FONAR Sympulse
Dicom 3.0 Conformance Statement
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REVISION RECORD

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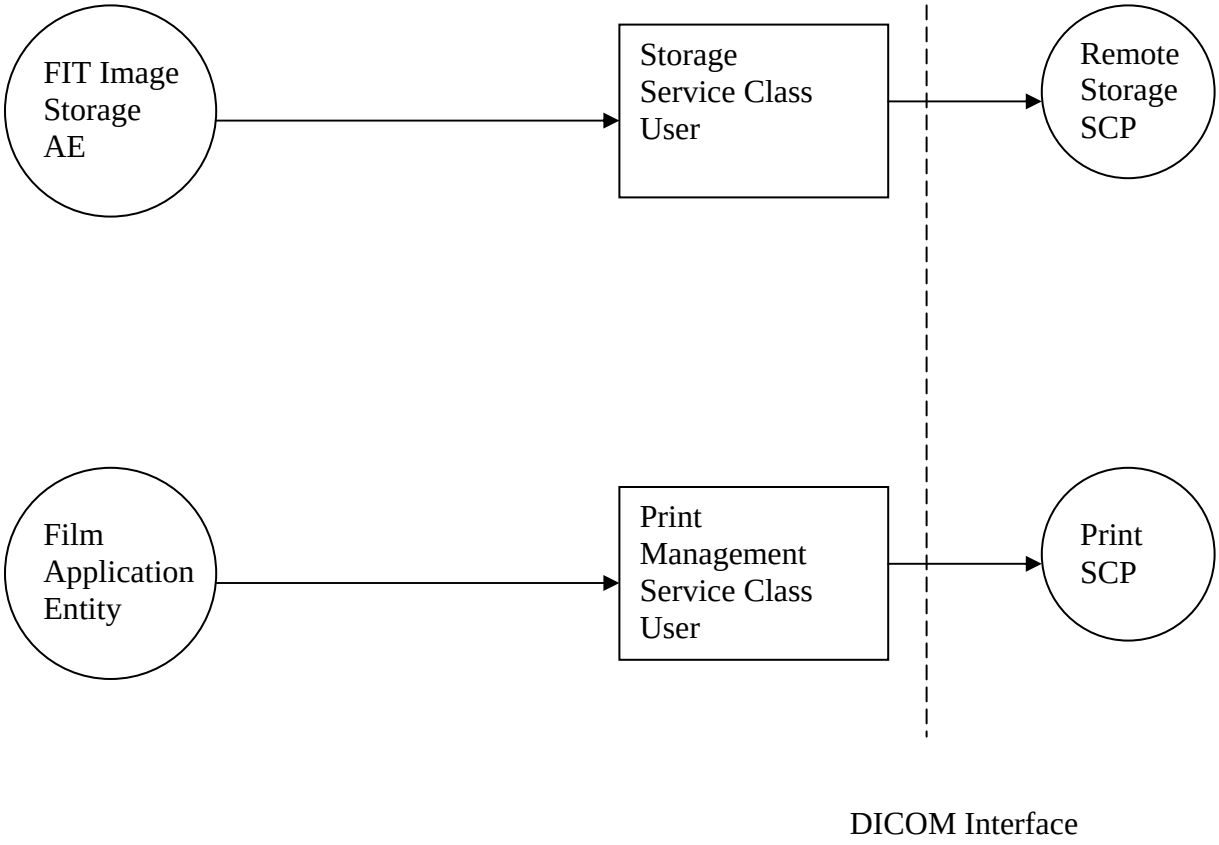
1 Introduction

This document details FONAR's Sympulse MRI computer subsystem's conformance to the DICOM 3.0 standard. FONAR's MRI scanners all utilize the Sympulse computer for scanner control, image reconstruction, and image database management. Through the Sympluse computer hardware and software the MRI scanners have the ability to acquire, store, accept, and film MRI images through DICOM services.

2 Implementation Model

This implementation provides for image transfer through the DICOM Storage Service Class as a Service Class User (SCU). Additionally, it supports MRI image filming via the DICOM Basic Grayscale Print Management Meta SOP Class as a Service Class User (SCU). Two applications (FIT and FILM) implement the storage and print capability.

3 Application Data Flow



3.1 FONAR Image Transfer (FIT) Software (SCU)

FIT is a WIN32 console application that transfers DICOM MRI images. The application may be invoked from the command line or indirectly from another process. FIT will translate a set of FONAR MRI images, contained in a FONAR propriety file format, to a corresponding set of DICOM images. The translated images are then transmitted and stored on the remote system.

FIT is invoked with the following command line:

FIT <image file path> <Remote IP> <Remote Port> <Remote AE> <Local AE>

The image file path specifies a fully qualified path to the file containing the FONAR MRI images. The IP specifies the SCP's TCP/IP IP address in dot notation (e.g., 192.9.20.42). The remote port specifies the SCP's TCP/IP port number. The remote AE specifies the SCP's DICOM Application Entity Title and local AE specifies the SCU's DICOM Application Entity Title for the C-STORE operation.

3.1.1 Functional Definition

When FIT is invoked, it will open the specified FONAR image file, establish an association with the remote system, translate the FONAR images and corresponding information (package them into **V**alue **R**epresentations), and transmit them for storage to the remote system.

3.1.2 Sequencing of Real World Activities

Not Applicable.

3.1.3 AE Specification

Fit only initiates associations and derives its operational parameters from its command line arguments. Please note that although multiple instances of FIT may be running simultaneously, each process represents the same application entity.

3.1.4 FIT Specifications

FIT provides Standard Conformance to the following DICOM v3.0 SOP Classes as an SCU:

Class Name	SOP Class UID
MR Image Storage SOP Class	1.2.840.10008.5.1.4.1.1.4

3.1.5 Association Establishment Policies

3.1.5.1 General

Fit will attempt to establish an association whenever it is invoked provided it is given a set of valid command line arguments (i.e.; file path, IP address and Port).

3.1.5.2 Number of Associations

FIT will attempt only one association establishment at a time. However, multiple copies of FIT may be invoked simultaneously. When multiple copies are invoked simultaneously synchronization between the copies is not attempted. Therefore only the resources available on the host computer limit the number of simultaneous associations.

3.1.5.3 Asynchronous Nature

FIT does not perform asynchronous operations and window negotiation.

3.1.5.4 Implementation Identifying Information

The Implementation Class UID used by FIT is:

“1.2.840.113781.”

The Implementation version name is:

“FONAR FIT 1.00”

3.1.6 Association Initiation Policy

Fit attempts to initiate a new association for each study transfer. The study’s images will be encoded using DICOM Implicit VR Little Endian Transfer Syntax.

3.1.7 Associated Real World Activity

The associated real world activity is the attempt to transfer the images contained in the specified study file. The images will be transferred using an implicit VR.

3.1.8 Proposed Presentation Contexts

FIT will propose a single presentation context:

Abstract Syntax
MR Image 1.2.840.10008.5.1.4.1.1.2
Transfer Syntax
DICOM Implicit VR Little Endian Transfer Syntax 1.2.840.10008.1.2
Role
SCU
Extended Negotiation
None

3.1.9 SOP Specific Conformance to the Storage SOP Class

FIT conforms to the SOP's of the Storage Service Class at Level 2 (Full). No elements are discarded or coerced by FIT. In the event of a successful C-STORE operation the images are stored on a remote AE.

3.1.10 Communications Profiles

3.1.10.1 Supported Communications Stacks (parts 8, 9)

FIT provides DICOM V3.0 TCP/IP Network Communication Support as defined in PS 3.8.

3.1.10.2 TCP/IP Stack

FIT inherits its TCP/IP stack from the Windows NT operating system upon which it is running.

3.1.10.3 Physical Media Support

FIT is indifferent to the physical media over which TCP/IP transmits the images.

3.1.10.4 Extensions/Specialization/Privations

Not Applicable.

3.1.10.5 Configuration

FIT obtains its configuration information from the command line.

3.2 FILM FONAR's Print Management Service Class User (SCU)

Film is a WIN32 console application that formats, labels, and transfers DICOM MRI images for filming. The application may be invoked from the command line or indirectly from another process. Film will translate a set of FONAR MRI images, contained in a FONAR propriety file format, to a corresponding set of DICOM images. The translated images are then transmitted and printed on the remote system.

The Film program has the capability to interface with several cameras using multiple 3M protocols or through a DICOM V3.0 interface. The 3M protocols require specialized digital parallel and serial hardware. This document shall focus exclusively on the program's DICOM capability. The DICOM interface uses the computer's LAN connection to transfer images.

3.2.1 Functional Definition

The Film application formats, labels, and transfers DICOM MRI images for filming acting as a Service Class user (SCU) for the Basic Grayscale Print Management Meta SOP Class. Film obtains its operational parameters from a definition file (Film.def) and from the command line. The film program has many parameters that are documented elsewhere. Those parameters that relate to the DICOM standard will be identified and explained in this document.

When Film is invoked it will open the specified FONAR image file, translate the pixel data (convert from 12 Bits to 8 Bits) as specified (windowing, zooming, and panning), label the images, encapsulate them into DICOM VR's, establish an association with the remote printer, and transmit the images. Film will initiate the association and will make use of the SOP classes defined for the Print Management capability. It will create a Film Session with one or more Film Boxes that have one or more Image Boxes.

3.2.2 Sequencing of Real World Activities

This section is not applicable to this program.

3.2.3 AE Specification

Film only initiates associations and derives its operational parameters from its command line arguments and definition file.

```
-ProDICOM      1              ;DICOM Protocol
-LocalAE       print_client   ;Local AE Title
-RemoteAE      print_server   ;Remote AE Title
-DicomIP       177.77.2.39    ;Remote IP address
-DicomPort     1024           ;Remote Port number
-Medium        blue           ;Media type
```

3.2.4 Film Specification

The Film SCU provides conformance to the following DICOM 3.0 Meta SOP Classes:

SOP Class Name	Sop Class UID
Basic Grayscale Print Management Meta SOP	1.2.840.10008.5.1.1.9
Basic Film Session SOP Class	1.2.840.10008.5.1.1.1
Basic Film Box SOP Class	1.2.840.10008.5.1.1.2
Basic Grayscale Image Box SOP Class	1.2.840.10008.5.1.1.4
Print Job SOP Class	1.2.840.10008.5.1.1.14

3.2.5 Association Establishment Policies

3.2.5.1 General

The SCU Application Entity (Film) attempts to initiate a new association for each film session.

3.2.5.2 Number of Associations

Film will attempt only one association establishment at a time. However, multiple copies of Film may be invoked simultaneously. When multiple copies are invoked simultaneously synchronization between the copies is not attempted. Therefore only the resources available on the host computer limit the number of simultaneous associations.

3.2.5.3 Asynchronous Nature

Asynchronous Operations Window Negotiation is not supported.

3.2.5.4 Implementation Identifying Information

The Implementation Class UID used by Film is:

“1.2.840.113781.”

The Implementation version name is:

“FONAR Film 1.00”

3.2.6 Association Initiation Policy

This section is not applicable for the Film SCU Application Entity.

3.2.7 Associated Real World Activity

The associated Real World Activity is the printing of a set of images that were encoded using the appropriate DICOM scheme (VR's).

3.2.8 Proposed Presentation Contexts

Film will propose the following presentation context items:

Abstract Syntax	
Basic Grayscale Print Management Meta SOP Class	1.2.840.10008.5.1.1.9
Print Job SOP Class	1.2.840.10008.5.1.1.14
Transfer Syntax	
DICOM Implicit VR Little Endian Transfer Syntax	1.2.840.10008.1.2
Role	
SCU	
Extended Negotiation	
None	

3.2.9 SOP Specific Conformance to the Storage SOP Class

When an image is transmitted on a remote printer it is converted from FONAR's format to DICOM V3.0 VR's and transmitted using DICOM v3.0 protocols.

3.2.10 Communications Profiles

3.2.10.1 Supported Communications Stacks (parts 8, 9)

Film provides DICOM V3.0 TCP/IP Network Communication Support as defined in PS 3.8.

3.2.10.2 TCP/IP Stack

Film inherits its TCP/IP stack from the Windows NT operating system upon which it is running.

3.2.10.3 Physical Media Support

Film is indifferent to the physical media over which TCP/IP transmits the images.

3.2.10.4 Extensions/Specialization/Privations

Not Applicable.

3.2.10.5 Configuration

Film obtains its configuration information from the command line and definition files.