



MEDSTRAT™

## **DICOM Conformance Statement**

**Revision 3.0**

**Jan 2010**

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# 1 Purpose

The Medstrat echoes server is a medical image archive and communication software. This Conformance Statement (CS) specifies the system's support of DICOM. It details the DICOM Service Classes and roles which are supported by this product.

## **1.1 Used definitions, terms and abbreviations**

DICOM definitions, terms and abbreviations are used throughout this Conformance Statement. For a description of these, see NEMA PS 3.3-1993 and PS 3.4-1994.

## **1.2 References**

The Digital Imaging and Communications in Medicine (DICOM) standard: NEMA PS 3.X (X refers to the part 1 - 13) and Supplements National Electrical Manufacturers Association (NEMA) Publication Sales 1300 N. 17th Street, Suite 1847 Rosslyn, Va. 22209, United States of America

# 2 Implementation Model

An echoes server provides the following features:

- The server receives images from a remote Application Entity (AE), such as an imaging modality, and stores the images on a local file system and tables them in a local database.
- The server receives DICOM Modality Work List searches from remote Application Entities and returns matching work list entries.

## **2.1 Application Data flow**

The DICOM services on an echoes server are provided by the DICOM C-STORE SCP Application Entity (AE) and the DICOM Modality Work List Application Entity.

The DICOM C-STORE SCP AE listens on a predefined port for incoming TCP connections. Once a TCP connection is established, images are transferred over the connection via the DICOM network transfer protocol and are stored on the server's local disk.

The DICOM Modality Work List AE listens on a predefined port for incoming TCP connections. Once a TCP connection is established, C-FIND searches of the worklist are received and matching worklist entries are returned.

## **2.2 Functional definition of Application Entities**

The DICOM C-STORE SCP Application Entity acts as a service class provider (SCP) for Storage Service Classes. The DICOM Modality Worklist AE acts as a SCP for the Modality Worklist Management Service Class. The server also may act as a service class user (SCU) for Storage Service Classes.

## 3 Application Entity Specifications

### 3.1 DICOM C-STORE SCP Specification

The DICOM C-STORE SCP AE provides Standard Conformance to the following DICOM V3.0 SOP Classes as an SCP:

SOP Class Name	SOP Class UID
VerificationSOPClass	1.2.840.10008.1.1
StoredPrintStorage	1.2.840.10008.5.1.1.27
HardcopyGrayscaleImageStorage	1.2.840.10008.5.1.1.29
HardcopyColorImageStorage	1.2.840.10008.5.1.1.30
ComputedRadiographyImageStorage	1.2.840.10008.5.1.4.1.1.1
DigitalXRayImageStorageForPresentation	1.2.840.10008.5.1.4.1.1.1.1
DigitalXRayImageStorageForProcessing	1.2.840.10008.5.1.4.1.1.1.1.1
DigitalMammographyXRayImageStorageForPresentation	1.2.840.10008.5.1.4.1.1.1.2
DigitalMammographyXRayImageStorageForProcessing	1.2.840.10008.5.1.4.1.1.1.2.1
DigitalIntraOralXRayImageStorageForPresentation	1.2.840.10008.5.1.4.1.1.1.3
DigitalIntraOralXRayImageStorageForProcessing	1.2.840.10008.5.1.4.1.1.1.3.1
StandaloneModalityLUTStorage	1.2.840.10008.5.1.4.1.1.10
EncapsulatedPDFStorage	1.2.840.10008.5.1.4.1.1.104.1
StandaloneVOILUTStorage	1.2.840.10008.5.1.4.1.1.11
GrayscaleSoftcopyPresentationStateStorage	1.2.840.10008.5.1.4.1.1.11.1
ColorSoftcopyPresentationStateStorage	1.2.840.10008.5.1.4.1.1.11.2
PseudoColorSoftcopyPresentationStateStorage	1.2.840.10008.5.1.4.1.1.11.3
BlendingSoftcopyPresentationStateStorage	1.2.840.10008.5.1.4.1.1.11.4
XRayAngiographicImageStorage	1.2.840.10008.5.1.4.1.1.12.1
EnhancedXAImageStorage	1.2.840.10008.5.1.4.1.1.12.1.1
XRayFluoroscopyImageStorage	1.2.840.10008.5.1.4.1.1.12.2
EnhancedXRFImageStorage	1.2.840.10008.5.1.4.1.1.12.2.1
RETIRED_XRayAngiographicBiPlaneImageStorage	1.2.840.10008.5.1.4.1.1.12.3
RTImageStorage	1.2.840.10008.5.1.4.1.1.128
PETCurveStorage	1.2.840.10008.5.1.4.1.1.129
CTImageStorage	1.2.840.10008.5.1.4.1.1.2
EnhancedCTImageStorage	1.2.840.10008.5.1.4.1.1.2.1
NuclearMedicineImageStorage	1.2.840.10008.5.1.4.1.1.20
RETIRED_UltrasoundMultiframeImageStorage	1.2.840.10008.5.1.4.1.1.3
UltrasoundMultiframeImageStorage	1.2.840.10008.5.1.4.1.1.3.1
MRImageStorage	1.2.840.10008.5.1.4.1.1.4
EnhancedMRImageStorage	1.2.840.10008.5.1.4.1.1.4.1
MRSpectroscopyStorage	1.2.840.10008.5.1.4.1.1.4.2
RTImageStorage	1.2.840.10008.5.1.4.1.1.481.1
RTDoseStorage	1.2.840.10008.5.1.4.1.1.481.2
RTStructureSetStorage	1.2.840.10008.5.1.4.1.1.481.3
RTBeamsTreatmentRecordStorage	1.2.840.10008.5.1.4.1.1.481.4
RTPlanStorage	1.2.840.10008.5.1.4.1.1.481.5
RTBrachyTreatmentRecordStorage	1.2.840.10008.5.1.4.1.1.481.6
RTTreatmentSummaryRecordStorage	1.2.840.10008.5.1.4.1.1.481.7
RETIRED_NuclearMedicineImageStorage	1.2.840.10008.5.1.4.1.1.5
RETIRED_UltrasoundImageStorage	1.2.840.10008.5.1.4.1.1.6
UltrasoundImageStorage	1.2.840.10008.5.1.4.1.1.6.1
RawDataStorage	1.2.840.10008.5.1.4.1.1.66
SpatialRegistrationStorage	1.2.840.10008.5.1.4.1.1.66.1
SpatialFiducialsStorage	1.2.840.10008.5.1.4.1.1.66.2
RealWorldValueMappingStorage	1.2.840.10008.5.1.4.1.1.67
SecondaryCaptureImageStorage	1.2.840.10008.5.1.4.1.1.7
MultiframeSingleBitSecondaryCaptureImageStorage	1.2.840.10008.5.1.4.1.1.7.1
MultiframeGrayscaleByteSecondaryCaptureImageStorage	1.2.840.10008.5.1.4.1.1.7.2
MultiframeGrayscaleWordSecondaryCaptureImageStorage	1.2.840.10008.5.1.4.1.1.7.3
MultiframeTrueColorSecondaryCaptureImageStorage	1.2.840.10008.5.1.4.1.1.7.4
RETIRED_VLImageStorage	1.2.840.10008.5.1.4.1.1.77.1
VLEndoscopicImageStorage	1.2.840.10008.5.1.4.1.1.77.1.1
VideoEndoscopicImageStorage	1.2.840.10008.5.1.4.1.1.77.1.1.1
VLMicroscopicImageStorage	1.2.840.10008.5.1.4.1.1.77.1.2
VideoMicroscopicImageStorage	1.2.840.10008.5.1.4.1.1.77.1.2.1
VLSlideCoordinatesMicroscopicImageStorage	1.2.840.10008.5.1.4.1.1.77.1.3

VLPhotographicImageStorage	1.2.840.10008.5.1.4.1.1.77.1.4
VideoPhotographicImageStorage	1.2.840.10008.5.1.4.1.1.77.1.4.1
OphthalmicPhotography8BitImageStorage	1.2.840.10008.5.1.4.1.1.77.1.5.1
OphthalmicPhotography16BitImageStorage	1.2.840.10008.5.1.4.1.1.77.1.5.2
StereometricRelationshipStorage	1.2.840.10008.5.1.4.1.1.77.1.5.3
RETIRED_VLMultiFrameImageStorage	1.2.840.10008.5.1.4.1.1.77.2
StandaloneOverlayStorage	1.2.840.10008.5.1.4.1.1.8
DRAFT_SRTextStorage	1.2.840.10008.5.1.4.1.1.88.1
DRAFT_SRAudioStorage	1.2.840.10008.5.1.4.1.1.88.2
DRAFT_SRDetailStorage	1.2.840.10008.5.1.4.1.1.88.3
DRAFT_SRComprehensiveStorage	1.2.840.10008.5.1.4.1.1.88.4
BasicTextSR	1.2.840.10008.5.1.4.1.1.88.11
EnhancedSR	1.2.840.10008.5.1.4.1.1.88.22
ComprehensiveSR	1.2.840.10008.5.1.4.1.1.88.33
ProcedureLogStorage	1.2.840.10008.5.1.4.1.1.88.40
MammographyCADSR	1.2.840.10008.5.1.4.1.1.88.50
KeyObjectSelectionDocument	1.2.840.10008.5.1.4.1.1.88.59
ChestCADSR	1.2.840.10008.5.1.4.1.1.88.65
XRayRadiationDoseSR	1.2.840.10008.5.1.4.1.1.88.67
StandaloneCurveStorage	1.2.840.10008.5.1.4.1.1.9
DRAFT_WaveformStorage	1.2.840.10008.5.1.4.1.1.9.1
TwelveLeadECGWaveformStorage	1.2.840.10008.5.1.4.1.1.9.1.1
GeneralECGWaveformStorage	1.2.840.10008.5.1.4.1.1.9.1.2
AmbulatoryECGWaveformStorage	1.2.840.10008.5.1.4.1.1.9.1.3
HemodynamicWaveformStorage	1.2.840.10008.5.1.4.1.1.9.2.1
CardiacElectrophysiologyWaveformStorage	1.2.840.10008.5.1.4.1.1.9.3.1
BasicVoiceAudioWaveformStorage	1.2.840.10008.5.1.4.1.1.9.4.1

The DICOM C-STORE AE will accept presentation contexts for all of the above mentioned supported SOP Classes using any of the transfer syntaxes:

SOP Class Name	SOP Class UID
LittleEndianImplicitTransferSyntax	1.2.840.10008.1.2
LittleEndianExplicitTransferSyntax	1.2.840.10008.1.2.1
BigEndianExplicitTransferSyntax	1.2.840.10008.1.2.2

### 3.2 DICOM Modality Work List SCP Specification

The DICOM Modality Work List AE provides Standard Conformance to the following DICOM V3.0 SOP Classes as an SCP:

SOP Class Name	SOP Class UID
VerificationSOPClass	1.2.840.10008.1.1
FINDModalityWorklistInformationModel	1.2.840.10008.5.1.4.31

The DICOM Modality Work List AE will accept presentation contexts for all of the above mentioned supported SOP Classes using any of the transfer syntaxes:

SOP Class Name	SOP Class UID
LittleEndianImplicitTransferSyntax	1.2.840.10008.1.2
LittleEndianExplicitTransferSyntax	1.2.840.10008.1.2.1
BigEndianExplicitTransferSyntax	1.2.840.10008.1.2.2

The DICOM Modality Work List AE supports the following attributes as matching keys:

- (0008,0050) AccessionNumber
- (0008,0090) ReferringPhysiciansName
- (0010,0010) PatientsName
- (0010,0020) PatientID
- (0010,0030) PatientsBirthDate
- (0010,0040) PatientsSex
- (0032,1032) RequestingPhysician
- (0038,0010) AdmissionID
- (0040,0100) ScheduledProcedureStepSequence

```

(0008,0060) > Modality
(0040,0001) > ScheduledStationAETitle
(0040,0002) > ScheduledProcedureStepStartDate
(0040,0003) > ScheduledProcedureStepStartTime
(0040,0006) > ScheduledPerformingPhysiciansName
(0040,1001) RequestedProcedureID
(0040,1003) RequestedProcedurePriority

```

### 3.3 DICOM C-STORE SCU Specification

The server expects support for the following DICOM V3.0 SOP Classes as an SCU:

SOP Class Name	SOP Class UID
ComputedRadiographyImageStorage	1.2.840.10008.5.1.4.1.1.1
DigitalXRayImageStorageForPresentation	1.2.840.10008.5.1.4.1.1.1.1
DigitalXRayImageStorageForProcessing	1.2.840.10008.5.1.4.1.1.1.1.1
DigitalMammographyXRayImageStorageForPresentation	1.2.840.10008.5.1.4.1.1.1.2
DigitalMammographyXRayImageStorageForProcessing	1.2.840.10008.5.1.4.1.1.1.2.1
DigitalIntraOralXRayImageStorageForPresentation	1.2.840.10008.5.1.4.1.1.1.3
DigitalIntraOralXRayImageStorageForProcessing	1.2.840.10008.5.1.4.1.1.1.3.1
EncapsulatedPDFStorage	1.2.840.10008.5.1.4.1.1.104.1
GrayscaleSoftcopyPresentationStateStorage	1.2.840.10008.5.1.4.1.1.11.1
ColorSoftcopyPresentationStateStorage	1.2.840.10008.5.1.4.1.1.11.2
PseudoColorSoftcopyPresentationStateStorage	1.2.840.10008.5.1.4.1.1.11.3
BlendingSoftcopyPresentationStateStorage	1.2.840.10008.5.1.4.1.1.11.4
XRayAngiographicImageStorage	1.2.840.10008.5.1.4.1.1.12.1
EnhancedXAImageStorage	1.2.840.10008.5.1.4.1.1.12.1.1
XRayFluoroscopyImageStorage	1.2.840.10008.5.1.4.1.1.12.2
EnhancedXRFImageStorage	1.2.840.10008.5.1.4.1.1.12.2.1
PETImageStorage	1.2.840.10008.5.1.4.1.1.128
PETCurveStorage	1.2.840.10008.5.1.4.1.1.129
CTImageStorage	1.2.840.10008.5.1.4.1.1.2
EnhancedCTImageStorage	1.2.840.10008.5.1.4.1.1.2.1
NuclearMedicineImageStorage	1.2.840.10008.5.1.4.1.1.20
UltrasoundMultiframeImageStorage	1.2.840.10008.5.1.4.1.1.3.1
MRImageStorage	1.2.840.10008.5.1.4.1.1.4
EnhancedMRImageStorage	1.2.840.10008.5.1.4.1.1.4.1
MRSpectroscopyStorage	1.2.840.10008.5.1.4.1.1.4.2
RTImageStorage	1.2.840.10008.5.1.4.1.1.481.1
RTDoseStorage	1.2.840.10008.5.1.4.1.1.481.2
RTStructureSetStorage	1.2.840.10008.5.1.4.1.1.481.3
RTBeamsTreatmentRecordStorage	1.2.840.10008.5.1.4.1.1.481.4
RTPlanStorage	1.2.840.10008.5.1.4.1.1.481.5
RTBrachyTreatmentRecordStorage	1.2.840.10008.5.1.4.1.1.481.6
RTTreatmentSummaryRecordStorage	1.2.840.10008.5.1.4.1.1.481.7
UltrasoundImageStorage	1.2.840.10008.5.1.4.1.1.6.1
RawDataStorage	1.2.840.10008.5.1.4.1.1.66
SpatialRegistrationStorage	1.2.840.10008.5.1.4.1.1.66.1
SpatialFiducialsStorage	1.2.840.10008.5.1.4.1.1.66.2
RealWorldValueMappingStorage	1.2.840.10008.5.1.4.1.1.67
SecondaryCaptureImageStorage	1.2.840.10008.5.1.4.1.1.7
MultiframeSingleBitSecondaryCaptureImageStorage	1.2.840.10008.5.1.4.1.1.7.1
MultiframeGrayscaleByteSecondaryCaptureImageStorage	1.2.840.10008.5.1.4.1.1.7.2
MultiframeGrayscaleWordSecondaryCaptureImageStorage	1.2.840.10008.5.1.4.1.1.7.3
MultiframeTrueColorSecondaryCaptureImageStorage	1.2.840.10008.5.1.4.1.1.7.4
VLEndoscopicImageStorage	1.2.840.10008.5.1.4.1.1.77.1.1
VLMicroscopicImageStorage	1.2.840.10008.5.1.4.1.1.77.1.2
VLSlideCoordinatesMicroscopicImageStorage	1.2.840.10008.5.1.4.1.1.77.1.3
VLP photographicImageStorage	1.2.840.10008.5.1.4.1.1.77.1.4
OphthalmicPhotography8BitImageStorage	1.2.840.10008.5.1.4.1.1.77.1.5.1
OphthalmicPhotography16BitImageStorage	1.2.840.10008.5.1.4.1.1.77.1.5.2
StereometricRelationshipStorage	1.2.840.10008.5.1.4.1.1.77.1.5.3
BasicTextSR	1.2.840.10008.5.1.4.1.1.88.11
EnhancedSR	1.2.840.10008.5.1.4.1.1.88.22
ComprehensiveSR	1.2.840.10008.5.1.4.1.1.88.33
ProcedureLogStorage	1.2.840.10008.5.1.4.1.1.88.40
MammographyCADSR	1.2.840.10008.5.1.4.1.1.88.50

KeyObjectSelectionDocument	1.2.840.10008.5.1.4.1.1.88.59
ChestCADSR	1.2.840.10008.5.1.4.1.1.88.65
XRayRadiationDoseSR	1.2.840.10008.5.1.4.1.1.88.67
TwelveLeadECGWaveformStorage	1.2.840.10008.5.1.4.1.1.9.1.1
GeneralECGWaveformStorage	1.2.840.10008.5.1.4.1.1.9.1.2
AmbulatoryECGWaveformStorage	1.2.840.10008.5.1.4.1.1.9.1.3
HemodynamicWaveformStorage	1.2.840.10008.5.1.4.1.1.9.2.1
CardiacElectrophysiologyWaveformStorage	1.2.840.10008.5.1.4.1.1.9.3.1
BasicVoiceAudioWaveformStorage	1.2.840.10008.5.1.4.1.1.9.4.1

### **3.4 Association Establishment Policies**

#### **3.4.1 General**

The echoes server will select which Application Entity to associate with for DICOM C-STORE SCU (Push) operations. The configuration file contains the configuration parameters such as network address, port number, and AE Title. The echoes server Application Entity always accepts the Verification and Store SOP Class. Server will offer a PDU size of 48k on associations initiated by itself. Server will accept any PDU size offered on associations initiated by remote applications.

#### **3.4.2 Number of Associations**

The server can only attempt one association establishment at one time; however, multiple copies of an SCU/SCP may be invoked simultaneously. There is no synchronization attempted between multiple copies of an SCU/SCP.

#### **3.4.3 Asynchronous Nature**

This release does not support multiple outstanding transactions.

### **3.5 Association Initiation by Real World Activity**

This section details the action of the echoes server SCU component as a result of automated work flow activity on the echoes server system. The echoes server initiates an associations as a result of the following events:

- The server receives an image study from a modality or other source.
- The server receives a request to push a study to remote AE.

#### **3.5.1 Image Auto-Forwarding and DICOM Push handled by C-STORE SCU**

The system automatically initiates an image send to every destination on the AE forwarding list. The association is released when the storage operation completes.

##### **3.5.1.1 Associated Real World Activity**

The system automatically initiates an image send to every destination on the AE forwarding list. The association is released when the storage operation completes. In addition, as initiated by the user, the system can perform a DICOM Push operation to any pre-configured AE.

##### **3.5.1.2 Proposed Presentation Contexts**

The C-STORE SCU will propose default JPEG lossless transfer syntaxes and all uncompressed transfer syntaxes.



### **3.6 Association Accepted from Real World Activity**

#### **3.6.1 Storage Association Request handled by C-STORE SCP**

The system listens for incoming associations on a configurable port. The association is released when the storage operation completes.

- The server accepts associations from any modality who is capable of constructing a TCP connection to its port.

##### **3.6.1.1 Associated Real-World Activity**

The echoes server stores the image Information Object Instances received on the accepted association into its local file system and tables the study in its database.

##### **3.6.1.2 Proposed Presentation Contexts**

See section 3.1 above to determine possible combinations.

## **4 Communication Profiles**

### **4.1 Supported Communication Stacks (Parts 8, 9)**

The TCP/IP Network Communication Support as defined in Part 8 of the DICOM Standard is supported.

### **4.2 TCP / IP Stack**

TCP / IP over Ethernet

### **4.3 Point-to-Point Stack**

Not supported.

## **5. Extensions/Specialization's/Privatization's**

Not applicable

### **5.1 Private Transfer Syntax's**

No Private Transfer Syntax's are used.

## **6. Configuration**

### **6.1 AE Title / Presentation Address Mapping**

The DICOM module is configured by means of a configuration interface. The echoes server Application Entity maps Application Entity Titles to IP address and port number via look-ups in the configuration file.

## **6.2 Configurable Parameters**

The port number listened on for C-STORE association requests is configurable, but is generally 4000.

The port number listened on for DICOM Modality Work List association requests is configurable, but is generally 4001.

The list of AEs which will automatically be sent copies of new studies received by the C-STORE SCP is configurable by the user of the echoes Browser.

## **7 Support of Extended Character Sets**

Extended character sets are not supported by any echoes server Application Entity.