

DICOM 3.0 Conformance Statement
for
DICOM PRINTER VERSION 2.0

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1 Conformance Statement Overview

This DICOM Conformance Statement specifies the behavior and functionality of the DICOM Printer application. This software provides the following features:

- Storage of images and presentation states on a remote DICOM system.
- Querying for data on a remote DICOM system.
- Printing of hardcopies on a remote DICOM print SCP.

Table 1.1: Overview of the network services provided by DICOM Printer.

Name	UID	(SCU)	(SCP)
VERIFICATION			
Verification	1.2.840.10008.1.1	Yes	No
TRANSFER			
Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7	Yes	No
QUERY / RETRIEVE			
Patient Root Query/Retrieve Information Model	1.2.840.10008.5.1.4.1.2.1.1	Yes	No
Modality Worklist Information Model - FIND	1.2.840.10008.5.1.4.31	Yes	No
PRINT MANAGEMENT			
Basic Grayscale Print Management (Meta)	1.2.840.10008.5.1.1.9	Yes	No
Basic Color Print Management (Meta)	1.2.840.10008.5.1.1.18	Yes	No

Contents

1	Conformance Statement Overview	1
2	Table of Contents	4
2	Introduction	6
2.1	Revision History	6
2.2	Audience	6
2.3	Remarks	6
2.4	Definitions, Terms and Abbreviations	7
2.4.1	Definitions	7
2.4.2	Abbreviations and Acronyms	8
2.5	References	9
2.6	Basics of DICOM Communication	10
2.7	How to use this document	10
3	Networking	12
3.1	Implementation model	12
3.1.1	Application Flow Diagram	12
3.1.2	Functional Definitions of AE's	12
3.1.2.1	Find SCU	12
3.1.2.2	Store SCU	12
3.1.2.3	Print SCU	12
3.1.3	Sequencing of Real-World Activities	12
3.2	AE Specifications	12
3.2.1	Find SCU	12
3.2.1.1	SOP Classes	12
3.2.1.2	Association Policies	12
3.2.1.2.1	General	12
3.2.1.2.2	Number of Associations	13
3.2.1.2.3	Asynchronous Nature	13
3.2.1.2.4	Implementation Identifying Information	13
3.2.1.3	Association Initiation Policy	13
3.2.1.3.1	Activity - Query	14
3.2.1.3.1.1	Description and Sequencing of Activities	14
3.2.1.3.1.2	Proposed Presentation Contexts	14
3.2.1.3.1.3	SOP Specific Conformance for Patient Root Query Retrieve Information Model SOP Class	14
3.2.1.3.1.3.1	Optional Keys	14
3.2.1.3.1.3.2	Relational Queries	14
3.2.1.3.1.3.3	Extended Negotiation	15
3.2.1.3.1.3.4	Specific Character Set	15
3.2.1.3.1.3.5	Response Behaviour	15
3.2.1.3.1.3.6	Communication Failure	15

3.2.1.3.1.4	SOP Specific Conformance for Modality Worklist Information Model - FIND SOP Class	15
3.2.1.3.1.4.1	Optional Keys	16
3.2.1.3.1.4.2	Person Name Matching	16
3.2.1.3.1.4.3	Use of Specific Character Set	16
3.2.1.4	Association Acceptance Policy	16
3.2.2	Store SCU	16
3.2.2.1	SOP Classes	16
3.2.2.2	Association Policies	16
3.2.2.2.1	General	16
3.2.2.2.2	Number of Associations	16
3.2.2.2.3	Asynchronous Nature	17
3.2.2.2.4	Implementation Identifying Information	17
3.2.2.3	Association Initiation Policy	17
3.2.2.3.1	Activity - Send Images	17
3.2.2.3.1.1	Description and Sequencing of Activities	17
3.2.2.3.1.2	Proposed Presentation Contexts	17
3.2.2.3.1.3	SOP Specific Conformance for Secondary Capture Image Storage SOP Class	17
3.2.2.3.1.3.1	Extended Negotiation	17
3.2.2.3.1.3.2	Response Behaviour	17
3.2.2.3.1.3.3	Communication Failure	17
3.2.2.3.4	Association Acceptance Policy	17
3.2.3	Print SCU	17
3.2.3.1	SOP Classes	17
3.2.3.2	Association Policies	18
3.2.3.2.1	General	18
3.2.3.2.2	Number of Associations	19
3.2.3.2.3	Asynchronous Nature	19
3.2.3.2.4	Implementation Identifying Information	19
3.2.3.3	Association Initiation Policy	19
3.2.3.3.1	Activity - Print	19
3.2.3.3.1.1	Description and Sequencing of Activities	20
3.2.3.3.1.2	Proposed Presentation Contexts	20
3.2.3.3.1.3	SOP Specific Conformance	20
3.2.3.3.1.3.1	Response Behaviour	20
3.2.3.3.1.3.2	Communication Failure	20
3.2.3.3.1.3.3	SOP Specific Conformance for Basic Film Session SOP Class	21
3.2.3.3.1.3.4	SOP Specific Conformance for Basic Film Box SOP Class	21
3.2.3.3.1.3.5	SOP Specific Conformance for Basic Image Box SOP Class	21
3.2.3.3.4	Association Acceptance Policy	21
3.3	Network Interfaces	21
3.3.1	Physical Network Interface	21
3.3.2	Additional Protocols	21
3.3.3	IPv4 and IPv6 Support	22
3.4	Configuration	22
3.4.1	AE Title/Presentation Address Mapping	22

3.4.2 Parameters	22
4 Support of Extended Character Sets	23
5 Security	24
5.1 Security Profiles	24
5.2 Association Level Security	24
5.3 Application Leve Security	24

List of Tables

1.1	Overview of the network services provided by DICOM Printer.	1
2.1	Revision history of the DICOM Printer software.	6
2.2	Abbreviations and Acronyms.	8
2.3	Documents Referenced in this Conformance Statement.	10
3.1	SOP Classes used by Find SCU.	13
3.2	Application context name proposed by all AE's.	13
3.3	Number of Associations for Find SCU.	13
3.4	DICOM implementation class and version for all AE's.	13
3.5	Proposed presentation context for Find SCU.	14
3.6	Find SCU DICOM Command Response Status Handling Behaviour.	15
3.7	Find SCU DICOM Command Communication Failure Behaviour.	15
3.8	SOP Classes used by Store SCU.	16
3.9	Number of Associations for Store SCU.	16
3.10	Proposed presentation context for Store SCU.	18
3.11	Store SCU DICOM Command Response Status Handling Behaviour.	18
3.12	Store SCU DICOM Command Communication Failure Behaviour.	19
3.13	SOP Classes used by Print SCU.	19
3.14	Number of Associations for Print SCU.	19
3.15	Proposed presentation context for Print SCU.	20
3.16	Print SCU DICOM Command Response Status Handling Behaviour.	20
3.17	Print SCU DICOM Command Communication Failure Behaviour.	21
3.18	Configuration Parameters.	22

2 Introduction

Flux DICOM Printer (FDP) is a DICOM enabler, designed to fit into existing healthcare network infrastructure and add DICOM-compliant query and storage functionality to devices that presently lack this capability. As such, FDP permits the querying of remote data and associated remote storage of printed documents and images on an existing PACS. For this purpose, FDP utilizes the DICOM 3.0 protocol to perform both query and store operations against compliant devices.

2.1 Revision History

See Table 2.1.

Table 2.1: Revision history of the DICOM Printer software.

Version	Date	Changes
2.0 Beta	2008.08.16	First revision
2.0.0	2008.10.31	Implemented suspension for all AEs and added Modality Worklist Information Model - FIND support

2.2 Audience

This document is written for the people that need to understand how FDP will integrate into their healthcare facility. This includes both those responsible for overall imaging network policy and architecture, as well as integrators who need to have a detailed understanding of the DICOM features of the product. This document contains some basic DICOM definitions so that any reader may understand how this product implements DICOM features. However, integrators are expected to fully understand all the DICOM terminology, how the tables in this document relate to the product's functionality, and how that functionality integrates with other devices that support compatible DICOM features.

2.3 Remarks

The scope of this DICOM Conformance Statement is to facilitate integration between FDP and other DICOM products. The Conformance Statement should be read and understood in conjunction with the DICOM Standard. DICOM by itself does not guarantee interoperability.

The Conformance Statement does, however, facilitate a first-level comparison for interoperability between different applications supporting compatible DICOM functionality. This Conformance Statement is not supposed to replace validation with other DICOM equipment to ensure proper exchange of intended information. In fact, the user should be aware of the following important issues:

- The comparison of different Conformance Statements is just the first step towards assessing interconnectivity and interoperability between the product and other DICOM conformant equipment.

- Test procedures should be defined and executed to validate the required level of interoperability with specific compatible DICOM equipment, as established by the healthcare facility.

2.4 Definitions, Terms and Abbreviations

2.4.1 Definitions

Informal definitions for the following terms used in this Conformance Statement are provided below. The DICOM Standard is the authoritative source for formal definitions of these terms.

Abstract Syntax The information that is to be exchanged between applications, generally equivalent to a Service/Object Pair (SOP) Class. Examples: Verification SOP Class, Modality Worklist Information Model Find SOP Class, and Computed Radiography Image Storage SOP Class.

Application Entity (AE) An end point of a DICOM information exchange, including the DICOM network or media interface software; i.e., the software that sends or receives DICOM information objects or messages. A single device may have multiple Application Entities.

Application Entity Title The externally known name of an Application Entity, used to identify a DICOM application to other DICOM applications on the network.

Application Context The specification of the type of communication used between Application Entities. Example: DICOM network protocol.

Association A network communication channel set up between Application Entities.

Attribute A unit of information in an object definition; a data element identified by a tag. The information may be a complex data structure (Sequence) composed of lower level data elements. Examples: Patient ID (0010,0020), Accession Number (0008,0050), Photometric Interpretation (0028,0004), and Procedure Code Sequence (0008,1032).

Information Object Definition (IOD) The specified set of Attributes that comprise a type of data object; does not represent a specific instance of the data object, but rather a class of similar data objects that have the same properties. The Attributes may be specified as Mandatory (Type 1), required but possibly unknown (Type 2), or Optional (Type 3), and there may be conditions associated with the use of an Attribute (Types 1C and 2C). Examples: MR Image IOD, CT Image IOD, Print Job IOD.

Joint Photographic Experts Group (JPEG) A set of standardized image compression techniques, available for use by DICOM applications.

Media Application Profile The specification of DICOM information objects and encoding exchanged on removable media (e.g. CDs).

Module A set of Attributes within an Information Object Definition that are logically related to each other. Example: Patient Module includes Patient Name, Patient ID, Patient Birth Date, and Patient Sex.

Negotiation First phase of Association establishment that allows Application Entities to agree on the types of data to be exchanged and how that data will be encoded.

Presentation Context The set of DICOM network services used over an Association, as negotiated between Application Entities; includes Abstract Syntaxes and Transfer Syntaxes.

Protocol Data Unit (PDU) A packet (piece) of a DICOM message sent across the network. Devices must specify the maximum size packet they can receive for DICOM messages.

Security Profile A set of mechanisms, such as encryption, user authentication, or digital signatures, used by an Application Entity to ensure confidentiality, integrity, and/or availability of exchanged DICOM data.

Service Class Provider (SCP) Role of an Application Entity that provides a DICOM network service; typically, a server that performs operations requested by another Application Entity (Service Class User). Examples: Picture Archiving and Communication System (image storage SCP, and image query/retrieve SCP), Radiology Information System (modality worklist SCP).

Service Class User (SCU) Role of an Application Entity that uses a DICOM network service; typically, a client. Examples: imaging modality (image storage SCU, and modality worklist SCU), imaging workstation (image query/retrieve SCU).

Service/Object Pair (SOP) Class The specification of the network or media transfer (service) of a particular type of data (object); the fundamental unit of DICOM interoperability specification. Examples: Ultrasound Image Storage Service, Basic Grayscale Print Management.

Service/Object Pair (SOP) Instance An information object; a specific occurrence of information exchanged in a SOP Class. Examples: a specific x-ray image.

Tag A 32-bit identifier for a data element, represented as a pair of four digit hexadecimal numbers, the “group” and the “element”. If the “group” number is odd, the tag is for a private (manufacturer-specific) data element. Examples: (0010,0020) [Patient ID], (07FE,0010) [Pixel Data], (0019,0210) [private data element].

Transfer Syntax The encoding used for exchange of DICOM information objects and messages. Examples: JPEG compressed (images), Little Endian explicit value representation.

Unique Identifier (UID) A globally unique “dotted decimal” string that identifies a specific object or a class of objects; an ISO-8824 Object Identifier. Examples: Study Instance UID, SOP Class UID, SOP Instance UID.

Value Representation (VR) The format type of an individual DICOM data element, such as text, an integer, a person’s name, or a code. DICOM information objects can be transmitted with either explicit identification of the type of each data element (Explicit VR), or without explicit identification (Implicit VR); with Implicit VR, the receiving application must use a DICOM data dictionary to look up the format of each data element.

2.4.2 Abbreviations and Acronyms

TODO: This shouldn’t be longtable but a simple tabular. When the contents of the document is finished, get rid of unused acronyms.

Table 2.2: Abbreviations and Acronyms.

Abbreviation or Acronym	Definition
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Abbreviation or Acronym	Definition
AE	Application Entity
CDA	Clinical Document Architecture
CD-R	Compact Disk Recordable
CR	Computed Radiography
CT	Computed Tomography
DHCP	Dynamic Host Configuration Protocol
DICOM	Digital Imaging and Communications in Medicine
DIT	Directory Information Tree (LDAP)
DNS	Domain Name System
HIS	Hospital Information System
HL7	Health Level 7 Standard
IHE	Integrating the Healthcare Enterprise
IOD	Information Object Definition
IPv4	Internet Protocol version 4
IPv6	Internet Protocol version 6
ISO	International Organization for Standards
JPEG	Joint Photographic Experts Group
LUT	Look-up Table
MTU	Maximum Transmission Unit (IP)
MWL	Modality Worklist
OSI	Open Systems Interconnection
PACS	Picture Archiving and Communication System
PDU	Protocol Data Unit
RIS	Radiology Information System
SC	Secondary Capture
SCP	Service Class Provider
SCU	Service Class User
SOP	Service-Object Pair
SPS	Scheduled Procedure Step
TCP/IP	Transmission Control Protocol/Internet Protocol

2.5 References

The following documents are referenced in this conformance statement:

Table 2.3: Documents Referenced in this Conformance Statement.

Name	Description
Nema PS3	Digital Imaging and Communications in Medicine (DICOM) Standard, available free at http://medical.nema.org/

2.6 Basics of DICOM Communication

This section describes terminology used in this Conformance Statement for the non-specialist. The key terms used in the Conformance Statement are highlighted in italics below. This section is not a substitute for training about DICOM, and it makes many simplifications about the meanings of DICOM terms.

Two Application Entities (devices) that want to communicate with each other over a network using DICOM protocol must first agree on several things during an initial network “handshake”. One of the two devices must initiate an Association (a connection to the other device), and ask if specific services, information, and encoding can be supported by the other device (Negotiation).

DICOM specifies a number of network services and types of information objects, each of which is called an Abstract Syntax for the Negotiation. DICOM also specifies a variety of methods for encoding data, denoted Transfer Syntaxes. The Negotiation allows the initiating Application Entity to propose combinations of Abstract Syntax and Transfer Syntax to be used on the Association; these combinations are called Presentation Contexts. The receiving Application Entity accepts the Presentation Contexts it supports.

For each Presentation Context, the Association Negotiation also allows the devices to agree on Roles – which one is the Service Class User (SCU - client) and which is the Service Class Provider (SCP - server). Normally the device initiating the connection is the SCU, i.e., the client system calls the server, but not always.

The Association Negotiation finally enables exchange of maximum network packet (PDU) size, security information, and network service options (called Extended Negotiation information).

The Application Entities, having negotiated the Association parameters, may now commence exchanging data. Common data exchanges include queries for worklists and lists of stored images, transfer of image objects and analyses (structured reports), and sending images to film printers. Each exchangeable unit of data is formatted by the sender in accordance with the appropriate Information Object Definition, and sent using the negotiated Transfer Syntax. There is a Default Transfer Syntax that all systems must accept, but it may not be the most efficient for some use cases. The receiver explicitly acknowledges each transfer with a Response Status indicating success, failure, or that query or retrieve operations are still in process.

Two Application Entities may also communicate with each other by exchanging media (such as a CD-R). Since there is no Association Negotiation possible, they both use a Media Application Profile that specifies “pre-negotiated” exchange media format, Abstract Syntax, and Transfer Syntax.

2.7 How to use this document

This Conformance Statement consists of the following chapters:

3: Networking Consists of two main sections:

3.1: Implementation Model The first section describes the Implementation Model. It explains the functional relation between the device and the DICOM services. A DICOM service is implemented

on a device by a software process, which is called an “Application Entity” (AE). Each AE has a unique name called the “AE Title” which is used to identify it to other AEs. The AE Title is configurable to avoid two devices with the same name on a network. The “bubble diagram” (Application Data Flow Diagram) shows the interaction of the AE with the outside world across the dashed line, i. e. the DICOM interface. This Application Data Flow Diagram depicts graphically the relationship of the DICOM AE with local functions at the workstation as well as the relationship with external activities. One should compare this implementation model and its description with the model of the other devices that the DICOMscope software will connect to in order to determine connectivity.

3.2: AE Specifications Each AE supports one or more Service Object Pair (SOP) classes. A SOP class consists of a combination of an object or information model with specific DICOM services. An example of such a SOP class is the CT Image Storage Class, which consists of the combination of the DICOM C_STORE command with the CT image object. Each of these classes is uniquely identified by an Identification number (UID), which is issued by the NEMA. The role of the AE is specified, which can be a client or server (compare with a speaker or listener). In DICOM terms, this is called a Service Class User or Service Class Provider (SCU or SCP). In order to interconnect with another device, the SOP classes as well as their role (SCU or SCP) have to be matched, i. e. a SCU has to match a SCP at another device with an identical SOP class. Make sure to compare the UID itself, not the description because there are SOP classes which have the same name, but support a different (newer) object. Each SOP class supports a particular presentation context which is the combination of the SOP Class and the transfer syntax. The transfer syntax defines the encoding of the DICOM basic elements, i. e. its attributes and how the data is represented. The encoding of the data type, or Value Representation (VR), can be done in two ways – implicitly or explicitly. Explicit VR means that the transmitted data will include the VR information along with data and attribute tags. Implicit VR means the VR information will not be included, and the receiving application must determine the VR type from the Attribute Tag. In addition, the data can be communicated in the Little Endian (Intel) or Big Endian (Motorola, Sparc, MIPS) byte ordering. This means that for certain 16 bit words, the two 8 bit bytes might have to be swapped to be able to interpret the information by a different device. The transfer syntax of two devices have to match in order to communicate.

4: Support of Extended Character Sets DICOM supports a large number of character sets, including ASCII (the default), some of the ISO 8859 character sets for use with most European languages and a number of character sets for use in the Far East. This section of the conformance statement specifies the character sets that an implementation actually supports. The supported character sets should be compared carefully if extended character sets are to be used, since the inability of a system to handle extended characters might affect the way names and identifiers can be entered, displayed, queried etc.

3 Networking

3.1 Implementation model

3.1.1 Application Flow Diagram

3.1.2 Functional Definitions of AE's

3.1.2.1 Find SCU

The user activates Find SCU in order to query for matching studies or worklist against one or more remote AEs. Requests are always handled synchronously.

3.1.2.2 Store SCU

Store SCU is initiated by the user, and activated in the background, always synchronously, when the user requests that images to be sent to a remote AE, which is selected from a configured list. Store SCU will only make a single attempt at association; if it fails, then another user request is required to commence another attempt.

3.1.2.3 Print SCU

Print SCU is an application entity that implements the DICOM Print Management Service Class as an SCU. The user activates PRINT SCU when a request to produce a hardcopy is made. When the user requests a print to a particular printer, PRINT SCU attempts to spool the print job. If DICOM Printer is terminated, the print job will continue to be transmitted until it is completed or aborted.

3.1.3 Sequencing of Real-World Activities

All activities occur in the sequence defined by user in configuration file. However, in a typical use, Query will precede store or print, and the later two are generally mutually exclusive.

3.2 AE Specifications

3.2.1 Find SCU

3.2.1.1 SOP Classes

This application entity provides standard conformance to the DICOM SOP class given in Table 3.1.

3.2.1.2 Association Policies

3.2.1.2.1 General

The DICOM standard application context name, which is always proposed, is given in Table 3.2.

Table 3.1: SOP Classes used by Find SCU.

Name	UID	(SCU)	(SCP)
Patient Root Query/Retrieve Information Model	1.2.840.10008.5.1.4.1.2.1.1	Yes	No
Modality Worklist Information Model - FIND	1.2.840.10008.5.1.4.31	Yes	No

Table 3.2: Application context name proposed by all AE's.

Application Context Name	1.2.840.10008.3.1.1.1
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3.2.1.2.2 Number of Associations

Find SCU will only propose a single association. See Table 3.3.

Table 3.3: Number of Associations for Find SCU.

Maximum number of simultaneous Associations	1
---	---

3.2.1.2.3 Asynchronous Nature

Find SCU will only allow a single outstanding operation on an Association. Therefore, Find SCU will not perform asynchronous operations window negotiation.

3.2.1.2.4 Implementation Identifying Information

See Table 3.4.

Table 3.4: DICOM implementation class and version for all AE's.

Implementation Class UID	1.2.826.0.1.3680043.2.1635.0.1.0.1
Implementation Version Name	FLUX_DICOM_101

3.2.1.3 Association Initiation Policy

Find SCU attempts to initiate a new association when while performing user-defined workflow, processed job reaches query action.

3.2.1.3.1 Activity - Query

3.2.1.3.1.1 Description and Sequencing of Activities

A single attempt will be made to query the remote AE. If the query fails, for whatever reason, the query will be suspended for some time or discarded. The actual behaviour depends on user who specifies error handling strategy inside configuration file.

3.2.1.3.1.2 Proposed Presentation Contexts

The default behavior of the Print SCU is to propose for each of the supported SOP classes a single presentation context containing transfer syntaxes given in Table 3.5.

Table 3.5: Proposed presentation context for Find SCU.

Abstract Syntax		Transfer Syntax		Role	Extendent Negotiation
Name	UID	Name	UID		
See Table 3.1	See Table 3.1	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1	SCU	None
		Explicit VR Big Endian	1.2.840.10008.1.2.2	SCU	None

3.2.1.3.1.3 SOP Specific Conformance for Patient Root Query Retrieve Information Model SOP Class

Find SCU supports queries against all levels of Patient Root Query/Retrieve Information Model, i.e:

- Patient.
- Study.
- Series.
- Composite Object Instance.

However, the default query level is the Study and without explicit user declaration inside configuration file this one will be used.

3.2.1.3.1.3.1 Optional Keys

Find SCU supports all available Optional Keys at each level of the SOP Class. To get the full list of attributes, please see PS3.4.C.6.1.1.2-5.

3.2.1.3.1.3.2 Relational Queries

Find SCU does not generate relational queries.

3.2.1.3.1.3.3 Extended Negotiation

Find SCU does not support extended negotiation of combined date-time matching and/or fuzzy semantic matching of person names.

3.2.1.3.1.3.4 Specific Character Set

Find SCU does not make use of Specific Character Set when encoding queries and interpreting responses.

3.2.1.3.1.3.5 Response Behaviour

See Table 3.6.

Table 3.6: Find SCU DICOM Command Response Status Handling Behaviour.

Service Status	Further Meaning	Error Code	Behaviour
Success	—	0000	The query request is considered succesully finished, i.e. all matching identifiers has been succesfully retrieved.
Pending	—	FE0*	The query request is considered being evaulated. The service will retrieve response identifier and continue sending C-FIND request.
Failure	—	Other	The service will abort association. The status meaning will be logged and reported to the user.

3.2.1.3.1.3.6 Communication Failure

See Table 3.7.

Table 3.7: Find SCU DICOM Command Communication Failure Behaviour.

Exception	Behaviour
Timeout	The Association is aborted using A-ABORT and the query is marked as failed. The reason is logged and the job failure is reported to the user via the log file.
Association aborted by the SCP or network layers	The query is marked as failed. The reason is logged and the job failure is reported to the user via the log file.

3.2.1.3.1.4 SOP Specyfic Conformance for Modality Worklist Information Model - FIND SOP Class

3.2.1.3.1.4.1 Optional Keys

Find SCU may request matching on Optional Matching Key Attributes but only those which are not a part of any Sequence of Items. There is no arbitrary list of these attributes – the user provide one inside configuration file. Find SCU does not request Type 3 Return Key Attributes and supports none Templates for Protocol Context Sequence.

3.2.1.3.1.4.2 Person Name Matching

Find SCU does not support extendent negotiation of fuzzy semantic matching of person names.

3.2.1.3.1.4.3 Use of Specific Character Set

Find SCU does not make use of Specific Character Set (0008,0005) when encoding queries and interpreting responses.

3.2.1.4 Association Acceptance Policy

Find SCU does not accept associations.

3.2.2 Store SCU

3.2.2.1 SOP Classes

This application entity provides standard conformance to the DICOM SOP classes given in Table 3.8.

Table 3.8: SOP Classes used by Store SCU.

Name	UID	(SCU)	(SCP)
Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7	Yes	No

3.2.2.2 Association Policies

3.2.2.2.1 General

The DICOM standard application context name, which is always proposed, is given in Table 3.2.

3.2.2.2.2 Number of Associations

Store SCU will only propose a single association. See Table 3.9.

Table 3.9: Number of Associations for Store SCU.

Maximum number of simultaneous Associations	1
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3.2.2.2.3 Asynchronous Nature

Store SCU will only allow a single outstanding operation on an Association. Therefore, Store SCU will not perform asynchronous operations window negotiation.

3.2.2.2.4 Implementation Identifying Information

See Table 3.4.

3.2.2.3 Association Initiation Policy

Store SCU attempts to initiate a new association when while performing user-defined workflow, processed job reaches store action.

3.2.2.3.1 Activity - Send Images

3.2.2.3.1.1 Description and Sequencing of Activities

A single attempt will be made to store image contents in the remote AE. If the operation fails, the Store SCU may attempt to retry operation after being suspended for some time or abort it. The actual behaviour depends on user, who specifies that in configuration file.

3.2.2.3.1.2 Proposed Presentation Contexts

The default behavior of the Store SCU is to propose for each of the supported SOP classes a single presentation context containing the transfer syntaxes given in one of groups listed in Table 3.10. Particular group is determined by user's declaration inside configuration file.

3.2.2.3.1.3 SOP Specific Conformance for Secondary Capture Image Storage SOP Class

3.2.2.3.1.3.1 Extended Negotiation

Find SCU does not support extended negotiation.

3.2.2.3.1.3.2 Response Behaviour

See Table 3.11.

3.2.2.3.1.3.3 Communication Failure

See Table 3.12.

3.2.2.4 Association Acceptance Policy

Store SCU does not accept associations.

3.2.3 Print SCU

3.2.3.1 SOP Classes

This application entity provides standard conformance to the DICOM SOP classes given in Table 3.13.

Table 3.10: Proposed presentation context for Store SCU.

Abstract Syntax		Transfer Syntax		Role	Extendent Negotiation
Name	UID	Name	UID		
See Table 3.8	See Table 3.8	Implicit Little Endian	1.2.840.10008.1.2	SCU	None
		Explicit Little Endian	1.2.840.10008.1.2.1	SCU	None
		Explicit VR Big Endian	1.2.840.10008.1.2.2	SCU	None
See Table 3.8	See Table 3.8	Implicit Little Endian	1.2.840.10008.1.2	SCU	None
		Explicit Little Endian	1.2.840.10008.1.2.1	SCU	None
		Explicit VR Big Endian	1.2.840.10008.1.2.2	SCU	None
		RLE Compression	1.2.840.10008.1.2.5	SCU	None
See Table 3.8	See Table 3.8	Implicit Little Endian	1.2.840.10008.1.2	SCU	None
		Explicit Little Endian	1.2.840.10008.1.2.1	SCU	None
		Explicit VR Big Endian	1.2.840.10008.1.2.2	SCU	None
		JPEG lossy	1.2.840.10008.1.2.4.51	SCU	None
See Table 3.8	See Table 3.8	Implicit Little Endian	1.2.840.10008.1.2	SCU	None
		Explicit Little Endian	1.2.840.10008.1.2.1	SCU	None
		Explicit VR Big Endian	1.2.840.10008.1.2.2	SCU	None
		JPEG lossless 14 SV1	1.2.840.10008.1.2.4.70	SCU	None

Table 3.11: Store SCU DICOM Command Response Status Handling Behaviour.

Service Status	Further Meaning	Error Code	Behaviour
Success	—	0000	The store request is considered succesully finished and job is marked as completed.
Warning	—	B00*	Image transmission is considered succesfull but the status meaning is logged.
Failure	—	Other	The service will abort association. The status meaning will be logged and reported to the user.

3.2.3.2 Association Policies

3.2.3.2.1 General

The DICOM standard application context name, which is always proposed, is given in Table 3.2.

Table 3.12: Store SCU DICOM Command Communication Failure Behaviour.

Exception	Behaviour
Timeout	The Association is aborted using A-ABORT and the send job is marked as failed. The reason is logged and the job failure is reported to the user via the log file.
Association aborted by the SCP or network layers	The send job is marked as failed. The reason is logged and the job failure is reported to the user via the log file.

Table 3.13: SOP Classes used by Print SCU.

Name	UID	(SCU)	(SCP)
Basic Grayscale Print Management Meta	1.2.840.10008.5.1.1.9	Yes	No
Basic Color Print Management Meta	1.2.840.10008.5.1.1.18	Yes	No

3.2.3.2.2 Number of Associations

Print SCU will only propose a single association. See Table 3.14.

Table 3.14: Number of Associations for Print SCU.

Maximum number of simultaneous Associations	1
---	---

3.2.3.2.3 Asynchronous Nature

Print SCU will only allow a single outstanding operation on an Association. Therefore, Store SCU will not perform asynchronous operations window negotiation.

3.2.3.2.4 Implementation Identifying Information

See Table 3.4.

3.2.3.3 Association Initiation Policy

Print SCU attempts to initiate a new association when while performing user-defined workflow, processed job reaches store action.

3.2.3.3.1 Activity - Print

3.2.3.3.1.1 Description and Sequencing of Activities

A single attempt will be made to print image contents on the remote AE. If the operation fails, Find SCU may suspend the operation and attend to retry it after some time or just abort it. The actual behaviour depends on provided by user configuration file.

3.2.3.3.1.2 Proposed Presentation Contexts

The default behavior of the Print SCU is to propose for each of the supported SOP classes a single presentation context containing the transfer syntaxes given in Table 3.15.

Table 3.15: Proposed presentation context for Print SCU.

Abstract Syntax		Transfer Syntax		Role	Extendent Negotiation
Name	UID	Name	UID		
See Table 3.13	See Table 3.13	Implicit Little Endian	1.2.840.10008.1.2	SCU	None
		Explicit Little Endian	1.2.840.10008.1.2.1	SCU	None
		Explicit VR Big Endian	1.2.840.10008.1.2.2	SCU	None

3.2.3.3.1.3 SOP Specific Conformance

Following behaviour is applicable to all supported SOP Classes.

3.2.3.3.1.3.1 Response Behaviour

See Table 3.16.

Table 3.16: Print SCU DICOM Command Response Status Handling Behaviour.

Service Status	Further Meaning	Error Code	Behaviour
Success	—	0000	The request is considered succesully finished.
Warning	—	B0**	The request is considered succesfull but the status meaning is logged.
Failure	—	Other	The service will abort association. The status meaning will be logged and reported to the user.

3.2.3.3.1.3.2 Communication Failure

See Table 3.17.

Table 3.17: Print SCU DICOM Command Communication Failure Behaviour.

Exception	Behaviour
Timeout	The Association is aborted using A-ABORT and the query is marked as failed. The reason is logged and the job failure is reported to the user via the log file.
Association aborted by the SCP or network layers	The query is marked as failed. The reason is logged and the job failure is reported to the user via the log file.

3.2.3.3.1.3.3 SOP Specific Conformance for Basic Film Session SOP Class

Print SCU uses two DIMSE Service Elements:

- N-CREATE,
- N-ACTION.

Optional attributes for N-CREATE are those belonging to Basic Film Session Presentation Module and they are listed in PS3.3.C.13.1.

3.2.3.3.1.3.4 SOP Specific Conformance for Basic Film Box SOP Class

Print SCU uses only N-CREATE DIMSE Service Element. Optional attributes for N-CREATE are those belonging to Basic Film Box Presentation Module and they are listed in PS3.3.C.13.3.

3.2.3.3.1.3.5 SOP Specific Conformance for Basic Image Box SOP Class

Print SCU uses only N-SET DIMSE Service Element. Optional attributes for N-SET are those belonging to Basic Image Box Presentation Module and they are listed in PS3.3.C.13.5.

3.2.3.4 Association Acceptance Policy

Print SCU does not accept associations.

3.3 Network Interfaces

3.3.1 Physical Network Interface

The application is indifferent to the physical medium over which TCP/IP executes; which is dependent on the underlying operating system and hardware.

3.3.2 Additional Protocols

No additional protocols are supported.

3.3.3 IPv4 and IPv6 Support

This product supports both IPv4 and IPv6. It does not utilize any of the optional configuration identification or security features of IPv6.

3.4 Configuration

3.4.1 AE Title/Presentation Address Mapping

The Calling AE Title of the local application is configurable in the configuration file. The mapping of the logical name by which remote AEs are described to Called AE Titles as well as presentation address (hostname or IP address and port number) is also configurable in this file.

3.4.2 Parameters

See Table 3.18.

Table 3.18: Configuration Parameters.

Parameter	Configurable	Default Value
GENERAL PARAMETERS		
PDU Size	Yes	16 KB
Time-out waiting for acceptance or rejection Response to an Association Open Request. (Application Level timeout)	Yes	1 s
General DIMSE level time-out values	Yes	1 s
Time-out waiting for response to TCP/IP connect() request. (Low-level timeout)	No	None
Time-out waiting for acceptance of a TCP/IP message over the network. (Low-level timeout)	No	None
Time-out for waiting for data between TCP/IP packets. (Low-level timeout)	No	None
Any changes to default TCP/IP settings, such as configurable stack parameters.	No	None
AE SPECIFIC PARAMETERS (ALL AE'S)		
Size constraint in maximum object size	No	None
Maximum PDU size the AE can send	No	Unlimited
AE specific DIMSE level time-out values	Yes	1 s
Transfer Syntax support	Yes	All proposed
Other parameters that are configurable	No	None

4 Support of Extended Character Sets

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

5 Security

It is assumed that FDP is used within a secured environment. It is assumed that a secured environment includes at a minimum:

- Firewall or router protections to ensure that only approved external hosts have network access to FDP.
- Firewall or router protections to ensure that FDP only has network access to approved external hosts.
- Any communication with external hosts and services outside the locally secured environment use appropriate secure network channels (e.g. such as a Virtual Private Network (VPN)).

Other network security procedures such as automated intrusion detection may be appropriate in some environments. Additional security features may be established by the local security policy and are beyond the scope of this conformance statement.

5.1 Security Profiles

None supported.

5.2 Association Level Security

None supported.

5.3 Application Leve Security

None supported.