



***Kodak DirectView PACS***  
**Storage Service Class Provider (SSCP) 4.2.1**  
***for Windows***

**DICOM V3.0 Conformance Statement**

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# 1 Introduction

This document describes DICOM V3.0 functions and services implemented by the *DirectView* PACS NT DICOM SSCP 4.2.1 product. This document can also serve as a Requirements Statement for connecting these products with products from other vendors through DICOM V3.0; other vendors should review this document before making those connections. This software provides DICOM Verification and Storage services.

## 1.1 Scope and Field of Application

This document is the DICOM Conformance Statement for *DirectView* PACS NT DICOM SSCP 4.2.1. The purpose of this document is to describe how *DirectView* PACS NT uses DICOM to accomplish its purposes.

## 1.2 References

Digital Imaging and Communications in Medicine, DICOM V3.0.

National Electrical Manufacturers Association (NEMA) Rosslyn, Virginia, USA.  
Publication is ongoing through the advent of supplements and correction proposals.  
<http://medical.nema.org/dicom.html>.

## 1.3 Definitions

All terms that are used in this document are defined in the DICOM Standard.

## 1.4 Symbols and Abbreviations

All symbols and abbreviations that are used in this document are documented in the DICOM Standard.

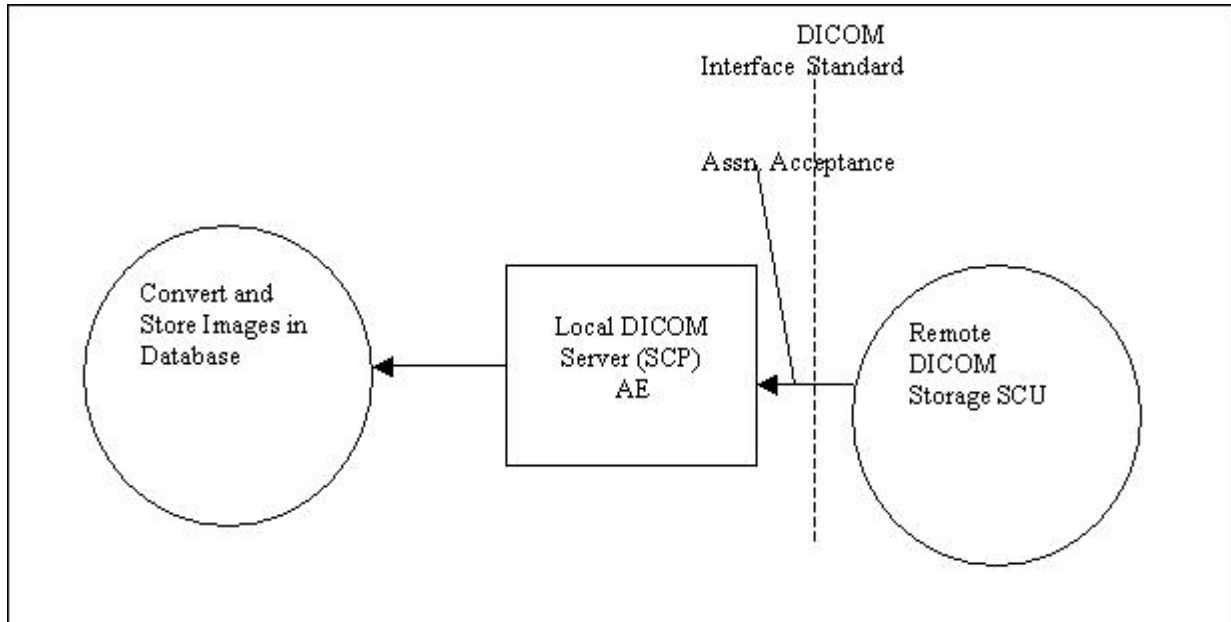
# 2 Implementation Model

The DICOM V3.0 Storage product is implemented to receive (import) DICOM Information Objects with DICOM communication protocols.

Receiving (Import) software allows a system to receive images or studies sent from other DICOM workstations. Receiving software conforms to DICOM V3.0 SCP Protocols.

## 2.1 Application Data Flow Diagram

The Application Data Flow Diagram, showing the Application Entities (AE) relationship to Real World Activities, is shown in Figure 1.



**Figure 1. Implementation Model**

The Local DICOM SSCP Server AE is a background process that runs from System Power-up until the system is powered down. When an association request is received, Local DICOM Server checks disk space for incoming images, and saves received images to disk files in ASFF 2.0 file format. These ASFF study files will be sent to the Study Server via NT NFS.

The *DirectView* PACS DICOM SSCP 4.2.1 is a *Windows*-based product. It can run on a separate machine or together with Workgroup Server 4.2.1 or *DirectView* workstation 4.2.1. More than one DICOM SSCP 4.2.1 Server can run simultaneously on a machine to receive data from different communication ports at the same time. In case of multiple servers running at the same time, they have to share system resources, so the performance of the system will be degraded as compared with the performance on a single server system.

Most of the time, DICOM SSCP 4.2.1 will preserve the original DICOM information. Original Private information can also be preserved, if known to the SSCP 4.2.1. Private attributes of each third party DICOM source can be set in SSCP 4.2.1 Configuration mode.

Figures 2 and 3 show the various components of this product and illustrate the networking environment for the system.

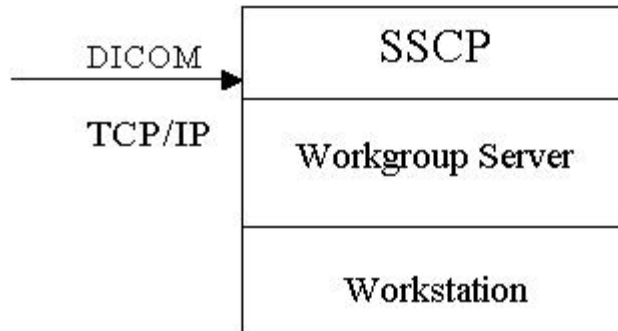


Figure 2. SSCP Local with Display

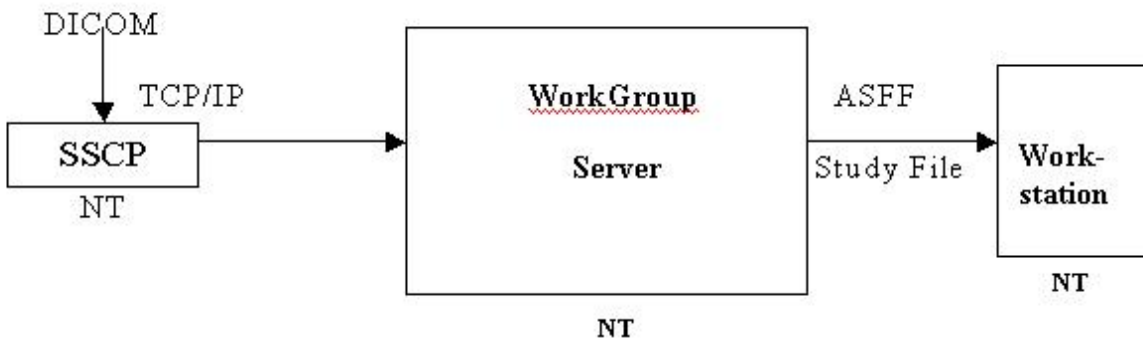


Figure 3. Standalone SSCP Configuration

## 2.2 DICOM SSCP AE

### 2.2.1 Functional Definitions

DICOM SSCP Server AE supports the following functions:

- Negotiates and accepts DICOM association requests.

- Checks for disk space, receives, converts and stores images to disk files.
- Requests study files be added to *DirectView* PACS database.

### 2.2.2 Sequencing of Real World Activities - Image Receive

- Responds to DICOM association initiation.
- Selects appropriate Abstract Transfer Syntaxes specified below.
- Checks for available disk space.
- Responds to C-STORE request.
- Converts DICOM stream into ASFF 2.0 study file format.
- Requests Study Server to add new study to *DirectView* PACS database

## 3 AE Specifications

### 3.1 DICOM SSCP Server AE Specification

DICOM SSCP Server AE provides Standard Conformance to the following DICOM V3.0 SOP Classes as an SCP:

**Table 1. Storage SOP Class**

SOP Class Name	SOP Class UID
Computed Radiography 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
Ultrasound Multi-frame Image Storage (Retired)	1.2.840.10008.5.1.4.1.1.3
Ultrasound Multi-frame Image Storage	1.2.840.10008.5.1.4.1.1.3.1
MR Image Storage	1.2.840.10008.5.1.4.1.1.4
Nuclear Medicine Image Storage (Retired)	1.2.840.10008.5.1.4.1.1.5
Ultrasound Image Storage (Retired)	1.2.840.10008.5.1.4.1.1.6
Ultrasound Image Storage	1.2.840.10008.5.1.4.1.1.6.1
Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7
X-Ray Angiographic Image Storage	1.2.840.10008.5.1.4.1.1.12.1
X-Ray Radiofluoroscopic Image Storage	1.2.840.10008.5.1.4.1.1.12.2
X-Ray Angiographic Image Bi-plane Storage (Retired)	1.2.840.10008.5.1.4.1.1.12.3

Nuclear Medicine Image Storage	1.2.840.10008.5.1.4.1.1.20
Digital X-Ray Image Storage - For Presentation	1.2.840.10008.5.1.4.1.1.1.1
Digital Mammography X-Ray Image Storage - For Presentation	1.2.840.10008.5.1.4.1.1.1.2
Digital Intra-oral X-Ray Image Storage - For Presentation	1.2.840.10008.5.1.4.1.1.1.3
Verification (Echo)	1.2.840.10008.1.1

### 3.1.1 Association Establishment Policy

#### 3.1.1.1 General

DICOM SSCP Server AE recognizes the following Application Context Name:

**Table 2. Application Context Name**

DICOM V3.0 Application Context Name	1.2.840.10008.3.1.1.1
-------------------------------------	-----------------------

The PDU length is set to 1MB. This information is checked at the time of association negotiation to ensure the proposed maximum length falls within the defined range.

#### 3.1.1.2 Number of Associations

DICOM SSCP Server AE can accept one association at a time.

#### 3.1.1.3 Asynchronous Nature

Asynchronous mode is not supported. All operations are performed synchronously.

#### 3.1.1.4 Implementation Identifying Information

The Implementation UID allows unique identification of a set of products that share the same implementation. The Implementation UID for this Implementation is:

**Table 3. Implementation UID Name**

Verification and Storage Implementation UID	1.2.840.113674
Implementation Version Name	OAKyyyymmddW
	Where yyyymmdd is the date of

	the software build.
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### 3.1.2 Association Initiation by Real World Activity

DICOM SSCP Server (SCP) never initiates an association.

### 3.1.3 Association Acceptance by Real-World Activity

DICOM SSCP Server SCP accepts an association when it receives a valid association request from a DICOM Storage SCU. A valid association request may be rejected if there is not enough available disk space.

#### 3.1.3.1 Real World Activity

DICOM SSCP Server SCP continuously waits for association requests.

##### 3.1.3.1.1 Associated Real World Activity

DICOM V3.0 SSCP 4.0 waits for the arrival of an association request from a Storage SCU. Upon receipt of the C-STORE request, the association is negotiated. Upon completion of a successful negotiation, the image is received, sorted, converted, and stored in the database.

##### 3.1.3.1.2 Accepted Presentation Context

DICOM SSCP Server will accept all of the Presentation Contexts shown in Table 4.

**Table 4. Acceptable Presentation Context Table**

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name List	UID List		
CR Image Storage	1.2.840.10008.5.1.4.1.1.1	Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1	SCP	None

		Explicit VR Big Endian	1.2.840.10008.1.2.2	SCP	None
		JPEG Extended	1.2.840.10008.1.2.4.51	SCP	None
		JPEG Lossless, Non-Hierarchical (Process 14)	1.2.840.10008.1.2.4.57	SCP	None
CT Image Info Object	1.2.840.10008.5.1.4.1.1.2	Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1	SCP	None
		Explicit VR Big Endian	1.2.840.10008.1.2.2	SCP	None
		JPEG Extended	1.2.840.10008.1.2.4.51	SCP	None
		JPEG Lossless, Non-Hierarchical (Process 14)	1.2.840.10008.1.2.4.57	SCP	None
Ultrasound Multi-frame Image Storage (Ret)	1.2.840.10008.5.1.4.1.1.3	Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1	SCP	None
		Explicit VR Big Endian	1.2.840.10008.1.2.2	SCP	None
Ultrasound Multi-frame Image Storage	1.2.840.10008.5.1.4.1.1.3.1	Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1	SCP	None
		Explicit VR Big Endian	1.2.840.10008.1.2.2	SCP	None

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name List	UID List		
MR Image Info		Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None

Object	1.2.840.10008.5.1.4.1.1.4	Explicit VR Little Endian	1.2.840.10008.1.2.1	SCP	None
		Explicit VR Big Endian	1.2.840.10008.1.2.2	SCP	None
		JPEG Extended	1.2.840.10008.1.2.4.51	SCP	None
		JPEG Lossless, Non- Hierarchical (Process 14)	1.2.840.10008.1.2.4.57	SCP	None
Nuclear Medicine Image Storage (Ret)	1.2.840.10008.5.1.4.1.1.5	Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1	SCP	None
		Explicit VR Big Endian	1.2.840.10008.1.2.2	SCP	None
Ultrasound Image Storage (Ret)	1.2.840.10008.5.1.4.1.1.6	Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1	SCP	None
		Explicit VR Big Endian	1.2.840.10008.1.2.2	SCP	None
Ultrasound Image Storage	1.2.840.10008.5.1.4.1.1.6.1	Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1	SCP	None
		Explicit VR Big Endian	1.2.840.10008.1.2.2	SCP	None
SC Image Info Object	1.2.840.10008.5.1.4.1.1.7	Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1	SCP	None
		Explicit VR Big Endian	1.2.840.10008.1.2.2	SCP	None
		JPEG Extended	1.2.840.10008.1.2.4.51	SCP	None
		JPEG Lossless, Non- Hierarchical (Process 14)	1.2.840.10008.1.2.4.57	SCP	None

**Presentation Context Table**

Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name List	UID List		

X-Ray Angiographic Image Storage	1.2.840.10008.5.1.4.1.1.12.1	Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1	SCP	None
		Explicit VR Big Endian	1.2.840.10008.1.2.2	SCP	None
X-Ray Radiofluoroscopic Image Storage	1.2.840.10008.5.1.4.1.1.12.2	Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1	SCP	None
		Explicit VR Big Endian	1.2.840.10008.1.2.2	SCP	None
X-Ray Angiographic Image Bi-plane Storage (Retired)	1.2.840.10008.5.1.4.1.1.12.3	Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1	SCP	None
		Explicit VR Big Endian	1.2.840.10008.1.2.2	SCP	None
Nuclear Medicine Image Storage	1.2.840.10008.5.1.4.1.1.20	Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1	SCP	None
		Explicit VR Big Endian	1.2.840.10008.1.2.2	SCP	None
Digital X-Ray Image Storage - For Presentation	1.2.840.10008.5.1.4.1.1.1.1	Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1	SCP	None
		Explicit VR Big Endian	1.2.840.10008.1.2.2	SCP	None
Digital Mammography X-Ray Image Storage - For Presentation	1.2.840.10008.5.1.4.1.1.1.2	Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1	SCP	None
		Explicit VR Big Endian	1.2.840.10008.1.2.2	SCP	None
Digital Intra-oral X-Ray Image Storage - For Presentation	1.2.840.10008.5.1.4.1.1.1.3	Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1	SCP	None
		Explicit VR Big Endian	1.2.840.10008.1.2.2	SCP	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1	SCP	None
<b>Presentation Context Table</b>					
<b>Abstract Syntax</b>		<b>Transfer Syntax</b>		<b>Role</b>	<b>Extended Negotiation</b>

Name	UID	Name List	UID List		
Verification	1.2.84010008.1.1	Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1	SCP	None
		Explicit VR Big Endian	1.2.840.10008.1.2.2	SCP	None

## 3.2 SOP Specific Conformance to Storage SOP Classes

### 3.2.1 Error and Status Handling

This application will return a response with a successful status value of zero except when the local host is low on disk space. This application considers the local host low on disk space if it determines that there is less than 100 megabytes available. If DICOM SSCP Server is unable to accept an association from a DICOM Storage SCU, it updates the status window with error messages

The following table lists the behavior of DIMSE C-Store service specific status codes.

**Table 5. C-Store Response Status**

Code	Status	Meaning
Success	0000	Storage was completed successfully
Warning	B000	Data element coercion has taken place
	B007	Data set does not match
	B006	Unsupported elements were discarded
Error	A900	Data set does not conform to Patient IE
	A901	Data set does not conform to Study IE
	A902	Data set does not conform to Series IE
	A903	Data set does not conform to Image IE
	C000	Cannot Understand
Refused	A700	Memory resources temporarily not available
	A701	Database temporarily not available
	A702	Out of Resources. Low disk space
	0122	SOP Class not supported

Failed	0211	Unrecognized operation on this association
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### 3.2.2 Presentation Context Acceptable Criterion

DICOM SSCP Server accepts any number of Presentation Contexts listed in the Acceptable Presentation Context Table. It rejects requests from applications not listed in the configuration file. It also rejects an association request if the system runs out of disk space at that time.

### 3.2.3. Implementation Specific Behavior

This application performs the following actions:

1. All group length attributes (gggg, 0000) are discarded.
2. All private attributes except Kodak Health Imaging private tag group's 0x0019 and 0x0029 that have not been configured to be retained are discarded.
3. Window center and window width will be modified, if forced through configuration settings.
4. No transfer syntax except Implicit VR Little Endian will be accepted if forced to receive only Implicit VR Little Endian transfer syntax through configuration.
5. Association timer is hard coded to 120 seconds.
6. The value of all attributes in the SOP Instance whose Value Representation is Date (DA) and the value does not conform to the definition of the Value Representation, are discarded. Note: An additional constraint is placed on the year component. A year is considered valid only if it is in the year range [1880,2099] inclusive.

### 3.2.4 Transfer Syntax Policies

DICOM SSCP Server supports multiple transfer syntax. It rejects any proposed Presentation Context, which does not contain any supported transfer syntaxes listed in the Presentation Context Table 4.

## 4 Communication Profiles

### 4.1 Supported Communication Stacks (Parts 8, 9)

DICOM Upper Layer (Part 8) is supported using TCP/IP.

### 4.2 OSI Stack

OSI stack is not supported.

### 4.3 TCP/IP Stack

The TCP/IP stack is inherited from a UNIX Operating System.

#### 4.3.1 API

Not applicable to this product.

#### 4.3.2 Physical Media Support

DICOM is indifferent to the physical medium over which TCP/IP executes (e.g., Ethernet V2.0 IEEE 802.3, ATM, FDDI).

### 4.4 Point-to-Point Stack

Not applicable to this product.

## 5 Configuration

### 5.1 Configurable Parameters

The following fields are configurable for the AE (local):

- Local AE Title
- Listening TCP/IP Port (port 3002 is default port number)
- Local IP Address

Storage on local or remote folders:

The following fields are configurable for every remote DICOM AE:

- Remote AE Title

- Remote IP Address
- Window/Level based on modality and body part
- Private groups and elements

## 5.2 Support of Extended Character Sets

European extended character sets are supported.

## 5.3 Kodak Health Imaging Private Tags

The following private tag sequences must be configured in the *DirectView* PACS 4.2.1 SSCP to store the Annotation Sequence from either *Kodak* Archive Manager or Kodak SSCU.

Annotation Sequence	(0x0029, 0x1020)	3	1	SQ
Annotation Sequence	(0x0029, 0x1090)	3	1	SQ