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PrintSCP DICOM Print Server

DICOM Conformance Statement

Version 9.0

Intended Audience

It is assumed that any readers of this document are familiar with the DICOM standard

Revision History

Revision	Comments	Date
9.0	Initial Version	April 2012

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1. Introduction

1.1 Overview

PrintSCP implements the necessary DICOM services to receive DICOM print jobs and DICOM Store objects, and provides an interface for printing the received data on any Windows™ printer.

1.2 Scope

This document is the PrintSCP Print Server conformance to the DICOM 3.0 Standard. This statement is intended for evaluating the integration and connection of PrintSCP with other DICOM compliant devices.

1.3 References

DICOM 3.0 Standard, Parts 1 through 14 (PS 3.1-PS3.14); 2009
PrintSCP User Manual.

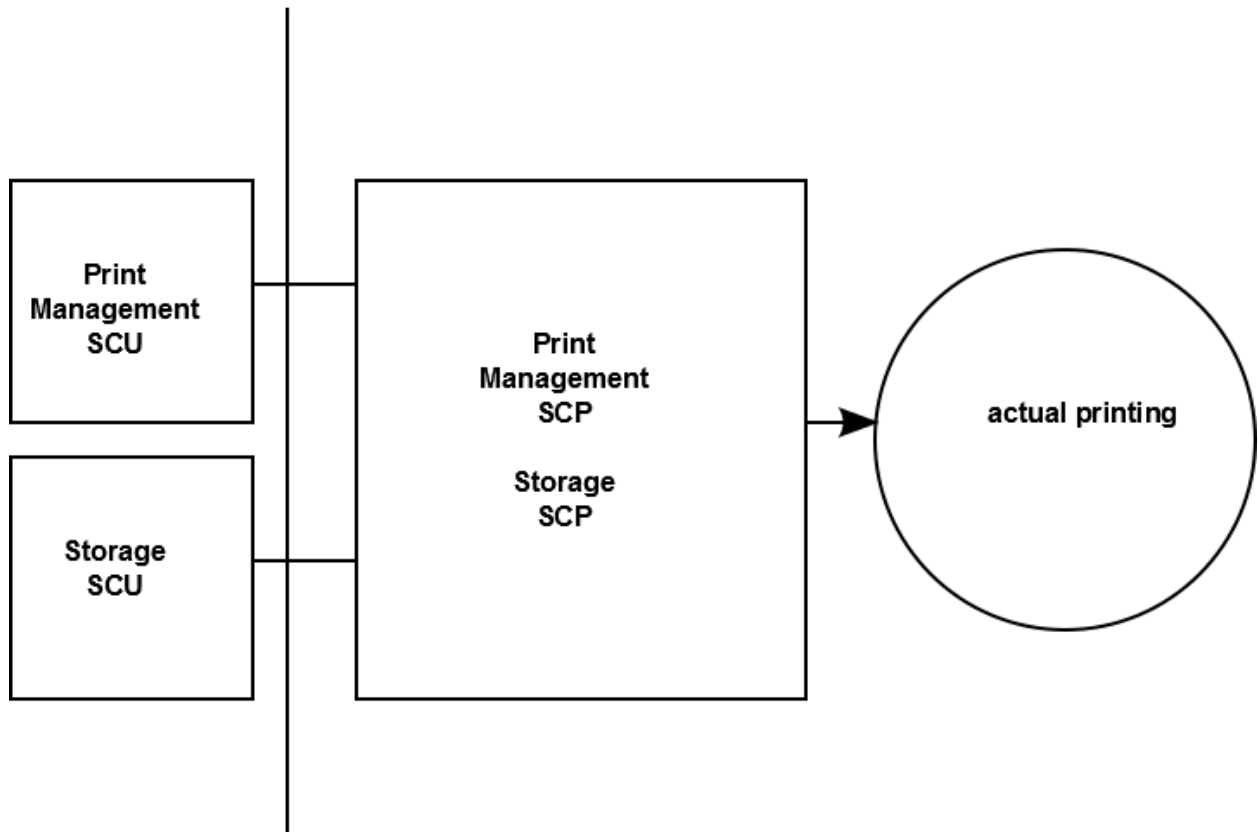
1.4 Definitions

AE Application Entity
AE-Title name of an AE
DICOM Digital Imaging and Communications in Medicine
IE Information Entity
IHE Integrating the Healthcare Enterprise
IOD Information Object Definition
PDU Protocol Data Unit
SCP Service Class Provider
SCU Service Class User
SOP Service Object Pair
TCP/IP Transmission Control Protocol / Internet Protocol
UID Unique Identifier
VM Value Multiplicity
VR Value Representation

2.0 Implementation Model

PrintSCP Print Server supports multiple Application Entities. Many DICOM Print SCUs and DICOM Store SCUs may concurrently initiate or maintain associations with PrintSCP.

2.1 Application Data Flow Diagram



2.2 Functional Definition of Application Entities

The Print Server waits for other Print SCU or Store SCU applications to connect at a specific TCP/IP port number. PrintSCP will accept associations with Presentation Context for the Print Management Service class and Store Service class.

2.3 Sequencing of Real-World Activities

A Film Session has to be created before one or more Film Boxes can be created. In turn the Film Box has to be created before one or more Image Boxes can be set.

3.0 AE Specifications

PrintSCP Print Server supports many Application Entities or AE.

3.1 AE Print Server – Specification

The Print Server provides Standard Conformance to the following DICOM 3.0:

SOP Class Name	SOP Class UID
Verification SOP Class	1.2.840.10008.1.1
Basic Grayscale Print Management Meta SOP Class	1.2.840.10008.5.1.1.9
Basic Color Print Management Meta SOP Class	1.2.840.10008.5.1.1.18
Presentation LUT SOP Class	1.2.840.10008.5.1.1.23
Storage Classes	
CR Image Storage	1.2.840.10008.5.1.4.1.1.1
CT Image Storage	1.2.840.10008.5.1.4.1.1.2
DX Image Storage (Presentation)	1.2.840.10008.5.1.4.1.1.1.1
MR Image Storage	1.2.840.10008.5.1.4.1.1.4
US Image Storage (Retired)	1.2.840.10008.5.1.4.1.1.6
US Image Storage	1.2.840.10008.5.1.4.1.1.6.1
SC Image Storage	1.2.840.10008.5.1.4.1.1.7
MG Storage (Presentation)	1.2.840.10008.5.1.4.1.1.1.2
NM Image Storage	1.2.840.10008.5.1.4.1.1.20
XA Image Storage	1.2.840.10008.5.1.4.1.1.12.1
RF Image Storage	1.2.840.10008.5.1.4.1.1.12.2
Standard PET Image	1.2.840.10008.5.1.4.1.1.128
Basic Text SR	1.2.840.10008.5.1.4.1.1.88.11

3.1.1 Association Establishment Policies

3.1.1.1 General

The maximum PDU size which can be transmitted by the Print Server is fixed at 16KB. The default maximum PDU size which can be received by the Print Server is configurable with a default value of 16KB and a maximum value of 32KB.

3.1.1.2 Number of Associations

PrintSCP can accept till 20 simultaneous associations. The Print Server will spawn a new process for each association request that it receives.

3.1.1.3 Asynchronous Nature

The Print Server does not support asynchronous operations and will not perform asynchronous window negotiation.

3.1.1.4 Implementation Identifying Information

The Print Server will provide an implementation class UID which is

1.2.826.0.1.3680043.2.1396.999.10

The Print Server will provide an Implementation version name of PrintSCP V9.0.

3.1.2 Association Initiation Policy

The Print Server does not initiate any associations.

3.1.3 Association Acceptance Policy

PrintSCP will accept any association regardless the called AE Title matches or not the PrintSCP AE Title. Also it is not requested that the calling AE Title be known by PrintSCP.

3.1.3.1 Presentation Context Table

Abstract Syntax		Transfer Syntax	Role	Extended Negotiation
Name	UID			
Verification	1.2.840.10008.1.1	1.2.840.10008.1.2 1.2.840.10008.1.2.1	SCP	None
Basic Grayscale Print Management Meta SOP Class	1.2.840.10008.5.1.9	1.2.840.10008.1.2 1.2.840.10008.1.2.1	SCP	None
Basic Color Print Management Meta SOP Class	1.2.840.10008.5.1.18	1.2.840.10008.1.2 1.2.840.10008.1.2.1	SCP	None
Basic Film Session SOP Class	1.2.840.10008.5.1.1	1.2.840.10008.1.2 1.2.840.10008.1.2.1	SCP	None
Basic Film Box SOP Class	1.2.840.10008.5.1.2	1.2.840.10008.1.2 1.2.840.10008.1.2.1	SCP	None
Basic Grayscale Image Box SOP Class	1.2.840.10008.5.1.4	1.2.840.10008.1.2 1.2.840.10008.1.2.1	SCP	None
Basic Color Image Box SOP	1.2.840.10008.5.1.4.1	1.2.840.10008.1.2 1.2.840.10008.1.2.1	SCP	None

Class				
Printer SOP Class	1.2.840.10008.5.1.16	1.2.840.10008.1.2 1.2.840.10008.1.2.1	SCP	None
Storage Classes				None
CR Image Storage	1.2.840.10008.5.1.4.1.1.1	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.4. 70 1.2.840.10008.1.2.4. 50 1.2.840.10008.1.2.4. 90	SCP	None
CT Image Storage	1.2.840.10008.5.1.4.1.1.2	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.4. 70 1.2.840.10008.1.2.4. 50 1.2.840.10008.1.2.4. 90	SCP	None
DX Image Storage (Presentation)	1.2.840.10008.5.1.4.1.1.1.1	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.4. 70 1.2.840.10008.1.2.4. 50 1.2.840.10008.1.2.4. 90	SCP	None
MR Image Storage	1.2.840.10008.5.1.4.1.1.4	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.4. 70 1.2.840.10008.1.2.4. 50 1.2.840.10008.1.2.4. 90	SCP	None
US Image Storage (Retired)	1.2.840.10008.5.1.4.1.1.6	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.4. 70 1.2.840.10008.1.2.4. 50 1.2.840.10008.1.2.4. 90	SCP	None
US Image Storage	1.2.840.10008.5.1.4.1.1.6.1	1.2.840.10008.1.2 1.2.840.10008.1.2.1	SCP	None

		1.2.840.10008.1.2.4.70 1.2.840.10008.1.2.4.50 1.2.840.10008.1.2.4.90		
SC Image Storage	1.2.840.10008.5.1.4.1.1.7	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.4.70 1.2.840.10008.1.2.4.50 1.2.840.10008.1.2.4.90	SCP	None
MG Storage (Presentation)	1.2.840.10008.5.1.4.1.1.1.2	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.4.70 1.2.840.10008.1.2.4.50 1.2.840.10008.1.2.4.90	SCP	None
NM Image Storage	1.2.840.10008.5.1.4.1.1.2.0	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.4.70 1.2.840.10008.1.2.4.50 1.2.840.10008.1.2.4.90	SCP	None
XA Image Storage	1.2.840.10008.5.1.4.1.1.1.2.1	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.4.70 1.2.840.10008.1.2.4.50 1.2.840.10008.1.2.4.90	SCP	None
RF Image Storage	1.2.840.10008.5.1.4.1.1.1.2.2	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.4.70 1.2.840.10008.1.2.4.50 1.2.840.10008.1.2.4.90	SCP	None
Standard PET	1.2.840.10008.5.1.4.1.1.1	1.2.840.10008.1.2	SCP	None

Image	28	1.2.840.10008.1.2.1 1.2.840.10008.1.2.4. 70 1.2.840.10008.1.2.4. 50 1.2.840.10008.1.2.4. 90		
Basic Text SR	1.2.840.10008.5.1.4.1.1.8 8.11	1.2.840.10008.1.2 1.2.840.10008.1.2.1	SCP	None

3.1.3.2 SOP Specific Conformance for Basic Film Session SOP Class

The following DIMSE services are supported:

N-CREATE
N-ACTION
N-DELETE

3.1.3.2.1 N-CREATE

Tag	Name	Value
(2000, 0010)	Number of Copies	1 to 32787, default is 1
(2000, 0030)	Medium Type	Ignored
(2000, 0040)	Film Destination	Ignored

3.1.3.2.2 N-ACTION

The SCP will return one of the following status codes for N-ACTION:

Code	Status	Comment
0x0000	Success	Film Session was successfully printed
0x0112	Failure	Not such SOP instance
0x0213	Failure	Resource Limitation

3.1.3.2.3 N-DELETE

The SCP will return one of the following status codes for N-DELETE:

Code	Status	Comment
0x0000	Success	Film Session was successfully deleted
0x0112	Failure	Not such SOP instance

3.1.3.3 SOP Specific Conformance for Basic Film Box SOP Class

The following DIMSE services are supported:

N-CREATE

N-DELETE

N-ACTION

3.1.3.3.1 N-CREATE

Tag	Name	Value
(2010, 0010)	Image Display Format	STANDARD\1,1 STANDARD\1,2 STANDARD\2,1 STANDARD\2,2 STANDARD\2,3 STANDARD\2,4 STANDARD\3,2 STANDARD\3,3 STANDARD\3,4 STANDARD\3,5 STANDARD\4,3 STANDARD\4,4 STANDARD\4,5 STANDARD\4,6 STANDARD\5,3 STANDARD\5,4 STANDARD\5,5 STANDARD\5,6 STANDARD\5,7
(2010, 0040)	Film Orientation	PORTRAIT LANDSCAPE
(2010, 0050)	Film Size ID	14INX17IN 14INX14IN 14INX36IN 11INX17IN 8INX10IN 8_5INX11IN 8_5INX28IN 24CMX24CM 24CMX30CM A4 A3
(2010, 0060)	Magnification Type	BILINEAR
(2010, 0100)	Border Density	BLACK WHITE
(2010, 0110)	Empty Image Density	BLACK WHITE
(2010, 0120)	Min Density	Default is 0
(2010, 0130)	Max Density	Default is 150
(2010, 015E)	Illumination	Default is 150

3.1.3.3.2 N-ACTION

The SCP will return one of the following status codes for N-ACTION:

Code	Status	Comment
0x0000	Success	Film Box was successfully printed
0x0112	Failure	Not such SOP instance
0x0213	Failure	Resource Limitation

3.1.3.3.3 N-DELETE

The SCP will return one of the following status codes for N-DELETE:

Code	Status	Comment
0x0000	Success	Film Box was successfully deleted
0x0112	Failure	Not such SOP instance

3.1.3.4 SOP Specific Conformance for Basic Grayscale Image Box SOP Class

The following DIMSE services are supported:
N-SET

Tag	Name	Value
(2020,0010)	Image Position	
(2020,0020)	Polarity	NORMAL or REVERSE
(2020,0030)	Requested Image Size	Width (x-dimension) in mm of the image to be printed. This is typically used for "true size" printing.
(2010,0060)	Magnification Type	Ignored. Always BILINEAR
(2010,0080)	Smoothing Type	Ignored
(2020,0110)	Basic Grayscale Image Sequence	
(0028,0002)	>Samples Per Pixel	1
(0028,0004)	>Photometric Interpretation	MONOCHROME1 MONOCHROME2
(0028,0010)	>Rows	
(0028,0011)	>Columns	
(0028,0100)	>Bits Allocated	8, 16
(0028,0101)	>Bits Stored	8, 10, 12
(0028,0102)	>High Bit	7, 9, 11
(0028,0103)	>Pixel Representation	0
(7FE0,0010)	>Pixel Data Mandatory	

The SCP will return one of the following status codes for N-SET:

Code	Status	Comment
0x0000	Success	Image Box was successfully set
0x0110	Failure	Processing failure

3.1.3.5 SOP Specific Conformance for Basic Color Image Box SOP Class

The following DIMSE services are supported:

N-SET

Tag	Name	Value
(2020,0010)	Image Position	
(2020,0020)	Polarity	NORMAL or REVERSE
(2010,0060)	Magnification Type	Ignored. Always BILINEAR
(2010,0080)	Smoothing Type	Ignored
(2020,0110)	Basic Grayscale Image Sequence	
(0028,0002)	>Samples Per Pixel	1
(0028,0004)	>Photometric Interpretation	RGB
(0028,0006)	>Planar Configuration	0 or 1
(0028,0010)	>Rows	
(0028,0011)	>Columns	
(0028,0100)	>Bits Allocated	8
(0028,0101)	>Bits Stored	8
(0028,0102)	>High Bit	7
(0028,0103)	>Pixel Representation	0
(7FE0,0010)	>Pixel Data Mandatory	

The SCP will return one of the following status codes for N-SET:

Code	Status	Comment
0x0000	Success	Image Box was successfully set
0x0110	Failure	Processing failure

3.1.3.6 SOP Specific Conformance for Presentation LUT SOP Class

The following DIMSE services are supported:

N-CREATE

The attributes of N-CREATE are shown in the following table:

Tag	Name	Value
(2050,0010)	Presentation LUT Sequence	
(0028,3002)	>LUT Descriptor	
(0028,3003)	>LUT Explanation	

(0028,3006)	>LUT Data	
(2050,0020)	Presentation LUT Shape	IDENTITY, INVERSE, LIN OD

Presentation LUT SOP class support depends on the configuration settings.

3.1.4 Storage SOP Class processing.

When receiving Storage SOP class objects a special processing is done to output them as if they were a Print class association.

For each new Storage association a Film session is created, then new Film boxes are created according to the following criteria:

- From 1 to 3 images, 1x1 Film boxes are created and print.
- For 4 images, one 2x2 Film box is created and print.
- For 5 or 6 images, one 2x3 Film box is created and print.
- From 7 and on, many 4x3 Film boxes are created and print.

For images received through the Store service Film Size ID is "8INX10IN" for Structured Reports and "14INX17IN" for image objects. Film Orientation is "PORTRAIT".

3.1.5 JPEG Printer

The application has a special printer called "JPEG", when selecting this printer the final result will be a jpeg image saved at the "filmbox" folder within the application folder. Each AET will have its folder and the images will be saved with a timestamp.

4 Communication Profiles

4.1 TCP/IP Stack

The Print Server provides DICOM V3.0 TCP/IP Network Communication Support as defined in Part 8 of the DICOM Standard.

4.1.1 TCP/IP API

The Print Server uses the TCP/IP stack from the Windows system upon which it executes. It uses a subroutine library that is based on a Berkeley socket interface.

4.1.2 Physical Media Support

The Print Server exists as a software application on a Windows operating system. As such, it places no restrictions on the physical network. The Print Server uses TCP/IP over Ethernet.

5 Extensions/Specializations/Privatizations

Not applicable