation Identifying Information

The application uses the following implementation identifying information:

Implementation Class UID	2.16.840.1.113669.2013.1.2
Implementation Version Name	MERGE UV 8.3

4.2.1.3. Association Initiation Policy

This section describes the conditions under which the Gateway AE SCU will initiate an association.

4.2.1.3.1. Activity – Route Studies

4.2.1.3.1.1. Description and Sequencing of Activities

When MUV server routes studies to a PACS Gateway installed in a remote site, the Gateway AE of that PACS Gateway is activated to forward received instances to the destination PACS.

For each received instance, the Gateway AE attempts to initiate a new Association with the remote DICOM C-STORE SCP that has been configured for the destination. If the association is successfully negotiated, the Gateway AE issues a C-STORE request for that instance.

The Gateway AE expects that a C-STORE response for each C-STORE request. When all C-STORE requests are complete, the Gateway AE will indicate completion to MUV server and the status will be reflected on user's outbounds page.

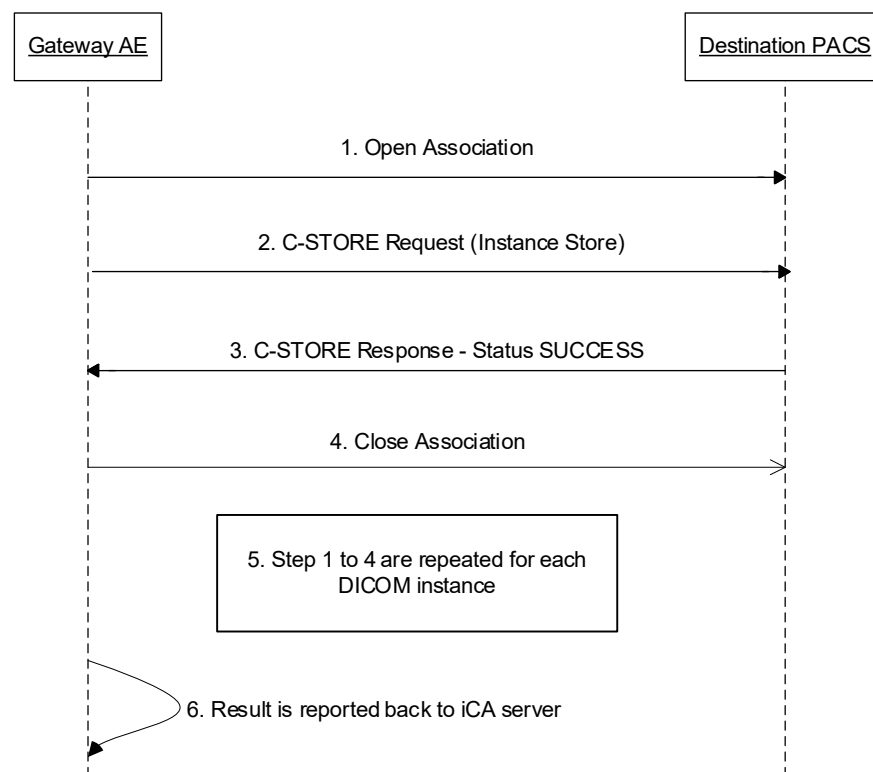


Figure 4 – Send Instances Interaction

The typical sequence of interactions for sending instances between the Gateway AE and a destination PACS as shown above is described as follows:

1. The Gateway AE opens an association with the destination PACS.
2. The Gateway AE sends a C-STORE request to the destination PACS asking for the DICOM instance to be stored to the PACS.
3. The destination PACS stores the DICOM instance and sends a C-STORE response.
4. The Gateway AE closes the association with the DICOM data.

5. Steps 1 to 4 are repeated for each DICOM instance.
6. The Gateway AE reports back to MUV server.

4.2.1.3.1.2. Proposed Presentation Contexts

The Gateway AE will propose Presentation Contexts as shown in the following table.

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Ext. Negot.
Name	UID	Name List	UID List		
The storage class name corresponding to the instance to be stored	The storage class UID corresponding to the instance to be stored	The transfer syntax as defined by the instance to be stored	The transfer syntax UID as defined by the instance to be stored	SCU	None

4.2.1.3.1.3. SOP Specific Conformance for C-STORE SOP Class

The behavior of Gateway AE when encountering status codes in a C-STORE response is summarized in the table below. If the remote AE returns a status other than “Success” or “Pending”, the store to that DICOM data source is considered to have failed. MUV server and the user will be informed that the store failed.

C-STORE Response Status Handling Behavior

Service Status	Further Meaning	Error Code	Behavior
Success	Matching is complete	0000	The SCP has completed the store. The user will be notified about the success.
Refused	Out of Resources	A700 – A7FF	The Association is aborted by closing TCP/IP connection and the operation is marked as failed. Error information is logged.
Failed	Data Set does not match SOP Class	A900 – A9FF	The Association is aborted by closing TCP/IP connection and the operation is marked as failed. Error information is logged.
Warning	Coercion of Data Elements	B000	The SCP has completed the store. The user will be notified about the success.
Warning	Elements Discarded	B006	The SCP has completed the store. The user will be notified about the success.
Warning	Data Set does not match SOP Class	B007	The SCP has completed the store. The user will be notified about the success.
Failed	Cannot understand	C000 – CFFF	The Association is aborted by closing TCP/IP connection and the operation is marked as failed. Error information is logged.
*	*	Any other status code.	The Association is aborted by closing TCP/IP connection and the operation is marked as failed. Error information is logged.

The behavior of Gateway AE during communication failure is summarized in the table below:

C-STORE Communication Failure Behavior

Exception	Behavior
Timeout	The Association is aborted by closing TCP/IP connection and the operation is marked as failed. The reason is logged.
Association aborted by the SCP or network layers	The operation is marked as failed. The reason is logged.

4.2.1.4. Association Acceptance Policy

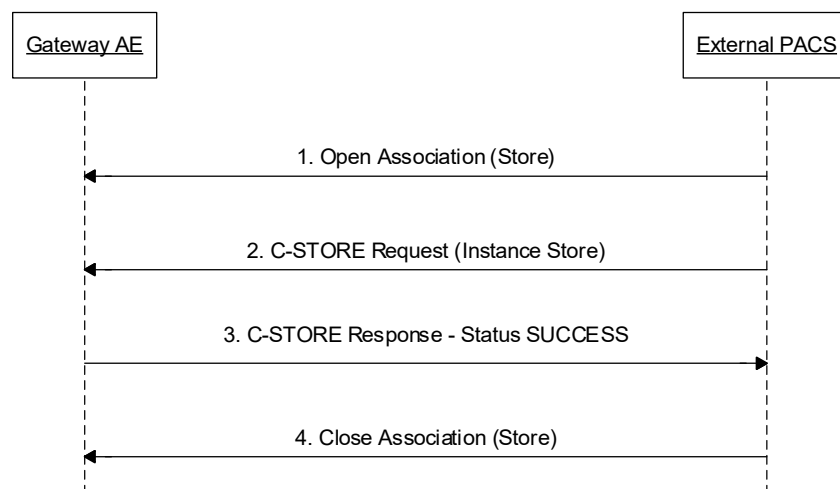
4.2.1.4.1. Activity – Upload Studies

4.2.1.4.1.1. Description and sequencing of Activities

When an external PACS is invoked to upload studies to MUV server, the external PACS sends DICOM instances to the application, the application follows the routine:

The Gateway AE listens for instances to be stored. Whenever a user action requires data to be moved to the Gateway AE, the instances are stored to the Gateway AE.

The Gateway AE SCP does not support Extended Negotiation and does not perform any validation or coercion of attributes.



The typical sequence between an external PACS and the Gateway AE is as follows:

1. The external PACS opens a new association with the Gateway AE.
2. The external PACS sends a C-STORE request.
3. The Gateway AE stores the instance and sends a C-STORE response.
4. The external PACS closes the association with the Gateway AE.

4.2.1.4.1.2. Accepted Presentation Contexts

The Gateway AE SCP will accept the following presentation contexts:

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Ext. Negot.
Name	UID	Name List	UID List		
Verification	1.2.840.10008.1.1	Implicit Little Endian	1.2.840.10008.1.2	SCP	None
		Explicit Little Endian	1.2.840.10008.1.2.1		
All storage classes listed under “Transfer” section of Table 1 in section Chapter 1	See Table 1	Implicit Little Endian	1.2.840.10008.1.2	SCP	None
		Explicit Little Endian	1.2.840.10008.1.2.1		
		JPEG Baseline (Process 1)	1.2.840.10008.1.2.4.50		
		JPEG Extended (Process 4)	1.2.840.10008.1.2.4.51		
		JPEG Lossless, Non-Hierarchical, First-Order Prediction (Process 14) [Selection Value 1])	1.2.840.10008.1.2.4.70		
		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		
		RLE Lossless	1.2.840.10008.1.2.5		
		MPEG-4 AVC/H.264 High Profile / Level 4.1 *	1.2.840.10008.1.2.4.10 2		
		Fragmentable MPEG-4 AVC/H.264 High Profile / Level 4.1 *	1.2.840.10008.1.2.4.10 2.1		
		MPEG-4 AVC/H.264 BD-compatible High Profile / Level 4.1 *	1.2.840.10008.1.2.4.10 3		

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Ext. Negot.
Name	UID	Name List	UID List		
		Fragmentable MPEG-4 AVC/H.264 BD- compatible High Profile / Level 4.1 *	1.2.840.10008.1.2.4.10 3.1		
		MPEG-4 AVC/H.264 High Profile / Level 4.2 For 2D Video *	1.2.840.10008.1.2.4.10 4		
		Fragmentable MPEG-4 AVC/H.264 High Profile / Level 4.2 For 2D Video *	1.2.840.10008.1.2.4.10 4.1		
		MPEG-4 AVC/H.264 High Profile / Level 4.2 For 3D Video *	1.2.840.10008.1.2.4.10 5		
		Fragmentable MPEG-4 AVC/H.264 High Profile / Level 4.2 For 3D Video *	1.2.840.10008.1.2.4.10 5.1		
		MPEG-4 AVC/H.264 Stereo High Profile / Level 4.2 *	1.2.840.10008.1.2.4.10 6		
		Fragmentable MPEG-4 AVC/H.264 Stereo High Profile / Level 4.2 *	1.2.840.10008.1.2.4.10 6.1		

4.2.1.4.1.3. SOP Specific Conformance for Storage SOP Class

The Gateway AE can report status codes as summarized in the Table below.

Service Status	Further Meaning	Error Code	Behavior
SUCCESS	Success	0000	The Gateway SCP has completed the store. Continue receiving next images.
ERROR	Error: Cannot understand Error Comment: Error while processing DICOM data in PacsGateway SCP for Device id:	C000	The Gateway SCP send C-STORE RSP with the given error code and error comment. Corresponding error message will be logged on the system of the application.
	Refused : Out of Resource Error Comment: Could not write image file for Device id:	A700	The Gateway SCP send C-STORE RSP with the given error code and error comment. Corresponding error message will be logged on the system of the application.

4.3. Network Interfaces

4.3.1. Physical Network Interface

The application supports any network interface configured in the Windows OS.

4.3.2. Additional Protocols

The application conforms to the System Management Profiles listed in the Table below by utilizing corresponding functionality in Windows OS. All requested transactions for the listed profiles and actors are supported. Support for optional transactions are listed in the following table:

Profile Name	Actor	Protocols Used	Optional Transactions	Security Support
Network Address Management	DHCP Client	DHCP	N/A	N/A
	DNS Client	DNS	N/A	N/A
Time Synchronization	NTP Client	NTP	Find NTP Server	N/A
	DHCP Client	DHCP	N/A	N/A

The application also supports WADO as a Web Client System. Please refer to WADO section below for restrictions.

4.3.2.1. DHCP

DHCP can be used to obtain TCP/IP network configuration information. The network parameters obtainable via DHCP are shown in the Table below. The Default Value column of the table shows the default used if the DHCP server does not provide a value. Support for DHCP is configured in the Windows OS. If DHCP is not in use, TCP/IP network configuration information must be manually configured instead.

DHCP Parameter	Default Value
IP Address	None
Host Name	Machine name
List of NTP servers	Empty list
List of DNS servers	Empty list
Routers	Empty list
Static Routes	None
Domain name	None
Subnet Mask	Derived from IP Address (see service manual)
Broadcast address	Derived from IP Address (see service manual)
Default Router	None
Time Offset	From Time Zone configured
MTU	Network Hardware Dependent
Auto-IP permission	No permission

If the DHCP server refuses to renew a lease on the assigned IP address active DICOM associations and communications may be aborted as a result.

4.3.2.2. DNS

DNS can be used for address resolution. If DHCP is not in use or the DHCP server does not return any DNS server addresses, the identity of a DNS server can be configured in the Windows OS. If a DNS server is not in use, local mapping between hostname and IP address can be manually configured in the Windows OS.

4.3.2.3. NTP

The Windows NTP client implements the optional Find NTP Server Transaction. The NTP client will issue an NTP broadcast to identify any local NTP servers. If no local servers can be found via NTP broadcast, the NTP Servers identified by DHCP will be used as time references. Additionally, one or more NTP Servers can be configured in the Windows OS. If no NTP Servers are identified, then the local clock will be used as a time reference.

4.3.3. IPv4 and IPv6 Support

This product supports both IPv4 and IPv6 connections.

4.4. Configuration

4.4.1. AE Title/Presentation Address Mapping

4.4.1.1. Local AE Titles

One or more local AE titles are configured to be exposed in the DICOM endpoint (C-STORE SCP) during the installation of the application. Each of these local AE titles corresponds to a destination data source belonging to an MUV Domain. The SCP is listening on a configured local port number with a corresponding local AE Title for each of these destinations. An external PACS sends DICOM instances to one of these exposed local AE titles in order to have the application first receive the data which will be uploaded to MUV through HTTPS and eventually will be transferred to the corresponding destination data source through DICOM.

4.4.1.2. Remote AE Title/Presentation Address Mapping

For uploading studies, the Gateway AE accepts associations from any DICOM AE for pushing data in.

For routing studies, the PACS Gateway admin configures each destination PACS in POP Configuration Tool. Any configured destination PACS is expected to provide C-STORE SCP service. Each destination is identified by an internal ID, and the Gateway AE will forward received instances from MUV server to the destination as identified by MUV, using host/port/AE title mapped from that destination ID.

Chapter 5. Media Interchange

The application does not support Media Storage.

Chapter 6. Transformation of DICOM to CDA

The application does not support transformation of DICOM to CDA.

Chapter 7. Support of Extended Character Sets

All of the character sets listed by DICOM standard PS3.3 as per DICOM standard version (referenced in section 3.6) are supported by the application.

Chapter 8. Security

8.1. Security Profiles

8.1.1. Secure Use Profiles

None of Secure Use Profiles are supported.

8.1.2. Secure Transport Connection Profiles

None of Secure Transport Connection Profiles are supported.

8.1.3. Digital Signature Profiles

None of Digital Signature Profiles are supported.

8.1.4. Media Storage Security Profiles

None of Media Storage Security Profiles are supported.

8.2. Association Level Security

The C-STORE SCP accepts associations only when the association request contains one of the configured Called AE in Upload Studies function.

8.3. Application Level Security

None supported.

Chapter 9. Annexes

Not applicable.