



DICOM

Conformance Statement

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Laurent Lussier

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Disclaimer

GVIMD's DICOM software complies with ACR-NEMA standard 3.0, but due to the broad range of the standard each user must perform testing to verify this DICOM package meets the requirements of your configuration. This testing must include all types of data (datasets) which are intended to be used.

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2. INTRODUCTION

2.1. Overview

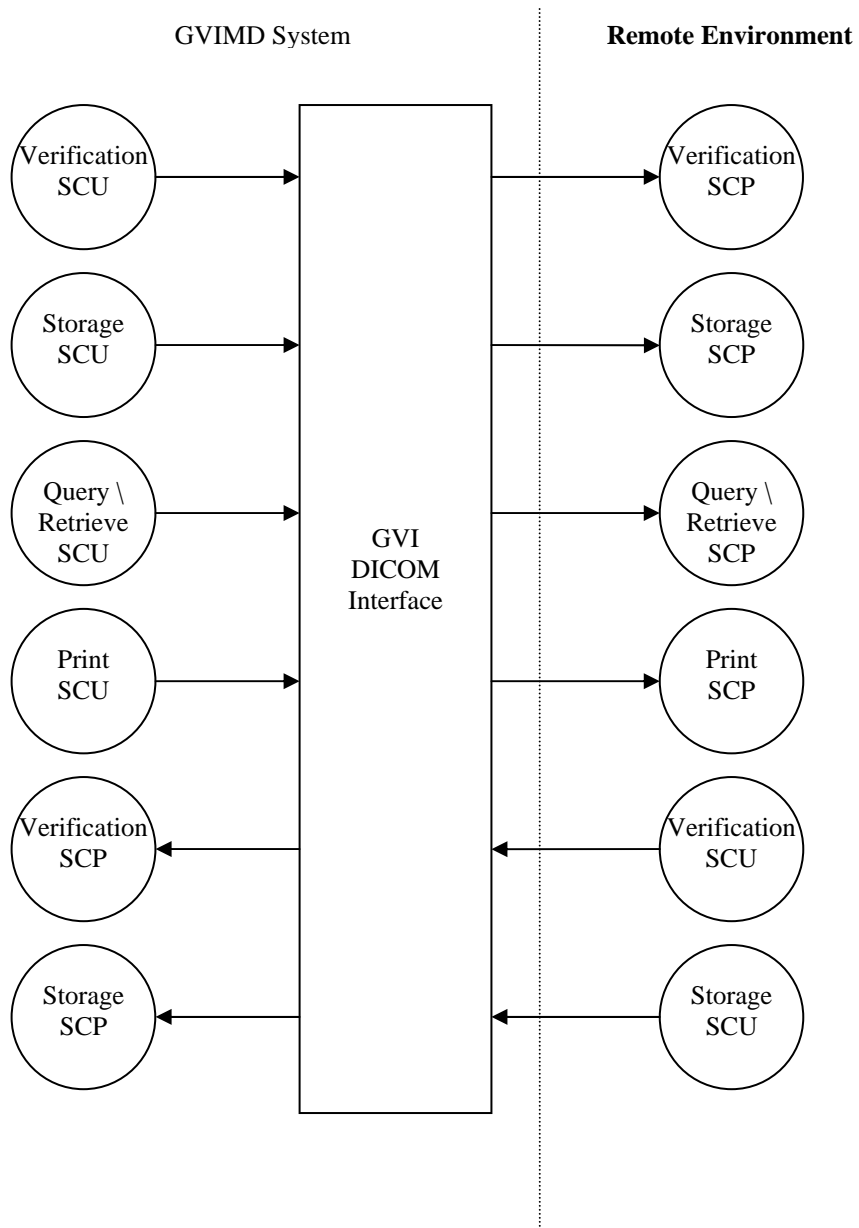
This conformance statement describes GVIMD’s implementation of the DICOM 3.0 standard.

2.2. Intended Audience

The reader of this document should be familiar with the DICOM concepts and terminology.

2.3. Data Flow Implementation

The basic application models are depicted below:



2.4. Application Entity Specifications

This application entity provides the following DICOM v3.0 SOP service classes:

SCU	
SOP Class Name	SOP Class UID
<i>ECHO</i>	
Verification - ECHO	1.2.840.10008.1.1
<i>STORAGE</i>	
Nuclear Medicine Image Storage	1.2.840.10008.5.1.4.1.1.20
Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7
<i>QUERY / RETRIEVE</i>	
Patient Root Query/Retrieve Information Model - FIND	1.2.840.10008.5.1.4.1.2.1.1
Patient Root Query/Retrieve Information Model - MOVE	1.2.840.10008.5.1.4.1.2.1.2
Study Root Query/Retrieve Information Model - FIND	1.2.840.10008.5.1.4.1.2.2.1
Study Root Query/Retrieve Information Model - MOVE	1.2.840.10008.5.1.4.1.2.2.2
Patient/Study Only Query/Retrieve Information Model - FIND	1.2.840.10008.5.1.4.1.2.3.1
Patient/Study Only Query/Retrieve Information Model - MOVE	1.2.840.10008.5.1.4.1.2.3.2
<i>PRINT</i>	
Printer SOP Class	1.2.840.10008.5.1.1.17
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 Color Image Box SOP Class	1.2.840.10008.5.1.1.4.1

SCP	
SOP Class Name	SOP Class UID
<i>ECHO</i>	
Verification - ECHO	1.2.840.10008.1.1
<i>STORAGE</i>	
Nuclear Medicine Image Storage	1.2.840.10008.5.1.4.1.1.20

2.5. Associations Establishment Policies

The maximum length PDU negotiation included in all associations establishment requests is: **16KBytes**.

The GVI Implementation UID is: **1.3.6.1.4.1.14522**

The number of simultaneous associations is limited only by the kernel parameters underlying the TCP/IP implementation.

All operations are performed synchronously (the asynchronous mode is not supported).

This DICOM v3.0 implementation supports the following Transfer Syntax within any Proposed Presentation Context:

UID Name	UID Value	Extended Negotiation
Implicit VR Little Endian	1.2.840.10008.1.2	None

2.6. Private Attributes

GVI's processing data is implemented within the NM Image Storage SOP Class guidelines. The goal of the Query/Retrieve & NM Storage implementations is to provide archive capabilities with PACS.

In order to support full fidelity transfers: all the GVI demographic data is encoded with the usage of both standard and private attributes (the complete demographic information is encoded in private tags).

2.7. Configuration

System configuration is completed via GUI interface.

3. SERVICE CLASSES

3.1. Verification

The Verification service class is implemented as both **USER** and **PROVIDER**. It is a tool to assess the status of the basic DICOM configuration between two stations.

Note: this Verification SCP does validate the identity of the remote user AE Title.

3.2. Storage

3.2.1. NM Modality

The NM Storage service class is implemented as both **USER** and **PROVIDER**. As stated earlier, this service class provides the means to archive GVI's nuclear medicine objects with full fidelity.

3.2.1.1. DICOM IODs

The support of the NM Image IOD Modules is implemented with respect to the following data types: **STATIC**

TOMO

GATED TOMO

RECON TOMO

RECON GATED TOMO

3.2.1.1.1. Standard Attributes

The following table depicts the NM standard attributes encoded in a DICOM object:

Name	Tag	Comment
<i>Patient Module</i>		
Patient's Name	0010,0010	
Patient ID	0010,0020	
Patient's Birth Date	0010,0030	
Patient's Sex	0010,0040	
<i>General Study Module</i>		
Study Instance UID	0020,000D	
Study Date	0008,0020	
Study Time	0008,0030	
Referring Physician's Name	0008,0090	
Study ID	0020,0010	
Accession Number	0008,0050	
<i>General Series Module</i>		
Series Instance UID	0020,000E	
Modality	0008,0060	"NM"
Series Number	0020,0011	
Series Description	0008,103E	
<i>General Equipment</i>		
Manufacturer	0008,0070	"GVI"
Institution Name	0008,0080	""
Manufacturer's Model Name	0008,1090	"OnePass"
<i>General image Module</i>		

Name	Tag	Comment
Image Type	0000,0008	“DERIVED\PRIMARY\TYPE\EMISSION” Where TYPE can be: STATIC TOMO GATED TOMO RECON TOMO RECON GATED TOMO
Instance Number	0020,0013	1
Patient Orientation	0020,0020	“”
<i>Image Pixel Module</i>		
Samples Per Pixel	0028,0002	1
Photometric Interpretation	0028,0004	“MONOCHROME2”
Rows	0028,0010	
Columns	0028,0011	
Bits Allocated	0028,0100	16
Bits Stored	0028,0101	16
High Bit	0028,0102	15
Pixel Representation	0028,0103	0
Planar Configuration	0028,0006	0
Pixel Aspect Ratio	0028,0034	“ 1 1 ”
Pixel Data	7FE0,0010	
<i>Multi-Frame Module</i>		
Number Of Frames	0028,0008	
<i>NM Multi-Frame Module</i>		
Frame Increment Pointer	0028,0009	
Energy Window Vector	0054,0010	For: STATIC TOMO GATED TOMO
Number of Energy Windows	0054,0011	
Detector Vector	0054,0020	For: STATIC TOMO GATED TOMO
Number of Detectors	0054,0021	
Rotation Vector	0054,0050	For: TOMO GATED TOMO
Number of Rotations	0054,0051	
R-R Interval Vector	0054,0060	For: GATED TOMO RECON GATED TOMO
Number of R-R Intervals	0054,0061	
Time Slot Vector	0054,0070	For: GATED TOMO RECON GATED TOMO
Number of Time Slots	0054,0071	
Slice Vector	0054,0080	For: RECON
Number of Slices	0054,0081	
Angular View Vector	0054,0090	For: TOMO GATED TOMO RECON GATED TOMO

Name	Tag	Comment
<i>Common SOP Module</i>		
SOP Instance UID	0008,0018	
SOP Class UID	0008,0016	

3.2.1.1.2. Specialized Attributes

The following table depicts the NM standard attributes encoded in a DICOM object:

Name	Tag	Comment
<i>NM TOMO Acquisition Module</i> (for TOMO, GATED TOMO and RECON GATED TOMO)		
Rotation Information Sequence	0054,0052	
>Start Angle	0054,0200	
>Angular Step	0018,1144	
>Rotation Direction	0018,1140	
>Scan Arc	0018,1143	
>Actual Frame Duration	0018,1242	
>Radial Position	0018,1142	
>Number of Frames in Rotation	0054,0053	
Type of Detector Motion	0054,0202	STEP AND SHOOT
<i>NM Multi-gated Acquisition Module</i> (for GATED TOMO and RECON GATED TOMO)		
Beat Rejection Flag	0018,1080	“Y”
Skip Beats	0018,1086	
Heart Rate	0018,1088	
Gated Information Sequence	0054,0062	(1 sequence)
>Data Information Sequence	0054,0063	(1 sequence)
>>Nominal Interval	0018,1062	Sum of time intervals divided by number of accepted beats
>>Low R-R Value	0018,1081	
>>High R-R Value	0018,1082	
>>Intervals Acquired	0018,1083	
>>Intervals Rejected	0018,1084	Number of short, long and skipped beats
<i>NM Reconstruction Acquisition Module</i> (for RECON TOMO and RECON GATED TOMO)		
Spacing Between Slices	0018,0088	

3.2.1.1.3. LISTMODE

There is no DICOM equivalency for this type of nuclear medicine dataset.

In order to satisfy the archiving requirements: a DICOM STATIC object is used as a template, with the corresponding mandatory attributes implemented. In addition to the standard attributes, all of the original GVI demographic information, as well as the image

data, are encoded in private attributes. For the sole purpose of compliance: the “Pixel Data” attribute (7FE0,0010) contains a rainbow generated image.

CAUTION: The LISTMODE derivative cannot be used for review analysis on a DICOM viewer application.

3.2.1.2. DICOM IODs: Private Attributes

The usage of private attributes is for archive purposes only, and is exclusively used by GVI applications.

3.2.2. SC Modality

The SC Storage service class is implemented on the **USER** side only (a GVI platform exports Secondary Captures, it does not receive them). No private attributes are used in this modality.

The following table depicts the SC standard attributes encoded in a DICOM object:

Name	Tag	Comment
<i>Patient Module</i>		
Patient's Name	0010,0010	
Patient ID	0010,0020	
Patient's Birth Date	0010,0030	
Patient's Sex	0010,0040	
<i>General Study Module</i>		
Study Instance UID	0020,000D	
Study Date	0008,0020	
Study Time	0008,0030	
Referring Physician's Name	0008,0090	
Study ID	0020,0010	
Accession Number	0008,0050	“”
<i>General Series Module</i>		
Series Instance UID	0020,000E	
Modality	0008,0060	“NM”
Series Number	0020,0011	
Series Description	0008,103E	
<i>General Equipment</i>		
Manufacturer	0008,0070	“GVI”
Institution Name	0008,0080	“”
Manufacturer's Model Name	0008,1090	“OnePass”
<i>SC Equipment Module</i>		
Conversion Type	0008,0064	“WSD”
<i>General image Module</i>		
Image Type	0000,0000	“”
Instance Number	0020,0013	
Patient Orientation	0020,0020	“”
<i>Image Pixel Module</i>		
Samples Per Pixel	0028,0002	1
Photometric Interpretation	0028,0004	“RGB”
Rows	0028,0010	

Name	Tag	Comment
Columns	0028,0011	
Bits Allocated	0028,0100	8
Bits Stored	0028,0101	8
High Bit	0028,0102	7
Pixel Representation	0028,0103	0
Planar Configuration	0028,0006	0
Pixel Aspect Ratio	0028,0034	“1 1”
Pixel Data	7FE0,0010	
<i>Multi-Frame Module</i>		
Number Of Frames	0028,0008	
Frame Increment Pointer	0028,0009	
<i>SC Multi-Frame Module</i>		
Burned in Annotations	0028,0301	“NO”
<i>SC Multi-Frame Vector Module</i>		
Frame Time Vector	0018,1065	
<i>Common SOP Module</i>		
SOP Instance UID	0008,0018	
SOP Class UID	0008,0016	

3.3. Query/Retrieve

The Query/Retrieve service class is implemented on the **USER** side only (a GVI platform allows the user to fetch archived data; it does not allow a remote station to import objects).

The query attributes are defined in the \$DICOMDIR/config/QueryAttributes.txt file. This text file contains the default query attributes used in the FIND action, and can be modified in order to add/remove attributes for any level of the query.

In addition to the actual query and retrieve procedures, a user interface is provided in order to allow the user to:

- Set the SCU query attributes for **wild card matching**:
 - Explicitly request GVI data (the value of the appropriate UID attribute is automatically filled with the GVI implementation class UID appended with the * wildcard). This feature is an “on/off” option.
 - Specify any non-UID attribute value (the usage of wildcard(s) must be compatible with the remote query SCP).
- Set a **range of date** and/or **range of time** (as defined by the standard).
- Set **single value matching** (as defined by the standard).
- Specify the **query information model** (**PATIENT ROOT**, **STUDY ROOT** (default) or **PATIENT / STUDY ONLY**).

The following table depicts the default query attributes encoded in a DICOM FIND object:

Name	Tag	Comment
<i>Patient Level</i>		
Patient's Name	0010,0010	
Patient ID	0010,0020	

Patient's Birth Date	0010,0030	
Patient's Sex	0010,0040	
<i>Study Level</i>		
Study Instance UID	0020,000D	
Study Date	0008,0020	
Study Time	0008,0030	
Referring Physician's Name	0008,0090	
Study ID	0020,0010	
Accession Number	0008,0050	
<i>Series Level</i>		
Series Instance UID	0020,000E	
Modality	0008,0060	
Series Description	0008,103E	
<i>Image Level</i>		
SOP Instance UID	0008,0018	
Image Type	0008,0008	

3.4. Print Management

The Print Management service class is implemented on the **USER** side only.

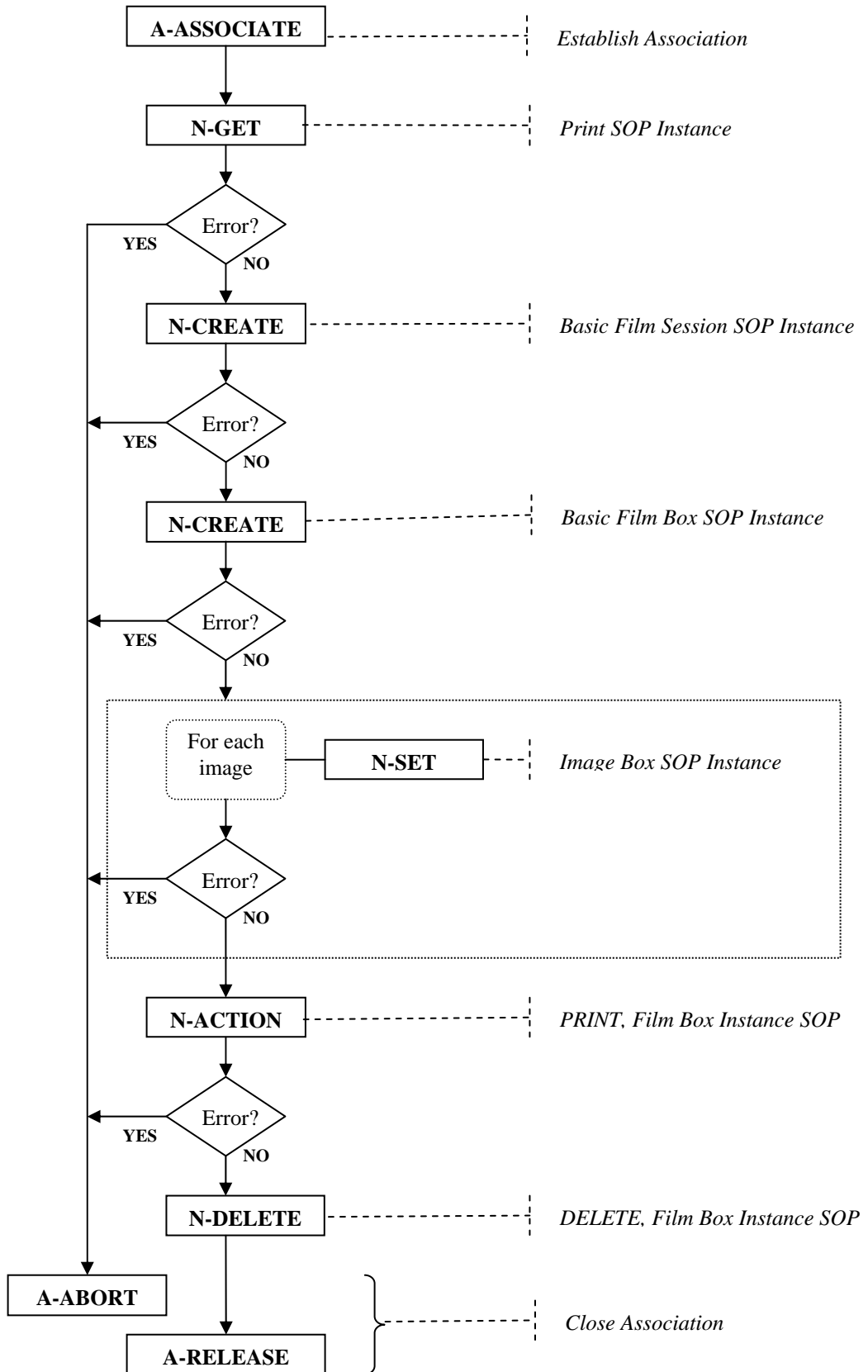
Two basic services are implemented:

- Printer status request.
- Print request.

The "Printer status request" consists of an N-GET Print SOP Instance.

The "Print request" is depicted in the following diagram:

PRINT MANAGEMENT DATA FLOW MODEL - (SCU)



The following table depicts the attributes encoded in the N-EVENT objects:

Name	Tag	Comment
<i>Print SOP Instance (N-GET event)</i>		
Execution Status		
Execution Status Info		
Print Priority		
Printer Name		
Originator		
Manufacturer		For "Printer status request" only
Manufacturer's Model Name		For "Printer status request" only
Device Serial Number		For "Printer status request" only
Software Versions		For "Printer status request" only
Date of Last Calibration		For "Printer status request" only
Time of Last Calibration		For "Printer status request" only
<i>Basic Film Session SOP Instance (N-CREATE event)</i>		
Number of Copies		
Print Priority		Default value: "LOW"
Medium Type		Default value: "PAPER"
Film Destination		
<i>Basic Film Box SOP Instance (N-CREATE event)</i>		
Film Orientation		"PORTRAIT" (default) or "LANDSCAPE"
Image Display Format		In PORTRAIT mode: "STANDARD\1,1" (1on1 layout) "STANDARD\1,2" (2on1 layout) "STANDARD\2,2" (4on1 layout) "STANDARD\2,3" (6on1 layout) In LANDSCAPE mode: "STANDARD\1,1" (1on1 layout) "STANDARD\2,1" (2on1 layout) "STANDARD\2,2" (4on1 layout) "STANDARD\3,2" (6on1 layout)
Referenced Film Session Sequence		
>Referenced SOP Class UID		
>Referenced SOP Instance UID		
Film Size ID		Default value: "10Inx12IN"
Magnification Type		Default value: "CUBIC"
Smoothing Type		Default value: "NONE"
Border Density		Default value: "BLACK"
Empty Image Density		Default value: "BLACK"
Trim		Default value: "NO"
<i>Image Box SOP Instance (N-SET event)</i>		

Name	Tag	Comment
Image Position		
Basic Color Image Sequence		
>Samples Per Pixel		3
>Photometric Interpretation		"RGB"
>Planar Configuration		0
>Rows		
>Columns		
>Pixel Aspect Ratio		1\1
>Bits Allocated		8
>Bits Stored		8
>High Bit		7
>Pixel Representation		0
>Pixel Data		
<i>PRINT Film Box Instance (N-ACTION event)</i>		
Referenced Print Job Sequence		
>Referenced SOP Class UID		
>Referenced SOP Instance UID		
<i>DELETE Film Box Instance (N-DELETE event)</i>		
Referenced Print Job Sequence		
>Referenced SOP Class UID		
>Referenced SOP Instance UID		

4. APPENDIX A – GLOSSARY

ACR	American College of Radiology
DICOM	Digital Imaging and Communication in Medicine
GVIMD	GVI Medical Devices
IOD	Information Object Definition
MUGA	Multi-Gated Acquisition
NEMA	National Electrical Manufacturers Association
NM	Nuclear Medicine
PACS	Patient Archive Communication System
PDU	Protocol Data Unit
RGB	Red Green Blue
SC	Secondary Capture
SCP	Service Class Provider (server)
SCU	Service Class User (client)
SOP	Service Object Pair
TCP/IP	Transmission Control Protocol/Internet Protocol
UID	Unique Identification
WSD	Workstation