

Technical Publication

DICOM Conformance Statement
Trauma 3.0

Document Revision 2

October 5th, 2010

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1 Conformance Statement Overview

This is a conformance statement for the BrainLAB software Trauma. The main purpose of this software is to intraoperatively receive fluoroscopic images from a C-arm and to make them available for planning and display in navigation. Among the different C-arm types integrated into the software, some are capable of sending the images in DICOM format over a network connection.

The DICOM part of the application is

- Receive DICOM data from other DICOM nodes (e.g. on a C-arm) via the network and load it into the software.

Not all of the supported DICOM Storage Classes are convertible to the BrainLAB file format. If the conversion is possible these classes are marked in the column “Convertible”.

| SOP Classes | User Of Service (SCU) | Provider Of Service (SCP) |
|---------------------------------------|-----------------------|---------------------------|
| Verification | | |
| Verification | No | Yes |
| Transfer | | |
| X-Ray Angiographic Image Storage | No | Yes |
| X-Ray Radiofluoroscopic Image Storage | No | Yes |

Table 1-1: Network services supported by the Trauma navigation application

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3 Introduction

3.1 Revision History

| Document Version | Date of Issue | Author | Description |
|------------------|---------------------------------|--------|----------------------|
| 1 | January 19 th , 2010 | | Trauma 3.0 - 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 Trauma 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:

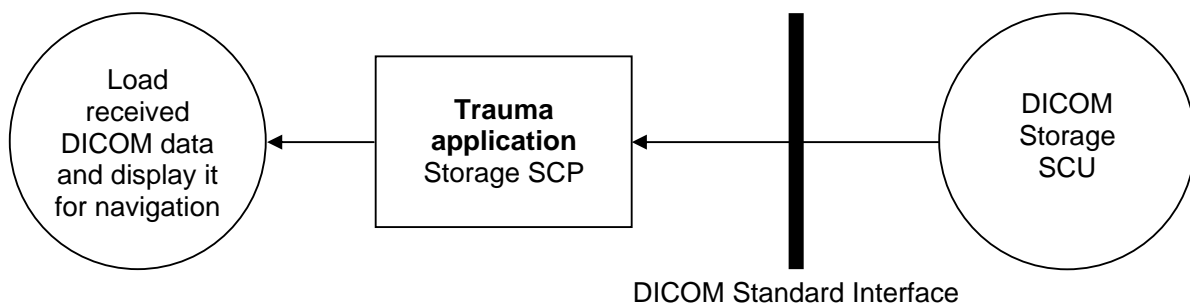


Figure 4-1: Application Data Flow Diagram

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 Trauma navigation application, a DICOM Storage SCP is invoked. It accepts any association with a Storage SCU 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 Trauma Dicom service Specification

4.2.1.1 SOP Classes and Transfer Syntaxes

The Trauma 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 | Yes | Yes |

Table 4-1: Supported Verification SOP Classes

The Trauma 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 | No | Yes |
| X-Ray Radiofluoroscopic Image Storage | 1.2.840.10008.5.1.4.1.1.12.2 | No | Yes |

Table 4-2: Supported Storage SOP Classes

The Trauma 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 | SCU | SCP | Extended Negotiation |
|--|------------------------|-----|-----|----------------------|
| DICOM Implicit VR Little Endian | 1.2.840.10008.1.2 | No | Yes | None |
| DICOM Explicit VR Little Endian | 1.2.840.10008.1.2.1 | No | Yes | None |
| DICOM Explicit VR Big Endian | 1.2.840.10008.1.2.2 | No | Yes | None |
| JPEG Lossless, Non-Hierarchical, First-Order Prediction (Process 14) | 1.2.840.10008.1.2.4.70 | No | Yes | None |

Table 4-3: Supported Transfer Syntaxes (association negotiation)

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 Trauma 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 | 1.2.276.0.20.1.1.17.3.0.0 |
| Implementation Version Name | Trauma30 |

4.2.1.3 Association Initiation Policy

The Trauma navigation application never initiates an association.

4.2.1.4 Association Acceptance Policy

The Trauma navigation application accepts an association in this case:

1. Receive: When the Trauma 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 | SCP | None |
| | | SCP | None |
| | | SCP | None |

Table 4-4: Storage SCP Presentation Contexts.

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.

4.2.1.4.1.3 SOP Specific Conformance

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

The Trauma navigation application may interrupt the transfer at any point. It then aborts the association immediately.

4.2.1.4.1.4 Presentation Context Acceptance Criterion

The Trauma 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 Trauma navigation application supports the DICOM upper layer using TCP/IP. The Trauma 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 Trauma 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 Trauma navigation application is configurable:

| Application Entity | Default AE Title | Default TCP/IP Port |
|-------------------------------|------------------|---------------------|
| Trauma navigation application | BRAINLAB_SCP | 104 |

Table 4-5: Local AE Titles.

4.4.1.2 Remote AE Title/Presentation Address Mapping

Since the Trauma 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 | 600 |
| 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 Trauma navigation application doesn't support Media Interchange.

6 Support Of Extended Character Sets

The Trauma 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.

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