# DICOM Conformance Statement

# 1 Introduction

## 1.1 Audience

This document is intended for the following groups of persons:

• System integrators of medical equipment

• Other vendors offering interfacing via DICOM

• Marketing and sales persons

It is assumed, that the reader is familiar with the DICOM standard.

The document is structured firmly along the template definition as specified in DICOM Standard PS 3.2 (Conformance).

## 1.2 Overview

The application is used to setup a patient for operation planning purposes. To support this function the following DICOM services for receiving diagnostic imaging modalities are supported.

Supported network services:

* Transfer:
  + CT Image Storage
  + MR Image Storage
* Query/Retrieve
  + Study Root Query/Retrieve Information Model – FIND
  + Study Root Query/Retrieve Information Model – MOVE

## 1.3 References

* Digital Imaging and Communications in Medicine (DICOM), Parts 1-18 (2011), National Electrical Manufacturers Association (NEMA) Rosslyn, VA, USA

## 1.4 Definitions, Terms and Abbreviations

This section provides the definitions of terms, acronyms and abbreviations that are used throughout the document.

|  |  |
| --- | --- |
| AE | Application Entity |
| DICOM | Digital Imaging and Communications in Medicine |
| DIMSE | DICOM Message Service element |
| IOD | Information Object Definition (DICOM term) |
| NEMA | National Electrical Manufacturers Association |
| PDU | Protocol Data Unit (DICOM term) |
| SCU | Service Class User |
| SCP | Service Class Provider |
| SOP | Service Object Pair |
| TCP/IP | Transmission Control Protocol / Internet Protocol, a widely used computer networking protocol |
| UID | Unique Identifier used to identify an object by a worldwide unique identifier |
| VR | Value Representation, a data encoding method in DICOM |

# 2 DICOM Network Conformance Requirements

## 2.1 Implementation Model

### 2.1.1 Application Data Flow



Conceptually, the network services may be modeled as the following separate AEs, though in fact all the AEs share a single (configurable) AE Title:

* FIND-SCU, which queries remote AE’s for lists of studies, series and instances.
* MOVE-SCU, which retrieves selected studies, series or instances.
* ECHO-SCU which sends outgoing echo request to Remote Application Entity.

### 2.1.2 Functional Definition of AE’s

#### 2.1.2.1 Query/Retrieve SCU Application Entity

The Query/Retrieve Application Entity is invoked when

* The patient is loaded in the application, and reference images need to be loaded
* CT or MR images must be loaded in order to generate DRRs.

#### 2.1.2.2 Imaging Client Storage SCP Application Entity

The Storage SCP Application Entity is invoked in order to receive objects requested from a remote Query/Retrieve SCP.

## 2.2 AE Specifications

### 2.2.1 SOP Classes

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Abstract Syntax** | | **Transfer Syntax** | | **Role** |
| **Name** | **UID** | **Name** | **UID** |
| CT Image Storage | 1.2.840.10008.5.1.4.1.1.2 | DICOM Implicit VR Little Endian | 1.2.840.10008.1.2 | SCU |
| DICOM Implicit VR Little Endian | 1.2.840.10008.1.2 | SCP |
| DICOM Explicit VR Little Endian | 1.2.840.10008.1.2.1 | SCP |
| MR Image Storage | 1.2.840.10008.5.1.4.1.1.4 | DICOM Implicit VR Little Endian | 1.2.840.10008.1.2 | SCU |
| DICOM Implicit VR Little Endian | 1.2.840.10008.1.2 | SCP |
| DICOM Explicit VR Little Endian | 1.2.840.10008.1.2.1 | SCP |
| Study Root Query/ Retrieve information model- FIND | 1.2.840.10008.5.1.4.1.2.2.1 | DICOM Implicit VR Little Endian | 1.2.840.10008.1.2 | SCU |
| Study Root Query/Retrieve information model- MOVE | 1.2.840.10008.5.1.4.1.2.2.2 | DICOM Implicit VR Little Endian | 1.2.840.10008.1.2 | SCU |

### 2.2.2 Association Policies

#### 2.2.2.1 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 |

#### 2.2.2.2 Number of Associations

The Application Entity can initiate (by default) up to three associations at a time. This value is configurable.

#### 2.2.2.3 Asynchronous Nature

Application Entity does not support asynchronous communication.

#### Implementation Identifying Information

The implementation UID for this DICOM 3.0 is

|  |  |
| --- | --- |
| **DCMTK Implementation UID** | **1.2.276.0.7230010.3.0.3.6.4** |

#### 2.2.2.5 Activity – Query/Retrieve

##### 2.2.2.5.1 Description and Sequencing of Activities

This function is typically performed by the application to load the CT. At this time an Association is requested.

This application supports Query/Retrieve in the SCU role. The table [below](#_bookmark7) shows the supported values for the tag Query/Retrieve Level (0008, 0052):

|  |  |
| --- | --- |
| Query/Retrieve Level | Value in (0008,0052) |
| Composite Object Instance Information | IMAGE |

##### 2.2.2.5.2 Proposed Presentation Contexts

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Presentation Context Table** | | | | | |
| **Abstract Syntax** | | **Transfer Syntax** | | **Role** | **Ext. Neg.** |
| **Name** | **UID** | **Name** | **UID** |
| Study Root | 1.2.840.10008.5.1.4.1.2.2.1 | DICOM | 1.2.840.10008.1.2 | SCU | None |
| Query/Retrieve |  | Implicit VR |  |  |  |
| information model |  | Little Endian |  |  |  |
| – FIND |  |  |  |  |  |
| Study Root | 1.2.840.10008.5.1.4.1.2.2.2 | DICOM | 1.2.840.10008.1.2 | SCU | None |
| Query/Retrieve |  | Implicit VR |  |  |  |
| information model |  | Little Endian |  |  |  |
| – MOVE |  |  |  |  |  |

##### 2.2.2.5.3 SOP Specific Conformance for C-Find Sop Classes

The behavior of Query/Retrieve SCU when encountering status codes in a C-FIND response is summarized in the table [below.](#_bookmark8)

|  |  |  |  |
| --- | --- | --- | --- |
| **Service Status** | **Further Meaning** | **Error Code** | **Behavior** |
| Refused | Out of Resources | A7xx | The object is not found, the user is advised. |
| Failure | Data Set does not match SOP Class | A9xx |
| Cannot understand | Cxxx |
| Cancel | Matching terminated due to Cancel Request | FE00 | Cancel is handled like Failure,  I.e. the object is not found and the user is advised. |
| Success | Matching is complete – No final Identifier is supplied | 0000 | The SCP has completed the match, the user is advised. |
| \* | \* | Any other status code. | Handled like failure. |

No C-CANCEL-FIND requests are ever issued. Relational-queries are not supported.

Specific Character Set is not supported. It is not included in a query and will be ignored when present in the response.

|  |  |
| --- | --- |
| **Q/R C-FIND SCU Communication Failure Behavior** | |
| **Exception** | **Behavior** |
| Timeout | The user is informed that the operation has timed out. |
| Association aborted by the SCP or network layers | When the Association is aborted during a C-FIND operation the user is informed. |

The table [below](#_bookmark9) lists the Attributes supported by the C-FIND SCU.

|  |  |  |  |
| --- | --- | --- | --- |
| **Name** | **Tag** | **VR** | **Type** |
| Query/Retrieve Level | (0008,0052) | CS | R |
| SOP Instance UID | (0008,0018) | UI | U |
| Study Instance UID | (0020,000D) | UI | U |
| Series Instance UID | (0020,000E) | UI | U |

The Types of Matching column in the above table should be read as follows:

U Universal Matching

R Range Matching

One or more matching types of the above list may be supported per Attribute.

##### 2.2.2.5.4 SOP Specific Conformance for C-Move SOP Classes

The behavior of Query/Retrieve SCU when encountering status codes in a C-MOVE response is summarized in the following table.

|  |  |  |  |
| --- | --- | --- | --- |
| **Service Status** | **Further Meaning** | **Error Code** | **Behavior** |
| Refused | Out of Resources – Unable to calculate number of matches | A701 | None of the requested SOP Instances could be retrieved. The user will be informed about the failure. |
| Out of Resources – Unable to perform sub-operations | A702 |
| Move Destination unknown | A801 |
| Failure | Identifier does not match SOP Class | A900 |
| Unable to Process | Cxxx |
| Cancel | Sub-operations terminated due to Cancel Indication | FE00 | Cancel is handled like Failure. |
| Warning | Sub-operations complete – One or more Failures | B000 | Some or all SOP Instances have not been transmitted successfully. The user is informed. |
| Success | Sub-operations complete – No Failures | 0000 | All SOP Instances have successfully been transmitted. |
| Pending | Sub-operations are continuing | FF00 | Transferring requested SOP Instances is continuing. This message is ignored. |
| \* | \* | Any other status code. | Any other status code is handled like Failure. |

After having received all requested SOP Instances or when the user aborts the operation the Association is released using A-RELEASE. All events occurring during querying and retrieving SOP Instances are logged. If any log entries are marked with internal category Error they will be shown to the user automatically.

No C-CANCEL-MOVE requests are ever issued.

The table below lists the Q/R C-MOVE SCU Communication Failure Behavior

|  |  |
| --- | --- |
| **Exception** | **Behavior** |
| Timeout | The user is informed that the operation has timed out. |
| Association aborted by the SCP or network layers | When the Association is aborted during a C-MOVE operation the user is informed. |

The table below lists the Attributes that will be sent by the C-MOVE SCU.

|  |  |  |  |
| --- | --- | --- | --- |
| **Name** | **Tag** | **VR** | **Type** |
| Query/Retrieve Level | (0008,0052) | CS | R |
| SOP Instance UID | (0008,0018) | UI | U |
| Study Instance UID | (0020,000D) | UI | U |
| Series Instance UID | (0020,000E) | UI | U |

The Types of Matching column in the above table should be read as follows:

U Universal Matching

R Range Matching

One or more matching types of the above list may be supported per Attribute.

##### 2.2.2.5.5 Supported Operations

This application performs only the operations listed below:

* C-FIND
* C-MOVE

#### Activity – Receive Storage Request

###### 2.2.2.5.1 Preconditions for CT Images

* All CT slices shall have the same Frame of Reference.
* The spacing between CT slices positions in z-direction (DICOM Patient coordinate system) may vary, although it is recommended, that they are equal throughout all slices.
* The maximal difference in x-direction and in y-direction (DICOM Patient coordinate system) between all CT slices shall be less or equal 0.1 mm.

###### 2.2.2.5.2 SOP Specific Conformance for all Storage SOP Classes

2.2.2.5.2.1 Presentation Context Acceptance Criterion

The Storage SCP will always accept any Presentation Context for the supported SOP Classes with the supported Transfer Syntaxes. More than one proposed Presentation Context will be accepted for the same Abstract Syntax if the Transfer Syntax is supported, whether or not it is the same as another Presentation Context.

###### Transfer Syntax Selection Policies

If offered a choice of Transfer Syntaxes in a Presentation Context, Storage SCP will select the first Transfer Syntax that is listed in the Presentation Context.

Storage SCP will accept duplicate Presentation Contexts, that is, if it is offered multiple Presentation Contexts, each of which offers acceptable Transfer Syntaxes, it will accept all Presentation Contexts, applying the same rule for selecting a Transfer Syntax for each as described above.

###### Response Status

Storage SCP will behave as described in the Table below when generating the C-STORE response command message.

|  |  |  |  |
| --- | --- | --- | --- |
| **Service Status** | **Further Meaning** | **Error Code** | **Behavior** |
| Refused | Out of Resources | A700 | Failed to receive incoming DICOM Stream. Problem is logged on the SCP side. |
| Out of Resources | A7xx |
| Failure | Invalid object instance | 0117 |
| Data Set does not match SOP Class | A9xx |
| Invalid C-STORE request | C000 |
| Data Set does not match SOP Class | B007 |
| Elements Discarded | B006 |
| Success |  | 0000 | Instance successfully stored in temporary file. |

## 2.3 Configuration

**Configurable Parameters**

The user can change the following parameters in the configuration at any time

* AE Title
* DICOM Port Number
* IP Address (if there are several IP Address)

# 3 DICOM Media Interchange Conformance Requirements

The Application Entity allows importing and exporting DICOM Media Files. Various import and export filters are available in the application to read and create DICOM Media Files.

The files conform to the Part 10 format.

# 4 Support of Character Sets

## 4.1 Character Sets

The default character set is ISO\_IR 100.

### 4.1.1 Standard Support

#### 4.1.1.1 Encoding / Decoding

The character sets listed in [the table below](#_bookmark13) are supported for encoding data to DICOM and decoding data from DICOM.

Encoding of a data set fails with an error, if any of the affected text attributes cannot be encoded completely with the selected character set.

|  |  |
| --- | --- |
| **Character Set Description** | **Defined Term** |
| **Single-Byte Character Sets Without Code Extensions** | |
| Latin alphabet No. 1 | ISO\_IR 100 |
| Latin alphabet No. 2 | ISO\_IR 101 |
| Latin alphabet No. 3 | ISO\_IR 109 |
| Cyrillic | ISO\_IR 144 |
| Japanese | ISO\_IR 13 |
| Thai | ISO\_IR 166 |
| **Multi-Byte Character Sets with Code Extensions** | |
| Japanese | ISO 2022 IR 87 |
| **Multi-Byte Character Sets Without Code Extensions** | |
| Unicode in UTF-8 | ISO\_IR 192 |
| GB18030 | GB18030 |

# 5 Security

## 5.1 Security Profiles

No Security Profiles are supported.

## 5.2 Association Level Security

Storage SCU does not support Association Level Security.

The Storage SCP instantiated to receive Instances requested by Query/Retrieve SCU checks the following additional values when determining whether to accept Association Open Requests:

* + - * Called AE Title
      * Calling AE Title
      * IP address of Association Request originator

The Application Entity optionally checks following values when determining whether to accept Association Open Requests:

* + - * Implementation Class UID

## 5.3 Application Level Security

In order to load patient information into the application, the user opens the patient in the application, which requires the user identification in the form of a user name and password.

# 6. Extensions／specializations／privatizations

**Standard Extended /Specialized/Private SOPs**

Not use

**Private transfer syntax**

Not use

编 制 人： 审 批 人：

编制日期： 审批日期：