Technical Publication

DICOM Conformance Statement

Hip 5.1

Document Revision 1

February 05, 2009

1 Conformance Statement Overview

This is a conformance statement for the BrainLAB software Hip 5.1. This software is an intra-operative image guide localization system in order to position hip implants at their correct position at the femur or pelvis bone. Optional intra-operative acquired 2D X-ray images can support this purpose.

The DICOM 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)
Verification		
Verification	–	☑
Transfer		
X-Ray Angiographic Image Storage	–	☑
X-Ray Radiofluoroscopic Image Storage	–	☑

Table 1-1: Network services supported by Hip 5.1.0

2 Table Of Contents

3 Introduction

3.1 Revision History

Document Version	Date of Issue	Author	Description
1	January 29, 2009		Hip 5.1 - initial

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. Test procedures should be defined to validate the desired level of connectivity.

• 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
IOD	(DICOM) Information Object Definition
ISO	International Standard Organization
PDU	DICOM Protocol Data Unit
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 – 2004

4 Networking

4.1 Implementation Model

The BrainLAB Hip 5.1 application uses an implementation of:

- A Storage SCP that receives DICOM data from other DICOM archives or workstations.

4.1.1 Application Data Flow Diagram

The Storage SCP:
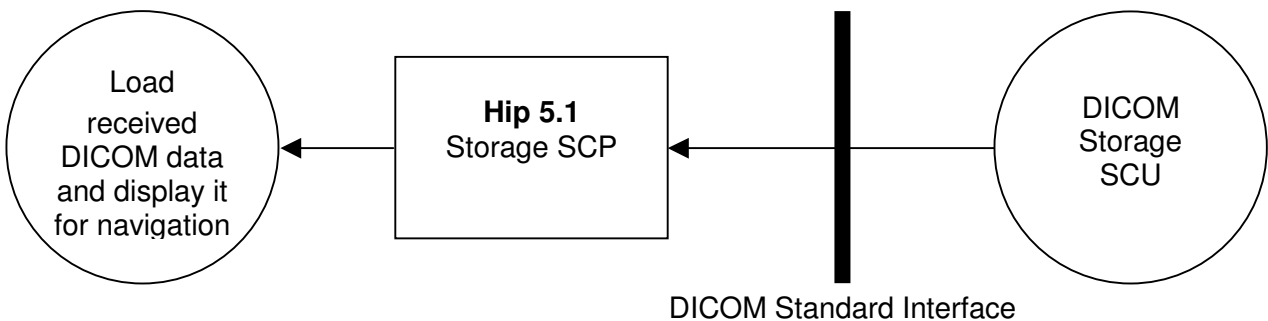
Figure 4-1: Application Data Flow Diagram

4.1.2 Functional Definition of Application Entity (AE)

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

- Storage SCP:
  With the start of the DICOM service module within the Hip 5.1 navigation application, a DICOM Storage SCP is invoked. It accepts any association with a DICOM Storage SCO negotiating any of the SOP Classes listed in Table 4-2.

4.1.3 Sequencing Of Real World Activities

No sequencing of real world activities is necessary.

4.2 Application Entity Specifications

4.2.1 Hip 5.1 Dicom service Specification

4.2.1.1 SOP Classes and Transfer Syntaxes

The Hip 5.1 navigation application receives C-ECHO requests in order to test the connection to a remote AE. It provides standard conformance to the following DICOM V3.0 SOP Classes:

SOP Class Name	SOP Class UID	SCU	SCP
Verification SOP Class	1.2.840.10008.1.1	–	☑

Table 4-1: Supported Verification SOP Classes

The Hip 5.1 navigation application is able to receive DICOM storage objects. It provides Standard Conformance to the following DICOM V3.0 SOP Classes:

SOP Class Name	SOP Class UID	SCU	SCP
X-Ray Angiographic Image Storage	1.2.840.10008.5.1.4.1.1.12.1	–	☑
X-Ray Radiofluoroscopic Image Storage	1.2.840.10008.5.1.4.1.1.12.2	–	☑

Table 4-2: Supported Storage SOP Classes

The Hip 5.1 navigation application supports the following transfer syntaxes. In an association negotiation the syntaxes are accepted in the order of appearance in the list.

Transfer Syntax Name	Transfer Syntax UID
DICOM Explicit VR Little Endian	1.2.840.10008.1.2.1
DICOM Implicit VR Little Endian	1.2.840.10008.1.2
DICOM Explicit VR Big Endian	1.2.840.10008.1.2.2
JPEG Lossless, Non-Hierarchical, First-Order Prediction (Process 14 [Selection Value 1])	1.2.840.10008.1.2.4.70

Table 4-3: Supported Transfer Syntaxes

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

For association acceptance:

Maximum number of simultaneous Associations	1

4.2.1.2.3 Asynchronous Nature

The Hip 5.1 navigation application does not support asynchronous communication (multiple outstanding transactions over a single association).

Maximum number of outstanding asynchronous transactions	1

4.2.1.2.4 Implementation Identifying Information

The implementation information for this Application Entity is:

Implementation Class UID	1.2.276.0.20.1.1.16.5.1.0
Implementation Version Name	Hip

4.2.1.3 Association Initiation Policy

The Hip 5.1 navigation application never initiates an association.

4.2.1.4 Association Acceptance Policy

The Hip 5.1 navigation application accepts an association in this case:

1. <u>Receive</u>: When the Hip 5.1 navigation application accepts an association, it will respond to storage requests.

Associations will be rejected,

- If the Called AE Title does not match the pre-configured AE Title
- If the application is not in receiving mode.

4.2.1.4.1 Activity – Receive

4.2.1.4.1.1 Associated Real-World Activity

As DICOM storage instances are received they are saved to the local file system. If the received instance is a duplicate of a previously received instance, the old file will be overwritten with the new one.

4.2.1.4.1.2 Proposed Presentation Contexts

Presentation Context Table			
Abstract Syntax	**Transfer Syntax**	**Role**	**Ext. Neg**
All SOP Classes as defined in Table 4-1 and Table 4-2[1]	All Transfer Syntaxes as defined in Table 4-3	SCU	None
		SCU	None
		SCU	None

Table 4-4: Storage SCP Presentation Contexts.

4.2.1.4.1.3 SOP Specific Conformance

The Hip 5.1 navigation application provides standard conformance to the DICOM Verification Service Class and to the DICOM Storage SOP Classes. No extended negotiation is implemented.

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[1] Be aware that the Storage SCP accepts more SOP Classes as defined in Table 4-1 and Table 4-2 while association negotiation. But later on it rejects all received messages of a SOP class not mentioned there.

The Hip 5.1 navigation application may interrupt the transfer at any point. The DICOM service module then aborts the association immediately after it got the interrupt signal.

4.2.1.4.1.4 Presentation Context Acceptance Criterion

The Hip 5.1.0 navigation application accepts multiple presentation contexts containing the same abstract syntax.

4.2.1.4.1.5 Transfer Syntax Selection Policy

The first Transfer Syntax encountered in the configuration file, which matches a Transfer Syntax offered for a given Presentation Context, will be selected as the accepted Transfer Syntax for that Presentation Context.

4.3 Network Interfaces

4.3.1 Physical Network Interface

The Hip 5.1 navigation application supports the DICOM upper layer using TCP/IP. The Hip 5.1 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 Hip 5.1 navigation application executes.

4.4 Configuration

All configuration parameters are read out from an application settings file, only BrainLAB support is allowed to modify.

4.4.1 AE Title / Presentation Address Mapping

4.4.1.1 Local AE Titles

The local AET of the Hip 5.1 navigation application is configurable:

Application Entity	Default AE Title	Default TCP/IP Port
Hip 5.1 navigation application	BRAINLAB_SCP	104

Table 4-5: Local AE Titles.

4.4.1.2 Remote AE Title/Presentation Address Mapping

Since the Hip 5.1.0 navigation application accepts associations from any DICOM remote node there is no configuration for remote AETs available.

4.4.2 Parameters

Parameter	Configurable	Default Value
General		
Timeout	Yes	30
Maximum PDU Size	No	28672
SOP Class Support	No	All supported will always be accepted
Transfer Syntax Support	No	All supported will always be accepted
Verbose logging	Yes	Disabled

Table 4-6: Configuration Parameters.

5 Media Interchange

The Hip 5.1 navigation application doesn't support Media Interchange.

6 Support Of Extended Character Sets

The Hip 5.1 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

None supported.

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.

9 Indexes

9.1 Index Of Images

9.2 Index Of Tables