DICOM Conformance Statement for Sentinelle Aegis 1.0

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1 INTRODUCTION

1.1 Purpose of this Document
This document is the DICOM Conformance Statement for Sentinelle's Aegis software. The purpose of this document is to describe how the workstation interacts with other DICOM devices on the network.

1.2 Related Documents
The Digital Imaging and Communications in Medicine (DICOM) standard. NEMA PS 3.1-13 2004 and Supplements.

1.3 Scope
This DICOM Conformance Statement documents the conformance of Sentinelle Aegis with the Digital Imaging and Communications in Medicine (DICOM) standard. This document is essential in order to evaluate whether or not another DICOM compliant device can communicate with this software product. This statement is conformant with the recommended format as described in PS 3.2 of the DICOM standard.

1.4 Acronyms and Abbreviations
DICOM abbreviations are used throughout this Conformance Statement. For a description of these, consult the DICOM standard publication.

1.5 Important note to the reader
The use of this conformance statement by itself does not guarantee successful interoperability of Sentinelle software with equipment from other vendors. The user or integrator of Sentinelle software should keep the following issues in mind:

1. Successful interoperability of the workstation with other devices may require functions that are not specified within the scope of DICOM. It is the user's or integrator's responsibility to ensure that the proper analysis and validation is performed to verify the connection.

2. Test procedures should be used to verify that data transferred into the workstation is correct. This is often done with the aid of phantom scans using a variety of clinical protocols.

3. Test procedures should be used to verify connectivity. Issues such as full database and broken connections should be verified.

4. The current version of this DICOM Conformance Statement is also available on the Sentinelle Medical Inc. web page at http://www.sentinellemedical.com

5. The DICOM standard will continually evolve to meet new user requirements. Sentinelle will follow the changes in the standard by implementing new features

as specified by the standard. Sentinelle reserves the right to make changes to its products or to discontinue its delivery. The user or integrator should ensure that any non-Sentinelle device providers, which connect with Sentinelle devices, should also follow the standard. Failure to do so will likely result in future connectivity problems.

2 IMPLEMENTATION MODEL

2.1 Application Data Flow
Aegis implements the C-STORE SCP application entity as a child process --
AegisStoreScp.exe -- of the main Aegis process. This child process is created
when the Aegis application is started and is terminated when it is closed. This
means that the user must ensure that the main Aegis application is running for
images to be successfully received.

The C-STORE SCU application entity is implemented as part of the main Aegis
executable.

2.2 Functional Definitions of AEs
Aegis uses a configuration file that contains information used to validate
association attempts from Remote Application entities. Aegis then listens on the
configured port for association requests.

An association request for Storage Services from a Remote Application Entity
causes Aegis to validate the request according to the configuration parameters
set at execution time. The Remote Application Entity then sends the Information
Object Instance. Aegis stores the received Information Object Instance in its local
database if the data does not already exist. The data remains in the database
until removed by some action external to this Application Entity.

A request from the workstation User Interface causes Aegis to initiate an
association with a Remote Application Entity. The Service Classes offered are
specified in the configuration file. The user can then initiate query and retrieve
requests that are sent to the Remote Application Entity. The workstation User
Interface displays the responses from the Remote Application Entity.

3 APPLICATION ENTITY SPECIFICATIONS

3.1 Aegis Application Entity Specification

The Aegis workstation DICOM Image Transfer capability consists of two logical components. The SCU portion originates associations for Query and Retrieve operations. The SCP portion accepts associations for Store operations. The two components are configured with the same Application Entity Title for use in the workstation. They are treated as a single Application Entity in this description. The Aegis Application Entity provides Standard Conformance to the following DICOM V3.1 SOP Classes as an SCP:

SOP Class Name	SOP Class UID
Verification	1.2.840.10008.1.1
CT Image Storage	1.2.840.10008.5.1.4.1.1.2
MR Image Storage	1.2.840.10008.5.1.4.1.1.4

The Aegis Application Entity provides Standard Conformance to the following DICOM V3.1 SOP Classes as an SCU:

SOP Class Name	SOP Class UID
Verification	1.2.840.10008.1.1
Study Root Query/Retrieve Model - FIND	1.2.840.10008.5.1.4.1.2.2.1
Study Root Query/Retrieve Model - MOVE	1.2.840.10008.5.1.4.1.2.2.2
CT Image Storage	1.2.840.10008.5.1.4.1.1.2
MR Image Storage	1.2.840.10008.5.1.4.1.1.4

3.1.1 Association Establishment Policies

3.1.1.1 General
The DICOM standard application context name, which is always proposed, is:
Application context name 1.2.840.10008.3.1.1.1
The maximum PDU length can be configured at installation time in the range 4096-131072 bytes. The default is 16384 bytes.
SOP Class extended negotiation is not supported.

3.1.1.2 Number of Associations
The number of parallel associations is only limited by the resources of the underlying operating system.

3.1.1.3 Asynchronous Nature
Asynchronous mode of operation is not supported.

3.1.1.4 Implementation Identifying Information
The implementation UID of this application is:
OFFIS DCMTK 3.5.4 Implementation Class UID 1.2.276.0.7230010.3.0.3.5.2

3.1.2 Association Initiation Policy
This section details the action Aegis will take as a result of user initiated activity on the workstation User Interface.

3.1.2.1 Query Request

3.1.2.1.1 Associated Real World Activity
The user of the workstation selects the Search operation button on the user interface. The user can specify wildcard or exact information for Patient Name, though wildcard queries can result in excessive number of responses. For Patient ID, only exact information may be given to the Query request.

The DICOM transfer utility defaults to using Study Root Query Model when initiating a query request.

3.1.2.1.2 Proposed Presentation Contexts
The following table describes the Presentation Contexts that may be presented for the Query request.

Presentation Context Table				
Abstract Syntax		Transfer Syntax		Role
Name	UID	Name	UID	
Study Root Query/ Retrieve Model - FIND	1.2.840.10008.5.1.4.1 .2.2.1	Implicit VR Little Endian	1.2.840.10008.1.2	SCU

3.1.2.1.2.1 SOP Specific Conformance for Patient Root Query/Retrieve Model – FIND

Aegis does not use Relational Queries.

Aegis does not use Extended Negotiation.

The Keys supported are listed below:

Study Level Keys

Description	Tag	Type
Study Date	(0008, 0020)	R
Study Time	(0008, 0030)	R
Accession Number	(0008, 0050)	R
Study ID	(0020,0010)	R
Study Instance UID	(0020, 000D)	U
Patient's Name	(0010, 0010)	R
Patient ID	(0010, 0020)	U
Patient's Birth Date	(0010, 0030)	O
Modalities In Study	(0008, 0061)	O
Study Description	(0008, 1030)	O
Number Of Study Related Series	(0020, 1206)	O
Number Of Study Related Instances	(0020, 1208)	O

Series Level Keys

Description	Tag	Type
Modality	(0008, 0060)	R
Series Number	(0020, 0011)	R
Series Instance UID	(0020, 000E)	U
Series Description	(0008, 103E)	O
Number Of Series Related Instances	(0020, 1209)	O

Image Level Keys

Description	Tag	Type
SOP Class UID	(0008, 0016)	R
SOP Instance UID	(0008, 0018)	U

3.1.2.2 Move Request

3.1.2.2.1 Associated Real World Activity
The user selects one or more studies and/or series within studies from a list presented as a result of a previous Query operation. The user of the workstation then selects the Retrieve operation item on the user interface to initiate the move operation. The Destination Application Entity Title is selectable on the User Interface.

3.1.2.2.2 Proposed Presentation Contexts
The following table describes the Presentation Contexts that may be presented for the Move request.

Presentation Context Table				
Abstract Syntax		Transfer Syntax		Role
Name	UID	Name	UID	
Study Root Query/ Retrieve Model - MOVE	1.2.840.10008.5.1.4.1 .2.2.2	Implicit VR Little Endian	1.2.840.10008.1.2	SCU

3.1.2.2.2.1 SOP Specific Conformance for Patient Root Query/Retrieve Model – MOVE
This implementation supports transfers against the Patient Query/Retrieve Information Model described in Section C.6.1.1 of NEMA PS3.4 (2004) Annex C using the C-MOVE SCU behavior described in Section C.4.2.2 of NEMA PS3.4 (2004) Annex C.

3.1.2.2.2.2 SOP Specific Conformance for Study Root Query/Retrieve Model –MOVE
This implementation supports transfers against the Study Query/Retrieve Information Model described in Section C.6.2.1 of NEMA PS3.4 (2004) Annex C using the C-MOVE SCU behavior described in Section C.4.2.2 of NEMA PS3.4 (2004) Annex C.

3.1.3 Association Acceptance Policy
When Aegis accepts an association, it will answer a C-ECHO request or receive any images transmitted on that association and store the images on disk. Store SCP requires that the called Application Entity Title (AET) matches the AET configured for the application. It places no limitations on who may connect to it, nor on the number of simultaneous connects it will support.

3.1.3.1 Storage Association Request

3.1.3.1.1 Associated Real-World Activity
Aegis stores image Information Object Instances received on the accepted association into its attached database.

3.1.3.1.2 Presentation Context Table
The following table lists the possible Presentation Contexts. The Application Entity configuration file specifies which of these Presentation Contexts are actually used in a specific configuration.

Presentation Context Table				
Abstract Syntax		**Transfer Syntax**		**Role**
Name	**UID**	**Name**	**UID**	
CT Image Storage	1.2.840.10008.5.1.4.1.1.2	Implicit VR Little Endian	1.2.840.10008.1.2	SCP
		Explicit VR Little Endian	1.2.840.10008.1.2.1	
		Explicit VR Big Endian	1.2.840.10008.1.2.2	
		Deflated Explicit VR Little Endian	1.2.840.10008.1.2.1.99	
MR Image Storage	1.2.840.10008.5.1.4.1.1.4	Implicit VR Little Endian	1.2.840.10008.1.2	SCP
		Explicit VR Little Endian	1.2.840.10008.1.2.1	
		Explicit VR Big Endian	1.2.840.10008.1.2.2	
		Deflated Explicit VR Little Endian	1.2.840.10008.1.2.1.99	

3.1.3.1.2.1 SOP Specific Conformance for all Storage SOP Classes

The Store SCP will receive any DICOM objects (images and non-image objects) transmitted in the open association provided that the correct presentation context is used. If the objects are received successfully, they are stored and registered in the local database, from where they can be loaded into Aegis. No integrity checks of the received objects are performed beyond tests of a very basic structural integrity. In particular, the sending system is not prevented from transmitting incomplete or incorrect IODs or objects that are correct but cannot be displayed. Such objects will be visible in the local database, but they cannot be viewed.

Objects are stored in the local database as files in DICOM part 10 format with Explicit VR Little Endian Transfer Syntax. When objects received in Implicit VR contain attributes unknown to this application, they are stored as "Unknown VR"

(UN) elements. Certain element values may be changed during storage, i. e.
group length values and sequence lengths are re-computed.

The following error/warning status codes can be sent by the Store SCP in the
context of a CSTORE- RSP message:

Code (Hex Value)	Name	Severity	Description
a700	refused: out of resources	failure	Application out of memory or file system full.
a800	SOP class not supported	failure	Received C-STORE-RQ for unsupported SOP class.
a900	data set does not match SOP class	failure	Received C-STORE-RQ for non-storage SOP class
c000	cannot understand	failure	Received dataset without SOP class or instance UID; received Presentation State that failed syntax check; internal application error

Aegis never removes, coerces or changes attribute values, except for the special
case of group length attributes mentioned above. The duration of storage
depends on the user, who can delete objects from the local database at any time.
Aegis implements Level 2 (Full) conformance to the Storage Service Class.
However, extended negotiation is not supported.

3.1.3.1.3 Transfer Syntax Selection Policies
The default behavior of Aegis is to select the explicit VR transfer syntax with the
byte order matching the local machine byte order (i. e. little endian on PC, big
endian on Mac OS) for each presentation context containing a supported SOP
class.

4 COMMUNICATION PROFILES

4.1 Supported Communication Stacks
DICOM Upper Layer over TCP/IP is supported.

4.2 OSI Stack
Not supported.

4.3 TCP/IP Stack
The TCP/IP stack is inherited from the underlying operating system

4.3.1 API
The application makes use the WinSock Interface.

4.3.2 Physical Media Support
DICOM is indifferent to the physical medium over which TCP/IP executes.

4.4 Point-to-Point Stack
Not supported.

5. Extensions/Specialization's/Privatization's

5.1 Standard/Extended/Specialized/Private SOPs
Not applicable

5.2 Private Transfer Syntax's
No Private Transfer Syntax's are used.

6 CONFIGURATION

6.1 Configurable Parameters

- The port number to listen on for association requests is configurable.
- The Application Entity title for Aegis is configurable.
- The local directory in which DICOM objects are stored is configurable.
- Application Entity host names can be specified as either actual host names or as IP addresses.

7 SUPPORT OF EXTENDED CHARACTER SETS

This application supports only ISO_IR 100 (ISO 8859-1 Latin 1) as extended character set.