BRAINLAB

Technical Publication

DICOM Conformance Statement

Spine 6.0.0

Document Revision 2

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1 Conformance Statement Overview

This is a conformance statement for the Brainlab navigation application Spine. One purpose of this application is to import and visualize DICOM data.

The DICOM import part of the application is

- Receive DICOM data from other DICOM nodes (e.g. archives or workstations) via the network and load it into the software.

SOP Classes	User Of Service (SCU)	Provider Of Service (SCP)
Transfer		
Enhanced CT Image	No	Yes
Enhanced MR Image	No	Yes
Standard CT	No	Yes
Standard MR	No	Yes
Standard X-Ray Angio	No	Yes
Standard X-Ray RF	No	Yes

Table 1-1: Services supported by Spine

The Brainlab Spine software is embedded in the Brainlab DICOM workflow infrastructure based on the DICOM Proxy (see [2] for more information). In this scope the Spine software supports more DICOM services like

- DICOM Query/Retrieve Service Class
- Brainlab Extended Instance Availability Notification Service Class

These service classes are not part of this DICOM Conformance Statement. It only describes the supported DICOM Storage SOP Classes.

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3 Introduction

3.1 Revision History

Document Version	Date of Issue	Author	Description
1	Feb 06, 2012		Initial version
2	Feb 29, 2012		Corrections

3.2 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.

3.3 Remarks

DICOM, by itself, does not guarantee interoperability. However, the Conformance Statement facilitates a first-level validation for interoperability between different applications supporting the same DICOM functionality. The Conformance Statement should be read and understood in conjunction with the DICOM Standard [1]. However, by itself it is not guaranteed to ensure the desired interoperability and a successful interconnectivity.

The user should be aware of the following important issues:

- The comparison of different conformance statements is the first step towards assessing interconnectivity between Brainlab and non–Brainlab equipment.
- This Conformance Statement is not intended to replace validation with other DICOM equipment to ensure proper exchange of information intended.
- The DICOM standard will evolve to meet the users' future requirements. Brainlab reserves the right to make changes to its products or to discontinue its delivery.

3.4 Abbreviations

There are a variety of terms and abbreviations used in the document that are defined in the DICOM Standard. Abbreviations and terms are as follows:

AE	DICOM Application Entity
AET	Application Entity Title
CD	Compact Disk
CD-R	Compact Disk Recordable
DVD	Digital Versatile Disc
FSC	File-Set Creator
FSU	File-Set Updater
FSR	File-Set Reader
HD	Hard Disk
IOD	(DICOM) Information Object Definition
ISO	International Standard Organization
MOD	Magneto Optical Disk
PDU	DICOM Protocol Data Unit
Q/R	Query and Retrieve
SCU	DICOM Service Class User (DICOM client)
SCP	DICOM Service Class Provider (DICOM server)
SOP	DICOM Service-Object Pair

3.5 References

[1] Digital Imaging and Communications in Medicine (DICOM) 3.0, NEMA PS 3.1-3.18 – 2006
[2] DICOM Conformance Statement DICOM Proxy 2.1, Brainlab, April 4, 2011

4 Networking

4.1 Implementation Model

The Spine navigation application is embedded in the Brainlab workflow infrastructure provided by the Brainlab DICOM Proxy (see [2] for more information). This service provides the DICOM Storage, Query/Retrieve and Worklist interfaces to communicate with the outside world. The Spine application communicates only with the DICOM Proxy.

In an abstract view the Spine navigation application is an implementation of a Storage SCP to receive DICOM instances of the supported SOP Classes.

4.1.1 Application Data Flow Diagram

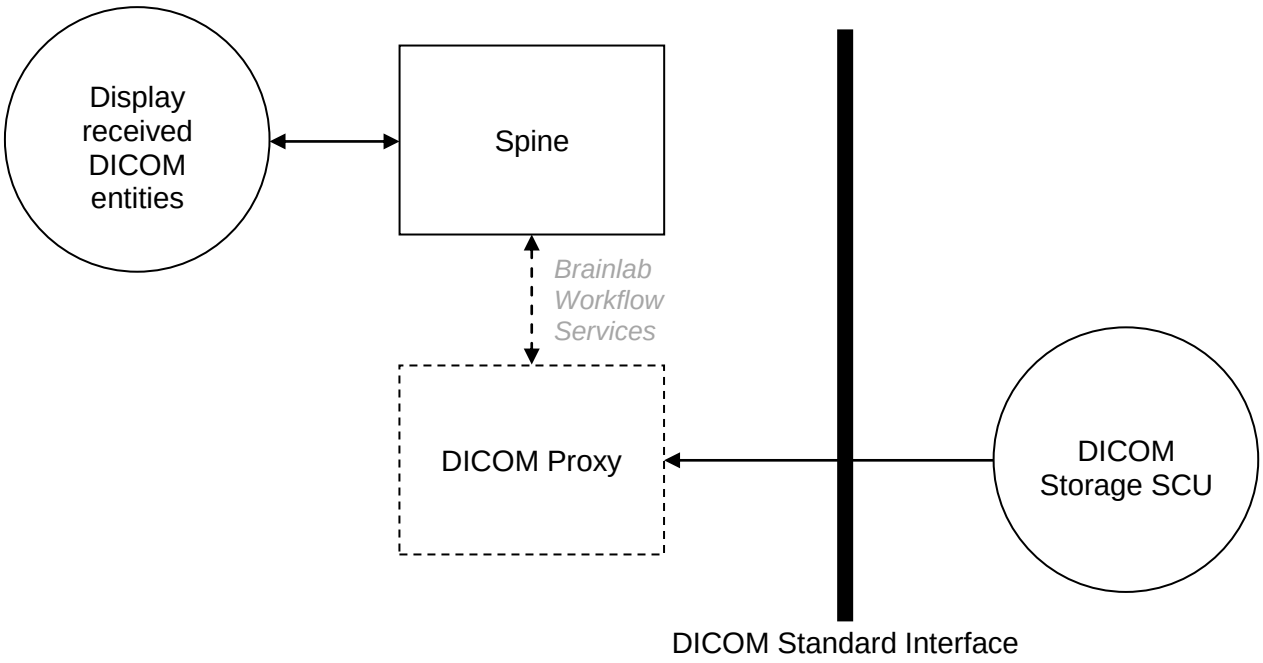

Figure 4-1: Spine Application flow diagram

4.1.2 Functional Definition of Application Entity (AE)

Some communications and data transfer with remote AEs are accomplished utilizing the DICOM protocol over a network using the TCP/IP protocol stack.

- Storage SCP: If the Spine navigation application shall display DICOM instances from remote DICOM nodes, with the start of the application, a running DICOM Proxy is required. The DICOM Proxy accepts any Storage Service Class. Via the Brainlab workflow infrastructure the DICOM instances with supported SOP Classes will be transferred to the Spine navigation application.

4.1.3 Sequencing Of Real World Activities

Spine is embedded in a sequencing of real world activities as follows:

Scenario 1: User queries for Patients via Patient Browser.

1. Spine is started with workflow entries referencing the selected data.
2. Patient Browser initiates a transfer of the selected data to the DICOM Proxy.
3. DICOM Proxy notifies Spine that selected data is available.
4. Spine initiates transfer of selected data to its Storage SCP

Scenario 2: DICOM Proxy receives images on AET "INTRAOP"

1. DICOM Proxy notifies Spine that the selected data is available
2. Spine initiates transfer of intra-op data to its Storage SCP

4.2 Application Entity Specifications

4.2.1 Spine

4.2.1.1 SOP Classes and Transfer Syntaxes

The Spine navigation application imports DICOM image data. It provides Standard Conformance to the following DICOM V3.0 SOP Classes:

SOP Class Name	SOP Class UID	SCU	SCP	Transfer Syntax
Enhanced CT Image	1.2.840.10008.5.1.4.1.1.2.1	No	Yes	UNCOMP, COMP
Enhanced MR Image	1.2.840.10008.5.1.4.1.1.4.1	No	Yes	UNCOMP, COMP
Standard CT	1.2.840.10008.5.1.4.1.1.2	No	Yes	UNCOMP, COMP
Standard MR	1.2.840.10008.5.1.4.1.1.4	No	Yes	UNCOMP, COMP
Standard X-Ray Angio	1.2.840.10008.5.1.4.1.1.12.1	No	Yes	UNCOMP, COMP
Standard X-Ray RF	1.2.840.10008.5.1.4.1.1.12.2	No	Yes	UNCOMP, COMP

Table 4-1: Supported Storage SOP Classes

Spine navigation application, via DICOM Proxy, supports the following transfer syntax lists. In an association negotiation the syntaxes are proposed in the order of appearance in the list.

Transfer Syntax Name	Transfer Syntax UID	SCU	SCP	Extended Negotiation
Uncompressed Transfer Syntax List (UNCOMP)				
DICOM Explicit VR Little Endian	1.2.840.10008.1.2.1	Yes	Yes	None
DICOM Explicit VR Big Endian	1.2.840.10008.1.2.2	Yes	Yes	None
DICOM Implicit VR Little Endian	1.2.840.10008.1.2	Yes	Yes	None
Compressed Transfer Syntax List (COMP)				
DICOM Explicit VR Little Endian	1.2.840.10008.1.2.1	Yes	Yes	None
DICOM Explicit VR Big Endian	1.2.840.10008.1.2.2	Yes	Yes	None
DICOM Implicit VR Little Endian	1.2.840.10008.1.2	Yes	Yes	None

JPEG Lossless, Non-Hierarchical, First-Order Prediction (Process 14)	1.2.840.10008.1.2.4.70	Yes	Yes	None

Table 4-2: Supported Transfer Syntaxes

4.2.1.2 Association Policies

4.2.1.2.1 Implementation Identifying Information

The implementation information for this Application Entity is:

Implementation Class UID	1.2.276.0.20.1.1.15.6.0.0
Implementation Version Name	Spine

4.2.1.3 Association Initiation Policy

The Spine navigation application never initiates an association.

4.2.1.4 Association Acceptance Policy

The Spine navigation application accepts no associations.

4.3 Network Interfaces

4.3.1 Physical Network Interface

The Spine navigation application supports the DICOM upper layer using TCP/IP. The Spine navigation application is indifferent to the physical medium over which TCP/IP executes. It inherits this from the operating system upon which it executes.

4.3.2 Additional Protocols

The usage of DNS and DHCP is possible and is based on the network configuration of the operating system upon which the Spine navigation application executes.

4.4 Configuration

All configuration parameters are read out from an application settings file that only may be modified by the BrainLAB support.

4.4.1 AE Title / Presentation Address Mapping

4.4.1.1 Local AE Titles

The local AET of the Spine navigation application is configurable:

Application Entity	Default AE Title	Default TCP/IP Port
Spine navigation application	INTRAOP	See DICOM Proxy

Table 4-3: Local AE Titles.

5 Media Interchange

The Spine navigation application doesn't support Media Interchange.

6 Support Of Extended Character Sets

Spine navigation application supports the

- ISO_IR 100 (ISO 8859-1:1987 Latin Alphabet No. 1 supplementary set)

7 Security Profiles

No security profiles are supported.

8 Annexes

8.1 IOD Contents

8.1.1 Usage Of Attributes From Received IODs

This section describes the requirements on the DICOM data, which can be displayed.

8.1.1.1 Images

Spine navigation application accepts all images of the SOP Classes in Table 4-1. Though, there are some restrictions and special conversions:

- Images with an attribute (0028,0030) Pixel Spacing containing different values for x and y distance[1] will be ignored.

8.1.1.2 3D X-Ray image treatment

If one of the following criteria is fulfilled the dataset is processed as 3D X-Ray modality:

- (0008,0060) Modality is “XA” and (0008,1090) Manufacturers Model Name is “XtraVision”

or

- (0029,xx04) for private creator code “Navigation” exists
- (0008,0008) Image Type contains “BrainlabVario3DNavigation”
- (0008,0008) Image Type contains “Vario3D”

or

- (0029,xx04) for private creator code “ISOC 3D NAVIGATIONMATRIX.R. 1.0” exists
- (0008,0008) Image Type contains “ISOC_3D”

or

- (0008,1090) Manufacturers Model Name is “AXIOM-Artis” and (0018,1210) Convolution Kernel is “EE”

[1] To be more precise: If the difference between both values is greater than 0.001 mm.

8.2 Data Dictionary Of Private Attributes

None supported.

8.3 Coded Terminology And Templates

None supported.

8.4 Grayscale Image Consistency

Not supported.

8.5 Standard Extended/Specialized/Private Sop Classes

None supported.

8.6 Private Transfer Syntaxes

None supported.

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